US Ink's Press Doctor

US INK

Presents

PRESS DOCTOR 2002

A Web Offset Newspaper Guide
Written and Designed By
Dennis Cheeseman

press return

US Ink A Division of Sun Chemical Corporation

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Welcome

Welcome to PRESS DOCTOR before we move into the Press Doctor program, you may wish to examine the license agreement, which covers use of this software. Simply select the highlighted link and then press returns. If you are interested in the philosophy and aims of Press Doctor, please select information Otherwise select proceed for the next stage. Experienced or previous users can select The Trouble Shooting Menu at this stage to go straight into the fast-track search routine.

How is a Newspaper Printed

Newspapers are printed by several different processes. All of these processes have several features in common. They are printed at high speeds, up to 70,000 copies per hour. They are all dried by absorption of ink into the newsprint. All newspapers are printed on rotary printing presses using a moving web of newsprint. To produce a newspaper there are multiple printing presses using several webs of newsprint. These multiple webs are fed through a complex system of guide rollers into a folding unit, which combines the webs and yields the newspaper we see everyday.

The major printing processes utilized are Lithography, Letterpress, Di-Litho, and Flexography. We will look at each of these processes individually.

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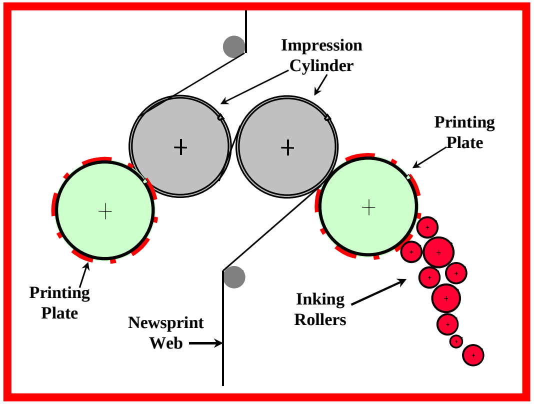
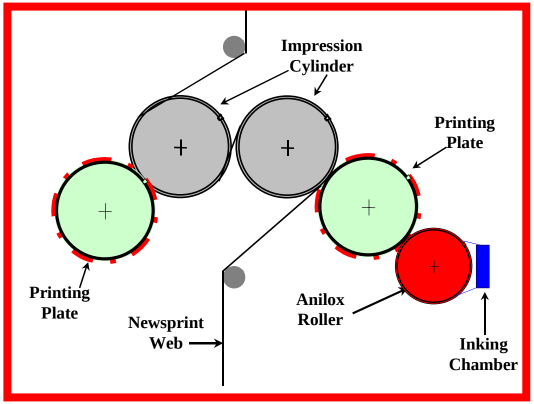
Letterpress



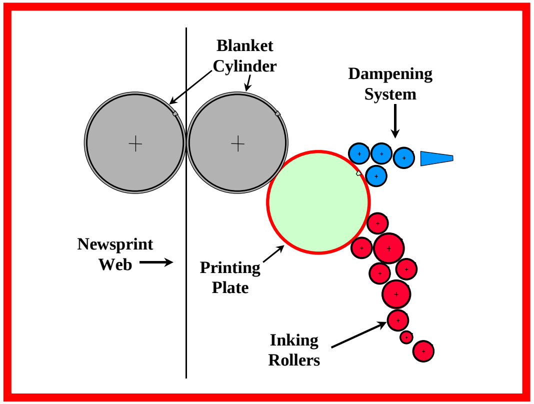
The letterpress printing process utilizes a rotary press with a raised image area printing plate. The printing ink is transferred from a series of inking rollers onto the raised areas of the plate. The image is then transferred to the newsprint. This is an older type of printing technology, which is being phased out as the equipment is replaced. The letterpress printing process depends greatly on high impression setting in order to print smooth and uniformly. The impression cylinder is covered with a hard rubber material that can withstand numerous impressions. The printing of the two sides of the web is done inline at different times.

Flexography



The flexographic printing process is similar to the letterpress process in that it utilizes a raised printing surface plate. The flexographic plate is typically softer than the letterpress plate. This process utilizes a water-based ink, which is metered onto the printing plate by an engraved or anilox cylinder. This anilox cylinder has a uniform engraving pattern, which allows a specific volume of ink to be transferred to the printing plate. The anilox cylinder has a scraper (doctor) blade that removes any excess ink from the anilox cylinder and returns it to the ink fountain. The image is then transferred directly from the printing plate onto the surface of the newsprint. This process requires a "kiss" impression for uniform printing.

Lithography (Offset)



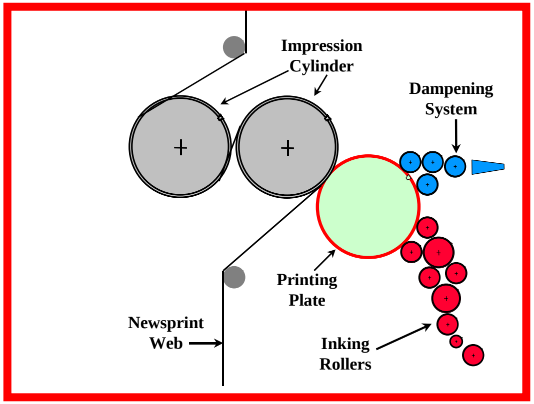
The lithographic printing process is the most commonly used process in producing today's newspaper. The process of lithography uses a planographic (flat) printing plate. This plate has two areas, which are chemically different. The non-printing or non-image area is hydrophilic or water loving. The image area is hydrophobic or not water receptive. In this printing process both an oil-based ink and a water-based fountain solution are applied to the printing plate. The fountain solution wets the non-image area of the plate while the ink wets the image area.

The ink is applied to the printing plate through a series of rollers. These rollers serve to thin the ink film so the proper amount is applied to the plate. The fountain solution can be applied in several different ways: the solution can be sprayed on, transferred from a high-speed brush or by a molleten or sock roller.

There is an old saying that oil and water do not mix, but as these materials are applied to the plate the chemistry of the plate is insufficient to separate the materials to their respective areas. These materials need to interact with each other so that the proper printing characteristics are achieved. The ink needs to emulsify the fountain solution so that it can properly wet the image area. If the ink does not have this capacity, the ink will not transfer uniformly to the plate. The fountain solution needs to have some detergency capacity so that it can wash out any ink that is deposited in the non-image areas. As the proper transfer of materials is complete, the ink is transferred to a blanket cylinder. The blanket cylinder is usually covered with a compressible blanket material. (See the role of the blanket in offset printing for more information.) This blanket cylinder then transfers the image to the newsprint. This process is usually blanket to blanket printing, with both sides of the web printed simultaneously.

Di-Litho

The process of Di-Litho or Direct Lithography uses the lithographic printing process, however the image is transferred directly from the printing plate onto the surface of the paper. This system is typically found in newspapers that have converted a letterpress printing press to utilize a lithographic printing plate.



To better understand the differences in the raised plate type of technologies versus the planographic plates, the following photomicrographs show these plates.

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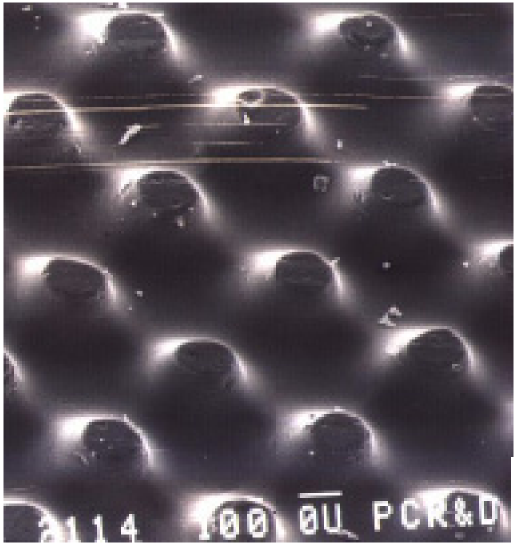

Letter Press Plate

Lithographic Plate

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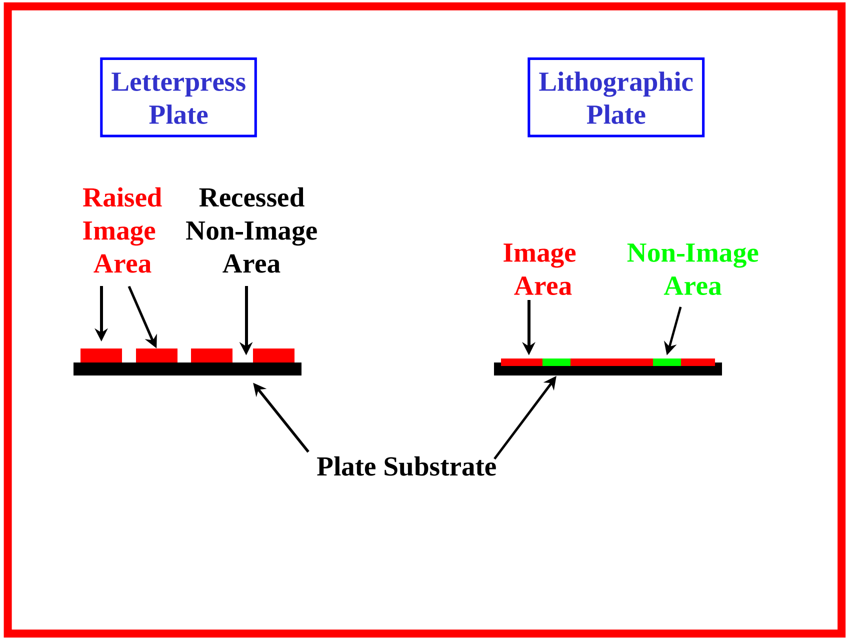
The following schematic drawings show a cross sectional view of the printing plates.



This section is a generalization of the types of printing processes for newspapers. Various manufacturers of printing presses utilize different designs for their presses. The intention of this section is to give an overview of the processes so that one can contrast the differences.

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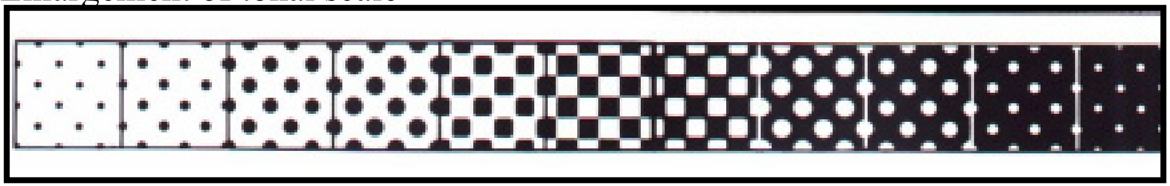
How is a Color Photograph Reproduced

To reproduce a color photograph in newspaper printing the newspaper uses a four-color printing process. This process separates the color photograph into four primary colors, Black, Cyan, Magenta, and Yellow with dots of varying sizes. These dots are then overprinted to achieve the variety of colors we see in the finished product. We will look at these steps in greater detail.

In traditional print production, a halftone is produced by placing a halftone screen between a piece of film and the image and then exposing the film. The film would be exposed through large industrial cameras. To produce color photographs, the halftone needs to be exposed through different color filters and different halftone screens to achieve the four-color separation.

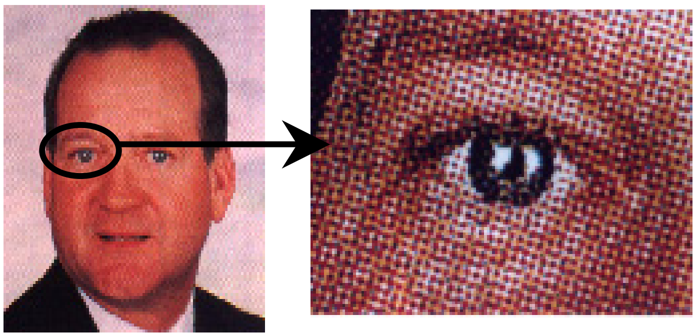
In today's world, the original artwork or photograph is analyzed on an electronic scanner. This scanner transforms the image into a digital format. Software is used to modify and enhance the image. The digital image now can be separated into its primary colors. Each of the four colors now can be converted into a series of dots. The dot size depends on the intensity of the color in each portion of the original image. The tonal range is shown below. The size of the dot increases from 0 to 50%, when the tonal scale reaches this point, the dot reverses and the non-image area becomes smaller as the tonal curves reaches 100%. The dots are small enough so that the eye sees the reproduction as a continuous tone. In a typical newspaper production, an 85-line screen is used. What this means is that there are 85 rows of dots in both the horizontal and vertical per square inch of screen.

Enlargement of tonal scale



HIGHLIGHTS MIDTONES SHADOWS

The following shows a halftone and photomicrograph showing the use of different tonal size dots



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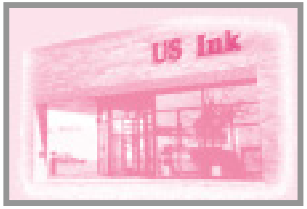
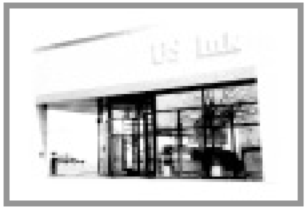
The following shows the four-color separations and their final result

Cyan Printer



Magenta Printer

Yellow Printer



Black Printer

Cyan & Magenta Printers

Cyan, Magenta, & Yellow Printers

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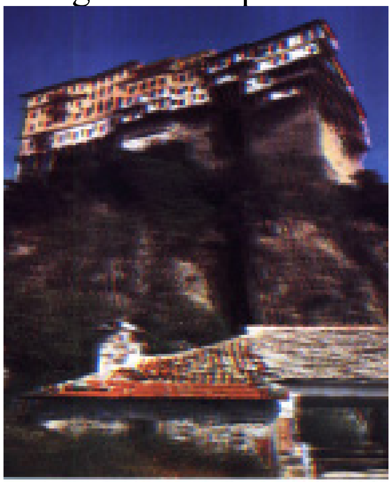
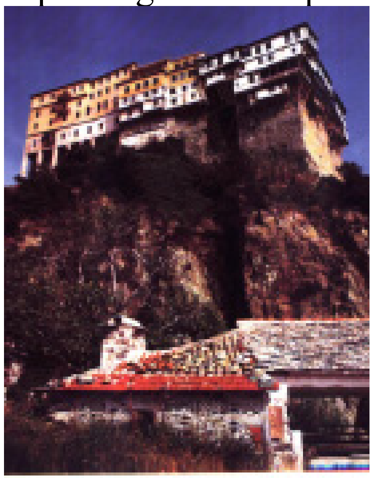
Each of the four colors needs to be produced at different angles to each other. This is done so that the resulting print does not cause a pattern called moiré. A moiré pattern is the effect of superimposing two color separations and creating a pattern different from the original. Cyan, magenta, and black screens must be separated by 30 degrees, with yellow at an angle 15 degrees from the other three colors. In all cases, black must not be placed at the 90-degree angle (SNAP recommendation).

The final step in the four-color printing process is the proper registration of the four colors. Careful steps are taken to align the four colors so that they print exactly in the correct positions. The following illustrations show the differences between a reproduction with proper registration and one misaligned. The misaligned reproduction looks fuzzy and out of focus, while the proper registered reproduction looks clean and sharp.

Misregistered Reproduction



Proper Registered Reproduction



Throughout the reproduction process a phenomena occurs called dot gain or tone value increase. The reproduced dot undergoes a growth from its original size. This process is fully explained in What is Dot Gain.

This section is a generalization of the four-color printing process for newspapers. The intention of this section is to introduce the process so that one can see the complexity and limitations of the process.

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Operational Problems

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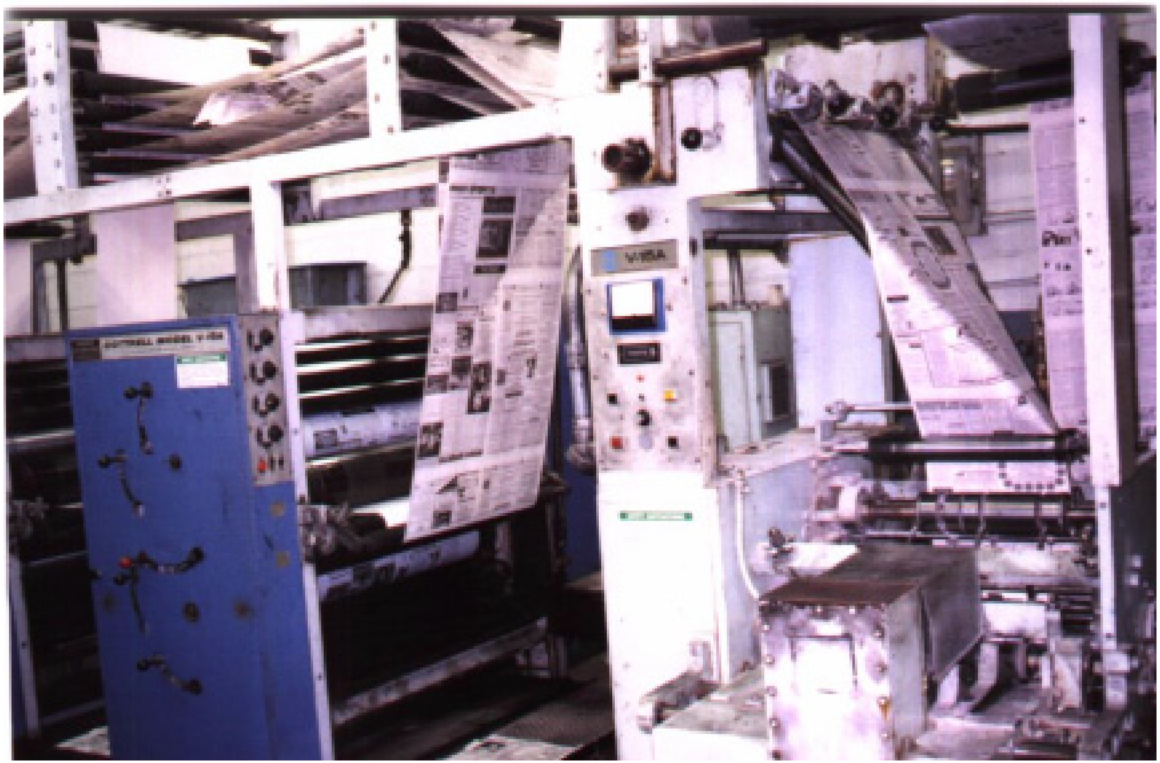
incoming water (Supply)
VOC (information)



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Physical Problems.......

chalking (data)
chalking (analysis)
conductivity
crease (copy creasing)
curl (copy curl)
dampening (overdampening)
Dampening (copy)
Dampening (data re wet copy)
fold (folding defects)
Odor (of copy)
odor (of copy-unusual)
odor (of copy-stronger)
odor (of fountain solution)
odor (test method)
rub off (data)
rub off (analysis)
set off
overinking
paper
pH (pH definition)
ratio (pigment/binder ratio)
print defects (of copy)

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Visual Problems......

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Problem classification

We need to sort any problems or difficulties into loose categories to enable us to examine them logically. This technique of progressive classification will be used throughout the program, and will become very familiar to users of Press Doctor. At this stage, let's make no assumptions about probable causes or effects. Consider only what is either observable or measurable. Most problems fall into two loose classifications. Don’t worry if your inquiry does not readily fall into a category, or straddles several. The versatility of Hypertext should allow us to arrive at the answer with minimal difficulty. Press Return

Problem Classification

The problem is that the finished copy is unacceptable, either with regard to some aspect of its print quality, physical appearance or physical attributes. or the problem to be addressed occurs as a printing difficulty, i.e. there is a problem in actually setting up or in producing the copy on press. or the problem cannot be considered to be either of these. other

Algae / Bacteria growth

The fountain solution baths or trays are contaminated by gelatinous material or slime? This is likely to be a growth of algae (closely related to seaweed). Although non-toxic, this material can give off objectionable smells, and can cause blockage of the fountain solution system, (particularly those with spray nozzles).any modern fountain solutions contain a biocide. This in capable of killing off most of the algae, but it is imperative that the strength or concentration of the solution is maintained within manufacturer's tolerances. Check concentration regularly. See strength for data on how to do this. If the problem is severe, it may be necessary to drain down the system and flush it through using a flushing solution. If these actions fail to alleviate the problem it may be necessary to trial a different fountain solution concentrate. It is good to note that algae or bacteria growth can effect the pH of the fountain solution, thus effecting the ink / water balance on press.

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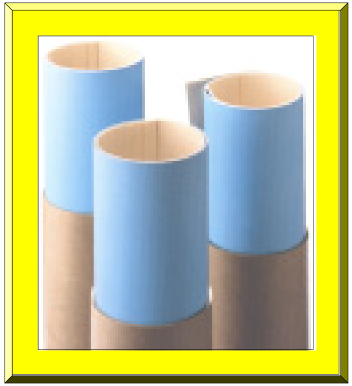
The Roll of the Blanket in Offset Printing

The change from the letterpress process to offset brought for the newspaper printer many new "things" to learn. Not only must the printer learn a new printing process and press, he must learn that a product which appears similar to the impression cylinder blanket of the letterpress has little in common with the familiar hard black blanket. The offset blanket has many characteristics, and these include: being a shock absorber; being ink and water receptive without mixing the two, and without swelling; transferring the ink both as solids and dots-clean and sharp without streaking; being an impression cylinder when printing blanket-to-blanket. All this while being soaked from the back and face with solvents and water and without coming apart. It must perform these functions at high speeds, with various papers, inks and plates, at often incorrect packing height and while "dirty" with ink and paper lint build up for long periods of use. The functions of the offset blanket bears little resemblance to the functions of its letterpress counterpart and is therefore different in characteristics. For other information on blankets see the following

Storage of Blankets
Blanket Torquing
Blanket Packing
Blanket Surfaces
Blanket Care

Offset Blanket Characteristics



In order to perform its' functions, the offset blanket has reached a high state of development. The carcass is made from high quality fabrics and laminated together with solvent resistant rubber compounds on very exact machinery. These factors contribute to a relatively long life, which however, is not as long as the life of a letterpress blanket. Even so, some blankets reach 16 million impressions before being taken from the press. However, most blankets are replaced due to damage suffered from web breaks. In the late 1960's a new type of blanket was produced, by more than one manufacturer, which has made the job of the printer easier and has become the standard blanket type for newspaper printing.

Prior to this time blankets consisted of fabrics and rubber, but after the late 1960's most blanket manufacturers found ways to include air voids in a rubber layer. Such blankets are called compressible blankets and approximately 70% of all blankets sold are compressible. On web presses, of all types, compressible blankets are standard equipment. Although there are approximately 4 methods of including voids in rubber, all such constructions can be placed into two categories, open cell or closed cell. As implied in the names, open cell layers are composed of interconnecting air cells, as in the common sponge. Closed cell layers are composed of individual cells. Although both types are used, the closed cell structure offers the advantage of retaining its compressibility and smash resistance over a longer period of time. Although there are many advantages in using compressible blankets, the main reason remains the elimination of the "bulge" in the printing zones which is common to conventional blankets. This allows using relatively high packing levels for good solids without causing undue dot gain / tone value increase.

The advantages of the compressible blankets over the conventional blanket are: increased smash resistance, increased packing latitude and quick gauge recovery after passing through the nips with the plate and paper. If this recovery is not fast enough the blanket fails to pick up or transfer the ink cleanly. The closed cell compressible blanket excels in this area. How much compressibility is enough? Although 4 to 5% rates as a compressible blanket, a functional compressibility lies between 5% and 7% with an average of approximately 6%. Over 7% the to print an un-sharp dot and under 5% does not have enough smash resistance. One test that many printers use themselves is the shore A hardness test. Unfortunately with today's compressible layers and 1,95 mm blankets with 3 or 4 plies of fabric, the shore A test is of no real value to a printer. An excellent compressible layer is necessary to a good blanket, but just as important are the fabrics which makeup the bulk of a blanket. These fabrics, as mentioned, are high quality (no defects) low elongation, high strength and of uniform construction and gauge. This attention to fabric is necessary if a blanket manufacturer is to make an acceptable product. What stable fabrics mean to a printer is a stable blanket, which does not move on the cylinder, maintains its width around the cylinder and does not shrink at the gap. Select this link for information on blanket surfaces

Blanket Shrinking

Shrinking is a word often heard among offset printers in connection with a blanket's loss in thickness. All offset blankets lose thickness and this is inherent in the product. Part of this gauge loss is due to the tightening of the blanket around the cylinder. Also, during printing, air is forced out of the fabrics, and in some cases the compressible layer giving a continuing loss of thickness.

What this means to a printer is that all blankets lose some thickness immediately, called setting in, and then continue to lose thickness throughout the life of the blanket. The initial loss is not only unavoidable but also necessary since during this period the blanket settles in absorbing unevenness in the packing, the press and the blanket itself.

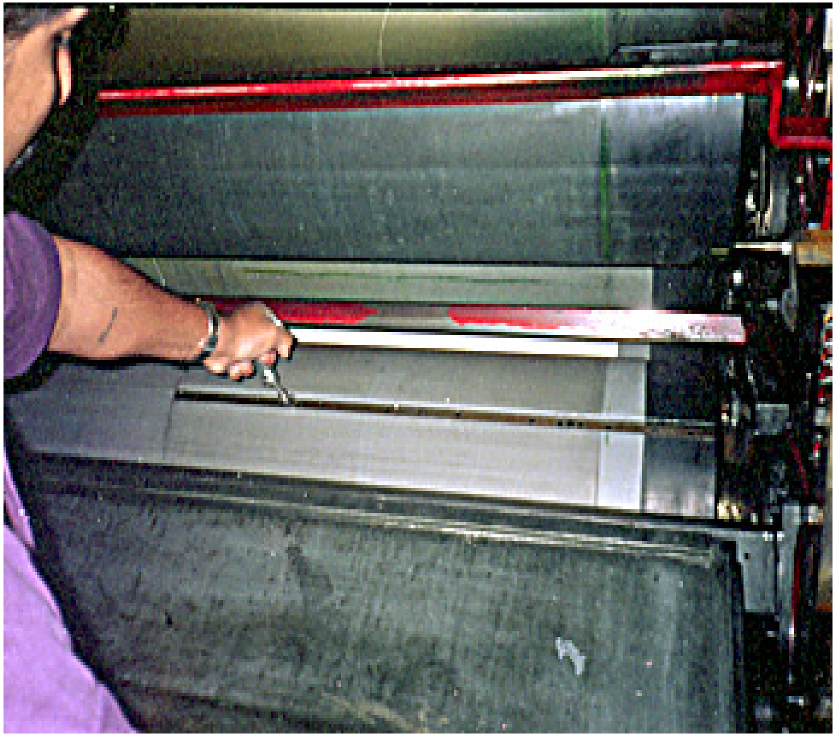
The second stage of thickness loss is the area that blanket manufacturers try to control. Stable fabrics and compressible layers control this to a large degree. What should a printer expect from his blanket in this area? Blankets which lose 1.5% to 3% of their original thickness are generally acceptable. Over 4% means an uncontrolled shrinking and causes problems.

Most blanket manufacturers and distributors can supply this information. Blankets should not only be dimensionally stable but also pliable enough to bend around the cylinder and into the gap. The softness of a blanket is dependent upon the fabrics, type of rubber, and production techniques which vary from manufacturer to manufacturer. When a blanket is too stiff, it causes an increase of thickness at the gap which increases the "bump" at the gap and the load on the bearers.

Storage Of Blankets

Pressroom crews can make their jobs easier by unpacking the rolled-up blankets, storing them face-to-face and back-to-back, flat and in a dark place. By unpacking the blankets they do not take an against-the-print-direction set which makes the blankets hard to mount and could give possible press problems in the gap area (increase of cylinder bounce).

Blanket Torquing



A question often asked blanket manufacturers is "how much torque does your blanket require to print?". As long as the blanket lies flat on the cylinder and does not move on the cylinder, the blanket is tight enough to print. In other words, use no more torque than necessary. Many more problems are caused by over-tensioning than by under-tensioning.

Over-tensioning causes shrinking at the gap in some blankets and severe over-tensioning can cause the blanket to tear in the gap area. A printer can see and hear the effects of a loose blanket, an over-tightened blanket only shows the bad effects later. Every press manufacturer uses different tensioning methods and specifies the required torque. In tightening mechanisms using bolts, careful attention must be made that all bolts are tightened evenly and at the same time. Over-tightening on the end bolts may cause the bars to pull off the blanket. On presses with single T-bar tensioning mechanism the recommended torque's should never be exceeded, as the lead end could lose excessive thickness in the gap area.

Blanket Packing

Many printing problems occur in this area and therefore, careful attention must be given to the height of the blanket over the bearers. For this reason the thickness of the blanket, plate and packing materials are to be measured. All these products have variances which could lead to an over or under packed blanket. The thickness of every blanket should be measured, as not only blanket manufacturers make mistakes but also the distributors who cut and bar them.

In other words, do not take the gauge stamped on the blanket as an absolute. This is especially important when using glued-on packing materials that stay on the cylinders through several blanket changes. Also be sure to specify the correct blanket gauge when using such packing materials. It must be stated at this point that even the best of blanket manufacturers have a gauge variation in their products. In addition, the use of a suitable blanket micrometer is important. Machinists' micrometers may not be suitable.

The exact blanket height over the bearers depends on several factors:

1. Manufacturer of the blanket.
2. Width and length of the blanket.
3. Bearer height on impression cylinder...
4. Weight of paper.

By far the most important is the blanket. The amount of packing used with one blanket brand is seldom the same as used with another. This is due to the already mentioned factors, such as elongation, compressibility and compressible layer type. Select this for signs of improper packing.

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Indication of Improper Packing

Too much.

Premature plate wear..
Plate cracking..
Contamination of succeeding inks.
Paper transport problems.
Damage to blanket..
Excessive dot gain / tone value increase.

Too little.

Poor solids..
Excessive ink and paper piling..
Paper transport problems.

Of particular importance is never to mix blankets from different manufacturers on a unit or units feeding into the same folder as it could cause severe paper fiber transfer problems. In addition, it is best to replace both blankets on a cylinder, at the same time, even when only one is damaged. The difference in height over the bearer from a new blanket to an old one can also cause paper transport problems. The undamaged used blanket could be used in later cases of damage to one blanket of a two blanket cylinder. Select this for more information on blanket packing.

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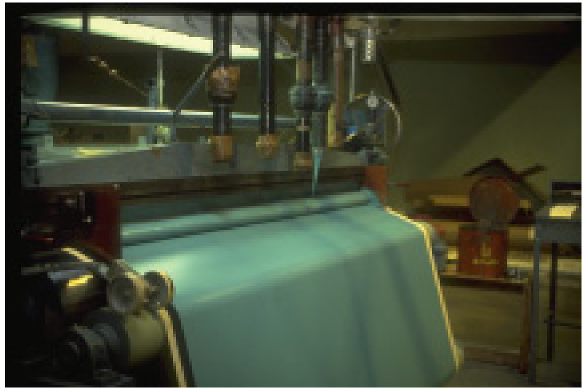
Blanket Identification

A blanket can be identified by the color stripe in the backing fabric
A list of the manufacturers identification is a s follows:



Company	Fabric Stripe
DAY International	Gold
Reeves International	Black
Polyfibron Technologies	Double Green
David M	Red
Kinyosha	Green
P.B. Cow	No Stripe
Dunlop	Black
Fujikura	Blue
Phoenix AG	Wide Brown
Rapidtec	Broken Green
Contitech	No Stripe
Sumitomo	Blue
Sungraphic	Brown

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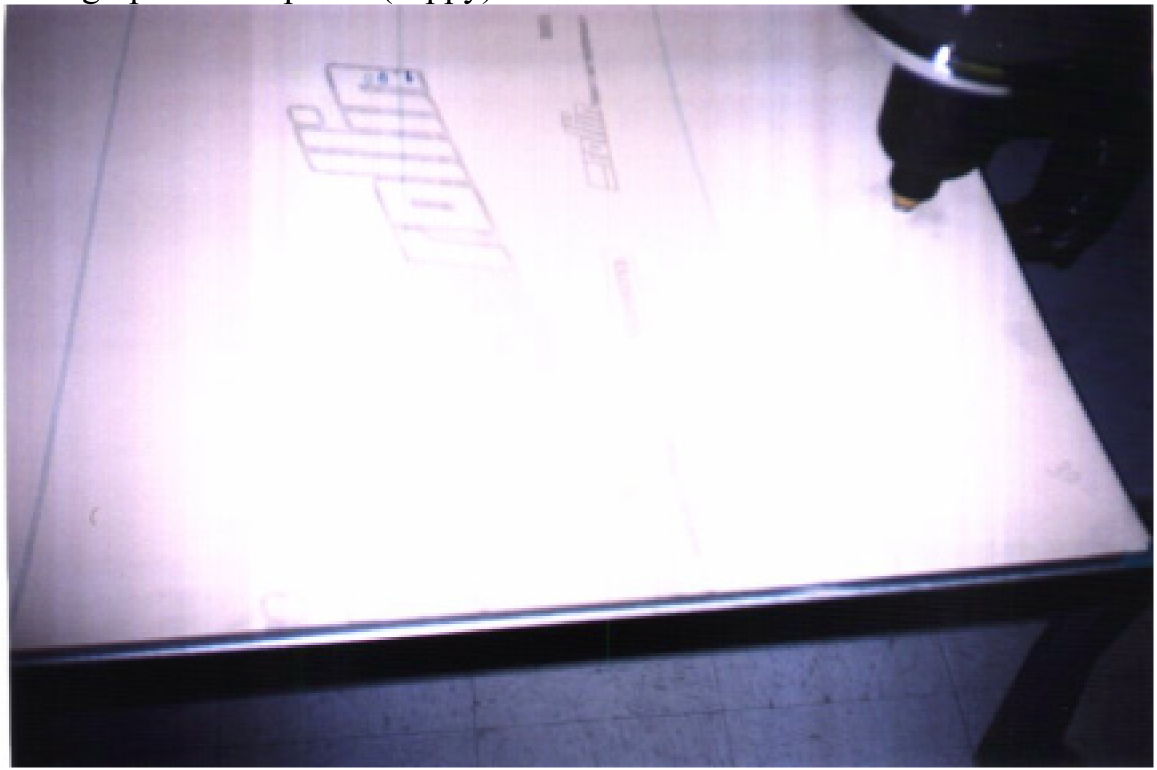
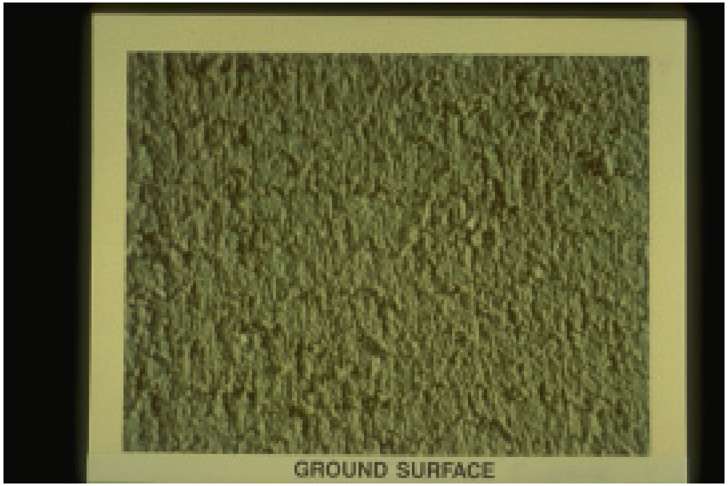
Meiji Red
Lithographic Enterprises (Zippy) Green



Blanket Surfaces

There are several different blanket surfaces on the market. These are ground surface (buffed), spread (coated) surface and a caste surface. All of these can be used on newspaper presses, but again never mix them on a unit or units feeding into the same folder. It goes without saying that units feeding into other units in 4-color or spot color work should not only have blankets from the same manufacturer but also the same type of surface (some blanket manufacturers offer more than one type of surface).



Blanket Care

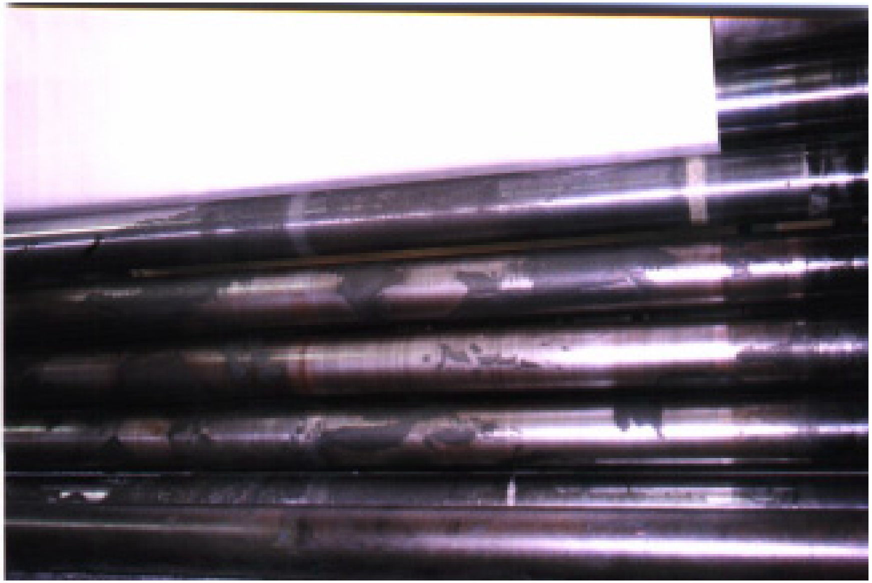
Newspaper printing due to the amount of ink and paper lint build-up on the blankets demands a particularly robust blanket. With the proper blanket and the proper care, excluding accidents, it should last a long time. Proper care includes, as mentioned, proper packing and tensioning but also the proper cleaning.

The paper lint and coatings must first be removed with water, and then the remaining ink is to be removed with a suitable wash. There are many suitable washes available but unfortunately also many unsuitable ones. To be avoided are all polar solvents such as esters, keytones, and chlorinated washes. These are not only harmful to the blanket as they swell the face rubber and remove chemicals necessary to the blanket, they also are health hazards. Any wash that dries extremely fast and cleans extremely well is probably harmful to the blanket. So called rejuvenators should only be used in the case of glazing of the surface rubber and at the most once a week. An offset blanket is the heart of the offset press and with attention to tensioning, packing and washing, it will perform to everyone's satisfaction.

Blanket Washes

The need for environmentally safer solvent compositions for pressroom chemicals has gained much interest in the last few years and will further increase in the future. Precise information on potential health hazards of pressroom chemicals can be obtained from the corresponding material safety data sheets, which con serve as a guideline to select the appropriate chemicals. Blanket washes have to remove gum, paper coating, lint and other residues from the blanket and should also help to keep the blanket resilient and ink-receptive.

Build Up



Build up is a deposit of ink and paper fiber adhering to pipe rollers, turner bars, former or nip/draw rollers. Build up often leads to marking which is usually seen as a general print defect of the copy which is worse behind, and in line with a heavily inked area. Some of the partially dry ink along with paper fiber has transferred from the copy to some part of the press usually the pipe rollers, bars, or former boards, and may subsequently transfer back to the copy.

Build up may be soft and readily removable, or hard and difficult to remove. There are several causes of build up, lets try to identify which are relevant to the problem observed.

Build up is a cumulative problem, and thus relates to length of run and period between cleaning of the relevant hardware. Have the affected units been cleaned according to their normal pattern? Obviously that should be easy to identify and correct.

First the easy checks, many problems are caused by overinking, so that has to be the first area to look at. If it is determined that the copy is overinked, it is necessary to establish causes, and to remove these or correct. Select overinking for more data.

So you have determined that inking levels are correct? Build up is very sensitive to the pressure and length of contact between the web and the rollers/bars etc. to which it comes into contact. Select contact pressure for more data.

If the build up occurs on trolleys or web break detectors they can often be aligned with the non-printed area of the web. Check the pressure, or setting of serrated folder guide rollers or RTF (drag) rollers. Is the copy pagination greater than normal?

Consider the nature of the copy being printed. Particular attention should be paid to very heavy solids, or heavy 4-color laydown. If these are normally present and run without problem then the cause obviously lies elsewhere. If however the copy has changed in character or is carrying an unusually difficult subject then you may need to attempt to alleviate the problem without necessarily being able to actually tackle the cause. Has the substrate paper in use changed?

Preprinted inserts may be printed on a smoother paper than is normally used. Paper that is smoother due to increased or a degree of sizing may give a better reproduction, but may also cause the ink to sit on the surface fractionally longer, and on fast presses this may lead to build up and thus marking. In such a case discuss the problem with the paper supplier. Select paper for more data. If the other consumable, a poorly formulated or inappropriate ink can certainly contribute to build up and marking. Ink which has too much solid component, see pigmentation or is of too high a viscosity for the nature of the press or the application, or which is too high in tack at the point of printing will all tend to cause build up and marking off.

Equally ink and water balance should be set properly with the correct ink / water balance, and maintained through the run. Incorrect ink and water balance may be caused by either the ink, the fountain solution or both, or may be a function of badly set dampening levels or due to a defect in the dampening solution, or the dampening system itself. Poorly processed plates can mean dampening levels have to be kept high for clean running. These possibilities are explored in dampening levels. If it is felt that the problem lies with either the ink the plate, the paper or the fountain solution then the relevant supplier should be involved. select data for on-the-run first aid and remedies.

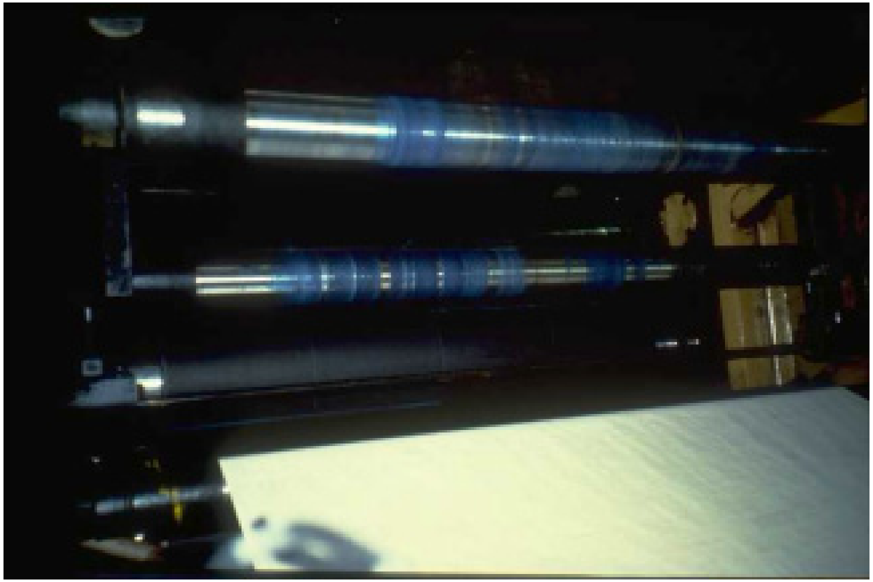
FORMER BOARD AND PIPE ROLLER BUILD-UP

ACCUMULATION OF INK AND LINT ON FORMER BOARDS AND PIPE ROLLERS

BUILD-UP

CAUSE	SOLUTION
POOR INK/WATER BALANCE	SET INK/WATER TO MINIMUM
POOR FOUNTAIN SOLUTION CONCENTRATION	SET F.S. TO PROPER CONDUCTIVITY
TOO MUCH INK	SET TO DENSITY SPEC.
POOR MAINTENANCE AND CLEAN-UP	CLEAN ITEMS REGULARLY
NOT ENOUGH PENETRATION	REFORMULATE INK

Build up-remedies?



Possible first aid for build up. Can you reduce or normalize web tension? It may however not always be possible to normalize web tension, nor is it likely to be possible to reconfigure the press, change the stock or alter the subject matter. In such cases, the only first aid on the run which might have some effect would be to reduce both ink weight and level of dampening . If that takes the density below what is normally acceptable then that needs to be weighed against the expected advantages.

If that is unacceptable, and time permits then extra cleaning of the relevant rollers/bars may be considered the only solution. If it can be predicted from past experience that a potentially difficult configuration is to be used, then some relief may be obtained by treating the rollers/bars with silicone fluid. It is possible to use silicone fluid on the run but this has very little effectiveness on already dirty rollers/bars. Two warnings though, any effectiveness of this treatment is short lived, and requires frequent re-application, and you should be VERY careful not to let the silicone fluid contact any part of the ink train or dampening system as this can cause severe lithographic problems.

If the problem is a new one, and not normally present, and all settings are correct, then suspect the ink and call in the ink supplier.

Chalking

Chalking is a term given to a fairly specific problem. If the problem of rub-off can be identified as due to chalking then this gives us useful clues as to the possible causes. Chalking occurs when the ink is absorbed by the paper. Under normal conditions the whole ink is absorbed into the surface of the paper giving the appearance of setting. However under certain circumstances it is possible for the liquid components of the ink to be preferentially absorbed, leaving a proportion of the dry components on the surface. The dry components will readily transfer to any surface against which they rub. Proceed ?

Chalking continued

Chalking can be brought about by several different causes. Let's look at them in turn. Ink and water balance is difficult to achieve and maintain? The plate may require a lot of water to keep it running cleanly? The difference between scumming and emulsification is minimal?

If any of this best describes your situation then select lithography.

Look at the fountain solution. Ensure that this is to the correct dilution ratio. Chalking is often caused by running with fountain solution that is too strong. Obviously if the strength is incorrect this should be corrected. For details select fountain solution strength testing.

Has the paper changed? stock with poor absorbency can tend to act as a filter and absorb oil and the pigment at differential rates. Please select paper for more information.

It is unlikely that the paper can be changed, so in such a case there is little to be done as first aid on-the-run. One of the few actions which could have any effect would-be to reduce the ink film weight and at the same time run with as little fountain solution as possible. Of course this might mean running at a density below specification, and that would need to be weighed up in terms of the gains to be seen.

So the paper is unchanged, and ink and water settings are normal? The fountain solution is of the correct dilution. If all other factors are as normal consider the ink, and call in the ink supplier.

Color problems/defects

The printed copy is not of the required standard. It has-been established that the problem is visual, and is due to poor color rendition. There are many reasons why the color may be substandard. In order to analyze the problem and its causes, and thus attempt to correct them, let's use the technique that has become familiar, and carry out a series of classifications. At this stage let us concentrate only on that which can be observed or measured. Does the problem lie with the quality of the solid color laydown? Include here hickies and other problems which affect the integrity of the printed image.

****

Closely examine the printed result. Is the problem associated with the color rendition of a spot color,(or a single color achieved by printing down a combination of process colors)? See also color definitions

****

The problem lies with the process colors? Select definition for definition/data on process colors.

****

The problem is a general one and is present irrespective of whether the color is process or solid/spot. remember, at this stage of the analysis we are only concerned with VISUAL defects. If the problem is physical or operational you should have taken a different route. If that is the case select this link for a shortcut back.

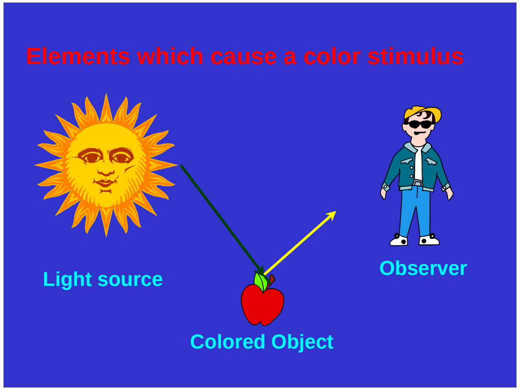
See UCR for information on Under Color Removal

See GCR for information on Gray Component Replacement

US Ink’s Press Doctor

Color Theory

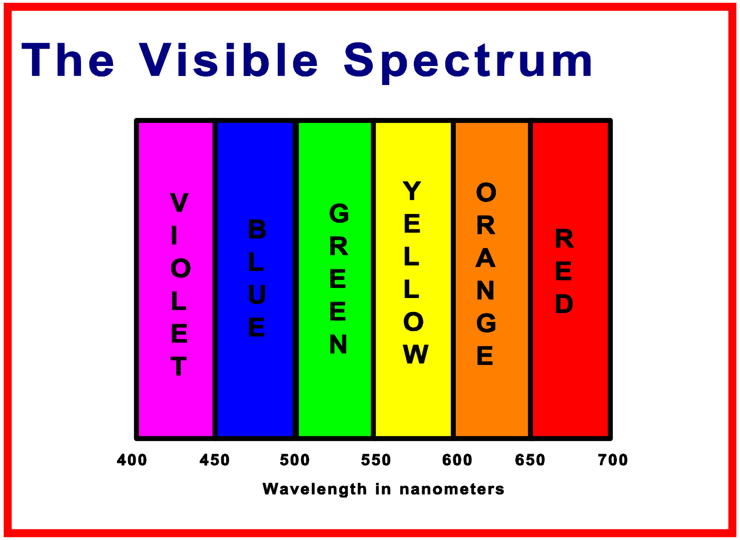
How does one describe the color attributes of an object? More specifically, how does one communicate color to customers and vendors at different locations in different cities, states, and countries? This article discusses how to describe an ink or a printed substrate by the lightness, chroma, and hue attributes of the printed color.



In 1986, the NAA (Newspaper Association of America) utilized the color spectrophotometer to characterize their AdLitho® and AdPro® colors. These products adopted a set of specifications that utilize these components to describe the colors in their color book.

The Components of Color

Color is the sensation that is produced when the eye senses visible light . Visible light is an energy known as electromagnetic radiation. Many different types of energy make up the complete electromagnetic spectrum. Visible light, as well as other types of electromagnetic energy, is measured and described by its wavelength --in nanometers. Visible light (or the visible spectrum) makes up a small portion of this electromagnetic spectrum; the portion from 400 nanometers to 700 nanometers in wavelength. A **nanometer (nm)** is one-billionth (1×10^{-9}) of a meter (.0004 mils). When the eye sees color, it sees electromagnetic radiation with wavelengths between 400 nm and 700 nm. In fact, each color has its own particular wavelength in the visible spectrum that makes it unique. The colors can be loosely described as follows: Violet 400-450 nm, Blue 450-500 nm, Green 500-550 nm, Yellow 550-600 nm, Orange 600-650, and Red 650-700 nm. This means a colored light source **emits** energy at the specific wavelengths mentioned, and a colored object **reflects** energy at the specific wavelengths.



The color of an object is produced by the interaction of that object with the energy from a light source. The object will selectively absorb or reflect all of the energy from the light source that strikes it. When all the energy is reflected, our eye sees white, absorption of all energy yields black, while selective absorption of specific wavelengths results in color. The reflected light is radiated out from the object in all directions and is received by the eye. The eye senses this reflected light and then sends a signal to the brain, which is interpreted as **COLOR**. Thus, the process of sensing color includes three separate components: a light source, an object, and an observer. The light source provides the energy (known as spectral power or spectral energy) to the object. The object then selectively absorbs or reflects this energy (or light), and the observer then sees (senses) the color. Each of these plays a critical role in the observation of color and each must be numerically characterized in order to be able to describe color precisely.

The Light Source

The light source can be any object that emits energy in the visible spectrum. Three typical light sources are: the sun that produces daylight, fluorescent tubes that produce fluorescent light, and tungsten filament bulbs, which produce incandescent light. Each of these light sources can be described or characterized by the amount of energy they emit at each wavelength in the visible spectrum. This is known as the spectral power distribution (SPD) of that light source. Three common light sources are daylight, fluorescent light, and incandescent light.

Daylight can be thought of as a white light. It is characterized as having all wavelengths of the visible spectrum in relatively equal amounts. Fluorescent light is a blue-green light because it contains a large amount of energy in the blue and green regions of light, but very little in the yellow and red regions of light. Incandescent light is a yellow-red light because it contains a large amount of energy in the yellow and red regions of light but very little in the blue and green regions of light.

The light sources and their color are described by the International Commission on Illumination (CIE). A typical daylight is illuminant D6500 or D-65 for short. It approximates an average noonday at a latitude equivalent to Washington, D.C.. A typical fluorescent illuminant is CWF, which is Cool White Fluorescent. It is equivalent to a GE Deluxe Cool White Fluorescent tube. The CIE has specified numerous other standard light sources and illuminants; these are among the most commonly used illuminants in the graphic arts industry.

At this point, it is appropriate to discuss the difference between a "light source" and an "illuminant." The two terms are often used interchangeably, but there is a distinction. A light source is a physical object that emits light, such as a fluorescent bulb. An illuminant is a set of numbers that represent a spectral power distribution, such as CWF. Once a light source has been described by a SPD, it becomes a standard light source. An illuminant may be represented by a standard light source, but not necessarily.

The Object

Once energy leaves the light source, it travels until it strikes an object that will either absorb the energy or reflect the energy away from the printed object. The amount and the wavelengths of energy absorbed or reflected depend on the type and quantities of colorants present in the object.

As light strikes the surface of the object, a small amount of that light is reflected away from the surface and this reflected light is known as **specular reflection** (or commonly referred to as gloss). It comprises about 4% of the incoming light and it leaves the surface at the opposite angle from the incoming light. Specularly reflected light will be the same color as the incoming light.

The remainder of the light then penetrates into the object and either is absorbed by the pigment particles in the ink or is reflected back toward the surface. The reflected light will then interact or strike other pigment particles in the ink film until it is bounced and deflected in all directions. It eventually leaves the surface of the ink film in all directions as **diffuse reflection**. The color of diffuse reflection will be dependent upon the particular characteristics of the pigment present in the ink film. For example, red pigments will absorb all wavelengths of light except red and, therefore, red light is reflected diffusely from the ink film. Blue pigments will absorb all wavelengths except for blue light and, therefore, blue light will be reflected diffusely from the film of the ink. Each color has its own unique wavelengths of light that it absorbs and reflects.

As was discussed earlier, each color has its own unique wavelengths in the visible spectrum which reflect light. Each color will reflect the light corresponding to the dominant wavelengths that the eye detects and will absorb the remaining wavelengths of light. In these examples, you can see that the blue ink reflects blue light in the region of 450 nm and absorbs light in the other portions of the spectrum. In other words, the ink reflects the blue light back to the observer and absorbs the remaining wavelengths of light. The Process Red reflects red light in the region of 600 - 700 nm and absorbs the remainder of the visible light. The Yellow reflects light at higher than 540 nm and absorbs light in other regions of the spectrum.

When a spectrophotometer measures a color, it calculates the amount of light reflected from the sample at 10 nm increments from 400 nm to 700 nm. This provides a unique “fingerprint” for each color. From this fingerprint, color numbers such as color difference, strength, and even color formulation can be derived. These values can be stored on a computer for future reference or transmitted to off-site locations for color standardization.

The Observer

When light strikes the human eye, it is detected by one of three-color sensors in the eye: a red, a green, or a blue receptor. These receptors send a signal to the optic nerve that sends a signal to the brain. However, the optic nerve does not send a red, green and blue signal to the brain but, in fact, sends information in terms of a red/green signal, a yellow/blue signal, or a black/white signal. This particular phenomenon about the way the human eye responds to color is known as the **opponent color theory**. It describes the way that we see and respond to color by opposites. For example, yellows or blues can be described as red-shade yellows and red-shade blues as opposed to green-shade yellows and green-shade blues. This response is consistent across the population of normal color vision and has been quantified into a **Standard Observer**.

The Standard Observer was first characterized back in 1931 when scientists showed a group of people colors in all areas of the color spectrum and had them make very subtle, precise judgments on those colors. This information came to be known as the 1931 CIE 2-degree Standard Observer. It is known as the two-degree observer because the people in the test were asked to look at color with a two-degree field of view. These tests were repeated again in 1964 with a larger sampling of people and they looked at color with a larger field of view, a ten-degree opening. This came to be known as the 1964 CIE 10-degree Standard Observer.

These two sets of data characterize the way a person with normal color vision would see color. In a practical sense, there are only very small differences between the two observers.

CIE Lab COLOR SPACE

As mentioned previously, the process of sensing color requires the combination of three separate components: a light source, an object, and an observer. We have just examined how each of these components can be quantified: a light source by a standard illuminant, an object by its reflectance curve, and an observer by either the two-degree Standard Observer or the ten-degree Standard Observer. Therefore, it is necessary to include all three components when attempting to describe color. If one of these three components is varied, the resultant color will vary.

All colors can be characterized by **hue**, that is, the dominant shade; by **saturation**, that is, how much color of any hue is present; and by **lightness,** that is, the degree of lightness or darkness of a particular color. Therefore, it is necessary to describe a different hue, saturation and lightness for each unique set of illuminant or observer conditions. By using a standard illuminant and a standard observer, the amount of light reflected from any one object can be converted into the hue, saturation, and lightness descriptions for any color. Additionally, a sample can be compared to any standard with these same three attributes. In

1976 the CIE adopted a standard method of calculating color attributes, known as 1976 CIE L*a*b* (or CIE Lab) Color Space. It uses the designation of Dh to signify a hue difference between a sample and a standard, the designation of DC* to signify a difference in saturation (or chroma) between a sample and a standard, and the designation of DL* to signify a difference in lightness between a sample and a standard.

Thus, by using these three terms, hue, lightness, and saturation, we can describe the attributes of any color, or the difference between a sample and a standard. There are two other terms that are occasionally used to describe color: a red/green color difference and a yellow/blue color difference. CIE Lab Color Space assigns the designation Da* for a difference in red/green value and the designation Db* for a difference in yellow/blue value.

SUMMARY

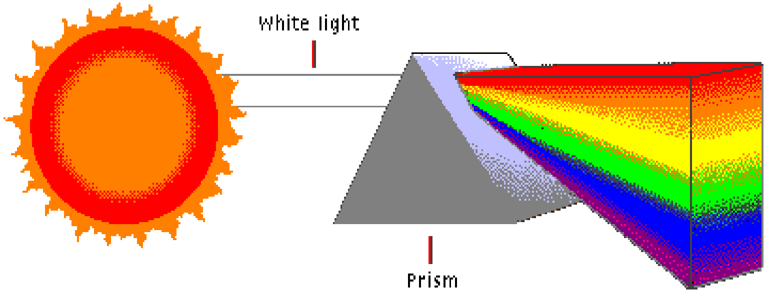
Most objects reflect visible light. It is that visible light that our eye detects as the color of the object. The color of the object should be characterized with a controlled light source. That means that we want to make sure that the light source we use to view the color under is identical or as close as possible to the light source that the product will be viewed by a customer or an end-user. We can then numerically characterize that light source by selecting the proper standard illuminant. The light from the object itself can be numerically characterized by measuring the amount of reflected light from the object. The observer can be characterized by one of the two standard observers, either the two-degree or the ten-degree observer.

Any color can be described by its hue, lightness, saturation, and total color difference by taking the percentage reflectance of that object using the correct standard observer and the correct illuminants and calculating DL*, Dh*, DC* for that color. This gives anyone the ability to characterize any color by those three attributes: lightness, hue, and saturation. It gives any person the ability to describe a color by those three attributes and communicate that to another location in these common terms. It helps insure that two different locations (or viewers) are discussing and talking about the same color. Thus, we have a common language to describe and communicate color so that both parties can easily understand and agree on color and its attributes.

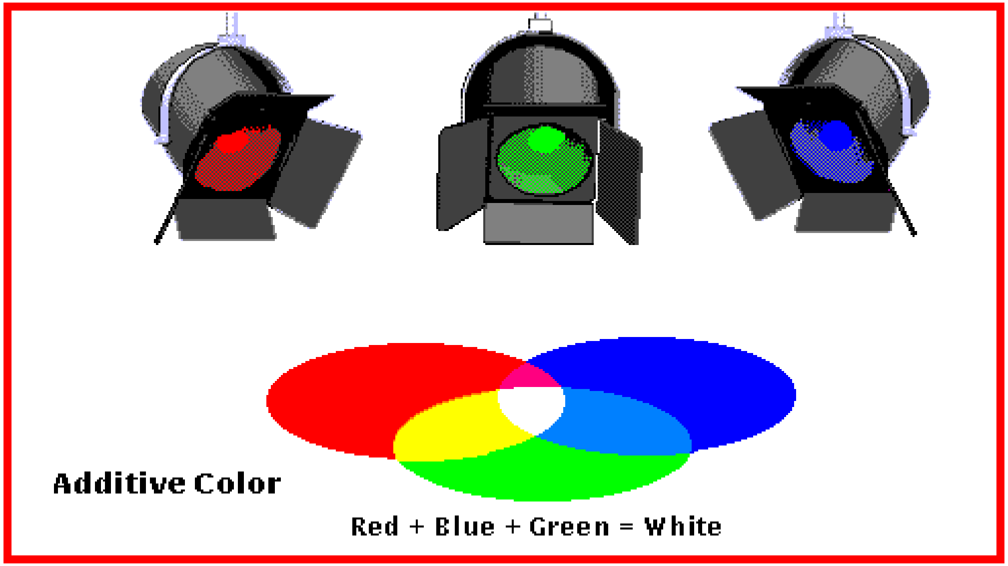
See color basics more a generalized description of color

Color Basics

In order to gain an understanding of process color reproduction, it would be helpful to gain an understanding of the phenomenon of color. See color theory for a more detailed description of color, This will describe the basic color theories so that one can better understand the measurement of color.



In short, white light is radiant energy that is visible to the normal human eye. The color of light will vary with its wavelength. To demonstrate this, white light can be split into its parts by passing it through a prism. A prism can separate the white light by its wavelengths, resulting in a rainbow effect as the light exits the prism. The visible spectrum consists of infinitesimal variations of color. However, in practice three broad bands of color can be classified. The three bands are blue, green, and red.



We are able to see colors because our eye contains three different color receptors, red, blue, and green. When equal parts of this blue, green, and red light are cast, the eye perceives this as white light. When light is combined in unequal proportions, we will see color. This is the basic premise of the **Additive Color Theory**. Blue, green, and red are the primary colors in this theory. Secondary color can be created by combining or adding any two of these colors.

Thus the following combinations can be created:

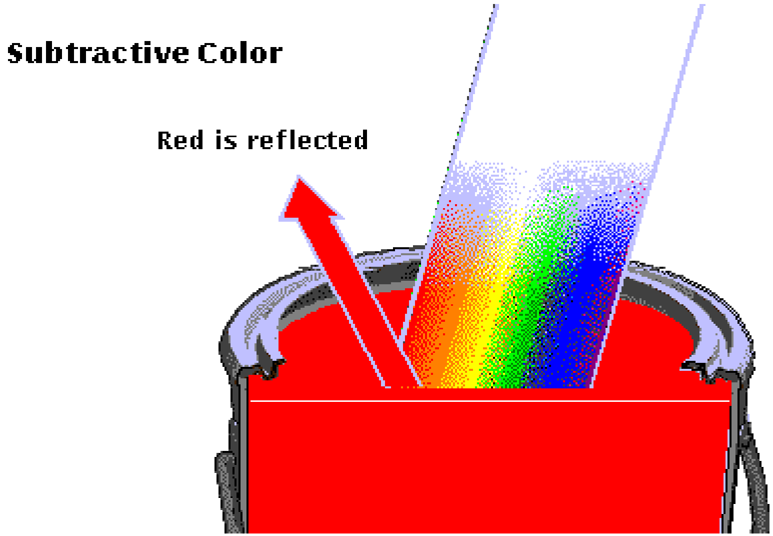
Yellow = Red + Green

Magenta = Blue + Red

Cyan = Blue + Green

The **Additive Color Theory** is best displayed by televisions. Television uses red, blue, and green lights to produce the images we see on the screen. The size of the light producing elements are consistent, the intensity of the light produced is varied to change the color.

As we look at the color printing process, the color cannot be produced by the additive process. Color prints are seen by viewing the light reflected off the surface of a print. **The Subtractive Color Theory** explains how colorants or pigments are used to subtract portions of white light illuminating an object. When white light illuminates an object, some wavelengths of light are absorbed while others are reflected.



The subtraction of red, green, and blue light is achieved by using colorants that are their opposites. Cyan ink reflects blue and green light (absorbs red light), thus the eye perceives blue. Magenta ink reflects red and blue light (absorbs green light), thus the eye perceives red. Yellow ink reflects green and red light (absorbs blue light), thus the eye perceives yellow.

Colors are achieved by subtracting portions of light away from the white paper. The following colors are examples of the Subtractive process.

To see **green**, a combination of **yellow** (minus **blue**) and **cyan** (minus **red**) is needed.
RGB - B - R = Green

To see **red**, a combination of **magenta** (minus **green**) and **yellow** (minus **blue**) is needed.
RGB - G - B = Red.

Thus, any color in the visible spectrum can be obtained by varying the proportions of any or all of the colorants used. In color printing the colors are overlayed or trapped to produce the secondary colors. When all three of the primary colors overlap, black is produced.

Color printing is achieved by breaking up or separating color pictures into tiny dots of varying sizes by means of a halftone screen. The color variation is produced by varying the amount of the color printed or the size of the dot being reproduced.

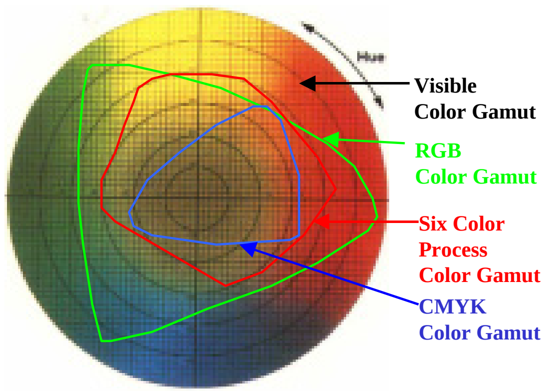
In summary, the sensation of color in printing is dependent on the ability of a pigment to absorb portions of the visible spectrum. The non-absorbed portions of light are reflected and perceived by the eye and stimulate the brain for the particular color response.

Color Gamut

Color Gamut refers to the range of colors that can be reproduced by any device/system. Unfortunately for printers, the color gamut in nature is much larger than any we can reproduce with paper, inks, dyes and pigments. The best we can do is to choose those conditions over which we have control in a manner that will permit us to get as close to the original scene/photograph as possible.

To better understand this concept, please refer to Figure 1. This portrays the color gamut of several different systems. It is quite obvious the gamut decreases as you move from the visible to CMYK process printing. This decrease in color gamut is due to several factors including:

Figure 1- Color Gamut



Additive vs. Subtractive Color
Colorant types and combinations
Paper selection
Solid ink printed density
Trapping

Additive vs. Subtractive Color

These two color theories explain how we create and perceive color. The Additive process uses colored light to create the gamut. A common example would be movie theaters, televisions or computer projectors. The Primary Colors are Red, Green and Blue. The Subtractive process uses chemical colorants that absorb various portions of visible light to produce the colors. The Primary colors are Cyan, Magenta and Yellow. This is how color is produced on a printed sheet.

Colorants

The production of a colorant is a complex chemical process. The creation of a perfectly pure Subtractive Primary colorant is not presently possible. Colorant manufacturers have created products that must be acceptable process colors, capable of large volume production, and reasonably economical. The colorant's function is to absorb visible light in certain parts of the spectrum and reflect light in other parts.

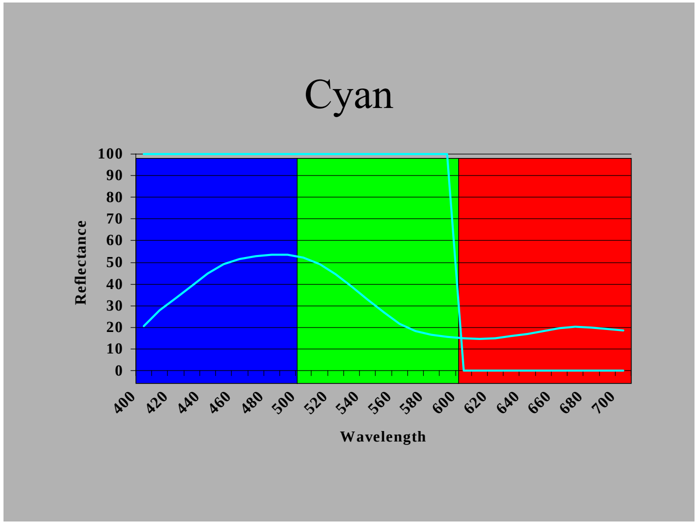


Figure 2 shows a Reflectance curve over the visible spectrum. A "perfect Cyan" would reflect all of the light in the Blue and Green areas of the spectrum and absorb all of the light in the Red region. The Cyan curve, as shown in this figure, is a typical Reflectance curve for ink printed on newsprint. The Cyan does not reflect all of the light in the Blue and Green areas and reflects some light in the Red area of the spectrum. This is a function of the pigment, paper and solid ink density of the print. The deviation of the printed Cyan from the "perfect Cyan" is one of the causes for a reduction in the color gamut. Typical printed process Magenta and Yellow inks are also inferior to their "perfect primaries". Alternate colorants can be used, particularly for the Magenta and, to a lesser extent, the Cyan, to minimize this difference. Unfortunately, these normally carry significant economic premiums.

The greater the number of colored inks you can use in a printing process the greater the color gamut one could create. As seen in Figure 1 the Six Color Process color gamut is greater than the CMYK. This is because more than four colors are used to create the printed product.

This is not a practical or economical approach in the publication market. More printing units are needed and the other two inks utilize premium priced colorants. The increased costs preclude this from happening. Unfortunately, the creation of a third color by combining two printed colors produces a color that is not as pure or "clean". This is another reason why the gamut is reduced.

Paper

The type and brightness of the paper that a colorant is printed on will also affect the total color gamut. The ideal substrate would reflect 100% of the complete spectrum of incident light. The printing of pigments on a stock such as newsprint will not be able to overcome the absorptive characteristics of the stock, thus the gamut will be significantly reduced. In comparing the gamuts of a commercial heatset print on coated paper vs. that on newsprint the gamut will be smaller on the newsprint due to the effect of the paper.

Solid ink density

The solid ink density of a print is a measurement of how much light is either absorbed or reflected from the surface of the print. The higher the print density the more the light is absorbed. This greater absorption or higher print density will create a larger color gamut. Figure 3 shows the practical densities of a transparency, commercial heatset and newsprint. The practical density range on newsprint is much lower. The newsprint surface is very rough and absorptive of ink and scatters incident light. The surface roughness does not allow for a uniform ink film and requires more ink to achieve equivalent densities. The commercial heatset paper is a coated paper that has a much more uniform, relatively non-absorptive surface. Because of these differences in the substrates, particularly in light scattering, the maximum achievable density on newsprint is lower. This has a significant limiting effect on the potential color gamut.

All of these factors can limit the gamut that can be reproduced by a particular printing process. Variations in the substrate are extremely significant. In most cases, little can be done, on a practical level, without raising other significant process or cost issues.

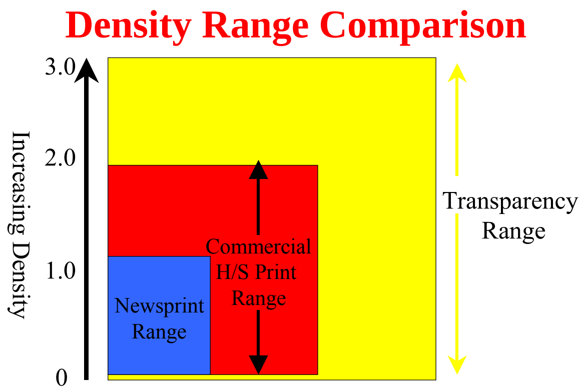
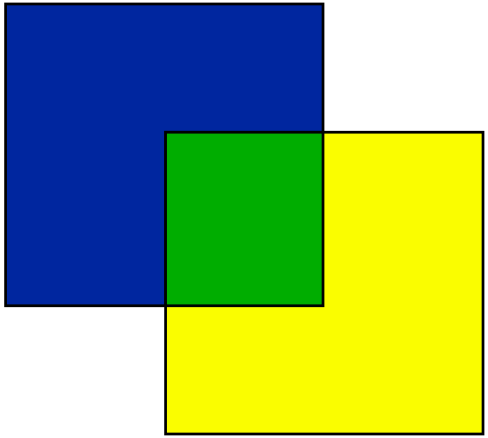


Figure 3- Density Ranges

Trapping



Process color relies on wet-on-wet printing. The first color down must trap the second, the second must trap the third, and so on. Any printed color will invariably transfer more efficiently to the paper than on top of a preceding color. Poor trapping will lead to color casts, but only on color pairs where the problem occurs. Other colors may be normal. The sequence or order in which the colors are printed will affect the color gamut. In order to achieve the largest color gamut the following recommended sequences should be used:

Printing Sequence

SNAP recommended printing sequences:

Offset	*Flexography*	*Letterpress*
CMYK or KCMY	YMCK	CMYK

Note: Industry tests indicate that the CMYK laydown sequence yields the widest gamut for letterpress. In newspaper flexography, yellow is laid down first so that it does not hide subsequent colors.

US Ink's Press Doctor

Summary

In order to achieve the maximum color gamut in newspaper offset printing the following steps must be maintained:

Print to SNAP specified densities.

Use a clean bright sheet of newsprint.

Ensure that all of the mechanical settings on press are correct so that a uniform ink film and proper trapping can be achieved.

Use the SNAP specified printing sequence to achieve the proper trapping.

US Ink's Press Doctor

Copy Defect Analysis

Finished Copy is not to Standard ? There may be many reasons why the finished copy is not of the required standard. In order to analyze the possible causes and their effects, let's attempt to look in detail at the factors that are substandard about the copy. In each case choose the link which best approximates the observed problem. Please indicate whether the observed problem relates to the visual appearance of the copy or whether the problem relates to some physical attribute of the copy.

Definitions/Examples

Color definitions

In order to specify a color or even to discuss color with a third party, it is necessary to use terms and descriptions that are precise and universally understood. Terms like warm red or deep green are often not accurate enough. If the ink supplier offers a color book or the NAA color book is available, utilize these in specifying the color. There are many systems of measurement, an example is the CIE. Lab system which places a colored print into a color space diagram, and which specifies the color in terms of its lightness (L) and of its hue (a and b coordinates).such a recognized system should be used if possible when measuring or specifying color and when a high degree of accuracy is needed or refer to a specific color guide. For a more detailed description select Color Theory now. See color basics for an introduction to color.

Color defects

There are problems with the overall color reproduction, or with the color pages. The problem is that the margin or non-image areas are defected by print defects, caused by one or more colors. This may be associated with many different causes, if you select the above link we can examine these in detail.

Creasing

Creases may show as single or multiple creases, often in or near the web direction. Creases may also show up as white lines, in this case the paper within the crease has missed being printed, while the crease itself has disappeared as the web has gone through the press. there are several reasons why creasing might occur. Let’s consider these separately. There are two factors which cause creasing and which probably occur more frequently than any others. The first is of course press settings, and this is largely outside the scope of this program. Note that Press Doctor has been written in such a way that further data can be added at a later date, if you have information you would like added to this program, contact US Ink.

As a general principle, web tension that is incorrect, either too slack or too tight can both bring about creasing of the copy. Also badly set turner bars or former/folder settings can lead to this problem. In such cases it is often possible to carefully observe the running web and to pinpoint and correct the cause of the problem, or incorrect settings.

A second cause of creasing is build up on either the pipe rollers or the former board edges. This can also lead in severe cases to web breaks. Build up which is capable of causing creases is likely to be hard and difficult to remove. Select build up to examine causes in some detail, along with some possible cures.

Plate Cracking

If the plate cracks when in use, usually some time after the run has commenced.

Several factors can cause such cracking, and each should be checked and eliminated.

Plate has incorrect grain direction important on web fed presses) Check that the grain direction of plate is parallel to the direction of travel of the cylinder.

Wrong plate thickness. (Caliper) Check that the required plate thickness is the same as what supplied. If so, check plate thickness with a micrometer.

Incorrect plate size. Check that the plate size required is the same as that supplied.

Plates cut out of square. Check squareness. (Measure diagonals). Replace plates if necessary.

Plates loosens on cylinder. Clean lock-up mechanism. Check that plate is fitted correctly.

Plate over tightened. Use less force. (torque)late fitted improperly. Ensure tension is even across the plate.

Packing short or askew. Check packing length. Check that packing does not move during run, causing a bulge. Carefully align sheets in packing.

Bending jig not square. Check alignment.

Sharp cylinder edge. Smooth the edge. Steel bars loosen during run. Check reel locks for wear.

Lead edge of plate improperly bent. Check plate bend for fit in cylinder gap.

Trail edge of plate improperly bent. Check fit.

Cylinder gap dirty. Clean gap.

Press mechanical settings incorrect. Ink and dampener roller bearing worn or settings too hard

Copy Curl

The copy when taken from the conveyor begins to curl almost immediately. As well as being unsightly, often this gives rise to problems in the delivery system, particularly in the counter/stacker. Curling is most noticeable on process color pages backed up with mono or single color printing. Since curling is almost invariably associated with an excess of moisture in the copy, the differential dampening levels between the process color (4 areas of dampening) vs. the mono (1 area of dampening) leads to differential swelling of the paper fiber and thus the observed curl.

The only real cure for curling is to reduce the dampening solution level.

Solids Poor Coverage

Solids areas which are defected by poor coverage can be due to several causes. The most likely is poor ink and water balance. As with many other problems, too much water can bring about poor coverage. If the problem is mild, then some emulsification may occur but not necessarily enough for classic emulsification symptoms to show themselves.) See emulsification.

The best remedy for poor coverage is to attempt to reduce dampening solution levels to normal(or below if that is possible without catch up occurring). If the ink will not run with normal levels of dampening solution, then that could be due to either the fountain solution, the ink, or (much less likely) the plate. Check the fountain solution strength, ensure that it is within manufacturers tolerances.

With a weak fountain solution you may require a higher VOLUME to keep the plate running cleanly, It is probably the fountain solution volume which leads to poor ink and water balance, loss of transference and poor flow, and thus poor coverage. Correct as necessary. If the ink exhibits poor coverage, and requires high levels of fountain solution to run cleanly, and this cannot be reduced, while the fountain solution strength is correct, then suspect the ink and call the ink supplier .

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Check the impression setting, and particularly blanket height. Ensure that the blanket height is within required tolerances. Low blanket height has a similar effect to insufficient impression.

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Consider also the paper, has this changed? The most likely problem with paper in this context is roughness. A paper with a rough surface may need extra ink and/or more impression to cover properly. In such a case refer to the paper supplier. As a first aid measure on the run you could try increasing impression slightly. less likely contender is the plate. Check whether this has changed. Ensure it has been correctly stored, exposed and processed. If possible try a different batch of plates.

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Poor coverage may also occur if there is an accumulation of lint or hard build up on the blanket. Instead of printing from a smooth blanket surface, printing is from the surface of the lint. The print therefore can only be as smooth as the lint surface and this is invariably very uneven, with intrinsically poor transfer properties. For information on linting select lint. Poor coverage may also be seen if there is an accumulation of hard build up on the impression blanket. Instead of presenting a smooth surface, impression is against the surface of the build up. The print therefore can only be as smooth as the impression blanket's, surface and in such a case this is invariably very uneven. build up

GRAY AND WEAK SOLIDS

SOLIDS APPEAR WEAK AND LACK DENSITY

GRAY AND WEAK SOLIDS

CAUSE	SOLUTION
POOR INK/WATER BALANCE	SET INK/WATER TO MINIMUM
FOUNTAIN SOLUTION TOO CONCENTRATED	SET F.S. TO PROPER CONDUCTIVITY
CONDITION OF DAMPENING SYSTEM	RESET CLEAN OR REPLACE SOCK ROLLERS, BRUSHES, ETC
LOSS OF IMAGE AREA	SEE "PLATE WEAR"

Contamination

Contamination is always potentially serious. Contamination may be caused by the wrong ink, cleaning materials, water, or most seriously by solid matter. If the contamination is by solid matter, then the possibility of damage to the press is real, and the current fountain ink should not be used if at all possible. It is important to identify the origin of the contamination, and this should be done with urgency.

The ink supplier may be able to assist. To help, keep a sample of the ink and also the contaminant if it can be isolated.

Dampening Control

Overdampening along with over inking are the cause of many of the problems we have already discussed. In fact poor dampening control or running too much ink and water is almost invariably related to too much dampening, since under dampening usually leads to an immediate and unacceptable scumming or catch up effect which has to be corrected to obtain saleable copy. Wherever possible run with the dampening level set just above catch-up. (the only real exception to this rule is linting that can occur if the blanket is run too dry).

SIGNS OF IMPROPER INK AND WATER BALANCE

1. Ink build-up on water form.
2. A very wet, shiny plate.
3. Ink spitting onto guards, floors, etc.
4. Solids look mottled, not uniform in density.
5. Solids appear weak, lack density.
6. Dots lack density.
7. Loss of detail in shadow portion of pictures.

Let's examine the factors that lead to the need to run too much dampening solution. First consider the fountain solution itself. Is this diluted correctly according to the manufacturer's instructions. Check its strength and correct as necessary.

Is the dampening system operating correctly?

Check that spray nozzles if fitted are operating properly, ensure particularly that the spray pattern does not overlap. Where brush dampening is fitted, is the flicker blade or brush correctly set, along with the correct brush rotation speed?

Consider also the plate. Ensure that this has been correctly exposed and processed (is the developer fresh and properly active?) Insufficient processing can lead to residual coating in the background area which tends to scumming and require excessive fountain solution to run cleanly. This can also be a symptom of a dirty or badly maintained processor.

Consider the ink, the clue here would be a need for high dampening solution levels on only some of the colors while the rest run normally. Again if the problem coincides with a change in supply (different delivery or different supplier) you can fairly suspect the ink. If any of the above factors are found to be the cause then the solution is, of course, to correct the defect. See Ink and Water balance data for more information.

Wet copy

As the name suggests, the copy has a limp "feel" and lacks any audible rustle as pages are turned. It is unlikely that this wetness could be attributed to high moisture levels in the newsprint, since other running difficulties would probably have precluded or hindered its use. However it is worth noting that a very dry newsprint gives the copy a particular "feel" and if the operator is used to examining a dry paper then a change to a more normal stock might lead him to believe the copy is wet. Also, harder, more calendared sheets may have a different “feel" to softer or more open sheets. Remember also that caliper or weight affect how a paper "feels". So as a first measure ask the question has the paper changed ? Check the 'feel' of a sample of unprinted newsprint(either slab/stripping waste or copies from the fly before the inkers and dampeners have cut-in). If however the copy really does have a wet "feel" it is likely that this is due to overdampening on the press. The only real cure therefore is to analyze why the copy is overdampened, and thus to remove or correct the cause.

Data overdampening

Dampening

Overdampening is the problem throughout the copy, i.e. mono and process, or confined to one or the other? It is in fairness difficult to assess since any moisture within the copy will equilibrate quite quickly until all pages are similar. If it can be seen that the problem lies only with the mono-pages, then that suggests that they are requiring a higher level of dampening solution to run cleanly. If the process color is supplied from the same fountain solution system, and the color runs with less dampening solution then it may be fair to suspect that the mono ink is less forgiving lithographically. If however the converse is true and the process color pages are the more wet ones then suspect the process colors. However remember that the mono pages will be only dampened twice (once each side) while process pages may be dampened as many as five times (three process colors one side plus mono each side).n some more modern presses (tower type presses) it is expected that some webs may be dampened four times each side. This will obviously have an impact on the final copy.

Obviously if the ink is thought to be suspect, then this should be examined by the ink supplier. It may be necessary to obtain a different, more appropriate ink for future deliveries. As a first aid measure attempt to reduce the VOLUME of dampening solution in use. Select and press return

Copy Defects (Examples)

A VISUAL defect in this context includes anything which detracts from the fidelity of the PRINTED IMAGE, or which defects or detracts from the cleanliness of the margin areas. Such a visual defect is due to the APPEARANCE either of the printed image itself or of the non-image area surrounding it.

Examples of visual defects might be "incorrect color balance", or "poor solids coverage". PHYSICAL defect in the context of this analysis will include anything which detracts from the overall appeal of the printed copy, but which is NOT attributed to the APPEARANCE of the actual printed image. An example of a physical defect might be "the copy has a tendency to curl after printing"

Density Specifications

It is important to establish and work to specifications. These will vary depending on the nature of the work being carried out and the capabilities of the press. As a starting point, consider the recommendations contained in the NAA guide, NAA being the Newspaper Association of America, or SNAP or X-Rite. Definition Density is the ability of a material to absorb light. Generally, the darker a process color is to the eye, the higher the density. Density measurements of solid ink patches are used to monitor the ink film thickness applied during a press run. In comparing two printed sheets, density readings should be within .05 units, when measured on a densitometer, for meaningful print quality assessment. Dot gain / tone value increase, print contrast and apparent trap are directly affected by this solid ink density. Generally, these values will vary as the solid ink density changes.

Therefore, monitoring solid ink density during a press run is essential when comparing any printed material in terms of quality. There are various publications that list target densities for printing on newsprint stocks. Listed below is a survey of these density recommendations.

	Black	Cyan	Magenta	Yellow
NAA VOL. 8 Target Density	1.05	.90-.95	.90-.95	.85-.90
X-Rite Target Density	1.00-1.10	.85-.95	.85-.95	.80-.90

Solid Ink Density (Dry)	Offset Newspaper	Offset Commercial	Flexography	Letterpress
Cyan	0.90	0.95	0.95	0.90
Magenta	0.90	0.95	0.97	0.90
Yellow	0.85	0.90	0.79	0.85
Black	1.05	1.10	1.05	1.00
SNAP Tolerances	+/- 0.05	+/- 0.10	+/- 0.04	+/- 0.05

Note- The values reported by SNAP are for dry ink films while the values for the X-Rite and NAA targets are for wet ink films. Other Densitometer functions to review are:

Print Contrast
Hue Error and Grayness
Trapping Data
Dot gain / tone value increase Data

How does a Densitometer Work?

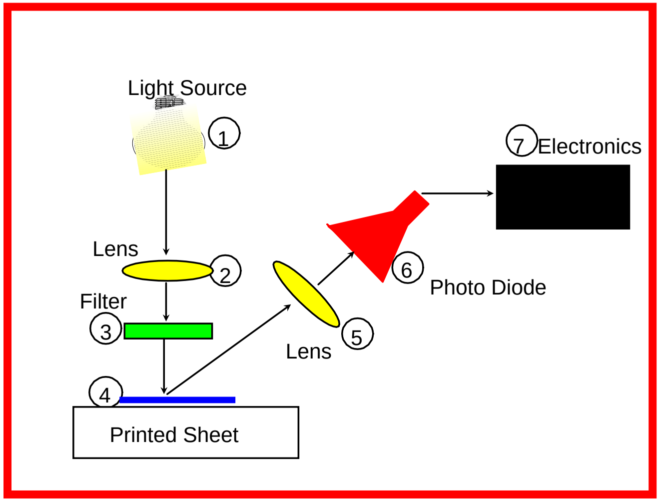
In order for correct print color reproduction to remain consistent throughout a run, it is primarily dependent on the following factors; ink film thickness, dot size, registration, and ink trapping. Most of these factors can be measured with a densitometer. With use of a densitometer, a press operator will have greater control of the color throughout a run. In order to gain a greater understanding of the densitometer, it is helpful to have the knowledge of how one works.

The eye is a very sensitive and a good comparison device. It can perceive density and shade variations and compare them to a known calibration standard that identifies these specific color standards. It cannot however, assign precise numerical values to those variations. A densitometer, on the other hand, can assign numbers to the density variations the eye perceives by quantifying the amount of light that is reflected from the surface of a printed sheet. The densitometer cannot be used to measure color differences. It is strictly a device to measure the optical density of the process colors of a printed sample.

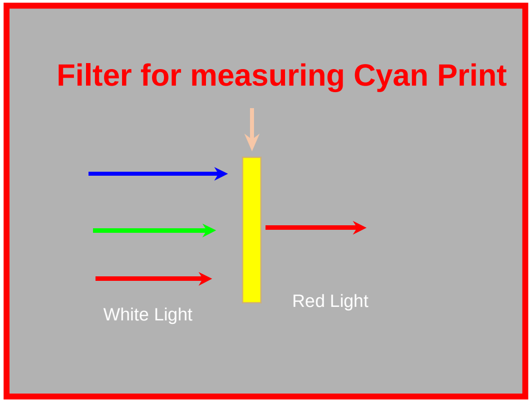
US Ink's Press Doctor

Densitometers are used for quality control in printing. Measurement is primarily concerned with the process colors of cyan, magenta, yellow, and black. The light emitted by the densitometer is white light. White light consists of the three primary colors of light, red, green, and blue. When the proportions of these three primary colors of light are approximately equal, the eye will perceive this light as white light.

A densitometer, in order to measure a printed sample, will produce light from a stabilized source (1) (See figure). The light passes through a lens (2), where it is focused on the printed surface. Depending on the film thickness and the pigmentation of the ink involved (4), part of the light is absorbed. The non-absorbed content of the light is reflected by the surface of the printed stock. A lens system (5) now captures the reflected light returning from the ink film at an angle of 45 degrees to the light source, and focuses them into a receiver (Photo Diode) (6).



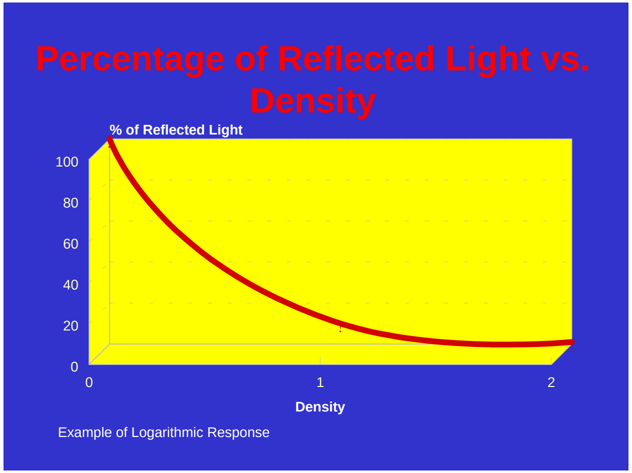
The quantity of light received by the photo diode is converted into electricity. The electronics of the densitometer now compares this current with a reference value (white). The difference obtained is the basis for calculating the absorption characteristics of the ink film being measured. The results of this show the value an operator will see on the densitometer display. Color filters (3) in the light path restrict the light to the range of wavelengths in question.



Different densitometers utilize different filters to measure their responses. In the US, it has been the custom to use the wide band or Status T filters. Several different types of filters are available. The filter set being used must be clearly stated when communicating any densitometer values, or there will be differences in the numerical values.

The printing ink to be measured (cyan for example) affects the light like a color filter. Color filters possess the property of allowing their own color to pass through and absorbing or blocking the light of the other colors. The mixture of arriving light colors of blue and green will produce cyan. These blue and green light contents are able to pass through the ink film unimpeded and reach the white surface of the paper before being almost completely reflected. The red light content, on the other hand, is absorbed by the cyan ink film to a greater or lesser degree. Consequently, depending on the pigmentation and the ink film thickness, only a relatively small proportion of the red light content is reflected. The eye perceives this reflected light as cyan, which consist of mainly blue and green components.

For measuring the ink density, however, only the smaller, red content of the light, which is strongly influenced by the ink film thickness, is significant. For this reason, a filter (see Figure 2) is inserted in the path of the light, which holds back the blue and green light contents. This allows only the red light content relevant for measuring the cyan color to reach the photo diode of the receiver. It is important to understand that the densitometer does not see color only light. Therefore, the other colors of light must be filtered out to achieve an accurate measurement on a sample. Depending on the type of instrument involved, the color filters are placed in the path of the light either before or after the measuring specimen.



The ink density values that are shown on the instrument display are always expressed as logarithmic numbers. As the logarithmic density values increases, the amount of available light decreases. For example, a density of 0.00 indicates that 100% of the light falling on the sample is being reflected. A density of 1.00 indicates that only 10% of the incident light is being reflected. A density of 2.00 indicates only that 1% of the light has been reflected. This is shown in graphical form in figure 3.

The densitometer is designed to adapt the density measurement to the peculiarities of the human sensory perception. The human eyes and ears evaluate optical and acoustic stimuli on a logarithmic scale. This means that the uniformly rising intensities are not perceived as uniformly rising. For example, if an observer is looking at a light table, where the glass top is being illuminated by a fluorescent bulb, he then perceives a light of certain intensity. If a second fluorescent bulb of equal brightness is now switched on, then although twice the amount of light energy is striking the glass top of the light table, the observer will not perceive the new energy level as double the first. Further doubling of the energy would be perceived to even a lesser degree. The more often the light energy is increased, the less the increase is perceived.

These logarithmic differences are extremely important to understand when setting color on press. The logarithmic increase in visual perception relates to the amount of ink on press to achieve this level of perception. What this means is the level of ink will also have to be increased on a logarithmic scale to achieve higher press densities.

To illustrate this point in the printing world, an excellent example would be to look at how rub off is affected by the print density. The amount of rub-off of a newspaper print is highly dependent on the print density or the ink film thickness. This varies exponentially with film thickness and becomes particularly bad when the density exceeds 1.10.

If you raise the print density from 1.0 to a density of 1.25 (an increase of 25%) the rub off of the printed sheet increases approximately 45%. The drying or setting process for newsprint is by absorption, and as the volume of ink is increased, the newsprint can only absorb a fixed amount. Therefore more ink will remain on the surface to rub off.

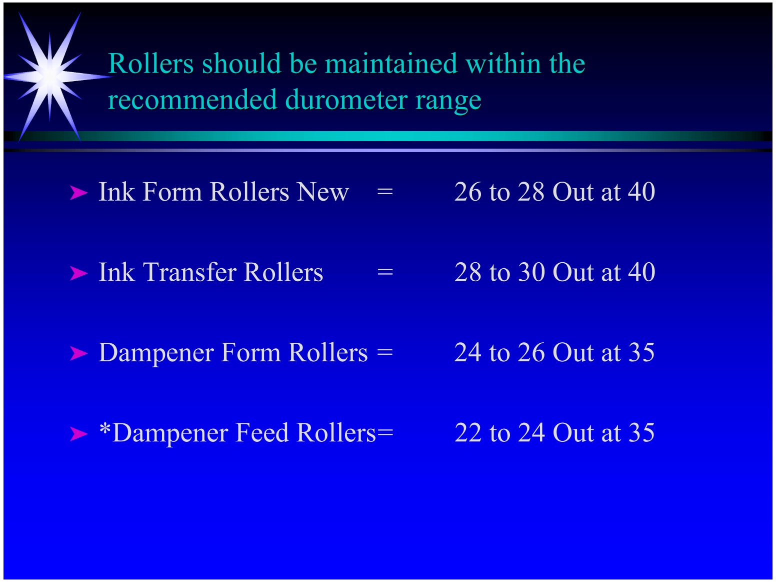
In addition to the adverse effect on rub-off, higher print density has other consequences leading to poorer ink mileage. For example, an increase in print density of 20% (from 1.0 to 1.2) requires an ink film weight increase of 58%. This film weight percentage increase is over double the percentage of the print density change.

A densitometer, like any other instrument, will not work properly unless it is calibrated. If the instrument is not using traceable calibration references, each instrument is its own system. One unit will not relate to another. The values obtained with a non-calibrated densitometer will not accurately reflect the variability of the process being monitored. Calibration of a densitometer is simple. In calibrating the instrument, a value for the “zero point", or low end response, is established first. Then a "high end" point is set. In setting these two points a slope between them is established, thus allowing for accurate measurements. Besides the calibration plaques offered by the densitometer manufactures, a "T-Ref™" is available from the Graphics Communications Association (GCA), which is a printed reference used to verify that a densitometer is truly a Status T response unit.

In today's times of rising costs it is easy to see the functionality of the densitometer in the pressroom. A densitometer will not have "eye fatigue" problems where the human eye becomes "used to" looking at a subject. When the human eye does this, it becomes less sensitive to changes. The densitometer is easily one of the most important instruments in the pressroom environment. Without it, problems beyond the rub off mentioned above, such as set off, pipe roller build up, tracking or marking, and color balance would be difficult to control. Much of the printing done today without this tool would be severely hampered, and production costs would skyrocket.

Direct Print Basics

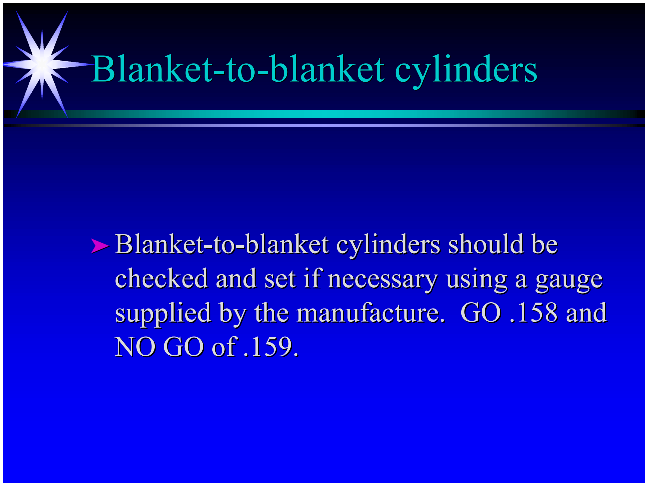
In printing newspapers through the offset lithographic process, the image is transferred from the plate to a blanket then onto the newsprint. However under certain press configurations this is not always possible. In order to achieve a four over one printing configuration, one on the printing units needs to be printed via direct lithography. In the direct lithographic process the image is directly transferred from the plate to the newsprint. This configuration can cause additional quality problems. We will discuss the variables involved and ways to maintain them, so that optimum print quality can be achieved.

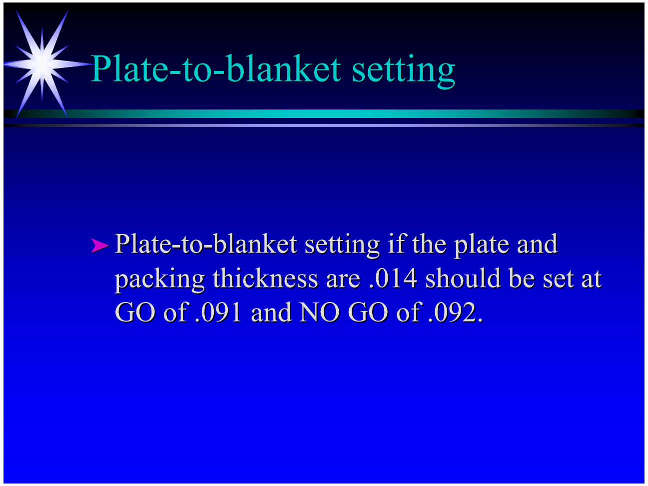


As with any press maintenance schedule the roller durometer needs to be checked and rollers should be replaced when out of specification. The rollers should be inspected with a shore A durometer gauge and replaced as they get too hard.

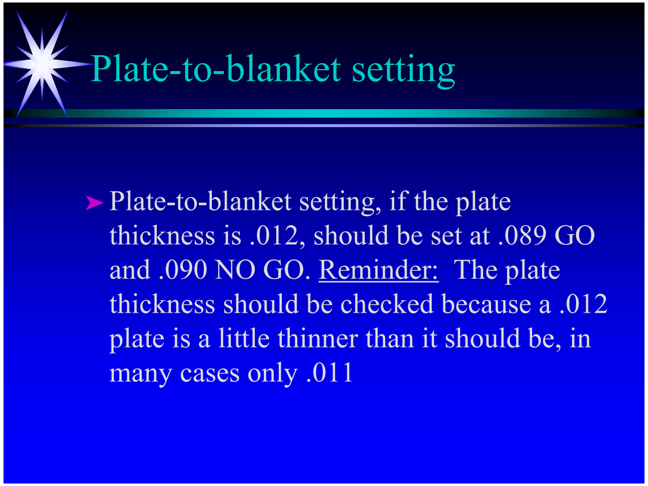
The dampener feed roller is a very critical roller and sometimes is replaced with a very hard ink transfer roller because it is covered with a sock. The delicate settings necessary to transfer water up to the dampener form cannot be achieved if it is too hard. Therefore, it is not a good practice to utilize old, hard transfer rollers in this system. The adjustment of the dampener feed roller, should be made using slip-sheets or a scale to measure the pressure. Example, chrome to the sock roller 2 lbs., sock to the chrome 3 lbs. The dampener form should be set in the same manor. The chrome to the dampener form at 4 lbs., dampener form to the plate at 5 lbs.

Impression settings need to be checked and adjusted as needed. The following settings are





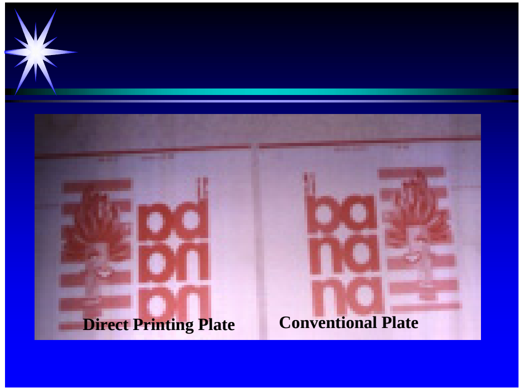
critical for proper reproduction quality in the direct lithographic process



The Blanket type being used should also be considered. For example, conventional blankets with packing would equal a total of .081 and when printing direct .003 would be removed from the plate and packing to accommodate the thickness of newsprint. This type of blanket is rarely used today. It printed very well but would not take a smash and the shore hardness was at 88 to 90 durometer.

A compressible 3 ply blanket plus packing should equal not less than .083 once it is run in, so depending on the drop off would equal .084 to .085 etc. This blanket in most cases can be printed direct without removing any packing from under the plate. In some cases, depending on the manufacturing process might require the removal of packing or a thinner plate when printing direct.

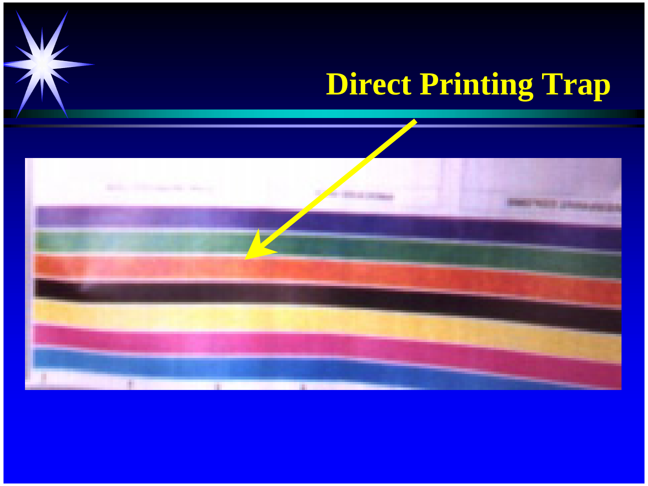
NO pack blankets are ordered at a thickness that will maintain the drop off standard of .083. Below this thickness it does not print well and in many cases <u>will require that a plate be packed in order to print direct.</u>



In preparing the plates, the negatives will need to be flipped over. In conventional offset lithography, the image on the plate is in the same direction as that of the print. For direct lithography, the image area needs to be inverted as to produce the correct direction on the print. The emulsion side should always be down or next to the plate when the burn is made. When using negative working subtractive plates, 2 to 4% increased dot gain can be expected under optimum conditions. However, if the plates are burned with the emulsion side of the negative up (not in contact with the plate surface) increase dot gain of approximately 8 to 10 % can be expected.

US Ink's Press Doctor

The Color lay down sequence is also critical when printing direct. The Cyan-Magenta-Yellow-Black, Yellow if possible, should be printed direct for the best results. The traps or overprints are the most difficult to maintain under the direct printing conditions. The differences with newsprint can dramatically effect the lay on the ink. Various papers show greater print quality differences when printed direct that with conventional offset printing.



As we have discussed the use of direct printing in the four color process can cause quality problems. The process needs to be properly maintained to optimize the reproduction so that the quality is not comprised.

Dot gain / Tone Value Increase

Of all print defects, probably more has been written on the topic of dot gain / tone value increase. There are many different causes of dot gain / tone value increase, some of which are outside the scope of this program. For that reason we should concentrate on the more common causes. To keep things brief, definitions and descriptions will be kept separate from the main analysis. They can however be accessed at any stage. For example, for data on dot gain / tone value increase select definition As a first measure, examine the dots using a low power magnifier (say 10x). Choose middle sized dots (those that are just about touching each other). Are they elongated as opposed to circular, are they misshapen due to dots of the same color partially overlapping. Looking at the halftone image, the midtones are ‘muddy' the highlights lose their clarity, while the shadow areas may be filled in. These are the classic symptoms of dot gain / tone value increase.

Dot gain /Tone Value Increase

We have established that the problem is excessive dot gain / tone value increase. As with many other print related problems, the major causes of dot gain / tone value increase are running with either too much ink, or too much dampening solution, or both. So as a first measure, check the solid density, preferably with a densitometer. See density for data on ink film weight reduction.

For more information on Dot gain / tone value increase, Select Dot Gain Data

If you wish, select data for information on setting up density standards. After ensuring that the ink film weight is as low as is possible, consistent with achieving the correct solid density, check that the fountain solution is set at the lowest possible setting, (just above catch-up). For data on this select dampening solution.

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The ink and water balance are quite normal, but the problem of dot gain / tone value increase persists? Has the ink changed? Consider particularly the ink’s strength. A weak ink will need a greater film weight to achieve correct solid density. If necessary, have the strength checked by the supplier. Remember it is the VOLUME of ink on the paper which most affects dot gain / tone value increase. Dot gain / tone value increase can be greatly affected by excessive pressure between the blanket and the paper. Ensure therefore that the blanket packing is correct, with the correct total blanket height according to manufacturer's specifications. Ensure also that impression is correctly set, again according to manufacturer's specifications. Select impression for more data. Compressible blankets generally tend to give less dot gain / tone value increase than non-compressible, and can usually run with less pressure. Again on the topic of pressure, it is unlikely to compensate for a paper with a rough surface. If the paper has a rough surface, you will not be able to expect low dot gain / tone value increase. Equally, there will be little which can be done as a first aid measure on the run, apart from changing the paper.

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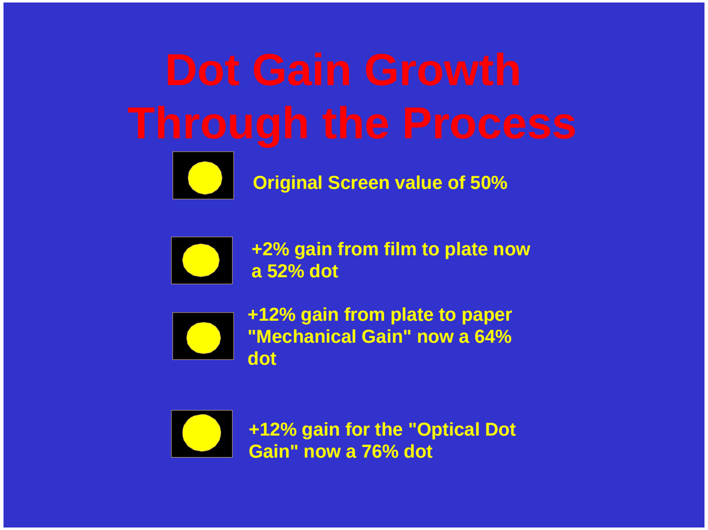
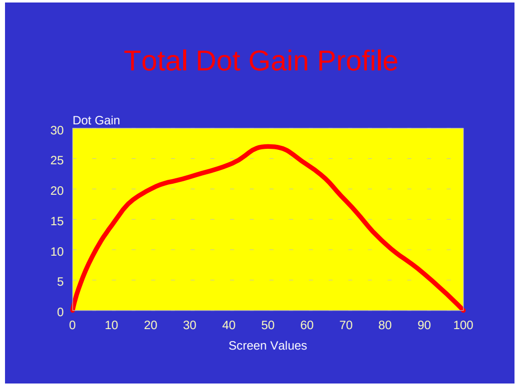
What has been talked about so far are dot gain / tone value increase problems which are the result of the physical printing process. Dot gain / tone value increase can be influenced by incorrect plate preparation.(This however is likely to be less than would be seen as a result of the factors already examined). Ensure that with a negative working plate the exposure is not excessive.(Check exposure regularly by means of a plate exposure signal strip such as a Stouffer scale).ensure also that contact between the plate and the negative is very good in the exposing frame. Remember also that shooting through the back of a negative(emulsion side up) will give a generally enlarged and degraded dot.

Dot gain data



As a first principle it has to be accepted that dot gain / tone value increase in the context of printing is a FACT OF LIFE. Dot gain / tone value increase will always be present, what causes the problems we see is excessive, variable, or unpredictable dot gain / tone value increase. Dot gain / tone value increase is an increase in diameter of the halftone dot. A dot pattern which (on the film) covers 30% of the image area, but which when printed covers 50% is said to show a total dot gain / tone value increase of 20%. Total dot gain / tone value increase therefore is the numerical difference between scanner settings, and corresponding dot size on the paper. Every stage of the process from film, through plate making, to the several stages of printing the final image contribute to dot gain / tone value increase. However, the largest contributor is the actual printing process itself. Not all dots grow to the same degree. The main area of dot gain / tone value increase is in the mid tones (40% 50% 60%). Above this range, as the dots progressively touch each other, the length of clear perimeter available for growth on each dot diminishes, which explains the tapering off.



Dot gain / tone value increase becomes more pronounced as the screen ruling becomes finer, this is often one of the factors which limits the choice of screen ruling. Select for data on dot gain / tone value increase measurement. Dot gain / tone value increase is a summation of several effects. Each time the ink is split (plate to blanket and blanket to paper) there is a degree of squash, which increases the physical diameter of the printable dot. When the dot is transferred to the paper, setting is achieved by absorption. This does not only take place in the vertical plane (into the paper), some in fact occurs sideways, contributing to the increased diameter.

Not all dots grow to the same degree. The highest area of dot gain / tone value increase is in the mid tones (40% 50% 60%). Above this range, as the dots progressively touch each other, the length of clear perimeter available for growth on each dot diminishes, which explains the tapering off. (See Figure 2)

Screen Ruling Vs. Dot Gain

Screen Ruling	Dot Gain
300 Lines/Inch	30%
150 Lines/Inch	15%
75 Lines/Inch	7.5%

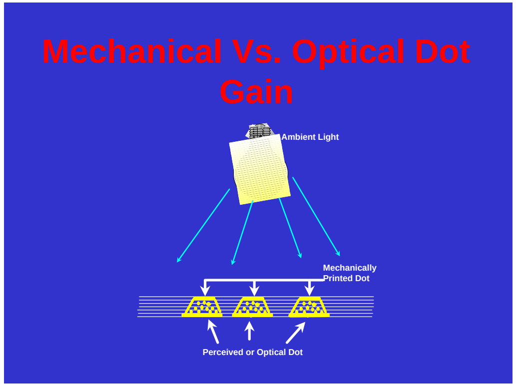
This Example is valid only with screens of the same dot shape

Dot gain / tone value increase becomes more pronounced as the screen ruling becomes finer, this is often one of the factors which limits the choice of screen ruling. As shown in the example in Figure 3 the dot gain / tone value increase will increase under the same conditions as the screen ruling becomes finer.

Dot gain / tone value increase in pre-press can occur in the making of the negatives and then in the development of the plate. Exposure times and contact between the negative and plate should be carefully monitored throughout the plate room. The dot gain / tone value increase in this area should be controlled to less than 2 percent.

Dot gain / tone value increase on press is a summation of several effects. Each time the ink is split (plate to blanket, and blanket to paper) there is a degree of squash, which increases the physical diameter of the printed dot. When the dot is transferred to the paper, setting is achieved by absorption. This takes place in the vertical plane (into the paper), and also occurs sideways, contributing to an increased dot diameter.

There is also an optical effect, which occurs, in the printing process. After the dot is printed (mechanical dot), the eye perceives this printed dot as larger than actually printed. This effect is called Optical Dot gain / tone value increase and is illustrated in Figure 4. The light is scattered within the paper and some of the light is trapped below the halftone dots and absorbed by the ink. The reflected light, striking the dot, throws a shadow onto the paper. This shadow can be perceived by the eye and by a reflection densitometer, and has the same effect as printing a larger dot. Optical dot gain / tone value increase can be larger if the shadow is more pronounced and depends on the opacity and the surface of the printed substrate.



With the press and its settings under control, dot gain / tone value increase should be consistent. For that reason it is possible to compensate for predictable dot gain / tone value increase at the scanning stage.

It is necessary, therefore, to measure the dot gain / tone value increase for a press (benchmark), under your normal printing conditions. For each color, prepare a plate with a dot gain / tone value increase target from a measured set of negatives, (this is a series of tone squares usually ranging from 5% dot to 95% dot). Measure the plates to determine the gain produced in the plate making operation. After a run, when the press is warm and set up for correct ink and water balance, mount the plates and run at normal operating speed.

Using a densitometer, measure the dot gain / tone value increase or dot area on the paper for each tone target. The dot gain / tone value increase is the measured dot area minus the dot area (of the corresponding area) on the negative.

After bench marking a press, one may consider that dot gain / tone value increase is excessive for that press and may want to improve the process. By going through the above process one may be able to isolate a particular area where the gain is excessive and thus concentrate on this area. The following variables have been found to affect dot gain / tone value increase:

VARIABLES AFFECTING DOT GAIN / TONE VALUE INCREASE

Ink

- Tack and Viscosity

- Ink / Water Balance
- Pigment Strength
- Temperature
- Ink Film Thickness (Print Density)

Paper

- Brightness, Whiteness, and Opacity
- Porosity / Holdout
- Smoothness
- Web Tension

Fountain Solution

- pH/Conductivity
- Hardness of Incoming Water
- Type of Dampening System
- Formulation

Blanket

- Compressibility

- Age
- Tension
- Surface Characteristics

Plate

- Exposure Time and Vacuum
- Processing
- Reactions (Age, Light, Chemicals)
- Tension

Rollers

- Durometer
- Settings
- Glazing

Speed

- Low / High

Packing

- Over / Under

Coverage

- Light / Heavy

It is important to note that the solid ink density (ink film thickness) will have a dramatic affect on dot gain / tone value increase. Therefore it is critical to monitor and control ink density during a run so that the dot gain / tone value increase is consistent throughout the run.

As one can see there are many variables that can affect dot gain / tone value increase. The bench-marking process should be rechecked after any variable is changed in the printing process. If this is left for too long before testing and several variables have changed, bringing the process back into control may be difficult.

Closely allied to dot gain / tone value increase are slur and doubling. These effects are observable as elongation of the dots, and can be seen under low power magnification. Slur is usually an elongation in the direction of the web's length, while doubling can be in any direction. Select data for information on slur and doubling.

Dot Measurement

With the press and its settings under control, dot gain / tone value increase should be consistent. For that reason it is possible to compensate for predictable dot gain / tone value increase at the scanning stage. It is necessary therefore to measure the dot gain / tone value increase for your press (benchmark), under your normal printing conditions. For each color, prepare a plate with a dot gain / tone value increase target, (this is a series of tone squares usually ranging from 5% dot to 95% dot). After a run, when the press is warm and set up for correct ink and water balance, mount the plates and run. Using a densitometer, measure the dot gain / tone value increase or dot area on the paper for each tone target. The dot gain / tone value increase is the measured dot area minus the dot area (of the corresponding area) on the theoretical value. The densitometer will probably use the Murray-Davies equation, which relates integrated density of the tone square to dot size:

$$\text{Dot area} = 1 - \frac{10^{-Dt}}{10^{-Ds}}$$

Where Dt is density of tone and Ds is density of solid.

Dot gain / tone value increase can be described as the growth in size of a halftone dot through the successive stages of the printing process. The value measured in this assessment is "total dot gain / tone value increase" which includes both mechanical and optical dot gain / tone value increase. It is a measure of the total dot growth when producing negatives, plates and the printed sheet. Dot gain / tone value increase values are typically reported from the midtone portion of the printed material (50%). This measurement is a direct increase in the percent dot area. Therefore, a 50% film dot that produces an 85% printed dot, has a35% total dot gain / tone value increase. All dot gain / tone value increase values in the attached assessment were calculated by the Murray/Davies formula. As mentioned earlier, print density can directly affect dot gain / tone value increase. Generally, when density increases, an increase in the amount of dot gain / tone value increase will occur. Listed below are typical dot gain / tone value increase ranges for printing on newsprint.

US Ink's Press Doctor

Dot Gain @ 25%	Offset (85 lpi)	Offset (100 lpi)	Flexography (85 lpi)	Letterpress (65 lpi)
Cyan	28%	32%	25%	15%
Magenta	28%	32%	25%	15%
Yellow	28%	32%	25%	15%
Black	28%	32%	25%	15%
SNAP Tolerances	+/- 3%	+/- 3%	+/- 3%	+/- 3%

Dot Gain @ 50%	Offset (85 lpi)	Offset (100 lpi)	Flexography (85 lpi)	Letterpress (65 lpi)
Cyan	30%	32%	27%	18%
Magenta	30%	32%	27%	18%
Yellow	30%	32%	27%	18%
Black	30%	32%	27%	18%
SNAP Tolerances	+/- 4%	+/- 4%	+/- 4%	+/- 4%

Dot Gain @ 75%	Offset (85 lpi)	Offset (100 lpi)	Flexography (85 lpi)	Letterpress (65 lpi)
Cyan	20%	20%	16%	16%
Magenta	20%	20%	16%	16%
Yellow	20%	20%	16%	16%
Black	20%	20%	16%	16%
SNAP Tolerances	+/- 3%	+/- 3%	+/- 3%	+/- 3%

Emulsification

Select definition for data on emulsification. Emulsification has already been described. Let us consider the possible causes, and suggest some courses of action to remedy the problem.

SIGNS OF IMPROPER INK AND WATER BALANCE

1. **Ink build-up on water form.**
2. **A very wet, shiny plate.**
3. **Ink spitting onto guards, floors, etc.**
4. **Solids look mottled, not uniform in density.**
5. **Solids appear weak, lack density.**
6. **Dots lack density.**
7. **Loss of detail in shadow portion of pictures.**

The most likely cause of emulsification is overdampening, see also dampening A problem with emulsification is that it can occur and be noticed quickly as the ink becomes waterlogged. However even if the cause of the overdampening is removed, it may take several hundred copies to fully see the effect. Consider why overdampening is happening.

A poorly developed plate may require more dampening solution to run cleanly, yet this excessive dampening can lead to emulsification. If you see catch up and emulsification happening simultaneously, then suspect such a factor. Check developer bath and that the plates have been correctly stored.

Examine the fountain solution strength. A fountain solution, which is too strong, may bring about emulsification due to the effect of surfactants or wetting agents. Equally however, a weak fountain solution may bring about emulsification by virtue of the VOLUME of dampening solution required to maintain clean plates. The only answer (apart of course from selecting a good quality concentrate from a reputable source) is to carefully ensure that the fountain solution dilution is within manufacturer's tolerances. poorly formulated ink can lead to emulsification. Ink may be inherently unstable when normal levels of dampening solution are used, or may have a need for higher levels of dampening solution to maintain clean running. In either case the effects are likely to be as described. The only real remedy in such a case is to call the ink supplier. On the run first aid would consist of running with minimal dampening solution.

Emulsification

All lithographic inks need to emulsify fountain solution in order to work correctly. However when we talk of emulsification problems on press we really mean excessive emulsification. Emulsification may show itself in many different ways. It may be dot-gain, type thickening, loss of density, or build up in plate gaps, at plate edges, or on the press near to the ink train due to sling. When an ink emulsifies too much, it changes its flow and tack properties, with the effect that transference is adversely affected. This leads to the need to run with an excessive ink film (just to achieve somewhere near the correct density) and all the problems to be associated with that. Please press return

Embossing

Embossing is a problem whereby a hard raised image occurs on the second impression blanket corresponding to the position of the image from the first impression. What is to say during the second impression some of the freshly printed ink is transferred from the back of the sheet to the blanket. Such transfer is a normal occurrence, and under normal circumstances the ink tends to self clean once a certain level has been reached, and thus no difficulty arises. embossing may be due to an ink which is inherently unstable, or is unstable in the presence of fountain solution and which may leave a hard deposit on the blanket. This problem is more likely to occur with highly resinated low rub inks. As a short term solution, the blanket may be cleaned with a (specially formulated) mildly abrasive roller cleaner, or a mildly abrasive cleaning pad.

See also second impression set off

Feedback data

Feedback is where ink finds its way from the inking system into the dampening solution system, thus contaminating the fountain solution. This shouldn't be confused with tinting or toning. Feedback contaminates the dampening solution system with(usually) floating scum, while toning or tinting discolors the fountain solution by being dissolved in it. Feedback can only occur on dampening systems with direct contact dampeners. In these systems a degree of feedback is common. Systems where the fountain solution recirculates should ideally be equipped with a filter or separation system to catch any contamination. common cause of feedback is where ink is removed from the non-image area of the plate by the scavenging action of the dampener form rollers. If this ink is overemulsified, it may not have sufficient physical properties to enable it to be redeposited on an image area. In such a case the only place it can go is into the fountain solution system, or remain adhering to the fountain solutions rollers. Feedback may be caused by either the plate, the fountain solution, or the ink.

Feedback

For data and a definition of feedback, see data.

Feedback is where ink finds its way from the inking system into the dampening solution system, thus contaminating the fountain solution. If you looked at the data you will have seen that feedback is closely related to both scumming and emulsification. Emulsification is probably the largest single cause of feedback. Ensure that the dampening level is correctly set on press. This should be at just above catch up point.

Examine the fountain solution strength. A fountain solution, which is too strong, may bring about emulsification and thus feedback due to the effect of surfactants or wetting agents. Equally however, a weak fountain solution may bring about a similar effect by virtue of the VOLUME of dampening required to maintain clean plates. poorly formulated ink can lead to feedback. Ink maybe inherently unstable when normal levels of dampening solution are used, or may have a need for higher levels of dampening solution to maintain clean running. In either case the effects are likely to be as described. The only real remedy in such a case is to call the ink supplier. On the run first aid would consist of running with minimal dampening solution.

Filling in of type matter

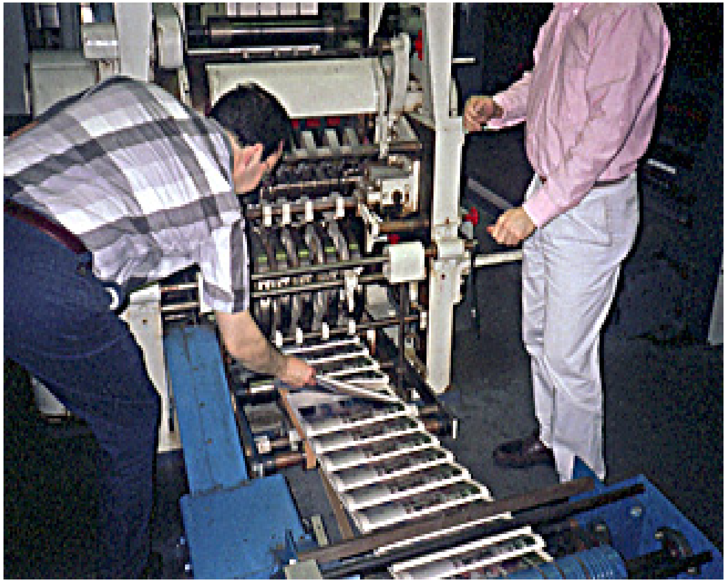
Type, particularly fine type shows a tendency to fill in or thicken?

This can be due to several factors, but the most likely is an ink and water imbalance which results in over emulsification. On a copy which consists of little more than fine type, the rate of replenishment of ink on the plate is much reduced, so the ink film's ability to deal with fountain solution is diminished. the fountain solution therefore needs to be run very low. Such imbalance can be due to the ink, the fountain solution, or the operator. It is necessary to decide which is at fault and correct.

Choose balance for more information. Another factor is running very fine type on a substrate, which is particularly rough. Has the paper changed? If the roughness of the paper is incompatible with the type work being printed, consider (if possible) using a smoother sheet. In such a case little can be done on the run, as a first aid measure.

Fold defects

Possible problems with the folder could include the following:.



Poor cut off - The cutting knives could be dull or broken, an enlarged cutting rubber slot, weak or broken cushion springs..

Enlarged or torn pinholes - It could be that the folding pins are not timed properly or the pins could be dull, bent or broken..

Uneven delivery - It is possible the belts are not adjusted properly or second folding rollers not set correctly..

Missed kick - Second fold rollers not properly set, or the kicker arm not adjusted correctly..

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Poor tabloid slit - Could be a dull or nicked knife, or the knife not adjusted properly..

Web tears at nipping rollers - The tension on the roll could be too tight, or nipping rollers not properly set..

Uneven first fold over the former - The roll side way adjustment not properly set..

Paper shreds on collect with heavy product - The wrong knife bar being used.

Fountain Solution Strength Testing

It is a relatively simple task to check the strength of your fountain solution. It is imperative that the fountain solution strength is maintained in order to ensure that working properties for proper ink/water balance as well as areas of corrosion inhibition, and antibacterial remain effective. First though a couple of areas of concern. Some fountain solutions may be buffered , which means that the pH will remain relatively constant over a wide range of dilutions. For this reason the most reliable method is to measure the conductivity which is in fact much more closely related to the strength of the solution.

Using a measuring cylinder or jug, make up a series of controlled dilutions, (say 1, 1.5, 2, 2.5 oz/gal). Ensure you use the same water supply as is used in the fountain solution dosing system. Check the conductivity of each of the standard solutions, and also the working strength fountain solution. To ensure that you comply with the fountain solution manufacturers recommendations make a note of the conductivity which corresponds to the desired dilution and use this figure for control purposes. If the incoming water supply or fountain solution concentrate change then this standard dilution test must be repeated. It is important to test the pH also since all fountain solutions are not buffered.

Definitions

Fountain Solution Test Definitions

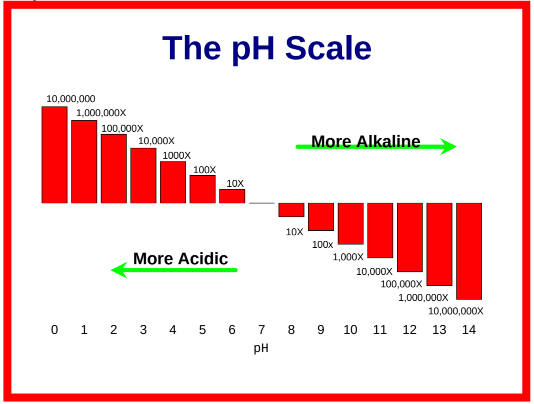
pH is a measure of the number of Hydrogen ions [H+]in solution. pH = -LOG(10)[H+]

Conductivity is a measure of all the ions in solution. Conductivity is a measure of the liquid's capacity to conduct electricity.

cond = 1/resistivity = mho, micromhos = siemens, microsiemens

Fountain Solutions are a major variable in the printing process. The use of a fountain solution can be as critical as its selection. All fountain solutions are supplied in the form of a concentrate, which must de diluted before use. Improper dilution or variability in dilution can create consistency problems, which can be difficult to diagnose on press. In a previous article we have covered the use and maintenance of the incoming water supply. This article will cover the basics on the use of fountain solutions in the pressroom.

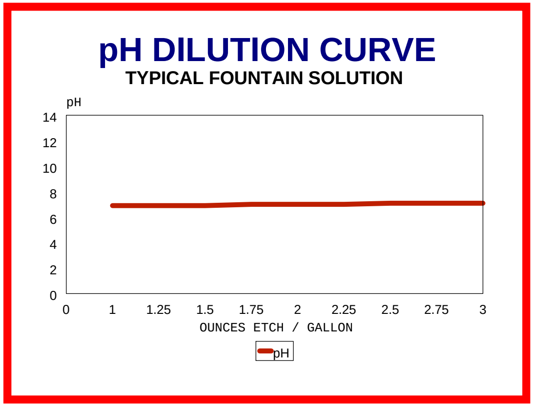
Fountain Solutions are typically diluted before use in a ratio of 1 to 2 ounces per gallon of water. Conductivity and pH are used to measure the dilution in order to ensure a proper dosage. The term pH is from the Roman meaning "potential for Hydrogen," thus the small p and the capital H. This really is a measurement of the "Hydrogen ion" in solution. In practical terms the pH is a measure of the acidity or alkalinity of the solution.



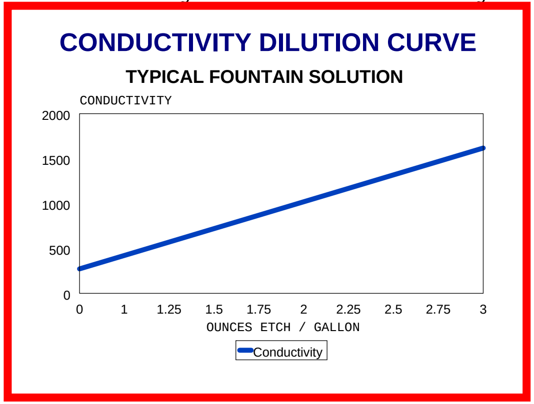
The pH scale runs from 0 to 14.0 with the midpoint, 7.0 being neutral. A solution with a pH lower than 7.0 is considered an acid. A solution with a pH above 7 would be considered a base (alkaline.) Each whole number on the pH scale represents a 10-fold change in the Hydrogen ion concentration. A change in pH from 5 to 6 would be a 10-fold change in acidity, whereas a change in pH from 4 to 6 would be a 100-fold change. Thus small changes in pH may in practical terms, be actually quite a large change in the hydrogen ion concentration (See Figure 1). The pH of a solution can be tested by the use of an electronic pH meter.

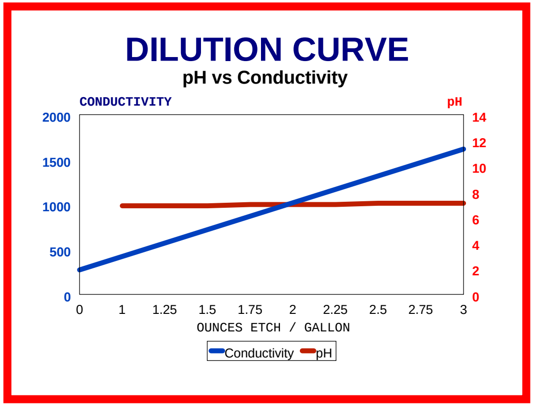
To complicate matters further, most fountain solutions today are buffered. A buffered solution is one that contains chemical salts that stabilize the acidity or alkalinity of the solution by neutralizing within certain limits any acid or base that is added to the system.

When fountain solutions are buffered, the use of pH to control dilution is much more difficult. For example, a solution with a dilution of 1.5 and another solution with a dilution of 2 ounces per gallon may have the same pH (see figure 2). So how can we assure a consistent dilution using these solutions? There is another measurement technique that printers can use to test the dilution of their solutions. This technique measures conductivity.



Conductivity is the ability to transmit or conduct an electrical charge. In solutions, the conductivity is determined by the number of ions present in solution (see figure 3.) Basically, the higher the level of fountain solution concentrate used in the solution, the higher the conductivity will be. Figure 4 shows a typical conductivity vs. pH curve for a fountain solution. As you can see from the graph, the conductivity gradient or slope is substantially greater than the pH. Which shows that the conductivity is a better method of measuring the dilution level of a fountain solution.





The unit of measurement for the resistance to the flow if electricity is "ohms." The unit of measurement for expressing conductivity, the opposite of resistance, is "mhos" (ohm spelled backwards). In measuring the conductivity of fountain solutions, a very small fraction of a mho, or "micromho" is used. A micromho is equal to one millionth of a mho.

The level of conductivity of a solution is measured with a conductivity meter, which gives readings in micromhos. As a rule, conductivity meters are accurate, easy to calibrate, and simple to use. They are operated simply by either dipping the electrode into the solution and stirring for a few seconds to obtain a reading, or pouring the fountain solution into a cup and then getting the reading.

A calibration schedule needs to be established, with the proper standards to ensure the accuracy of the instrument. Many battery operated models have an internal calibration standard that is tested by just pushing a button. This is an electronic calibration and may not always be accurate. Check the meter's operating instructions for more details on your particular model.

A better way to test a conductivity meter would be to use a calibration standard conductivity fluid (around the conductivity range of press ready solution), which can be purchased from any scientific catalog. Discarding this solution after use is important, since it may be contaminated. These simple calibration steps can save a lot of confusion in discerning differences between meters and potential problems on press.

Some of the problems which could be associated with the improper dilution ratio are as follows:

Improper Ink/Water Balance

Scumming

Gray and weak solids
Linting

Plate Wear

Stripping

[Build up](#)

[Rub off](#)

[Set off](#)

The pH and conductivity of a fountain solution should be the first logical step in diagnosing a press problem. It is quick and easy to test, yet it can prevent a lot of press problems, if properly maintained.

Fountain Solution Odor

Fountain solution has unpleasant or unusually strong odor. Determine first whether the odor is just unusually strong, or whether the odor is uncharacteristic. It may be necessary to make a controlled dilution to check the odor. If the odor is in fact normal in nature but unduly strong, check the fountain solution strength. The odor is uncharacteristic? Is it due to contamination?

Check for cleaning solvents such as blanket wash or reviver, or general cleaning solvents. If the odor is of either stagnant water, or bad eggs, it is likely that this is due to the presence of either algae or bacteria. Check the fountain solution reservoir for slime. If slime is present it may be necessary to use a proprietary system flush during the next drain down. Ensure the fountain solution is maintained at the correct strength.

Select for data on fountain solution strength.

Fountain Solution Problems

The fountain solution may be one of the lowest cost consumable in the lithographic process, but its potential to cause difficulties when substandard or wrongly used is immense. Let us consider some problems that may be a result of incorrect fountain solution. It is difficult to maintain clean running? It becomes necessary to run with high dampening solution settings in order to keep the plate running cleanly. As a consequence the copy shows print defects by ink in the non image area, at near normal dampening solution levels this may be scumming(sometimes called catch-up or greasing) which is often localized, and may be quite pronounced, or there may be an overall tinting which is a general coloration and which may be quite subtle. Bleeding and toning are terms often used as an alternative for tinting. Both these problems can be a direct consequence of fountain solution which is not of the correct strength. Scumming may be due to fountain solution that is weak, while tinting may be due to fountain solution that is too strong. It is a fairly straightforward operation to test the strength of the fountain solution, and this should be done routinely. See strength testing for data.

****

Ink feeds-back into the fountain solution and may cause contamination of the fountain solution system. This is in the form of a scum, as opposed to a general dissolved coloration as with tinting. Feedback is due to incompatibility, and may be due to the fountain solution, the ink, or to a lesser extent, the plate, or may be a combination.

****

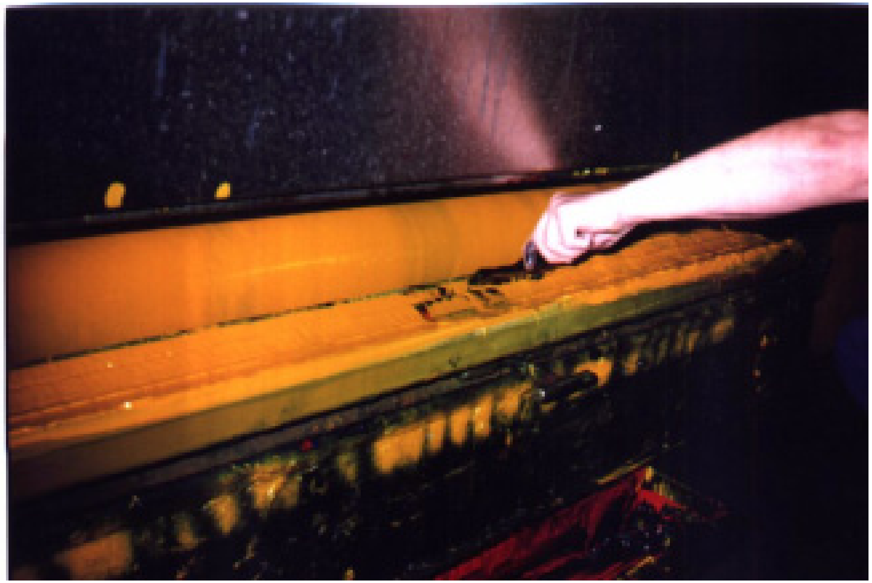
There is a strong odor from the fountain solution system. This is probably most noticeable after a long shut down.

****

The fountain solution system is contaminated by organic growth . This may be in the form of gel or slime, and maybe accompanied by strong odor.

Fountain problems

Let us consider difficulties, which can arise in the fountain or ink delivery system on the press. Let us examine the symptoms of the problem.



There is a tendency for the ink to seep and drip. This originates from the gap between the fountain ball (roller) and the ink metering blade on a conventional or undershot fountain.

The ink drips through the gap between the ink rail and the fountain ball (roller) on a press fitted with an ink rail system.

US Ink's Press Doctor

There is difficulty handling the ink manually from a bucket or kit, there being a problem holding the ink on the palette knife.

The ink hangs-back in the fountain and thus refuses to transfer onto the fountain ball (roller).

The ink strips off the metal inking rollers leading to a weak print.

The fountain ball (roller) has been scored by metallic foreign contamination

Gray Balance

Conceptually, color is first created in the "Mind”. The creative mind is a fertile area and hampered with few rules and regulations. In the Graphic Arts, the only real constraints to creativity are the limitations of the reproduction processes themselves. Sometimes these limits are pushed knowingly or otherwise. This is where problems arise and where the need to measure and quantify color comes in. Measurements and standards can serve to more realistically achieve consistent results. This can be illustrated by the following of the factors we live with in the printing world:

- Viewing an image on a computer screen in the 16.7 million shades of color mode; when the printed process is only capable of approximately 5,000 shades.

- Viewing a desktop color proof, at the incorrect line screen (DPI) on a stock that does not represent the one you will be printing on.

Gray balance is the first important step undertaken by the color separator, in determining the color content and contrast that the final printed piece will have. Gray balancing is a scanner calibration procedure, in which the operator programs specific dot percent ratios of

YELLOW, MAGENTA and CYAN into the scanner output. When film is output to these percentages and is proofed or printed, it should reproduce a "neutral gray" color. Once the scanner is Gray Balanced all of the color contained in the separations is a default of these settings.

A midtone three-color gray can be comprised of 50% yellow; 50% Magenta and 60% Cyan. This will render a neutral gray tone. All other midtone process color values will be dependent upon this setting. If the "gray balance" settings are altered; then the color balance will also be altered. Because of the limitations of the pigments in the process inks, when equal amounts of cyan, magenta, and yellow are printed on white paper, they do not reflect equal amounts of red, green and blue to produce gray (See Figure 1). Each of the process inks absorbs or reflects an unequal amount of its share of the red, green, and blue of the spectrum. As such, if equal amounts of cyan, magenta, and yellow are printed, they would make a brownish color rather than a neutral gray.

The second most important control the scanner operator has at his disposal is the choice of gradation. The choice of gradation dictates how "full" a job prints. In other words the scanner determines or influences the amount of dot gain / tone value increase a job will have.

The third most important control the scanner has is the %UCR setting. This setting dictates how much Yellow, Magenta and Cyan are printed in order to make up a three color shadow neutral (Grays and Browns). This will affect how well inks will trap or overprint and what shadow colors can be reproduced.

With scanning having this much influence and control over color, it is imperative that the prepress and press operations attempt to reproduce the scanner "gray balance" set up. Otherwise we are only guessing at correct color during a make ready on press.

Gray Balance agreement occurs when the proper proportions of yellow, magenta, and cyan that were blended together at the scanner; are reproduced at the press. Gray Balance is a significant factor in determining what the over all color gamut will be.

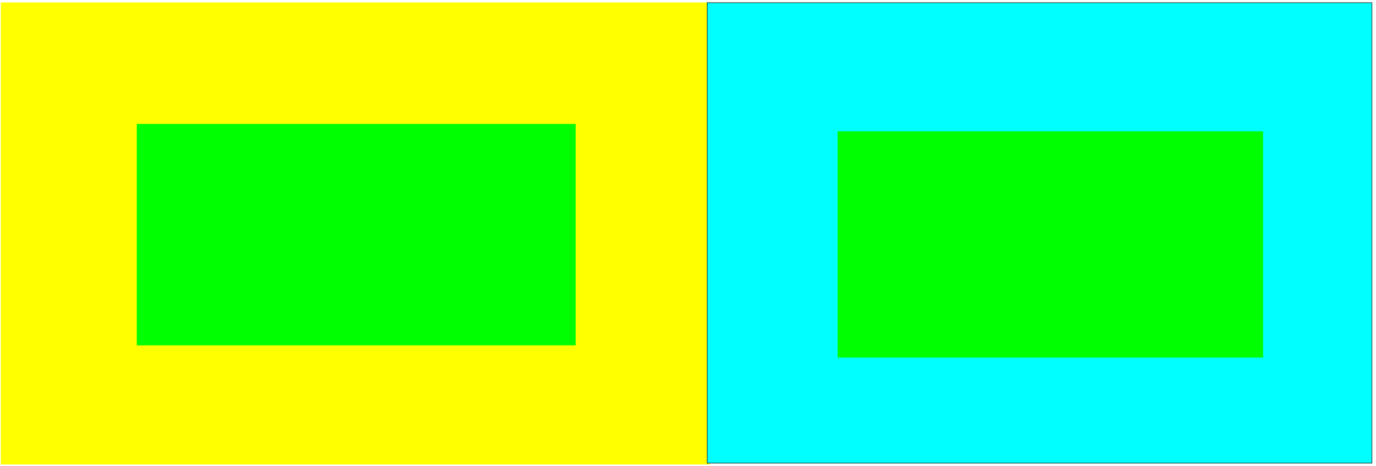
Proper color reproduction at press can only occur when the press has achieved the same "gray balance proportions" as were present in the color separations. Proper assessment of a printing ink's performance can be made only after the press has been "Gray Balanced."

"Proper Gray Balance" is achieved when the values put in at the scanner are reproduced on the pre-press proof and the printing press: with little to no color difference between the two.

One area that complicates the gray balance process and sometimes requires some interpretation, is the prepress proof. Some proofs are manufactured with a color bias or cast. This will force the scanner operator to "alter his gray balance setup" in order to get a better proof for his sales staff or the print buyer. In this case, the final films having been prejudiced will not yield proper color on a balanced printing process. Furthermore, if the press is pushed to an imbalanced condition; the inks will be compromised and not allowed to perform to peak ability.

We need to measure for Gray Balance because each erson's individual perception of color is different. Each person has subconscious preferences that influence their color judgment. The human eye can detect any shift in neutrality when neutral areas are compared side by side. Comparing just by looking at the neutrality of two gray scales is much easier than comparing the purity of the reproduced process inks with a color in the original. The eyes can quickly detect if there is any color cast in the neutral area. In this respect, the eyes become the most sensitive instrument for checking gray balance. We are all influenced by variables in our environment that we are usually not aware they exist. To illustrate this, compare the two greens in Figure 2.

Although the two Greens in the squares in Figure 2 are the same, they appear to be different. This is caused by the different "surround color" in the two frames. Our eyes "take in" the surrounding tones and incorporate them into the initial color data for our brain to process.



We are incapable of eliminating this information unless we mask out the offending areas. Often we are unaware that there is an offending or influencing other color. Without measurement, the judgment of color becomes an arbitrary exercise and is always open to argument. This is but one of many examples of how we are influenced in our perception of color.

The color we view on the CRT (computer) monitor is made up of RED, BLUE, and GREEN spots that are generated by the monitor's electronic systems. The resulting combinations of these colors can amount to as high as 16.7 million shades; of which we can see approximately 8 million.

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The printing process on the other hand uses mixtures of YELLOW, MAGENTA, CYAN and BLACK. These colors filter out various portions of the electromagnetic spectrum in an attempt to "simulate" the RED, BLUE and GREEN monitor colors. This is an imperfect process right from the start due to limitations of the inks and stocks. This process can reproduce approximately 5000 shades of color. In essence we have severe tone and color compression. This is why we must be more critical of color at the pre-press proofing stage. If we are not happy at this stage (proofing) it will not get better at press.

Some of the factors that influence Gray Balance and color at press:

- Dot gain / tone value increase.

- The balance of dot sizes between the various colors.
    - Choice of scanner gradation
    - Dot shape
    - Screen ruling
    - Incorrect contacting of film and/or plates

US Ink's Press Doctor

Plate and blanket choice
Ink formulations
Paper choice

- The trapping efficiencies with regard to over printing of the inks.
  - Ink formulation
  - Press blanket packing
  - Choice of stock
  - Choice of printing plates

- The density of the 100% solid prints.
  - Ink formulations
  - Target solids density values.

- The Hue Error and Grayness of the process colors.
  - Ink formulations
  - Coloration of the printing stock
  - In line ink contamination at press

US Ink's Press Doctor

- The Press.
  Any number of mechanical conditions and settings.

- People.

GCR

The theory behind GCR is that whenever dots of yellow, magenta, and cyan are present in the same color, there is a gray component to that color. That is, if the smallest of the three dot values were to be removed from the color, together with appropriate amounts of the other colors in order to produce a neutral gray tone, then that gray tone could be replaced with a dot of black. For example to produce a brown a balance of 30% cyan, 40% magenta, and 55% yellow could be used. By using GCR a similar color could be produced by removing the cyan and printing 35% magenta, 45% yellow, and 20% black. The 3 color separation would require 125% of an ink film while the GCR separation would require only 100%.

With the introduction of GCR, the function of UCR has become less prominent in the separation in a scanner. To better understand why this has taken place, let us discuss some of the differences between the two methods. UCR is mainly concerned with the removal of cyan, magenta, and yellow from the neutral areas of the original and replacing the three pigments with black. Originally UCR was referred to as the reduction of the process inks in the dark or near neutral areas of the print. Electronic UCR works satisfactorily with gray, but is deficient in colors close to the gray. With GCR, in addition to the function of removing cyan, magenta, and yellow from the neutral areas of the print, it is also possible to remove the gray component from all colors in the separation, from the highlight through the shadow areas and replace them with black. In other words, GCR consists of those components of the three colors in a reproduced color, which would have produced gray if it had been separated from the reproduction.

The percentage of GCR is related to how much of the tertiary color is removed. For example, if the tertiary color is fully removed, it is said that there is 100% GCR, if 80% of the tertiary color is removed, 80% GCR is said to be used.

GCR is given different names by various scanner manufactures. Some of these are: PIR, Royal Zenith's Programmed Ink Reduction, CCR & PCR, Hell's complementary Color Reduction and Programmed Color Reduction, PCR, Crossfield's Polychromatic Color Removal, and ICR, Dainippon's Screen's Integrated Color Removal.

Advantages of GCR

1. **Color ink consumption is reduced.**
2. **Dot gain / tone value increase fluctuation is generally less critical because most color shades are darkened with black, because only three colors are used to produce these shades as opposed to four.**

3. **The reproducible color space is better. Colors darkened with black show the changes in tonal range better compared to hue shifts caused when a third primary color is used.**

4. **Register problems are reduced because black is dominant and covers most outlines.**

5. **Trapping problems are minimized because the quantity of ink is reduced in all colors.**

The percentage of GCR applied will depend on individual press room conditions, such as paper, ink, fountain solution, blankets, plates, etc. Separations with 40 to 60% GCR seem to be optimum at this point. It has been indicated that 100% GCR may create problems such as a white line around an object if the registration on the press is not perfect.

The following are the industry source levels for GCR:

SOURCE	RANGE
GATF 1989	40 - 70 %
SNAP 1994	60 - 80 %

US Ink's Press Doctor

GOOD COPY CALL Procedure

Goal: To ensure good quality reproduction of copies produced at the start or re-start of the press.

Background: The objective is to have sellable copies with minimal waste. As the pressrun progresses, press settings will be adjusted to further improve reproduction quality beyond the initial good copy call.

Procedure:

1. Check entire paper for correct folios, datelines and zones.
2. Confirm press layout/imposition to printed copy.
3. Verify proper ad version.
4. Check for proper image orientation, color breaks and plate sequence.
5. All pages should be free of scumming/smutting with no blank pages.
6. Attain proper page compensation. Margins and back-to-back page alignment must be within tolerance.
7. Ink must be uniform and color balanced across the page. Site specific density ranges must be achieved.
8. Maintain all advertising within acceptable visual limits of proof.

9. Color register achieved within 0.020” maximum between any two colors in any direction.
10. Nips, trolleys, final fold rollers set and adjusted if necessary, to minimize folder marks.
11. Communicate good copy call to mailroom/packaging.
12. Retain and label first sellable good copy for future reference.

This Procedure was developed by the NAA Color Quality Task Force

Gray Bars

Many newspapers and commercial advertisers have included the use of three-color gray bars in their page design because it provides the printer an opportunity to measure all color inks with one densitometer measurement and provide good visual judgment.

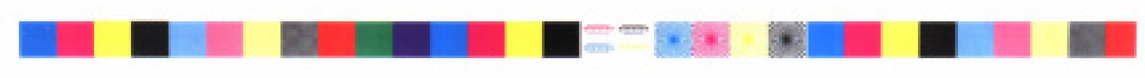
Accurate color image reproduction requires good gray balance throughout the tonal range of the picture. The dot size values of the gray should be selected in the mid-tone range for best control. This also corresponds to the area where the photograph emphasis normally occurs. A bar consisting of film dot sizes of 40% cyan, 30% magenta and 30% yellow usually prints gray on a newsprint sheet and represents the mid-tone range of the picture.

Good color reproduction in the newspaper industry requires consistency in the pressroom. This is the area that has the largest affect on tonal reproduction(dot gain) because of all the components necessary to transfer the image from the plate to the substrate(newsprint). Variables such as newsprint, press settings, blanket height and maintenance, ink formulation, and ink film thickness have a major impact on dot gain.

This section focuses on ink film thickness and how to control it using a gray bar. In the newspaper industry all colored pictures are formed with screens of the three process colors and black. Once the screens have been set for the picture, the amounts of ink used must be controlled to get the proper reproduction off the press. If the ink film thickness is not controlled the color cast, color saturation, and detail in the picture can be lost. The ink film thickness is monitored with a reflection densitometer. In order to use the densitometer effectively a control device must be present in all columns where color is printed and this can be done by color bars.

Color bars containing solid ink density patches that are typically used in commercial printing can not be used in newspapers due to the trim area. Commercial presses place the color control bars in the trim area. Thus, after printing, these color bars can be cut off and not seen by the consumer. In newspaper printing there is no trim area. Color bars would, therefore, be left on the printed copy and detract from the print quality.

Typical Color Bar



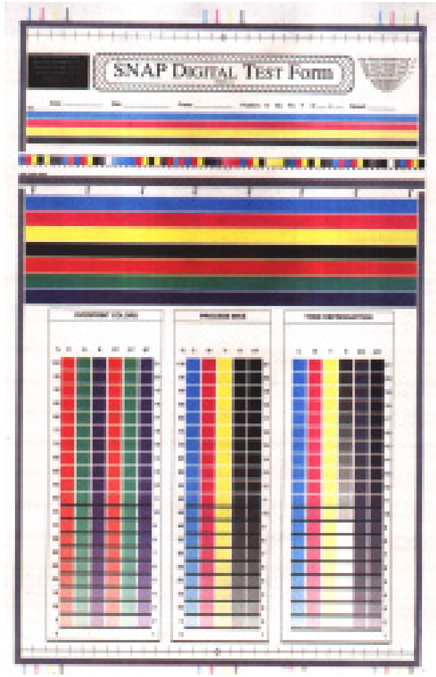
In order to control color reproduction, newspapers must utilize other methods to control the print density. The development and use of a gray bar for density control for newspaper will be discussed below.

WHAT IS A GRAY BAR?

When the three process colors are printed in the proper ratio a shade of gray is produced. (see What is Gray Balance for more detail). A gray bar is the proper screening of the three process colors to obtain the desired level of grayness. Cyan is always the highest screen in a gray bar because of the inherent impurities in the pigments that are used in the process inks. Some examples of typical gray screening combinations are indicated in the table below.

SHADE OF GRAY	PERCENT SCREEN AREA		
	CYAN	**MAGENTA**	**YELLOW**
Midtone	40	30	30
Quartertone	**25**	**18**	**18**

WHAT SCREEN AREAS SHOULD MY NEWSPAPER USE?



The use of a gray bar in the newspaper must be transparent to the reader and advertiser. It should not detract from the reproduction on the page where it is used. A test form (such as SNAP, GATF, or NAA) should be run on the press that includes two gray bars so that the editorial department will have samples to look at and can make a decision on which gray bar screening is acceptable to them. Many newspapers have gone to the quartertone gray bars. It is felt that the quartertone gray bar is more sensitive to variation by the eye, yet still yields high enough density readings to be considered accurate (by the densitometer.) During this test run the solid ink densities are set to industry specifications such as SNAP, GATF, NAA.

Dot gain is determined from this run so that proper compensation can be made in the prepress area. The dot gain is very critical to the proper use of the gray bar. If dot gain increases, color saturation decreases at the same density specifications. What this means if the dot gain increases, a higher density would be apparent in the gray bar if the solid ink density was set correctly. If the density of the gray bar was reduced to standard levels, in actuality the solid ink density levels would be reduced.

Once the gray bar is selected from the test form, the reflection densitometer density specifications for the selected gray bar can be determined by reading the gray bar in the same column where the solid ink densities are in specification. Some examples of density specifications for various gray bar screenings are listed in the table below:

Gray Bar Screens				***Density Specifications***
C	M	Y	K	
25%	18 %	18 %	0%	0.52 +/- 0.05
40%	30 %	30 %	0%	0.65 +/- 0.05

It should be noted that values above should be used only as a guide because they are dependent on the dot gains for each color on the press.

US Ink’s Press Doctor

Gray bars and color bar targets should be large enough to permit measurement. A target height/width or diameter of 3/8” is recommended so that proper measurements can be made. Gray bar targets do not need to be continuous and can be creatively designed across the width of the page.


EVENTS

Icing on the Cake

Raga Time

Archie's Play

Picasso's Last Stand

INSIDE

Caruso's Return

Emmy Awards

IMPORTANT CONSIDERATIONS WHEN USING A GRAY BAR

Listed below are some critical points that must be adhered to when using the gray bar.

The imagesetter/film processors must be checked regularly to insure that they are outputting the proper film screening for the gray bar. This can be checked with a transmission densitometer.

The width of the gray bar should be as wide as the target window for both the transmission and reflection densitometers to insure proper readings.

Densitometers should be checked for proper calibration daily.

The print density specification range for the gray bar has to be within the density variation capability of your press.

Always make gray bar density corrections on press from dark color to light. This should be done because the cyan and magenta pigments contain components that effect the yellow component of the gray bars. If the yellow is adjusted first, it would have to be reset after the other colors are brought into adjustment.

Always take readings on the same position of the gray bar and same plate position (high side or low side) to minimize density variations due to impression on the press.

US Ink's Press Doctor

USE OF THE GRAY BAR IN THE PRESSROOM

When starting up the press the following steps should be taken when using the gray bar:

Get page in register

Get gray bar balance across the page by eye

Check the gray bar with the reflection densitometer

Adjust the density if necessary, darkest color first

Recheck density after a few minutes in the same position and adjust as necessary

The gray bar can be a powerful tool that allows you to have good color reproduction and consistency if it is used properly.

Ghosting

Please see ghost definition. The low density area is in the form of a distinct image, or possibly in the form of partially reversed out type. There are several reasons why ghosting might occur. Let’s look at these in turn.

It is often said that ghosting is a result of poor rolling power on the press. So as a first measure ensure the form rollers are correctly set, particularly the inside form roller which is hidden from view. Severe ghosting can occur if this is not in contact with the plate or ink drum. Ghosting may occur if the copy is laid out badly, large solid areas should if possible not be inline* with each other. Ghosting may be caused by a degree of emulsification (which effectively reduces the ink's transference). If the problem is mild, then some emulsification may occur but not necessarily enough for other classic emulsification symptoms to show themselves.) See emulsification.

If the ink will not run with normal levels of dampening solution, then that could be due to either the fountain solution, the ink, or (less likely) the plate. Check the fountain solution strength, ensure that it is within manufacturers tolerances. With a weak fountain solution you may require a higher VOLUME to keep the plate running cleanly, It is fountain solution volume that causes many of the transference/ghosting problems observed. Correct as necessary. In line* in this context means the same distance from the web's edge and in line along the direction of travel. If it can be seen that all settings are correct, the ink will not run with minimal water and nothing else has changed, then suspect the ink and call the ink supplier.

Ghosting

The low density area is in the form of a distinct image, or possibly in the form of partially reversed out type. It can often be seen that the ghost image occurs at a distance of exactly one form-roller's circumference away from the original and corresponding image, which has caused the ghosting. What effectively happens is that on each revolution of the plate cylinder, insufficient ink is transferred to the form rollers to replenish that which has been used. This results in certain parts of the form rollers(where the heaviest or most frequent solids are to be found) being deplete of ink and thus the corresponding areas of the plate are also deplete of ink.

Glazing

A hard film builds up on the dampener rollers and interferes with the correct transport of fountain solution. This may be due to a poor cleaning cycle. A degree of glazing is inevitable, and is normally kept to a minimum by effective cleaning. Glazing may also be due to incorrectly set rollers, particularly rollers that are set too hard and may run hot. This effect may also be due to a fountain solution. If the problem coincides with a change of fountain solution then this cause may justifiably be suspected. Contact the fountain solution supplier.

It is also possible for a change in the fountain solution make up water (to one having a very high dissolved solids content HARD WATER), to promote roller glazing. In this case it is possible for a complex insoluble salt to be formed when the hard water reacts with either the ink or some component of the fountain solution concentrate. In such a case little can be done in the short term to correct the cause. However a call to the fountain solution supplier, ink supplier, or local water company can produce a full analysis.

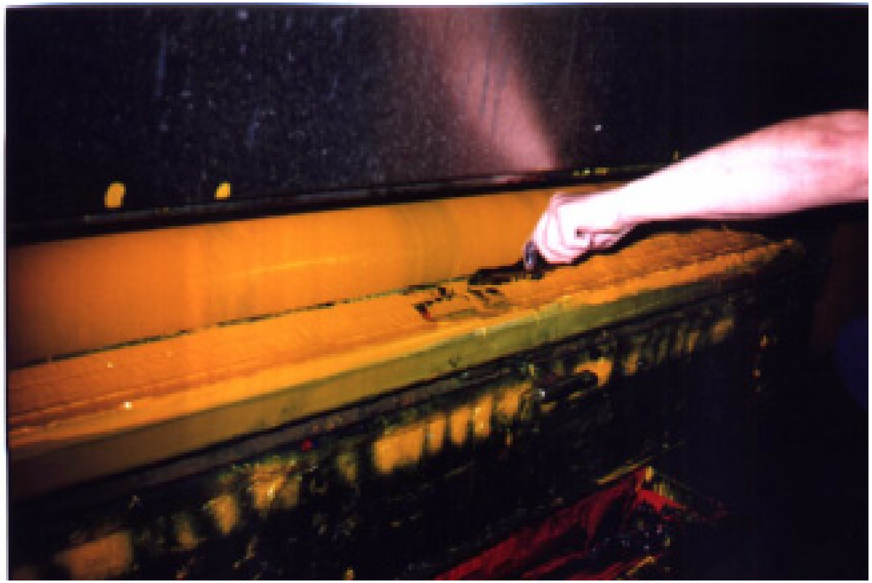
An ink, which has a high level of resin or is inherently unstable in the presence of fountain solution may leave a glaze on the rollers. If this is suspected, call the ink supplier. As a short term solution, the rollers may be cleaned with a (specially formulated) mildly abrasive roller cleaner, or a special mildly abrasive cleaning pad.

Handling-manual

Inks which are intended to be handled manually from a small container (-bucket/pail/kit etc.) are formulated to enable this to be done cleanly, with minimum dripping. The ink should have flow characteristics appropriate not only to the process and fountains in which it will be used but also to the method of storage and handling. An ink will be formulated for manual handling either by ensuring it has reasonably short flow or by building in a degree of thixotropy which will be quickly achieved on standing. If the ink is too long inflow, or if it has insufficient thixotropy, manual handling will be made difficult.

When handling ink using a pallet knife, some simple precautions will help. Avoid agitating the contents remaining in the bucket as ink is removed. Store buckets in a cool place. Rotate stock so that you are never actually using ink that has been freshly delivered. Inks which are supplied in buckets for evaluation or trial but which will eventually be pumped may be expected to have flow properties that are inappropriate to manual handling. In such a case it is advisable to endure the handling difficulties since the evaluation or trial will more realistically reflect the eventual end use

Hanging back



Hanging back occurs where the ink in the fountain is relatively immobile. During the printing process the ink in the fountain does not correctly flow towards the fountain ball (roller). This leaves a gap between the mass of ink in the fountain and the fountain ball(roller), thus a degree of ink starvation may occur. The ink should have flow characteristics appropriate not only to the process and fountains in which it will be used but also to the method of storage and handling. A difficulty often arises where ink has necessarily been formulated with short flow for manual handling, but this leads to a tendency towards hanging back. In such a case an automatic fountain agitator is a possibility. As a short term solution it may be necessary occasionally to manually agitate the ink in the fountain. Ensure that the ink is kept and stored in relatively warm conditions (70 - 80 F is ideal).f the problem is severe or persists, the ink maker should be able to provide an ink with modified flow properties.

Hickies

Hickies are (usually) small imperfections found (usually) on solid print areas. They have a characteristically sharp outline, are completely uninked, and have a solid inked mark in their center. Hickies are caused by hard particles adhering to the blanket, the particle itself prints (the solid center) while the blanket immediately surrounding it is held off from contacting the paper. Hickies may be caused by the ink, the paper, or by contamination of the press by foreign matter.

Attempt to closely examine the cause of the hickies by carefully lifting samples from the blanket (using a strip of adhesive tape is a convenient method).ensure that no foreign matter has entered the press. Fibrous material which (under a microscope or strong magnifier) resembles wooden splinters is probably from the paper. Is has also been seen that plastic material has been introduced through the recycling on newsprint. In such a case after ensuring no foreign contaminant has entered the inking system, call the paper supplier. As the material removed from the blanket skin from the ink? It is unlikely that normal coldset colors would skin. If the hickies are thought to come from the ink, call the ink supplier in to investigate.

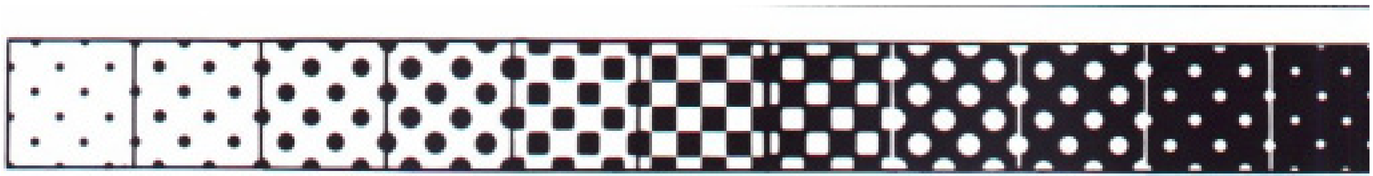
Halftone Defects

The print quality is unacceptable, and on inspection, the problems relate to the halftone areas. Problems associated with the halftones are usually obvious in terms of their visual effect, but often difficult to explain in terms of their cause. In order to analyze the problem it will be necessary to examine the halftone area by means of a low power magnifying glass (10x is probably ideal). It will also be necessary to determine whether the whole of the copy is affected, or whether the problem is with only a part. If the problem relates to only apart of the copy, decide whether it relates to specific cylinders, a specific color, specific subject matter, or just a part of a page. To keep things brief, definitions and descriptions will be kept separate from the main analysis, but will be readily accessible.

Continue?

Halftone defects

This is a complicated area, with many different causes and effects. let us carry out the analysis based on the observed defects. The problem is a form of patterning, but only occurs on process color images. The pattern is very regular, even, well defined. This is probably a moire pattern. If the problem is that the heavy, or shadow tones tend to fill in or that they may be described as "muddy", or that the tonal range is unacceptable? The problem is very likely caused by dot gain / tone value increase. Is the problem that the highlight dots are lost, and cannot be printed, thus compressing the tonal range? This is known as dot sharpening



Hue Error and Grayness

"Hue error," is an expression that indicates how far a process color is from its theoretical ideal. Grayness is an indication of how "clean" a process color is, again compared to its theoretical ideal. Some typical hue error/grayness values for process colors printed on newsprint follow.

Hue Error/Grayness	Cyan	Magenta	Yellow
X-Rite Corp	28/42	58/34	10/25
SNAP	28/10	56/11	7.5/1.4

Note- The X-Rite Corp. values for hue error/grayness are calculated with the newsprint included. The SNAP values do not include the affect from the paper

The History of Printing

Printing, a name used for several processes by which words, pictures, or designs are reproduced on paper, fabrics, metal, or other suitable materials. These processes, sometimes called the graphic arts, consist essentially of making numerous identical reproductions of an original by mechanical means, and the printed book has thus been called the first mass product. The history of printing, which by its very nature is the most thoroughly documented of any history, is practically identical with that of relief, or letterpress, printing (printing from a raised surface). Historically, the bulk of all printing has been produced by this entirely mechanical method. Modern printing, however, increasingly relies on photomechanical and chemical processes.

Ancient Techniques

The application of signet stones is possibly the earliest known form of printing. Used in ancient times in Babylonia and elsewhere, apparently both as substitutes for signatures and as religious symbols, the devices consisted of seals and stamps for making impressions in clay, or of stones with designs cut or scratched on the surface. The stone, often set in a ring, was dabbed with pigment or mud and pressed against a smooth, resilient surface in order to make an impression.

NOTE: This History section is compiled from Encarta and Grolier's Encyclopedia

US Ink's Press Doctor

The elaboration of printing from the simple stamping or signet-stone method to the process of printing on a printing press apparently occurred independently at different times in different parts of the world. Manuscripts copied by hand in ink applied with pen or brush were a significant feature of the Egyptian, Greek, and Roman civilizations. Such handwritten manuscripts were also produced in medieval monasteries and were greatly valued. In ancient Rome, commercial book publishers issued editions comprising as many as 5000 copies of such works as the epigrams of the Roman poet Martial. This copying work was done by literate slaves.

Printing in the East

By the 2nd century AD the Chinese had developed and put into fairly widespread use the art of printing texts. Like most inventions, it was not entirely new, because the printing of designs and pictures on textiles had preceded the printing of words in China by at least a century.

Two important influences that favored the development of printing by the Chinese were their invention of paper in AD 105 and the spread of the Buddhist religion in China. The common writing materials of the ancient Western world, papyrus and vellum, were not suited to printing. Papyrus is too fragile to be used as a printing surface, and vellum, a thin tissue taken from inside the hides of newly skinned animals, is an expensive material. Paper, on the other hand, is relatively strong and inexpensive. The Buddhist practice of making many copies of prayers and sacred texts encouraged mechanical means of reproduction.

The earliest surviving examples of Chinese printing, produced before AD 200, were printed from letters and pictures cut in relief on wood blocks. In 972 the Tripitaka, the sacred Buddhist scriptures comprising more than 130,000 pages, was printed entirely from wood blocks. A Chinese inventor of this period progressed beyond wood blocks to the concept of printing entirely from movable type, that is, from individual characters arranged in sequence as in present-day printing. Because the Chinese language requires between 2000 and 40,000 separate characters, however, movable type did not seem practical to the early Chinese, and the invention was abandoned. Movable type made from molds was invented separately by the Koreans in the 14th century, but they also found it less practical than the traditional block printing.

Printing in the West

Movable metal type was first cast in Europe and printed with a printing press on paper by the middle of the 15th century. The invention appears to have been unrelated to earlier developments in the Far East, and the techniques differed considerably in detail. Whereas

Eastern printers had used water-soluble inks, Western printers used oil-based inks from the beginning. In the East, printers made impressions simply by pressing the paper against the wood block with a flat piece of wood. The earliest Western printers in the Rhine River valley used mechanical presses derived in design from winepresses, and made of wood. The Eastern printers who had used movable type held the letters together with clay or with rods pushed between the types. Western printers developed a technique of casting types with such precision that the letters could be held together by pressure applied to the edges of the tray containing the type for the page. In this system, a single letter a fraction of a millimeter too big could cause the letters surrounding it to fall out of the page. The development of a method of casting letters to precise dimensions was the essential contribution of the Western invention.

The principles involved in printing had been used by European textile workers, in printing designs on cloth, for at least a century before printing on paper was invented. The art of papermaking, introduced into the West in the 12th century, spread throughout Europe in the 13th and 14th centuries. By the mid-15th century paper was available in abundance. During the Renaissance, the rise of a prosperous and literate middle class increased the demand for quantities of reading matter. The rise of Martin Luther and of the Reformation and the subsequent religious wars were heavily dependent on the printing press and on the steady stream of printed pamphlets.

Johann Gutenberg, of the German city of Mainz, is traditionally considered the inventor of Western printing. The date associated with the invention is 1450. Both Dutch and French historians of printing have attributed the invention to people in their own countries and have produced considerable supporting evidence. The books of the first Mainz printer, however, particularly the book known as the Gutenberg Bible, far surpass in beauty and artisanship all the books that reputedly preceded them. Gutenberg's great accomplishment undoubtedly contributed decisively to the immediate acceptance of the printed book as a substitute for the handwritten or manuscript book. Books printed before 1501 are said to belong to the incunabula era of printing.

In the period between 1450 and 1500, more than 6000 separate works were printed. The number of printers increased rapidly during the same period. In Italy, for example, the first press was established in Venice in 1469, and the city had 417 printers by 1500. In 1476 a Greek grammar was printed wholly in Greek type in Milan, and a Hebrew Bible was printed at Soncino in 1488. Also, in 1476 printing was brought to England by William Caxton; in 1539 Juan Pablos set up a press in Mexico City, bringing printing to the New World. Stephen Day, a locksmith by profession, came to Massachusetts Bay in 1628 and helped establish the Cambridge Press. He is often considered the earliest printer in the New England region. In 1639 The Freeman's Oath, a broadside, was issued from this press, followed in 1640 by the Whole Book of Psalms or Bay Psalm Book and an almanac.

The printers of northern Europe produced mostly religious books, such as Bibles, Psalters, and missals. Italian printers, on the other hand, printed chiefly secular works, for example, the newly revived Greek and Roman classics, the stories of secular Italian writers, and the scientific works of Renaissance scholars. An important early use of printing was in pamphleteering: in the religious and political controversies of the 16th and 17th centuries propaganda pamphlets were widely circulated. The production of these pamphlets made considerable work for the printers of those days.

Printing Presses

The machine used to transmit the ink from a printing plate to the printed page is called a press. The first printing presses, such as those of the 16th century and earlier, were screw-type presses designed primarily to bring pressure on the printing form, which was placed face up in a flat bed. The paper, generally dampened, was pressed against the type by the movable surface, or platen. The upper parts of the posts of the press often were braced against the ceiling, and after the form was inked the platen was screwed down against the form. The press was equipped with rails on which the form could be slid out of the press and then back onto the bed, so that the platen did not have to be raised far. Nevertheless, the operation was slow and cumbersome; such a press produced only about 250 impressions an hour, printing only one side of the paper at a single impression.

In the 17th century springs were added to the press to aid in lifting the platen rapidly. Presses made of iron were introduced about 1800, and about that time levers were substituted for the screws that brought the platen down onto the bed. These levers were rather complex; the first portion of travel on the lever bar had to bring the platen down most of the way, and the last portion of travel of the bar had to move the platen the remainder of the distance and apply great pressure. Although the best hand presses of this period produced only about 300 impressions an hour, much larger forms could be used with metal presses than with wooden ones, and therefore the press operator produced many more pages at each impression.

Lithography

By far the most important and versatile printing process today is offset lithography. The underlying principles were established at the end of the 18th century by a German map inspector, Aloys Senefelder, who was experimenting with methods of producing limestone relief printing surfaces using an acid etching process. Senefelder found that a wet limestone surface would repel an oil-based printing ink, and that an image drawn on the surface with a grease pencil would repel water and attract ink. Any drawing on the stone surface could be reproduced by bringing a damp sheet of paper into contact with the freshly inked image. This cycle could be repeated several hundred times before the drawing could no longer be faithfully reproduced.

The process, called chemical printing by Senefelder, quickly became a popular art medium because it enabled artists to produce multiple copies of freehand drawings. By the late 19th century, multiple stones were being used to transfer as many as 30 separate colors to a single sheet of paper to produce exquisite color lithographs that resembled fine watercolor paintings. Modern lithography uses only four color inks for a wide range of natural color reproduction.

During the 19th century improvements included the development of the steam-powered press; the cylinder press, which uses a revolving cylinder to press the paper against a flat printing form; the rotary press, in which both the paper and a curved printing plate are carried on cylinders; and a practical perfecting press, which prints on both sides of a sheet of paper simultaneously. Large-circulation daily newspapers require a number of these presses, side by side printing identical material simultaneously. In 1863 the American inventor William A. Bullock patented the first web-fed newspaper press, which printed from paper in rolls rather than sheets. In 1871 the American printer Richard March Hoe perfected the continuous roll press; his device produced as many as 18,000 newspapers in an hour.

The Offset Principle

In the early part of the 20th century, it was discovered that ink could be transferred from the lithographic surface to an intermediate rubber surface and then to paper. The rubber intermediate, called a blanket, can transfer ink to paper and to a wide variety of materials that cannot be printed directly, including plastics and metals. Because the soft blanket conforms to the texture of the surface to be printed, lithographic image quality is greatly improved.

Offset Lithography Today

The function of the original stone printing surfaces is now served by thin aluminum plates, although other materials, such as stainless steel and plastic, can also be used. The plates are wrapped around the circumference of the printing cylinder and make direct contact with the rubber blanket cylinder. Rubber rollers carry ink and water to the plate surface. The ink is transferred first to the blanket cylinder and then to the paper.

Lithographic plates are the least expensive printing surfaces available today, and this fact has contributed greatly to the success of the process. Aluminum plate materials have a thin surface coating of light-sensitive material, such as a photopolymer, that undergoes a solubility change when exposed to an intense source of blue and ultraviolet light. Images are transferred to the surface by exposing the plate through a film positive or negative. Some materials can be exposed directly, as in a graphic-arts camera or by a computer-controlled laser beam, thereby eliminating the expense of film and speeding up the plate making process.

Modern offset lithographic presses range in size from small sheet-fed duplicators used for small, single-color jobs such as brochures and newsletters to massive web presses capable of printing millions of copies of newspapers, magazines, catalogs, mailing pieces, and packaging materials in full color. No other process has such a broad range of applications.

With today’s Printing Techniques, there are several different ways in which printing may be accomplished, such as lithography, letterpress, flexography, gravure, and screen printing. All of these printing techniques use simple mechanisms for rapidly applying colorants to substrates such as paper or plastic to form multiple reproductions of original images for mass distribution.

Multiple colors can be printed in one pass through the press. Spot color printing uses custom mixed inks to reproduce specific colors and is widely used in package printing, where large areas of uniform color are common. Process color printing uses four transparent inks—cyan (blue-green), magenta (red), yellow, and black—printed one on top of another in varying amounts. Color photographs and other artwork can be faithfully reproduced by this method.

US Ink’s Press Doctor

Most modern printing presses transfer ink from a cylindrical printing surface to moving sheets or rolls of substrate. Presses that print on rolls, or webs, can achieve speeds of 600-900 m (2000-3000 ft) per minute. Presses that print on sheets are generally slower than web presses but can print on thicker substrates, such as bristol board and sheet metal.

Since the 1960s, advancements in photography and electronics have had a profound effect on the manufacture of printing surfaces. Light-sensitive materials such as diazonium resins and photopolymers make it possible to produce durable printing surfaces photographically rather than mechanically. Computer-based systems allow the rapid production of the films used to transfer images to printing surfaces. Some printing surfaces can even be prepared directly by machines employing computer-controlled laser beams or diamond styluses. Images generated on computer systems and stored in databases can now be transferred directly to printing surfaces without any intermediate steps. Taken as a whole, these changes have been called the prepress revolution.

References: "Printing," Microsoft® Encarta®
Grolier’s Encyclopedia

High Strength Inks

US Ink and its predecessor companies have been manufacturing offset news inks significantly above standard Newspaper Association AD-LITHO strength for more than twenty years. These inks have been supplied to a limited number of customers to overcome particular mechanical problems or print quality defects.

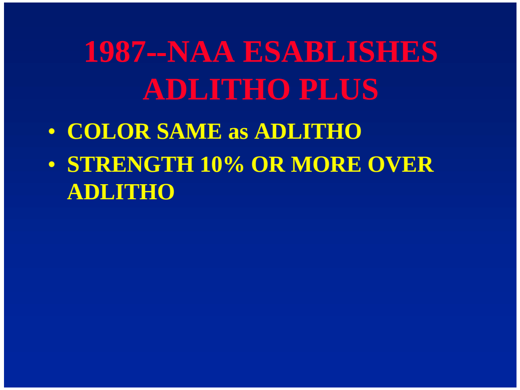
Any textbook on Lithography will tell you that the Lithographic process is optimized by running minimum films of ink and fountain solution. Clearly, one route to achieving this, and yet obtaining good print density, is to utilize higher strength inks. Such inks have been shown to produce cleaner and brighter print with less set-off in the folder and through the mail room and reduced build-up on the press idler rollers and angle bars.

NEWSPAPER ASSOCIATION of AMERICA SPECIFIES ADLITHO INKS

- **COLOR INKS ONLY**
- **SPECTROPHOTOMETRIC PARAMETERS**
- **STRENGTH WITHIN ±7% of standard**
- **SPECIFIES CHEMISTRY for HEALTH and SAFETY**

With all of these advantages to high strength inks and their established availability, why are they not major volume products within our industry? Historically, there were two factors inhibiting widespread adoption. Originally, the newspaper association AD-LITHO standards did not recognize the high strength approach. If an ink was outside the normal plus or minus 7% AD-LITHO strength tolerance it could not be called an AD-LITHO ink, even if it complied with all other shade and safety specifications established by the Newspaper Association. The other major roadblock to adoption of high strength inks has always been the cost of the ink.

In color inks, the major raw material cost factor is the organic color pigment. Consequently, if the level of pigment is significantly increased to produce increased strength inks, there is a very substantial increase in the cost per pound of the ink. This is such a major factor that it has to be passed on in the price that the customer pays.



US Ink's Press Doctor

With the introduction of the Volume 7 Color Book by the Newspaper Association in 1987, the potential benefit of stronger inks was recognized by that body for the first time. They established an AD-LITHO PLUS designation for inks that were a minimum of 10% stronger than the AD-LITHO standards. This made it possible for inks that were as much as 40% or 50% stronger but the same shade as the Newspaper Association standards to be specified within the AD-LITHO system.

IMPORTANT CONSIDERATIONS WHEN USING ADLITHO PLUS INKS

- **NEWSPRINT QUALITY**
- **PRICE**
- **DENSITY CONTROL**
- **DIRECT PRINTING**

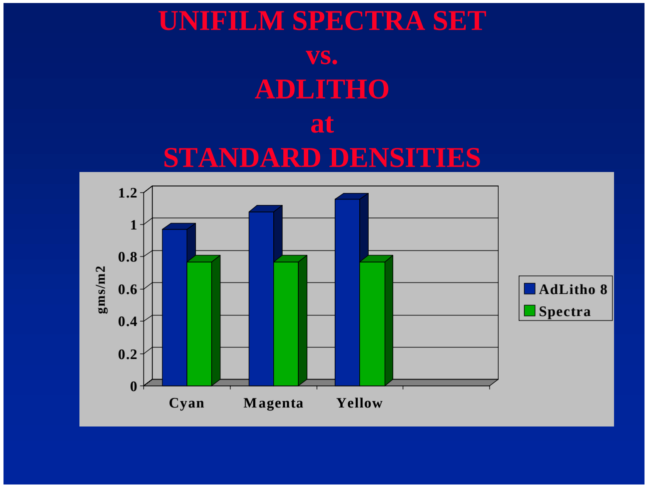
This change in policy left the per pound price of the ink as the major inhibitor to a more widespread use of high strength inks. Where the inks have been used with significant technical benefit, it has been because the customer was prepared to undertake a long-term study of the true cost impact. This could only be done by looking at the total cost of color ink purchases over a sufficiently long period to eliminate day-to-day fluctuation in color coverage in the paper.

WHY SHOULD I CONSIDER USING ADLITHO PLUS/SPECTRA INKS?

- **BETTER MILEAGE**
- **LESS PAGE-TO-PAGE SET-OFF**
- **REDUCED DAMPENING**
- **BETTER TRAPS**
- **LESS FAN-OUT**
- **LESS DOT GAIN**
- **BETTER PRINT CONTRAST**

A limited number of our customers have conducted such

studies and found that the additional per pound price of the ink is at least off-set by the reduction in the number of pounds of ink consumed. Of course, this only happens if the press room carefully regulates ink usage by means of rigorous densitometer control. Some of the benefits to using a higher pigmented ink would be less set off, reduced ink and fountain solution volumes, better trapping and less fan out.



US Ink's approach to the high strength ink concept was to take a scientific look at how the Ad Litho inks are applied during the printing process. It was found that the current Ad Litho inks required different film weights to achieve standard printing densities. Thus, the development of US Ink’s Spectra Unifilm colors were designed to provide a uniform ink film weight between the process colors.

The Spectra Colors have been increased by disproportionate levels to achieve this unifilm approach. The Cyan was increased by 25%, Magenta by 40%, and the Yellow by 52%. As can be seen in the chart, standard printing densities can be achieved with a consistent film thickness. This allows for better trapping of the colors, which can help to increase the color gamut in the printing process.

Unfortunately, not too many printers have been prepared to invest all the time and effort required to really establish the benefits and true costs of running high strength inks. Therefore, if one is to switch to these stronger inks, careful density control must be observed to yield any benefits.

Ink and Water Balance Data

All lithographic inks need to emulsify fountain solution in order to work correctly. The process of emulsification provides the means whereby the fountain solution is transported from the dampening system to the surface of the plate, at which point it has the desired effect on the physical characteristics of the plate. At the surface of the plate a degree of de-emulsification takes place, partially due to the pressure differences set up, and partially due to the physics and physical-chemistry of the plate surface. The free water released forms the aqueous film on the non-image area and thus aids the repulsion of the greasy ink.

There is no "universally correct" ratio, the correct ratio is dependent on the consumable in use, and on the various interacting systems on the press. As a rule it is usually safe to assume that near-optimal transfer will occur with minimal dampening levels. Ink and water balance will shift depending on the fountain solution type and concentration. Some fountain solutions promote clean running at low levels of emulsification, while with others the exact reverse occurs. The same is true of the ink, with different formulations requiring different levels of dampening to run cleanly. When an ink over-emulsifies, or takes up too much water, it changes its flow and tack properties, with the effect that transference is adversely affected. This leads to the need to run with an excessive ink film (just to achieve somewhere near the correct density) and all the problems to be associated with that.

SIGNS OF IMPROPER INK AND WATER BALANCE

1. **Ink build-up on water form.**
2. **A very wet, shiny plate.**
3. **Ink spitting onto guards, floors, etc.**
4. **Solids look mottled, not uniform in density.**
5. **Solids appear weak, lack density.**
6. **Dots lack density.**
7. **Loss of detail in shadow portion of pictures.**

FACTORS WHICH INFLUENCE WATER SETTING

1. **Size of image area on plate.**
2. **Image area, solid or screened.**
3. **Overall printing area across cylinder**

ADVANTAGES OF PROPER WATER/INK BALANCE AND USE OF DENSITOMETERS

1. When water and ink are at minimum levels, ink settings are more consistent (less fluctuation) throughout run.

2. Combinations of solids are better.

Example: Solid magenta - solid yellow = reds better

Solid cyan - solid yellow = greens better

Improved "trapping" because of reduced water levels.

3. Single Color - signatures are better. Lay-down smooth, not mottled.

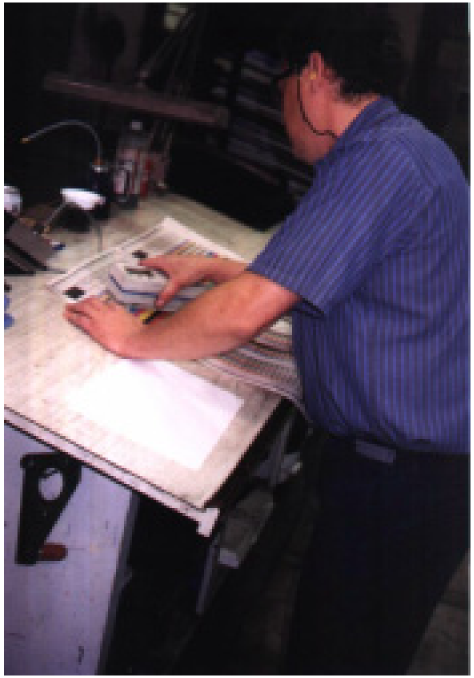
4. Better 4-color reproduction.

5. REDUCED build-up on ink rails..

6. REDUCED misting..

7. REDUCED plate wear.

8, REDUCED lint build-up on blankets.
9. INCREASED pages per pound of ink.
10. Lower cost, less waste, increased productivity.



HOW TO ACHIEVE THE CORRECT INK AND WATER BALANCE

1. At unit reduce water level 5 points at a time. Allow time for the press to react.

2. Observe ink level and reduce as necessary to maintain proper density.

3. Continue this process until you reach the minimum water setting. Minimum setting is when the type turns gray and background looks dirty.

4. If you get toning in background, bring water level up slightly.

5. Once water setting is correct, proceed to adjust ink to proper density. Check with densitometer, don't guess.

US Ink's Press Doctor

Ink and Water balance

All lithographic inks need to emulsify fountain solution in order to work correctly.

See data for more information.

However it is important that the ratio of ink and water is correct to maintain optimal running properties. On press it is a good practice to turn the dampening level down until catch-up just occurs and then to take the dampening level back up to just above catch-up level. Since the level of dampening required depends on the nature and concentration of the fountain solution, this should be checked regularly and closely controlled, see fountain solution checks.

What is Ink

Printing Ink is a complex mixture of ingredients that are combined in a specific formulation to meet desired characteristics of the printing application of the ink. This article will focus on no-heat printing ink formulations and how they are derived. Ingredients in no-heat inks fall into four major classifications: Pigments, Resins, Oils or Carriers, and additives.

The function of the pigment is to provide the coloristic properties of the ink. The resin is added as a dispersion aid and also as a binder to affix the pigment to the paper. The oil or carrier is the medium for transferring the pigment and resin through the press to the paper.

Additives are used in no-heat inks to control pigment wetting and dispersion, viscosity and flow characteristics, as well as to provide a proper ink/water balance.

To review these ingredients in more detail, let us look at some news ink formulations. Figure 2 shows typical black formulations for both the Web Offset and Letterpress printing techniques. The ingredients used in these types of formulations are both similar, however they are different in concentration.

Typical Black Formulation

Component	Web Offset	Letterpress
Carbon Black	17 - 20 %	12 - 14 %
Resin	3 -18 %	0 - 4 %
Oils	50 - 65 %	70 - 75 %
Additives	1 - 5%	0

The pigment used in news ink blacks is carbon black. Carbon black is produced by cracking oil in a continuous furnace. These furnaces are highly controlled in order to produce a specific grade of pigment varying in particle size and structure. The oil used is also of a specific grade so that certain requirements can be met. The ink film thickness applied by the printing application dictates the concentration of pigment needed to meet the required print density. As you can see from the typical formulations, the web offset ink has a higher concentration of pigment than that of the letterpress. This is because the letterpress printing process applies a much thicker film of ink than web offset.

Resins for news ink vary depending on the rub off quality that an ink requires. The resins are the most expensive part of a news ink black, so their selection and concentration are limited by economic restraints. The oil or carriers used in today's news black are treated napthenic petroleum oils. These oils are non-drying. The drying process of a news ink is by absorption of this oil into the paper stock. Changes in the absorption characteristics of the newsprint can drastically affect the rub off quality of the finished product also.

The oils are non-drying under press conditions and are designed this way. Typically newspaper presses are not temperature controlled nor are the rollers washed up at the end of a run. If any volatile material was used, the ink would tend to dry on the roller train and cause problems. The heat set printing process by contrast uses volatile oils in their printing process. These oils are driven off the ink film by passing the printed web through an oven, thus leaving only the pigment and resins on the printed sheet. This would explain why heat set will have better rub off characteristics.

Additives used in news black are from a variety of different materials. News ink black will require different viscosity or flow characteristics depending on the type of press used. The ink is also required to provide a proper emulsification rate so that the web offset printing process will work. If a formulation did not accept any fountain solution, the ink would not transfer to the plate and stripping would result. If an ink emulsified too much fountain solution, high dot gain / tone value increase and poor print quality would result. In extreme cases, ink would tend to go to the non-image area of a plate and scum.

Typical Color Formulation

Component	Web Offset	Letterpress
Pigment	10 - 15 %	7 - 10%
Resin	10 - 25 %	5 - 10 %
Oils	30 - 45 %	75 - 85 %
Pigment Extenders	10 - 20%	0
Additives	1 - 5%	0

Figure 3 shows a typical color ink for a newspaper ink. The pigments used in news ink colors are what are classified as organic pigments. Organic pigments are synthetic materials that are formed under specific conditions to produce the desired characteristic of color and crystal size. The typical pigments used are Phthalocyanine blue for cyan, Lithol Rubine for magenta, and Diarylide yellow for yellow. Pigments for the printing ink industry are supplied in the form of heavy concentrated bases or "Flushes." In the normal course of pigment manufacture, the color pigment is produced in an aqueous environment. After synthesis, the color pigment is filtered from the suspension and dried to produce dry color. In producing the flush color, the pigment is not fully dried. The water-based slurry is concentrated to approximately 20 to 30% pigment. The slurry at this point would be called a presscake. The presscake instead of going through the drying process, would be mixed with an oil-based varnish. The two components are kneaded together in a mixer. The pigments have a greater affinity for the oil-based material. The water is "flushed" out or displaced by the varnish as the pigment migrates from the water phase into the oil. This process is continued until all the water is removed, thus creating the flushed color.

The resins used for colors tend to be much cleaner in color than those used for black inks, so that the printed color can reflect its truer color. The oils used by the newspaper market today are from the vegetable family. The newspaper market found that the soy bean oil type formulations produced a better product for this application. Soy bean oil is a naturally renewable resource, which is extracted from the bean. The food industry would also use this type of oil in some of their products.

Colored printing inks also use extender pigments. These pigments are typically kaolin type clays and provide functional properties to a given formulation. The additives used in colored inks will be of a similar nature to that of a news black.

In formulating newspaper inks, it is not only important to have the proper ingredients, but the proper manufacturing and quality control techniques for a good quality news ink.

See Ink manufacture for greater detail on how ink is manufactured.

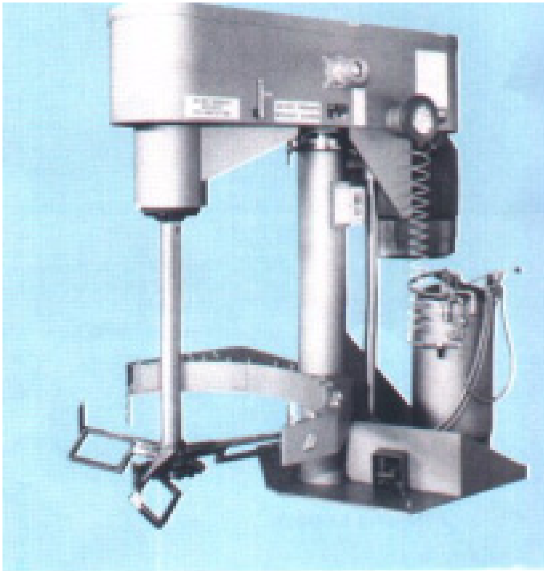
See Ink Quality Control for greater detain on the QC of News Inks

Ink Manufacture

The manufacturing process of a news ink is a critical step in producing a quality product. The formulation, equipment and manufacturing steps are "recipes" for the production of the ink. In this article we will discuss two different types of ink manufacture, one from dry pigment, the other from flushed color pigments.

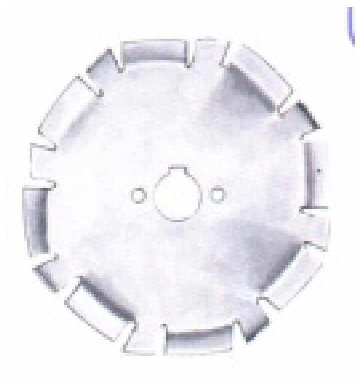
Dry pigment, carbon black, is predominantly used for black news ink manufacturing in the US. Different grades of carbon black are selected for different types of news ink: Letterpress, Web Offset, and Aqueous. The manufacturing goal is to disperse the pigment in a vehicle that can transport the pigment to the paper. For news inks, the primary carriers are petroleum oil, soy bean oil, or water (for the flexographic printing process). Resins are also introduced to help disperse the pigment and to bind the pigment to the paper after printing.

As a pigment is dried and densified in its manufacturing phase, "aggregates" and "agglomerates" are formed. Dispersion is the process of breaking-up or reducing aggregates and agglomerates of pigment particles to a desired particle size. One of the main steps of the manufacturing process is "wetting" of the carbon black by the vehicle. This means displacement of occluded air and covering the surface of the agglomerates completely with vehicle. This is accomplished in the step called premixing. During premixing, the pigment is introduced into the oil phase. The viscosity of this mixture is high and large amounts of energy are used to wet and de-aerate the carbon black. For the early part of premixing, the mixture should be properly proportioned to obtain optimum dispersion. Otherwise, poor dispersion or damage to the mixer will occur. This part of premixing is sometimes called the "shear intensive part." The optimum mixture for the shear intensive part is different for each type of mixer configuration.



The most commonly used equipment for premixing and pre-dispersion work is a high-speed disperser. These types of dispersers are most commonly found in ink manufacturing sites. They may have a variable, dual, or fixed speed drive.

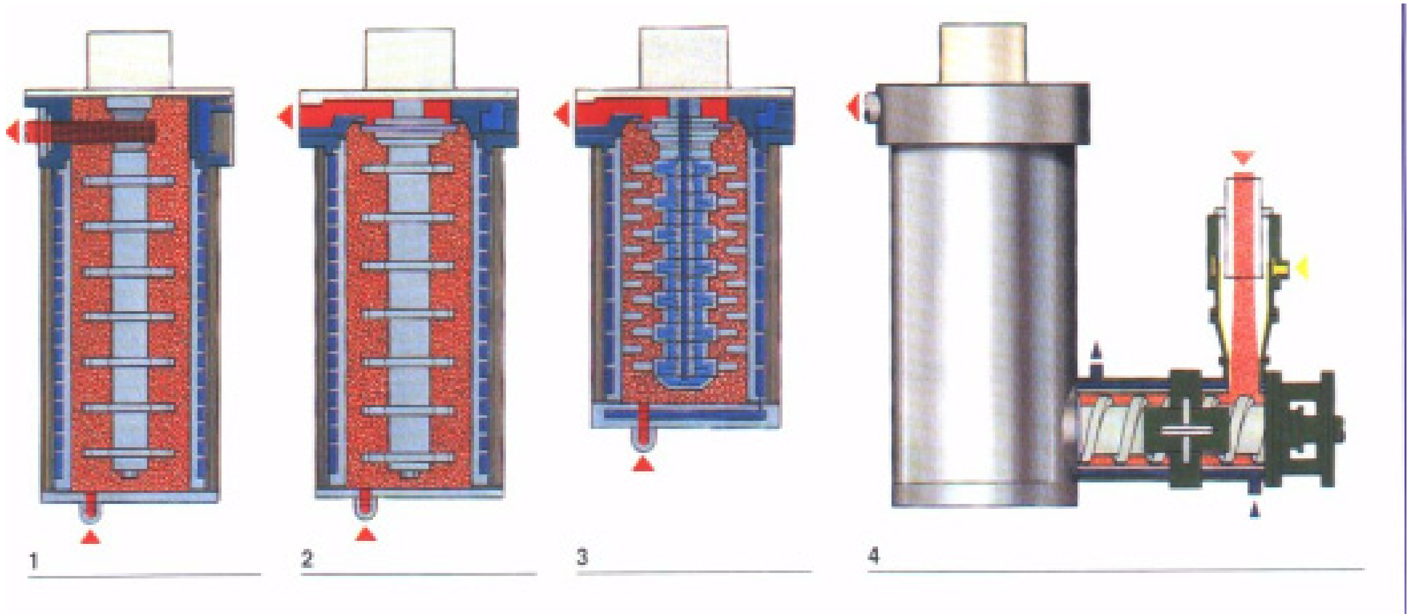
The equipment is mounted on a hydraulic lift, which can be raised or lowered. This is to either withdraw the mixing blade from a tank or to place the high speed mixing impeller at


the most desirable level in order to achieve the best flow pattern. The equipment can also have a low speed blade to aid mixing.

There are many types of dispersion impellers that are commonly used in news ink manufacturing.

When the shear intensive part is completed, the premix is mixed further with more oil and resin to attain proper milling viscosity. This is called "mill base." Milling follows premixing to achieve higher degree of dispersion with higher shear forces. For news ink black



manufacturing a shot mill or media mill is used. The shot mill is made up of a chamber, rotating disks, and shot. The chamber is made of hardened steel and holds a shaft with

rotating disks, the shot charge is placed inside the chamber. The shot can be made of several different types of material but, typically for news inks, some type of steel alloy would be used. Inside the mill the shaft will rotate a high speed, thus spinning the shot inside the chamber. The ink is pumped through the chamber. As the ink passes through the chamber, the pigment is subjected to shear between the shot, thus producing smaller and smaller particle sizes of the pigment. The residence time in the shot mill will vary depending on how long it takes to achieve the desired degree of dispersion.

A mill base containing large particles will require extended residence time with a corresponding decrease in throughput rate. There are several different types of milling equipment. However, for the news ink industry, bead mills are typically used. The mill can be either vertical or horizontal mode. The grinding media must be contained and kept out of the mill discharge flow. This is done with screens and/or rotating controlled gap spaces. Many different sizes and types of media are available. Normally, chrome alloy steel shot with a 1 - 3 mm diameter are used for news inks. To achieve the optimum conditions for grinding/dispersion, it is necessary to achieve a maximum of energy input while obtaining “bead flotation.” This varies from product to product and also with temperature, surface area, behavior under shear, etc.

After the product exits the mill, it goes through a series of filtration steps to remove any oversized particulates. The filtration system consists of bag filters that have decreasing pore sizes (~150 microns to as small as 10 microns, one micron equals .000039 inches). Since milling involves metal media, an electromagnetic filter is used as a part of the filtration system to eliminate any metal fragments from the product. The product is then pumped to a tank called the "letdown tank" for final adjustments to meet customer's requirements. If physical properties of the ink lie within the specifications, it is now ready to be shipped to the customer.

The manufacturing process of color inks is somewhat different from black inks. Instead of using dry pigment, flushes are used. Color pigments are formed in aqueous based reactions. In the final stage of the pigment manufacturing process, the water-based slurry is filtered and concentrated to approximately 15 to 30% pigment. The pigment/water mixture at this point, would be called a presscake. The pigment can either be dried or it can be "flushed" into the base form. The presscake, instead of going through the drying process, is mixed with an oil-based varnish. The two components are kneaded together in a mixer. The pigments have a greater affinity for the oil-based material. The oil phase displaces the aqueous phase from the surface of the pigment. The water is thus "flushed" out of the system. Small remaining amount of water are removed under vacuum at elevated temperatures.

One of the main reasons for flushing is to have pigment in a "fully dispersed" form and in a vehicle that can be used efficiently by the ink manufacturer. By using flush, the need for energy intensive milling equipment is eliminated. However, a thorough mixing of flush with raw materials such as oil, varnish, and extender is required. Processing temperature needs to be monitored constantly so that deterioration of the pigment does not occur. Once the ink is properly mixed, the ink is checked using Quality Control tests. If the ink meets all the physical property requirements, it is processed through a series of filtration steps to remove any oversized particulates. An electromagnetic filter is not required, since no milling is involved. After checking the grind quality, it is now ready to be shipped to the customer.

In addition to what is mentioned above, several different technologies of manufacturing inks are available. The methods described above are the most common currently for the news ink industry. In our next issue we will discuss how the ink is Quality Controlled after it is manufactured.

See What is Ink for a more detailed look at the formulation of a News Ink

See Ink Quality Control for greater detain on the QC of News Inks

Ink Quality Control

The Quality control of news inks consists of several tests that must be satisfied in order for a batch of ink to be approved. The following tests are performed on each batch of ink that is produced:

1. **Grind**
2. **Viscosity**
3. **Tack**
4. **Strength/Shade**
5. **Water Pick Up**

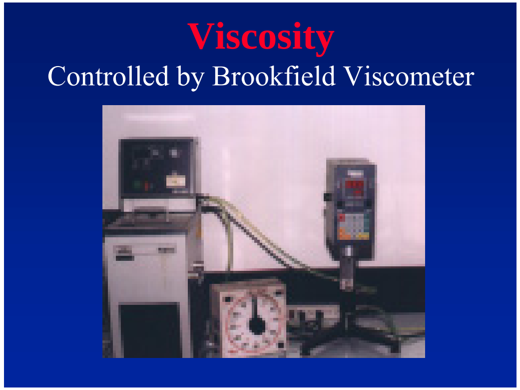
Quality control tests are designed for testing the critical properties of an ink important in high-speed printing.

The “grind”, as ink makers typically refer to is the fineness of the pigment dispersion. What is really looked at is the amount of oversized particles. It is important that the fineness of grind be monitored because an improper grind can adversely affect print quality, performance, and could cause plate wear on press. This test is a pass/fail type test and can be performed via several different methods.

The most common procedure utilizes a NPIRI (National Printing Ink Research Institute) grind gauge . This is a precision milled instrument that contains two channels varying from 1 mil to zero depth. The test ink is placed at the deep end on the channel and a machined scraper pulls the ink along the length of the channel. If oversized particles exist in the sample, then these particles will show as scratches when the size of the particle exceeds the depth of the channel. Ink makers will typically set specifications at the point where four scratches and then ten scratches show on the gauge.

Another commonly used method is a residue test. In this type of test the ink is diluted in a low viscosity solvent so that the mix is very fluid in nature. The mixture is then passed through a 325 mesh (44.5 micron) screen . The screen is then dried and any residual matter is weighed on an analytical balance. Maximum amounts of residue are set for this type of procedure.

Viscosity



Viscosity is a very complex property of ink and it is critical that similar **methods and equipment** are utilized in comparing ink viscosity. Viscosity is the scientific term for resistance to flow.. The most common instrument used in the news ink industry to measure viscosity, is a Brookfield viscometer with a small sample chamber. This is a rotational type viscometer. The test sample is weighed into a chamber. The chamber is placed in the instrument temperature controlled jacket. After the sample is allowed to come to an equilibrium temperature, the viscosity readings are taken at several different rotational speeds. Specifications are set for a certain rotational speed for each product.

Tack

Tack is another ink property, which, in laymen’s terms is a measurement of the force required to split an ink film between two rollers. In more scientific terminology, it is a relative measurement of the internal cohesion of an ink film which is responsible for its resistance to splitting between two rapidly separating surfaces. Tack is a critical property used to control the ink’s tendency to pull lint from the newsprint.

Tack
Controlled by Inkometer

Tack is measured on an Inkometer. This instrument has a series of three rollers, two rubber rollers and a brass drive roller. A standard volume of ink is placed on the instrument and the resistance to separation between the brass and a rubber roller is measured versus time. Tack is typically reported at the one minute interval.

Strength / Shade

During the printing process the strength of an ink determines what ink film thickness is required to achieve a desired print **density**. Strength is dependent on the grade, content, and dispersion of a pigment. Since the pigment is the most expensive ingredient in the ink, it is critical to maintain a consistent strength. The strength of an ink is determined by a reduction of the ink in an opaque white base (a "bleach"). This test is performed versus a standard ink of known strength level. The bleach with the opaque white base is done so that the difference in the strength/shade vs. the standard can more easily be seen by the naked eye. The use of color spectrometers can be used to quantify the bleach results and to measure shade differences. A color spectrometer is an instrument that measures reflectance within the visible spectrum of a sample.

Water Pick Up

There are two commonly used methods for characterizing water emulsification of an ink.

US Ink's Press Doctor

These tests are critical for determining the consistency of an ink to emulsify fountain solution. The first utilizes a Duke Emulsification tester. In this method the ink is placed into a mixing chamber and a fixed amount of fountain solution is added and mixed for a period of time. After the mixing time the excess water (**fountain solution**) is decanted off and measured. The difference between the amount decanted and the original quantity of fountain solution is what has emulsified into the ink. These steps can be repeated several different times to get an emulsification curve. Values for the range of emulsified water are placed at a given time interval for quality control.

Another method for the QC of water pick up utilizes the Kershaw emulsification tester. This instrument is different from the Duke in several ways. The Duke is a low shear mixer (mixer speed 90 rpm's) while the Kershaw is a higher shear mixer(1200 rpm's). The Kershaw uses a constant speed mixer. The fountain solution is pumped into the mixing vessel with a volumetric pump. As the fountain solution is introduced, the viscosity of the ink/fountain solution mixture increases. Higher viscosity produces resistance to mixing which is electronically measured and recorded as a torque increase. This torque increase is monitored until there is a sharp decrease. This decrease in torque is caused by free water in the mixture and is called the emulsion capacity of an ink. Again values for the emulsion capacity can be placed on an ink.

All of the above tests have documented procedures (which conform to ISO 9000 requirements) for both calibration and performance that a quality control laboratory would follow. This insures that we follow a consistent method so that reproducible results can be obtained.

See What is Ink for a more detailed look at the formulation of a News Ink

See Ink manufacture for greater detail on how ink is manufactured.

Ink tends to chalking

VISCOSITY

If the ink has been formulated to be of very low viscosity (to give for example rapid setting) then this too increases the likelihood of separation and chalking.

LITHOGRAPHY

Lithography is a crucial factor and the ink and water balance must be optimal. An ink with narrow tolerance may separate and lead to chalking. In both the above cases little can be done on the run as first aid. Contact your ink supplier for further details.

LIQUID-SOLID RATIO

Ink is a careful blend of liquid and dry solid components. It is important that the ink has a correct balance of these materials. This is called the pigment to binder ratio. Ratio problems may occur if the ink is too strong. Ink must also have good lithography, with a wide tolerance to all the likely variables. If either of these conditions is not met then it is possible that the ink components may become imbalanced in the presence of fountain solution. This could lead to preferential absorption of liquid components and thus solid components more readily left on the surface. This leads to classic chalking.

Impression

Impression is crucial to smooth printing and proper coverage. This should be set according to manufacturer's specification. Impression should be checked regularly. Blankets should not be over torqued, especially if using compressible type blankets. Ensure the impression is sufficient (otherwise mottle, linting, or poor coverage may be likely), while if the impression is too great, there maybe problems with overfeeding the web, and impression blanket/cylinder build-up. Slur can be a symptom of over impression. Dot gain / tone value increase may also be a symptom of over impression

See also Press Maintenance

IT8 Target Interpretation

With the introduction of the NAA / IFRA International Color Quality Contest, a lot of interest has been raised about the use of the IT8 color target, information in this section is based on the NAA/IFRA CQC of 2000.

The IT8 target can be an excellent tool to review the process within a newspaper. The target provides a way to measure the colors reproduced on press with calculated values (based on the original target values) to compare the results. The target should be used in normal newspaper controlled testing to benchmark the process.

Color input scanners do not see color the same way the human eye does. The IT8.7 1 & 2 are targets that were created as a standard so that scanners could be calibrated. The IT8.7.1 is a reflective target, while the IT8.7.2 is a transparency target. The specifications for these targets are described in ISO 12641 Graphic Technology – Prepress Digital Data Exchange – Color Targets for Input Scanner Calibration. This publication describes the target L* a* b* values that each of the color squares are to achieve. These targets are available from either AGFA or Kodak. In addition to having specific universally defined colors, IT8.7 targets are defined in terms of specific physical colorants.

US Ink's Press Doctor

These targets are basically precision photographic images that provide the following carefully defined sets of color patches according to internationally accepted specifications:

A set of standard "conservative" color patches that are likely to fall within most device-color gamuts. A standard neutral lightness scale Target-specific color patches, many at the gamut limits of the colorants used to produce each target Each target also contains vendor-specific material - additional patches or images

The color values of the standard patches are specified in terms of device-independent CIELAB color, otherwise known as the L*a*b* color space, or in Photoshop simply as Lab. The color values of the other patches are specified in terms of the colorants (photographic dyes) used in specific targets. Since targets are real physical objects and not just a set of numerical specifications, a color error of 10 Delta E* units (maximum Delta-E* = 10) is permitted in the standard patches to allow for reasonable manufacturing tolerances. For the NAA/IFRA Color Quality Contest, a set of batch calibrated targets are used. These calibrated targets have tighter tolerances; the goal is to be less than 2 Delta E*'s for each patch.

How is the Target layed out?

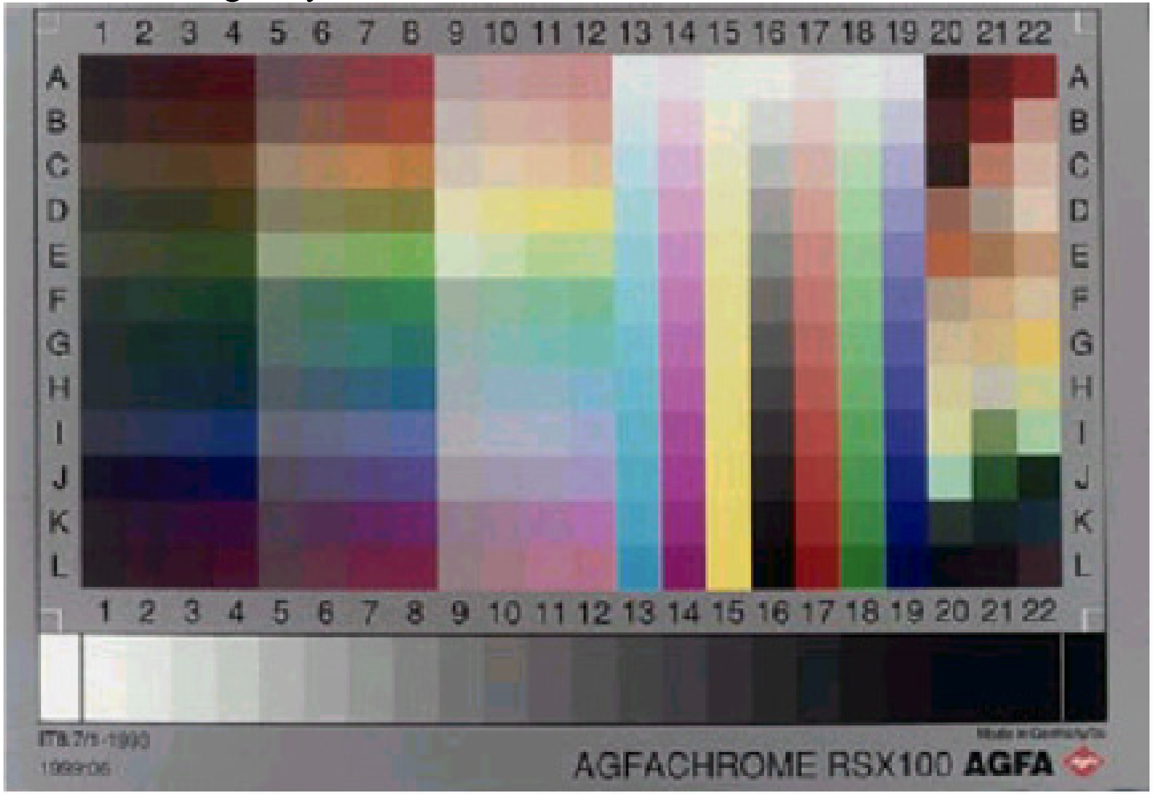


Figure 1 IT8 target

The NAA / IFRA Color Quality Contest uses the IT8 target to measure a newspaper’s control over their process. For this part of the contest, a newspaper is given the IT8 target and asked to reproduce it through their process. The target must be scanned and then reproduced on press. The press reproduction is then measured spectrophotometrically and compared to target values established by IFRA. For the contest, the measurements breakdown into the following three categories:

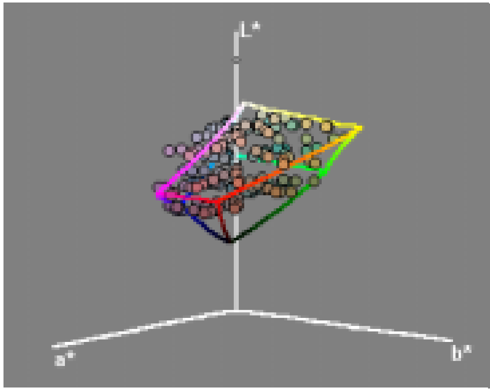
Color Accuracy

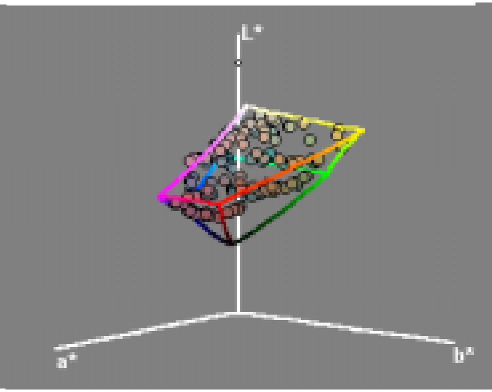
Columns 1 through 12, rows A through L (144 total patches) are measured via a spectrophotometer to establish their color in L* a* b* color space. The measured values are compared to their corresponding target values for the particular patch with a formulation called Delta E*. Delta E* is a mathematical calculation that compares the differences in L*, a*, b*. The formula for this is the square root of the differences in L* a* b* squared, or

$$\text{Delta E*} = ((L_{test}-L_{std})^2 + (a_{test} - a_{std})^2 + (b_{test} - b_{std})^2)^{0.5}$$

The higher the Delta E* the greater the deviation from the required color. In the last Color Quality Contest there are 60 points allotted to this portion. If a newspaper achieves less than 1000 total Delta E*’s, they would receive the maximum of 60 points. If a newspaper achieves 2000 total Delta E*’s they would receive no points for this section. For newspapers that fall in between these Delta E* goals, a portion of the 60 points will be awarded based on a linear scale.

In order to illustrate these differences, several three-dimensional figures have been created. The figures on the next page are a graphical representation of the measured values for the printed target patches (the small colored circles) vs. the standard color gamut as defined by SNAP (the wire cage). The color gamut is the total range of colors for the process. Figure A shows the target values (for a newspaper to achieve this they would have zero Delta E*’s), Figure B shows a newspapers results that achieved 600 total Delta E*’s, and Figure C is a newspaper’s results that achieved 1400 total Delta E*’s. As you can see from the figures, as the total Delta E*’s get larger the reproduced colors on press form a tighter cluster within the standard gamut.





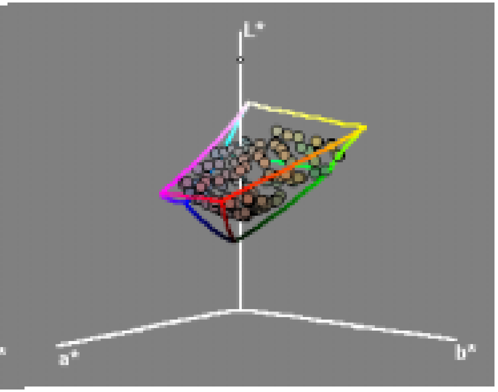


Figure A

Figure B

FigureC

Tone Gradation Evaluation

The Gray step wedge will be measured for lightness values. The L* for five of the steps will be measured for lightness and compared to Standard values. If a newspaper achieves a delta lightness difference of 5 or less, 15 points would be awarded for this section. If 30 or higher delta lightness units are achieved, no points will be awarded for this section. Again, for newspapers that fall between these values the points will be distributed on a linear scale. The target values for the step wedge are listed below. The gray lines are the proposed areas that will be measured for the contest.

US Ink's Press Doctor

Step	
1	81.4
2	80.31
3	77.98
4	75.95
5	72.73
6	70.4
7	68.04
8	65.11
9	62.72
10	60.27
11	57.93
12	55.91
13	53.79
14	51.49
15	48.78
16	46.18
17	43.75
18	41.52
19	38.82
20	36.37
21	35.47
22	34.58

Gray Balance Evaluation

The third part of the target that was measured is for gray balance. The step wedge will also be used to measure this section. The chroma for the grays produced will be measured again via a spectrophotometer. The closer the chroma is to zero the more the color will resemble a gray. Since newsprint is not a pure white, it is difficult to get a zero chroma on each of the steps in the wedge, therefore IFRA has come up with target values for each of the steps in the wedge. The chroma of a color is defined as the square root of ($a^{*2} + b^{*2}$). So to calculate the chroma differences for the reproduced color, the formula would be the square root of the differences in a^{*2} plus the difference in b^{*2}. The following table lists the target values for a* and b* for the step wedge.

US Ink's Press Doctor

	a*	b*
Step 1	-0.11	3.3
2	-0.11	3.14
3	-0.1	2.96
4	-0.09	2.8
5	-0.08	2.63
6	-0.05	2.43
7	-0.01	2.27
8	0.05	2.11
9	0.12	2
10	0.27	1.87
11	0.42	1.79
12	0.57	1.78
13	0.68	1.77
14	0.82	1.82
15	0.95	1.91
16	1.07	2.03
17	1.14	2.19
18	1.17	2.35
19	1.2	2.52
20	1.21	2.7
21	1.23	2.92
22	1.25	3.16

If a newspaper achieves a delta chroma difference of 5 or less, 15 points would be awarded for this section. If 30 or higher delta chroma units are achieved, no points will be awarded for this section. Again for newspapers that fall between these values the points will be distributed on a linear scale.

Several factors need to be reviewed to maximize the results.

Print to the solid ink density standard values. Lower solid ink densities will result in a lower color gamut.
Print uniformly within the process colors, incorrect gray balance will result in a color shift.
Proper press maintenance to insure that the press conditions are correct.
Proper trapping of the process color on press.
Proper separation. This is the most critical in the process. The separation must be set up correctly for the press so that the target will be reproduced on press.

The IT8 target can be an excellent tool to review the process within a newspaper. The target provides a site, the ability to measure the colors reproduced on press and compare those to specified values. The target should be used in normal newspaper controlled testing to benchmark the process and not just as a color quality contest device.

So what do you do if the target is printed and the results do not match the expected values? There are two important steps to understand. The first is the color gamut and the second is

L*a*b* color space. Once the target is printed, the first thing to check is the color gamut. If the color gamut does not meet SNAP standards, it is probably not even worth reading the rest of the targets. Achieving the color gamut on press is critical to be able to create the colors in the IT8 target.

In looking at the gamut, the gamut is measured by printing solid ink targets and the trap overprints on press. The solid ink density is critical in this step. The SNAP density specification should be achieved to maximize the gamut. After the solid ink densities have been achieved, the spectral values for the targets can be measured in L*a*b* color space.

Target the higher end of the Density range and be sure to allow for dry back after printing.

Minimize the Ink and Water Balance to achieve the best results.

Production Printing Specifications

Solid Ink Density *(Dry)*	***Offset*** *Newspaper*	***Offset*** *Commercial*	***Flexography***	***Letterpress***
Cyan	0.90	0.90	0.95	0.90
Magenta	0.90	0.90	0.97	0.90
Yellow	0.85	0.90	0.79	0.85
Black	1.05	1.10	1.05	1.00
SNAP Tolerances	+/- 0.05	+/- 0.10	+/- 0.04	+/- 0.05

CIELAB L*, a*, b* Aim Values	***L****	***a****	***b****
Cyan	57	-23	-27
Magenta	53	48	0
Yellow	79	-5	60
Black	40	1	4
Cyan & Yellow	53	-34	18
Cyan & Magenta	41	7	-22
Magenta & Yellow	52	41	25

Values come from ISO 12647-3. They represent offset and letterpress inks only. Measurements are according to ISO 13655 (2° observer, illuminant D_{50}, 45°/0° or 0°/45°, black backing).

The figures below show a plot of the a*b* values for the standard SNAP values and two test

results. In figure 2 one can see that the lines for the test and the standard overlap, which means the color gamut meets the standard values. In figure 3 however, you can see that the test gamut is smaller than the gamut for the standard. In this example, it would be difficult to match
the other colors within the target.

Figure 2

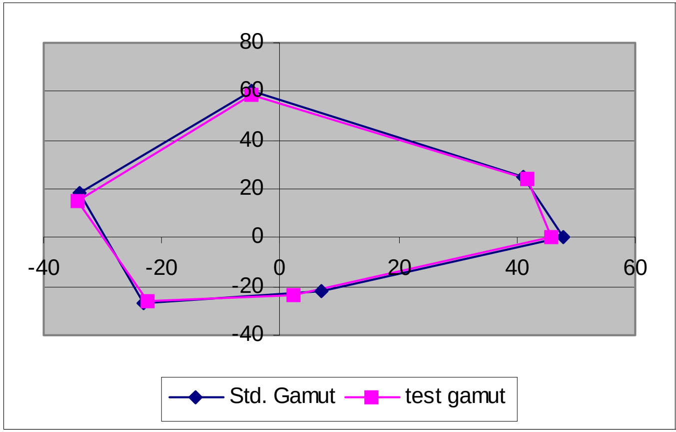
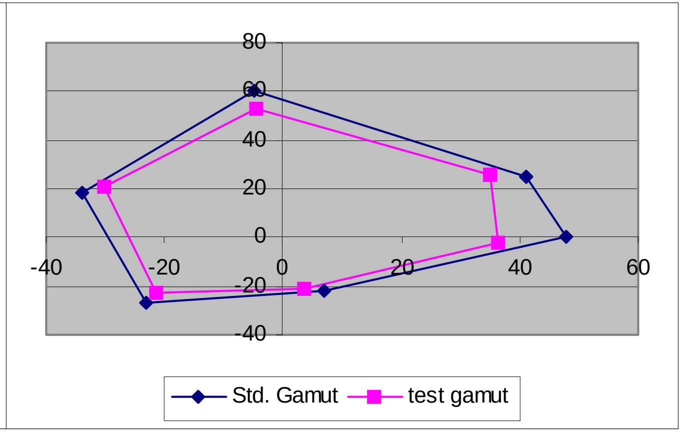


Figure 3



In looking at these diagrams, they show both the solid points and the overprints. If the solid ink points are acceptable or close to the standard and the overprint value if off, there may be a trapping problem on press. Ensure that the proper printing sequence is used (CMYK or

KCMY).

Once the correct color gamut has been achieved on press, one can then look at the values for the rest of the target. Again the target should be measured with a spectrophotometer in the L*a*b* color space. The target will be compared to the standard values based on the calculation of Delta E*. The Delta E* calculation is based on the differences in L*a*b* values, so it is important that each of the values are close to the target values.

The most common cause of differences is based on the L*. This will have the greatest impact and should be one of the first checks in adjusting the target. The L* values should be looked at globally to see if any adjustments can be made. If there are large differences in these values, the target should be adjusted for this first. You should look at different areas on the gray step wedge to see if a global adjustment is necessary or a particular area of the tonal curve (i.e. shadow areas or midtones) needs adjustment. This could be easily accomplished in Photoshop by placing the target in L*a*b* color space. The target can then be adjusted by going into the curves and adjusting the L* curve. By doing this the lightness of the target can be adjusted without affecting the a* or b* values.

As a guide you can look at the gray step wedge lightness values and compare them to the target values. For example the lightness of step 11 is supposed to be 57.93 and you are printing darker than the target let's say 45. You can look at your printed target and see at what step the lightness of 58 is. You can then use this as a guide to readjust the target in pre-press. The target should then be reprinted and re-measured until the L* values are similar to the target values.

Once the color gamut and lightness have been corrected, the next step would be to get the gray balance in line. As stated before, a printed area having a chroma close to zero would appear as a neutral gray. The balance within the separation needs to be adjusted so that these printed areas have a neutral color balance to them. Again you would need to compare the printed values to the reference values and then go back and make adjustments to pre-press. Look at different areas of the tonal curve and check again if a global or local area tonal correction is needed.

If these steps are followed the resulting color balance of the 144 areas to be measured should be within acceptable tolerances. We do not recommend going through and trying to adjust each of these squares individually. This is not something that would happen on a daily production run and the intent of the Color Quality Contest is to test the principles and practices in reproducing a color gamut on press.

The guidelines are being updated for the 2002 NAA/IFRA CQC, please contact your local representative for the latest updates.

Lithographic problems

A large area of potential problems in lithographic printing is not surprisingly ink and water balance.

SIGNS OF IMPROPER INK AND WATER BALANCE

1. **Ink build-up on water form.**
2. **A very wet, shiny plate.**
3. **Ink spitting onto guards, floors, etc.**
4. **Solids look mottled, not uniform in density.**
5. **Solids appear weak, lack density.**
6. **Dots lack density.**
7. **Loss of detail in shadow portion of pictures.**

Poor or incorrect ink and water balance can lead to many different problems. Let's look at these and suggest some areas to check, as a first stage in correcting them. The copy shows print defects by ink in the non image area, this may be scumming (sometimes called catch-up or greasing) which is often localized, and may be quite pronounced, or it may be overall tinting which is a general coloration and which may be quite subtle. Bleeding and toning are terms often used as an alternative for tinting.

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Ink is feeding-back into the fountain solution. In this case the contamination is in the form of a floating scum which can contaminate the fountain solution system. Closely related to feedback is contamination of the dampener rollers. If this is your problem select this link.

****

The ink has over emulsified. A degree of emulsification is necessary for the lithographic process to work. However over emulsification may cause the ink to lose its transference, (print weakly or require a high ink film weight to achieve correct density). Coupled with this may be piling where the ink film on the ink train becomes progressively thicker, often in bands. An experienced printer may even detect changes in the sound of the ink film splitting.

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The blanket has a heavy deposit of lint. The lint is usually a very dry deposit consisting mainly of paper fibers, and may be very smooth.

****

There is a loss of density in the print, or the background non-image area begins to print, (and cannot be cleaned up even with excessive fountain solution levels). Plate wear may be visible as a loss of density in some areas of the image. (Inspect the used plate, there may be polishing of the non-image area.) Blinding is a loss of density in the image, but the non image area is largely untouched.

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The metal inking rollers strip and refuse to accept ink, which may lead to loss of density in the print.

ADVANTAGES OF PROPER WATER/INK BALANCE AND USE OF DENSITOMETERS

1. When water and ink are at minimum levels, ink settings are more consistent (less fluctuation) throughout run.

US Ink's Press Doctor

2. Combinations of solids are better.
   Example: Solid magenta - solid yellow = reds better
   Solid cyan - solid yellow = greens better
   Improved "trapping" because of reduced water levels.

3. Single Color - signatures are better. Lay-down smooth, not mottled.

4. Better 4-color reproduction.
5. REDUCED build-up on ink rails..

6. REDUCED misting..

7. REDUCED plate wear.

8, REDUCED lint build-up on blankets.

9. INCREASED pages per pound of ink.

10. Lower cost, less waste, increased productivity.

Localized density problems

There are probably two main reasons for localized areas of low density. By examination of the copy determine whether the low density area represents an irregular shape or whether it represents a definite ghost image. If the low density area is irregular then the most likely cause is blanket damage, probably as the result of a smash or wrap around. A blanket reviver could help but the only real cure in severe cases is to replace the blanket.

Lint

Lint is a deposit of mainly paper debris on the blanket. It is usually present to some degree, and is only a problem when severe or when it affects the print quality. Lint may be a result of substandard paper, incorrect ink and water settings, poor press settings, poor blankets, or incorrectly formulated ink. Taking the points in order, the paper should not have any significant quantities of loose fibers or debris on the surface. This is a classic cause of lint, which will appear as a paper-like, thin, very even deposit on the blanket. (this should not be confused with blanket build up, which originates from the ink, and is uneven, often hard and difficult to remove.) With paper of this type, there is little to be done as first aid on the run. This is one of the few cases where running with very little fountain solution can lead to a problem. Some improvement may be possible by running with more dampening solution, however the positive effects may be short term due to other problems this will create.

Incorrect ink and water balance can lead to instabilities within the ink film, loosening of fibers and consequential lint build up. Ink and water balance should usually be set with minimal ink settings along with lowest dampening solution settings, consistent with clean running, (subject to the points made above).he tendency to lint will also be increased if the press is run with non-true rolling, particularly if the blanket height is wrong. Blanket height should be maintained according to press manufacturer's specifications. Poorly formulated ink might have an excessive initial tack, or may increase when in use. It is possible also for a poorly formulated ink to be come unstable in the presence of fountain solution, and for the resins to become less soluble and to cause a tack increase. Each of these cases could lead to excessive lint build up. In such cases the ink supplier should be called.

LINTING

BUILD UP OF PAPER LINT ON PLATES, BLANKETS, AND/OR INK TRAIN ROLLERS

LINTING

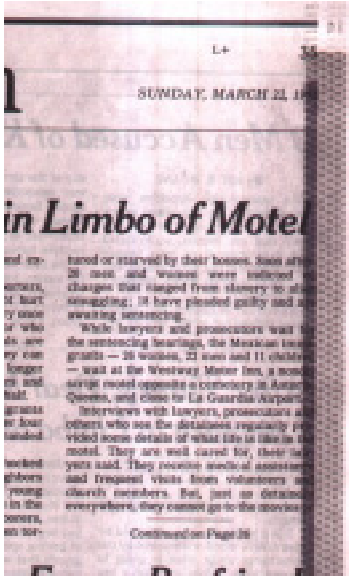
CAUSE	SOLUTION
HIGH TACK INK FOR PAPER	CUT INK TACK
EXCESSIVE WATER	USE LOWEST INK/WATER BALANCE
FOUNTAIN SOLUTION TOO CONCENTRATED	SET F.S. TO PROPER CONDUCTIVITY
LOW PLATE BLANKET	USE GAUGE AND SET TO SPEC.
POOR TENSION CONTROL	CHECK SPECS/MODIFY
EXCESS NEWSPRINT LINT	CHECK WITH PAPER MFR.

Marking

Marking is usually seen as a general print defects of the copy, which is worse behind, and in line with a heavily inked area. The partially dry ink has transferred from the copy to some part of the press usually the pipe rollers, bars, or former boards, and subsequently transferred back to the copy. There are several causes of marking, lets try to identify which is relevant to the problem observed. Marking is a cumulative problem, and thus relates to length of run and period between cleaning of the relevant press equipment. Have the affected units been cleaned according to their normal pattern? Obviously that should be easy to identify and correct.

First the easy checks, many problems are caused by overinking, so that has to be the first area to check.   Select overinking for more data.

So you have determined that inking levels are correct?



Marking is very sensitive to the pressure and length of contact between the web and the rollers/bars etc. to which it comes into contact.   Select contact pressure for more data.

Is the problem caused by build up and transfer of ink from the actual delivery system or web trolleys. If the problem arises from the trolleys they can often be aligned with the non printed area of the web. If however the problem stems from the delivery system, again the question of what has changed should be addressed. Check that grippers or wires etc. are acting on the correct part of the copy, and are at the correct pressure. Check the pressure, or setting of serrated folder guide rollers or RTF (drag) rollers.

Consider the nature of the copy being printed. Particular attention should be paid to very heavy solids, or heavy 4-color laydown. If these are normally present and run without problem then the cause obviously lies elsewhere. If however the copy has changed in character or is carrying an unusually difficult subject then you may need to attempt to alleviate the problem without necessarily being able to actually tackle the cause.

Has the substrate paper in use changed? Preprinted inserts may be printed on a smoother paper than is normally used. Paper which is smoother due to increased calendering or a degree of sizing may give a better reproduction, but may also cause the ink to sit on the surface fractionally longer, and on fast presses this may lead to build up and thus marking. In such a case discuss the problem with the paper supplier. Select paper for more data.

Select remedies for data on tackling the symptoms of marking.

Of the other consumables, a poorly formulated or inappropriate ink can certainly contribute to build up and marking. Ink which has too much solid component, see pigmentation or is of too high a viscosity for the nature of the press or the application, or which is too high in tack at the point of printing will all tend to cause build up and marking. Equally ink and water balance should be correct, and maintained through the run. Incorrect ink and water balance may be caused by either the ink, the fountain solution, or both, or may be a function of badly set dampening solution levels or due to a defect in the dampening system itself. Poorly processed plates can mean dampening solution levels have to be kept high for clean running. These possibilities are explored in dampening solution levels. If it is felt that the problem lies with either the ink, the plate, or the fountain solution then the relevant supplier should be involved.

Marking-Remedies?

Possible first aid for marking, on the run. Reduce or normalize web tension. It may however not always be possible to normalize web tension, nor is it likely to be possible to reconfigure the press, change the stock, or alter the subject matter. In such cases, the only first aid on the run, which might have some effect would be to reduce both ink weight and level of dampening solution. If that takes the density below what is normally acceptable then that needs to be weighed against the expected advantages.

If that is unacceptable, and time permits then extra cleaning of the relevant pipe rollers/bars may be considered. If it can be predicted from past experience that a potentially difficult configuration is to be used, then some relief may be obtained by treating the rollers/bars with silicone fluid. It is possible to use silicone fluid on the run about this has very little effectiveness on already dirty pipe rollers/bars. Two warnings though, any effectiveness of this treatment is short lived, and requires frequent re-application, and you should be VERY careful not to let the silicone fluid contact any part of the ink train or dampening system as this can cause severe lithographic problems.

Matching Printed Copy Visually to Proofs

Goal: To ensure optimal reproduction of printed copy to supplied proofs.

Background: This procedure assumes that the "Good Copy" procedure is completed. Prior to press start, press crew must review important areas (as defined by the customer) of the proof under standard viewing conditions.

Procedure:

1. When press achieves proper running speed, set registration to conform to specification using a loupe with a minimum of 8X magnification.
2. If using the offset process, set water to minimal levels to prevent ink scumming.
3. Set black inking level in solid areas using a calibrated reflection densitometer.
4. Make global color adjustments to inking levels, i.e., areas that are too light or too dark.
5. Satisfy customer specific color matching requests.
6. If no specific requests are provided:
   a) Set neutral tonal areas to proper level to match the proof. Color casts should be maintained if visible in the proof.
   b) Look for red, green and blue areas in the proof and adjust inking levels accordingly.

7. Continue to monitor the reproduction for the remainder of the run.

Ink mist

Ink mist may also be known as ink fly or sling. In fact there are subtle differences about which we should be aware. See definition, for more data.

Ink sling may cause print defects in the form of relatively large individually visible droplets, this usually occurs in the immediate vicinity of the inking train.

Misting or fly however is more likely to cause print defects of structures further away from the inking train, and be visible as a film of ink composed of droplets too small to be seen by the unaided eye. Misting or sling can be caused by several factors. As with many printing related problems overinking can be a major factor. Therefore as a first measure check that the inking level or density is correct, preferably by means of a densitometer. For data on setting density level specifications see specification. If the density is correct consider the ink and water balance. Overdampening is a cause of sling, and is due to the ink partially emulsifying, and losing its inherent tack and transfer properties. This leads to a thick film on the ink train which when split may cause droplets to break and be propelled away as sling. Such droplets would be quite large and visible individually.

The ink and water settings are the most easily checked. If the problem persists, and (particularly if it is localized rather than press wide), consider roller settings. Uneven settings, or settings which are either under or over manufacturer's specifications can lead to misting or sling. You should also consider whether anything has changed. Is the press being run faster, longer, or hotter? The degree of misting is proportional to each of these factors, and their effects are additive. However if they are the main factors, little can be done as a first aid measure on the run, consult your ink maker who maybe able to offer a modified product.

Misting

Misting is a term often wrongly applied to ANY material ejected from the press. In fact the term misting should only be applied to ink which has been ejected from the inking train, and which is composed of very small particles or droplets. Such airborne material remains suspended for some time and thus may travel a considerable distance and be deposited some distance from the press. With ink mist the individual particles are only just discernible with the unaided eye. They usually have a particle size(diameter) of less than 15-20 microns. Particles that are ejected and settle in the immediate vicinity of the press or on the press itself, and are individually clearly visible to the unaided eye should normally be referred to as sling. Misting is produced by the splitting of the ink film, while sling is usually due to a build up of ink(often emulsified) on the inkers.

Mottle

Mottle may be caused by several different factors. However some are more likely, while others are not very common in coldset printing. If these, two classifications are most likely, these are lithographic, and linting. As with many other problems, too much water can bring about mottle. See Definition If the problem is mild, then some emulsification may occur but not necessarily enough for classic emulsification symptoms to show themselves) See emulsification.

The best remedy for mottle is to reduce dampening solution levels to normal or below if that is possible without catch up occurring. If the ink will not run with normal levels of dampening solutions, then that could be due to either the fountain solution, the ink, or (much less likely) the plate.

Check the fountain solution strength, ensure that it is within manufacturers tolerances. With a weak fountain solution you may require a higher VOLUME to keep the plate running cleanly, It is fountain solution volume that causes many of the mottle problems observed. Correct as necessary. Mottle can occur on process color printing if too much dampening solution is present from a previous color printed. In this case attempt to reduce dampening solution levels for earlier colors as detailed already. If the ink mottles, requires high levels of fountain solution to run cleanly, and this cannot be reduced, while the fountain solution strength is correct, then suspect the ink and call the ink supplier.

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Mottle may also occur if there is an accumulation of lint on the blanket. Instead of printing from a smooth blanket surface, printing is from the surface of the lint. The print therefore can only be as smooth as the lint surface and this is invariably very uneven. For information on linting select lint.

Mottle definition

Mottle may be caused by a degree of emulsification(which effectively reduces the ink's transference).Mottle however is more likely to be due to the presence of excessive numbers of relatively large water droplets. The printed film is effectively broken up or interspersed by a series of lighter spots which correspond to the droplets of water which were present as the film was laid down.

Odor (copy)

The printed copy has an unacceptable odor. You need to decide whether the odor is different than normal, or whether it is merely stronger. Our sense of smell is not very consistent, in fact when we have been in an environment with a characteristic odor for a period of time, we become accustomed to that odor and thus unaware of it. It is only when the odor is removed, or replaced that we become aware of the change. The first factor to look at is "has anything changed ? If it can be demonstrated that the problem is due to one of the consumables, i.e. ink, paper, or fountain solution, then the problem should be referred to the supplier. However, although odor may be present, it may be quite normal, characteristic of that consumable and only noticed because it is different to normally used material.

Different odors
Stronger
Odor testing

Odor (normal but stronger)

If the copy has been found to have an excessive or unacceptable odor, and this has been found to be “normal" in character, then there is little that can be done by way of first aid, on the run. It is likely that the cause is due to one of the print consumables, i.e. the ink, paper, or fountain solution. Consider setting up a odor panel, (remember to use non-smokers) and if the offending item can be identified then refer the problem to the appropriate supplier. Odor Testing

Odor (unusual)

The copy odor is unacceptable, and has been noticed to be different to normal. Can the nature of the odor be identified ?t is possible (but fairly unlikely) that the odor is the result of cleaning materials finding their way into either the ink or fountain solution. Check samples of ink and fountain solution from different areas of the press. In such a situation it's unlikely that every unit would become equally contaminated, so any differences seen by this technique would suggest contamination.

Consider the fountain solution, not only on its own(at working strength) but also in contact with the different newsprint in use. If the odor is due to the fountain solution, it maybe the result of algae or bacterial growth. This however would give a characteristic (probably) bad-eggs, or swamp-water type smell, and would be likely to be obvious throughout the pressroom. There would also be evidence of growth within the fountain solution system.

Consider the fountain's solution strength. Check that this has not been overdosed, some fountain solution components have a fairly strong odor. Consider whether the fountain solution has changed, not only to a different supplier, but has a change been made to overcome some other problem (inhibitors and biocides for example may have a strong odor)?

The ink itself has quite a noticeable odor, which is due mainly to the oils and solvents. A change of suppliers or particularly a change in ink type(even from the same supplier) can mean a significant change in odor. Mineral oil inks have their own characteristic odor, as do vegetable oil inks, and low rub formulas, all may be very different. If the problem is due to a change of ink then there is little by way of first aid on the run which would-be effective. It might be possible (but of limited effect) to run with reduced ink film until the problem is either resolved or the odor becomes familiar and thus accepted. If the problem is ink related and persists refer to the ink supplier.

Odor Testing

The testing of the odor of substances is a very specialized science, covered by a series of ASTM and other standard test methods. However with care and a few precautions, useful results are possible. For your panel, use non-smokers. Ensure that samples to be tested are at room temperature. Seal equal sized samples in inert containers. (metal tins are probably acceptable, plastic containers should be selected with care to be odor free). As a last resort you can use the plastic bags used for cooking food in. The most reliable odor test is a comparison. Ask the participant to remove the lid, and sniff the sample, comparing the standard against a test sample and to say which is stronger, and to grade any difference as slight, moderate, very obvious or extreme. Also get the participant to grade the odor as bland, obvious, unpleasant, or objectionable. To achieve any accuracy, the test will need to be repeated several times with different people. Note, each participant can only reliably check two or three pairs of samples before becoming insensitive. Also as the containers are opened, some of the odors will be released, so multiple tests on the same sample containers are difficult.

Ink Film Weight

It is necessary to analyze why you are carrying too much ink. There are several possibilities, so let's look at the most likely. The most likely cause of over inking is running to an optical density higher than is required. Check the density, preferably using densitometer. You have probably already seen the section covering over inking, if you haven’t it is suggested you look at it now. There is also a section devoted to assisting you to set in-house density specification, again this is well worth a look if you do not yet have a set specification.

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You have checked and determined that the density is to specification but you still feel you need to carry excessive ink to achieve this ?his could be due to a degree of overemulsification. Try cutting back the level of dampening solution, in fact it is worth cutting back the dampening solution level until catch up occurs, and then increasing it very slightly. Remember however that a decrease in the level of dampening solution may require the printing of several hundred copies before the full effect is seen. If you have not already seen it look at the section covering ways of reducing dampening. This problem could also be caused by ink that is weak,(has insufficient pigment). If the ink and water balance is thought to be correct yet the copy still requires excessive ink to achieve the required density then suspect ink strength. Call the ink supplier. If this is the case there is nothing that can be done as a first aid measure on the run. The ink maker will probably supply a stronger formulation.

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Consider also the paper, if this is excessively rough, then a higher than normal level of ink may be required to give correct density. In this case, close inspection of the printed image will show poor coverage, with paper showing through. Again if this is the case there is little which can be done as a first aid measure on the run. You could try increasing the level of impression if this is readily possible (carefully, since this can lead to other problems occurring).

Overall Density Problems

The density over the whole of the copy (or particular web)is down and if the ink is increased to give satisfactory density, the copy then shows signs of over inking. In such a case the first thing to check is ink and water balance.

If the copy is being run with too much water this can have an adverse effect on transference. Try to reduce the level of fountain solution being used. If the problem is mild, then some emulsification may occur but not necessarily enough for other classic emulsification symptoms to show themselves.) See also emulsification.

If the ink will not run with normal levels of dampening solution, then that could be due to either the fountain solution, the ink, or (less likely) the plate. Check the fountain solution strength, ensure that it is within manufacturers tolerances. With a weak fountain solution you may require a higher VOLUME to keep the plate running cleanly, It is fountain solution volume that causes many of the problems observed. Correct as required.

Look also at the impression settings are these normal? Ensure that blanket height is within required tolerances. Low blanket height has a similar effect to insufficient impression.

Consider also the paper, has this changed? The most likely problem with paper in this context is roughness. A paper with a rough surface will need extra ink to cover properly. In such a case refer to the paper supplier. As a first aid measure on the run you could try increasing impression slightly. less likely contender is the plate. Check whether this has changed. Ensure it has been correctly stored, exposed and processed. If possible try a different batch of plates.

If it can be seen that all settings are correct, and nothing else has changed, then suspect the ink and call the ink supplier.

Oxidation

Oxidation is a term, which is often misapplied. In the most widely accepted definition of oxidation, the lithographic plate has been processed normally but then stored for a length of time with the non-image area exposed to the air. The non-image area then becomes chemically changed by the action of the oxygen in the air and may acquire an affinity for the ink. This leads to the non-image area becoming difficult(or impossible) to clean up and run cleanly.

Most modern litho plates can be stored for a short time without the need to gum-up (gum acts as an oxygen barrier) but longer storage times may still require gumming. The term is often misapplied, and used to describe scumming. It should however be noted that scumming may be a consequence of oxidation, so the terms should usually be considered together.

As a first aid measure, it may be possible to clean the plate with a plate cleaner or strong fountain solution etc. It may also be possible to run with slightly stronger fountain solution, but this should be undertaken with caution since other problems can be introduced. It is good practice to follow manufacturers guidelines when storing processed plates particularly regarding the use of gum (or gum substitute).

OXIDATION

Small spots of ink appear on the plate surface upon roll-up. Plate may be drying out from picking up ink from dampeners. Ensure the plates are properly gummed and that the gum is to the correct strength and not contaminated. Check that dampeners are carrying adequate moisture. Check airflow across the press - reduce or eliminate if possible. Check fountain solution. Verify pH/conductivity standards. Correct if necessary. Examine the deletion technique. Use recommended method.

Overinking

A positive symptom of over inking may be unusually good coverage, and since a high ink film weight will require a corresponding high dampening solution level, the copy may be limp and have a wet feel. Other possible symptoms of over inking may be a more noticeable inky odor, and after a few hours, noticeable strike through. Rub off straight from the press and even after time will be poor. Set off will be high as well as pipe roller build up. Mileage of the Ink will be poor.

If you have a densitometer available, check that inking levels are correct and that density is within specified tolerances. Select this link for guidance on setting density level specifications?

To look at how to decrease ink film weight, and some information on over inking select and press return now. In addition to the adverse effect on rub-off, higher print density has other consequences leading to poorer ink mileage.

It can be seen that very little increase in density is achieved when excessive amounts of ink are printed. For example, an increase in print density of 20% (from 1.0 to 1.2) requires an ink film weight increase of 58%. This is over double the percentage increase of ink required to accomplish this change. It is possible for all the symptoms of over inking to be exhibited, while the actual inking levels are normal. This usually happens when the paper in use has a very smooth surface. In such a case use of the "special" paper is probably unavoidable, so the only first aid on-the-run is to reduce the ink film weight as far as possible. If this entails reducing density below acceptable levels then that has to be considered in light of the expected improvements. To look at ways of reducing film weight, or information regarding causes of over inking select this link and press return now.

Operational problems

At this point we will begin to deal with problems which may or may not affect print quality, but which adversely affect the production of the copy. If you wish to analyze defects of a visual nature, you should have taken a different route. Select print quality for a quick path back.)Let us examine the various operational problems in loose categories.

The first area we will consider relates to difficulties in handling the ink. This will include pumping difficulties, and any problems of seepage(dripping) or hang back. The second area to consider will be problems associated with print defects, or more loosely ink which has accumulated or built up in the wrong place. This should not be confused with seepage or dripping.

We may need to consider problems associated with the plates this will include wear, blinding, cracking etc. The largest areas of potential difficulty in lithographic printing are probably the ink and water balance, and all the problems associated with poor lithography.

Piling

Piling can occur in different forms. The first and probably most common is an accumulation of circumferential bands of ink on the inkers. This may be due to incorrect ink and water balance. This leads to emulsification of the ink, which loses much of its tack, and as a consequence, refuses to adequately transfer along the ink train. The bands of piling which accumulate are usually composed of very short flowing "buttery" ink.

If piling of this type occurs, look closely at the level of dampening, reducing this if possible. Piling of this type can also occur if the ink has poor lithography. In such a case run with minimal dampening, consistent with clean running. If the problem is thought to be due to the ink then the supplier should be contacted.

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The other main form of piling also occurs as ink, which accumulates on the inkers, but in this case the accumulated material is much drier. This may be due to one of several causes. The ink may be either poorly ground, or have incorrect pigment to binder ratio The liquids tend to transfer more efficiently than the solids, which get left behind and accumulate on the rollers.

In such cases the ink supplier should be contacted.

Closely related is a situation where the stability of the ink is upset when in the presence of fountain solution. In this case check the fountain solution's strength correct the fountain solution.

If this does not cure the problem contact the ink supplier.

Print Defects of press/surrounding area

The problem relates to print defects of parts of the press or its vicinity. (If the problem relates to print defects of the COPY, you should be looking elsewhere, in such a case select this link for a quick path back). Let us consider print defects in terms of where it occurs on the press, or its vicinity. Is the problem one of ink "flying or mist? This may cause print defects of the press structure in the immediate vicinity of the inking train, or structures a considerable distance away.

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Is the problem that ink has accumulated in the plate gaps, or at plate edges and is causing print defects of the copy?

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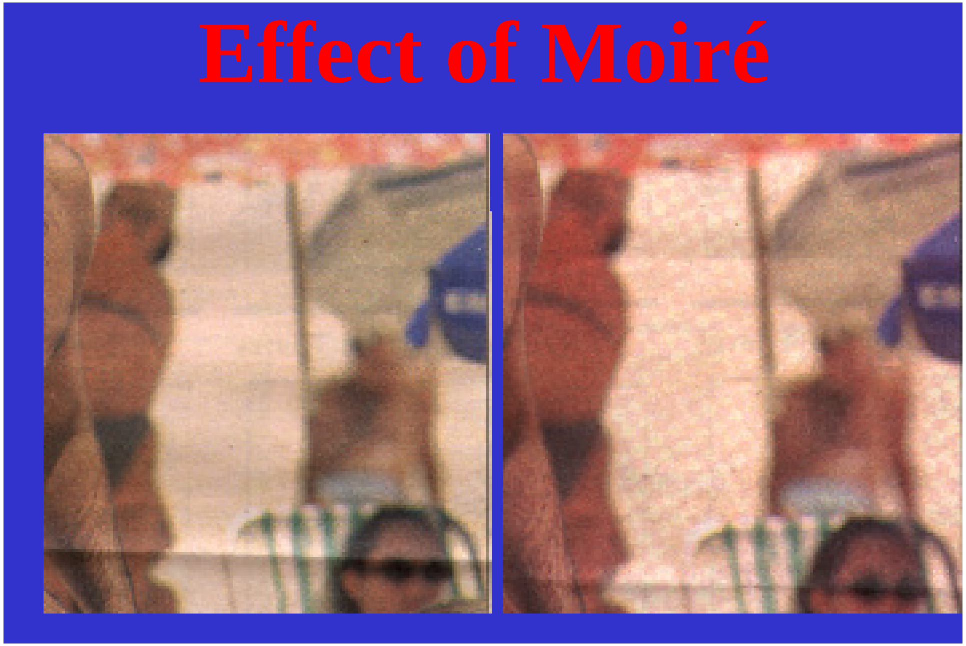
Is the problem build-up on parts of the press into which the freshly printed web has been in contact?

Patterning - Moiré

Patterning has been identified as a problem, on process color halftones. In the case of moire patterning, the pattern is very regular, and will probably be comprised of two different colors. Invariably this problem is a result of inappropriate choice of screen angles.



US Ink's Press Doctor

Paper Properties

The paper may be a calendared or sized and thus have poor absorbency. There are several checks that can be carried out to determine either the oil or water absorbency of the sheet. Contact the paper supplier or ink supplier for more details on testing. As a very rough guide if the length of absorption take along time, it can be expected that ink will set more slowly and may tend to chalking. At the same time build up on pipe rollers etc. is more likely. If however absorption time is very quick, then absorption is rapid and it is more likely that ink coverage problems will be experienced. More information on paper qualities:

PAPER FIBER

Newsprint is produced by blending various types of fibers together to make a product which has a combination of good runnability and printability properties. reducing number of mills still use stone ground wood pulps which entails removing the bark from logs and grinding them under pressure into a fine pulp slurry. This presents a fiber with good printability but lacks the strength required for good runnability as 100% of the supply. It is therefore necessary to incorporate a percentage of chemical fiber, which gives sufficient strength to the newsprint sheet when added to the stone ground wood fiber. The chemical fiber is produced by cutting the wood into small chips, which are processed through a chemical treatment in a digester to break down the lignin and release the fiber.

Chemical pulps do, however, have certain disadvantages in newsprint. Apart from being expensive to produce in comparison with ground wood grades, they can reduce the opacity of the sheet of newsprint, lower the caliper and increase the porosity. Proportions of the two fibers in the furnish mix will vary, but as a general rule, 15% to 20% of chemical fiber was considered a standard before the new pulps were developed. Developments in pulping techniques have resulted in a move from the traditional stone ground wood and chemical pulps to a range of different pulping systems, for example, Thermo-Mechanical pulp TMP, Chemi-Thermo-Mechanical CTMP and De-Inked pulps DIP.

PAPER OPACITY

If a newsprint sheet is opaque, it contains a property that will prevent a printed object on the reverse side being seen from the non-printed side. (show-through)therefore, a sheet with good opacity will minimize the observing of the printed image through the newsprint substrate. Measurement of this property is generally made by optical viewing a known value of a black object through the sheet being measured. As indicated earlier, certain pulps produce poor opacity results mainly due to the nature of production. Chemical pulps with long fiber can cause this type of problem.

PAPER SMOOTHNESS

Parker Print Surf equipment is now more commonly used as this relates the surface characteristics to the printing process. It is the combination of air pressure and variable blanket packing pressure which are the means for determining the printing value of the newsprint.

How is Paper Made

Paper in the form of thin sheets is manufactured by the webbing of vegetable cellulose fibers. Paper is used for writing and printing, for wrapping and packaging, and for a variety of special purposes ranging from the filtration of precipitates from solutions to the manufacture of certain types of building materials. In 20th-century civilization, paper became a basic material, and the development of machinery for its high-speed production has been largely responsible for the increase in literacy and the raising of educational levels of people throughout the world.

The basic process of making paper has not changed in more than 2000 years. It involves two stages: the breaking up of raw material in water to form a suspension of individual fibers and the formation of felted sheets by spreading this suspension on a suitable porous surface, through which excess water can drain.

Today more than 95 percent of paper is made from wood cellulose. For the cheapest grades of paper, such as newsprint, thermal mechanical pulp alone is predominately used; for better grades, greater ratios of chemical wood pulp, or a mixture of pulp and rag fiber is employed; and for the finest papers, such as the highest grades of writing papers, rag(cotton) fiber alone is used.

Wood is a hard, fibrous substance found beneath the bark of trees and shrubs. It is composed of specially hardened cells whose two main functions are transporting water and dissolved minerals from the roots to the leaves and supporting the plant body. Most wood cells are dead. Only young cells, those laid down during the current growing season, are alive (primary xylem). Once the xylem cell hardens with lignins, it is referred to as secondary xylem. The ratio of dead to living wood cells increases as the girth of the tree increases.

The wall of the wood cell consists of two principal chemicals: cellulose and lignin. Cellulose constitutes 70 percent of the dry cell wall and is important economically. Lignin fills the spaces within the cellulose network and is the "glue" that holds the wood together. It will rapidly decompose and discolor paper if it is left in the pulp. Cellulose is a polymerized carbohydrate; many glucose (sugar) molecules are linked together in long chains to form macromolecules. The cellulose becomes arranged in long, threadlike fibrils. Cellulose wound in this fashion is as strong as an equivalent thickness of steel. Lignins also add rigidity to the cell wall.

PULPING

To produce paper the wood must be broken down into the pulp form. Mechanical wood pulp is made by two quite different processes. The classic method is grinding against a stone and the more recent method uses a refiner. In the classic ground wood process debarked logs are pressed against a rotating grinding stone while hot water is sprayed on. The rough surface of the stone breaks the wood to approximately 1 to 4 mm long fibers and finer particles called fines. The careful balanced proportion of the long and short fibers determines the quality of the ground wood.

Sawmill waste or wood chips are the raw material for the refiner process. This process is more commonly known as the Thermo-Mechanical Process(TMP). This process permits a gentler defibering of the wood and thereby produces a higher proportion of longer, unbroken individual fibers.

Chemical pulp is a higher quality fiber, which is produced by dissolving and removing the lignin and resins in the wood. Both of these materials are not good for paper quality. To make chemical pulp the wood is cooked with chemicals to remove the lignin and gently break down the wood into individual fibers. Chemical pulp has a higher proportion of fibers in their original length and thus has a higher strength. In addition chemical pulp fibers are more flexible and do not yellow with aging, since the lignin has been removed.

Another type of fiber used is wastepaper or old newspapers (ONP). The old newspapers are first soaked in water and mechanically broken down into a fiber slurry. Many of the contaminants are removed as the slurry is deinked. The deinking process removes most of the ink and contaminants. However, the fibers do lose quality during the process. Thus there are limits as to how many times a sheet may be recycled.

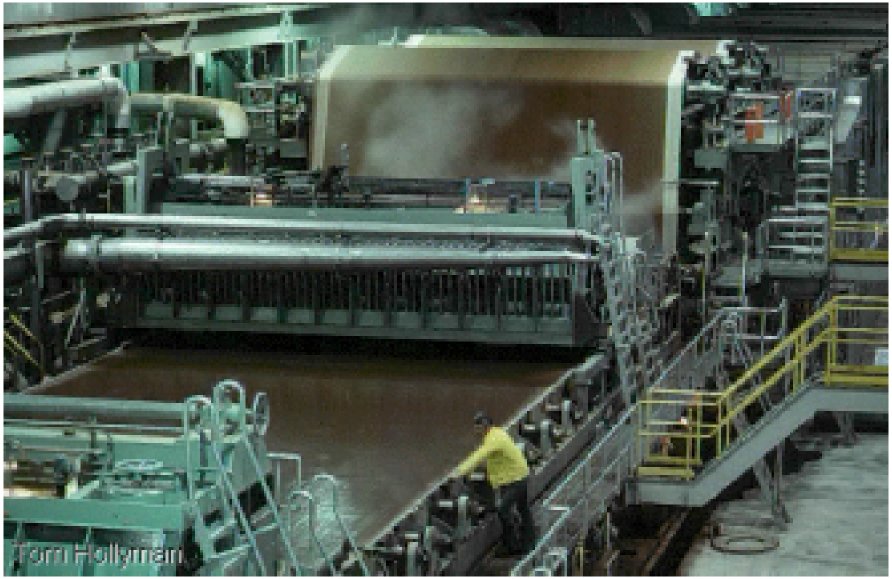
BLEACHING and REFINING

All of the above forms of fiber go through a bleaching process to achieve their desired whiteness. Typical types of bleaching chemicals are chlorine, chlorine dioxide, ozone, peroxide, or any of several other treatments. A typical mill uses multiple stages of bleaching, often with different treatments in each step. Bleaching must be carefully controlled so that the cellulose fibers are not weakened by the process. Newsprint is produced by blending various types of fibers together to make a product, which has a combination of good runnability and printability properties. The ratio of the above fiber types vary between manufacturers of newsprint, but once the desired ratio of fibers are obtained the paper making process can begin.

FORMING THE SHEET

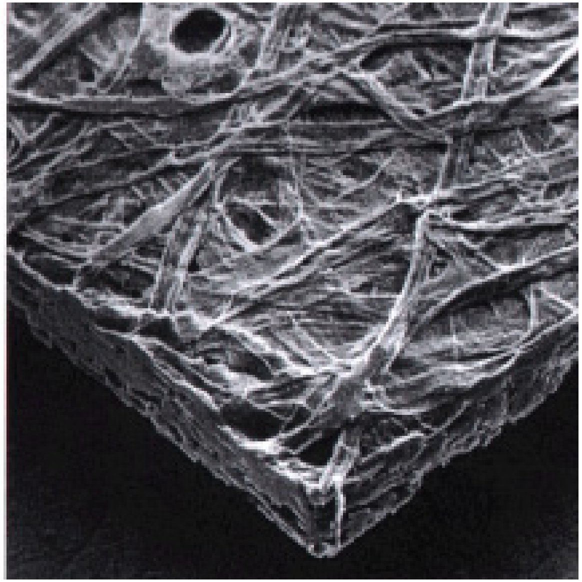
Most paper today is made on Fourdrinier machines patterned after the first successful papermaking machine, which was developed in the early years of the 19th century. The first mechanical papermaking process was invented (1798) by Nicolas Louis Robert (1761-1828), a Frenchman who devised a machine with an endless wire-mesh web that, as it was turned by hand, dipped into a vat of pulp, lifting out a pulp layer. The mesh vibrated to shake off the excess water and to lock the fibers together; the pulp layer was then squeezed through rollers and dried. Robert traveled to England seeking backers for his idea; eventually (1805), a practicable, commercially successful machine was built by the Fourdrinier brothers. The screen end of a modern papermaking machine is still called a Fourdrinier

The heart of the Fourdrinier machine is an endless belt of wire mesh that moves horizontally. A flow of watery pulp is spread on the level belt from the head box that passes over a number of rolls. The headbox delivers a very dilute mixture of fibers and water (typically 1% fibers and 99% water) uniformly onto a continuously running wire. The fibers orientate themselves on the wire and the water drains through and is collected in a shallow wooden box beneath the belt. This water is remixed with the pulp to salvage the fiber contained in it.



Spreading of the sheet of wet pulp on the wire belt requires a great deal of sophisticated engineering to keep them set in place. Air suction pumps beneath the belt hasten drying of the paper, and the belt itself is moved from side to side to aid the felting of the fibers. Throughout this stage, the fiber concentration is increased from the 1% level to approximately 20%. At this point the paper web leaves the forming section and enters the pressing section.

DRYING THE SHEET



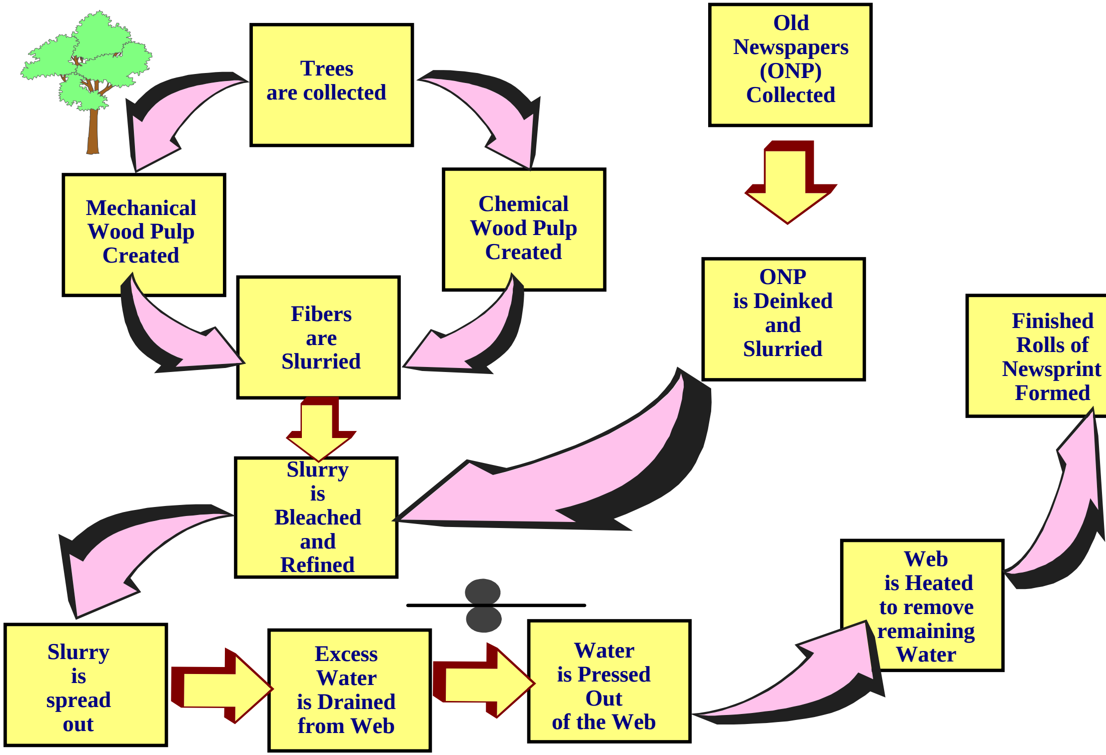
Near the far end of the machine, the belt passes through two felt-covered couching rolls. These rolls press still more water out of the web of paper and consolidate the fiber, giving the paper enough strength to continue through the machine without the support of the belt. The function of these rolls is the same as that of the felts used in couching handmade paper. From the couching rolls, the paper is carried on a belt of cloth through two sets of smooth metal press rolls. These rolls impart a smooth finish to the upper and lower surface of the paper.

After pressing, the paper is fully formed; it is then carried through a series of heated rolls, which complete the drying. The web enters this section with about 40% moisture content and it is generally manufactured to a final target moisture content of about 6 to 9%.

The paper is then cut into rolls of desired length and shipped to the customer for printing. In future issues, we will investigate the physical properties of paper.

US Ink's Press Doctor

PAPER MAKING FLOW CHART



US Ink's Press Doctor

PhotoShop Version 5.x Setup

In order to create a quality reproduction for newspaper printing using Adobe's PhotoShop (Ver. 5.x) the following settings can help match monitor viewing to the reproduction produced on Press.

The values suggested in this report will be from SNAP, which specifies values for the Coldset market. If one wishes, to customize the values to accurately predict what is coming off press, a digital test form such as the SNAP/NAA/GATF Digital Test Form can be run on press. This form needs to be run at standard ink densities for all of the values to be correct.

US Ink can supply a Print Quality Test package to help with this process. The Print Quality Package analyzes the total reproduction process from data input (digitally supplied from disk) to final output (printed sheets). Furthermore, it offers an opportunity to identify any problems along the way.

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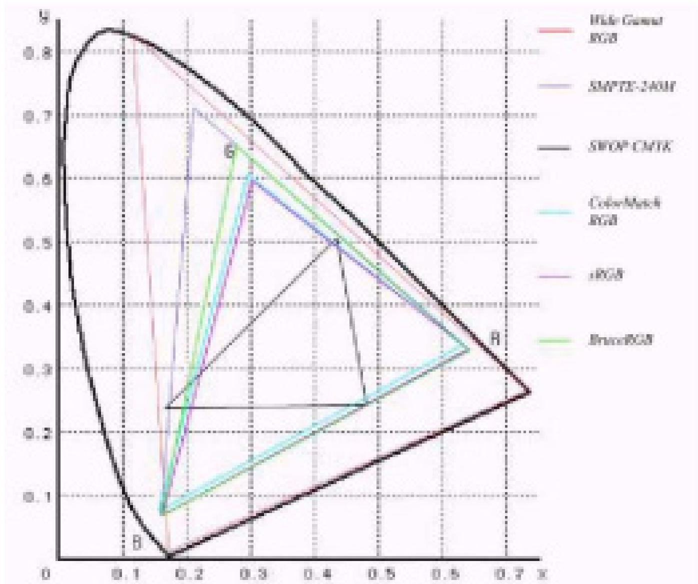
Your film output from the disk is analyzed by a properly calibrated transmission densitometer to ensure that your **Imagesetter** is operating within normal tolerances. The **Plate Making Process** is evaluated next. Problems with drawdown and exposure can be easily identified by analyzing the amount of dot gain present from the film that you output, to the plates that you produce. Finally, sheets printed on your **Press**, are evaluated and compared to industry standard print quality characteristics, such as, dot gain, print contrast, hue error/grayness and apparent trap.

Running a test form is easy and can provide valuable information concerning print quality. As stated earlier the package provides an opportunity to look at every step of the reproduction process in an orderly step by step manner. Small problems in a certain area can be identified to improve quality even further. Additionally, utilizing the package allows you to **fingerprint your reproduction process**. This initial "fingerprint" can become the baseline for future evaluations to ensure that your process stays in control.

The default settings in PhotoShop are set up for commercial printing. In PhotoShop one will be adjusting photographs in both the RGB and CMYK color space. The first step to customize your settings is to adjust the RGB settings. Open the RGB set up window (Choose File>Color Settings>RGB Setup). RGB Setup controls the translation of RGB into the CIE Lab color space (theoretically, the space containing all the colors a human can perceive). There are several RGB working spaces in Photoshop 5.x. It's designed this way to allow users to share color with other systems regardless of the difference in monitors. The default space is sRGB, which is not acceptable for newspaper printing because it clips a chunk of the cyan corner of the print gamut (the range of colors within a specific color space or the range of colors a device can produce), so the reproduction of bright cyans, greens and blues are drastically compromised.



This figure shows the gamuts of several of Photoshop's working RGB spaces, and the gamut of SWOP CMYK plotted in CIE xyY space. It illustrates the trade-off inherent in choosing an RGB space between clipping the gamut of CMYK and wasting bits on unprintable colors.

Recommended RGB Setup:

RGB: ColorMatch RGB is based on the Radius Pressview monitor and has a large gamut although it clips some of the cyan. SMPTE-240M comes close to encompassing the entire CMYK gamut. Either of these would be considered a safe choice.

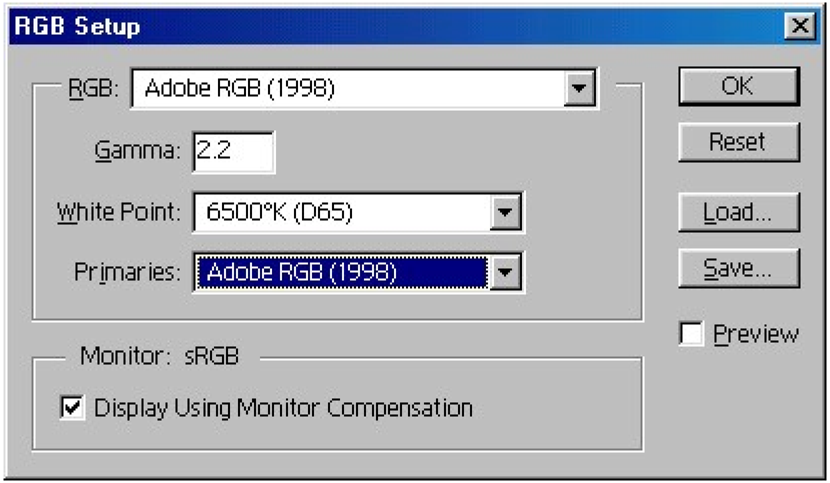
Gamma: 2.20

The Gamma of the editing space not the monitor. It controls the bit distribution over the tone curve. A gamma value of 2.2 is considered perceptually uniform and devotes more bits to the shadows.

White Point: 6500K
This is the white point for the editing space, not the monitor.

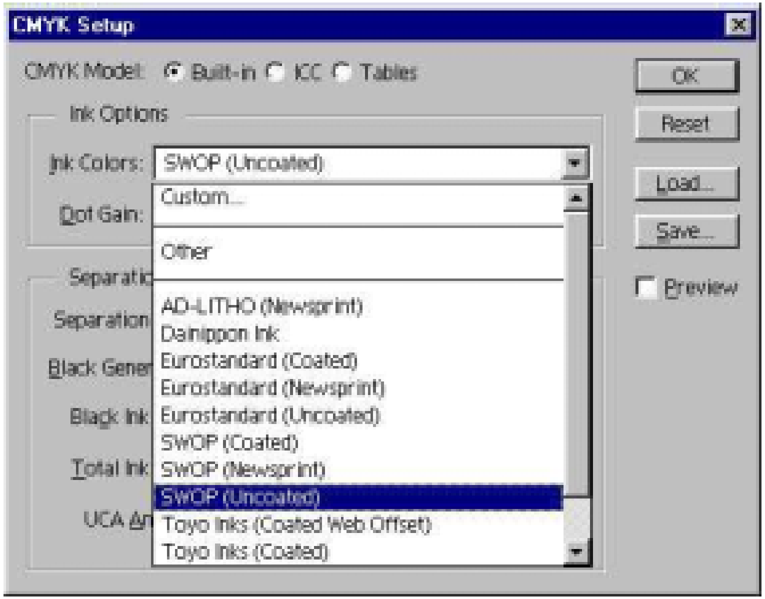
Primaries: Adobe RGB
This sets the boundaries of the working space and tells Photoshop exactly what Red, Green and Blue are supposed to look like.

Monitor: Display Using Monitor Compensation
Transforms the data sent to the screen so that it displays accurately on everyone’s monitor.



Save these settings in the ColorSync Profiles folder in the System Folder.

The next step is to set up the CMYK color space. To convert this setting for Coldset printing, open the CYMK set up window (Choose File>Color Settings>CMYK Setup). There is a drop down list for choosing ink colors. One of the choices is for AD-LITHO Newsprint. This set of ink values does not accurately reproduce on press due to incorrect gray ramps. Although one may be using NAA's standard AD-LITHO® set of inks. A better choice from the standard values would be to choose the SWOP (Uncoated) values.

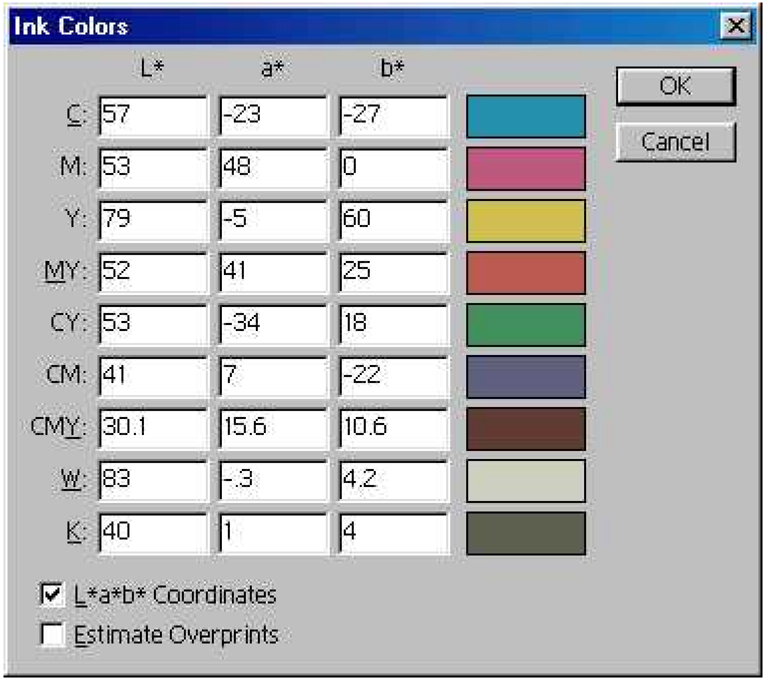


You can also create your own custom set of ink values for a better match to your ink set and newsprint. After running a print quality assessment, the values for a custom ink set can be determined by reading the process colors and overprints with a spectrophotometer. (Note:

US Ink's Press Doctor

Some test forms do not have a three color patch, if so ensure it is added to the test form.) These values can then be entered in the Ink Colors Table. This table is found by choosing the custom setting on the drop down list in the CMYK set up window.

Note: By default, the Ink Colors dialog box defines colors as Y (lightness), x, and y values. The default ink sets are calibrated for viewing conditions of 5000K (when viewed under D50 lighting), 2° observation.



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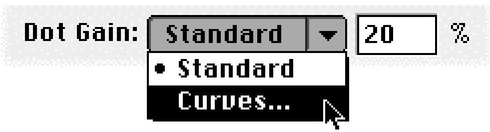
The next step would be to establish the dot gain curves for your particular press conditions.

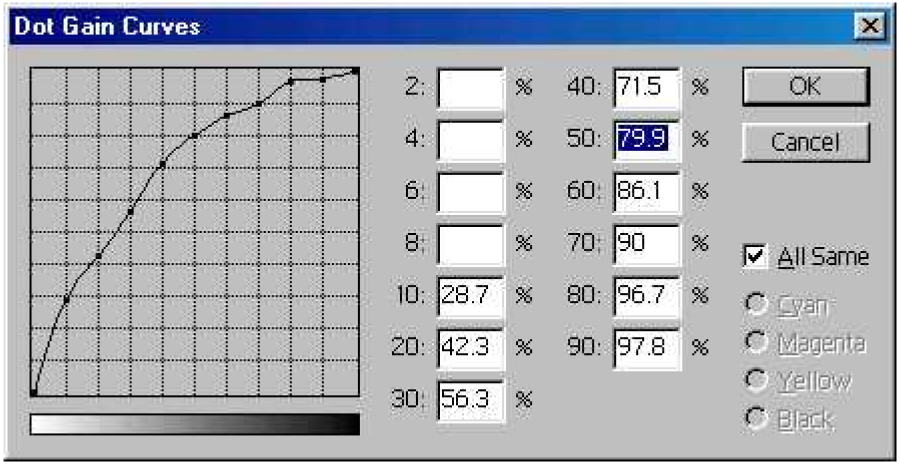
Dot Gain @ 25%	Offset (85 lpi)	Offset (100 lpi)	Flexography (85 lpi)	Letterpress (72-85 lpi)
Cyan	28%	32%	25%	15%
Magenta	28%	32%	25%	15%
Yellow	28%	32%	25%	15%
Black	28%	32%	25%	15%
SNAP Tolerances	+/- 3%	+/- 3%	+/- 3%	+/- 3%
Dot Gain @ 50%				
Cyan	30%	32%	25%	18%
Magenta	30%	32%	25%	18%
Yellow	30%	32%	25%	18%
Black	30%	32%	25%	18%
SNAP Tolerances	+/- 4%	+/- 4%	+/- 4%	+/- 4%
Dot Gain @ 75%				
Cyan	20%	20%	16%	16%
Magenta	20%	20%	16%	16%
Yellow	20%	20%	16%	16%
Black	20%	20%	16%	16%
SNAP Tolerances	+/- 3%	+/- 3%	+/- 3%	+/- 3%

The standard SNAP values for dot gain are listed below.

Customized dot gain curves can also be established by using the data collected from the print quality assessment. It should be noted that the values from the assessment should be compared to the SNAP values. What this means is that the process should be reviewed to ensure that no problems were encountered during the assessment. If this occurs, the problems should be corrected and the print quality assessment should be redone to determine the new values. Once these values have been established, they can be entered into PhotoShop by the following steps. Select dot gain curves from the CMYK setup window in PhotoShop.



The dot area values for the four process colors can then be entered in the tables.



The final steps in the setup would be to enter the separation values into the CMYK setup. You must decide if you want to use some type of under color removal.

Under Color Removal (UCR), Under Color Addition (UCA) and Gray Component Replacement (GCR) are the three most effective methods that are very critical in correcting for total ink coverage during color separation process.

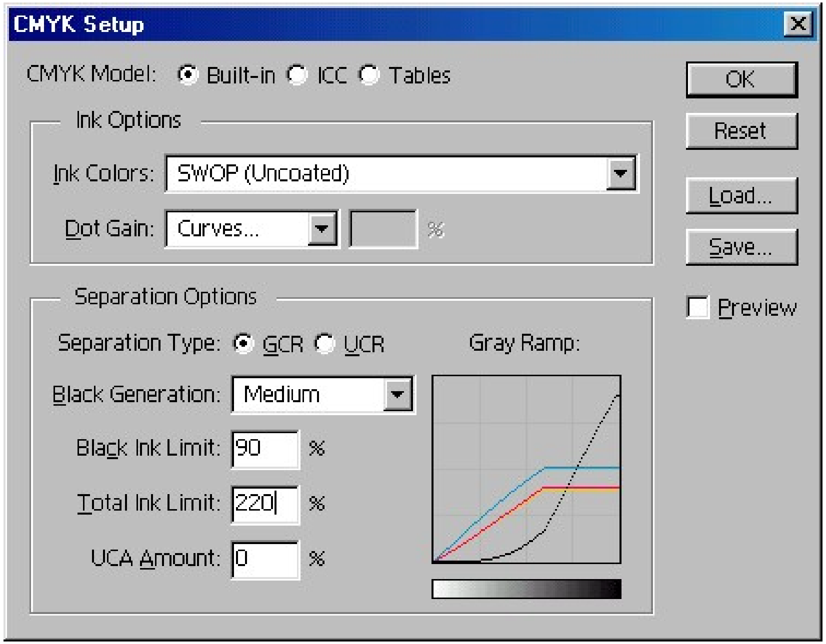
UCR is a function of color separation that replaces specified amounts of cyan, magenta and yellow inks with black ink in neutral shadow areas. Inversely it is also possible to increase

the three-color component in a variation of the UCR technique called UCA.
GCR is a similar concept applied to saturated color areas. The concept of GCR is to remove the gray caused by the three colors of ink and replace it with black.

Achieving the proper amount of ink coverage for process color reproduction has many advantages that include improvement of printability and quicker drying of ink, ink cost reduction, shadow colorcast correction and stability of gray neutrality. (See Technical Bulletin Volume XV for a more detailed description on UCR and GCR.)

SNAP recommends to use UCR or GCR only with proper testing on press.

In order to print good shadows the Total area coverage (TAC) of all four inks for process color material should be between 220% - 240%. This helps to allow maximum shadow detail with minimum shadow area ink set-off. TAC exceeding 240% may result in reduced shadow detail, set-off and build up problems.



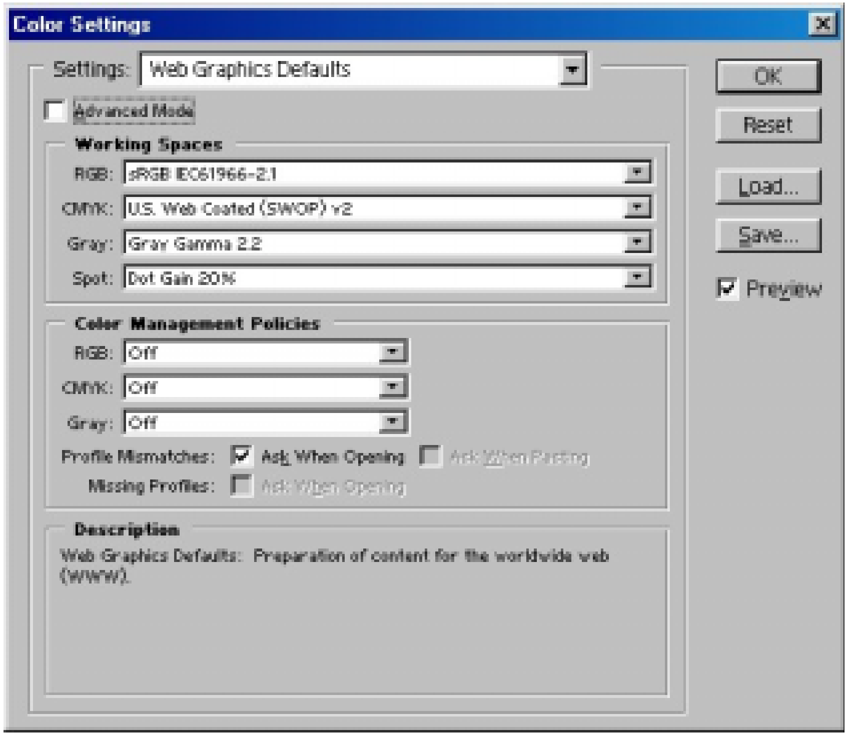
Once all of these values have been entered, save the file in the ColorSync folder on the system level. Then quit and restart PhotoShop. When using customized values, the process will be in control and the image created on screen can more accurately predict what the process is capable of while giving the optimized values for your production process.

PhotoShop Version 6.x Setup

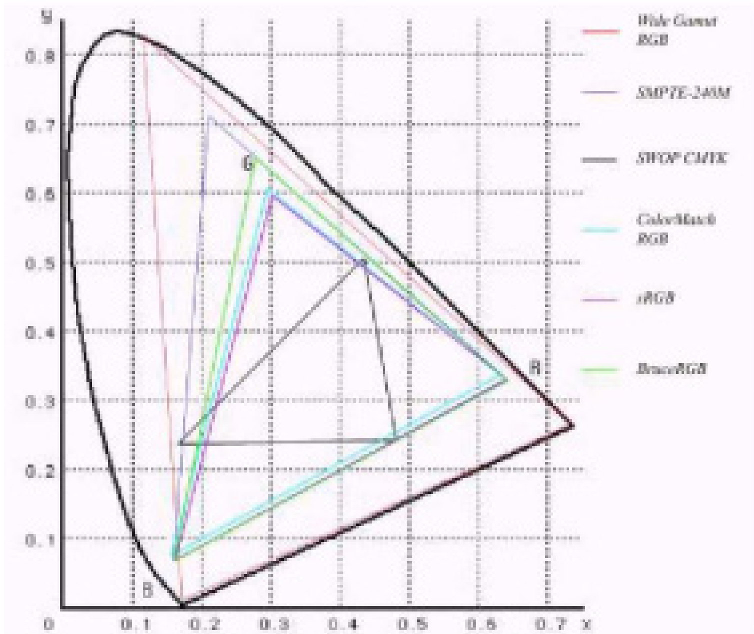
In order to create a quality reproduction for newspaper printing using Adobe's Photoshop (Ver. 6.x) the following settings can help match monitor viewing to the reproduction produced on Press.

The values suggested in this report will be from SNAP, which specifies values for the Coldset market. If one wishes, to customize the values to accurately predict what is coming off press, a digital test form such as the SNAP/NAA/GATF Digital Test Form can be run on press. This form needs to be run at standard ink densities for all of the values to be correct.

US Ink can supply a Print Quality Test package to help with this process. The Print Quality Package analyzes the total reproduction process from data input (digitally supplied from disk) to final output (printed sheets). Furthermore, it offers an opportunity to identify any problems along the way. Your film output from the disk is analyzed by a properly calibrated transmission densitometer to ensure that your **Imagesetter** is operating within normal tolerances. The **Plate Making Process** is evaluated next. Problems with vacuum drawdown and exposure can be easily identified by analyzing the amount of dot gain present from the film that you output, to the plates that you produce. Finally, sheets printed on your **Press**, are evaluated and compared to industry standard print quality characteristics, such as, dot gain or Tone Value Increase (TVI), print contrast, hue error/grayness and apparent trap.



Running a test form is easy and can provide valuable information concerning print quality. As stated earlier the package provides an opportunity to look at every step of the reproduction process in an orderly step by step manner. Small problems in a certain area can be identified to improve quality even further. Additionally, utilizing the package allows you to **fingerprint your reproduction process**. This initial "fingerprint" can become the baseline for future evaluations to ensure that your process stays in control.



This figure shows the gamuts of several of Photoshop's working RGB spaces, and the gamut of SWOP CMYK, plotted in CIE xyY space. It illustrates the trade-off inherent in choosing an RGB space between clipping the gamut of CMYK and wasting bits on unprintable colors.

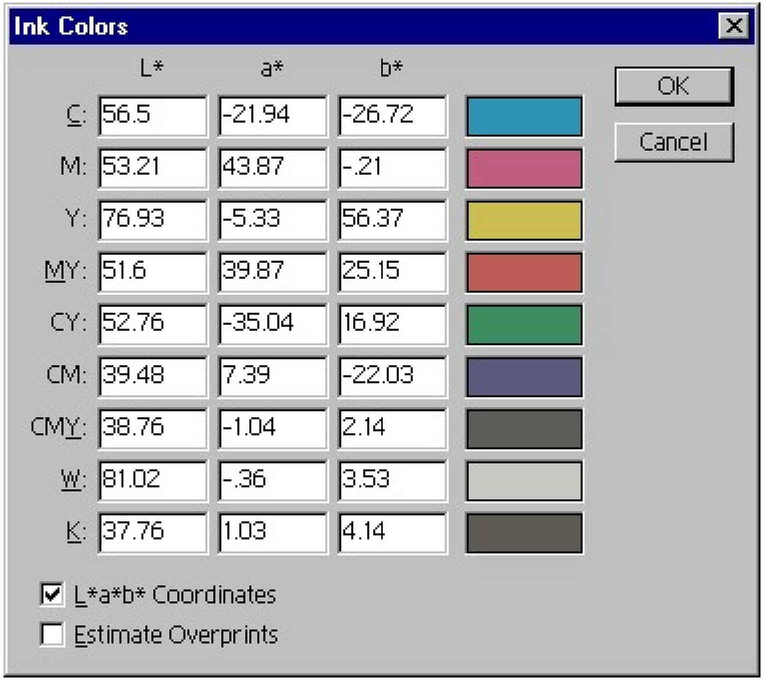
The default settings in Photoshop are set up for commercial printing. In Photoshop one will be adjusting photographs in both the RGB and CMYK color space. Photoshop 6.x has made the customizing of the color setting into one drop down menu. To get to the color settings, chose from the menu bar, Edit>Color Settings. The follow pop up window will appear:

The first step to customize your settings is to adjust the RGB settings. On the Color Settings Pop Up Window, use the drop down arrow on the RGB color space line to chose this setting. RGB Setup controls the translation of RGB into the CIE Lab color space (theoretically, the space containing all the colors a human can perceive). There are several RGB working spaces in Photoshop 6.x. It's designed this way to allow users to share color with other systems regardless of the difference in monitors. The default space is sRGB, which is not acceptable for newspaper printing because it clips a chunk of the cyan corner of the print gamut (the range of colors within a specific color space or the range of colors a device can produce), so the reproduction of bright cyans, greens and blues are drastically compromised.

Recommended RGB Setup:

RGB: ColorMatch RGB is based on the Radius Pressview monitor and has a large gamut although it clips some of the cyan. SMPTE-C or Adobe RGB comes close to encompassing the entire CMYK gamut. Either of these would be considered a safe choice.

The next step is to set up the CMYK color space. An acceptable choice from the standard values would be to choose the SWOP (Newsprint) 30%.



A better choice for printing on newsprint would be to create your own custom set of ink values for a better match to your ink set and newsprint. After running a print quality assessment, the values for a custom ink set can be determined by reading the process colors and overprints with a spectrophotometer. (Note: Some test forms do not have a three color patch, if so ensure it is added to the test form.) These values can then be entered in the Ink Colors Table. This table is found by choosing the custom setting on the drop down list in the CMYK set up window. This will open another pop up window. On the custom CMYK window, again choose custom on the ink colors line. The following table will appear:

Note: By default, the Ink Colors dialog box defines colors as Y (lightness), x, and y values.

The default ink sets are calibrated for viewing conditions of 5000K (when viewed under D50 lighting), 2° observation. The L*a*b* values entered in the table are the average values for 40 printers in the US.

The proper setting of the CMYK setting will greatly affect the image on the screen visually as well as colorimetrically. The following illustration show the same image set up with four different CMYK color settings:

US Ink's Press Doctor

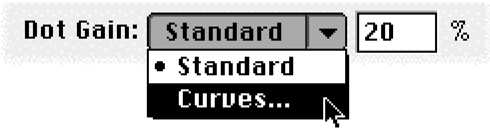
US Ink's Press Doctor

Toning of this image would obviously be different in each case depending on the CMYK setup.
The next step would be to establish the dot gain curves for your particular press conditions. The standard SNAP values for dot gain are listed below.

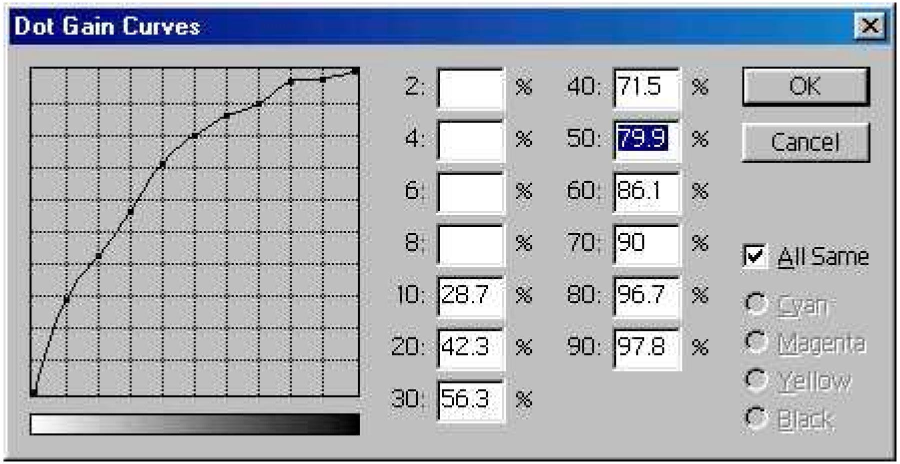
Customized dot gain curves can also be established by using the data collected from the print quality assessment. It should be noted that the values from the assessment should be compared to the SNAP values. What this means is that the process should be

Dot Gain @ 25%	Offset (85 lpi)	Offset (100 lpi)	Flexography (85 lpi)	Letterpress (72-85 lpi)
Cyan	28%	32%	25%	15%
Magenta	28%	32%	25%	15%
Yellow	28%	32%	25%	15%
Black	28%	32%	25%	15%
SNAP Tolerances	+/- 3%	+/- 3%	+/- 3%	+/- 3%
Dot Gain @ 50%				
Cyan	30%	32%	25%	18%
Magenta	30%	32%	25%	18%
Yellow	30%	32%	25%	18%
Black	30%	32%	25%	18%
SNAP Tolerances	+/- 4%	+/- 4%	+/- 4%	+/- 4%
Dot Gain @ 75%				
Cyan	20%	20%	16%	16%
Magenta	20%	20%	16%	16%
Yellow	20%	20%	16%	16%
Black	20%	20%	16%	16%
SNAP Tolerances	+/- 3%	+/- 3%	+/- 3%	+/- 3%

reviewed to ensure that no problems were encountered during the assessment. If this occurs, the problems should be corrected and the print quality assessment should be redone to determine the new values. Once these values have been established, they can be entered into Photoshop by the following steps. Select dot gain curves from the Custom CMYK setup window in Photoshop.



The dot area values for the four process colors can then be entered in the tables.



The final steps in the setup would be to enter the separation values into the CMYK setup. You must decide if you want to use some type of under color removal.

Under Color Removal (UCR), Under Color Addition (UCA) and Gray Component Replacement (GCR) are the three most effective methods that are very critical in correcting for total ink coverage during color separation process.

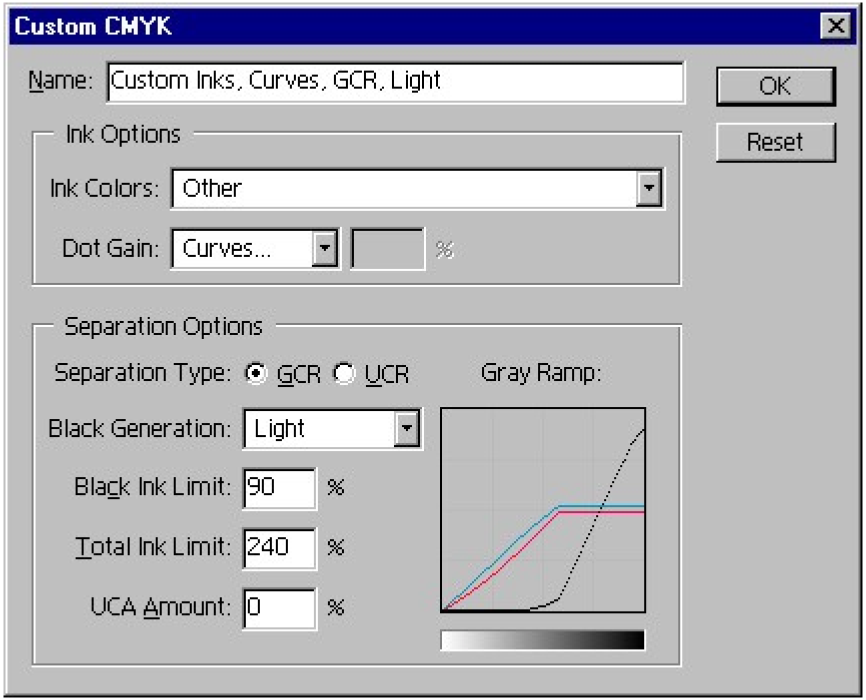
UCR is a function of color separation that replaces specified amounts of cyan, magenta and yellow inks with black ink in neutral shadow areas. Inversely it is also possible to increase the three-color component in a variation of the UCR technique called UCA.

GCR is a similar concept applied to saturated color areas. The concept of GCR is to remove the gray caused by the three colors of ink and replace it with black.

Achieving the proper amount of ink coverage for process color reproduction has many advantages that include improvement of printability and quicker drying of ink, ink cost reduction, shadow colorcast correction and stability of gray neutrality. (See Technical Bulletin Volume XV for a more detailed description on UCR and GCR.)

SNAP recommends to use UCR or GCR only with proper testing on press.

In order to print good shadows the Total Area Coverage (TAC) of all four inks for process color material should be between 220% - 240%. This helps to allow maximum shadow detail with minimum shadow area ink set-off. TAC exceeding 240% may result in reduced shadow detail, set-off and build up problems.



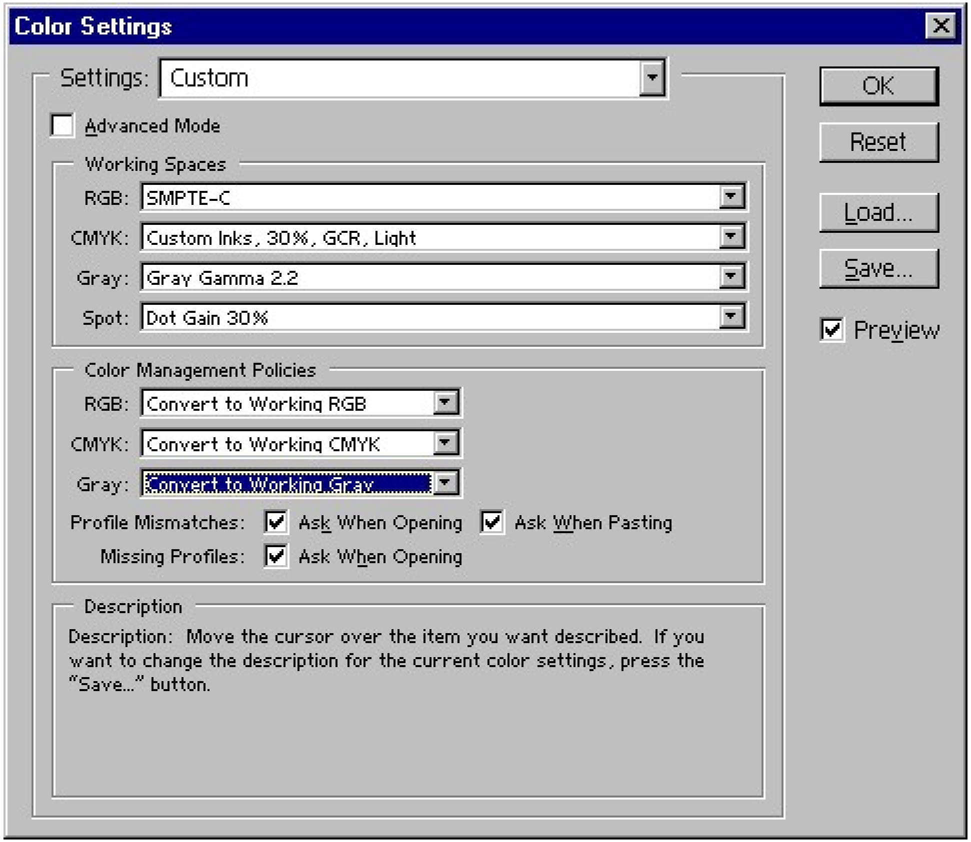
After all of the settings have been entered, click OK to return to the color setting pop up window. You could then enter the color management policies. Chose the settings here as in the color working spaces and select to ask when opening for profile mismatches. This will allow you to see that an incoming file has a different setup then you are using and allow you to convert it to your customized settings.

Gray Gamma Settings

Photoshop recommends that the Gamma setting for PC's running Photoshop should be 2.2, while a Mac should use a 1.8 setting.

Once all of these values have been entered, save the file. When using customized values, the process will be in control and the image created on screen can more accurately predict what the process is capable of while giving the optimized values for your production process.

Final Color Setting Window.



Print Contrast

Print contrast measures how well shadow detail is maintained on a printed sheet. It is a ratio of the 75% screen dot density to solid density and calculated as follows:

% PC = DS - D75 X 100 DS

DS = density of solid
D75 = density of 75% screen

Print contrast should only be used as a comparison of one print to another. In general, a print with a higher print contrast will produce an image with greater shadow detail. Typical print contrast numbers for printing on newsprint follow.

US Ink's Press Doctor

	Black	Cyan	Magenta	Yellow
GATF	7-20	7-20	7-20	7-20
SNAP	12.7	12.0	14.5	15.7
X-Rite Corp.	24	22	22	18

Physical Defect Analysis

Remember that at this stage we are only dealing with PHYSICAL attributes of the printed copy. We will deal first with the ones most likely to be encountered. By far the problem most likely to require addressing would be rub-off or poor rub-resistance. fairly common problem is copy creasing .

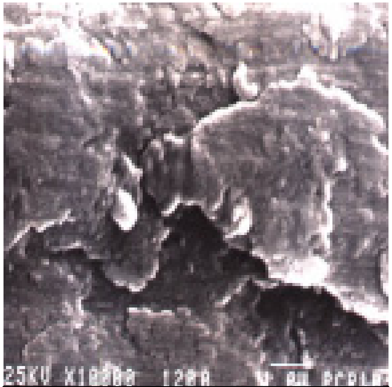
This may be an ongoing problem, seen on certain pages of most copies, or transient, appearing only occasionally. Also fairly common is that the copy has a tendency to CURL often immediately after printing. Occasionally the copy appears acceptable for most parameters but feels limp, or wet much rarer, but not unheard of is that the copy has an unusual or unacceptable Odor. The copy has uneven or misplaced FOLDS

Lithographic Plate Basics

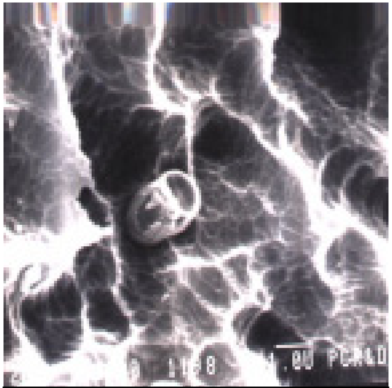
Offset printing uses the “Lithographic Method” which is based on the principle that ink and water does not mix. In reality, ink and water does mix and prints a “balanced emulsion” of ink and water from the plate to the paper via the blanket cylinder.

A negative working offset lithographic plate is an aluminum plate with a coated surface of light sensitive adhesive, which is hardened (or exposed) by light passing through the clear areas of a film negative. The areas that are hardened by the exposure become the image area and the polymer in non-image areas (dark areas of the negative film) is removed during the plate processing. When developed, the image area of the plate is oleophilic (ink receptive) and the non-image area of the plate is hydrophilic (water receptive).

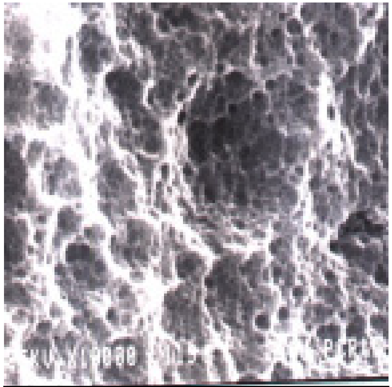
The plate starts with the base aluminum and the surface is grained to become water receptive. There are several methods for graining the surface of the aluminum. The following SEM photographs show different methods for graining the surface.



Wire Brush Grain



Pumice Grain



Electrochemical

As one can see from the photomicrographs, the different graining processes will result in differences in the plate's ability to hold fountain solution. High porosity grains such as the electrochemical will hold larger volumes of fountain solution then compared to the Wire Brush grain. The grained plate is then anodized to harden the surface for better plate life. The thicker the anodic layer the longer the plate life. At this point there are two basic types of plate chemistry used in the industry.

Two Basic Types of Offset Plates:

- **Additive Wipe on or presensitized plates** – Diazo sensitized lithographic offset aluminum printing plate developed by adding a lacquer emulsion.
- **Subtractive presensitized plates** – Lithographic offset aluminum printing plate coated with ink-receptive resins and a photosensitive medium. Exposed image does not need reinforcement during development.

Additive Plates

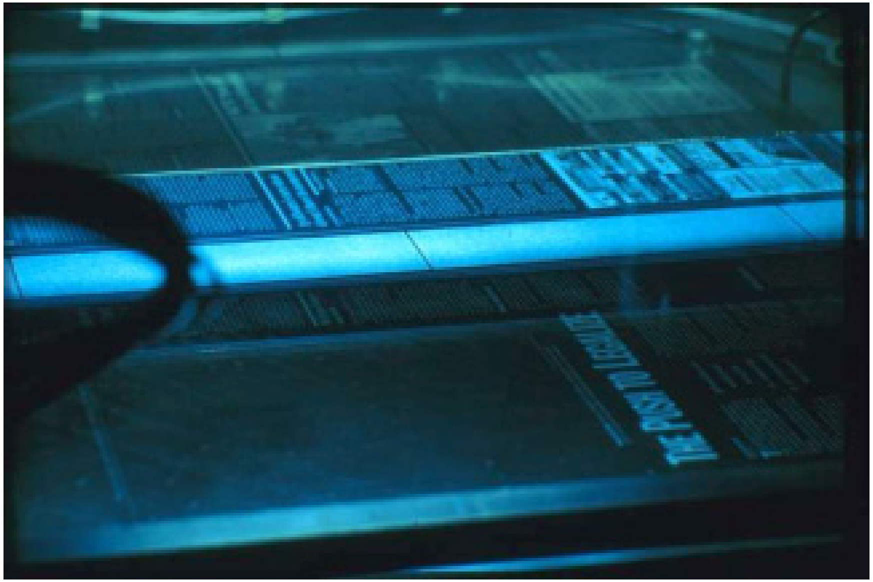
Additive lithographic plates are grained, anodized aluminum with a water-soluble diazo coating applied either by the manufacturer (presensitized) or by the pressman (wipe-on). Diazo is highly acidic (pH 1.5). So long as diazo stays dry, it is inactive. But diazo is also hygroscopic, i.e. it attracts moisture. Diazo literally pulls water out of the atmosphere, which, in turn, activates the acid. The acid then begins to eat, or etch, into the surface of the plate. This is why most presensitized plates have a maximum shelf life of six months depending on many variables from manufacturing tolerances to weather conditions.

Subtractive Plates

The basic plate substrate for a subtractive is the same as the additive. In the subtractive plates, the diazo coating is suspended in a photopolymer resin applied to the plate. The diazo, suspended in the photopolymer, is isolated and protected from the atmosphere so it cannot attract moisture nor can it etch the plate.

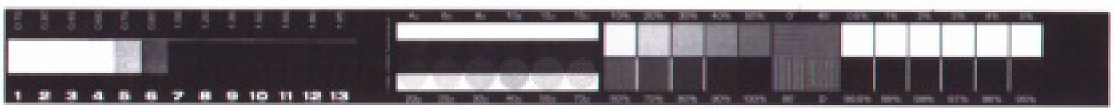
Exposure

When a lithographic plate is exposed, the portion of the diazo, which is struck by the light, is chemically altered (polymerized) and fixes the image to the plate. The exposed diazo also becomes oleophilic (oil loving). The unexposed diazo in the non-image area retains its original properties including sensitivity to light.



Exposure speed will vary from plates of different manufacturers due to the effective range of the plate’s emulsion sensitivity for each product with the particular light source that is being used. Light sources vary in their intensity and their concentration within the UV portion of the light energy spectrum. It is important to understand that the exposure speed (time/units) used to achieve the solid step recommended by each manufacturer is dependent upon these factors.

A properly exposed plate will provide consistent reproduction from your film negative. There are two (2) quality control tools available to check exposure…the Stouffer scale and UGRA scale. A typical recommendation for plate exposure is a **solid 5** on a Stouffer sensitivity guide (Note. Check with your manufacturer for their specific recommendations).



UGRA scales may also be used to check exposure in addition to evaluating resolution. It is suggested to take daily readings to assure quality standards are being met. One must remember that these tools are pieces of film and therefore have a shelf life of one (1) year from the date of manufacture. The more you expose UV light through these tools, the faster the emulsion will age. One should replace Stouffer and UGRA scales after six (6) months of use to assure accurate readings.

The recommended checklist for assuring consistent, high quality exposures in a frame are:

- ✓ Glass must be cleaned often with residue-free cleaner and lint-less cloth. Clean glass reduces light absorption and refraction.
- ✓ Insure that the vacuum pump is clean and the vacuum sub system is free of leaks.
- ✓ Backing mats should be gray or black and stiff to resist deformity. The surface should be uniform, free of hills and valleys.
- ✓ Verify integrity of seal / bead around the mat.
- ✓ Lamp distance should be great enough to cover the printing frame with even illumination, but short enough for practical exposure. Experts suggest as a rule of thumb, a twenty-one step (Stouffer, RIT, GATF or UGRA) scale should not be more than one step different from the center of the image to the edge of the largest possible image you would use in that frame. Be aware of light falloff (lower exposure) towards the edges. Determine the evenness of exposure
- ✓ Lamp bulbs must be replaced from time to time, because their spectral output changes as they age. Over the life span of a bulb, its efficiency decreases by about 20%. Follow manufacturers replacement schedule.
- ✓ An original exposure control guide (such as a Stouffer, RIT, GATF or UGRA scale) should be contacted or duplicated in the same manner as the production materials are to be processed. A test target must be used on a daily basis. New lamps can vary by as much as 40% from one manufacturer to another and from bulb to bulb of the same manufacturer.
- ✓ Insure consistent light intensity. Light intensity is influenced by lamp to substrate distance, age and condition of bulb, type and condition of reflector, and accuracy of resetting lamp brightness control.

Changes in the voltage supplied to a contact exposure lamp can cause significant changes in the actual exposure obtained. Integrators should be set to "Integrate" as opposed to "Time".

✓ Draw down time should be sufficient to insure intimate contact. A test should be done to verify draw down time.

Development

Once the plate has been exposed, it is then developed. The exposed plate is passed through a developer bath. The developer bath contains chemicals from the plate manufacturer to remove the unexposed areas of the plate coating.

The developer bath needs to be maintained with fresh chemicals. Each manufacturer recommends the usage life of these chemicals. Be sure to follow these recommendations.

Additive Development

The developer must scrub and rub the surface of the plate. The developing solution adds resin to the image area and removes the unexposed diazo in the non-image area. A sponge or brush applies pressure to develop the surface.

Subtractive Development

The developer will flood the surface to dissolve the non-image area. The developer can be recirculated, filtered and reused.

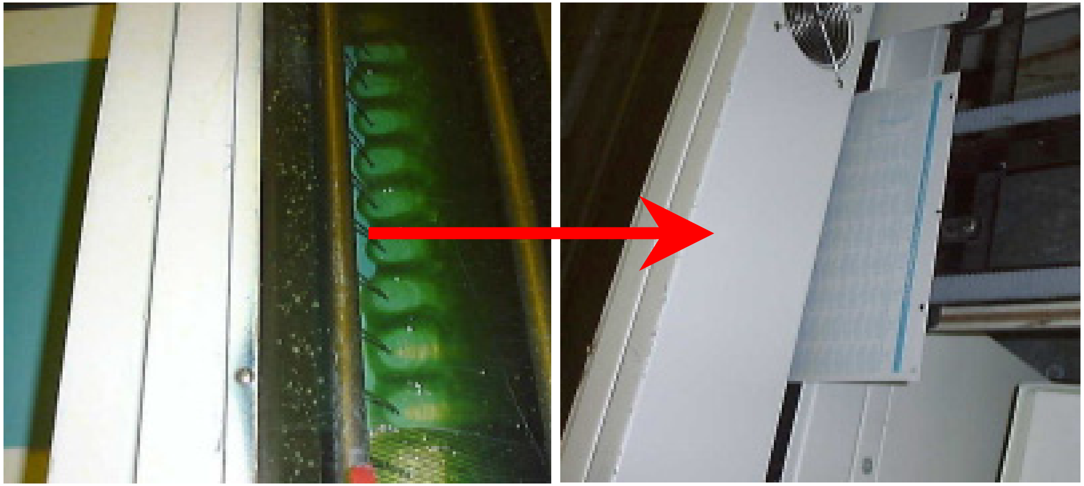
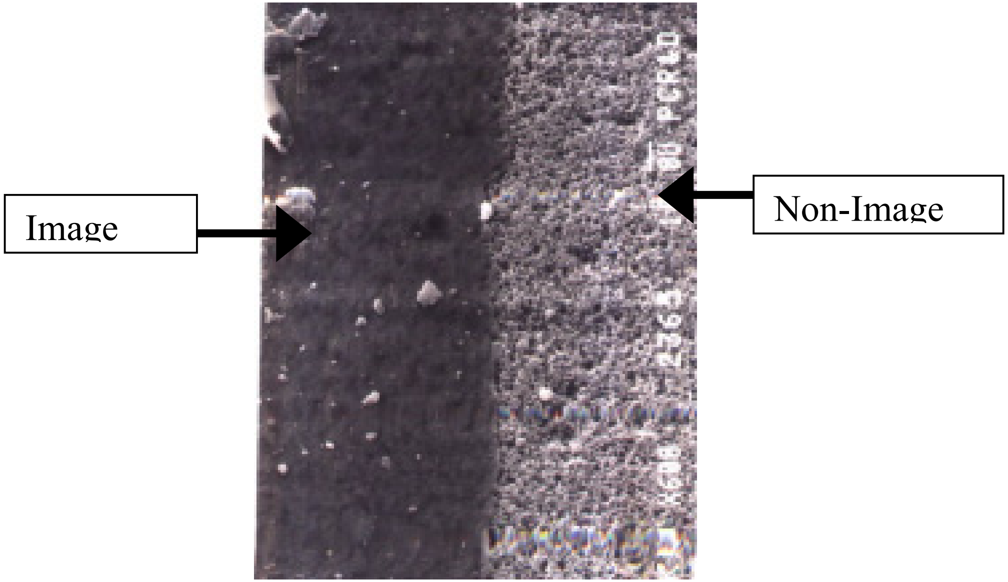


Plate into developer   Plate exiting developer



Photomicrograph of Lithographic Plate

Finishing

Finisher is used to protect the integrity of the non-image area of the plate from the ambient conditions in the production environment. It ensures that the water loving property of the plate is protected. The plate is coated with a solution of Gum Arabic or synthetic gum to accomplish this. Gum Arabic is a gum obtained from either two species of Acacia trees. Gum Arabic solution is used to desensitize or remove any affinity for ink in the non-printing areas of a lithographic plate. The plate is then bent so that it can be properly mounted on press.

US Ink's Press Doctor

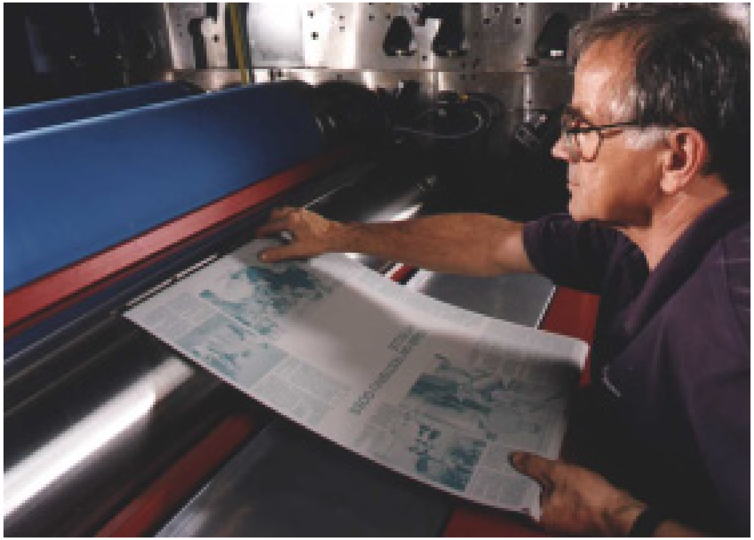


Plate edge related problems

This is an area where relatively few problems occur. However let us consider the 3 most common. There is a definite line across (usually) the leading edge of the plate. This is often associated with an oversharp angle produced at the bending stage, and less commonly a fault of the plate coating which ruptures during the bending operation. Little can be done to remedy this problem short of major mechanical alterations to the hardware. It is common for plate wear to begin at the edge, at which point the worn area begins to accept ink and produce an unwanted image in the margin area, which appears as an irregular patch. dark patch which starts (usually) at a leading plate edge and extends into the non image area, or which is obviously due to ink which has accumulated in the gaps between the plates can be an indicator of poor ink and water balance, and can suggest emulsification.

PLATE EXPOSURE

Plate exposure should be regularly checked. Lighting levels can be checked by use of a photometer. However, the simplest method is to expose a plate through a test strip such as the Stouffer gauge. Strips should be placed at least at the center and at a plate corner. The plate should be processed in the normal way, inked in, and the wedge checked. The steps which are clear, or solid respectively should be noted and compared against manufacturer's specification.

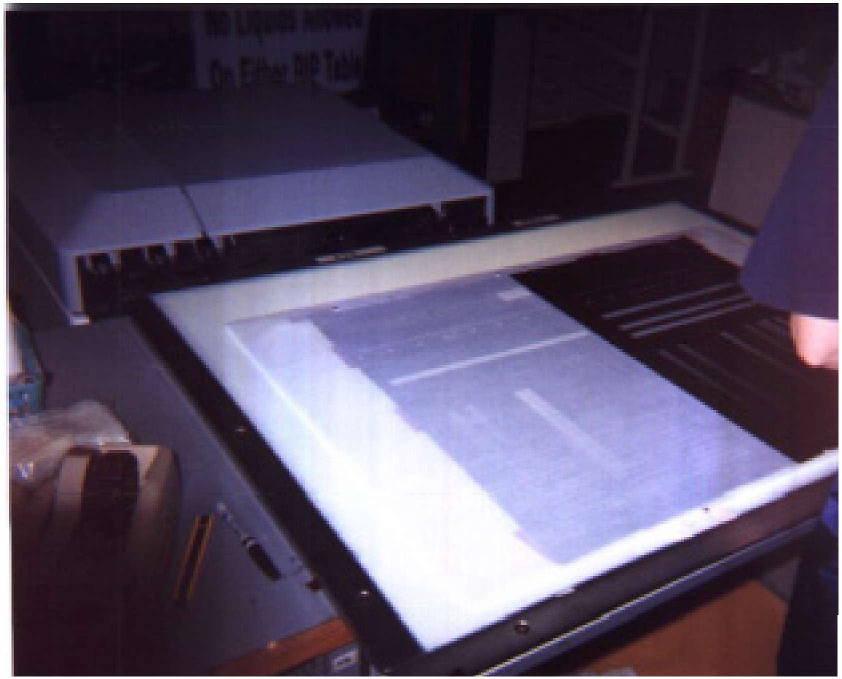


Plate gap filling in

Ink accumulates in the plate gaps or at plate edges, and eventually transfers back onto and defects the copy. This is most likely to be a consequence of over emulsification, therefore consider the ink and water balance.

Overdampening is the main cause of emulsification, with the ink partially emulsified, it loses its inherent tack and transfer properties. This leads to a thick film on the ink form rollers, which combined with the poor cohesion and lack of tack leads to the problem. See also emulsification.

Plate problems

There are several areas of difficulty that may be associated with the litho plate. In addition to those that are specifically associated with the plate, a substandard plate can contribute to many other problems that maybe wrongly attributed to other factors.

Let's here only look at problems which manifest themselves as plate problems. It is difficult to maintain clean running? It becomes necessary to run with high dampening settings in order to keep the plate running cleanly. As a consequence the copy shows print defects by ink in the non image area, at near normal dampening levels this may be scumming (sometimes called catch-up or greasing) which is often localized, and may be quite pronounced, or there may be an overall tinting which is a general coloration and which may be quite subtle.

Bleeding and toning are terms often used as an alternative for tinting. Many of us have encountered a press problem with either tinting/toning or scumming, and had difficulty telling the difference. Toning/tinting and scumming are two of the most common problems in offset printing. Both of these conditions result in background printing in the non-image areas.

How do we know which is which? Plate related problem occurs when the ink and plate are not compatible or diazo is not fully removed. Problems can also be caused by fountain solution and damper settings. However, the core problems are typically plate, ink, or plate preparation. Once a plate scums, the ink cannot easily be washed from the plate. This differentiates scumming from toning/tinting, as the tint can be washed from the plate.

There are tests that can be used to determine the core problem for scumming. To determine if the plate and ink and incompatible, rub ink on a new uncoated plate. Wash the ink off with cold tap water, lightly rubbing with a clean rag. If the ink is not fully removed from the metal, there is, most likely, a compatibility problem. Buying a better plate, changing to pre-sensitized plates, or changing ink should solve this problem.

There is an on-press test you can conduct to determine if the problem is a processor or material problem. In the non-image area, erase a spot that was scumming, until it is shinny or down to the metal. If the area starts scumming again, this eliminates the possibility that all the diazo was not removed. The problem, then, could be an ink and metal compatibility problem or inadequate fountain solution.

Both these problems can be a direct consequence of plate defects. Look at plates for data, and recommendations for identifying and correcting plate problems.

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We have already seen that a poorly processed or substandard plate can lead to running high levels of dampening solutions to keep the plate clean. However in severe cases it becomes almost impossible to clean the non-image area of the plate. This can be worst after a stoppage or edition change. This effect may sometimes be known as oxidation.

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Other possible consequences of a substandard plate or of running high levels of fountain solution, may be plate wear, or plate Blinding. Plate wear may be visible as a loss of density in some areas of the image. (Inspect the used plate, there may be polishing of the non-image area.) Blinding is a loss of density in the image, but the non-image area is largely untouched.

The lithographic plate can be a source of unacceptable print. This unacceptable print is usually a premature density loss during the course of a press run, which may be associated with blinding or plate wear. Premature plate wear is a problem that may have underlying causes that are not frequently addressed.

The following are typical problems and their effects:

Mechanical plate wear - loss in density of print
Chemical plate blinding and wear - loss in density of print
Chemical contamination - Ink receptivity onto plate and paper
Paper fiber buildup on plate - loss in density of print

As one can see, the problems result in similar effects on printed form and therefore discriminating and providing solutions can be difficult. Proper diagnosis should be made by investigating the symptoms prior to determining the causes.

Phase I : Acquiring Initial Information

The following questions should be addressed prior to performing any required experimentation.

What unit (color) is the problem occurring ? (i.e.... magenta - typically associated with chemical blinding)

2. What type of printing process do they use ? (offset/direct)

3 What type of water does the customer use to make their fountain solution ? (tap or deionized, hard or soft) what type of fountain etch ?

3. What type of plate and what make is it ? (wipe on, press ready)

4. What is the shelf life of these plates and when were they used in reference to the shelf life ?

5. What type of plate processor do they use ?

6. Are processor settings different from manufacturer's recommended settings ? (if yes then why/what)

7. Has plate developing parameters changed recently ? (if yes then why/what)

When the above questions have been addressed, most problems can be categorized from the diagnosis and some situations can be isolated as possible causes. For instance, printing problems associated with magenta units may often be due to chemical blinding via cation exchange of the pigment (i.e.. lithol rubine) with the aqueous phase. This ion exchange results in the formation of an insoluble salt, which adheres or clusters near the image area rendering that area to become less ink receptive. Therefore water quality, fountain etch, ink unit questions can isolate possible causes of a problem quickly without performing a single experiment.

Phase II : Detailed Information

Additional questions are often required and should be addressed to the people who have observed the problems.

When does the problem start to occur ?
after a long period of time
upon restart
If customer utilizes a variety of plates, does the problem occur on selective plates or does it vary ?

Is the problem specific to printing unit ?

Is the problem specific to ink ?

After assessing the situation, several possible causes can be targeted as the main problem.

Phase III : Test Procedures

This phase consists of all relevant experimentation that must be performed in order to establish cause and assure proper diagnosis. The following are experimentation capabilities of the Carlstadt facility :

SEM **- observe the topography of image and non-image area for any irregularities (can determine what type of wear is present, if any)**

X- Ray Analysis - determine whether there are chemicals not of plate chemistry

Visual Assessment of plate and print

Plate wear

image transfer from previous printing unit (symptom associated with wear)

IR Spectroscopy - presence of organic contaminants and or extent of image area polymer cure

Zincate Test - determine interlayer wear

Dynamic Contact Angle - measure ink receptivity on new and used plates

Emulsion Rheology - determine flow curve differences of emulsion vs. neat ink

Pigment Dispersion

Phase IV : Create a Database

A database should be created for plate related problems from various customers so that quick and accurate diagnosis can be made. Certain types of problems are customer specific and/or region specific and/or seasonally specific, therefore, problems should be classified as such. Database on all relevant items regarding plates (i.e. plate processors) should also be created because they also have their own peculiarities.

Plate wear

Plate wear may be most commonly seen as a loss of image in the image or printing area, known as plate Blinding, or as a polishing of the background or non image area, known as physical plate wear(which may sometimes be seen as a combination of the two.)Let us NOT at this stage consider scratching of the plate, this should be dealt with under contamination.

PLATE WEAR

GRADUAL LOSS OF IMAGE AREA

PLATE WEAR

CAUSE	SOLUTION
POOR PROCESSING OF PLATES	CHECK PROCESSING, EXTRA DIAZO...USE STOUFFER SCALE
LOW PLATE BLANKET	USE GAUGE AND SET TO SPECS
OVERLONG RUNS OF PLATES	SWITCH TO LONGER RUN PLATE

PLATE WEAR

CAUSE	SOLUTION
POORLY SET INK/WATER FORM ROLLERS	ADJUST TO SPECS.
FOUNTAIN SOLUTION TOO CONCENTRATED	SET F.S. TO PROPER CONDUCTIVITY
HARD FORM ROLLERS	REPLACE FORMS

PLATE WEAR

CAUSE	SOLUTION
USING VERY STRONG INKS	WEAKEN INK TO LUBRICATE
VERY POOR INK GRIND	INK MANUFACTURE CHECK GRIND
EXCESSIVE LINTING	SEE "LINTING"

Plate blinding

A progressive loss of ink receptivity in the image or printing area while the background remains unaffected is a sign that the image has been attacked chemically. This is known as plate blinding. There may be several causes and these should be checked out and corrected as appropriate. Let us look at some possible causes of plate blinding...examine the fountain solution strength.

A fountain solution which is too strong may bring about emulsification (and as a possible consequence: plate blinding) due to the effect of surfactants or wetting agents. Has the source of the fountain solution concentrate changed?

Check with the supplier whether it contains any different wetting agents, biocides, or preservatives. Examine the incoming water supply, to see if the conductivity has changed. Harder water can be a source of minerals that can be deposited on the plate. A type of water treatment system can eliminate this source of problems. The answer (in addition of course to selecting a good quality concentrate from a reputable source) is to carefully ensure that the fountain solution dilution is maintained within manufacturer's tolerances.

Examine the plates. Have they been correctly exposed?

Check condition of the developer bath and also that the plates have been correctly stored. Has a proprietary plate cleaner or abrasive scratch remover been used? Ensure that the plate has been thoroughly rinsed afterwards. Ensure that plate cleaner has not been allowed to dry on the plate. Check the dampeners. If they have recently been cleaned, ensure that no detergent has found its way into the dampening system. Covered dampeners must be thoroughly rinsed after being cleaned with detergent and before use on the press.

PLATE BLINDING

Plate blinding is usually associated with some form of chemical attack or deposit on the polymer, which forms the image on the plate. The image refuses to accept ink and print correctly. First, clean the plate with plate cleaner. As an emergency or short term solution, redeveloping or re-etching a positive working plate on-press during a stop in the run can often improve the situation temporarily.

Avoid the use of harmful solvents/cleaners. Use ONLY recommenced solvents and cleaners on the plates, blankets and rollers. Use sparingly and ALWAYS follow manufacturer's instructions. Particularly, avoid excessive use of plate cleaner. Check for contamination of fountain solution, dampening system and or sponge/bucket. Blinding can be caused by precipitation of calcium salts either from the ink, the paper or the fountain solution. In this case, change the fountain solution. Sponge and bucket should be kept free from detergents and wash up solution should be kept from the plate. Clean and rinse dampener rollers/covers.

Plate wear - physical wear

Let us look at some factors which might bring about physical plate wear....his will often be seen as a progressive polishing of the background or non image area. This is usually considered to be caused by mild (but continuous) abrasion. The image area is untouched because the film of ink adhering to it acts as a lubricant and prevents the abrasion occurring.

Consider which factors can bring about such an abrasive process?

Is there a deposit of lint on the blanket`? Lint is commonly present but if excessive may lead to several problems including plate wear. While examining the blanket, check if it is correctly tensioned, and of the correct height. A loose blanket will inevitably lead to slight slippage, which in turn can lead to plate wear. An over height blanket will also be prone to cause plate wear.

Check the dampener and form rollers. If they are set too hard to the plate then wear is a likelihood. Ink which is badly formulated or badly ground may tend to cause plate wear. If the problem coincides with a change of ink batch or supplier, then it may be worth asking the ink supplier to check this out.

US Ink's Press Doctor

In event of a problem it is important to save sample of both the problem plates and the printed sheets showing the defect, when working with your suppliers to diagnose the problem.

Plate defects

We have already discussed problems, which may be a result of plate defects, without actually going into detail about the defects themselves. Let us do that now. negative working plate (which is the most common type for newspaper use) will, if overexposed, tend towards enlarged halftone dots. Underexposure may lead to a loss of some of the highlight dots, a phenomenon known as sharpening. In the case of a positive working plate the exact opposite occurs. An underexposed plate may in extreme cases suffer from a weakened image and thus loss of plate life.

Exposure should be regularly checked. A photometer will determine that the light levels are correct, but will only pick out any problems with regard to uneven lighting if used with care. An easy and reliable method is to expose a plate using the standard settings, but including at least one plate control wedge. The Stouffer scale is a neutral density(non-screen)step wedge, which is both cheap and reliable. Plate control strips are available from many suppliers, and many of these will include elements to check for resolution etc. On use these should be placed in the center of the plate in the exposing-down frame, and also at the corners. After normal exposure and processing the scale's image should be inked in and the steps checked against manufacturers recommendation. If it is thought that a plate or batch of plates is slower to expose than normal, then this should be checked out as suggested. Check also that the plates have been correctly stored, and are within their useful life.

PLATE EXPOSURE

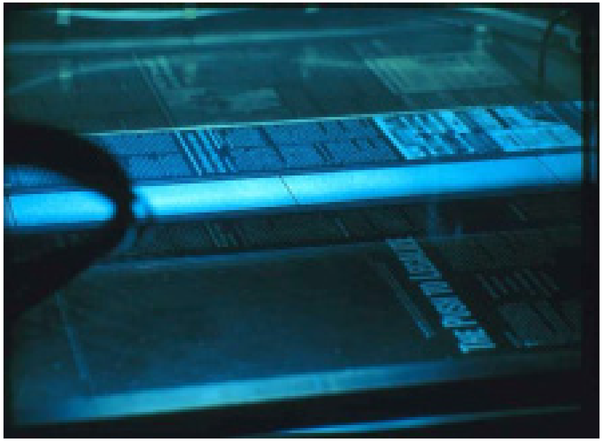

Plate exposure should be regularly checked. Lighting levels can be checked by use of a photometer. However, the simplest method is to expose a plate through a test strip such as the Stouffer gauge. Strips should be placed at least at the center and at a plate corner. The plate should be processed in the normal way, inked in, and the wedge checked. The steps which are clear, or solid respectively should be noted and compared against manufacturer's specification.

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If background tinting has been observed, it is possible to check whether this is due to a plate defect. On an area of tinting, clear a small area using a deletion pen or pencil eraser. If on the press this prints cleanly, it is fair to question whether the plate has been correctly developed. In the case of poor development, check that the developer bath has been correctly replenished, and has not sludged up. Check also that it is clean and that any brushes or rollers are clean and correctly set.

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If it has been found that impression is light, yet the press settings appear correct, then check the caliper of the plates. It is unlikely to be the cause, but the test is quick.

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Dot formation on the halftones is poor but the problem is uneven across the copy. Examine the plate, if the dots are uneven there also, then the problem could be due to poor contact between the negative and the plate. Check the vacuum.

Poor rub resistance

When a printed area is gently rubbed by a clean dry surface, some of the ink may be transferred to the clean surface. If this occurs WITHOUT any significant abrasion taking place, then the transfer of ink is called rub-off. It is possible for ink to be transferred between surfaces which touch each other, but which are in static contact.

In this case the problem is referred to as set-off. Set off is often associated with many of the same causes as rub-off. If however a degree of abrasion does take place then the process is known as scuffing. Scuffing is not really relevant to newspaper printing. Rub-off usually shows as a print defects of the hands, or print defects of fabrics against which the print has rubbed.

RUB OFF

PRINTED SHEET HAS INSUFFICIENT RUB RESISTANCE

The problem of finger/hand print defects is exacerbated if the hand is moist. The skin produces a sebaceous oil known as squalene, which exaggerates rub-off. Select and press Rub-off or select Set-off

RUB-OFF

CAUSE	SOLUTION
POOR INK/WATER BALANCE	SET INK/WATER TO MINIMUM
TOO MUCH INK	SET TO DENSITY SPEC.
FOUNTAIN SOLUTION TOO CONCENTRATED	SET F.S. TO PROPER CONDUCTIVITY
POOR MAINTENANCE OF ROLLERS	IMPROVE MAINTENANCE, ETC
POOR PAPER ABSORPTION	IF POSSIBLE USE MORE ABSORBANT SHEET

Poor rub resistance

We have identified that the problem is lack of rub resistance. At this stage we should make a distinction. Is the print defects caused by a greasy film, or can it be seen as a very dry powdery deposit on the surface? While the end result may be similar, making this distinction will assist in finding the cause.

Select Dry deposit or Greasy film

Poor rub resistance

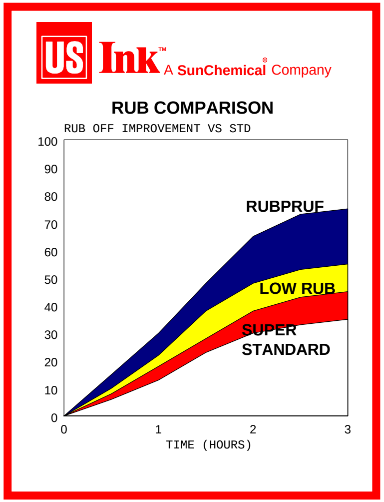
Poor rub resistance is one of the most frequent causes of dissatisfaction with the printed newspaper. Let's look at some of the likely causes. To do this we will need to look closely at the printed copy. the most likely cause of rub-off is over inking. Is the copy unusually dense? If the copy is over inked, the rub resistance straight off the press will be poor, and this will not improve significantly with time, the printed area will remain greasy, and any rub-off will also be greasy.

For more data on over inking select Data.

The film weight is quite normal, with no symptoms of overinking, and the substrate, or paper in use is unchanged? The following gives a detailed description into the factors that can affect rub off on press:

The drying or setting process in newspaper printing is by the absorption process. There are no external drying assists, which can aid this process. Therefore, the factors involved with rub off have to effect this absorption process. We have attempted through laboratory and field-tests to determine what factors effect the rub off qualities in a newspaper. The following list are the factors that we have determined to have a direct impact on the level of rub off.

1. Type of Formulation
2. Ink Film Thickness (Print Density)
3. Lithography (Ink / Water Balance)
4. Newsprint
5. Elapsed Time after Printing
6. Blankets
7. Fountain Solution
8. Roller Condition
9. Humidity in the Pressroom
10. Coverage



1. Type of Formulations:

Currently US Ink offers three general types of low rub ink formulations. These are Super Standard, Low Rub, and Rub Pruf. The rub resistance qualities of these inks increase as the resin content increases. Ink viscosity will also have an effect on the penetration rate into the stock that will effect the rub off values. Higher viscosity inks will yield greater rub off.

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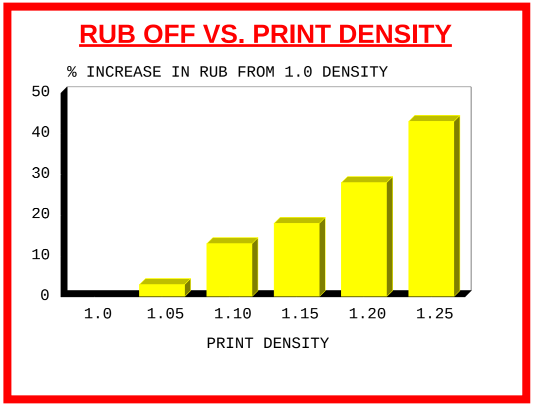
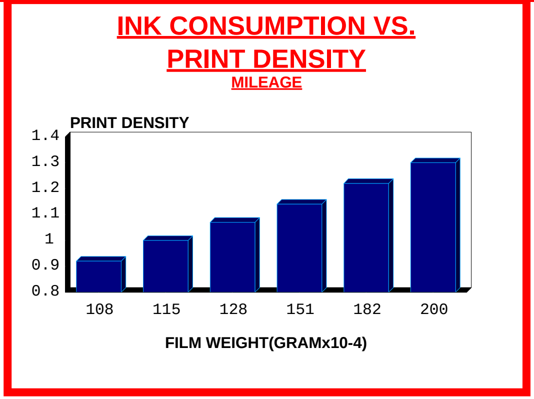
2. Ink Film Thickness (Print Density):

The amount of rub-off of a newspaper print is highly dependent on the print density or the ink film thickness. Rub off varies exponentially with film thickness and becomes particularly bad when the print density exceeds 1.10. If you raise the print density from 1.0 to a density of 1.25 (an increase of 25%) the rub off of the printed sheet increases approximately 45%.n addition to the adverse effect on rub-off, higher print density has other consequences leading to poorer ink mileage. It can be seen that very little increase in density is achieved when excessive amounts of ink are printed.



For example, an increase in print density of 20% (from 1.0 to 1.2) requires an ink film weight increase of 58%. This is over double the percentage increase of ink required to accomplish this change. As we explained before the drying or setting process for newsprint is by absorption, and as the volume of ink is increased, the newsprint can only absorb a fixed amount, so more ink will remain on the surface to rub off.



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3. Lithography:

The compatibility of the ink and fountain solution being used is of great importance in maximizing the low rub qualities of the final print. In general, it is desirable to have a moderate emulsification capacity between 40-70g/100g of ink. This offers good control of density and no blanket buildup. Minimal change in rheology of the emulsion is critical to produce good transfer and no "boiling over the rail." The Ink / Water balance is critical in terms of rub off.

Not only is the newsprint absorbing the ink, but also the fountain solution. The newsprint only has a certain capacity for absorption, and if the balance is set high the newsprint will not absorb this material. Thus, more ink will be left on the surface to rub off. Different types of dampening systems can cause the rub off to vary. The level of fountain solution applied via a spray dampener vs. an ink train brush can be quite different, thus effecting the ink / water balance, which results in greater rub off.

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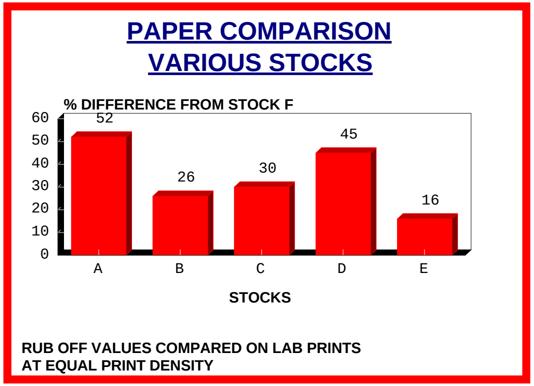
US Ink’s Press Doctor

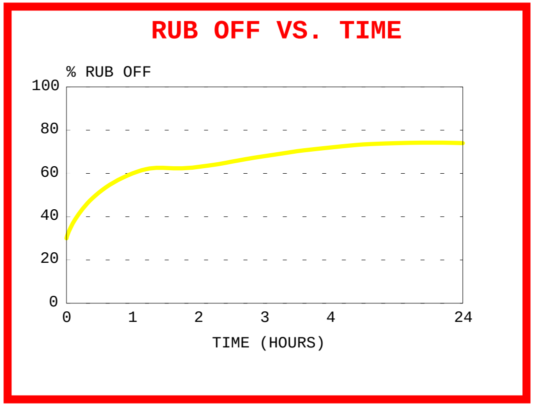
4. Paper Quality:



A study of the newsprint vs. ink rub off was also conducted. Where a variety of various stocks tested under laboratory conditions with the same ink formula and batch. The prints were prepared to equal print density and tested three hours after printing. There was a 52% difference in the rub off level with the various stocks. The same study was also done by a major newspaper over a two week period, and similar results were found. The values were not as great as the laboratory, but a 40% difference was found in this field test. In testing these stocks further in the laboratory, it was found that various paper parameters indicate that absorptivity of hydrocarbon oil has the most effect on rub-off qualities. Higher absorptivities lead to better rub-off in all cases.

5. Elapsed Time after Printing:

Because news inks set by absorption, the time after printing has a significant effect on the rub-off qualities of the print. After two hours there is only a small improvement in reduction of rub-off. Most of the change overs in the first hour after printing. Even after 24 hours, almost no further reduction was observed. Typically the industry standard for testing rub off is three hours after printing.



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6. Blankets

Blankets have an effect on the rub off in two ways. The first is the blanket type or surface. The blanket surface can come in different types, which can effect the amount of water needed to properly run. This can effect the ink water balance and thus effect the rub. The second way blankets can effect rub is through blanket height. A low blanket will change the printing pressures and thus more ink will have to be carried on press to achieve density. Also a low blanket will require a thicker ink film to be maintained, allowing for ink and paper lint to build up and act as a bridge between the blanket and paper. Thus, these factors will increase the amount of rub off.

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7. Fountain Solution

The marriage between the ink and fountain solution is very critical in achieving proper press performance. Different fountain solutions can have dramatically different emulsification properties with the same batch of ink. Therefore once the proper print qualities are achieved, it is important to maintain both the pH and conductivity of the selected fountain solution. Higher pH or conductivity of the fountain solution can cause the ink to emulsify more fountain solution, which will ultimately effect the rub off.

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8. Roller Condition

The hardness of the rollers will effect rub off in that harder rollers will effect the Ink /Water balance on press. Harder rollers will cause increased pressure in the nips while maintaining the same stripe. Thus this will effect the balance and then the rub off.

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9. Humidity in the Pressroom

The humidity in a pressroom can vastly effect both the runnability of the press and the rub off. If a pressroom is too humid the paper stock will contain a lot of moisture, which will effect its ability to absorb ink, thus leaving more ink on the surface of the newsprint to rub off. If a pressroom has too low humidity, it can effect the runnability of the web throughout the press.

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10. Coverage

This is a simple point, however greater coverage in the paper will have more ink available to rub off. It is important to note that when comparing two inks for rub off value, equal coverage must be tested or the test will be invalid.

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If you suspect the cause lies with the ink. Call in the ink supplier.

Pigment to binder ratio

Ink is a delicate balance of solid and liquid components. The solids include the pigment and extender, while the liquids (or vehicle) include the oils, solvents, varnishes etc. The balance between the two is critical. Too much liquid and the ink is prone to over-rapid setting, chalking, strike through, and possibly dot reproduction problems. Too little and the ink may sit on the surface giving rise to build up and set off.

US Ink's Press Doctor

Strike Through

Strike through is less of a problem with web offset than it was with letterpress. Strike through is composed of two factors, which are added together to give the effect we see. Strike through itself is what we observe when a printed image is viewed from the other side of the sheet. Show through is one of the factors and is due ENTIRELY to the lack of opacity of the paper. The other factor is strike through, and that is due to a combination of the ink migrating through the sheet, and also rendering it translucent.

Print defects of non-image areas

The copy is unacceptable, and the main symptoms are a print defects of the white or non image-areas. This can be a fairly obvious marking which is due to ink being transferred either from another printed page, or from another part of the press, which the copy has contacted. Also readily obvious is the effect of scumming or catch up which shows as irregular patches. Less obvious is when there is an overall tinting effect, which may be quite subtle and difficult to spot. Also in this section we should include a phenomenon sometimes known as dragging or trailing, and which is seen as an inky mark trailing behind heavy solids areas. Finally we will also include marks which correspond to and emanate from the plate edges.

If ANY of these describe the symptoms print defects your copy you should select print defects as your next link.

Print defects of non-image area

If you had a look at the definitions you will have some idea of the range of factors, which can cause print defects of the white margin areas. In order to attempt to resolve the causes of this print defects, lets look again in some detail at the copy. common cause of print defects is set off. This is seen as an image, which is transferred from a heavily inked solid or a heavy 4-color build up onto a facing page. There are in fact two main forms of set off. What has been described here is inter-page set off. The other common form of set off is due to ink being transferred back to the copy from a subsequent impression blanket or cylinder. This will be identified fairly easily since the source of the ink (the heavy solid or color build up) will not lie opposite the problem. The set off observed will probably be fairly indistinct, the subject area from which it originated not being readily recognizable. This is known as second impression set off.

Another problem closely related to set off is commonly known as marking. This occurs when ink is transferred from the printed image to some part of the printing press, and thus back to the sheet. This will often be identifiable as print defects which occurs in line* with heavy solid areas, or heavy color laydown. 'in line' in this context means the same distance from the edge of the web and aligned along the direction of travel of the web.

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By carefully examining the copy determine whether the problem is caused by the image ON THE REVERSE of the sheet, being visible on the topside. If this is the case, then the problem is likely to be caused by a form of strike through. This can easily be confused with set off or marking, however the main clue regarding strike through is that the image is fairly sharp and distinct, even though it may be very faint.

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Look for scumming or catch up. This will be visible as irregular patches, often light in shade, sometimes even, sometimes granular. Unless the problem is severe, they tend to be seen on only a small portion of the copy. This is usually where the dampening is least efficient.

Similar to scumming is tinting or toning. This as the name suggests is usually visible as a very fine overall coloration. This may often be difficult to spot since the effect is often very subtle and since it may cover the entire sheet, presents no contrasting edges, and appears as a general discoloration of the paper. Many of us have encountered a press problem with either tinting/toning or scumming, and had difficulty telling the difference. Toning/tinting and scumming are two of the most common problems in offset printing. Both of these conditions result in background printing in the non-image areas. How do we know which is which? plate related problem occurs when the ink and plate are not compatible or diazo is not fully removed. Problems can also be caused by fountain solution and damper settings. However, the core problems are typically plate, ink, or plate preparation. Once a plate scums, the ink cannot easily be washed from the plate. This differentiates scumming from toning/tinting, as the tint can be washed from the plate.

There are tests that can be used to determine the core problem for scumming. To determine if the plate and ink and incompatible, rub ink on a new uncoated plate. Wash the ink off with cold tap water, lightly rubbing with a clean rag. If the ink is not fully removed from the metal, there is, most likely, a compatibility problem. Buying a better plate, changing to pre-sensitized plates, or changing ink should solve this problem. There is an on-press test you can conduct to determine if the problem is a processor or material problem. In the non-image area, erase a spot that was scumming, until it is shinny or down to the metal. If the area starts scumming again, this eliminates the possibility that all the diazo was not removed. The problem, then, could be an ink and metal compatibility problem or inadequate fountain solution.

Finally under this heading lets consider marks which grow or emanate from the plate edge

US Ink's Press Doctor

Printed image defects

Analysis of defects associated with the printed image. This is probably one of the most difficult areas to analyze since it is very easy to establish that an image is not of the required standard but much more difficult to establish why. So let's use the techniques that have become familiar and attempt to identify effects and causes by classification. For the purpose of this analysis, color (either process or spot) will be dealt with separately. If the defect is specifically related to color then select color as your next link.

Let us first of all decide whether the problem lies with the SOLIDS print, with the halftones, or with the text.

Process inks-definitions

In the context of this analysis process colors will be taken to mean a set of colored inks which when printed in combination will attempt to reproduce a representation of the full gamut of colors seen in the original subject. Process color sets are usually four colors, which are cyan,(most commonly phthalocyanine pigment,) magenta(which is most commonly lithol rubine pigment), and yellow (which is usually a diarylide pigment). The black is based on carbon black pigment. process colors are usually based on single pigments (since this gives the cleanest results).e must always remember that if a normally lit scene outdoors has a contrast range of 100:1, from the brightest to the lightest areas, then a corresponding transparency will have a contrast ratio of 100:1, the result when printed on newsprint will have a contrast ratio of only 10:1. Remember also when viewing a transparency that the optical density will range between 0 and approx. 3.0. This has to be reproduced on newspaper by inks that can only achieve a density range of between 0 and (about)1.5. These facts must always be borne in mind when comparing the printed result with a transparency.

See also color definitions

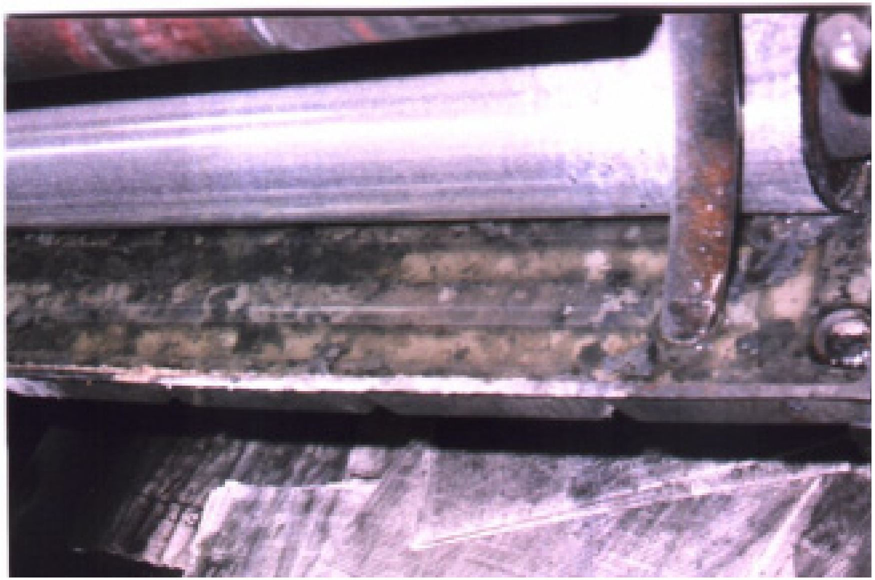
OFFSET PRESS MAINTENANCE

The web offset newspaper press requires a strict maintenance schedule that must be followed by pressroom personnel. The maintenance schedule should be put into effect as soon as the offset begins. Without a proper maintenance schedule in the offset pressroom operation, there will be many printing problems developing that have no bearing on the training of personnel. These problems will result in a greater waste of paper and increased labor costs. The pressmen will find the operation of a poorly maintained press very difficult. The printing quality of the press will deteriorate rapidly. Every press manufacturer has a suggested maintenance routine in their press manual. A checklist for the press crew should be developed which will describe daily, weekly and monthly service points on the press. Pressroom personnel should be informed of the importance of using the checklist as a help in maintaining the proper printing condition of the press. The pressroom foreman or the production manager when preparing a maintenance list must be careful to include the following basic assignments:

US Ink’s Press Doctor

Daily:

1. Before the press is run the form dampener and the steel rollers in the dampening system should be cleaned of all lint and ink deposits.



2. The condition of the sock roller should also be checked at this time.. Before webbing the press, pipe rollers should be checked and if necessary cleaned..

3. When removing plates and before putting on new plates, the plate cylinder should be checked and cleaned..

4. The press blankets should be thoroughly washed with a good blanket wash. It is preferable to complete this operation immediately after the press is shut down..

5. The pH of the fountain solution should be tested.

6. Check of all form roller settings should be made. With old plates still on the cylinder it is a simple step to drop ink forms and check their setting.

Weekly:.

1. The dampening systems should be completely drained and cleaned. This would include the following:

   A) The circulator tanks
   B) The water fountain tray
   C) The feed lines.

2. Check the blanket, first for tight lockup on cylinder and then with packing gauge for proper height..

3. Wash up entire press. Remove ink and lean out ink fountains. At this time it is desirable to wash up ink roller train..

4. If acid fountain solution is being used wash the blankets thoroughly with good blanket wash. Follow this wash up with a glaze remover.

Monthly:.

1. Check all iron to iron settings that are specified by the press manufacturer. The Goss Company supplies GO-NO-GO gauges for this purpose..

2. The inking rollers should be inked, checked, and properly set with the stripe method to insure good passage of ink from fountain to plate and provide clean wash up of press.

3. The lubrication schedule recommended by the press manufacturer should be followed at all times.

Process color defects

The printed copy is not of the required standard? You have determined that the problem lies with the process colors? Let's look only at what is observable or can be measured, and make some distinctions. Is the problem that there is a pattern superimposed on the halftone areas? This could be a regular MOIRE pattern covering much of the copy and (on inspection) composed of two or more colors.

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Is the problem due to loss of highlight tones? This is known as sharpening, and where it occurs, it affects to a greater or lesser degree all the halftones, however it is the loss of the highlights which is most noticeable (Ensure by inspection that the highlights were actually present on the plate to begin with).f they are not, then refer the problem to the process department, See plate for data.

Is the problem due to poor color reproduction, this would include color casts, non-neutral grays, poor saturation etc.

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US Ink's Press Doctor

Is the problem that the range of tones available is compressed, with reduced detail in heavy color laydown, or the shadow area in particular (so called muddy halftones), with a lack of clarity or sharpness in the highlights? If so these are classic symptoms of dot gain / tone value increase or the effects closely similar to dot gain / tone value increase, known as slur or doubling.

See also:
Print Contrast
Hue Error and Grayness
Trapping Data
Dot Gain Data

Process color defects

The process color has been closely examined and it has been determined that the color reproduction is not of the required standard? This is often noticed on flesh tones or mid green tones. Neutral gray should be obtained when the three process colors are printed down superimposed at balanced film weights. See data for information on setting color density standards.

See also:
Print Contrast
Hue Error and Grayness
Trapping Data
Dot Gain Data

Ensure that the solid density is correct for each of the colors. It is essential to use a densitometer since the eye is quite poor at assessing strength of printed color. Please select specification for data and assistance on setting up a specification for process color printing. Ensure that the solid density is achieved with the fountain solution and inking levels both set at a minimum. For data on this see dampening and inking respectively. The solid density of each color is correct, but the grays show a color cast, and there are color inaccuracies in some of the secondary colors(2-color build up). In such a case suspect poor trapping. As the result unacceptable because of poor contrast, which is the result of using a newsprint of low brightness,(visual efficiency). In this case little can be done as a first aid measure on the run. Refer to the newsprint supplier.

Physical/handling problems

The operational difficulties relate to physical properties/material handling of the ink. Let us first consider problems that occur in the pumping system. Here we will consider any problems which can be related to pumping including for example slow pump rates, loss of pressure, pump blockages etc.

If however the problems relate to the behavior of the ink in the fountain, ink rail or on-press recirculation system, then these should be dealt with by selecting fountain to be included in this section is a thankfully rare but potentially serious problem, that of contamination of the ink.

Pumping problems-bulk

Let us consider problems associated with pumping the ink from fixed bulk storage. Almost invariably the problems will relate to either a loss of sufficient line pressure, or in severe cases a total loss of ink feed. Observe what is happening?

Is there a lack of in flow in the delivery line, is it intermittent and punctuated by bursts of air? If this describes the situation select this link.

Is the problem that the ink line pressure is constant but poor, or that the ink flow has ceased altogether? If so select this link.

Pumping flow problems

We have identified that the problem is in fact an intermittent flow problem, possibly with intermittent spurts of air. If this is the case then we can assume that the air is finding its way into the system on the suction side of the pump.

Check the obvious factors first. Is the tank nearly empty?

If the tank is low, it is possible that the ink would flow into the outlet slower than it is being pumped away, in such a case air would occasionally be sucked in. The obvious correction is to re-fill the tank.

If the ink is cold, the effect could be the same, with a hole being sucked into the mass of ink in the tank allowing air to enter the pump. Again the answer is to correct the cause of the problem, by warming the tank if possible. Also if possible, leave the tank on recirculation between runs this will warm the ink slightly and also break down some of the inherent structure in the ink. A fresh delivery of ink (specify to the supplier that this should be hot) should also help.

Check the pressure relief system where fitted, ensure that the bypass pressure is correctly set.

If this system fails it is possible for the bypass to open intermittently feeding the ink straight back to the tank.

Check any connections particularly temporary ones on the inlet side of the pump. Even a slight leak will allow air to be sucked in and affect the ink flow.

Is the ink viscosity correct?

If all in-house checks fail to find any problem areas then call in the ink supplier to check the ink's flow properties.

Pumping flow problems

The problem has been identified as a lack of line pressure, or in extreme cases, a total loss of ink flow.

Check the obvious factors first. Trace the ink line from the tank to the press ensuring that all valves are open.

Is the tank low or nearly empty?

If the tank is low, it is possible that the ink would flow into the outlet slower than it is being pumped away, in such a case air would occasionally be sucked in. The obvious correction is tore-fill the tank. If the tank is low and the ink is cold, the effect could be the same, with a hole being sucked into the mass of ink in the tank allowing air to enter the pump. Again the answer is to remedy the cause of the problem, by warming and/or refilling the tank if possible.

Where fitted, check the pump protection line filters, ensure that these are clean and not blocked (blinded).

Ensure the pump is operating effectively. If air pumps are used ensure the air-line pressure is correct, regulator is set correctly, and the piston is not badly worn.

If rotary electrical pumps are used, ensure the rotors are in good order.

Check the pressure relief system where fitted, ensure that the bypass pressure is correctly set. If this system fails it is possible for the bypass to remain open feeding the ink straight back to the tank.

Check for the presence of contamination within the pumping system. The most common problems are caused by rags or wipers, which have been used, to temporarily seal inlet pipes, dropped in open tanks or otherwise allowed to get into the system. BEWARE of these situations. Washers used to make seals between hoses and the inlet pipe can break free and cause pumping problems.

Is the ink correct?

If all in-house checks fail to find any problem areas then call in the ink supplier to check the ink's flow properties.

Pumping difficulties

Let us consider pumping difficulties in two distinct categories.

The first will include problems of pumping from bulk fixed storage tanks.

Second, consider problems associated with pumping from portable tote bins.

Pumping problems bins

There is a problem pumping from a bulk / tote-bin.

First check the connection between the outlet and the suction side of the pump. A poor connection, which allows air to enter, will lead to poor or uneven line pressure. Check tightness and ensure that a washer is present(where appropriate) and that it is in good order.

Ensure that the suction line (bin to pump) is as short as possible. A good pump can develop very high pressure on the output or pressure side, but on the inlet side the best that can be achieved is atmospheric pressure plus the head of ink.

Ensure that there are no partially closed valves on the delivery line.

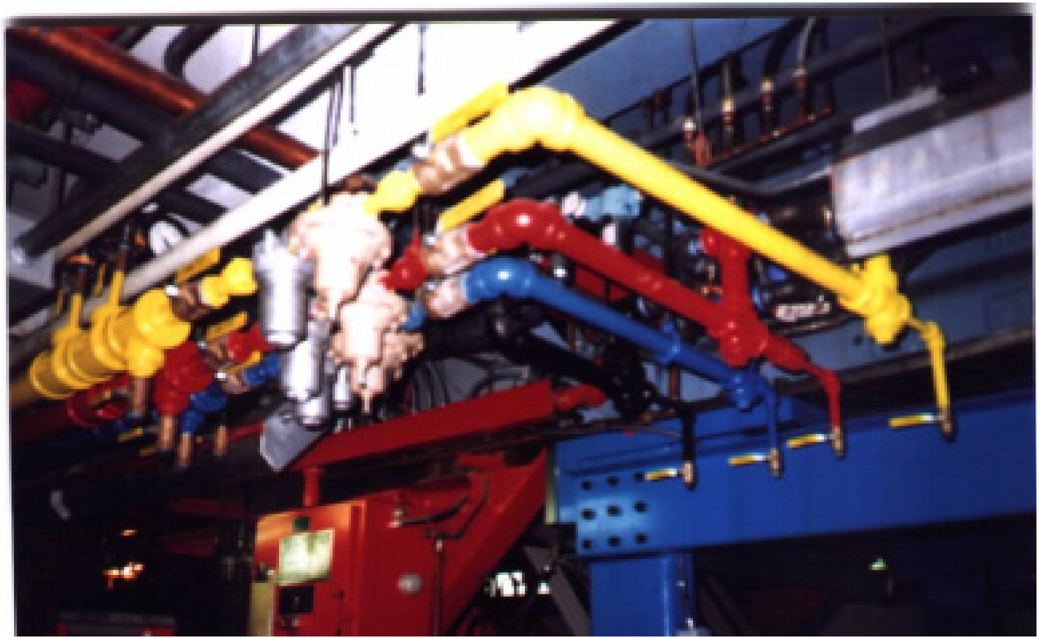
Ensure the pump is operating effectively. If air pumps are used ensure the air-line pressure is correct, regulator is set correctly, and the piston is not badly worn. If rotary electrical pumps are used, ensure the rotors are in good order, the by-pass (where fitted) is not locked open, and when belt driven, the belts are correctly tensioned and not oil contaminated or slipping.

Has the tote bin been stored in the cold. Attempt wherever possible to store the ink at room temperature, particularly in cold weather.

Has the ink changed, if this is suspected, call in the ink supplier .

Refusal to pump

The ink refuses to pump. There is a lack or total loss of pressure in the ink lines. In this case please see this link.



ROLLER SETTINGS

Perhaps the most important part of the pressman's job is proper setting of rollers. Improperly set rollers cause excessive wear, which destroys plates as well as the roller itself. Improper settings can generate heat (caused by friction) which quickly brakes down the rubber compound. Rollers should be set as lightly as possible for proper ink distribution and plate coverage. Forced setting soften cause severe damage to journals and bearings.

Here are several problems that can be traced back to an improper roller setting: variation of print quality, scumming, streaking, filled screens and reverse type. Proper setting begins with the ductor roller, the prime conveyor of the ink from the fountain.

A hard setting of this roller can produce a bounce that will materially affect the amount of ink being picked-up for transfer to the distributors or other supporting rollers. It is very important that this roller be set exact and parallel to the fountain roller. Distributor rollers, too, must be parallel to each other and to the ductor and forms - or streaking may result. Form rollers are unforgiving and must b set evenly and lightly.

A too-hard setting will seriously affect the ink lift from the other supporting rollers, and could have a damaging affect on plates. As a general rule, rollers should be set with thin feeler stock - as near to 0.002 thickness as possible. The pressman will normally combine three pieces between the rollers - one near each end of the roller and one in the center. The feel of the combined paper stock should be snug but not tight. A properly set roller will permit removal of the middle feeler stock with very little effort.

Cold rollers should be set lightly. Once in operation, they generate heat - causing a slight expansion of the rubber compound. A certain amount of ink and roller wash absorption will also expand the physical dimensions of the rollers. Roller settings should be re-checked after the press has been in operation for about one hour. If roller diameter has increased, re-setting may be required. good rule-of-thumb check for proper roller setting is to pull a printed sheet immediately after start up, and again at thirty to sixty minutes.

Check the entire length and width of the sheet for ink film variation.

ROLLER CARE

Proper setting isn't the only potential problem to watch for while rollers are on the press. Rollers should be checked regularly for tell-tale signs of premature wear. Small indentations caused by the plate edge can soon become deep cuts on the forms. The pressman should always be aware of the hardness of the printing rollers.

A Shore A Durometer can tell him when a physical change is taking place in his rollers. Another problem is caused by accumulations of dried vehicle, gum Arabic, lint and paper coating. These deposits solidify and produce a hard spot. Eventually, this area cracks - rubber breaks out, and the roller must be retired for recovering. The surface of the roller should always be kept in a soft, velvety condition for best performance. Careful attention should be paid to the type of roller wash that is employed to clean rollers. good cleaner must remove unwanted ink. A number of straight solvents will do this. However, they often penetrate the rubber, causing it to swell abnormally, and become unusable. Roller washes should be used as quickly as possible after the press has been shut down - while the ink is still wet. There are many effective and safe washes manufactured by firms who understand the requirements. It is more economical in the long run to pay a little more for a specially developed roller wash, than to use a lower cost ineffective one. Even the best wash will eventually have an effect on the roller, and the only solution is to have it reground. Constant checks should be made for rule marks. The deeper they cut into the rubber, the easier it is for solvent to penetrate and produce swelling - rendering the roller incapable of depositing an even ink film.

For more information on rollers see the following:

Roller Problems
Roller Storage
Roller Terms Definitions

ROLLER PROBLEMS

Here are examples of problems with rollers. These were victims of poor housekeeping. Their productive life was shortened because they were not cared for properly. Their condition cost many valuable and expensive press hours. All rollers will eventually wear out, but proper care will extend their life for several years.

END BLOW OUT Symptom: Minute cracks in rubber. Cause: Running roller with little or no lubrication in non-inking area. Remedy: Apply light film of oil or other lubricant to minimize friction, which produces burn up.

END BURN UP Symptom: Cracked ends; rubber splitting near end of roller. Cause: Rollers permitted to run dry; heat build-up by friction breaks down rubber. Remedy: Lubricate non-inking portion of roller.

SCORING Symptom: Ring around the roller with depression. Cause: Heavy setting of the roller on ruled plate form. Remedy: Although this condition is sometimes unavoidable due to layout of work, it should be carefully watched and, at the first opportunity, the roller should be given a light grind.

GLAZING Symptom: Shiny spots on roller face. Cause: Dried ink vehicle or gum allowed to build upon roller. Remedy: If roller wash will not remove the hard shiny spots, roller should be reground.

LENGTHWISE PICKING Symptom: A picking out of the roller across the face. Cause: Sometimes improper cleaning of the roller allows residual ink to remain on the roller surface. A prolonged period of shutdown allows roller surfaces to adhere to each other. A quick start causes rubber to pick out. Remedy: Clean rollers thoroughly with a reputable wash. Turn press over slowly to be certain all trace of ink has been removed from the rollers. Wipe roller ends.

ROLLER STORAGE

Do not attempt to refinish a roller still wet from roller wash. Before storing, inspect journal surfaces for excessive wear. A good grade of grease or rust-resistant material should be applied to the roller ends before storage. Pressure sensitive paper may be substituted for grease. Cover the entire roller surface with wrapping paper to shut out sunlight and dust particles. Upon completion of the cleaning and refinishing process, roller should be stored vertically in racks enclosed in a cabinet. Horizontal racks are satisfactory for short rollers, but vertical storage is recommended. Long rollers should be stored vertically, to avoid sag or bending of the shaft. Regardless of storage method, all rollers should be placed in an area free from excessive moisture and ozone. Never permit a roller to rest on the rubber surface or permanent damage will result.

ROLLER TERMINOLOGY

Here are definitions of some of the terms used in describing, testing, and defining the applications of rollers. While this is not an all-inclusive list, it presents a beneficial review of these terms.

HARDNESS:

Two instruments are used to measure rubber hardness: The Shore Durometer and the Pushy & Jones Plastometer. The units of hardness are unique to each instrument; therefore, a conversion chart must be used to convert from one to the other. The "Shore" measures the resistance to penetration of an indenter point under spring tension. The harder the material, the higher the reading. The "A" is the most popular Shore instrument, but here are several others. The most used is the

"D" for materials harder than those tested with the "A". The accepted practice is to refer to the hardness as so many points duro(durometer) or Shore. If "D" is used, the reading will be designated as "60 Shore D." Shore hardness. It is easy to use, and is the most popular measure of the hardness of rubber.

The "P & J Plastometer" measures the depth of penetration of a 1/8" ball under a 1000 gram (2 lb.)weight in hundredths of a millimeter. Reading is taken one minute after ball has been released for penetration. The harder the material, the lower the reading. P & J is used to express hardness almost exclusively on paper mill rolls. Waxing rolls are often ordered by P & J. Comparing it with the Shore, it more accurately expresses the hardness of the whole roll, but is larger, and relatively difficult to use.

COMPRESSION SET:

"Compression Set" (or Permanent Set), is defined as the amount-in-percent-by which a sample of rubber fails to return to its original thickness (or length) after being subjected to a compression load (or tension), is greatly influenced by the amount of distortion. All rubbers will take some set. Some are better than others, depending on their compounding. A good compression set resistance is 5%; a poor one, 50%. The worst polymer we have is Thiokol, which takes a complete set (100%) in 22 hours at 158 oF (standard test)-but strangely enough, has excellent rebound or bounce. Set is an important property in laminating rolls, or any rolls under pressure with a web running between them (i.e. carbon coating rolls) where the edge of the web causes a depression to develop. It is also important in rolls intended for use with the 3M sleeve. Since sleeves shrink down on the rubber and hold it under compression, the rubber is under ideal conditions to take a set. This causes a problem with new sleeves, which tend to "walk off" the roll...now too small for the paper to grip.

RESILIENCE:

"Rebound or impact" resilience, or snap, or aliveness of rubber is usually expressed as percentage rebound. Resilience is determined by dropping a metal ball from a given height and measuring the returned height. Rebound is the percentage of the returned height to the original height. Heat Buildup" is measured as temperature rise when a sample of rubber is repeatedly and rapidly deformed under controlled conditions. Excessive heat buildup will cause blowout. Stocks with low heat buildup are said to be more resilient than those with a high heat generation. Heat buildup is an extremely important property of rubber rolls, especially with gravure and industrial rolls operating under pressure, where the area at the nip is repeatedly and violently compressed and released, and with the rubber literally pushed through an opening less than the wall thickness of the rubber on the roll. Not all stocks of the correct Shore can be used to make a gravure roll because low heat buildup is a property which must be compounded into the rubber.

TENSILE:

Tensile, elongation, and modulus are determined at the same time, with the same sample. Tensile strength," expressed in pounds per square inch, is defined as the force or stress required to rupture or break a sample of rubber. In the laboratory, tensile strength is determined by using a1/4" wide sample .060-.080" thick in the shape of a dumbbell, with the constricted portion about an inch long. The rubber dumbbell is pulled apart at a constant predetermined rate until it breaks. From the pounds at break, the strength of a square inch is calculated. As the sample is pulled apart, strength readings are taken at various elongations for the modulus determinations. Rolls of high tensile strength usually perform best. it is desirable to have as high a tensile as possible. Some correlation exists between tensile and abrasion-resistance (and possible tear). But, tensile strength is not the only important physical characteristic.

Other characteristics-heat buildup, heat resistance, oil resistance-play a more important role in the roll's function. Thus, in making a good roll covering, a compromise and a balance of properties in the rubbers is needed. Tensile strength is still a fundamental and important test for all rubber compounds. The higher the tensile, the tougher the rubber and the harder it is to break. Possibly the highest tears are found in properly compounded stocks between 55 and 75 Shore.

RESISTANCES:

Rolls can be subjected to various environmental and service conditions, such as temperature, speeds, pressures, solvents, inks, and coating - all of which influence the covering to a greater or lesser degree. Knowing the conditions under which a roll will operate is always important. If there are any unique or unusual requirements, the laboratory should always be consulted. Tests can be devised in the lab to duplicate conditions in the field. From these results, a suitable covering can be chosen or developed. Any number of these tests can be devised to duplicate operating conditions.

ROLLER HARDNESS

For Press rollers to perform their function they must have the proper shore hardness and maintain the proper setting. The shore hardness of press rollers is measured by the Shore A durometer gauge, which measures rubber hardness on a scale from "0" to "100" (hard).. **Check roller durometer (28 - 30 for new transfer rollers and take out by 40, 26 - 28 for new ink forms and take out by 40, and 24 - 26 for new dampening forms and take out by 35)**

High shore hardness readings for dampening forms or inks form rollers will cause plate wear and will improperly distribute the ink and fountain solution to the plate, making ink and water balance difficult to achieve.

Set-off

Poor set-off is a frequent cause of dissatisfaction with the printed newspaper. Let’s look at some of the likely causes. To do this we will need to look closely at the printed copy. The most likely cause of set-off is over inking. Is the copy unusually dense? If the copy is over inked, set-off will be much more likely. For more data on over inking select Data The first thing to check is that the printed density is to specification. Preferably using a densitometer. See specification for data, which might help you to set a density specification.

****

Has the paper changed? A very smooth paper will be more likely to cause set-off than a normal sheet. Check or have checked the absorbency of the sheet. If this is slower than normal then this could lead to more set-off.

****

Check also that the ink and water balance is correct. Overdampening can lead to chalking and thus set-off. See balance.

****

The ink film weight is quite normal, with no symptoms of overinking, and the substrate, or paper in use is unchanged? In this case it is probable that the cause of the problem lies with the ink. Call in the ink supplier .

PAGE TO PAGE SET-OFF

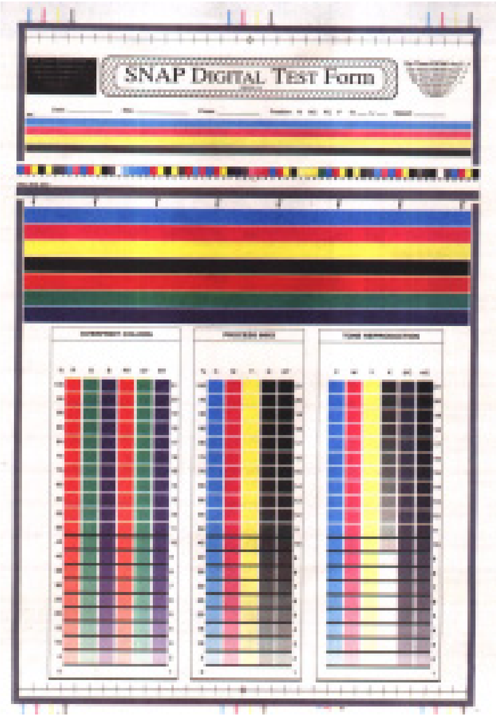
INK FROM THE PRINTED SIDE OF PAGE SETTING OFF ONTO THE OPPOSITE PAGE

SET-OFF: PAGE TO PAGE

CAUSE	SOLUTION
POOR SETTING OF FOLDER NIP ROLLERS	SET TO MANUFACTURE SPECS.
TOO MUCH INK	SET TO DENSITY SPECS.
POOR FOUNTAIN SOLUTION CONCENTRATION	SET F.S. TO PROPER CONDUCTIVITY
POOR INK/WATER BALANCE	SET INK/WATER TO MINIMUM

US Ink's Press Doctor

SNAP DIGITAL TEST FORM



The SNAP Digital Test Form was designed to support the measurement of printing process variables. It can be used in press testing or as a powerful guide for setting printing parameters in the image scanner or Adobe Photoshop.

The test form size is 21 inches by 13 inches which fits many non-heatset newspaper pages. The target sizes were created to provide measurement by hand held or scanning densitometers. The format, created in QuarkXPress, can be easily changed to fit specific needs.

The test elements address the printing process by creating tone curve dot sizes from a 21 step gray scale. This data can be used to create Jones diagrams and help determine the best separation standards. The other targets are used to check the film processor, plate-room, and pressroom. The solid elements help to set ink/water balance and density standards. Separations can also be tested by combining photography with the elements in the upper half of the form.

Contact your US INK representative if you are interested in more information about this form.

ATTRIBUTES EVALUATED:

- **Density, Dot Gain & Print Contrast Level and Variation**
- **Hue Error, Grayness/Saturation of CMY & RGB**
- **Image Slur and Doubling**
- **Register Accuracy and Variation**
- **Ink Trapping Levels and Variation**
- **Maximum Vertical Printable Area**
- **Process Color and B/W Tone Reproduction**
- **RGB Tone Reproduction for Color Correction**
- **3/C Gray Balance**
- **Maximum Printed Density for B/W and Color**
- **Paper Density**

USES:

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Measure image setter film output for dot area accuracy if test is output in-house
Measure CMYK ink densities to SNAP specifications across page
Scanning densitometer color bar included to set densities and for SPC applications
Set image register between CMYK using center target and determine fan out
Use maximum printable area lines to determine image position within cut-off length
Inspect ink water balance using thick solid bars across page
Calculate dot gain / tone value increase values and balance between CMYK
Measure print contrast values for CMYK
Inspect and measure gray balance across and down page to determine slur or doubling
Use BNV tone reproduction scale to determine optimum B/W halftone specifications
Use tone reproduction scales to determine optimum color separation specifications
Use overprint color sections to determine hue error of overprints
Use overprint tone colors to determine color correction required for color separations

BENEFITS OF SNAP DIGITAL TEST FORM:

Form can be distributed in diskette form (Pre-imaged films also available)
Films can be produced using in-house imagesetters representing actual conditions
Scanning densitometers can be used to facilitate data collection
Accurate image register indicators

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Tone reproduction scales to determine B/W halftone and color separation specification
Tone reproduction scales can be adjusted to base-line in-house specification
Test form is easy to run on press

Print Quality Press Test Procedure

The best way to obtain a quantitative analysis of print quality is to print a test form that can provide the necessary information. The first step in the process is choosing the correct form for your specific needs. Industry organizations such as NAA, GATF and SNAP offer different test forms that can provide valuable information. However, many printers create their own versions of a test form that can be used as well. At the minimum, the form should contain the following:

1. Patches for evaluating solid ink density and hue error/grayness.
2. Solid overprints for evaluating two-color trap.
3. A step screen gradation for dot gain / tone value increase measurement (25%, 50% and 75% minimum).

Running a test form is easy and can provide valuable information concerning print quality. However, since some investment in press time and paper is required to run a test, it will be necessary to communicate the test goals and objectives to all involved, before the actual test run. As described in the previous pages all quantitative measurements of print quality are dependent on solid ink density. Therefore, it is imperative that the tools for controlling density are available to the pressmen running the test. Calibrated reflection densitometers with T-response filters should be used for density control. Care should be taken to ensure that print densities are within the industry recommended target range and are consistent across the printed page. With this in mind a general outline for running a press test is presented below.

I. If using digital media, produce four color negatives on properly calibrated image setter. Check the outputted negatives to ensure proper reproduction.

II. Ensure plate processing equipment is operating within specification (Exposure, draw down and light source.)

III. Produce plates from negatives. Check plates to ensure proper reproduction.

IV. After bringing press to normal operating speed, achieve proper ink/water balance.

V. Adjust ink density, using a calibrated reflection densitometer, one color at a time. Allow a minimum of 1 to 2 minutes for adjustment to take effect. Ensure density is uniform across the printed sheet before making adjustments to the next color. Check a least 3 sheets and average the density reading before making any adjustments.

VI. After all final adjustments for density pull a quantity to sheets for evaluation. (A minimum of 25 printed sheets are necessary for a statistically valid sample).

Spot colors

A spot color is one which is printed singly (not in combination with any other colors). You have identified that the quality of the spot color printed area is not satisfactory. Is this due to the quality of the solid laydown? Is the problem due to inaccurate color reproduction, (a discrepancy between the printed result and the color standard?)

It is important to ensure that the viewing conditions are correct. If a daylight viewing cabinet or lamp is not available, ensure that viewing is carried out in day light away from the influence of any colored surfaces. Some colors appear very different under different lighting conditions. This is called metamerism, and is the reason why lighting conditions must be agreed and standardized. In the case of inaccurate color reproduction, check that when the color was originally specified, the originals watch or color guide was printed on the same type of stock as that to be used for the final job.

Colors selected from (for example a Pantone guide printed on uncoated stock) will be very different if printed up on newsprint. The result will be lacking in brightness and may also show a color shift. Check also that the film weight is correct. Many inks will exhibit very different results at different film weights. (Warm Reds for example may become bluer at lower print densities and yellower at higher print densities).

Problems of color quality can occur if trapping of second hand subsequent colors is poor. If solid densities are acceptable but color laydown are poor, consider trapping. If all appears to be correct, but color of the correct quality cannot be achieved, call your ink supplier.

SPOTS AND PINHOLES

Spots or pinholes occur on the plate or the final image, but none are present on the original film. It is likely, therefore, that the problem lies with dirt or foreign matter on the glass of the vacuum frame. Spots on the glass which fall within the IMAGE area of a negative will yield pinholes or 'holes' on the corresponding image on the plate and thus the final image, while spots within a positive NON-IMAGE area will likewise yield spots in the same position on the plate and the final image. As a short term solution, spots in the non-image area of the plate can be removed with deletion fluid or a deletion pen. It is necessary to keep the glass of the vacuum frame absolutely clean. If necessary, remake the 'offending' plates after cleaning the vacuum frame glass.

If the vacuum frame is not to blame, but small spots of ink appear on the plate surface upon roll-up, consider oxidation. Spots in the IMAGE area of a negative will yield pin holes the corresponding image on the plate and thus the final image, while spots on a positive NON-IMAGE area will likewise yield spots in the same position on the plate and the final image. Pinholes in the NON-IMAGE area of a negative will yield opaque spots on the corresponding image on the plate and thus the final image, while pinholes on a positive IMAGE area will likewise yield pinholes in the same position on the plate and final image. As a short term solution, spots in the non-image area of the plate can be removed with deletion fluid or a deletion pen.

Where spots or pinholes have been identified on the original, the only real answer is to correct the problem and remake the plate. Spots can be removed from the original by use of bleach or a knife, while pinholes may be obliterated by use of opaque spotting medium. It is necessary to identify how the film came to be defective, and to correct the cause.

Second impression set off

For a brief definition select this link. Several factors bring about second impression set off. Let's look at the most common. As with many other printing problems, over inking is one of the most common causes. In the case of second impression set off it is the first color printed which should be suspected. Check for overinking.

Build up on the impression cylinder is a progressive phenomenon, ensure that the normal cleaning cycle has been adhered to. As a first aid measure, extra cleaning of the cylinder may be necessary until the problem is resolved. Consider the nature of the copy being printed. Particular attention should be paid to very heavy solids, or heavy 4-color laydown. If these are normally present and run without problem then the cause obviously lies elsewhere. If however the copy has changed in character or is carrying an unusually difficult subject then you may need to attempt to alleviate the problem without necessarily being able to actually tackle the cause.

Has the substrate paper in use changed? Preprinted inserts may be printed on a smoother paper than is normally used. Paper which is smoother due to increased calendering or a degree of sizing may give a better reproduction, but may also cause the ink to sit on the surface fractionally longer, and on fast presses this may lead to build up on the impression cylinder and thus set off. In such a case, discuss the problem with the paper supplier.

Paper may also have a degree of free dust or lint on the surface, which can contribute strongly to build up on the impression blanket. Select paper for more data.

Regarding the other consumables, a poorly formulated or inappropriate ink can certainly contribute to build up and set off. Ink which has too much solid component, see pigmentation or is of too high a viscosity for the nature of the press or the application, or which is too high in tack at the point of printing will all tend to cause build up and set off.

Second impression set off

This occurs where the web has been printed (say on side a), it then passes to the next unit to be printed on (side b),during the second printing, some of the ink, and possibly paper debris, from side a passes onto the impression cylinder. During subsequent revolutions, the accumulation of build up on the impression cylinder may partially transfer back to the web (on side a).

Solid print area defects

The printed copy is unacceptable due to defects or deficiencies associated with the solid areas. This is an area where many different defects are both possible and fairly common. Let us analyze the problem by the now familiar method of classification.

Is the problem associated with the overall density of the solid area?

The problem is ghosting. Select this link for a definition of ghosting.

Close examination of the solid areas,(preferably using a low power magnifier) shows uneven laydown, possibly with paper showing through.

The solid areas show the presence of hickies. For a description of hickies, select this link.

The problem is spots or pinholes in the solid areas. For a description, select this link.

US Ink's Press Doctor

Solids density problems

The solids areas are covered adequately, no paper shows through? The problem however lies in achieving the correct density? Assuming that coverage is good it is likely that any difficulties with the density will relate to bringing it up to the correct level, without incurring any other problems associated with over inking, rather than printing at too high a density.

There are three aspects to examine here.

Is the problem one of overall difficulty achieving density, or is it a localized problem, on only part of the image area?

Is the problem that the density is apparently low, and despite carrying sufficient ink, the paper is inadequately covered giving the impression of low density**?**

US Ink's Press Doctor

Solid laydown defects

The solid is of the correct density, but the overall effect is defected by uneven laydown. This may be a mottle (on a microscopic scale, the film is composed of alternate light an dark patches)or may be due to incomplete coverage(check using a low power magnifier whether paper can be seen through 'holes' in the ink film).

Slur and doubling

These may initially appear to be very similar. However slur is invariably elongation of the dots in the web direction, while doubling is often identifiable as being caused by dots, which are partially superimposed, and elongation can be in any direction. Slur is likely to be attributable to press conditions rather than to any of the consumables. Slur can be greatly affected by excessive pressure between the blanket and the paper. Ensure therefore that the blanket packing is correct, with the correct total blanket height according to manufacturer's specifications. Ensure also that impression is correctly set, again according to manufacturers specifications. Select impression for more data. Wear on the press which detracts from true rolling between any of the cylinders can cause slur.

Doubling can be caused by many of the same factors as slur. In effect when the cylinders rotate the halftone dots are not placed in exactly the same position every revolution. Therefore the dots print up as double or multiple images. Identify slur and doubling by printing down special targets, which clearly show both degree and direction of the fault.

SLUR

Slur: Image distortion or smearing on printed sheet. Horizontal bands in tints/solids. Shadow areas lack sharpness. Examination of the dot formation by means of a magnifier (linen, glass or loop) will confirm that the dots are elongated in a specific direction. Slur is usually the result of slippage or mismatch in speed between two surfaces (an image carrier and an image receiver).

Blanket/plate loose or slipping.- Tighten blanket or plate as required. Cylinder bearers oily. - Clean bearers, then keep them dry and free of oil.

Too much ink being run. - Reduce ink feed. Incorrect plate/blanket packing. Check packing and adjust as required.

Too much back-cylinder pressure. (impression) Adjust and run with minimum pressure. Ink rollers set too hard. - Check width and end to end evenness of ink stripe.. Re-adjust pressure as necessary. Paper coating or lint on blanket. - Wash blanket. Investigate cause.

Sharpening

Sharpening is a term given to a loss of highlight detail and a compression in the midtones. The key to remedying this problem lies in identifying why the highlights are being lost. Check a new and a used plate, using a low power magnifier. If the highlight dots are not present on the unused plate, check that exposure is correct. Ensure that with a negative working plate the exposure is sufficient. (Check exposure regularly by means of a plate exposure signal strip such as a Stouffer scale).ensure also that contact between the plate and the negative is very good in the exposing frame. Remember also that shooting through the back of a negative (emulsion side up)will give a generally degraded dot. The highlights are present on the plate but are lost as the run proceeds?

Check ink and water balance. Ensure that you have the dampening solution set to a minimum, consistent with clean scum free working. A degree of emulsification could cause mild plate wear, which might only show up as sharpening. Select dampening solution for data.

Sharpening can be a form of plate wear. Select plate wear for data.

Seepage

Seepage in this context is taken to mean dripping of ink from the gap between the fountain ball (roller) and either the ink metering blade, or the gap formed by the edge of the ink rail where fitted. Seepage can usually be directly attributed to one of two causes. Obviously if the press is badly set, with the fountain or rail gap set too wide, then seepage will be likely. The obvious remedy in such a situation is to close down the gap, particularly at the end of a run if this is possible. On older worn presses the likelihood of seepage is increased.

For injector type presses check to see that the ink rail is zeroed properly. The other main cause of seepage is likely to be the ink itself. This should have flow characteristics appropriate to the fountains in which it will be used. An ink will be formulated for undershot fountains either by ensuring it has reasonably short flow or by building in a degree of thixotropy which will be quickly achieved on standing. If the ink is too long in flow, or it has insufficient thixotropy, seepage will be a possibility.

If the press is set correctly, it is worth checking whether the ink has changed (new delivery/batch/supplier?) If the ink is suspected, call the ink supplier who can advise on the flow properties and supply an alternative grade.

Stripping

Stripping is where the metal inkers acquire a film or coating and consequently refuse to accept or transfer ink properly. This may be due to a poor cleaning regime. A degree of film build up is inevitable, and is normally kept to a minimum by effective cleaning. An ink which is inherently unstable, or is unstable in the presence of fountain solution may leave a glaze on the rollers. As a short term solution, the rollers may be cleaned with a (specially formulated) mildly abrasive roller cleaner, or a special mildly abrasive cleaning pad. Cleaning with a mild acid (citric or acetic), or strong fountain solution can often alleviate the problem. The spraying of common vinegar on the effected spots can be a short term fix. If the problem persists and the cause can be established it is worth contacting the relevant supplier.

STRIPPING

ROLLER OR PORTION OF ROLLER
DOES NOT ACCEPT INK

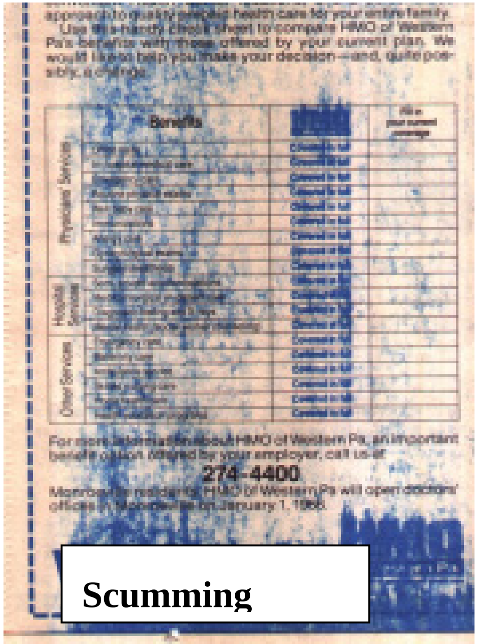
STRIPPING

CAUSE	SOLUTION
HYDROPHYLIC MATTER ON ROLLER	CLEAN ROLLER PROPERLY
POOR ROLLER SETTINGS	RESET ROLLER TO SPECS.
COPPER WORN FROM DRUMS	RE- COPPERIZE DRUMS

STRIPPING

CAUSE	SOLUTION
EXCESSIVE EMULSION OF INK	CHECK AND SET TO PROPER INK/WATER BALANCE
POOR FOUNTAIN SOLUTION CONCENTRATION	SET F.S. TO PROPER CONDUCTIVITY
BLANKET WASH IN THE INK TRAIN	REVISE WASH-UP PROCEDURE

Scumming and catch-up



Scumming and catch up occur where ink has adhered to the non-image area of the plate, and begins to print. Catch-up can be readily differentiated from scumming since it is a direct consequence of insufficient dampening. Increasing the dampening solution slightly usually clears catch-up, while increased dampening solution levels has little effect on scumming. Catch-up is rarely a problem since it is readily remedied as detailed simply by increasing the level of dampening solution. Scumming however, since it does not respond to increased fountain solution is much more of a problem.

When considering scumming it is necessary to discover which factor or factors have caused this. Let us look at some of the most common causes. First consider the plate. Is this correctly stored, exposed and processed? See plates. Has the processed plate been correctly stored, (consider oxidation).

If scumming has been observed, it is possible to check whether this is due to a plate defect. On an area of scumming, clear a small area using a deletion pen or pencil eraser. If on the press this prints cleanly, it is fair to question whether the plate has been correctly developed. On the run you could try cleaning the plate with strong fountain solution, or as an extreme measure(and with caution) plate developer. In the case of poor development, check that the developer bath has been correctly replenished, and has not sludged up. Check also that it is clean and that any brushes or rollers are clean and correctly set.

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Check fountain solution strength, see fountain solution check. Weak fountain solution will not keep the plate running cleanly, at normal levels of dampening, and may be unable to keep the plate clean even at elevated levels.

See also Fountain solution.

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Consider also the ink. If this has an incorrect ink and water balance then the problem of scumming may occur. As a first aid measure it may be possible to run with fountain solution which is stronger than normal. This should however be undertaken with care since this can lead to other problems. If the ink is suspected then contact the ink supplier.

SCUMMING

INK PRINTING FROM RANDOM PORTIONS OF NON- IMAGE AREA

SCUMMING

CAUSE	SOLUTION
PLATE IMPROPERLY MADE	REMAKE PLATE CHECK PLATE MAKING PROCESS
FOUNTAIN SOLUTION TOO CONCENTRATED	SET F.S. TO PROPER CONDUCTIVITY
INK WITH POOR WATER RESISTANCE	CHECK WITH INK MAKER

RYCO Spray Bars

PROCEDURE FOR SETTING UP A WATER CURVE

This information has been provided by RYCO Graphics

The objective is to find the correct frequency versus current press speed, so you can set your water and ink balance at any press speed. That balance will stay consistent with any change of press speed.

The folder control receives a signal from the tach generator which can be calibrated in the folder control to match the tach on the press, thus the Ryco folder control knows the current press speed at all times. In the folder control there will be a red light lit up, corresponding to all spray bars to pulse and how many times a second to pulse. At slower press speeds you can change the frequency to pulse slower or faster every 2000 iph. Thus, every time the press increases, or decreases, by 2000 iph the folder control sends a different frequency to the spray bars. This is from 0 iph up to 22000 iph. After 22000 iph, and up to 70000 iph, the Ryco folder control changes frequency every 4000 iph.

The spray bars have either four (4) or eight (8) coils, depending on whether they are four (4) or eight (8) nozzle bars, which when charged pull back a plunder allowing water to escape through the nozzle. The amount of times per second is determined through the frequency set at that particular press speed. For example: If at a particular press speed the frequency happens to be 5.00, which is five pulses a second, all nozzles on all spray bars pulse or spray at the same time. During that five pulses a second, DC voltage is sent to the coils, the bar controls at the unit, controls the amount of time the DC voltage is held to the coil out of a one second pulse duration. In other words, the higher the number on the bar control, the longer the DC voltage is held to that particular coil, inevitably delivering more water on that particular page. Of course, the lower the number, the shorter the time DC voltage is held at the coil in the five pulses a second duration, inevitably delivering less water.

In the folder control at every press speed indicated, there is a pot, which a frequency can be dialed in to build a gradually increasing water curve. The current frequency at any press speed is displayed in the folder control. In conjunction with the dialed in frequency, there is a set of multipliers -- one for the dampening frequency and one for the A.S.O. frequency. The reason for the multipliers is because the pots that you dial in a frequency have high and low limits, so with the multipliers and the pots you can achieve any frequency desired.

The frequency displayed, from what you dialed in the pot, is actually multiplied by the number setting of the multipliers for dampener and A.S.O. For example: If at 50.000 iph the frequency dialed in is 3.00 and the multiplier is set at 2.5X, the actual signal to the bars is 7.5

time a second.

The ideal way to set a curve from scratch is to have all the numbers on the bar controls the same, start out with the multipliers at 2.5X and take the press to each speed indicated in the Ryco folder control.

For example: take the press to 14,000 iph under printing conditions, if the press overall seems to be delivering too much water, or not enough, adjust the pot under the red L.E.D. at current speed higher or lower (which is changing the frequency to bars) until an overall average of proper water is delivered. Allow enough time after a frequency change for the press to adjust. If, for example, the pot has reached its maximum or minimum adjustment, and more or less water is still desired, you can change the multiplier to 2.0X for less water, or 3.3X for more, and repeat procedure. Once at 14,000 iph the amount of water being delivered is acceptable, bring the press up to 16,000 iph and find the frequency needed. Repeat procedure -- pot after pot, until you have reached your maximum running speed.

At this point, whatever the press speed is, the frequency should deliver desired amount of water overall. Some pages will require slightly more or less water. This can be controlled by raising or lowering the numbers on the bar controls.

This is a basic guide for setting water curve. With some presses the press will stay clean at any speed, but when you increase, or especially decrease, press speed you may see some scumming. If this applies, it can be overcome by increasing the curve slightly in the range that the press is scumming. This is acting as a buffer. For example: If you are running top speed and bring the press down, the water reacts instantly with press speed, and the ink in the ink train may be too heavy, thus causing scumming.

US Ink's Press Doctor

Temperature's Affect on Print Quality

As discussed in the section on Rheology, Viscosity is one of the most important properties of a printing ink. This previous writing provided a basic understanding of Viscosity as the measure of a fluid's resistance to flow. When an ink chemist formulates a new ink, selecting the proper viscosity for a specific situation is one of his first considerations. The viscosity range chosen is based on a combination of factors such as the press inking system, (injector or open fountain), press speed, and ink delivery (bulk handling or pumped from containers). The formulating chemist also sets viscosity specifications at a temperature that is within the normal operating range of most web offset printing presses. However, since viscosity is dependent on temperature, it is important to recognize that a large fluctuation in temperature can change viscosity and ultimately the ink performance. **Figure 1** predicts the viscosity of a typical Web Offset Injector Ink over a range of

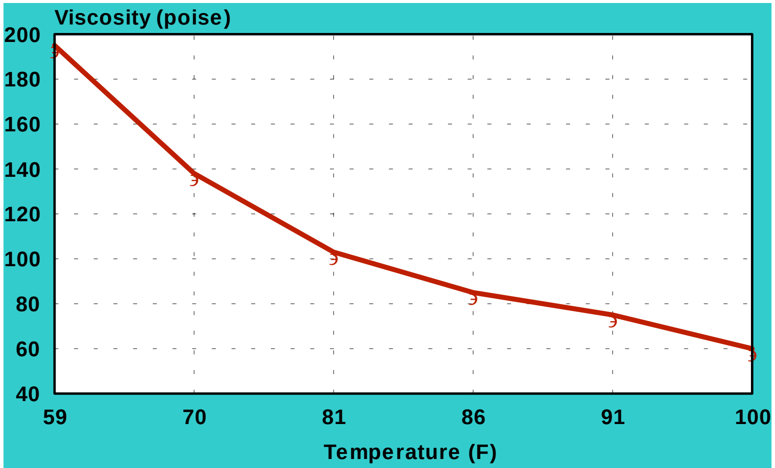
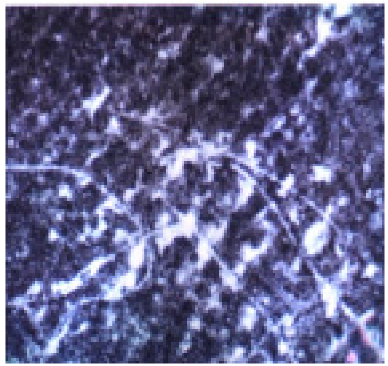


Figure 1

temperatures. As you can see, viscosity decreases markedly as temperature increases. Therefore, the viscosity at temperature extremes can be significantly different from the range chosen during the formulation stage. The tack of an ink will also have a decrease as the temperature increases. The following will discuss the affect of temperature on ink performance.

Printing with ink that is at a temperature lower than intended can lead to several different problems. First, delivery from a bulk handling system can become difficult as viscosity increases at lower temperatures. The pumps required to deliver ink within the system are rated for a specific viscosity. A significant increase in viscosity will restrict ink flow and can result in print density fluctuation or starvation because the correct volume of ink can no longer be delivered to press.



Print quality can also suffer as viscosity increases significantly. Ink transfer through the roller train can be impeded resulting in inconsistent or mottled print as seen in **Figure 2.** This affect will be magnified in large printed solids that cover the width of the entire page. An increase in viscosity may also contribute to excessive linting, especially on newsprint that has many loose fibers on the printing surface.

As seen in **Figure 3** an ink with significantly higher viscosity than intended, can contribute to fiber build up on the plates and blankets resulting in poor print quality. High viscosity ink may also lead to problems with runability. A dramatic increase in viscosity can inhibit ink penetration into the newsprint causing ink and fiber build up on turning bars and former boards throughout the press.

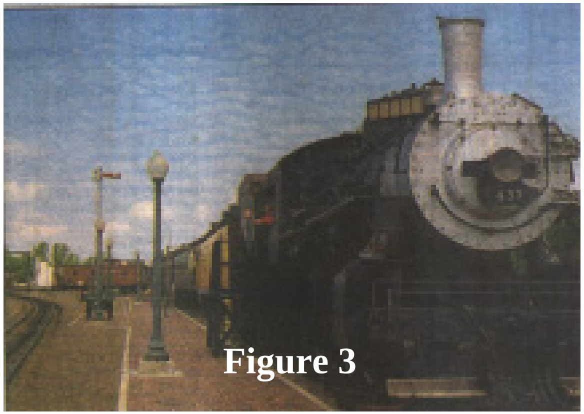


Figure 3

Ink with a low viscosity due to an extremely high temperature can contribute to a separate set of problems. One of the most important relationships within the lithographic process is the compatibility of ink and fountain solution. This relationship is considered by the Ink Chemist during the formulation stage. Extensive laboratory testing is performed to ensure that proper emulsification occurs between ink and the current fountain solution. If ink viscosity is decreased due to dramatically high temperature, over emulsification can occur. Generally, as ink viscosity is decreased an increase in emulsification rate will result. The increase in temperature will cause the fountain solution's conductivity to increase slightly. This increase in conductivity will also increase the emulsification on press. These changes could radically affect the ink and water balance on press.

There are many problems associated with over emulsification. Inconsistent solids, excessive dot gain and interpage set off may occur as a result of over emulsification. If an excessive amount of water is emulsified into the ink film dot spread in the half tones will result in loss of shadow detail and print contrast. In addition, over emulsification inhibits ink absorption into the newsprint contributing to page to page set off.

A common problem in many pressrooms is ink dripping, misting, or spitting. The ink viscosity can be a factor in this. If the temperature varies in the pressroom, these characteristics will also vary from day to day. In many pressrooms where there is no temperature control, ink manufacturers have gone to so-called "winter or summer" formulations. What the ink manufacturer is doing is to increase the viscosity in the summer, so that due to the higher temperatures in the pressroom, the ink dripping or misting will be reduced. Conversely, when the cooler temperatures of the winter months return, the heavier viscosity summer formulations will be too heavy for the press conditions. The ink will tend to back away in the fountain and will be slower to penetrate into the stock. This will result in greater pipe roller buildup and interpage setoff.

The temperature of the ink roller train is a critical measurement. The roller temperature can be measured simply and easily with a pyrometer. This can be a useful tool in diagnosing press problem. If the rollers are too hard or set too tightly, this will increase the friction on a unit. The result would be an increase in the temperature of the train.

The fountain solution is used on press for keeping the non-image area clean, but also plays another important role on press. As a press is running fountain solution backs its way into the ink roller train due to emulsification. The fountain solution acts as a coolant in the process by evaporation. The evaporation of the fountain solution results in a heat loss on press thus cooling the roller train. The impact of not using a fountain solution can be seen on waterless presses. On these presses there is no fountain solution used and special plates are used. The ink train temperature is critical in maintaining good printability. The rollers in the press must be cooled to make the process work, if not the plate would start to print in the non-image area. Therefore the temperature of the fountain solution is critical in maintaining good printability on offset presses. It has been shown that cooling the fountain solution and maintaining a constant temperature help to maintain constant good printing.

Another often-overlooked factor is the delivery cycle of ink. The modern ink manufacturer produces ink in large volume. Batch size generally reaches 18,000 pounds and is transported via truck in 50,000 pound quantities. It is common practice to maintain an elevated temperature of the printing ink while in the tank truck. Increased temperature reduces viscosity and shortens the time required to transfer the ink to the bulk storage tanks present at large metropolitan newspapers. For blacks in particular, temperatures can exceed 120F. Therefore, a fresh batch of ink should be allowed to undergo a cooling process for a reasonable amount of time before printing. This aging process will help avert the problems attributed to high temperature.

All of these factors show that temperature control is an important step in providing consistency in the pressroom. If temperature control is not available, you must work with your supplier to maximize the performance of the product.

Thixotropy

Many fluids exhibit a degree of false or apparent viscosity, which disappears when agitated. This is often known as thixotropy. In fact thixotropy is composed of two main components. These are shear thinning (where the degree that the fluid thins towards its minimum viscosity depends mainly on the AMOUNT of shear applied), and time thinning (where the degree that the fluid thins towards its minimum viscosity depends mainly on the length of TIME that the shear is applied. Both of these phenomena are fully reversible, with the apparent viscosity spontaneously building when the fluid is left undisturbed.

Tinting & Toning


Death Notices

Tinting (sometimes called toning) is caused by contamination of the fountain solution by either ink, or some coloring matter from the ink. Since fountain solution is all over the non-image area, any coloration will be likewise. Tinting is usually very subtle and often difficult to pinpoint. Tinting can be a problem caused either by the ink, by the fountain solution, or by the plate. Check that the fountain solution is to the correct strength, if it is strong, it will be more likely to cause this problem. Ensure the strength is within manufacturer's tolerances.

Has the fountain solution changed? If the strength is correct but the fountain solution HAS CHANGED, possibly to another batch, version, or even supplier then involve the supplier. If the above checks show everything is normal, then the problem may be due either to the plate, or the ink. clue here is whether the process colors ALL tint, if they do then suspect the plates. This however is not definitive since some colors (magenta ?) are often more sensitive and will show up slight defects elsewhere.

To check the plate, clear a small patch using an pencil eraser. If that patch prints cleanly then suspect plate problems. If only one color is problematic, or if everything else is acceptable, then suspect the ink and call in the ink supplier. As a first aid measure and for a SHORT TIME you maybe able to improve the situation by weakening the fountain solution

Type defects

If the problem to be considered is with large headline type, then please refer to the section on defects with SOLIDS areas. Problems with text are fairly uncommon, let's briefly deal with the ones most frequently encountered. In close examination, (preferably using a low power magnifier) is the type matter showing signs of filling in or thickening? This is often a sign of poor ink and water balance, leading particularly to emulsification. As with many print related problems, over inking can lead to filling in and thickening of the type, particularly if it is very fine.

Ensure then that the inking level is as low as is possible consistent with achieving sufficient density, see density for information on reducing ink levels. When running with very fine type matter, consider running with reduced density, providing that the solids and halftones are minimal. If this means the density is below required standard then this has to be weighed up in light of the expected benefits.

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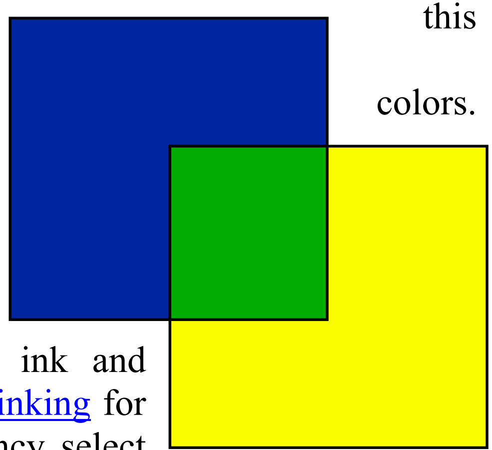
The type matter has ragged edges, this is sometimes referred to as wicking. This can be a consequence of overinking. For notes on reducing film weight select this link. It can also be a consequence of an ink that is badly formulated. For example ink which is too low in viscosity for the application for which it is being used, will tend to migrate sideways from the type area and give the effect described. If this is the case, or the ink shows signs of emulsification or will not run with minimal fountain solution, then call the ink supplier.

Trapping

Process color relies on wet-on-wet printing. The first color down must trap the second, the second must trap the third, and so on. Any color printed down will invariably transfer more efficiently to the paper than on top of a preceding color. For this reason it is important that AT THE POINT OF PRINTING subsequent colors are of equal or lower tack than preceding colors. This will be achievable if the color's tacks are equal when supplied. At the point of printing absorption of preceding colors will increase their tack's sufficiently between impressions, to effectively trap. Poor trapping will lead to color casts, but only on color pairs where the problem occurs. Other colors may be normal. Ensure that the ink and dampening levels are set at a minimum. See dampening or inking for more information. For data on measuring trapping efficiency select Trapping



Trapping

Measurement of trapping is a function available on many modern portable densitometers. If it is available then use it as per manufacturer's instructions. The principle involved is relatively straightforward. Using solid targets on the printed test strip, measure the reflection density of two of the process colors. Measure also the reflection density of their respective overprint target. (When measuring the overprint, ensure the reading is through the filter, which is complimentary to the second color printed down, i.e. the filter, which makes the second color, appear black).

Trapping efficiency T% is given by the following calculation.......

$$T\% = \frac{Dov - D'}{D''} \times 100$$

Where D' is density of first or bottom color

D'' is density of second or top color

Dov is density of overprint apparent trap indicates how well a printed ink film accepts an ink overprinted on it.

US Ink's Press Doctor

Changes in these values throughout a press run can indicate changes in the hue of secondary colors that are critical to good color reproduction. All apparent trap values in the attached assessment were calculated using the Preucil Equation. These values are directly affected by solid ink density, ink/water balance, paper, and press conditions. Typical trap values for overprints on newsprint follow:

	Green	Blue	Red
GATF	80-90%	70-79%	40-59%
SNAP	81%	69%	49%
X-RITE	65%	60%	55%

Note- The reported trap values are only valid for the CMY color sequence. Black can be printed first or last.

Visual problems

The printed copy is not of the required quality. The factors which make it unacceptable are visual as opposed to physical. In order to identify and thus attempt to cure these problems we must closely examine the copy and identify the various symptoms. As is now familiar, please select the link, which best describes what can actually be seen. The first fairly crude classification concerns the area of the copy affected. The problem is visible as print defects of non-image areas? In many cases this will be immediately obvious, The less obvious occurrences and to help you make a choice select definition

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The problem lies with the printed image itself? Again in the majority of cases the defect or problem will be readily visible even though at this stage it may not be recognized for what it is. Hopefully Press Doctor will assist you in identifying both the nature and the possible causes.

UCR

Theoretically, when all the process colors cyan, magenta, and yellow are printed on the same piece of paper, they should absorb all the colors reflected from the surface of the paper and thus create black. However because of the nature of the pigments used, the combination of equal amounts of the three colors is brownish in nature. As a result, the black ink is added to the three colors to compensate for this deficiency. Undercolor removal is the process of reducing yellow, magenta, and cyan dot values wherever black is printed. In other words, areas that are 100% of the four solid colors are reduced to 60% yellow, 60% magenta, 70% cyan, and 70% black. This allows for a total coverage reduction from a 400% ink film to a 260% ink film. This would be described as having 260% UCR. This is an extreme example and is not necessarily real. Most halftone prints would not have this level of coverage. However, the theory would be the same for lower coverage areas with a similar reduction possible. Some advantages of UCR are as follows:

1. **Black brings out better detail and contrast in the photograph than it is possible with the process colors. Black will make the white appear whiter and will add density, resulting in improved contrast in the shadow areas. Higher contrast usually also increases the image sharpness.**

2. **Substantial amounts of the process colors removed from the areas where black is to be printed allows better ink trapping during the run.**

3. **Process colors are more expensive than black. Substituting three process colors with black makes under color removal more economical.**

4. **With UCR, the total deposit of ink on paper is reduced, hence the set off problems are minimized.**

5. **Show through or strike through and pipe roller buildup are reduced because lower-volumes of ink are used. This allows for the use of lighter weight papers.**
6. **Because of the use of black, balancing the other three colors is less critical, especially in the shadow areas.**

See GCR for information of Gray Component replacement

Viscosity

The ink has a carefully balanced rheology. The ink maker will ensure that the flow, tack, and viscosity are all appropriate to the process and substrate in use. For coldset printing on newsprint, the ink must have a combination of low tack and low viscosity. in cases of build-up or set-off in particular, the ink maker may be in a position to reduce the viscosity and tack, without sacrificing other working properties.

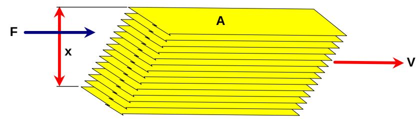
RHEOLOGY

DEFINITION

- Study of Flow and Deformation of Matter

A basic understanding of Rheology, the science dealing with the deformation and flow of matter, is needed to appreciate why this is important to printing inks. Shear Stress, Shear Rate, and Viscosity are the building blocks leading to an understanding of rheology. Viscosity is a measure of a fluid's resistance to flow. When a fluid starts to flow under the action of a force, a shearing stress arises everywhere in that fluid that tends to oppose the motion. As one layer of the fluid moves past an adjacent layer, the fluid's molecules interact so as to transmit momentum from the faster layer to the slower layer tending to resist the relative motion. The intent of this report is to explain the fundamentals of rheology and to acquaint you with the different types of flow behavior.

SHEAR RATE AND STRESS



- Shearing Stress = Force/Area (Newton/Square Meters)
- Shearing Rate = Change in Velocity/Distance (1/Seconds)
- Must Control One of these and Measure the other usually with well defined conditions

The distinguishing feature of a fluid, in contrast to a solid, is the ease with which the fluid may be deformed. If a shearing force, however small, is applied to a fluid, the fluid will move and continue to move as long as the force acts on it. For example, the force of gravity causes water poured from a pitcher to flow; it will continue to flow as long as the pitcher is tilted. If the pitcher is turned back up the flow ceases because the gravitational force is then exactly balanced by the pressure force of the pitcher wall.

Even though a fluid can deform easily under an applied force, the fluid's viscosity creates resistance to this force. Viscosity can be appreciated by visualizing a cube of fluid between two plates as shown in figure 2. If a shearing force (F) is applied to the top plate (A), this plate will move at a specific velocity (V). The layer of fluid immediately below the plate will also move, reaching a velocity almost but not equal to that of the plate. In the same way, each successively lower layer of fluid will move at a velocity less than that of its immediate predecessor so that the last layer is almost motionless. The force applied to the top plate divided by the area (A) of the top plate is defined as shear stress and is typically expressed in units of Newton's per square meter. The velocity gradient or, more commonly, the shear rate is the differential change in velocity divided by the distance between the top and bottom plates and is expressed in units of reciprocal seconds. The viscosity of a fluid is derived from these two properties. Viscosity is defined as the ratio of shear stress to shear rate .

NEWTON'S LAW

- Assumes
  - Only Shear Stress is Generated when a Liquid Flows
  - Stress is Proportional to the Rate (Constant = Viscosity)
  - Stress Appears and Disappears without Time Delay
- Reality (Non-Newtonian Fluids)
  - Other Types of Stress Appear (Normal)
  - Not a Simple Proportionality
  - Time Dependent Phenomena

Sir Isaac Newton was the first to define viscosity by considering the model represented in Figure 2. Newton assumed the force required to maintain a difference in speed was proportional to the difference in speed through a liquid. This simple relationship in fluids for which the shear stress divided by the shear rate which remains equal independent of the shear rate, would be called a Newtonian fluid. As we shall see, Newton was only part right.

What this means in practice is that at a given temperature the viscosity of a Newtonian fluid will remain constant, regardless of the shear rate used to measure it. Typical Newtonian fluids include water and thin motor oils. Newtonian fluids are often pure fluids, not dispersions. Newtonian fluids are the easiest fluids to measure. They are not, unfortunately, as common as the more complex fluids described as non-Newtonian. As we stated before, Newton was only partially right; many fluids can be described as non-Newtonian.

A non-Newtonian fluid is broadly defined as one in which the relationship between the shear stress and shear rate is not a constant In other words, when the shear rate is varied, the shear stress does not vary in the same proportion (or even necessarily in the same direction). The viscosity of such fluids will therefore change as the shear rate is varied. This measured viscosity is called the “apparent viscosity” and is accurate only when explicit experimental parameters are furnished and followed.

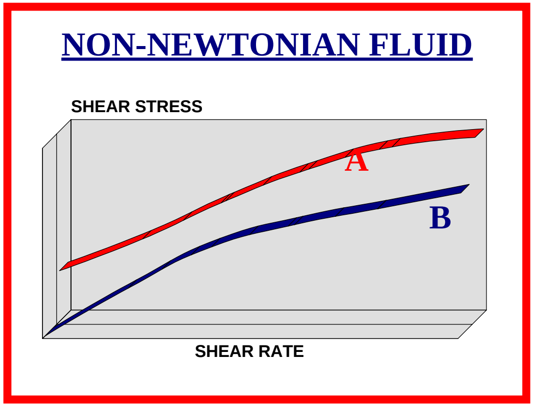
VISCOSITY

- Viscosity = Shear Stress / Shear Rate
- Typically It Is Easier to Define and Control Rate. If Specify Rate, then we measure Stress.
- Viscosity can be thought of as Resistance of Matter to Flow.

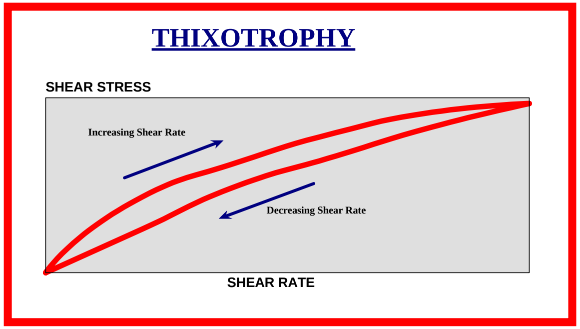
There are several types of non-Newtonian flow behavior, characterized by the way a fluid's viscosity changes in response to variations in shear rate. The most common types of non-Newtonian fluids you may encounter include:

PSEUDO PLASTIC This type of fluid will display a decreasing viscosity with an increasing shear rate, as shown in Figure 8. Probably the most common of the non-Newtonian fluids, pseudo plastics include inks, paints, emulsions, and dispersions of many types. This type of flow behavior is sometimes called "shear-thinning."

DILATANT Increasing viscosity with an increase in shear rate characterizes the dilatant fluid. Although rarer than pseudoplasticity, dilatancy is frequently observed in fluids containing high levels of deflocculated solids, such as clay slurries, candy compounds, corn starch in water, and sand/water mixtures. Dilatancy is also referred to as "shear-thickening" flow behavior. This type of property is almost never found in printing inks.



So far we have only discussed the effect of shear rate on non-Newtonian fluids. What happens when the element of time is considered? This question leads us to the examination of another type of non-Newtonian flow called "thixotropy." Some fluids will display a change in viscosity with time under conditions of constant shear rate.



Thixotropy may occur in combination with any of the previously discussed flow behaviors, or only at certain shear rates. The time element is extremely variable; under conditions of constant shear, some fluids will reach their final viscosity value in a few seconds, while others may take up to several days.

When subjected to varying rates of shear, a thixotropic fluid will react as illustrated in Figure 9. A plot of shear stress versus shear rate was made as the shear rate was increased to a certain value, then immediately decreased to the starting point. Note that the "up" and "down" curves do not coincide. This "hysteresis loop" is caused by the decrease in the fluid's viscosity with increasing time of shearing. Such effects may or may not be reversible. Some thixotropic fluids, if allowed to stand undisturbed for a while, will regain their initial viscosity, while others never will.

Many printing ink formulations exhibit this property, so that the proper balance between setting of the ink film and dripping of the ink can be carefully controlled.

What Affects the Rheological Properties?

Viscosity data often functions as a "window" through which other characteristics of a material may be observed. Viscosity is more easily measured than some of the properties that affect it, making it a valuable tool for material characterization. Having identified a particular rheological behavior in a material, you may wonder what this information implies about its other characteristics.

VISCOSITY DEPENDS ON

- Shear Rate
- Temperature
- Pressure
- Time (History of Shear)
- Physical / Chemical Properties
  - For Ink - Oils, Resins, Pigment, etc.

Shear Rate

Non-Newtonian fluids tend to be the rule rather than the exception in the real world, making an appreciation of the effects of shear rate a necessity for anyone engaged in the practical application of rheological data. It would, for example, be disastrous to try to pump a dilatant fluid through a system, only to have it go solid inside the pump, bringing the whole process to an abrupt halt. While this is an extreme example, the importance of shear rate effects should not be underestimated.

SHEAR RATE LIFE CYCLE

TYPICAL INK

PROCESS	SHEAR RATE	TIME
Storage	0.001 -0.00001	Days
Pumping	1 - 1000	Minutes
Roller Nip	10,000 - 10,000,000	Fraction of Second
Leveling	0.001 - .1	Seconds
Draining	0.1 - 10	Minutes

When a material is to be subjected to a variety of shear rates in processing or use, it is essential to know its viscosity at the projected shear rates. If these are not known, an estimate should be made. Viscosity measurements should then be made at shear rates as close as possible to the estimated values.

It is frequently impossible to approximate projected shear rate values during measurement due to these values falling outside the shear rate range of the Viscometer. In this case it is necessary to make measurements at several shear rates and extrapolate the data to the projected values. This is not the most accurate method for acquiring this information, but it is often the only alternative available, especially when the projected shear rates are very high. In fact, it is always advisable to make viscosity measurements at several shear rates to detect rheological behavior that may have an effect on processing or use.

Temperature

One of the most obvious factors that can have an effect on the rheological behavior of a material is temperature. Some materials are quite sensitive to temperature, and a relatively small variation will result in a significant change in viscosity. Others are relatively insensitive. Consideration of the effect of temperature on viscosity is essential in the evaluation of materials that will be subjected to temperature variations in use or processing. Printing inks are sensitive to temperature, so the temperature must be carefully controlled when measuring rheological properties.

Time

The time elapsed under conditions of shear obviously affects thixotropic materials, but changes in viscosity of many materials can occur over time. Aging phenomena must be considered when selecting and preparing samples for viscosity measurement.

Physical / Chemical Properties

The composition of a material is a determining factor of its viscosity. When this composition is altered, either by changing the proportions of the component substances, or by the addition of other materials, a change in viscosity is very likely. For example, the addition of a solvent to printing inks will lower the viscosity.

As one can see, Rheology is a very complex subject. In the formulation of a printing ink, many different types of viscosity measurements are made to define the proper viscosity profile. Once a formulation has been finalized, defined procedures are followed to properly measure the consistency of the batches produced. If these procedures are not followed, drastically different values for the viscosity of the same ink can be produced. There is no standardized test method for the no-heat printing industry. Each ink manufacture follows their own test methods. Therefore, one cannot compare viscosity measurements from different sources unless the same measurement procedures have been followed.

Web contact pressure

Is the web tension unusually high? Check that this has not been increased either inadvertently, or intentionally in order to compensate for some other occurrence. Preprints may occasionally require extra tension in order to achieve proper "fit”.

Consider also the blankets, and their **underpacking**. Ensure that height-over-bearer, or blanket height is correct, **overpacking** can lead to overfeeding of the web and consequent tension related difficulties. Consider also the press configuration, the length of contact with any pipe rollers is very significant. For example a 180 degree wrap around a compensator roller will be much worse than a 90 or 45 degree or less wraparound a normal pipe roller.

So called bay window leads are often problematic in this area and although probably unavoidable, potential problems should be understood.

VOC - Volatile Organic Compounds

An issue which has come to the forefront of today's discussion is VOC. Questions which are raised are: What are VOC's?, Where do they come from in ink?, What replaces the VOC? VOC, or Volatile Organic Compounds, as defined by EPA, are any volatile organic compounds that participate in atmospheric photochemical reaction.

For the newspaper industry, the EPA has determined that Test Method 24 be used to assess the volatility of inks. The conditions for inks under this test are as follows : three-tenths of a gram of sample is weighed and then dispersed in toluene. The use of toluene is needed to assure a uniform distribution of an ink in the testing dish. The sample is then placed in a forced draft air oven for 1 hour at 110 øC or 230 øF. At the end of 1 hour, the sample is then reweighed to determine the percent loss, or VOC. This procedure was originally developed for paints and does not have the greatest of precision to it, especially when applied to printing inks.

TEST METHOD 24

CONDITIONS

- **Temperature - 110 C**
- **Time - 1 Hour**
- **Sample - .3g Dissolved in Toluene**
- **Oven - Forced Draft Air Type**

A round robin conducted by an ASTM subcommittee showed a reproducibility level as high as 52% in a series of tests they have performed. In looking at the black inks commercially available in today's market, they generally fall into three categories. Standard blacks typically have a volatility from 5 to 10%. Low rub, no rub type inks have 6 to 28%; and low VOC, low rub and soy inks generally have less than 5%. This is a wide range in VOC.

VOC ANALYSIS OF NON-HEATSET INKS USING ASTM D2369

Sample	A	B	C	D
Average % VOC	5.2	15.48	30.73	31.62
Reproducibility as % of the Average	52.3%	46.2%	31.4%	12.9%

To determine what components in an ink cause these VOC, let us examine some typical formulas for a conventional and low rub black ink. In examining these formulas, both contain similar type ingredients: mineral oil, carbon black, varnish, solvent or low viscosity mineral oil, and additives. In comparing a conventional type black ink to a low rub ink, you can see that the varnish level has been increased. In doing this, ink makers have typically raised the levels of low viscosity oils to compensate for the tack and viscosity increase that the additional varnish (resin) causes. In general, the resin and pigment portions are solid materials, which result in low VOC emission, so the major volatility of an ink must come from the oil portion. In examining the oils currently utilized by ink manufacturers, they are broken down into different viscosity grades based on fractional distillation of crude products.

Low viscosity oils have higher volatility. It decreases with the increase in viscosity, however there are exceptions to the rule. If the oil is not properly stripped at the refinery, it would contain higher VOC. So, in creating a low VOC type product, the low viscosity oils must be eliminated from an ink and the oils must be carefully selected from the refinery. As you can see if you change a formula, for any reason, you can potentially affect the VOC of that ink. In standard production of a formulation, adjustments are made to each batch for tack, viscosity, water pick up, and other various physical properties. These adjustments can affect the VOC's of any given formula. So it is important to note that the reported values on a given type of formula are generally the average values.

VOC CONTENT
OF NEWS INK OILS

Component	% VOC's Method 24
Heavy Visc. Mineral Oil	.2 to 4%
Medium Visc. Mineral Oil	3 to 12%
Low Visc. Mineral Oil	50 to 70%
Soy Bean Oil	.2 to 2%

RETENTION FACTOR

EPA is investigating a retention factor in which 95% of the volatiles generated by test method 24 for No Heat Printing to be retained in the web

One issue, which potentially could reduce the concerns for VOC in newspaper inks, is a study that was done by the Control Techniques Guidelines (CTG). This report summarizes the emissions in the offset lithographic process. The information contained in this report shows that for no-heat web offset newspaper applications, 95% of the volatiles produced by Test Method 24 are retained in the web. For example, an ink with 20% VOC, 95% of these volatiles would be retained in the web, or 5% of the total VOC would be emitted to the atmosphere - for a resulting 1% VOC level from this ink. The EPA has announced that they will not be able to issue these guidelines as specified in the Clean Air Act Amendments of 1990, due to budget cut backs and other restraints.

Contact your local Air Protection agency to see if these guidelines can be applied. The VOC's of an ink, as shown above, can vary not only from batch to batch but also greatly with the established test procedure. It is critical to understand, that when applying for air permits that these factors are taken into effect and realize that in checking particular samples for VOC’s can vary from the reported averaged values.

Water Quality For Fountain Solutions

As litho printers become increasingly sophisticated, they realize that the key to improved quality and productivity is to understand the ink/fountain solution interaction, measure the relevant physical parameters and control them.

A. Typical City water salts level are as follows:

	mg/liter or ppm
Aluminum Chloride	0-200
Chromium	0.05 max
Copper	0.5
Fluoride	0.5-1.0
Iron	<1
Phosphorous	0-3
Sulfates	0-100
Hardness (Calcium and Magnesium)	10-300
Silicates	50-100
Total Dissolved Solids	50-500B.

B. Typical salts used in fountain solution formulation:

Salts Role in Lithography

Magnesium	Scratch curing
Chromium	Anchors gum to plate
Phosphates & Citrates	Helps prevent restart scumming
Sulfates	Anti Scumming
Aluminum	Helps in proper phase equilibria
Chloride	Constituent of biocides
Silicates	Anti-tinting

It is apparent by comparing tables A and B, which several salts used in typical fountain solution formulations are naturally occurring in untreated water. This should be taken into account when reformulating etches for water treated by one of the processes described in water treatment.

It is imperative that a printer who installs a water treatment system of any sort, inform his fountain solution and ink supplier so that printing performance does not suffer.

See reasons for water treatment for additional information

Reasons for Water Treatment:

The following are several reasons one might want to consider a type of water treatment.

High Hardness Level:

Hardness levels exceeding 200 ppm of calcium generally lead to formation of calcium soaps in conjunction with the resins used in ink, or salts like calcium citrate and calcium phosphates, by combining with the acids found in fountain solution. Calcium soaps, because of their oil loving nature, lead to deposits of ink in unwanted areas such as water form rollers, molten covered rollers, etc. Calcium salts, because of their water loving nature prevent ink transfer and leads to stripping on ink rollers. Therefore, if a printing plant experiences the above mentioned problems especially if present in all colors, water treatment is highly recommended.

Fluctuations in Conductivity of Incoming Water:

The dynamic surface tension of fountain solution depends on the concentration of the etch used. The higher the concentration, the lower the surface tension. Some commercial automated feed units control the concentration of the etch to a preset conductivity. Large fluctuations in incoming water conductivity would lead to variations in etch concentration, which leads to changes in dynamic surface tension, resulting in changes in ink/fountain solution ratio, creating lithographic problems. If the feed rate of the etch is accurately volumetrically controlled as it is in other units, this is not as serious a problem. However, severe fluctuation of water supply conductivity can still cause variations in fountain solution ink interactions and treatment may be indicated.

Multi plant Customers:

Customers having plants in several cities, who wish to standardize their ink and fountain solution generally prefer to have zero conductivity for incoming water and the etch reformulated accordingly.

Select treatment for an explanation of the major type of water treatment types.

Water Treatment Processes

There are many water treatment processes available, such as distillation, softening, deionzation, or reverse osmosis. Select a particular link for further information when a plant experiences lithographic problems due to water quality, some form of water treatment is indicated. The choice of the treatment process is governed ultimately by the economics and the applicability of the treatment process in solving the particular problems being encountered. trial period of use with the selected treatment method and optimized fountain solutions and ink formulations is highly recommended to assure good performance in any given pressroom with the new water source.

Fundamentals of Water Softening:

Water is a very complex fluid. It contains a little bit of practically everything it contacts; the air while falling as rain, the earth as if percolates into the ground, the piping as it is transported and all kinds of organic and inorganic matter it may contact in its series of uses. Dissolved minerals in water that contain an electric charge are called ions. These ions can be either positive or negatively charged with electrons.

The positive ions are called cations and the negative ions are called anions. It is these positive cations in the form of calcium, magnesium, iron and manganese that cause the hardness that is associated with water. Substitution of these hardness ions via cation exchange is the process used for softening water. The ion exchange process requires a resin tank and a brine is sent into the mineral tank and washes over the resin in the mineral tank. Since the resin has a salt splitting capability and a cation accepting characteristic, sodium ions of the sodium chloride (brine) solution are attracted to the resin beads. This is called the regeneration process and it will continue until most of the exchange sites have been occupied with the sodium ions.

As the complex raw water enters the tank the positive hardness ions exchange on the resin and displace the sodium ions to the service stream. Because calcium and magnesium are positive cations, they repel other positive cations. The resin, being charged with positive sodium ions, will exchange with the calcium and magnesium ions. Calcium and magnesium will now occupy the exchange sites on the resin beads.

This process will continue for a length of time until the hardness ions begin to leak out the bottom of the resin bed. For all practical purpose, the resin is exhausted with calcium and magnesium and has no more sodium available to displace. This is the point where the softener must be regenerated. This softening is an exchange process and does not lower the conductivity of the water

.

Deionization Process

Deionization is the process of removing the dissolved ionized solids from water by ion exchange. The major portion of total dissolved solids is mineral salts, such as calcium bicarbonate, magnesium sulfate, and sodium chloride. Mineral salts consist of cations and anions. Since deionization requires the removal of all ions, both negatively charged anions and the positively charged cations, materials capable of attracting both are required. These materials are known as cation exchange resins and anion exchange resins.

Deionizers are fixed bed systems in which the ion exchange resins are contained in pressure tanks, and the water to be deionized is forced through the resins. The cation and anion exchange resins have a specific capacity to remove a known amount of ionizable solids. After a service run, the resins become exhausted, and are unable to remove additional ions. When the resins are exhausted, they must be regenerated with a strong acid and a strong base restore their ion exchange capacity. cation resin is typically regenerated with hydrochloric or sulfuric acid. Anion resin is normally regenerated with sodium hydroxide, although potassium hydroxide can be used under certain circumstances.

Two-bed model deionizers have two separate resin containing vessels, the first being cation unit followed by an anion unit. Cation resin in the hydrogen form (as it will be after regeneration with a strong acid) collects all of the positively charged cations such as calcium, magnesium, sodium and potassium, and exchanges them for hydrogen. The discharge from the cation tank is very low pH because the hydrogen combines with the negatively charged anion in the water to form acids, such as hydrochloric, sulfuric and nitric. There will be a small amount of sodium, which will not be exchanged, and the sodium "leakage" will determine the final water quality. Two types of two-bed units are available. Strong base anion resin units remove all anions including silica and carbon dioxide. They typically produce a deionized water with a pH greater than 7, and the amount of silica remaining is usually less than 0.2 ppm. Weak base anion units are used when removal of silica and carbon dioxide are not required. Weak base anion resin has a higher capacity at lower regeneration consumption. Since they do not remove carbon dioxide, they typically produce deionized water with a pH lower than 7.

Mixed bed units contain intimately mixed cation and anion resin in a predetermined ratio that produces extremely high quality water. Silica removal and cation dioxide removal are usually accomplished by the use of strong boxes resins. Mixed bed unit pH is typically 7.0 before the water is exposed to the atmosphere, because of the almost complete deionization that occurs. The quality or degree of deionization is generally expressed in terms of specific resistance (ohms) or specific conductance (mhos). Ionized material in water wheel conduct electricity. The more ions, the more conductivity and the less resistance. When ions are removed, conductivity decreases, and therefore, the water quality is purer.

Reverse Osmosis Process:

Reverse osmosis, as a form of water treatment, is a newer technology. The first membrane was developed in 1958. In the years following, membrane technology has grown a great deal and will continue to grow in the future. In fact, some of the membranes that are currently in use maybe obsolete in the future, in favor of some new membrane material that is more resistant to a particular fouling contaminant.

The reverse osmosis membrane is used for various applications from precious metal reclamation, to chemical reclamation, to food processing, nuclear waste reclamation, laboratory water purification, etc.. We will limit our discussion to water purification and its applications. To fully understand the technology of reverse osmosis, one must first understand the concept of normal osmosis. Simply put, in normal osmosis, water flows from a less concentrated solution through a semi-permeable membrane, to a more concentrated solution.

Reverse osmosis utilizes pressure to reverse normal osmotic flow, thus in reverse osmosis, water flows from a more concentrated solution across a semi-permeable membrane to a less concentrated solution. The mechanism employed by the membrane to remove particular contaminants relies on a combination of reactions. There is a thin porous layer on the surface of the membrane, which contains a multitude of micro pores. Due to the physio-chemical interaction between the solution and the membrane, salts are rejected and only water passes through the membrane.

Organics are removed dependent on their size. In most cases, this is dependent on the molecular weight of the organic molecule. The feed water to the reverse osmosis system flows over the surface of the membrane. The pressure forces a percentage of the water through the membrane, while the remaining water, heavy in contaminants, is flushed to reject. the movement of the water through the membrane is constantly cleaning the surface of the membrane, preventing the build-up of contaminants that could potentially damage the membrane. Reverse osmosis is a percent removal technology.

A typical reverse osmosis system rejects 90-95% of the impurities found in most potable water supplies. Because it only removes a percentage of the contaminants in a given water supply, it is impractical to predict the purity of water by this technology. Due to the mode of purification, certain contaminants are removed more effectively than others. Polyvalent ions have better removal capabilities than others. Polyvalent ions have better removal capabilities than monovalent ions. Large molecular weight organics (greater than 200) are effectively removed where smaller organics pass through the membrane. Gases readily pass through the reverse osmosis system and can affect the purity of the product water. Because of the relatively large size of bacteria and pyrogens, reverse osmosis effectively removes this class of impurities.

Due to the removal capabilities of reverse osmosis, one of its uses in water treatment is the pretreatment of water being fed to a deionizer. Depending on the membrane material, certain factors will affect quality and quantity of reverse osmosis water. Currently, there are three different membrane materials that comprise the vast majority of membranes used for matter purification. Cellulose acetate is the type of membrane material that has been available for the longest period. The second type is polyamide, and the third and most recent material, is a thin film composite. Each membrane has certain feed water requirements that must be adhered to if normal membrane life is expected. The factors that most often affect membrane material are as follows: pH, temperature, bacteria, free chlorine, and langlier saturation index.

Most of the factors listed above should be easily understood with the exception of langlier saturation index. This is the measure of the scaling tendency of a particular water source. In most cases, langlier index is calculated and considered positive or negative. When calculating the langlier index, certain feed water components must be measured.

They are as follows: water temperature, total ionized solids, calcium hardness, alkalinity, and pH. If the index is positive, the feed water is considered to show a high potential for scaling and subsequent membrane damage. If this is the case, pretreatment is warranted. There are many feed water contaminants that can affect reverse osmosis membranes, such as silica and iron, but the previously listed five classes constitute the majority. Resulting from the feed water limitations of reverse osmosis membrane materials, a percentage of the systems require some form of pretreatment to maximize the useful life of the membrane.

The most common form of pretreatment is softening. By exchanging the hardness ions in a particular water supply with sodium, the scaling tendencies of water are reduced, thus correcting for a positive langlier index. If pH adjustment is required to correct for a high feed water pH, then acid injection is warranted. Normally sulfuric acid is injected into the incoming water stream in a metered amount to affect the needed pH change. This is normally accomplished by converting alkalinity to carbondioxide. Bacteria affects some membrane materials and others are resistant. Cellulose acetate membranes are affected by the presence of bacteria.

If a water supply is not sufficiently chlorinated to prevent bacterial damage, then chlorine must be added. Certain membranes are not affected by bacteria but cannot tolerate the presence of any oxidizing agents. If this is the case, then incoming water must be treated to remove the potentially damaging component. Carbon is most often used for pretreatment. While carbon is effective at removing chlorine, it may not remove other oxidizing agents that may be present. For this reason, sodium bisulfate injection is often used in place of carbon.

US Ink's Press Doctor

Quality Newspaper Reproduction Guide

Prepared by the Operations Work Group of The NAA Color Quality Task Force

US Ink's Press Doctor

1.Overview

Getting Quality Newspaper reproduction of color or black and white materials is a collaborative effort. It requires attention to detail and maintenance of standards from the moment the ad is conceived until it comes off the press.

This document is designed to provide useful guidelines for advertisers and newspapers as they strive to reach their common goal - better reproduction on a consistent basis. While many industry observers decry the lack of good quality reproduction, a great number of newspapers both in the United States and around the world prove, on a daily basis, that newspaper advertising does not have to mean substandard quality. The NAA Quality Color Task force is committed to helping the industry insure that advertising placed in newspapers meets the same standards as other media and that advertisers can expect consistent quality in every newspaper.

The potential for quality reproduction improves as the technology changes. The NAA and other organizations are constantly evaluating new systems, hardware and software to test their application for the industry. Advances in printing presses, platemaking, chemicals, prepress software are just some of the areas where the NAA is evaluating products to see if they can help in the search for better quality.

This reports attempts to address both the needs of the high-end users who run 4-color ads on a regular basis and the newcomer who is faced with the daunting task of placing an ad for a new demanding client. While we recognize the rapid advance of technology we have tried to put together a document which can also be used by employees at publications who may not have the same financial resources as a major metropolitan daily but still are expected to reproduce the same ad.

We begin with newspaper basics - a primer on how most newspapers are printed and move through every step of the reproduction process including creation, layout and design of the artwork. The committee has attempted to review both digital and traditional workflows, and has tried to look at the most current technologies available from color profiles to pre-flighting.

Throughout the review, there are a number of constants that have become obvious. The most important factor is the willingness of both the advertiser and newspaper to commit the time and effort necessary to insure quality. This means making sure employees are properly trained and that training is updated, and that once standards are established they are followed.

The process begins with the ad creation where agencies and pre press firms must understand the capabilities of the newspaper media. For example, it makes no sense to create an ad using a Pantone© color, which is outside the limits that a newspaper can reproduce. While this may appear obvious, it is a common problem which newspaper production managers face every day.

At the same time newspapers that receive good materials whether they are traditional or digital, cannot simply fall back on the phrase "I printed what I got." Especially if they pay no attention to calibration and standards at the camera or platemaking steps. The number of forms and iterations that an advertisement takes as it moves from concept to print is tremendous. Failure to maintain standards at any junction can ruin in final product and have a cascading affect where a small miscue early in the process becomes a major problem further down the road.

Proofing is a good example. An agency will frequently send materials either digital or traditional and expect that their proof on glossy white stock and a 133-line screen is a good target for their newspapers. Newsprint is not glossy; it absorbs much more ink, and is seldom white. In fact, many times it is seldom consistent from roll to roll at individual newspapers. Lines screens over 85 may look good to an ad agency's client but they will not reproduce the same where reproduced at the line screen the newspaper uses.

The use of calibration, proofing, profiles ink densities and a host of other factors are major components of this report. We believe that the standards outlined here have worked for many of the best examples of quality newspaper reproduction and that if they are followed will result in better reproduction at every newspaper. Our goal is to provide a document that everyone can use and understand and to ultimately encourage more advertisers to use the industry to get their message to the public.

Layout

The design of a newspaper advertisement is critical to its ability to communicate effectively. Your advertisement must be able to arrest the attention and interest of people scanning the newspaper's pages at a rate of seconds per page.

The basic elements of any advertisement are space, copy and art. The illustrations you select should serve to both attract attention and inform the reader. The copy further explains the message, and the space provides the environment in which that message is presented.

Within the space, the layout must take into account the average reader's tendency to start reading at the top of an advertisement or page, and then scan diagonally downwards from left to right. The elements of an advertisement are best placed so as to take advantage of this tendency. Too many breaks in the expected flow of reading may be enough to distract readers and move them away from the advertisement.

DESIGN CONSIDERATIONS

Newspapers provide an excellent medium for reaching a variety of markets. While different advertising formats appeal to different markets, there are some general concepts for newspaper advertising which help positively impact readers with quality reproduction.

Simple design and layout considerations can improve print quality perception. Effective use of white space (non-image) and strategic placement can increase cleanliness and desirability of an ad.

WHITE SPACE (NON-IMAGE)

White space is probably the most underestimated and under used element in newspaper advertising. Regardless of the ad size, format and whether it is color or black/white, white space effectively captures the reader’s attention and interest. Not only does open space focus the reader'’ attention on the copy and art, it also helps to increase the perception of overall contrast, cleanliness and image quality.

DOUBLE TRUCK

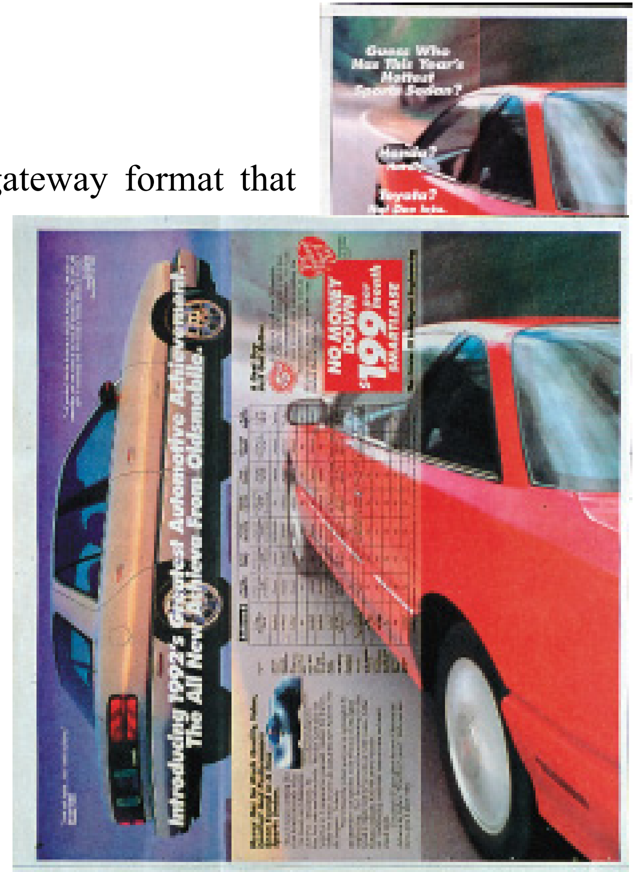
One of the main advantages of a double page ad versus two single pages, is the capability to bleed through the center margin. However, mechanical press paper controls (nips and trolleys) which are necessary to hold and guide the paper through the press, can result in undesirable markings through the center margin. It is not possible to completely eliminate these markings.

Therefore, we recommend avoiding the placement of important images (i.e. logos) in the center fold, especially if they require a large amount of ink. The mechanical devices will not only track through the image, but cause it to set-off on the facing page.

For broadsheet double page ads, the standard image size is 26¾” across the page. Limiting the image area to 26½” will allow for the mechanical trolleys to run in the non-image area, thus eliminating unwanted markings on the left and right edges of the page. For tabloid double page ads, it is recommended that the regular height of 13” be reduced to 12¾” to eliminate these mechanical markings.

Positioning is a critical factor when working with color images. It is not recommended to have a heavily inked image on one page, with a light image mirroring it on the facing page.

This may cause ink set-off or smearing from one page to the next.



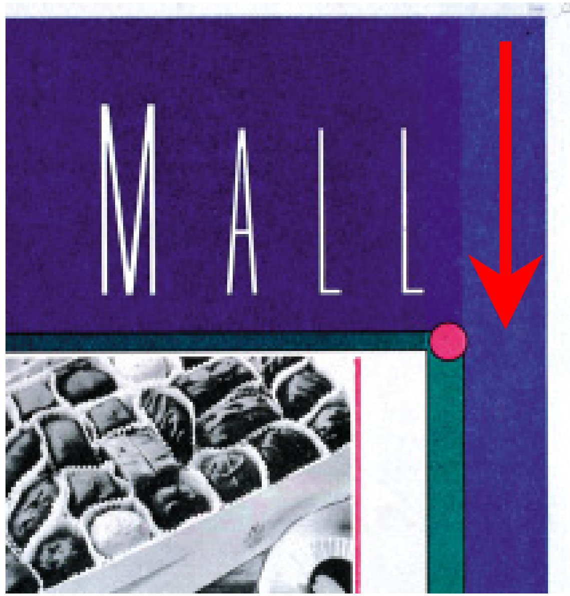
GATEWAY

Some newspapers provide the option to run a gateway format that offer the advertiser a unique way to deliver their message.

A gateway is an advertising product that is two or three columns wider than a single six column page. The excess width is folded from the gutter toward the outside edge of the page, creating a flap with its hinge at the gutter fold.

One of the most important aspects of a gateway ad, which determines its success or failure, is that it built to the proper layout dimensions. This is especially important if an image is to bleed off the front page. To minimize ink set-off and mechanical markings, the same considerations for double page ads apply.

INK STARVATION



Certain layout formats contribute to non-uniform ink distribution, commonly referred to as ink starvation. When a solid, tint, or halftone is followed by or adjacent to a heavily inked bimage in the same inking zone, there is potential for a noticeable appearance of uneven ink laydown.

Borders, in particular, are especially prone to ink starvation. It would be best not to use continuous solid, borders around the perimeter of an ad. However, if a border is desired, lighter screen values are recommended.

Preliminary sketch

A small, simple sketch of the original concept is the best way to start designing an ad. Sometimes a series of these quickly prepared thumbnail drawings are used to compare various ideas.

Rough

The rough layout is a full-size drawing that presents a reasonably accurate guide to the size and position of all the elements of the finished advertisement. The layout can often be okayed in rough. Many ads go to the newspaper composing room at this stage, with specifications for typefaces and sizes of elements indicated on the rough, and copy and illustrations attached.

Comp

The comprehensive or comp is a fine-tuned version of the rough. Its purpose is to give a very precise idea of the finished ad, but without actually setting type or producing other elements.

Comps may be prepared for clients or others who have to okay an ad layout. Often no comp is needed.

Once the layout and copy have been okayed, art and type are prepared.

Paste-up

Advertising materials may be delivered to the newspaper ready to go directly to the process camera—a camera-ready mechanical or final paste-up. More commonly, advertising materials are delivered together with instructions the newspaper production staff is to follow in making the materials camera-ready.

General guidelines for the mechanical

The mechanical must be meticulously clean, since any stray bits of paste-up wax or rubber cement will show up on the negative. Try not to write instructions in the image area. If it’s unavoidable, use a very soft, light-blue non-reproducing pen or pencil—a blue that is invisible to the process camera.

Mechanicals should be prepared on a substantial base such as illustration board or a heavy grade of grid paper that will not bend easily. If elements are pasted down on flexible paper, they will have a tendency to pop off during handling.

All typeset copy should be of equal density. The recommended density range is from 1.4 to 1.8.

Elements should be carefully positioned, using gridlines or T-squares to guide alignment. The widely used hot-wax system of affixing elements makes repositioning easy. Cellophane tape should never be used to secure type or art copy.

Waxed elements should be rolled down after they have been positioned to fix them firmly in place. Use minimal amounts of wax or glue and keep the roller clean, so that there is no excess adhesive on the surface of the paste-up.

Indicate all instructions for reverses, tint blocks or art on the base or on a tissue overlay. Any instructions written on the base material should be put in the borders, using a non-reproducing pen or pencil. When a tissue overlay is used, areas to be in reverse should be shaded in red, and areas to be tinted should be shaded in blue, with the proper percentage screen indicated.

Prepare individual acetate overlays for each color to be used. Include all special instructions for that color—screens, tints, rules, photos—on the overlay. Place at least three register marks on the base art and on each overlay.

Camera-ready mechanical

A camera-ready mechanical or paste-up is ready to be photographed as part of the negative for the newspaper page on which the ad will appear.

It is a representation of a complete newspaper advertisement on which all typeset copy and illustrations have been fixed into exact position. The photographs have already been screened, and the mechanical may include a pre-screened positive print of a photograph. Any tint blocks and reverses have been positioned.

Mechanical

The more common practice is to have the actual reproduction copy for type and other line elements pasted down, but the space for continuous-tone illustrations indicated with a photostat marked "for position only".

At the newspaper, halftones of the photographs are shot separately and stripped into the mechanical or the finished negative.

Artwork

Artwork can be divided into three general categories: line drawings, continuous-tone drawings and photography.

The choice of the type of art to be used for a particular ad is largely an aesthetic one, but be aware of the limitations of the different art media. For example, a black or dark-colored product may not hold detail in a small photograph, and might be better illustrated with line art or a continuous-tone illustration.

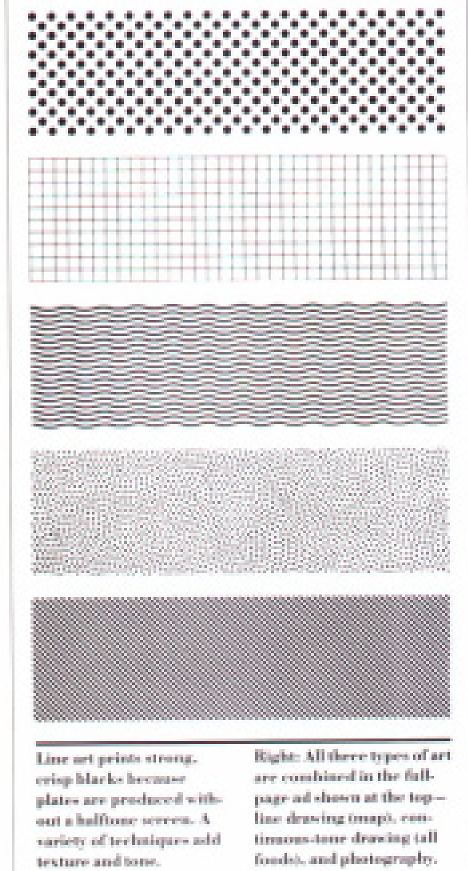
Line art

The simplest artwork to reproduce in a newspaper is line art. A piece of line art is either black, where the artist has produced lines or dots, or white, where no ink has been put down.

Line art has a limited range of tonal variations, simulated through the use of various techniques:
Patterns pre-printed on transparent sheets.
Dot information produced by the artist with a fine point pen or pencil.
Textured board used with a pen, pencil or dry brush. Textured boards have the advantage of precise tonal control in adjacent areas.

The line drawing simulates tonal variation by using solid black lines spaced close together for darker tones, and farther apart to give the appearance of lighter tones.

Give the artist the exact reproduction size of the drawing--its final size in the printed advertisement. For the best reproduction, the original drawing should be made to the final size or as near to it as is practicable. Reducing a drawing too much causes unacceptable loss of detail, as fine lines fade and



narrow spaces fill in; and enlarging a drawing too much exaggerates imperfections.

Make sure line art is dark enough. Areas where the ink is not sufficiently black and dense will tend to drop out.

Continuous-tone art

Continuous-tone artwork contains a wide range of tonal values, from white through the increasingly dark gray of black-and-white art or through the many hues in color, to black. It is similar in range to the photograph or color transparency.

Wash drawings must have good contrast between adjacent areas—about a 15% to 20% difference in tone values. The gray scale reproduced here illustrates a good choice of tones: 0, 20%, 40%, 60%, 80%, 100%.

Very light backgrounds often print poorly. Vignettes especially are troublesome. The soft edges harden and blacken during the process of newspaper printing and lose the fade-out effect. It is much better to eliminate them altogether.

Typography

The right typeface will help create the mood and atmosphere you want in your advertising message. A soft, delicate typeface that’s a good choice for copy selling lingerie or flowers tends to be a bad choice for copy describing heavy machinery. The bold, heavy typeface that suits the machinery is probably wrong for the lingerie.

Typefaces in newspaper ads should also be chosen for their ability to reproduce well in the newspaper printing process. Sans serif faces and faces with uniform thickness throughout the letter reproduce better than type with delicate lines or serifs.

Choose typefaces that are easy to read; the reader shouldn’t have to make an effort to understand your message. Ornate faces should be used sparingly. A good rule is to limit them to headlines.

Avoid setting body copy or long headlines in all capitals; lower case words are easier to read. Condensed typefaces can also be troublesome for a reader.

Limit copy to three different typefaces in your ad. Too many faces can result in a jumbled look and confuse or distract the reader. An alternative to changing typefaces is to change the point size, style or weight of the face you are using. The Helvetica typefaces available, for example, may include sizes from 6 to 24 points; in light, medium or bold; in roman, italic, condensed, or expanded.

As a rule of thumb, choose the largest typeface you can use without creating a crowded feeling in the ad. Overcrowding cuts down the readability of the ad.

Too small a typeface can fill in during the printing process. Type smaller than 6-point should be avoided. Display ads should rarely go below 8-point.

Check the type repros carefully for broken letters and any spacing problems.

A word about proofing type: The graphics or production person should always make sure that a person with copy responsibility checks the typeproof for errors that may creep into copy. Nothing looks quite as bad as a typo or a misspelled word in an advertisement. It diminishes the credibility of the advertiser.

TYPE FACES

Sans serif type faces are the best choice for newsprint reproduction. They easily reproduce with desired clarity and readability. Type faces with thin or delicate serifs and strokes, and non-uniform character thickness, should be avoided. Extremely fine strokes can drop out in the conversion process, while thick strokes can fill-in on press.

Type is 6 points
Type is 8 points
Type is 10 points
Type is 12 points
Type is 14 points

For clarity and readability, we recommend using type sized at 7 points or above into our advertising design. Because of the ink and newsprint relationship, small type tends to lose definition on press.

SURPRINTED TYPE

For optimum results, it is suggested that type not overprint a background screen (tint or ghosted images) greater than 25%. This allows for dot gain and provides necessary contrast between text matter and the background image.

REVERSE TYPE

Type is 4 points
Type is 6 points
Type is 8 points
Type is 10 points
Type is 12 points
Type is 14 points

When utilizing reverse type, be aware that some type styles with delicate serifs and fine strokes tend not to reproduce well. Thin strokes usually fill with ink when reversed. Incorporating reverse type which is less than 10 points is not recommended. Text reversed out of a 4-color image area should be 12 points or greater in size. This allows for slight variances in register, while maximizing legibility.

For contrast and readability, reverse type should not be positioned within screened areas containing less than a 70% screen, nor in a yellow or other light colored background.

SCREENED TEXT

Reproducing text matter as a screen percentage of a solid can be successfully achieved on newsprint. For best results, avoid screening type styles with a fine to medium weight and those with serifs. As a general rule, text screened at 80% or more will reproduce as solid. For legibility reasons, consideration should be given when attempting to reproduce type as a light screen tint.

COLOR/CONTRAST IMPORTANCE

For best results, black original linework is recommended. This provides optimum clarity and contrast in reproduction. Linework produced using colors other than black often reproduces with low contrast. Many colors are difficult to convert into a dense black, which is necessary for optimum linework reproduction.

Red type on a black background is considered to be poor copy for linework. Many scanner and camera optics used for line art reproduction see red as black. Therefore, the total distinctions between images are greatly minimized.

Light original material (i.e. charcoal and pencil drawings) is also not recommended for linework reproduction. Assuming the intent is to maintain a pure white background, the lighter tonal values are difficult to reproduce. Images that lack contrast and sharpness, or are not dense enough, tend to disappear in the reproduction process.

SIZE

Material submitted in its final size dimensions will reproduce best. Enlarging and/or reducing images too much causes a loss in detail. Enlarging material to a great extent exaggerates imperfections. Reducing causes small spaces or openings to fill-in and fine lines may fade. It is especially important that pre-screened material be submitted in final size dimensions.

Gray bars

Gray bars should be used by printers to make sure they have their ink levels and gray balance is set correctly. Traditionally press operators have relied on their own estimation of correct color and since color can be very subjected it has resulted in many inconsistencies. If gray bars are used and the colors of Cyan, Magenta, and Yellow are set to the correct specifications the images on the printed page should reflect the intention of the advertiser if they were created correctly.

The use of a gray bar establishes dual accountability in the reproduction process. The press room is responsible for maintaining even gray bar densities across the page and the advertisement material supplier is accountable to follow the specifications contained in this document.

When the three process colors are printed in the proper ratio, a shade of gray is produced. A gray bar is the proper screening of the three process colors to obtain the desired level of grayness. Cyan is always the highest screen in a gray bar because of the inherent impurities in the pigments that are used in the process inks. Some examples of typical gray screening combinations are indicated in the table below.

SHADE OF GRAY	PERCENT SCREEN AREA		
	CYAN	MAGENTA	YELLOW
Midtone	40	30	30
Quartertone	25	18	18


EVENTS

Icing on the Cake

Raga Time

Archie's Play

Picasso's Last Stand

INSIDE

Caruso's Return

Emmy Awards

What Percent Screen Area Should My Newspaper Use?

The use of a gray bar in the newspaper must be transparent to the reader and advertiser. It should not detract from the reproduction on the page where it is used. A test form (such as SNAP, GATF, or NAA) should be run on the press that includes two gray bars so that the editorial department will have samples to look at and can make a decision on which gray bar screening is acceptable to them. Many newspapers have gone to the quartertone gray bars. It is felt that the quartertone gray bar is more sensitive to variation by the eye, yet still yields high enough density readings to be considered accurate (by the densitometer.) During this test run the solid ink densities are set to industry specifications such as SNAP, GATF, NAA.

Dot gain is determined from this run so that proper compensation can be made in the prepress

area. The dot gain is very critical to the proper use of the gray bar. (See Section on Dot Gain for greater detail on this topic) If dot gain increases, color saturation decreases at the same density specifications. What this means is if the dot gain increases, a higher density would be apparent in the gray bar if the solid ink density was set correctly. If the density of the gray bar is reduced to standard levels, in actuality the solid ink density levels will be reduced. Uniform gray balance is often times more critical then the solid ink density.

Once the gray bar is selected from the test form, the reflection densitometer density specifications for the selected gray bar can be determined by reading the gray bar in the same column where the solid ink densities are in specification. Some examples of density specifications for various gray bar screenings are listed in the table below:

Offset 3-C Gray Balance				Black Tint Equivalent	Aim Density of Three-Color Patch
C	**M**	**Y**	**K**	**K**	
25 %	18%	18%	0%	25% (Quartertone)	0.52 +/- 0.05
40 %	30%	30%	0%	50% (Midtone)	0.65 +/- 0.05

Note: The densities of all three colors should be within +/- .02. If low all should be low, if high all high.

It should be noted that density values above should be used only as a guide because they are dependent on the dot gains for each color on the press. The aim densities for your press should be established through the use of test forms.

Gray bars and color bar targets should be large enough to permit measurement. A target height/width or diameter of 3/8" is recommended so that proper measurements can be made. Gray bar targets do not need to be continuous and can be creatively designed across the width of the page.

Screen Ruling

The industry standard for halftone reproduction is 85 lines per inch (lpi). However, a finer screen ruling, up to 120 lpi for web offset, may be considered if it could improve image quality. A finer screen ruling minimizes the appearance of halftone dots and could provide greater detail, print smoothness, and overall perception of a continuous tone image. Because a higher screen ruling can lead to plugging in the shadow areas, it is important that the midtones and three-quarter tones be opened an additional 5-15% to allow for dot gain.

Don't ask the newspaper to use art material at its final size that already contains a too-fine screen, such as a 120- or 133-screen made for use on magazine stock. When a finer screen than the one a paper specifies is used, there is a tendency for the ink to connect adjoining dots. This results in muddy or plugged-up printing, with loss of detail in shadow areas.

You should consult with the newspaper and find out what line screen they use before submitting final materials. In most cases, they will only be able to use a single line screen value. In addition, for proofing purposes you should view you finished documents at the same line screen that the newspaper will use.

In the digital world, many files sent to newspapers contain no line screen information. For example, PDF files contain only enough digital data to permit reproduction up to about 133-line screen. Data that is not needed when the file is output is simply discarded. Re-screening pre-screened material with the newspaper screen is a bad idea, too: much detail is lost and a moiré pattern is often created.

Space

An effective advertisement must have enough space to communicate its message. “Extra” white space that eliminates crowding can go a long way toward capturing interest and promoting effective communication.

It is best to try to feature a few items rather than include everything. If many items must be mentioned, select one for major emphasis. This dominant element will attract the reader and lead to more complete reading of the entire message.

An ad that surrounds a body of copy with white space attracts more viewers than one that has copy running from border to border. Blank space focuses the reader’s attention on the copy and/or art.

Copy

This section deals with copy as an element in the layout. See also the separate section on typography.

In the copy block of an ad, the lines of type are usually set flush left—that is, with each line beginning directly under the preceding line—so as to take advantage of the natural left-to-right reading pattern of our culture. The right margin can be left ragged or set flush, depending on the image the advertiser is seeking to promote. The flush-right style is the more formal looking.

Runaround or wraparound is a popular technique in which the typeset copy is fitted around the shape of the art. Be alert for the point at which runaround type may impair readability.

Think twice before using a reverse (white type or artwork dropped out of a solid black or toned background) and before using overprinting type on a gray tone background. If you do choose one of these methods, use a limited amount of copy. Choose a strong sans serif typeface of 12 points or larger, adequately spaced, and preferably, all caps. Small type in a reverse tends to fill in with ink when printed.

Overprinting on a screen tone such as benday will attract reader attention, provided that the screen background is not too coarse and the type is bold enough to be easily read. Keep the screened background light—no more than a 25 to 30% tone screen. Here, too, use a strong type of 12-point size or larger. Don't use a reverse illustration or type with a light screen.

Every advertiser should have a distinctive logo, incorporating such standard information as the business's name, location and telephone number. The logo tells the reader where the advertised goods or services can be bought, and at the same time, it builds recognition for future advertising.

Art

Illustrations guide the reader to the copy. Ideally, lines within the artwork lead the reader's eyes to the message. These major lines, called lines of force, are important guides and can make or break an advertisement.

Make use of the fact that the reader tends to look in the direction in which the model, car or other subject is looking or moving. A model looking toward the copy block takes the reader to it. A model looking out of the ad space may move the reader's eyes away from the ad.

Color Selection (NAA Color Book)

NAA specifies ink sets for the various newspaper printing processes. These inks conform to strength and shade standards established by NAA. Currently Volume 8 edition of the NAA color book is available. The recommendations are as follows:

Offset	Flexography	Letterpress
AD-LITHO®	NAA AD/FLEX™	AdPro®

Inks conforming to NAA specifications are made using the following pigments:

Cyan	Phthalocyanine blue (green shade)
Magenta	Rubine red
Yellow	Diarylide yellow
Black	Furnace black (blue shade)

Photography

Digital

Digital photography has become an integral part of many ad preparation work flows. Digital cameras are now available in studio models for high resolution product and fashion work, in 35 models for deadlines news and sports photography, and as consumer models designed for at home use. All three when used in the proper setting can produce useable results.

The key element in the digital camera is the CCD (charged coupled device display) which translates directly into input resolution and image quality. For studio work when lighting can be controlled and image scaling is a primary concern the studio cameras can provide results that identical with traditional methods. The 35mm units manufactured by several vendors and sold by resellers the CCD display produces a lower resolution and necessitates some compromises in the use of lenses and lighting conditions.

But for most general news and sports use the ability to create a photograph and within minutes transmit it back to a desk editor is more than worth any minor limitations. We are now seeing photographs of major news events on the front pages of newspapers virtually minutes after they take place. For newspaper use where 85 line screens are the norm the reproduction can be excellent Consumer models of most digital cameras are designed for web use and at home viewing on computer screens. To date most of these models are not adequate for general newspaper uses in news or advertising situations. The exception is where images are to be used very small (2 inches by 2 inches and no photo retouching is needed. Examples would be real estate or car ads where small images are needed to illustrate an ad. They can generally be handled by a non-professional with acceptable results and can be manipulated to an extent. The advantage is that no additional scanning is needed and they can be simply downloaded from a desk. In many models the photographer can actually see what he or she has taken and make another picture before even returning to the office.

Digital photography will no doubt continue to improve, particularly at the low end, where cameras will need to be less expensive to be a general purpose item, but they are a significant part of the digital environment and when used properly can produce excellent results in many newspaper settings.

Conventional Photography

The quality of the original photograph will determine the quality of the halftone that is reproduced in the newspaper. Bracket exposures to be sure of getting a good original. Especially when working with color transparencies, supply alternate exposures to the newspaper.

Some defects in an original photo can be corrected at the newspaper—accentuating highlights, for example, or enhancing the density of middle tones and shadow tones—but the surest way to get good reproduction of a photograph is to supply a good-quality original.

Characteristics of a good black-and-white image

An ideal photograph for newspaper reproduction is one where details are clearly visible in both highlight and shadow areas, there is good contrast within the mid-tone range, and shadow is held to an absolute minimum. Avoid prints that are either very contrasty or very flat and light.

The print of a black-and-white photograph should have a black image on clean, smooth-surfaced white paper with a matte finish. Avoid textured and color-tinted originals.

Photographs taken with black-and-white film are best. Prints made from color transparencies tend to have too much contrast, and they are rarely as sharp as original black-and-white prints.

US Ink's Press Doctor

Selecting original images is a critical step in the coldset print reproduction process because coldset printing is able to image a density range of approximately 1.20. A high quality image cannot be reproduced on press unless a high quality image has been selected from the start. This is important for black-and-white as well as color photography.

Color reproduction can be enhanced by selecting a bracketed exposure that is 1/2 stop lighter than an optimal meter reading, do not over expose.

Clarity and Sharpness

The sharpness of the original photograph, and especially in the areas of interest within the photograph, has a greatest impact on the clarity of the reproduction. When selecting a photograph, art directors, artists, and others should scrutinize the original picture or transparency using a glass loupe or projection to determine the level of image sharpness. An important step in producing a sharp photograph, especially in outdoor settings, is the use of fill flash in tandem with a smaller camera lens aperture setting. This combination provides improved focus and depth of field.

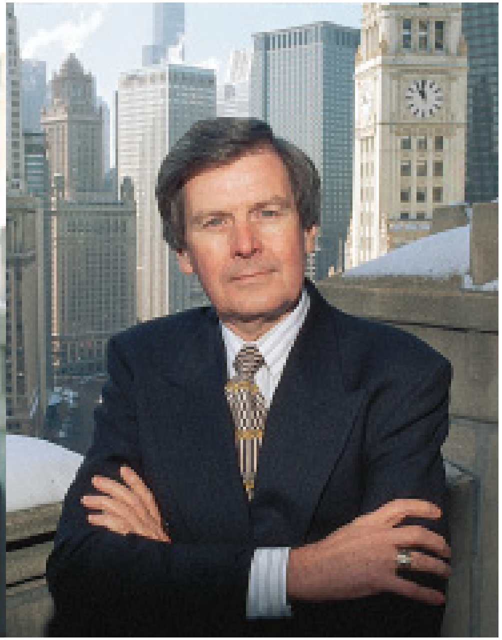


Photo using available light only   Fill flash photography

Use of non-original copies of a photograph (often called duplicates), faster speed films, and enlarging grainy photographs all contribute to a reduction in the sharpness achievable in the printed reproduction. These photographs also have a detrimental impact on scanning since sensitive scanner optics cannot reliably sense the “pixelized” grain effect.

US Ink’s Press Doctor

Self-Developing Photographs

Photographic media that are self-developing are not recommended for use as originals.

The film format

The 35mm format can produce excellent results for newspaper reproduction; newspaper editorial photographers use 35mm almost exclusively. Larger format cameras--2¼” x 2¼” or larger—are recommended if the photograph’s size in the advertisement will be large. In general, the larger the film format, the sharper the final photograph will be.

Print size

The size of the photographic print should be as close as possible to the size of the image to be printed in the advertisement. In the case of a full-page or double-truck format, the material supplied should be no smaller than 4 x 5. If the original is too small, the photograph may become grainy and blurry when enlarged. A large print is easier to retouch.

Flare and Haze

Flare and haze are the main causes of color saturation loss in original photos. Flare desaturates and washes out colors in the form of non-image light that strikes the camera lens

Photo with no flare or haze

Haze results in flat appearance during the exposure. Backgrounds, strobe lighting, and camera angles can all contribute to an increase of image flare. To prevent non-image light from striking the camera lens, filters, lens hoods, lens angles, and a Gobo or flag can be used.

Haze is a normal atmospheric condition associated with hazy and overcast weather. Like flare, haze often reduces color brilliance. The degree of which depends on the camera angle and abundance of haze.

The photographer

Look for a photographer whose portfolio includes a wide range of published newspaper advertisements that demonstrate precise focus and exposure, and good contrast, color saturation and depth of field.

Some subject matter is so difficult to photograph that it is worth your while to pay higher fees to a photographer who is a specialist in the particular area. You save money in the long run by avoiding costly reshooting. Photographers who specialize in food, for example, may have complete professional kitchens in their studios. They can ensure the low temperature range that may be needed to keep perishable food at its visual peak; they know the special lighting techniques that make photographed food appealing.

Products and other subject matter

If the subject is a product, it must be in perfect condition. The slightest blemish will stand out in the photograph, either requiring costly retouching or making the photograph unusable.

If there's to be a person in the photo, a professional model will help you get better results in a shorter time. You can select the look that will best convey your message, and, almost as important, you will have a person experienced in following the photographer's directions and in making up and dressing for photography.

Any person whose photograph is in your advertisement should be required to sign a model release, whether they are the main subject or just appear in the back-ground. In the case of a child, a guardian's signature is needed. Using a model release protects the advertiser from the legal problems that unauthorized use could cause.

Planning the shoot

Detailed advance planning will help in many ways to produce a quality photograph and to save the photographer's expensive time.

Get any necessary permissions in advance. On an outdoor shoot, if you don't want parked cars in your photo, you'll need to get permission to rope off the area. You'll need releases from the owners of property that might appear in the background.

Lighting

Lighting for good newspaper reproduction should be relatively even, without extreme highlights or extreme shadows. Dark shadows do not print well on newsprint, and tend to distort shapes. Arrange lighting so as to enhance subject texture and allow detail to show in shade areas. Light reflected onto a subject increases the sense of shape and texture. Extra care is needed with subjects that are either very light or very dark.

Avoid harsh lighting and backlighting. Avoid direct lighting from a source on or near the camera as the only light source; it makes the subject appear flat and shapeless.

The outdoor photograph that will reproduce best in a newspaper is one taken in the evenly lit hours around noon—unlike photography intended for magazine reproduction or exhibition, which is usually planned for the early morning or late afternoon hours specifically to get shadows.

Use fill-in flash or reflectors to eliminate shadows and increase detail in outdoor photos. This is especially important for color photography, where the amount of correcting that can be done in the lab is more limited than with black-and-white.

ILLUMINATION

Front Lighting

The most essential element is achieving high quality images is proper illumination. Proper front lighting on subject matter will increase printed detail and maintain color fidelity. From a technical standpoint, it positions the subject matter towards the lighter, more distinguishable detailed region of the print range. With color, ample illumination on the subject provides a truer rendition. Conversely, avoid back lighting, it results in dark and dirty color reproduction.

US Ink's Press Doctor


Back light image Front Light Image

Uniform/Non-Uniform Lighting

Uniform lighting on all subject matter within the photo results in optimum reproduction. Detail is maximized throughout the full tonal range of the image.

Non uniform or uneven lighting of elements in the same photo can pose technical problems for optimum scanning. Extreme differences in lighting should be avoided. Scanners are unable to maximize the reproduction of detail in both the illuminated subject area and that which is cast in shadows. However, lighting which falls behind the subject is not a technical problem. With a contrasting background, it is acceptable and encouraged. When the background is not lit it will go black, adding a sense of depth.

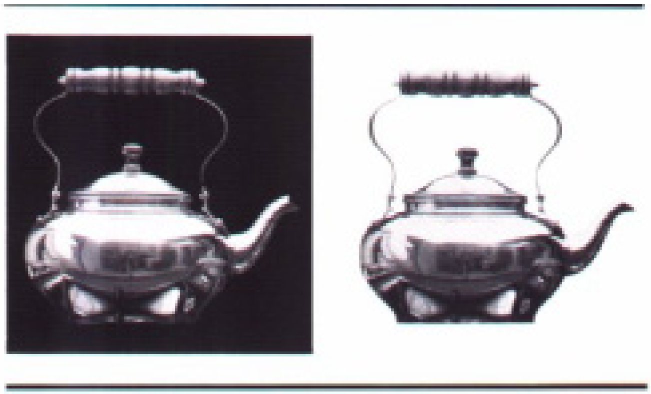
Uniform lighting

Non-Uniform Lighting

Background

For black-and-white photography, light and medium-colored subjects are best shot against a dark background. Dark subjects are best photographed against a background that is only moderately light; too light a background may merge into the page it is printed on.

When there are light and dark subjects in the same photograph, compromise on an intermediate tone background that will provide a fairly good contrast with both.



Photograph the subject against a contrasting background. Avoid a very light background, as at right. The halftone edge would not show against newsprint.

Color photography has the advantage of providing color contrast, even when subject and background are of the same tone. Make sure that if subject and background are the same general color, the hues are not so close that they blend into one another.

Background contrast

Background contrast in studio photography plays an important role in successful newspaper reproduction. White or highly reflective backgrounds impact the critical exposure time (**fraction of seconds**) that the camera/film needs to record the light absorbing subject detail. This reflectance, if not carefully directed, can also introduce unwanted flare that furthers the loss of detail and color saturation. For example, do not assume a white background is required for a dark brown or black product.

Backgrounds that still provide contrast, but are not highly white reflective, serve both the technical and aesthetic requirements of optimum print reproduction.

US Ink's Press Doctor

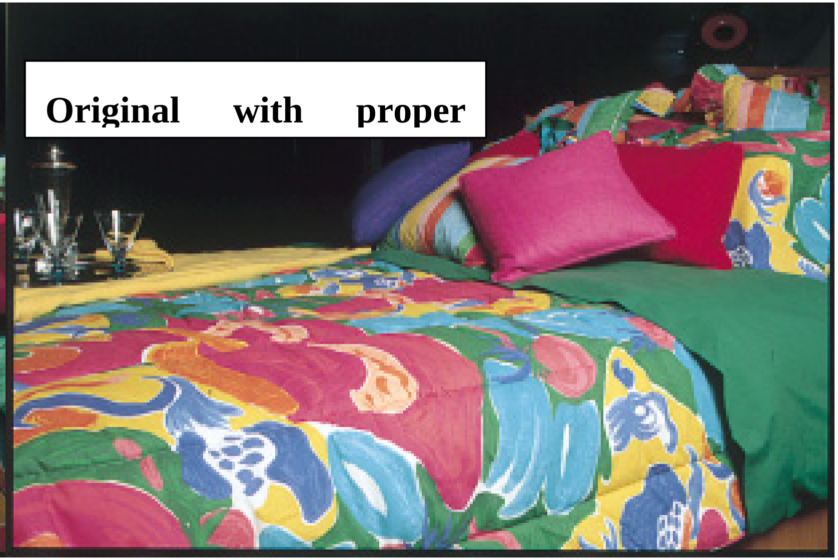
High contrast background

Medium contrast background

FULL TONAL RANGE ORIGINALS

Whenever possible, use a full tonal range image. This is defined as a photo that has all the representative tonal values from light to dark, including specular lights (**reflection from shiny surface**) or non-detail whites.

With a full tonal range original, print contrast is significantly increased since image dots are not required in the non-detail whites during the screen separation process. This optimizes the full effect of the entire print range from the paper brightness to the maximum ink saturation



density.

Originals with excessive contrast (**extreme bright to dark**), may be visually appealing. Nevertheless, extreme contrast is usually detrimental to optimum reproduction, because it loses detail in prepress conversion (**refer to Halftone Reproduction**). Over-duped originals generally have excessive contrast.

ORIGINAL COPY –QUALITY SELECTION FACTORS

- Proper front uniform illumination
- Sharpness/focus (especially "area of interest")
- Size of original vs. reproduction size
- Background which accentuates subject matter
- Full tonal range
- No apparent grain
- Absence of flare/haze
- Instant prints are not recommended

Density range

Professional layout artists and others who work with photos learn to tell at a glance whether a print will reproduce well. Contrast is a familiar quality they judge; density range is a related but less familiar one. Printing technicians use an instrument called the densitometer to measure density precisely.

Density range is the difference between the density of the lightest highlight in a photo and the darkest shadow. For optimum newspaper reproduction, the recommended densitometer reading is 1.4—1.8 for a black-and-white photograph, and 2.5—2.8 for a transparency. (Note: Densitometer must be zeroed on a calibration plaque—not on newsprint).

Image Prep

You've selected art that will reproduce well. Now you must supply the information that the process camera operator digital image technician at the newspaper needs in order to make a negative of the right image area at the right size. A number of characteristics need to be carefully considered such as indicating image area and final size, along with indicating cropping marks. See Image Preparation Checklist for additional details.

Handling photographs

In handling photographic prints, follow these guidelines:

Don't draw cropping or sizing lines on the surface of the print. Make any crop marks on the white border of the print or on an overlay. Or make a photocopy of the print and mark cropping on this.

Don't write on the back of the print. Don't write on an overlay or other piece of paper while it is on top of the print. Any pressure can mar the surface and show up in the reproduction.

Avoid paper clips. They will damage the print. Put notes or copy on a separate piece of paper, and attach it to the back of the print with tape.

Don't bend, fold or roll the print. This can cause cracking of the surface that may show up in the reproduction.

Scaling art

You scale or size art to find out, for example, what the measurements of your reproduction art will be, given the measurements to which you have cropped your original art. Or you might need to work backwards from the already set measurements of the reproduction art on a layout, to find out what the cropped measurements of the original art must be.

In a typical case, you first crop your original, say, to 5" wide by 7" deep. You know the image must come down to 3" wide on the layout, and you want to find out how deep the layout image(reproduction image) will then be.

There are two basic scaling methods:

Proportional scale method

A proportional scale will make this kind of calculation for you, and give you your percentage of original figure at the same time.

Diagonal line method

Many artists prefer to use the diagonal line method. It produces the actual reproduction size and shape, and the needed dimension can be measured directly.

Determining percent of original figure

Using the percentage of original figure is the preferred way of instructing the process camera operator digital image technician as to the reproduction size of artwork.

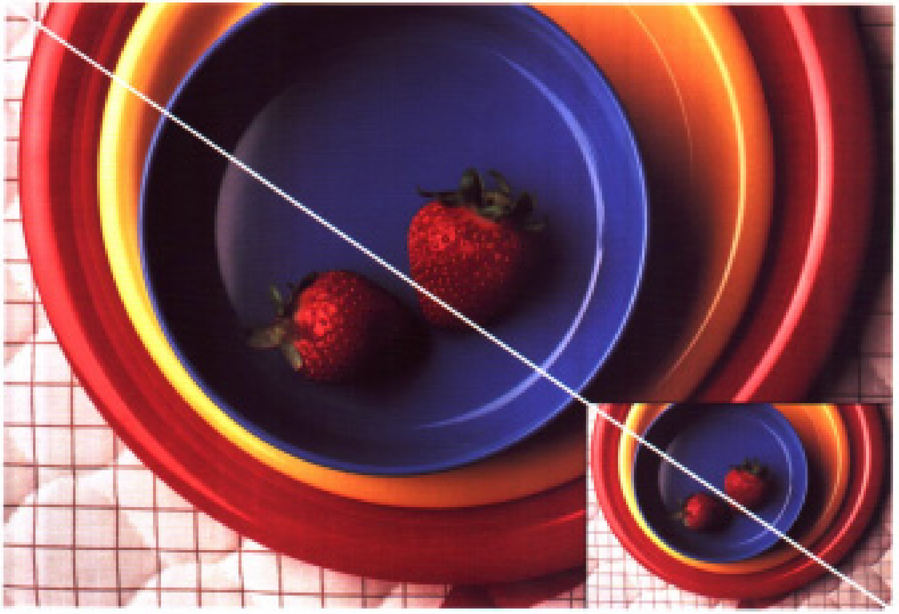
To calculate percent of original, you need to know the length of the controlling dimension of the reproduction image and the length of that dimension of the original image.

An inexpensive proportional scale offers a quick and accurate method of finding this ratio between the reproduction size and the original size, expressed as a percentage. At the same time, the artist can check the new size of the copy’s other dimension, to make certain both dimensions will be correct in the reproduction.

You could also work out the figure with a calculator or by hand, using this formula: divide reproduction measurement by original measurement and multiply the result by 100. That’s the percentage of original.

Example: Your controlling dimension is 5”, to be reduced to 3”, 3/5 = .6, and .6 x 100 = 60. The percentage of original is 60%.

Example: Your controlling dimension is 3”, to be enlarged to 5”, 5/3 = 1.6667 x 100 is 166.67 or 1662/3%.



Scaling with the diagonal line method has the advantage of letting you see with your own eyes the various possibilities for cropping and for enlargement or reduction. Any point on the diagonal defines a size that maintains the proportions of the original.

Percent of original is a crystal-clear instruction to the image technician, because the focusing scales on the process camera are calibrated in percentages. And since a single percentage figure applies to all dimensions, there are no mix-ups as to which is the controlling dimension.

Scanning Line Art and Pre-Screened Copy

For optimal results, it is recommended to use the same resolution as plotting resolution of the output device. Line art images should have a minimum input resolution of 800 pixels per inch (ppi) at the final image size. Line art should be scanned at close to the final reproduction size to avoid scaling problems that can compromise quality. If resizing is called for after the art is scanned, then the input/output scanning ratios reported previously should be applied.

Scanned Art	Recommended Input Resolution	Minimum Input Resolution	Considerations
Type	Same resolution as output resolution	1200 ppi if the output resolution is not known at time of input	Higher resolution leads to larger file sizes
Line art	Same resolution as output resolution	800 ppi if the output resolution is not known at time of input	Thinner/finer lines may demand higher input resolution
Line drawing/ cartoons	Same resolution as output resolution	800 ppi if the output resolution is not known at time of input	Thinner/finer lines may demand higher input resolution

Copy	Usage	Considerations
Imagesetter Paper Film	Final Copy	See SNAP guidelines for range and screening
Fax Laser printer Inkjet	Proofing only	If used as original copy, reproduction will not meet quality expectations
Electronic	See page #	
Magazine Directory	Not recommended	If used as original copy, reproduction will not meet quality expectations
Pre-screened		

What is Gray Balance?

The reproduction of a visually neutral scale comprised of cyan, magenta, and yellow tints is referred to as gray balance. A neutral three-color gray is produced using unequal halftone dot sizes of these three colors, with cyan halftone value always being larger than the yellow or magenta tint values when printing to SNAP densities. Cyan, magenta, and yellow tint values that produce proper gray balance in SNAP proofs and printing are shown in Table N. Dot gain/tone value increase must be controlled throughout the scanning, proofing, film creation, and printing process in order to maintain the relative halftone dot values required for gray balance to be achieved.

Why is Gray Balance Important?

Gray balance is essential to quality four-color printing since reproducing images, including shadow areas and blacks that do not have a cast, or tone, requires that the undercolors of cyan, magenta, and yellow be imaged or printed in a manner that appears neutral. This type of reproduction is referred to as printing in proper gray balance.




Correct gray balance | Blue cast in neutrals | Green cast in neutrals | Yellow cast in neutrals

How Is Gray Balance Measured?

Gray balance is visually assessed by comparing an overprint of the cyan, magenta, and yellow tints with a black tint having an equivalent visual density or “weight.” Gray balance must be assessed under standard viewing conditions. Gray balance can also be measured with a densitometer by using the three-filter mode and measuring the gray balance patch.

Total ink Coverage

Under Color Removal (UCR), Under Color Addition (UCA) and Gray Component

Replacement (GCR) are the three most effective methods that are very critical in correcting for total ink coverage during color separation process.

UCR is a function of color separation that replaces specified amounts of cyan, magenta and yellow inks with black ink in neutral shadow areas. Inversely it is also possible to increase the three-color component in a variation of the UCR technique called UCA.

GCR is similar concept applied to saturated color areas. The concept of GCR is to remove the gray caused by the three colors of ink and replace it with black.

Achieving the proper amount of ink coverage for process color reproduction has many advantages that include improvement of printability and quicker drying of ink, ink cost reduction, shadow colorcast correction and stability of gray neutrality.

In order to print good shadows the maximum dot area of all four inks for process color material should not be more than 220% - 240%. This helps to compensate for dot value increase/decrease and allow maximum shadow detail with minimum shadow area ink set-off. Dot area exceeding 240% may result in darker shadows on newsprint.

Dot Gain/Tone Value Increase/Decrease

Tone Value Increase/Decrease is an important aspect, which must be compensated for in reproduction in order to achieve excellent quality. Physical dot increase is the natural spread of dot as the image is transferred from one production step to the other. Because of the highly porous nature of newsprint, newspaper reproduction incurs a significant amount of dot increase.

For example, a 50% dot could increase to approximately 80% dot after printing. Dot increase is also slightly higher as the line screen increases. To compensate for dot value increase/decrease and avoid poor reproduction quality, the following specifications for dot value adjustments are recommended:

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Dot Gain @ 25%	Offset (85 lpi)	Offset (100 lpi)	Flexography (85 lpi)	Letterpress (65 lpi)
Cyan	28%	32%	25%	15%
Magenta	28%	32%	25%	15%
Yellow	28%	32%	25%	15%
Black	28%	32%	25%	15%
SNAP Tolerances	+/- 3%	+/- 3%	+/- 3%	+/- 3%
Dot Gain @ 50%	**Offset (85 lpi)**	**Offset (100 lpi)**	**Flexography (85 lpi)**	**Letterpress (65 lpi)**
Cyan	30%	32%	27%	18%
Magenta	30%	32%	27%	18%
Yellow	30%	32%	27%	18%
Black	30%	32%	27%	18%
SNAP Tolerances	+/- 4%	+/- 4%	+/- 4%	+/- 4%
Dot Gain @ 75%	**Offset (85 lpi)**	**Offset (100 lpi)**	**Flexography (85 lpi)**	**Letterpress (65 lpi)**
Cyan	20%	20%	16%	16%
Magenta	20%	20%	16%	16%
Yellow	20%	20%	16%	16%
Black	20%	20%	16%	16%
SNAP Tolerances	+/- 3%	+/- 3%	+/- 3%	+/- 3%

Color Balance Considerations

In order to help obtain proper color balance, included in this specification is the restriction that dot gain/TVI values of the three process colors (Y, M, C) should not differ from each other by more than 4% from the aim value. That is: if either cyan or magenta is +2% (32%) in dot gain/TVI, yellow deviation should not be greater than -2% (28%).

Resolution

Resolution – both for input devices and for output devices – is an important consideration in the printing process. Several measurements are used to describe image characteristics in the process:

> *ppi*, or pixels per inch, is a measure of the amount of information scanned in from an image or captured using a digital camera. The higher the resolution capability of the input device, the higher the possible scan resolution. Scan resolution is critical to image quality.
>
> *dpi*, or dots per inch, sometimes referred to as spi (spots per inch) is a measure of the resolution of the printer, imagesetter, platesetter, or other output device. SNAP

recommends use of dpi to refer to output resolution.

lpi, or lines per inch, is a measure of the frequency of the halftone screen used to print an image. The specific lpi chosen is a function of both the printing process and substrate on which the job is being printed.

When Digital Media Are Supplied

Unless previously agreed upon, all digital files will be accompanied by proofs that represent how these files will reproduce on the final printed piece. With each set of files and accompanying proofs, the organization sending these files and proofs should provide the information shown below. This information is needed by the printer/newsprinter and should be communicated by the originator of the digital file(s)/proof(s). A sample form is supplied in the back of this document for use in recording this information.

HALFTONE REPRODUCTION

After selecting the most suitable image, the next challenge is successfully preparing it for press reproduction. At this critical prepress stage, the major factors of tone compression, dot gain and tone reproduction must be managed. As with photography, these issues apply to both black/white and color images.

TONE COMPRESSION

Normal

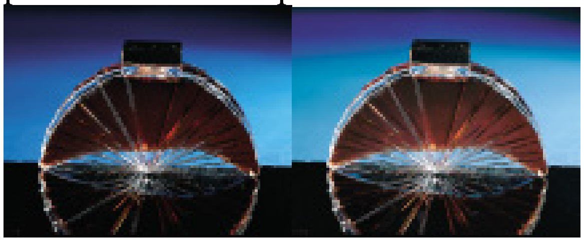
To reproduce an image on newsprint, an important alteration known as tone compression must take place. It allows for the reproduction of an original photo with a wide range (0 to 3.0 density) of tones from light to dark, into the limited reproducible range (0.1 to 1.1 density) of ink on newsprint.

Extreme

Extreme contrast photos lack detail and often have the appearance of being too dark and/or too bright. When tone compression occurs, tonal areas lose contrast. Therefore, it is critical to capture and select images with a normal contrast range. Originals with extreme contrast will lose detail when scanning compression is applied.

If an original with high contrast or non-uniform subject lighting is chosen, avoid employing significantly more compression in an attempt to capture both light and dark detail. Over-compressing simply results in the loss of detail and the appearance of a flat reproduction.

Generally, standard compression of a normal photograph will produce acceptable results. A normal photograph for optimum newspaper reproduction contains a full range of contrast from light to dark, with noticeable detail throughout. This separation of tonal values will produce excellent print contrast.



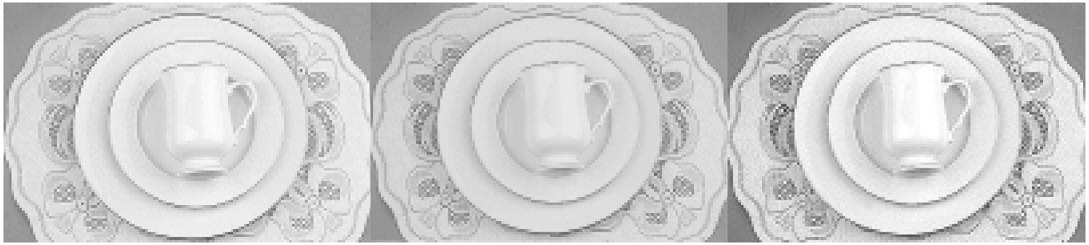
Normal Compression Optimized Tonal Compression

TONE REPRODUCTION

The theory behind tone reproduction is to successfully manage the placement of halftone dots (highlight, midtone and shadow) to maximize contrast and detail for the interest area of an image. To optimize reproduction, every image should be handled on an individual basis for proper tonal distribution.

The following examples illustrate why tone manipulations must vary according to original copy, and that standard dot aimpoint specifications serve simply as a guide for normal contrast images. Non-detail white drop-outs, midtone placement, and shadow/range restoration are major strategic factors which must be addressed for quality halftone reproduction of each image. See

OPTIMIZING TONE REPRODUCTION



BLACK & WHITE HALFTONES
Material dot percentage aimpoints for normal full tonal range originals.

Halftones intended for offset printing can have dropout highlights. It is advisable to carry a minimum highlight dot in halftones used in direct letterpress printing.

NON-DETAIL WHITE DROP-OUT

Remove all printing dots from non-detail whites to maximize the entire available print range between paper brightness and total ink saturation. A common example of a non-detail white is the reflection from a shiny surface (i.e. chrome on vehicle, jewelry and electronics).

Dots held on shiny surface of car

Dots dropped out on shiny surface of car

ADJUSTING MIDTONE PLACEMENT

Adjusting the midtone is crucial to optimizing the area of interest in an original. Lighting conditions and subject content dictate the need for modified midtone placement.

Many quality failures occur when subject midtones are not properly adjusted in the scanning process. This can result in images printing too dark, even though specifications are adhered to. Midtone placement is dependent on each unique image and subject content. Midtones should be lightened (less printing weight) for dark images.

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Improper midtone adjustment Properly adjusted midtone

It is important to note that commercial proofs seldom reflect the 28% - 32% midtone dot gain incurred on newsprint. Often, the proof will represent a match of the original, however, the printed reproduction will appear too dark.

SHADOW/RANGE RESTORATION

A common error made in tone reproduction is to make necessary midtone adjustments without restoring the shadow range (darkest setting). Because the shadow is pulled open by powerful midtone manipulations (opening up for detail) it is important to restore the shadow to its maximum density.

With high-key originals, slightly more weight than specified can be given to non-detail shadows to enhance print contrast.

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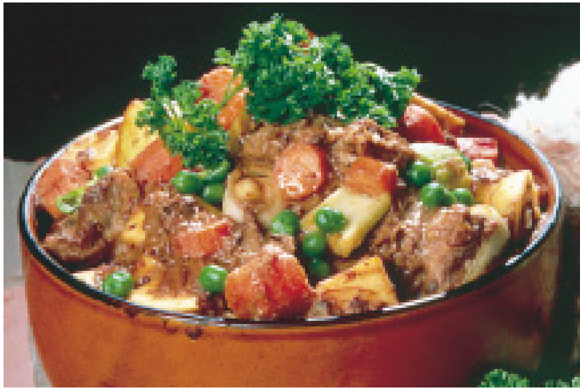
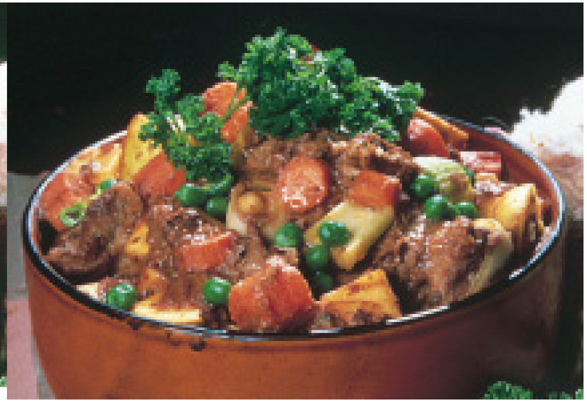




Properly adjusted midtone which results in open shadows

Shadow range restored

Enhancing Sharpness

Aside from tone reproduction, a final strategy for producing quality halftones is electronic digital sharpness. The original image sharpness is extremely important factor in optimum newsprint reproduction. In most originals, it may be beneficial to apply additional electronic digital sharpness. This works to improve the perception of detail and clarity in the image. The amount of sharpness employed depends on the smoothness of photo emulsion and enlargement size. Noticeable white or black image outlines can result if an excessive amount of digital sharpness is applied.

Conservative amount of unsharp masking   Optimum Unsharp masking

Color management

Because equipment used in the color printing process – scanners, monitors, output devices, printers, printing presses, etc. – interpret colors differently, it is difficult to maintain original colors accurately throughout the process. In the past, expensive specialized computer systems were used in an effort to preserve accurate color reproduction. The components of such systems were designed to work together exclusively, and were tuned to interpret colors consistently from one step in the process to the next. Generally, these systems were considered “closed loop” systems because all the pieces worked only with one another.

The introduction of personal computer technology and desktop publishing software made the color printing process considerably less expensive. However, it also introduced the problem of varying components having to work together. Color production components are now available from many different sources, but they are far more difficult to “tune” to work together to produce consistent results.

To solve this problem, two major developments have taken place. First, a standard method of describing colors was agreed upon. The International Color Consortium (ICC) has agreed upon a numbering scheme to describe all the colors in the spectrum. Second, software tools have been developed to translate colors into these standard "codes" for each device in the process. Thus, if the scanner sees red, it records the standard numbers for red. The monitor then reads the standard numbers for red and shows the proper red when it reproduces the image on the screen. The same holds true for all the devices in the process, including – theoretically – the printing press. If properly set and the combination of the given printing inks allow, the press should be able to reproduce the same red whenever those particular numbers are called for.

The hardware and software tools that allow for this translation and interpretation of colors comprise color management technology. The goal of the technology is to reproduce accurate colors consistently, regardless of the source of input or destination of output. The ability to reproduce colors consistently from one newspaper to the next is extremely important to advertisers. Technologies that can achieve such consistency are of obvious interest to the publishing industry.

1. **Color management alone won't help.** Color management is a total process, not simply a piece of software. Quality color reproduction is dependent on process controls, standards, and software working together. It is essential to identify process variables and stabilize them. Color management can work, but problems arise when something new is

introduced, which is a frequent occurrence. If process control is not in place, color management will not help. For example, the press must be properly calibrated and able to reproduce SNAP standards (standard printing specifications developed for coldset printing) and the advertiser must provide ads based on those standards. The industry must agree to the SNAP standard and follow it in order to assure advertisers of consistent high-quality printing.

2. **Implementation is complex and requires adequate knowledge.** Color management implementation is complicated and requires time, commitment, energy, and dedication. It remains difficult for newspapers because of required resources, including press time, training, labor, hardware, and software. Lack of training remains a critical problem in providing consistent color quality. Employees must be provided with the opportunity to learn the process and gain requisite technical skills.

3. **Color space transformations could cause problems.** While it is possible for color management software to accurately transform colors from one color space to another, it is not certain if it is possible to change them back again. Based on where the conversion takes place in the production process, this could cause problems for archiving material, re-use of materials for different printing processes, and Internet publishing.

4. **Consistency of results among color management systems has not yet been**

demonstrated. While color profiles may be exchanged among different color management programs, it is not proven that the different programs will produce the same results. In other words, it is not yet known if different programs will yield identical results from the same profile.

5. **Color management has potential benefits for newspapers.** Color management has the potential to allow people "upstream" from the presses to see what the product will look like before, rather than after, it comes off the press. More people will have more information about the finished product in advance. Advertisers might know earlier what to expect from the finished product, and could have more control over the results. The rigorous calibration required for color management can also help determine when individual components begin to drift.

Color profiles

In essence, the color-sync software is a switchboard that relays information about color devices to your software. This information is stored in a small file called a profile. By coordinating the profiles for your scanner, monitor, and printer. Color-sync helps to ensure that the color on your monitor matches the color that comes out of your printer.

For example, let's track an image from the scanner to the printer, focusing on one color in the image. For the sake of this example we'll call the color ruby red, although colors are represented by a much more complex naming system.

1. The scanners profile contains information about how the scanner defines its color space or gamut.

2. Before the image is displayed on the monitor color-sync will check the monitor profile and compared with the scanner profile, it may find that the monitor and the scanner display ruby red differently in their gamuts.

After comparing the profiling and adjusting the image, the monitor will display the color that both profiles agree is closest to the true ruby red.

3. Before the image is printed, color-sync will consult the printer's profile to see how it portrays ruby red in its gamut. It will then adjust the color so that the printed image will resemble as closely as possible the image on the monitor.

Output

Proofing

The Function of Proofs

Different types of proofs have different functions in the workflow process. These include position and press proofs.

Position Proofs are copies of ads given to sales reps and/or accounts when requested. The purpose of a proof is to correct any typos and make minor style corrections. Do not use proofs to aesthetically revise the layout or copy. Preferred type faces, sizes and client ad styles must be communicated to artist or Mac operator in advance.

Overview of Technologies and Types of Proofs

If a proof is made from an electronic file, it is Digital and if it is made from film, it is called Analog. Note: Some digital proofs have dots and some continuous tone. Both technologies can be used to produce a proof at various points along the production process.

A layout only shows the elements and their relative position.

A contract proof shows a final version of the job.

Types of Color Proofs:

The two types of color proofs are press proofs and photomechanical proofs.

1. Press Proofs

Proofs should be pulled on newsprint similar to that used by newspapers, so that the press proof will approximate the finished reproduction as closely as possible.

2. Photomechanical Proofs

A fundamental difference between color overlay proofing systems and color press proofs is that a color overlay proofing system can be expected to simulate the dot percentages in the film negatives, while a color press proof should approximate the finished reproduction.

Most newspapers use photomechanical proofs, since the press-proof method is both expensive and time-consuming.

There are two kinds of photomechanical proofs - one-piece color proofs and color overlay proofs.

One-piece Photomechanical Proofs: A one-piece color proof is made by producing a separate transparent sheet carrying a color dye image, for each color ink to be used. The transparent dye images are placed in register with each other and then laminated onto a white board or sheet of paper.
With the improvements in digital proofing most newspapers are trending toward digital proofing systems. The most effective proofing systems are digital proofs made directly onto

newsprint substrates. Such proofing systems allow for accurate calibrations between proofs and press reproduction.

PDF Workflow

The Portable Document File (PDF) was developed by the Adobe Corporation in the early 1990's. As an alternative to HTML the company envisioned it as a way to create World Wide Web documents that could be displayed and downloaded in the exact format of the authoring program. The format, which is a shorthand kind of postscript, was quickly adopted for a number of uses and thanks to the efforts of several major corporations, AT&T, The United States Government, and The Associated press among others, it has quickly become a standard for a variety of uses.

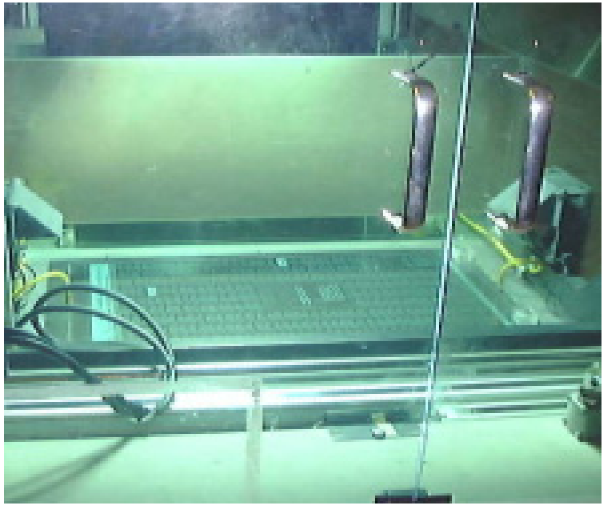
Included is the transmission of documents from one site to another where it can be printed without sending the high resolution graphic files or the fonts along with the documents. The portable files contain all the necessary printing data, including fonts, and lose none of the original quality. The PDF format has already gone through a number of changes and will continue to evolve as Adobe opens the code and creates new forms. Therefore, the workflow for PDF will be changing as the technology changes. Currently a Black and white file sent to a publication can either be printed directly to film or velox, or can be exported to a standard EPS format for placement in a page layout program.

For color files, the standard method of output is the export to EPS where the layout program converts the composite color information into CMYK or spot color separations. One disadvantage of the PDF format is the lack of edibility of the files. Depending on how the file is created it maybe impossible to make any changes to the document without sophisticated equipment. As the format changes this edibility is expected to change with the use of plug-ins to allow re-toning of images as well as font changes.

In addition newer page layout programs and some rips are being developed that will allow direct import of the PDF file and with PostScript level 3 direct output of color files for in-RIP separations.

Platemaking Processes

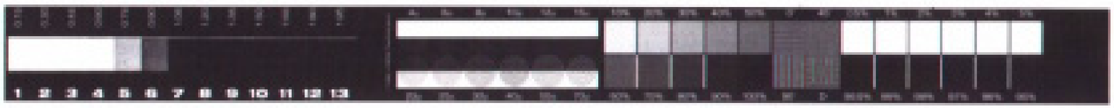
Printing plate issues are among the most crucial affecting reproduction quality. Accurate image transfer from film to plate is essential for good print reproduction. Improper exposure can cause excessive dot growth on negative working plates. Plates must be accurately exposed and processed, hold image details well and register correctly.



Quality assurance tools such as the NAA Digital Color Test Form, IFRA PostScript Color Test forms, GATF Star Targets, UGRA/FOGRA Control Strips, digital test targets, etc., should be used with plate image measurement.

The UGRA/FOGRA plate control wedge is used to control platemaking and detailed evaluation of print reproduction curves. The wedge consists of continuos tone wedge, microline targets, halftone wedge, doubling and slur patches and highlight and shadow tints.

Image resolution and exposure latitude, tonal value transport and range, film quality and plate reproduction curve should also be checked for quality and consistencies.



Newspapers using digital plates need to be capable of precisely and consistently imaging them. Digital plates will not provide excellent reproduction quality if the process is not properly calibrated. Image data has to be accurately processed, manipulated and maintained and results must be predictable for correct reproduction on the press.

Newspapers should also be aware that the type of plate screening can affect densitometer measurements. As the line screen ruling increases, the corresponding measured dot will also likely increase. Care should also be taken when attempting to measure images on digital plates to avoid measurement bias and inconsistency. Instrument aperture, calibration measurement techniques, plate and image contrast, plate gaining characteristics and plate processing conditions are some of the factors that can affect plate measurement consistency.

Although densitometer use does not constitute a perfect plate measurement process, their use, when combined with consistent plate measurement procedures, will enable newspapers to better control their printing processes.

Printing plates must be accurately bent to press specifications. Plate squareness must be checked and verified prior to using them for production.

Presswork

Gray bar

Listed below are some critical points that must be adhered to when using the gray bar.

- The imagesetter/film processors must be checked regularly to insure that they are outputting the proper film screening for the gray bar. This can be checked with a transmission densitometer.

- The width of the gray bar should be as wide as the target window for both the transmission and reflection densitometers to insure proper readings.

- Densitometers should be checked for proper calibration daily.

- The print density specification range for the gray bar has to be within the density variation capability of your press.

- Always make gray bar density corrections on press from dark color to light. This should be done because the cyan and magenta pigments contain components that effect the yellow component of the gray bars. If the yellow is adjusted first, it would have to be reset after the other colors are brought into adjustment.

- Always take readings on the same position of the gray bar and same plate position (high side or low side) to minimize density variations due to impression on the press.

USE OF THE GRAY BAR IN THE PRESSROOM

When starting up the press the following steps should be taken when using the gray bar:

- **Get page in register**

- **Get gray bar balance across the page by eye**

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- **Check the gray bar with the reflection densitometer**
- **Adjust the density if necessary, darkest color first**
- **Recheck density after a few minutes in the same position and adjust as necessary**

The gray bar can be a powerful tool that allows you to have good color reproduction and consistency if it is used properly.

Solid Ink Density (SID)

The following solid ink densities (dry SID values measured using Status T densities and as absolute, meaning that paper density is included) should result in optimum reproduction quality:

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Dry Solid Ink Density, SID	**Offset Newspapers**	**Flexography**	**Letterpress**
Cyan	.90	.95	.90
Magenta	.90	.97	.90
Yellow	.85	.79	.85
Black	1.05	1.05	1.00
SNAP Aim Point Tolerances	+/- 0.05	+/- 0.04	+/- 0.05

What is SNAP?

SNAP provides guidelines for the exchange of information and preparation of materials for the non-heatset printing process. The specifications pertain to proofing and printing for all non-heatset printing processes on webs of paper. They apply to offset lithography, direct lithography, letterpress and flexography for a wide variety of products, including newspapers, pre-printed advertising inserts, and other printed material. SNAP is *not* intended for magazine, catalog, packaging, direct mail printing, or for the sheetfed, gravure, or heatset web offset processes. Other specifications have been developed to provide guidance for these processes. *

Why Use SNAP?

Effective communication among those involved in the reproduction process ensures that the ideas of the designer and art director are printed in an accurate, efficient, and timely manner. SNAP provides guidance for:

- Designers
- Art directors
- Ad agencies
- Editors
- Marketers
- Merchandisers
- Print buyers
- Print production experts
- Pre-press professionals (for both analog and electronic processes)
- Service bureaus
- Color separators, electronic pre-press studios, and trade shops
- Printers
- Material suppliers to non-heatset printers

Some Important Notes About SNAP

- SNAP now addresses more than web offset reproduction. Specifications have been added for the flexographic and letterpress printing on newsprint and other uncoated groundwood papers. All flexographic values in SNAP apply specifically to newspaper printing.
- The term "coldset" is increasingly being used to describe the non-heatset process. While the term "non-heat" remains in the SNAP title, "coldset" is used throughout the text of the document.
- SNAP addresses coldset reproduction on uncoated groundwood papers. Uncoated groundwood papers include paper grades such as newsprint and premium groundwood, which is sometimes called "high-bright" paper. This document does not address coldset printing on other substrates, including uncoated freesheets, corrugated, or other materials.
- For many characteristics, SNAP provides a range of aim values and tolerance limits to allow for variation in manufacturing and measurement. Using these aim values will result in predictable, high-quality reproduction.
- SNAP also includes guidelines and references intended to help manage and understand the coldset process.
- The SNAP Committee supports and endorses industry standards. References to American National Standards Institute (ANSI) and International Organization for Standardization (ISO) standards are used where appropriate.

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- SNAP uses the term "dot gain/tone value increase" to describe what was formerly known as simply "dot gain."
- All density values reported in SNAP are absolute (include paper density) unless otherwise noted. See the Measurement section.
- SNAP contains the most complete set of specifications available today. Any modification of these guidelines should be discussed with the printer.

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Coldset Reproduction Process Responsibilities

In today's world of electronic pre-press technology, the roles and responsibilities of advertisers, agencies, pre-press service suppliers, newspapers, and printers have changed. Tasks have shifted from one portion of the process to another. Today an agency may prepare material for digital submission directly to a newspaper or printer, bypassing the pre-press service supplier. With shifting tasks come shifting responsibilities. A clear understanding of the roles of each party is critical to ensure a high quality result on time.

The Creator

The printing process begins with those who design and create the original materials -- an advertiser, an advertising agency, a design studio, or a pre-press service supplier. The responsibilities of those who create the materials include:

- Training employees to use the SNAP specifications
- Preparing digital and physical materials that conform to SNAP
- Providing an accurate and complete description of analog and digital materials submitted to the newspaper or printer
- Alerting the printer if materials do not meet SNAP specifications, and agreeing on alternative approaches
- Providing knowledgeable representatives to answer the printer's questions about the materials

- Cooperating and communicating with the others involved in coldset reproduction process
- Explaining to designers or others in the creation process if some expectations cannot be achieved because of the limitations of the coldset printing process.

The Printer/Newspaper

Responsibilities of the printer or newspaper include:

- Training employees to use the SNAP specifications
- Matching the appearance of the supplied proof if the proof conforms to the SNAP specifications
- Preparing digital and physical materials that conform to SNAP
- Managing the imaging process to meet SNAP aim values
- Notifying the supplier when material or electronic files do not meet SNAP specifications, and alerting the supplier of the possibility of substandard reproduction
- Providing knowledgeable representatives to answer questions for the advertiser, agency, pre-press service supplier, or other preparers
- Cooperating and communicating with the others involved in coldset reproduction process
- Explaining to customers if some expectations cannot be achieved because of the limitations of the coldset printing process.

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The Materials Supplier

Responsibilities of the suppliers of materials (e.g., digital or physical materials, hardware, software, etc.) include:

- Training employees to use the SNAP specifications
- Providing products that help achieve coldset reproduction that reflects SNAP aim values
- Preparing digital and physical materials that conform to the SNAP specifications
- Consulting with others involved in the printing process if materials that meet SNAP specifications are not available; explaining why conformance is not possible and discussing alternative approaches
- Providing knowledgeable representatives to answer questions about the application of the supplier's materials and the effect they may have on coldset reproduction quality or consistency
- Cooperating and communicating with others involved in the coldset reproduction process and providing technical support and analysis

Consistent quality reproduction begins with accurate and timely information. The information must contain comprehensive and accurate job information for the pre-press service and printing supplier, and it must be received by the appropriate person in a timely manner.

Required Information for Films and Proofs

All films must be accompanied by color proofs that show how the films are to be reproduced in the final printed piece. With each set of films and proofs, the following information should be provided (a sample form is supplied in the back of this document):

- Advertiser name
- Name of advertiser's representative (e.g., the design or production studio, or the pre-press service supplier)
- Name of contact person(s), telephone numbers, and hours of operation of the organization creating the films and proofs
- Name of the job, including pertinent edition and version information
- Reflection densitometer brand, model, and aperture size that was used to measure the

proof

- Transmission densitometer brand, model, and aperture size that was used to measure the films
- Measurements of proof color-bar densities and at least mid-tone dot gain/tone value increase for all colors
- Proof system manufacturer, brand, colorants, substrate, and finishing processes.
- Printing process for which the film was intended
- A photocopy, blueline, contact print, or other representation of one of the film printers. This is usually the cyan or magenta film for process color images. It should be marked to indicate representative areas containing approximate highlight (3% to 7% depending on the coldset process), quarter tone (25%), mid-tone (50%), three-quarter tone (75%), and deep shadow areas (75% to 90%, depending on the coldset process).
- Whether Gray Component Replacement (GCR) was used in creating the films and, if so, what software was used and at what percent
- A statement confirming that the creator has negotiated or retains copyright permissions for all images contained in the supplied films
- Film production information, including:

➢ Nominal screen ruling for each color, including whether stochastic screening is used

➢ Nominal screen angles for each color

➢ Image area total area coverage in percent

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- Confirmation of the film’s orientation (e.g., right-reading emulsion down)
- Whether the film is negative or positive

Required Information for Digital Media

Unless otherwise agreed among the parties, all digital files must be accompanied by proofs that represent how these files will reproduce on the final printed piece. With each set of files and accompanying proofs, the following information must be provided.

- Advertiser name
- Name of advertiser’s representative (e.g., the design or production studio, or the pre-press service supplier)
- Name of contact person(s), telephone numbers, and hours of operation of the organization creating the films and proofs
- Information about the job, including:
- Job due-date/on-press date
    - Job purchase order number
- Advertiser or advertiser representative job number, if any
- Name of the job, including pertinent edition and version information
- Description of supplied media type
- Description of hard-copy materials accompanying digital media
- Proof system manufacturer, brand, colorants, substrate, and finishing processes.

- Whether Gray Component Replacement (GCR) was used in creating the files and, if so, what software was used and at what percent
- A statement confirming that the creator has negotiated or retains copyright permissions for all images contained in the supplied digital files
- Descriptions of the supplied digital files, including:
  - Disk labeling information
  - Number of files on each supplied disk
  - Name of each file on each supplied disk
  - Name of page composition software and version used for each file
  - Name of graphics creation/illustration software and version used for each file
  - Name of image manipulation software and version used for each file
  - Manufacturer, name, style, and any version of each type font used in each supplied file
  - Whether the file has been image trapped, software used, and amount of trap applied
  - Number of linked graphic files per disk file
  - Name of each linked graphic file
  - Input scan resolution of each image intended to print
  - Percent re-sizing required of each image intended to print
  - A description of required physical output for each file

A sample Pre-press Planning and Preflight Worksheet is supplied at the back of this book.

US Ink's Press Doctor

Disposition of Input Materials

The organization receiving transmissions, disks or other electronic media, and physical films and proofs for printed reproduction will return these supplied materials to advertisers or advertiser representatives if arrangements for this return are discussed and confirmed when the specific job is initiated. If these arrangements are not discussed or confirmed, the printer or newspaper will store these digital and physical materials for a specified time period, which is commonly, though not a standard industry practice, not longer than 30 days after the sale or publication date of the printed piece. Supplied digital and physical materials cannot be retained at the newspaper or printing facility indefinitely, and charges might be incurred when retention is required.

Typography and Rules

Selection and placement of rules and type can have a critical impact on any print job. When working with rules and type, consider:

- *Readability*, which encompasses not only whether the printed message is legible, but also such factors as writing style and whether the typeface is serif or sans serif.
- *Legibility*, which affects how quickly and accurately readers recognize type. Legibility is determined by typographic features such as the typeface, type size, letter spacing, line length, leading/interlinear white space, paper color, and ink density.
- *Printability*, which describes how efficiently a piece, can be produced. Poor printability caused by any process component, including the piece's design and typography, typically creates longer production time, higher waste, and additional cost.
- *Profitability*, which is often how the success of a printed piece is judged. Each link in the production chain -- from advertiser to supplier -- makes or loses money on each job. Type and rule selection, as well as placement, can affect this key measurement of each job.

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Here are some guidelines to improve reproduction quality and efficiency.

Fine Rules and Small Type

Type is 4 points
Type is 6 points
Type is 8 points
Type is 10 points
Type is 12 points
Type is 14 points

Rules that are 4 points or thinner, as well as small type, should be reproduced as one color only. Small type is defined as:

- sans-serif type that is 7 points or smaller
- serif type that is 12 points or smaller
- fine-serif type, such as Bodoni, that is 14 points or smaller

Sans-serif type is the best choice for newsprint reproduction.

Reversed Rules and Type

Type is 4 points
Type is 6 points
Type is 8 points
Type is 10 points
Type is 12 points
Type is 14 points

Type smaller than 12 points should not be reversed on a four-color background and type smaller than 10 points should not even be reversed on a single-color background. Serif type and fine-serif type should not be reversed at sizes smaller than 12 points, and even in cases of larger type, testing should be done to verify whether the process can reproduce the serifs. For contrast and readability, reverse type should not be positioned within screened areas containing less than a 70% screen of any one, two, three, or four colors. Type should not be reversed on a yellow or other light-colored background.

Screened Text

When reproducing text as a screen percentage of a solid color, avoid type styles with serifs or with a fine to medium weight. Generally, text screened at 80% or more will reproduce as a solid. Consider the affect on legibility before attempting to screen type as a light screen tint.

Surprinted Type and Tints

To assure readability of rules and type that are overprinted on a tint background, the tint background should be no more than 25%. Pre-press service suppliers should create these tints keeping dot gain/TVI in mind. These flat tints will reproduce darker on press than on a display monitor or on most proofing systems. It may be possible to specify higher tint values when using primarily magenta or yellow tints. The originator of the films and/or files should consult with the newspaper or printer about tints before creating the file or film. The background should not be knocked out in areas of 12 points or less. For larger bold text or headings, background screens should be trapped behind black text to hide misregister and show through of background colors.

Tints or color builds should be adjusted to take into account dot gain/TVI.

Image Trapping/Spreads and Chokes

Image trap should be 0.005 inches or higher. One inch is approximately 72 points; one point is approximately 0.013888”. To achieve image trap of 0.005”, file originators should use a minimum of 0.36 points for trapping settings.

When type is reversed out of more than one color, the darker color used in the tint build should be kept constant and the lighter colors used in the tint build should be spread to prevent any visible mis-register.

In general terms, file originators should allow the darker color to define the image or shape and either spread or choke the lighter colors to accommodate the darker color.

Photography

Unlike photography for exhibition, photography and image capture for reproduction requires an understanding of the needs of subsequent processes. Below are guidelines to assure the best results.

Image Capture and Selection

A high quality image cannot be reproduced on press unless a high quality image has been selected from the start. The human eye, camera film, and digital camera CCD arrays are able to capture a wider range of tones than can be reproduced using any printing process. Here are some guidelines for taking or selecting images for coldset reproduction:

- Because coldset printing is able to image a density range of about 1.20, photographers should strive for middle tones in the critical elements of a photo. Darker areas tend to fill in or "go solid." Lighter areas tend to disappear or get "blown out."
- Shadow detail areas should be light enough to reproduce with 70% to 80% halftones.
- Highlight detail areas should be dark enough to reproduce with 5% to 10% halftones.
- Remember that highlights and shadow details captured on film or digitally will be compressed at a later stage. Agree before a shoot on what details are important to the image. Light the image to preserve the detail in both highlight and shadow areas when they are compressed in the pre-press process.
- Remember that while the resulting photo transparency might look flat, it will be optimized on the press during the printing process.

F-stop Targets

Color reproduction can be improved by selecting a bracketed exposure that is 1/2 stop lighter than an optimal meter reading. Care should be taken to not overexpose the image. Generally, the photographer should capture the image so that the resulting transparency contains a density range of no more than two to three f/stops.

The density range represents the difference between the lightest and darkest areas of a photograph.

Photographers measure light intensity using the term "f/stop." One f/stop is approximately equal to 0.30 in reflected density. To reproduce a transparency having 6.8 f/stops of density would call for printing a set of films so that the darkest shadow areas printed a density of 6.8 x .30, or 2.04 higher than the lightest highlight parts of the image area. The density range would then be 2.04.

Papers used in coldset printing commonly have densities of about .25. The upper end of a coldset black ink density is generally 1.25. That leaves a density range of 1.00 (1.25 for deep shadows minus .25 for white paper) for coldset printing. Thus the photo in the example above has a greater density range (2.04) than can normally be reproduced in the coldset process. Usually, tone compression algorithms in image manipulation programs adjust for the difference in ranges during pre-press preparation.

However, if the photographer captures the image using only two f/stops of light, the density range of the processed transparency will be about 1.02*. No tone compression then will be needed to reproduce all the tones in the transparency. The photographer has eliminated the need for tone compression and has retained control over reproduction of the image.

Of course, if the photographer wishes for some aspects of the captured product or image to print without highlight or shadow detail, then the f/stop range can be expanded from two to as much as three f/stops of light. Testing and communication are the keys to success. The art director must communicate what is important about the image to the photographer. The photographer must alert the customer and pre-press professionals that these controlled images will appear different and must be handled differently than uncontrolled images.

* When film is developed, contrast increases in the process. The amount of additional contrast varies from film to film. To judge the effect of the increased contrast, film manufacturers provide an index called the film's gamma. The gamma is used to help the photographer adjust for the expected contrast gain. The f/stop measure multiplied by the film's gamma will indicate the density after the film is developed. For example, if a film has a gamma of 1.7 and a TTL (Through-the-Lens) meter measures an image as having two f/stops of light, the film would have a density range of 2 x 1.7, (3.4 f/stops) of density after the film is processed. The 3.4 f/stops times 0.30 reflected density per f/stop results in total density of 1.02.

Tonal Range

If f/stop targets are not used, photographers should aim for a full tonal range. "Full tonal range" means all tonal values from light to dark, including specular highlights (shiny surface reflection, also called non-detail whites). With a full range original, print contrast is significantly increased since the image's halftones are not required in the non-detail whites during the separation process. Scanning in this manner optimizes the full effect of the entire print range from the paper whiteness to the maximum ink total area coverage density. Originals with excessive contrast may be visually appealing, but extreme contrast is usually detrimental to printed reproduction. It can lead to loss of detail during the separation process due to tone compression. Over-duped originals generally have excessive contrast.

Lighting

Proper front lighting of the subject will increase printed detail and help maintain color fidelity. It helps position the subject toward the lighter, more distinguishable detailed region of the print range by providing detail in the shadow regions of the image. Photographers should avoid backlighting because it results in a darker, dirtier reproduction. Uniform lighting throughout the photograph results in the best reproduction. This allows detail to be maximized throughout the full tonal range of the image. Non-uniform or uneven lighting of elements in the same photograph can pose scanning problems because scanners are unable to maximize the reproduction of detail in both illuminated subject areas and in areas that are cast in shadow. Lighting that falls behind the subject does not create difficulties. A contrasting background that accentuates the subject matter is the goal. When a background is not lit it will scan and reproduce as dark gray or black, adding a sense of depth to the image.

Clarity and Sharpness

When selecting a photograph, art directors and artists should scrutinize the original picture or transparency using a glass loupe or projection to determine the level of image sharpness. To produce a sharp photograph, especially in outdoor settings, use fill flash along with a smaller camera lens aperture setting. This combination provides improved focus and depth of field.

Use of non-original copies of a photograph (also called duplicates), faster speed films, and enlarged grainy photographs all contribute to a reduction in the sharpness achievable in the printed reproduction. These photographs also have a detrimental impact on scanning because sensitive scanner optics cannot reliably sense the "pixelized" grain effect. Use larger format (2-1/4" or 4"x5") originals when making extreme enlargements or undertaking selective cropping of an image. Generally, the larger the original, the sharper the final reproduction will be.

Flare and *haze* are the main causes of color saturation loss in original photographs. Flare -- non-image light that strikes the camera lens during the exposure process -- desaturates and washes out image colors. Backgrounds, strobe lighting, and camera angles can all contribute to an increase in flare. To prevent non-image light from striking a camera lens, the photographer should use filters, lens hoods, lens angles, and a Gobo or flag. Haze is a normal atmospheric condition associated with hazy or overcast weather. Like flare, haze often reduces color brilliance. The extent of this reduction is a function of the camera angle and the amount of haze.

Background Contrast/Color

Background contrast in studio photography plays an important role in successful newspaper reproduction. White or highly reflective backgrounds affect the critical exposure time that camera films need to record the light-absorbing details of the main subject. If not carefully managed, this light reflectance can introduce unwanted flare that causes loss of detail and desaturation of colors. As an example, a bright white background can create loss of detail when photographing dark brown and black products. Backgrounds that provide contrast – but are not highly reflective – will enhance printed reproduction.

Self-Developing Photographs

Photographic media that are self-developing are not recommended for coldset reproduction due o the limitations of the process and the lack of sharpness and inability to hold detail.

Scanning

Gray Steps

SNAP recommends that output devices -- including proofers, imagesetters and platesetters -- be capable of producing a minimum of 142 gray steps. The number of gray steps determines the number of tonal transitions achievable. The effect of insufficient gray steps is very noticeable when working with vignettes (sometimes called blends), which can result in banding. As a rule of thumb, a minimum of 100 gray steps or levels is required. The calculation for gray steps is:

$$\# \text{ of Gray Steps} = (\text{dpi} / \text{lpi})^2$$

Example:
An output device of 1016 dpi, outputting images with a line screen of 85 lpi, yields $(1016/85)^2$ or 142 gray steps.

SNAP Recommended Output Device Resolutions	
LPI	DPI

65	800
85	1020
100	1200
133	1600
200	2400

Input and Output Resolution

Resolution – both for input devices and for output devices – is an important consideration in the printing process. Several measurements are used to describe image characteristics in the process:

- *ppi*, or pixels per inch, is a measure of the amount of information scanned in from an image or captured using a digital camera. The higher the resolution capability of the input device, the higher the possible scan resolution. Scan resolution is critical to image quality.
- *dpi*, or dots per inch, sometimes referred to as spi (spots per inch) is a measure of the resolution of the printer, imagesetter, platesetter, or other output device. SNAP recommends use of dpi to refer to output resolution.
- *lpi*, or lines per inch, is a measure of the frequency of the halftone screen used to print an

image. The specific lpi chosen is a function of both the printing process and substrate on which the job is being printed.

For examples when using a 100 lpi screen ruling for output, continuous tone images should have a minimum input resolution of 200 pixels per inch (ppi) at the final image size.

Scanning resolution is also affected by the input/output size ratio and the screen ruling required of the output image. A scan-to-screen ruling ratio of 2:1 is recommended, although industry experts suggest that a ratio as low as 1.5:1 can be acceptable. A ratio of less than 1.5:1 could create coarse, uneven halftones and a fuzzy printed appearance. The scanner used and subject matter being scanned has an impact on this ratio as well. File originators are encouraged to test any scan-to-output ratio that is less than 2:1.

A guideline to use in determining the input scan resolution is:

(Intended Output Size Ratio) x (Screen Ruling) x 2 = (Minimum Scanning Resolution)

Example 1:
Intended output size ratio = 1.00 (100% size of original)
Intended screen ruling = 100 lpi
Scanner input resolution = 1.00 x 100 lpi x 2 = 200 ppi

Example 2:
Intended output size ratio = 4.00 (400% size of original)
Intended screen ruling = 100 lpi
Scanner input resolution = 4.00 x 100 lpi x 2 = 800 ppi

Example 3:
Intended output size ratio = 4.00 (400% size of original)
Intended screen ruling = 133 lpi
Scanner input resolution = 4.00 x 133 lpi x 2 = 1064 ppi

The table below suggests scanning resolutions for different lines-per-inch levels, assuming that the image output size is the same -- 100% -- as the image scan size.

Minimum Input Scan - Ppi	130 ppi	170 ppi	200 ppi	266 ppi	300 ppi	400 ppi
Output Image - Lpi	65 lpi	85 lpi	100 lpi	133 lpi	150 lpi	200 lpi

Scaling

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Scaling scanned images changes the effective resolution and can adversely affect quality and file sizes. Enlarging a halftone image after it has been scanned may result in loss of sharpness and clarity. Enlarging images more than 110% may result in pixelization, or a breaking apart, of the image. SNAP suggests rescanning the original at a higher resolution if the scan is to be output at a size larger than 110%. Users may wish to test the 110% threshold to confirm whether the quality is acceptable.

The following table shows how the effective resolution changes when an image is enlarged digitally after it has been scanned. Remember that the resolution after enlargement should still meet the suggested scan-to-output ratio of 2:1. Assuming a final output resolution of 100 lpi, shaded boxes in the chart indicate resolutions that fall below the acceptable ratio. Pixelization or poor imaging may result. For some images, however, a scan ratio of 1.5:1 can work successfully.

The table is based on optical, or true, resolution rather than enhanced resolution scanning. True resolution scanners – primarily high-end drum or flatbed scanners – have a one-to-one pixel capture capability. Desktop scanners typically interpolate data at ranges higher than their actual capture mechanisms. In some cases, a scanner may scan a file at a true resolution of 300 dpi and enhance it by interpolation to 1200 dpi or higher. Some desktop scanners interpolate horizontally while others interpolate vertically in the direction of the CCD array. Further technical developments in scanner products may minimize this difference. Consult the scanner manufacturer for information about the resolution of your system.

Scaling Percent	**Scanning Input Resolution (True) for 100 lpi output**						
When the input scan is enlarged by this percent after scanning:	**The effective ppi of the enlarged image will be:** (boxes with a cyan tint indicate a poor scan:output ratio assuming 2:1; red boxes indicate a poor scan:output ratio assuming 1.5:1)						
100%	170 ppi	200 ppi	266 ppi	300 ppi	600 ppi	1200 ppi	2400 ppi
125%	136 ppi	160 ppi	213 ppi	240 ppi	480 ppi	960 ppi	1920 ppi
150%	113 ppi	133 ppi	174 ppi	200 ppi	400 ppi	800 ppi	1600 ppi
175%	97 ppi	114 ppi	152 ppi	171 ppi	342 ppi	686 ppi	1372 ppi
200 %	85 ppi	100 ppi	133 ppi	150 ppi	300 ppi	600 ppi	1200 ppi
300 %	57 ppi	67 ppi	87 ppi	100 ppi	200 ppi	400 ppi	800 ppi
400 %	43 ppi	50 ppi	67 ppi	75 ppi	150 ppi	300 ppi	600 ppi

SNAP Recommended Scanning Resolutions An output line screen ruling of 100 lines per inch is assumed	
Percent Output Size	Input Scanning Resolution
100%	200 ppi
125%	250 ppi
150%	300 ppi
175%	350 ppi
200%	400 ppi
300%	600 ppi
400%	800 ppi

Line Art and Pre-Screened Copy

For line art SNAP recommends using the same input resolution as the plotting resolution of the output device. Line art images should have a minimum input resolution of 800 ppi at the final image size. Line art should be scanned at close to the final reproduction size to avoid scaling problems. If resizing, use the input-output scanning ratios outlined above.

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Scanned Art	**Recommended Input Resolution**	**Minimum Input Resolution**	**Considerations**
Type	Same as output resolution	1200 ppi if the output resolution is not known at time of input	Higher resolution leads to larger file sizes
Line art	Same as output resolution	800 ppi if the output resolution is not known at time of input	Thinner/finer lines may demand higher input resolution
Line drawing/ cartoons	Same as output resolution	800 ppi if the output resolution is not known at time of input	Thinner/finer lines may demand higher input resolution
Pre-screened halftones (Example: Copy Dot)	Same as output resolution	1200 ppi if the output resolution is not known at time of input	A lower input resolution can create moiré in the output image.

Detail Enhancement

Scanned images may reproduce with a “soft” appearance. If this effect is not desired, use image sharpening. Image sharpening is recommended for both black & white and color images to improve the perception of detail and clarity. The amount of sharpness to apply depends on the original image, the enlargement size, and personal preference. Noticeable white or black image outlines, posterization, and artifacts (e.g., jaggies) can result if excessive sharpness is applied. Computer monitors present a low-resolution display of the final reproduction. The effects of unsharp masking may look very different on a monitor than on a prepress proof or printed product. Testing can reveal this visual difference.

Re-scanning

Re-scanning an image that has already been converted to a halftone will often lead to a moiré pattern in the printed reproduction. High-resolution “copydotting” of the original screened image at the imagesetter output resolution may minimize the moiré.

Digital File Preparation and Management

As personal computers and desktop publishing software make it easier to design ads on computers, digital files are quickly becoming the most common way to prepare and deliver materials. To ensure that these materials can be properly received and processed by the printer, standard procedures must be agreed upon and followed. Below are guidelines for the preparation and delivery of digital materials.

Advertisers dealing with printers for the first time should submit material to the printer in advance for testing. Testing should ensure that the raster image processor (RIP) can properly process files, and a proof of the file should be generated. Testing should be repeated whenever upgrades or software changes are made.

Digital images and pages should conform to the image capture, image area, tone reproduction, and other guidelines outlined by SNAP. Also, make sure the printer has the equipment to read the media on which the file is supplied (e.g., floppy disk, CD-ROM, digital tape, etc.).

There is only one way to insure that the file output by the printer contains all the elements that were sent by the customer: a hardcopy proof. To verify image accuracy and placement, a hardcopy proof must accompany the digital file. For digital transmissions, a proof can be faxed or supplied by mail, courier or overnight delivery. Any changes to the digital file require the submission of a new proof. See section titled Proofing Processes for more information.

File Exchange Formats

In an effort to eliminate incompatibilities among various file formats, SNAP recommends the use of standard PDF (portable document format) for the exchange of digital materials between advertisers and printers.

Recognizing the inherent problems in reading and processing files arriving in many different program formats, the Committee for Graphic Arts Technical Standards (CGATS) set out to identify a software-independent format that could be accepted by all those involved in the printing process. Such a format would allow all parties to read and process files, regardless of the programs used to create them – a kind of universal language.

As a result, a subcommittee developed “ANSI/CGATS.12/1 *Graphic technology — Prepress digital data exchange — Use of PDF for composite data — Part 1: Complete exchange (PDF/X-1)*.” This standard is based on a portable document format developed by Adobe Systems Incorporated. It allows finished files to be converted to PDF/X format, and then read and processed by “readers” designed to interpret the format. Commercial software is readily available to “encode” and “decode” PDF files.

The PDF format offers a number of advantages over other formats:

- It is highly compact and can contain embedded fonts, pictures, and compressed vector objects.
- It is device- and media-independent, with CMYK and named (spot) color support and color space definitions incorporated
- Files are able to be trapped and imposed
- It is viewable in a number of operating systems using readily available readers.
- It can be more easily “preflighted” to identify errors before it is sent to the printer
- Last-minute changes can be made without the use of the original software used to create the file.

TIFF/IT-P1 is a specific type of graphic arts format used in some segments of the publishing industry. TIFF/IT-P1, as defined in *ISO 12639, Graphic technology — Pre-press digital data exchange — Tag image file format for image technology (TIFF/IT)* provides a simpler conformance level called profile 1 (P1) which limits the options for most tag values. P1 maximizes the compatibility between pre-press systems.

Contact your printer / newspaper to discuss which format to use.

Layout Guidelines

- Digital pages should be designed to conform to the image area, margin, and bleed guidelines specified in the Requirements for Printing Processes in the Film Preparation section. Note that newspapers are not able to reproduce bleed images.
- Make the dimensions of the file the actual size that it will be printed, with no margins. Be sure to set the X-Y coordinates at (0,0) for the advertisement or page size. Use this guideline for advertisements or pages that will float, so that the page size is equal to the final insertion or press-delivered product size.
- Use the portrait printing orientation to prevent pages saved accidentally as landscape documents from being cut off or compressed by newspaper or printer imaging systems.
- Assume that files will be output at 100 percent. Printing options for page set-ups should be set for 100 percent output.
- Don't overlay filled graphic elements to hide non-printing items; delete unused elements and other extraneous items from the pasteboard area outside of the advertisement or page perimeter.
- Place all the elements for each ad — logos, photographs, graphics, and page layout — in a single ad folder. This will facilitate the use of Automatic Picture Replacement (APR) and Open Pre-press Interface (OPI) technologies used by some printers.

Text and Font Guidelines

Files stored in portable document format (PDF) should embed all fonts within the file (see above). That is one reason why PDF is the preferred format for exchanging ad materials.

If PDF format is not used, save all screen and printer fonts in a folder and place the folder inside the primary ad folder, along with the ad and accompanying images. Make sure all parties have information about the screen and printer fonts you are using, including specific font name, manufacturer, version, kerning pair information, and font preferences.

Follow these guidelines for all files:

- Keep text and graphics boxes completely within the advertisement or page dimension boundaries to prevent possible errors during file processing.
- Text included in a logo should be converted to outline graphics.
- When color text in an advertisement or page will be converted to black & white (grayscale), avoid combining colors of similar contrast. For example, red text on a black background will become illegible.
- Remember that type scanned as a graphic element is like a photo; it cannot be edited like text that is entered on the keyboard.

Color Management Systems (CMS)

Computer-based color management, using standard color printing characterization data, is an emerging technology that promises to bring more consistency to color reproduction in printed materials. Computer hardware and software are being developed to compensate for differences among components in the reproduction process by mapping color outputs to a reference gamut. So-called color management system (CMS) technology is finding increasing application in the printing and publishing industry. While work in this area is underway, no applicable specifications are currently available for the implementation of such systems.

Color Graphics and Image Files

- Place graphics onto the page using the tools of your layout program. Avoid shared document features. Do not use the "publish and subscribe" features for graphics on Macintosh computers, and do not use the "cut/copy and paste" features on any platform.
- When a logo or graphic is used in more than one ad, it should be copied and included as a linked element in each of the different ad folders.
- Avoid intricate layered blends; they may make the page files too complex for a RIP and the file may not print as expected. To minimize output problems, flatten or composite all

layers before saving the final file.

- Remember that an EPS file nested within another EPS file causes layering complexity. These nested files may cause the RIP to improperly output the file or fail altogether.
- Avoid fade-to-zero blends; they are difficult to reproduce in the printing process.
- When creating clipping paths, minimize the number of points used. Large numbers of points can make page files too complex for the RIP and the file may not print as expected.
- Color graphics and images should be CMYK format.
- Use the appropriate file extension to indicate the format (e.g., filename.tif, filename.jpg, filename.eps).
- Do not change the names of photo or graphic files after they have been imported into the ad layout; vital file path links will be broken.

File Naming Conventions

The suggested format for naming files is:

(Publication/Event Date) (Advertiser Name) (Sequence Letter) (Version Number)

- The *publication date* is the date on which the advertisement will run in the newspaper or the insert will appear in the newspaper. It should be four numerals with the month first, followed by the day. For example, "0904" means September 4. For multiple run or insertion dates, only the first date should be used.

- The *advertiser's name* should be abbreviated with no punctuation. For example, "Joe's Tires" could be abbreviated as "JTires".
- The *sequence letter* is used to distinguish different advertisements or insertions from the same advertiser. Use letters "A" through "Z". If the advertiser is running a second ad or insertion on the same publication date, a different sequence number would be used for each. For example, "0904JTiresA1" would be one advertisement; "0904JTiresB1" would identify the second.
- The *version number* is used to distinguish changes in the original advertisement or insert. It should be a numeral. For example, "0904JTiresB1" would be one version of an advertisement; "0904JTiresB2" would identify a second version.
- Don't use any punctuation in the file name.
- For applications limited to eight-character filenames, use the first four characters for the publication date and the remaining four characters for the advertiser name, sequence letter, and version number.
- The file extension should indicate the file format. For example, "0904JTiresB2.EPS" would indicate an EPS.

Final Checks

- Make sure that all colors are prepared for CMYK separations and that unused colors are removed from the color palette.
- Make sure that all extraneous information is cleared from the pasteboard and that no unprintable items remain in the digital document.
- Make sure that all "job jacket" and other extraneous information have been removed from the digital file.
- Make sure that all pages have the correct dimensions and zero margins.
- Use the "SAVE AS" rather than the "SAVE" command to save the final version of the page or advertisement. In some software packages this creates a cleaner, more compact file.
- Put the page layout, photographs, and graphics into one main folder and put a separate font folder inside it. Package the entire main folder using archival software, for transmission via removable media or electronically.
- Verify that the correct version of all files required for the job have been included on the supplied media, including linked graphics files and less obvious page elements, such as borders and rules.
- Any versioning information associated with the file must be clearly communicated to the printer. Use the File Naming Conventions (noted on page 23) All versioning information

should be marked on the content proofs as well.

- Pages or ads supplied on removable media should fit on a single disk or cartridge and should not be supplied on multiple disks.
- For files submitted on disks, attaching written pre-press and preflight information can help assure a successful result. Similar information can be sent along with digital files as a simple text file. Sample forms that can be used to provide such information are provided at the back of this book and can also be found on various industry web sites.
- Back up all files before sending them.
- Label disks (or other media) with a contact name and phone number, along with the names of the files on the media (see naming conventions below).
- Notify the printer of any potential compatibility issues due to program enhancements such as extensions, plug-ins, or add-ons.

Compression of Image Files

Many image or advertising files are compressed to increase file transfer speed and minimize storage requirements. File compression techniques are either "loss-less" or "lossy".

"Lossy" compression merges similar and equal value data, resulting in a loss of original data in the final, uncompressed file. The most popular type of compression for images in the printing industry is JPEG (Joint Photographers Expert Group). The higher the "lossy" compression setting, the more dissimilar information is merged into the same value. High compression of the "lossy" type results in quality degradation of image files, typically affecting image detail and often produces "artifacts" in the file when it is transformed.

Files should be compressed by a ratio of no more than 10:1, which is usually a low compression/high quality setting.

Repeated compressing and decompressing, even at a ratio of 10:1 or less, will also result in quality degradation. For example, an image might be compressed in JPEG format, then decompressed, edited and compressed once more in JPEG format. The same image might later be decompressed, placed in a design application, and saved in portable document format, causing compression yet again. These repeated cycles of compression/decompression may result in additional loss of quality.

Loss-less compression merges equal data values only, resulting in no quality loss when the image is later decompressed. Examples of loss-less compression include Zip™ and LZW™ formats. They typically compress data at a 3:1 ratio.

Data compression is not required for transmission of digital files, but it can expedite the transmission of large files. It should be used only if the sender and receiver agree on the compression method.

Here are some specific guidelines for using compression software:

- The extent of file compression affects image quality. Do not compress files more than 10 to 1. Pre-testing to determine the effects of any compression scheme is recommended.
- Generally, compression programs require the receiver to have the same software tools as the sender to properly decompress the file.
- Segmenting files during compression is not recommended.
- There are several commonly used applications for compression. Check with the printer or newspaper to determine which applications are supported.
- Compression and decompression can require a fair amount of computing power and time. However, it may be worthwhile to produce a smaller ad file that a network can handle and that costs less to transmit.
- If your application allows control of the extent of JPEG compression, specify the "maximum quality" setting for black & white photographs and the "high quality" setting for process color. These settings will preserve high quality reproduction while providing the benefits of compression.

PDF software typically has its own compression features. It is not advisable to further compress PDF files.

File Transmission

There are many ways to get your digital files to a printer or newspaper. It can be as simple as handing over a diskette. But long distances and short deadlines make this method impractical. Modems, phone lines, bulletin board systems, and the Internet have made it easy to send digital ads electronically. And services specializing in exchanging materials among advertisers and newspapers have emerged to make the transmission of digital files even easier.

Specific methods and software tools for transmitting digital files are beyond the scope of these specifications. If you follow the guidelines above, you should have a finished file ready for delivery to the printer. Refer to the instructions for your particular communications hardware and software for guidance on sending and receiving the files.

Meanwhile, a few general procedures will make transmissions easier and less costly:

- Be prepared. Before transmitting the files, be sure all material is ready. This will prevent a telephone line from being tied up needlessly and will help reduce communications costs.

- Use file compression as described above.
- Use a fast modem. The faster the modem, the shorter the transmission time. Check with the printer or newspaper to determine its preferred operating speed.
- Poor telephone line quality can lower the effective speed of the modem. If many data packets need to be re-sent, have the phone company check the condition of your lines.
- Don't hang up. Never terminate a modem connection by turning off the originating modem or computer. This may cause operational difficulties for the receiver.
- Call the printer or newspaper before sending large files (more than 3MB) to verify that enough storage is available at the receiver site. This also alerts the receiver to a pending extended communications session.
- Check all files for viruses prior to transmission. Even though the receiver may also perform verification, it is poor etiquette to send files that have not been checked.
- Allow time for retransmission. There are numerous reasons that a file needs to be retransmitted, including telephone line noise and dropped connections.
- Use the proper protocol. Verify with the printer or newspaper any technical protocols that should be used for modem operations.

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While the use of digital material in the coldset printing process is growing rapidly, many materials are still prepared for delivery as paper or film. Here are some guidelines for preparing these materials.

Camera Ready Pre-screened Reflective Materials

When preparing final materials for the printer that will be delivered as pre-screened reflective materials such as Veloxes, Paper Positives, or other reflective media, follow these guidelines:

- Black original artwork is recommended for best results. Red type on a black background yields inferior results.
- Light original materials, such as pencil and charcoal artwork, will not reproduce well and is not recommended.
- Material submitted in its final size dimensions will reproduce best. Enlarging or reducing artwork too much causes loss of detail.
- Prescreened materials should be supplied in final size dimensions because enlarging or reducing will alter tone reproduction.
- Type, line work, Veloxes, and other hard-copy materials should be output at a resolution of 1200 dots per inch (dpi).

- Type, line work, Veloxes, and other hard-copy materials should have a uniform and minimum Dmax of 1.7. Consistent Dmax that falls between 1.7 and 1.9 should reproduce well.
- Avoid submitting photocopied or faxed materials as originals for reproduction. Each successive generation after the original diminishes print quality and causes lines and type to break up.

Tone Reproduction Aim Points

To allow for dot gain/TVI, use the following tone reproduction aim points for Veloxes or originals to be reproduced as black-and-white or single-color halftone images.

When the materials will be shot with a line camera:

Tonal Area - Line Camera	Offset (85-100 lpi)	Flexography (85 lpi)	Letterpress (65-85 lpi)
Specular/non-	0%	0%	0%

detail			
Highlight	10%	15%	15%
Quartertone	20%	20%	20%
Midtone	38%	38%	38%
Shadow	80%	80%	80%

(NOTE: Line cameras add contrast to the original copy. A loss of 10% in highlight tones and a gain of 10% in shadow areas is common when making line shots of Veloxes. These values are derived using the Yule-Nielsen equation with an N Value of 1.7)

When the materials will be scanned with a copy dot scanner:

Tonal Area – Scanner	Offset (85-100 lpi)	Flexography (85 lpi)	Letterpress (65-85 lpi)
Specular/ Non-detail	0%	0%	0%
Highlight	5%	7%	8%
Quartertone	22%	18%	20%
Midtone	35%	38%	38%
Shadow	85%	85%	85%

(NOTE: Copy dot scanners tend to lose 2 to 3% in the highlight to quartertone areas of the tone curve. These values are derived using the Yule-Nielsen equation with an N Value of 1.7)

Film Preparation

To assure optimum reproduction of supplied films, care should be taken to meet the proper specifications for the printing process. Films that do not meet these specifications require discussion among those involved in the printing process. Delays or additional costs can result if materials do not conform to the specifications.

General Guidelines

- Supplied film must be clean, free of pinholes and scratches, have good fit (internal register) and be in register (external register).
- Before films are created, suppliers should confirm format requirements with printers, such as whether films should be provided as single pages or as printer spreads.
- Suppliers should confirm with printers whether films should be punched and if so, the punching configuration recommended by the printer.
- Suppliers should confirm with printers the correct film image areas, including required margin or bleed dimensions.
- Suppliers should confirm the required film emulsion orientation with the printer.
- Any loose elements should be incorporated into films before they are provided to the printer. Films requiring this type of work by the printer should be discussed in advance with the printer.
- To optimize flexibility and minimize costs of last-minute changes, some advertisers may wish to place black text on a separate piece of film. In most cases, the printer will print this black type using the same plate used to print the black portion of a four-color separation. All parties should discuss whether to place black type on a fifth piece of film prior to taking this step.
- With regard to D_{min} film guidelines:

- D_{min} values in the chart below refer to film alone. The D_{min} of the film stripped to acetate or other clear base will be higher.
- For optimal plate exposure consistency and quality, it is recommended that users not mix films with substantially different D_{min} values.
- The D_{min} values shown refer to film having a thickness of 0.004". Films having a greater thickness will typically have higher D_{min} values.

The following tables provide the physical requirements for films to be supplied for coldset printing processes.

Common Film Requirements

Film Characteristic	Offset, Flexography, and Letterpress
Minimum base thickness/ type	0.004” polyester
Polarity	Negative
Dmax	Typically 3.8 or higher unless otherwise agreed (UV or ortho)
Dmin	0.10 or less (UV); 0.05 or less (ortho) unless otherwise agreed
Halftone hardness	Hard dots with a minimum of fringe
Opaquing	Should be minimal and only on the base side of the film
Screen angles	Cyan, magenta, and black screens must be separated by 30 degrees, with yellow at an angle 15 degrees from the other three colors. In all cases, black must not be placed at the 90-degree angle.
Register marks	Each piece of film should include center register marks that are 1/4” (0.250”) in length and located at least 1/4” (0.250”) away from the live area.
Crop marks	Each piece of film should include corner crop marks indicating final trim and fold dimension that are located at least 1/4” (0.250”) away from the live area.
Identification	Each piece of film should include, color, and version

	identification of that film (e.g., page number).
Bleed extension beyond the live area (Note: In offset and letterpress, bleeds are not possible for products that are not trimmed, such as daily newspapers.)	Bleeds of at least 1/4" (0.250") should exist on all sides of the page that are to bleed. Smaller bleeds should be used only after consultation with the printer. Bleed image should consist of only non-essential image area.
Bleed image area (Note: In offset and letterpress, bleeds are not possible for products that are not trimmed, such as daily newspapers.)	Live matter on bleed pages, including text, folios, important images, and other copy, should not be placed closer than 3/8" (0.375") to the printed product's finished size in any direction.
Margins/Borders	Margins of 1/2" (0.5") should exist on all four sides of the page. Smaller margins may be used only after consultation with the printer/ newspaper.
Film output resolution for process color and halftones (See discussion of output	Film imaging process color and single-color or two-color halftones should have a minimum output resolution.

resolution)	
Film output resolution for mechanical and single-color line work (See discussion on output resolution)	Film imaging mechanical color and single color line work should have a minimum output resolution

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Film Characteristic	**Offset**	**Flexography**	**Letterpress**
Orientation (emulsion down)	Right-reading (RRED)	Wrong-reading (WRED)	Wrong-reading (WRED)
Halftone shape	Round preferred	Round preferred	Round preferred
Screen ruling	85 lines per inch to 100 lines per inch. Higher screen rulings are acceptable upon consultation with the printer.	85 lines per inch to 100 lines per inch. Higher screen rulings are acceptable upon consultation with the printer.	65 lines per inch to 72 lines per inch. Higher screen rulings are acceptable upon consultation with the printer.
Image trapping (aim point)	Total image overlap should be 0.010”	Total image overlap should be 0.015”	Total image overlap should be 0.015”
Cross-overs	Images that require critical alignment and crossover a gutter should be	Image can cross over gutter	Images that require critical alignment and crossover a gutter should be

	avoided. "Critical alignment" is defined as 1/8" (0.125") or less.		avoided. "Critical alignment" is defined as 1/8" (0.125") or less.

Contacting/Duplicating Control

When duplicating films, halftone dot size must vary no more than plus or minus 2% from the original. A process test should be completed at the beginning of each shift or on a regular basis.

1. An original exposure control guide (such as a UGRA scale) should be contacted or duplicated in the same manner as the production materials are to be processed.
2. With a properly calibrated transmission densitometer, the actual values of the original exposure guide tints should be recorded along with the actual values of the contacted/duplicated exposure guide. Both sets of values should be communicated to the recipient of the contact/dupe along with information about the transmission densitometer and the spectral response (ortho, UV, Type 1, etc.) used to measure the films.

Camera Halftone for Reflection Continuous Tone Images

To reproduce reflective copy, proper halftone dot values should be assigned to the input density values of the continuous tone original. This allows the greatest possible tone range and gradation of the original image to be captured. The following table is for Normal Key copy.

Tone Curve Portion	**Input Density Values for Continuous Tone Reflection Images**
Highlight	0.05 to 0.10
Midtone	0.90 above highlight
Shadow	1.60 above highlight
Total Range (substrate white to solid)	1.65 to 1.70

Tonal ranges greater than 1.70 may lead to loss of detail in the final printed product.

Tips for Vacuum Frame Exposures

- Clean the glass often with residue-free cleaner and lint-less cloth. Clean glass reduces light absorption, refraction and image defects.
- Insure that the vacuum pump is clean and the vacuum subsystem is free of leaks.
- Backing mats should be gray or black and stiff to prevent deformity. The surface should be uniform, free of hills and valleys.
- Verify integrity of the seal/bead around the mat.
- Lamp distance should be great enough to cover the printing frame with even illumination, but short enough for practical exposure. A 21-step scale (Stouffer, RIT, GATF or UGRA) should not be more than one step different from the center of the image to the edge of the largest possible image you would use in the frame. Be aware of light falloff (lower exposure) toward the edges. Determine the evenness of exposure.
- Lamp bulbs must be replaced occasionally because their spectral output changes as they age. Over the life span of a bulb, its efficiency decreases by about 20%. Follow the manufacturer's replacement schedule.
- An original exposure control guide (such as a Stouffer, RIT, GATF or UGRA scale) should be contacted or duplicated in the same manner as the production materials are to be processed. A test target should be used daily. New lamps can vary by as much as 40% from one manufacturer to another and from bulb to bulb from the same manufacturer.
- Insure consistent light intensity. Lamp-to-substrate distance, age and condition of bulb, type and condition of reflector, and accuracy of resetting lamp brightness control can all influence light intensity. Changes in the voltage supplied to a contact exposure lamp can cause significant changes in the actual exposure obtained. Integrators should be set to "integrate" as opposed to "time".
- Draw-down time should be sufficient to insure intimate contact. A test should be done to verify draw-down time.

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Final Output

If SNAP specifications have been followed, the screened tone values should have the following values.

Black-and-white or single-color images

Tonal Area	**Offset (85 lpi)**	**Offset (100 lpi)**	**Flexo-Graphy (85 lpi)**	**Letter-Press (65-72 lpi)**	**Letter-Press (85 lpi)**
Specular/ non-detail	0%	0%	0%	0%	0%
Highlight	3%	3%	5%	8%	5%
Quartertone	18%	16%	15%	20%	15%
Midtone	35%	32%	35%	38%	35%
Shadow	85%	85%	85%	85%	75%

Four-color images:

Cyan	**Magenta**	**Yellow**	**Black**	**Tonal area**
Offset 85 lpi				
3	1	1	0	Highlight

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20	14	14	0	Quartertone
38	30	30	10	Midtone
60	50	50	80	Shadow
Offset 100 lpi				
5	2	2	0	Highlight
20	14	14	0	Quartertone
38	30	30	10	Midtone
60	50	50	80	Shadow
Flexography 85 lpi				
8	5	5	0	Highlight
20	14	14	0	Quartertone
38	30	30	10	Midtone
60	50	50	80	Shadow
Letterpress 65 - 72 lpi				
9	5	5	0	Highlight
20	14	14	0	Quartertone
42	33	33	0	Midtone
61	52	52	75	Shadow
Letterpress 85 lpi				

8	5	5	0	Highlight
20	14	14	0	Quartertone
38	30	30	10	Midtone
60	50	50	80	Shadow

The values shown in Table N should exist in the file and on the film or plate imaged by that file following the application of any Gray Component Replacement (GCR) or Undercolor Removal (UCR) applications.

In addition, when evaluating output material they should meet these other requirements:

Film Characteristic	**Offset**	**Flexography**	**Letterpress**
Total Area Coverage (TAC) Maximum	240%	260%	240%
TAC Minimum Area Coverage for neutral shadow	220% Note: lower values may be possible with prior testing	220% Note: lower values may be possible with prior testing	220% Note: lower values may be possible with prior testing

Stochastic Screening	Not recommended without prior consultation	Not recommended	Not recommended
Exceeding the TAC	Acceptable provided the area is not larger than approximately 1" in diameter and all segments understand that this area will print as a solid. Do not exceed 260%.	Acceptable provided the area is not larger than approximately 1" in diameter and all segments understand that this area will print as a solid. Do not exceed 280%.	Not recommended
Neutral Maximum Shadow areas	For any separation, not more than one color should print as a solid	For any separation, not more than one color should print as a solid	For any separation, not more than one color should print as a solid

	(100%); the two secondary colors should each not exceed 75%.	(100%); the two secondary colors should each not exceed 75%.Black should not print more than 90%.	(100%); the two secondary colors should each not exceed 75%.

(Note also that current US and International Standards refer to the term Tone Value Sum (TVS) to describe Total Area Coverage.)

How to Linearize an Imagesetter

To assure high quality reproduction, it is important to set and maintain proper exposure and linearization conditions on output devices. Maintaining these conditions results in more accurate and predicable dot percentage values throughout the tone range of images and optimizes reproduction of fine type. Use the following procedure to achieve more consistent output results with film and photographic paper.

1. Verify that processor conditions meet the requirements of manufacturers and suppliers, including time, temperature, chemistry concentration and replenishment rate.
2. Verify that all transmission densitometers are properly calibrated and are capable of reading optimal D_{max} as specified by the supplier of the film.
3. For each designated resolution, line screen, and dot shape, perform an exposure sweep to determine optimal setting for achieving both fine type and the manufacturer-recommended D_{max}. Confirm that the imagesetter is operating within the manufacturer's recommendations. Density variation should not exceed 0.40 across the page.
4. Output an unadjusted, screened step-scale or other test target through the Raster Image Processor (RIP).
5. Measure all tint values from the unadjusted, final plate-ready film test target.
6. Input test values.
7. Verify linearization.
8. Activate linearization and apply to production files.

Proofing Processes

Proofing is a term that refers to the process of checking a job during its production. Proofs are used in prepress and pressroom departments for functions such as content and color approval, process control, quality control and to confirm corrections. Proofing methods and requirements differ depending on both the production stage and the customer’s expectations. A range of proofing solutions exist which vary in quality, complexity, and cost.

Proofs can be classified in three ways:

- Analog or Digital
- Hard copy or Softcopy
- Content or Final (Contract)

1. **The image source for the proof**
   - Analog proofs can be created from film using an ultraviolet light source.
   - Digital proofs can be imaged directly from a file using a laser, ink jet, or other technology.
2. **The format in which the proof is supplied**
   - Hardcopy proofs are output using physical materials. These include:

A. Press proofs, which are printed from plates on a press using ink and paper.
B. Off-press proofs, sometimes called prepress proofs, which use photosensitive materials that are exposed with the separation films.
C. Digital hardcopy proofs, which are created without the use of film directly from a file using any one of many direct imaging approaches.

- Softproofs appear as an image on a screen or terminal.

3. The proof's purpose

The term "proof" encompasses a range of functions. These include:

1. A "content proof" or "position proof" is used for checking for image content, color breaks, and position (not for color matches).
2. A "Contract or Final Proof" is used for final color guidance and position of all elements.

Typically created from either final film or the final digital file, the final proof is sometimes called the Color OK proof. This proof is intended to represent the final version of the job that is correct in terms of color, tone reproduction, substrate, layout and position of elements, and content of elements. The purpose of the final proof is to predict the printed reproduction of the supplied film or file.

Final Insights

1. All proof types – analog and digital, hard and soft, content and final – are useful tools for assessing jobs and their images. Each type has its own features, benefits, and limitations.
2. A proof that one customer of marketplace segment deems as useful as only a content proof may be acceptable for other customers and marketplace segments as a final proof.
3. The classification described in this section is intended to promote communication and understanding. Process demands and customer expectations should dictate the selection of the proofing approach.

Requirements for SNAP proofs

Content Proofs

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To provide complete instructions for the printer/newspaper, the content proof should:

- Be actual size and tiled if necessary. Tiled proofs should be taped together to represent the complete image. If this is not possible, the proof should indicate the percentage of reduction or enlargement.
- Include trim, fold, and register marks.
- Identify rules as For-Position-Only (FPO) or to image.
- Identify tinted page elements as either fifth color/match colors or as CMYK tint builds, including the percent of each process color required.
- Be a color proof if the image is to reproduce using color. This provides helpful insight into color breaks as well as potential trapping issues and whether images are black-and-white or in color.
- Identify all silhouettes as "silo" since these effects typically will need to be recreated. If these graphic elements are ready to be output, identify them as "Live."
- Be labeled with the customer name, event name or date, proof provider's name and telephone number, and any versioning information.
- For-Position-Only (FPO) graphic files, including photographs and special effects, should be clearly marked on the content proof accompanying the digital file along with either high-resolution scan files of these photographs or the original photographs.

Final Proofs

Final proofs for coldset printing should visually predict the final job as closely as possible. The final proof should accurately simulate the final printing results, including:

- Final Layout
- Substrate characteristics (i.e. surface, color, brightness, whiteness)
- Ink color/gamut
- Tone reproduction
- Image area surface appearance
- Good register.
- Origin and date of creation.
- Standardized color bars

Press Proofs

Press proofs should use inks printed to the density specifications listed below under *Press Production Guidelines*. The proof's dot gain/TVI should be controlled and monitored for optimum consistency. The coldset industry uses a wide variety of uncoated groundwood papers. It is therefore not practical to designate a standard proofing stock because paper color, brightness and opacity will vary widely. It is suggested that if press proofs are required, the proofer determine the specifications of the production sheet and pull the proofs on either the same stock or one with similar characteristics. The recommended ink sequence for a press proof should follow the pressroom production guidelines. Color bars should include a solid, 25%, 50%, and 75% tint of each color, 2-color overprints and a 3-color gray patch of 40%C/30%M/30%Y. Such color control targets are available from NAA, GATF, RIT, and other organizations.

Off-press Proofs

Many types of pre-press color proofing systems are available. They include digital and analog (overlay and single sheet) methods. These proofs should be made according to the manufacturer's recommendations in order to simulate the final printed job and comply with the general guidelines above. Analog proofing systems require exposure frames with appropriate light sources. Follow the proofing manufacturer's recommendations for bulbs and exposure times. Proper calibration and monitoring are required. Although they are similar, all analog systems are unique, with their own characteristics and procedures. Consult your manufacturer. Color management software is available on most digital proofers enabling the user to choose characteristics consistent with SNAP. See appendix XX. Digital proofs should be imaged from the same RIP file used to image the final film and/or plate materials.

Proofing solutions in a digital workflow remain a challenge. At this time, in many cases digital and analog workflows exist side by side and are used together. There are emerging technologies in this area and change is occurring rapidly. Digital proofs are often used to verify content and position. SNAP strongly recommends that digital proofs be tested for both accuracy and consistency.

Platemaking Processes

Conventional Processes

Accurate image transfer from film to plate is essential for good print reproduction. Improper exposure can cause excessive dot growth on negative working plates. Here are some guidelines:

- Plate exposure frames and processors should be maintained according to manufacturers' specifications.
- Test images -- such as an UGRA scale, RIT Microline target, or GATF plate control target

-- should be used to evaluate plate exposure at least once a week.

- Stouffer scales should be used on a daily basis to maintain exposure.
- Plate control targets must be replaced when physically damaged or faded. Scheduled target replacement depends on how each is used and stored. The manufacturer should provide guidelines on care and useful life.
- All plates should be burned with hard dot negatives.
- Plate exposure vacuum control is important to provide accurate plating. See Appendix X for more detail.

Computer-to-Plate Processes

Computer-to-Plate (CTP) workflow is the process of printing a digital file directly onto plate material instead of paper or film. Relatively new platesetter technology makes this possible. A platesetter outputs a file to plate material much like a traditional imagesetter outputs a file to paper or film. The guidelines above for digital file preparation and management apply to computer-to-plate output just as they do for film output. However, there are two important differences between film output and plate output. First, even with a perfectly calibrated digital prepress system and a calibrated digital platesetter/plate system, the plates may not have the same dot gain/TVI as plates made from film. And second, there is no opportunity to proof the final file, short of a press proof.

Here are some guidelines for computer-to-plate processes:

- The exposure and processing conditions for the digital plate should be checked weekly with a suitable target, such as the digital UGRA image or tint scales supplied by the RIP vendor. Follow the manufacturer's recommendations. Tint values on plates are typically measured by densitometry, as on press sheets. Plate densitometers, intended to eliminate interference from plate grain effects, are available.
- Tone reproduction on CTP plates typically shows a decrease of 3% to 5% dot gain/TVI because of the elimination of contact exposure. In CTP, the dot gain/TVI is controllable from the RIP.

Press Production Guidelines

Advancements in equipment, processes and controls have dramatically improved the quality of printing. Nevertheless, acceptable results depend on the right combination of many variables, including materials and press conditions. The SNAP guidelines are intended to standardize printing practices to yield the highest quality results. The guidelines are based on extensive testing and settings that have been proven to generate good results. When the proof has been prepared according to SNAP specifications, and the printing process is carried out according to the guidelines below, the result should be of high quality.

The tolerances shown in the tables make appropriate allowances for variation in measurement methods, materials and equipment.

See the section on Viewing and Measurement Methods below for information on measurements of press sheets.

Solid Ink Density

Solid ink densities are determined by printing the solid color and measuring the result with a densitometer. The values measure the relative amount of ink applied to the substrate. For balanced color reproduction, recommended aims for solid ink densities are outlined in the following table.

Dry Solid Ink Density (SID)	**Offset Newspapers**	**Offset Commercial**	**Flexography**	**Letterpress**

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Cyan	.90	.95	.95	.90
Magenta	.90	.95	.97	.90
Yellow	.85	.90	.79	.85
Black	1.05	1.10	1.05	1.00
Tolerances	+/- 0.05	+/- 0.10	+/- 0.04	+/- 0.05

(Dry SID Status T densities measured as absolute; paper density included)

Notes:

1. *Dry-back* is the difference in density between ink measured immediately after printing and ink measured after it has had time to set. If ink is measured immediately after printing, dry-back values must be added to the numbers above. Typical industry experience has seen dry-back values of 0.02 to 0.05 for offset and letterpress. Dry-back values will vary from press to press and from color to color. See Viewing and Measurement Methods section below for information about dry-back testing.
2. Coldset density aim points for commercial printing are slightly higher and variation is slightly larger than for newspaper printing because the intent of commercial printing is to match the proof. Newspapers generally run to match density numbers.
3. See section on gray balance for additional information on color balance.

Dot Gain/TVI

Dot gain/TVI (tone value increase) is an increase in the halftone dot that results from different stages of the reproduction process. Every stage of the process -- from film, through platemaking, to the stages of final printing -- contributes to dot gain/TVI.

Total dot gain: Mechanical (physical) plus optical (visual) dot gain

Dot gain/TVI is an increase in the halftone dot that results from different stages of the reproduction process. Every stage of the process--from film through platemaking to the stages of final printing--contributes to dot gain/TVI.

Total dot gain: Mechanical (physical) plus optical (visual) dot gain

Total Dot Gain/TVI is defined as the combination of mechanical (physical) and optical (visual) growth in the halftone dot. As the dot transfers from the plate to the paper, it physically increases in size. After the dot is printed on newsprint, the eye and densitometer perceive it as larger than the physical growth alone because light is scattered within the paper and some of the light is trapped below the halftone dots in addition to being absorbed by the ink. This effect is called optical dot gain/TVI. Optical dot gain/TVI can increase if light scattering and reflection is more pronounced due to surface characteristics of the stock. (See section on Viewing and Measurement Methods on page 46.)

Dot gain/TVI is measured with a reflection densitometer. It is important that the instrument use the Murray-Davies equation option for measurement, which measures the combined mechanical and optical gain. The values in the tables below assume use of the Murray-Davies equation.

Although dot gain is stated as a percentage, it is not really a percentage value. For example, if a dot area or tone value of 50 percent in the image area measures 80 percent when printed, it is said to have a dot gain/TVI of 30 percent. That number is simply the difference between the two percentages, not a percentage value of the original number.

The tables below show the expected dot gain/TVI (as measured by a densitometer) at different tonal values. For instance, for offset printing an initial 25 percent cyan tone value in the film or file can be expected to reproduce on the printed sheet as a 53 percent cyan tone value (25% initial dot+28% gain = 53%). Knowing these values, the material can be adjusted in the prepress process so it reproduces properly when it is printed. An optimal tone reproduction curve can thus be developed for the film, file, or RIP, and appropriate preference tables can be created in electronic prepress software applications.

Press operators should use these numbers as aim points and tolerances. If on-press values consistently differ from these values, you should investigate why. You should also communicate your specific values to the providers of the film or file.

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Dot Gain/TVI @ 25%	**Offset (85 lpi)**	**Offset (100 lpi)**	**Flexography (85 lpi)**	**Letterpress (72 - 85 lpi)**
Cyan	28%	32%	25%	15%
Magenta	28%	32%	25%	15%
Yellow	28%	32%	25%	15%
Black	28%	32%	25%	15%
Tolerances	+/-3%	+/- 3%	+/- 3%	+/- 3%

Dot Gain/TVI @ 50%	**Offset (85 lpi)**	**Offset (100 lpi)**	**Flexography (85 lpi)**	**Letterpress (72 - 85 lpi)**
Cyan	30%	32%	27%	18%
Magenta	30%	32%	27%	18%
Yellow	30%	32%	27%	18%
Black	30%	32%	27%	18%
Tolerances	+/- 4%	+/- 4%	+/- 4%	+/- 4%

Dot Gain/TVI @ 75%	**Offset (85 lpi)**	**Offset (100 lpi)**	**Flexography (85 lpi)**	**Letterpress (72 - 85 lpi) @ 65%**
Cyan	20%	20%	16%	16%
Magenta	20%	20%	16%	16%
Yellow	20%	20%	16%	16%
Black	20%	20%	16%	16%
Tolerances	+/- 3%	+/- 3%	+/- 3%	+/- 3%

For offset, dot gain/TVI, ink trap, and print contrast values assume use of negative working film, surface plate materials, and plate-to-blanket image transfer. Direct offset printing, where the plate prints directly onto the paper, will yield different dot gain/TVI, ink trap, and print contrast values.

Color Balance Considerations

Changes in dot gain values among the various colors can lead to color balance problems. If dot gain values stray too much from the values above, the relationship among the colors can be seriously damaged. Color balance is typically evaluated at the 50% dot area. While the dot gain tolerance for any given color is +/-4% in the 50% dot area table, the values for each color should not differ from each other by more than 4%. For example, if cyan is 2 percentage points above the recommended value, then yellow should not be more than 2 percent *below* its recommended value. Otherwise, the spread between the two colors would exceed 4 percentage points and color balance would be adversely affected.

Direct Lithography Considerations

When using direct lithography plates commonly are exposed with the emulsion side of the negative up (not in contact with the plate surface). This results in dot gain/TVI of approximately 8 to 10 percent on the plate. The potential for variation of dot gain/TVI between direct lithography and offset lithography may be substantial. Measurement of the process is recommended to verify actual results.

Print Contrast

Print contrast is an objective way to describe how open the shadow portion of a printed image is. It is calculated using densities from a solid and a shadow dot area. If densities are within SNAP guidelines, higher print contrast values indicate an improved ability to maintain shadow detail on the printed sheet. It is calculated using the following formula:

$$\frac{\text{(Density of Solid)} - \text{(Density @ 75\% Tone Value)}}{\text{(Density of Solid)}} \times 100$$

US Ink's Press Doctor

If densities are within SNAP guidelines the result of this equation should be as indicated in the following table. If not, adjustment will be required to properly reproduce material prepared according to SNAP specifications.

Print Contrast @ 75%	**Offset**	**Flexograp hy**	**Letterpres s**
Cyan	13	20	20
Magenta	12	20	20
Yellow	15	20	20
Black	16	20	20
Tolerances	+/- 5	+/- 5	+/- 5

Printing Sequence

SNAP recommends the following printing sequences:

Offset	**Flexography**	**Letterpress**
Cyan-Magenta-Yellow-	Yellow-Magenta-Cyan-	Cyan-Magenta-Yellow-

Black or Black-Cyan-Magenta-Yellow	Black	Black

Note: Many tests conducted throughout the industry have shown that the widest possible gamut for offset and letterpress colors is obtained through the CMYK laydown sequence. In newspaper flexographic printing the opaque yellow is laid downed first so that it does not hide the subsequent colors.

Image Registration on Press

The final step in the four-color printing process is the proper registration of the four colors. Careful steps are taken to align the four colors so that they print exactly in the correct positions. A misaligned reproduction looks fuzzy and out of focus, while the properly registered reproduction looks clean and sharp.

Registration should be as precise as possible:

> Must not exceed 0.012" of color in any direction, lateral, circumferential or skewed, referenced to the black printer.

> Must not exceed 0.015" maximum between any two colors in any direction. This is equivalent to 1.5 rows of dots @ 100 lpi, 90º angle.

Paper

The shade and brightness of newsprint and uncoated groundwood papers vary. These variations influence printed ink hues and overprints. The SNAP specifications are based on materials that were printed on newsprint with the characteristics below. If your substrate is substantially different from these reference values, adjustments to SNAP specifications may be necessary to achieve desired results.

	L*	a*	b*	Opacity	Brightness
SNAP Stock	83.0	-0.3	4.2	94.5	58
L*, a*, and b* measured according to TAPPI Standards using Technidyne and sphere geometry? See Appendix 4 for regional values.					

Ink

The aim values for inks and overprints to be used in press processes are shown below. Although the process colors may yield the aim values below this does not necessarily mean that the secondary colors will yield the aim values. The values for red, green, and blue can vary depending on press, paper, and ink.

CIELAB L*, a*, b* Aim Values

	L*	a*	b*
Cyan	57	-23	-27
Magenta	53	48	0
Yellow	79	-5	60
Black	40	1	4
Cyan + Yellow	53	-34	18
Cyan + Magenta	41	7	-22
Magenta + Yellow	52	41	25
Values come from ISO 12647-3. They represent offset and letterpress inks only. Data for flexographic inks were not available at the time of publishing. Measurements are according to ISO 13655 (2^0 observer, illuminant D_{50}, $45^0/0^0$ or $0^0/45^0$, black backing).			

Many coldset printers are embracing the use of CIELAB as an objective means to specify and communicate information about ink and colorant hues and the results anticipated using these inks or colorants. For others, hue error, grayness, and trap -- measured using reflection densitometry -- remain helpful tools to objectively measure, describe, and communicate these process components.

Hue error, grayness, and trap measurements can serve as a crosscheck for SNAP specifications. If the printed result looks good and the hue error, grayness, and trap measurements are close to those shown in SNAP, the process components are working properly. If the measurements are not close but the image looks good, then consult the ink, press, or paper suppliers to determine why. Also consult suppliers if the measurements are close but the image looks bad.

The values in the tables are hue error, grayness, and trap values representative of those found in coldset printing. Because both methods can be found in different pressrooms, the tables include measurements for both absolute hue error and grayness, which include paper density, and relative hue error and grayness values, where paper density is subtracted. SNAP recommends that hue error and grayness values be measured in the absolute manner, so that paper values are included in the resulting measurements.

The values in these tables are included in SNAP to provide users with a reference and not to serve as specifications. Printers and newspapers should undertake a print quality press test using their combination of paper, ink, printing press, printing sequence, and other process components. They should then measure the printed targets created from this test in order to determine hue error, grayness, and trapping values when quality printing is achieved.

Ink Trap	**Offset**	**Flexography**	**Letterpress**
Ink Sequence	CMY	YMC	CMY
Blue	69%	78%	63%
Green	80%	98%	80%
Red	50%	89%	50%

Hue error/grayness	**Offset "Paper Excluded"**	**Offset "Paper included"**	**Flexography "Paper Excluded"**	**Letterpress "Paper excluded"**
Cyan	28 toward magenta 10	28 toward magenta 42	33/15	32/16
Magenta	56 toward yellow 11	58 toward yellow 34	61/15	57/16

Yellow	8 toward magenta 1.4	10 toward magenta 25	5/1	8/7

Absolute hue error and grayness values (paper density included) and *relative* hue error and grayness values (paper density excluded) are shown because both methods are in general use. However, SNAP recommends printers use *absolute* values for process evaluation.

When printed on the same substrate at similar densities, inks made to conform to specifications set by the Newspaper Association of America (NAA) appear very similar to inks made to conform to Specifications for Web Offset Publications (SWOP). However, subtle differences do exist. Here are recommended ink sets for newspaper and commercial printing:

Market	**Offset**	**Flexography**	**Letterpress**
Newspaper	NAA AD-LITHO®	NAA AD/FLEX™	NAA AdPro®
Commercial	AD-LITHO® Hues		

Offset inks conforming to NAA and SNAP specifications are made using the following pigments:

Cyan Phthalocyanine blue (green shade)
Magenta Rubine red
Yellow Diarylide yellow

Black	Furnace black (blue shade)

The difference between commercial and NAA AD-LITHO inks is strength only; the hue characteristics are identical. NAA has ink verification programs for coldset inks. For a fee, they will evaluate ink samples submitted voluntarily by printers or ink manufacturers and verify conformance to NAA AD-LITHO, AD/FLEX, and AdPro specifications. GATF will also evaluate SNAP inks for a fee.

Gray Balance and Color Bars for Process Control

This section of the document addresses selected tools, procedures, and methods that printers and newspapers can use to achieve consistent and repeatable results.

Gray balance is a measure of how well the three process colors – cyan, magenta, and yellow – are properly adjusted for printing. It is determined by reproducing a gray color scale using cyan, magenta, and yellow tints. A neutral three-color gray is produced using unequal tints of these three colors, with the cyan tone value always being larger than the yellow or magenta tone values when printing to SNAP densities. Cyan, magenta, and yellow tints that produce proper gray balance in SNAP proofs and printing are shown in the table below. Dot gain/tone value increase must be monitored, adjusted and controlled throughout the scanning, proofing, film creation, and printing process in order to maintain the relative halftone dot values required for gray balance to be achieved.

Process Control and Testing

There are several locations in the SNAP document referencing testing prior to establishing a production procedure. This is recommended before agreeing with a client to use certain production methods or technologies for the first time or if you are changing specifications. This concept is associated with the output from a step in the reproduction process such as an imagesetter, a scanner, or a press sheet. It is very important that before using the output or the data gathered from it, obvious defects must be identified the output process must qualified be "in control". This refers to the Statistical Process Control (S.P.C.) definition of a process that has no "special causes" or defects that are present. A *special cause* would be an unusual event that is not commonly seen or accepted. It is something that you can usually eliminate once you are aware of it. For example if you were fingerprinting a press by printing the IT8 target intending to create a "profile" you must first examine the press sheet to make sure it was printed properly from a properly exposed plate. If it had a slur or double in the cyan and you based your decision on the data gathered from that sheet,- you could be getting your self into trouble.

Gray balance is an important indicator that dot gain/TVI values among the component colors are in balance. It is important to ensure that gray tones reproduce accurately.

How Is Gray Balance Measured?

Gray balance is subjectively assessed by comparing an overprint of cyan, magenta, and yellow tints with a black tint having an equivalent tone value. Gray balance must be assessed under standard viewing conditions. Gray balance can also be objectively measured with a densitometer. Absolute densitometer values for each major filter should be approximately equal.

Gray Bar Targets

It is recommended that every printed job include either a gray bar or a series of objective solid and tint targets. These targets should be included on every page or on as many pages as possible. Recommended gray bar values to produce a 3-color neutral gray, and the black tint that it should approximate, are shown in the table below. The aim density shown in the tables below represents the density of the combined tint patch density as measured with each of the filters.

The total range among the three ink densities for the following tables should not be greater than +/- 0.03.

Offset 3-C Gray Balance				**Black Tint Equivalent**	**Aim Density of Three-Color Patch**
C	**M**	**Y**	**K**	**K**	
25%	18%	18%	0%	25% (Quartertone)	0.52 +/- 0.05
40%	30%	30%	0%	50% (Midtone)	0.65 +/- 0.05

Flexography 3-C Gray Balance	**Black Tint Equivalent**	**Aim Density of three-Color**

					Patch
C	**M**	**Y**	**K**	**K**	
12%	7%	10%	0%	20% (Quartertone)	
20%	14%	14%	0%	25% (Quartertone 2)	0.52 +/- 0.05
38%	30%	30%	0%	50% (Midtone)	0.65 +/- 0.05

Letterpress 3-C Gray Balance				**Black Tint Equivalent**	**Aim Density of Three-Color Patch**
C	**M**	**Y**	**K**	**K**	
40%	30%	30%	0%	50% (Midtone)	0.52 +/- 0.05

Color Bars

In addition to gray bars, it is recommended to run color bars on every job if possible. Color bar targets should include:

- Solids of all four colors
- Nominal 50% tints of all four colors
- Solid overprints of each two-color combination

If space permits, inclusion of nominal 75% tints and nominal 25% tints of all four colors is also recommended. Gray bars and color bar targets should be large enough to permit measurement. A target height/width or diameter of 3/8” is recommended. Smaller sizes are possible with consultation with the printer or newspaper. Color bar targets do not need to be continuous and can be creatively designed across the width of the page.

Viewing and Measurement Methods

It is recommended that coldset measurements mirror the measurement methods found in the following documents. These include:

Check Appendix XX for information about where various standards can be found.

Viewing Conditions

Transparent and hard-copy artwork, physical mechanicals, proofs, and printed material should be viewed using lighting, equipment, and a physical surround that conform to *ANSI/PH2.30 -- 1989 Standards for Graphic Arts and Photography -- Color Prints, Transparencies, and Photomechanical Reproductions -- Viewing Conditions*. This standard requires that the surrounding area, including floors, walls, and ceiling, be painted using a Munsell N8/gray color. It also requires that lighting have a color temperature of 5000 degrees Kelvin and it specifies the light source's minimum color rendering index, luminance, uniformity, and spectral power.

At the time of publication of SNAP, ANSI PH2.30 and its equivalent, ISO 3664, were being revised. The revision includes the concept of spectrally defining the illumination and specifies sample backing for reflective images. It also introduces two levels of illumination. One level is for critical comparison and the other is a lower level for aesthetic viewing. For communication with customers and suppliers, SNAP recommends using the illumination level intended for critical comparison because this level represents current practice.

Reflection Densitometer Measurements

Reflection density measurements should be made with a properly calibrated densitometer. All reflection density and dot gain/TVI values in SNAP are based on ISO Status T equipment that conforms to ANSI/ISO 5/3 and 5/4 standards. Use of a 4mm aperture is recommended when measuring newsprint and other coarse papers. In all cases the aperture size should be communicated with the measurements. All measurements are made with non-polarized instruments. Density measurements are absolute and include paper density.

Dot gain/TVI calculations should conform to ANSI/CGATS.4 (based on the Murray-Davies equation). Trap measurements should conform to ANSI/CGATS.4 (based on the apparent trap Preucil equation). All measurements are made using a flat, neutral matte black backing conforming to ANSI/ISO standards ANSI/CGATS.4 and ANSI/ISO 5/4.

Transmission Densitometer Measurements

Transmission density measurements are based on use of orthochromatic light, although both ultraviolet (UV) and orthochromatic (ortho) values should be reported. Percent dot area calibration is verified using a device such as an UGRA scale, with the .5% tint area serving as the zero reference (base fog) patch. Use of a 3mm aperture is recommended. In all cases the aperture size should be communicated along with the measurement. Measurements should be made in accordance with CGATS.9.

Use of Ultraviolet (UV) Light

Dmax and Dmin values are reported using both ortho and UV light values because historically the industry has referred to these values using ortho measurements. Most plates are exposed using high-intensity ultra-violet light (UV) light, making the UV values more useful and predictive. The UV absorption of many films is quite different from the ortho absorption of these films, making the UV measurements an important and often overlooked contributor to variation in contacting, duping, proofing, and platemaking processes.

Spectrophotometric Measurements

SNAP recommends the use of the CIELAB uniform color space for comparison and presentation of color data. ISO 13655:1996, *Graphic technology — Spectral measurement and colorimetric computation for graphic arts images* (ANSI/CGATS.5 – 1993 of the same title) specifies the use of weighting functions using the CIE 2° observer and illuminant D_{50}. The standard specifies 45°/0° or 0°/45° instrument geometry for reflectance measurement, and a black backing behind the sample to be measured. It is important to evaluate any measuring system (instrument, operator and environment) using ANSI/CGATS.11

PIMA/IT2.11, *Graphic technology and photography — Reflection and transmission metrology — Documentation requirements for certified reference materials, procedures for use, and determination of combined standard uncertainty*.

Dryback Testing

To evaluate dry-back, density measurements of printed solid ink targets should be made immediately after printing, three hours later, and again after 24 hours. These values should be recorded and graphed to indicate the slope with which the paper/ink process dries back. Typical industry experience has seen dry-back values of 0.02 to 0.05 density units after 24 hours. These dry-back values vary by press and color and are not specified or recommended values.

Hue Error/Grayness

For SNAP measurements, hue error and grayness values are calculated including paper.

Print Contrast

Print contrast measurements are absolute and include paper density. Print contrast measurements call for measuring the density of the solid printed or imaged target, the density of a 75% printed or imaged target of the same hue, dividing the difference of these two values by the density of the solid target, and multiplying result by 100 to determine the percent value.

Appendix #2:Color Management Systems (CMS)

Color management systems are software programs usually run at the operating system level, no application level, that control color characteristics of input devices such as scanners and digital cameras and output devices such as imagesetters, digital proofers, and printing presses.

About Color Management

Every EPP device used has unique color gamut and tone reproduction characteristics. As an image moves from scan to proof to final print, each device along the workflow introduces its own subtle changes in color. When organizations formerly purchased all equipment from one manufacturer, that manufacturer took responsibility for ensuring color control from input scan to the print. Today, most companies use a "plug-and-play" approach to building systems that calls for mixing and matching devices and software supplied by a range of manufacturers. One consequence of this approach to the digital workflow has been loss of a guarantee of color consistency. Because each device used is likely to come from a different manufacturer, no piece of equipment can know which device preceded it in the workflow. Nor can any device correct any color discrepancies that are introduced into this workflow. One solution to this dilemma is the technology known as a Color Management System, or

CMS.

Why Use CMS Technology?

Just as perception of color varies from one person to another, each device in the imaging workflow -- input, display, output – relies on a different method to process colors. The technology employed by each machine limits the range of colors that any particular machine can scan, display, or output. This range of colors is called its color gamut. Regardless of the device, certain colors exist that are outside of its color gamut and thus cannot be easily processed with that device. For example, presses using standard cyan, magenta, yellow, and black inks cannot easily print deep blues and deep reds because these colors are outside of the color gamut achievable using the process of printing these inks on paper. In a similar manner, monitors are often poor at accurately displaying certain other colors, such as warm yellows. Differences in color space can play havoc with an image as it progresses through a workflow. For example, a specific blue might be inside the color space of a designer's monitor but outside that of the gamut achievable printing ink-on-paper with a printing press. Consequently, on the monitor the blue will appear quite saturated. Once it is printed on press, however, the result might appear too desaturated because of the limitations associated with the reproduction process. This lack of a common color gamut extends to EPP printers. A specific color may reproduce well on one printer device but not on another.

US Ink's Press Doctor

The Value of CMS

Two hazards exist to good color predictability:

- Differences in color gamuts among the different devices in a workflow
- Deviations from the standard performance of any device in a workflow

CMS technology manages the differences in color reproduction of the devices in a workflow. The approach it uses is to translate the color space that each device is able to reproduce into a common color space and then transform – or color match – each of these colors into those code values necessary to obtain a close match to another device in the workflow.

Applying CMS Technology

Applying CMS requires three steps:

1. Calibrating each step of the color reproduction process
2. Characterizing each step of the color reproduction process
3. Controlling through measurement the variation associated with each step of the color reproduction process.

Here's a closer look at each step:

Calibration

Monitors, proof devices, imagesetters, and other output devices performance capabilities change over time. In monitors, phosphors degrade and become unstable. In proofing devices the dyes or colorants can change with age, heat, humidity, and other factors. Each device used in the color reproduction process should have a calibration routine to assure that the equipment will image colors at correct levels.

Characterization

The process of identifying the color gamut that any specific input device, monitor, or output device can achieve is called characterizing that device. Following device calibration, characterizing a device –sometimes referred to as profiling a device -- follows a process that employs: Scanning, displaying, or printing a standard target that is comprised of many different solids and tints. Normally an IT8 target or some variation of these standard targets are employed. Once scanned, displayed, or imaged, this target is measured (for scanners, the colors associated with the scans of each solid and tint are evaluated; the target is displayed on monitors or output using EPP proofing devices or film and then printed and measured using spectrophotometers). Measurements are converted using software into a designated standard color space – a color space is the name given to an agreed-upon way of objectively describing colors – called CIE Lab.

The resulting captured device-specific color space is referred to as a device profile.

Characterizing a device results in a profile of the color gamut achievable using that device. This gamut is described using a CIELAB Diagram. The CIELAB Diagram provides a plot, or gamut, of all hues at a range of saturation and lightness values. CMS characterization software is able to understand the gamut that each device should be able to render and, through measurement of the targets, the gamut that the device is actually able to reproduce. The amount of difference at each point is determined, and the measured, actual hues are "mapped" in relation to anticipated, known points. The resulting "map" provides the CMS software with a description of the device's imaging capabilities.

Controlling

Control of each element of the color reproduction process, often referred to a process control, is the third key element to applying CMS. Each process component, including the scanner, the monitor, the proofer, the imagesetter, and the printing press must be managed so that the variation associated with each of these components is predictable. A CMS profile requires this because the profile assumes that the process being profiled remains fairly constant in terms of the color gamut that it is capable of reproducing. An unpredictable process will render the CMS profile less effective -- or ineffective -- since the profile will not necessarily anticipate the specific, unpredictable color gamut that the process might be generating at that time.

CGATS Reference Printing Conditions

The Committee for Graphic Arts Technologies Standards (CGATS) and ISO TC130 Graphic Technology standards communities are developing one or more standard “reference printing conditions” for defining press output. In addition, each reference printing condition will be used to create characterization data from the IT8.7/3 (ISO 12642) target. The colorimetric data characterizing each condition will be made publicly available as standards which should then be used by color management systems in the creation of standard CMYK data for all digital data exchanges. Prepress service providers should use these standards when preparing CMYK data for SNAP.

ICC Profile Format

The International Color Consortium (ICC) was established in 1993 by eight industry vendors for the purpose of creating, promoting and encouraging the standardization and evolution of an open, vendor-neutral, cross-platform color management system architecture and components. The current ICC Profile Format Specification is ICC.1:1998-09. One of the first decisions made by the ICC was that color space transformations were the responsibility of the operating system. Putting it there meant that it did not have to be replicated in each application while still being available to the applications. Device profiles, which contain information on the color behavior of the various peripherals, provide the data necessary to perform these transforms. Various profile types that are specified in an ICC Profile include: Input Device, Display Device, Output Device, Color Space Conversion, Device Linking, and Abstract Profile. ICC profiles should be developed using color characterization data being developed by CGATS.

SNAP Color Ink Table

A custom Ink table was created by SNAP to address the translation of RGB to CMYK in a leading software application. The SNAP99 table can be downloaded from the NAA web site http://www.naa.org**.** The user can then load the table under File>Preferences>Printing Inks Setup.

US INK CORPORATION BRANCHES

Contact any one of these locations for further help:

EASTERN REGION

East Rutherford, NJ (Murray Hill Pky.)	800-223-0717
East Rutherford, NJ (Central Avenue)	201-438-4041
Springfield, VA	800-282-5713

MIDWEST REGION

Cincinnati, OH	800-543-1822
Burr Ridge, IL (Chicago)	800-325-4657
St. Louis, MO	314-429-2400

WESTERN REGION

San Leandro, CA	800-222-7709

Santa Fe Springs, CA (Los Angeles)	800-345-4718
Tukwila, WA (Seattle)	800-426-7652
Portland, OR	503-252-7181

SOUTHERN REGION

Jacksonville, FL	800-874-7950

SOUTHWEST REGION

Dallas, TX	800-445-7549
Denver, CO	800-648-8103

See What is Ink for a more detailed look at the formulation of a News Ink

See Ink manufacture for greater detail on how ink is manufactured.

See Ink Quality Control for greater detain on the QC of News Inks

US Ink Corporate Information

US Ink is the leader in providing printing inks to the newspaper and no-heat printing industries. Although it is autonomous and flexible, US Ink is further supported by the depth and resources of the multi-billion dollar Sun Chemical Corporation. With its one-of-a-kind Corporate Research Center, Sun Chemical assists the printing industry by advancing the state of the art of technology in pigments, resins, plate making, and printing ink. By understanding all these technologies, we are better able to address your most complex ink requirements.

US Ink is totally devoted to the non-heat market. More than 95% of our sales are into this segment of the printing industry. All of our interests in technology and business development exist in this area. Our major competitors lack this focus. For most of them, newspaper inks are a small portion of their total sales. Therefore, they are often forced to make compromises to satisfy the diverse requirements of other product lines. At US Ink, we firmly believe that this difference gives us a competitive edge in the marketplace.

US Ink's Press Doctor

We approach the newspaper industry as a responsive partner, not just as a product supplier. A partner that has the highly skilled scientists and technicians to provide a knowledgeable response to your business needs.

Executive Summary

US Ink is uniquely positioned to provide outstanding service all of your newspaper needs. US Ink is dedicated to the newspaper and non-heat ink marketplace. We are able to use the resources of the two billion dollar Sun Chemical Corporation, the largest ink manufacturer in the world, to provide you with an unmatched level of technical depth and support.

With our headquarters and research and development staff in New Jersey, we are able to access the unique resources available to us at the Sun Chemical Corporate Research Center in Carlstadt, New Jersey. From a sales perspective, we have divided the country into five regions; each region is able to fully support the manufacturing, sales, and technical requirements of their customers.

US Ink is capable of producing over 200 million pounds of news ink annually. This capacity does not account for the vast additional capacity available through Sun Chemical.

US Ink’s Press Doctor

US Ink's formulations are developed with a keen eye toward environmental and quality concerns. At US Ink, our commitment to the environment manifests itself in more ways than in the products we supply. Our active concern for the welfare of our employees, our customers, their employees, and for our plant is established corporate policy.

For years we have carried out the most extensive research and development activities in our industry. Full time environmental specialists monitor our work and our products in use. More than 250 scientists within Sun Chemical, in over a dozen disciplines, work in our labs and in the field to fulfill our commitment to producing better, safer products.

Working together - industry members and customers - we believe that we will be able to continue to bring you innovative, cost-effective products that are in harmony with our environment.

We also believe that our technical strength enables us to manufacture the highest quality products. Many of our employees, from every area in our organization, have been involved with Total Quality Management training and/or projects. We have found that by formally focusing our organization on quality, we have been able to improve the consistency in our procedures and, ultimately, in our products as well.

US Ink's Press Doctor

Our distribution strategy is also designed with your delivery requirements in mind. Through a prudently managed combination of rail car, commercial truck, and US Ink owned vehicles, we are able to ensure timely delivery to your facilities from any of our fourteen dedicated manufacturing facilities. In addition, in the event of extraordinary challenges, we could utilize the more than fifty Sun Chemical, General Printing Ink facilities to ensure your continued supply of printing inks.

Quality Assurance

US Ink has a defined corporate Quality Manual, which is a controlled document that each of the manufacturing locations follows. The manual follows the ISO format and addresses the elements of ISO one by one. The Quality Manual calls for a documented system in each of our locations for the laboratory, office, and production. These written procedures provide detailed step by step instructions for performing all processes.

US Ink's Laboratory QA program starts with our suppliers of raw materials. Each supplier's product undergoes a rigorous testing program before it is considered a standard material. Once the material has been approved, specifications are established for the product under defined test methods. US Ink works closely with its suppliers to develop mutually agreed upon test methods and standards.

These materials are then put together in specifically designed formulations. US Ink manufactures with a batch process, so that each batch can be individually controlled to meet the specifications required. If a material does not conform to specification, it will be isolated and labeled non-conforming. Batches within specification are placed in the desired container for the customer and labeled. Records are kept for the batch documentation and retains are kept of the batch for a period of no less than six months.

By using this batch process, US Ink can customize each of its formulations to meet its customers' desired needs. US Ink has formulating chemists at each of the manufacturing sites that do much more than just quality control. As production trends occur, they are identified quickly, before the production process gets out of control. These chemists also work with our customers to isolate their needs and adjust our products accordingly. In many cases, they act as chemical/graphic arts consultants to help resolve problems, whether or not they are ink related. The ink chemists correspond on a daily basis with our corporate laboratories. This permits us to quickly identify trends and communicate common concerns to other regions.

US Ink is committed to customer satisfaction. Our marketplace demands this commitment and US Ink's survival will depend on it. We like to think that we care more about our business than our competitors. We must continually work with all of our processes to improve and be the leaders in this market. This statement, as it is on paper, is only words, if US Ink does not follow what is printed.

Quality is a priority not just in the QC laboratories, but throughout our company. Our customers view US Ink through its sales, service, products, delivery, accounting, and, most importantly, consistency in everything we can provide for them.

Our goal is to continue to grow with our customers, continually improving the quality of their product, and thus expand the newspaper market. With this focus, we have to concentrate all our resources to this end, without compromise. Achieving our quality commitment will require significant resources. US Ink will continue to invest in the human and capital resources necessary to elevate our level of quality.

US Ink's regional approach to the news ink market helps us build partnerships with our customers. We believe it is important that our operations be as close to the consumers as possible. Our regional approach assures appropriate local resources to give timely delivery and technical services. US Ink's manufacturing system keeps us close to our customer's needs and permits us to fine tune our products to their press conditions quicker, more thoroughly and efficiently. We believe that partnerships with our customers will yield great benefits. Without local representation, we could not make this work.

US Ink personnel have a wealth of knowledge and variety of backgrounds. They include people with pressroom backgrounds through trained formulating chemists. We have personnel that specialize in various parts of our business, for example analytical chemists and a group for environmental affairs. US Ink takes pride in all of its personnel, from our dedicated sales force to our operators in production, all with the commitment to continually improve our products. As we have stated before, US Ink is devoted to the newspaper industry and committed to service it.

US Ink is also part of a larger company, Sun Chemical. Sun Chemical is a global graphics arts corporation with many companies and divisions in various segments of the market. (Ink, Plates, Pigments, and Resins) This allows us to correspond with printing ink related businesses all around the globe in researching any type of question.

The US Ink Corporate technical staff reports to Larry Lepore, Vice President of Operations.

The following people report directly to Larry;

Dennis Cheeseman	Customer Services Director
Peter Ford	Technical Director
Greg Walker	Manager, Customer Services Engineering
Tom Donvito	Regulatory Manager

The Customer Services Department reports to Dennis Cheeseman. This department is comprised of a National Technical Service Laboratory, a Press Operations Group, National Quality Assurance Laboratory, and a Print Technology Lab.

The National Technical Service Laboratory is managed by Joe Messeri. As head of this National group, Joe is responsible for coordinating field activities throughout the regions, and providing feedback to the formulating group on product weaknesses and trends. Joe's group is available for assisting with customer trials, presentations, and diagnosing customer problems. Joe is located in the Carlstadt laboratories and has two Senior Field Service Technicians reporting to him. The purpose of this group is to assist the efforts of our regional personnel. In addition, they are used to promote open communications between the field and corporate staff (as well as between regions) concerning major accounts, their concerns and the status of any potential or pending problems. It is our belief that this effort results in the most efficient identification and resolution of problems.

US Ink’s Press Doctor

The Press Operations Group reports to Bill Simon. The press operations group provides a consultative reputation within the industry. Working with Bill is Ralph Stephens. This group is available to evaluate customer equipment through press audits, provide recommendations to our customers for improving their print quality, and monitoring of crucial press trials. They are also available to provide insight into customer problems from an equipment perspective. Bill and Ralph come from the newspaper production environment, so they are quite familiar with the day to day operations of a pressroom. The Press Operations Group is available as part of a presentation team for a variety of topics, such as ink/water balance.

The National Quality Assurance Laboratory is managed by Alan Liebel. The National QA Laboratory is responsible for maintaining US Ink's practices on ISO, TQM, and SPC. The National QA Lab is pursuing better ways of controlling our incoming raw materials and finished inks. The National QA Laboratory is available for training and establishing procedures in US Ink locations as well as customer sites.

US Ink's Press Doctor

Paul Zelinsky is our Print Technology Specialist. He has many years of experience working with customers on long term print quality aspects. He will review the process from pre-press through the finished product.

These four groups provide a level of service for the no-heat Printing Industry that is unmatched by any of our competitors.

The Research and Development group is headed by Peter Ford. Peter's personnel are responsible for developing new ink systems and procedures, as well as providing support to our field operations. This department is comprised of two laboratories, Research and Development and Manufacturing Services.

Our R&D Laboratory manager is Bob Newsome. This laboratory has a variety of functions to perform including, development of new ink systems, evaluation and determination of specifications on all new raw materials, development of new test methods, and laboratory support for performance problems.

The Manufacturing Services Laboratory is managed by Mimi Park. This group is responsible for assisting production in scaling up new formulations so that, as a new ink system is developed, it can be transferred to bulk manufacturing. Mimi's group is currently focusing on integrating our manufacturing techniques. The group is also exploring new techniques for improving our manufacturing methods and resolving performance problems at our plants.

Customer Services Engineering can design new ink handling systems, and troubleshoot or modify existing systems. This department provides a full range of support to our customers for Ink Management Systems. We present ink system alternatives to achieve proper handling of our products at the printing site. System designs, whether for a new site, expansion or improvement project, emphasize function, simplicity and economy.

We work closely with the press and equipment manufacturers and the customer's Architects and Engineers to assure the integrity of the system. Customized drawings, specifications and bill of materials information are prepared for each project. If desired, we can work with the customer in purchasing the ink system equipment. We will review the installation procedures with the initial start-up and any subsequent adjustments to assure that the system is fully operational and meets expectations.

Tom Donvito is our Regulatory Manager. His staff issues all MSDS and maintains our compliance with EPA, OSHA, etc. The regulatory staff is available for any customer consultation, including environmental plant audits, telephone assistance, etc., that is required.

Continuous Quality Improvement

Total Quality Management (TQM) is quite complex and we are in the implementation stages of this management style. TQM is not a policy, it is a process that will change the way we do business. This effort is company wide and includes customers and suppliers. The main goal of any Quality plan is customer satisfaction, so we need our customers' input into our process. Without the proper customer feedback and ideas, we will not fulfill their requirements. We believe in partnership programs with our customers to meet these demands.

We will be making changes through continuous improvement. Continuous improvement contains many elements that contribute to quality: leadership, team effectiveness, quality management tools, and managing and improving processes. This will be a continuous cycle so that we are constantly improving and exceeding our customers' needs. The use of SPC (Statistical Process Control) techniques will help to guide us on this journey for continuous improvement.

Research and Development

US Ink's Press Doctor

The US Ink Corporate R & D Laboratory exists not only to develop new technology but, also to ensure that state of the art technical support is provided to our branches in their day-to-day work with our customers. Much effort is directed toward raw material quality to enable us to ensure that our own quality assurance is based on properly specified products from our suppliers.

Many people view Research and Development as the pursuit of "blue sky" futuristic ideas. Certainly, we devote substantial resources to ensuring that US Ink will have the correct ink products available for whatever printing processes or press equipment are applied to the future of newspaper printing.

Our R & D efforts are also driven by our continuing search for more ecologically acceptable ink technology. Examples of past successes of such long-term R & D work are the development of Soy oil-based inks, Water-based inks for Flexographic printing and inks suitable for use on Keyless Offset presses.

Another key area of involvement for the Corporate R & D Laboratory is providing troubleshooting capabilities and technical support, either directly to our customers, or via the technical departments in each of our branches. This is the area of our work that provides immediate, day-to-day assistance to our customers on all technical areas.

US Ink's Press Doctor

To assure rapid response, our first line of support is through the regional labs. However, we have equipment, capabilities and expertise in corporate that it is not available in each of our branch laboratories. Our Analytical Group is a prime example of such a facility. Our chemists and analysts stand ready to assist in problem solving, even if the problem is not directly attributable to ink. Recommended solutions may involve an ink formulation change or may identify necessary changes in some other component of the printing operation such as fountain solution, plates or rollers. We believe that US Ink's combination of local technical presence and centralized scientific capabilities provides the best balance of technical resources to our customers.

US Ink is part of the larger organization, Sun Chemical. Sun Chemical is a graphic arts company with facilities and sales around the world. Sun Chemical's R&D objectives are as follows:

1. To anticipate our customers' needs for advanced ink and coating - needs created by the technological advancements in printing equipment and processes.

2. To search out enhancements to our existing products-improvements that can bring even more vivid color, clarity and detail to the printer's finished product.

3. To serve as our customer's troubleshooter, seeking solutions to any problems they might have using our products.

Sun Chemical's research laboratory in Carlstadt NJ is the largest technical center in the world for graphic arts development. Each year numerous patents and proprietary developments are made. Sun Chemical is the world's largest producer of newspaper ink and backs this up with a substantial R&D budget. At Sun Chemical, the focus has always been to be the worlds leader in graphic arts technology.

Statistical Process Control

US Ink recognizes that a solid, comprehensive QC testing program is only a start to ensuring the quality of our products.

Where appropriate, it is the joint responsibility of Plant Management and the US Ink Quality Manager to identify opportunities for meaningful uses of statistical techniques, throughout our plants. These would include, but not be limited to the following: Statistical Process Control, Histograms, Run Charts, Parieto Analyses, Flow-Charts, Cause and Effect Diagrams, Design of Experiments, Cpk calculations, Sampling Plans and Tests of

Significance.

It is also the joint responsibility of Plant Management and the US Ink Quality Manager to identify who is responsible for using the selected statistical techniques and ensure they have been appropriately trained.

It is the sole responsibility of the Technical Manager to ensure the agreed to statistical techniques are implemented and reviewed, on a continuous basis. This would include appropriate documentation, record retention and timely analysis of the information collected.

The use of statistical techniques is determined on a plant by plant basis, depending on the process, the degree of criticality, the product produced and/or the customers' requirements for statistical data.

Certificate of Analysis Program

The C of A references all of the requirements with the additional information of the reference test procedure that recorded the results. The data can also be provided in statistical format, which will show the control limits for the process.

US Ink's Press Doctor

Product Inspection Procedures

US Ink believes in documented testing procedures for each type of test being performed. This document not only covers the test procedure steps but also the calibration steps required by each piece of equipment to ensure that the information gathered by the testing equipment is accurate. This manual is a controlled document within US Ink and is distributed throughout all of our locations. This provides a level of uniformity within US Ink, in that all of our locations can produce similar testing results.

US Ink’s Press Doctor

ISO 9002 Certification

US Ink is actively committed to ISO certification at its major production sites. US Ink has been using the regimen of the ISO guidelines in establishing all of its working procedures. The Quality Manual is a corporate statement of US Ink policies following the ISO guidelines. The QA manual has been in place for 3 of our 4-year existence.

US Ink has two of our major production sites certified. These are our St. Louis and Jacksonville locations. Other sites will work closely with the National Quality Manager to achieve this certification.

Training

US Ink’s Press Doctor

US Ink provides several training services to its customers. As a starting point, we present seminars geared to the pressroom audience on densitometry, Ink/Water balance, trouble shooting on press, and the basics of ink formulation and quality control. We can specialize any presentation to suit our customer's needs. We also have a Press Services group, which assists operators with press settings and achieving the optimum ink/water balance. For those wishing to understand more about ink testing and basic formulation, US Ink provides laboratory training in one of our facilities.

US Ink also provides many technical bulletins for use in training and the education of the production operators. These technical bulletins are written in plain language so that the press operators can understand the concepts being presented. New bulletins are being developed on a monthly basis. The titles include the following:

1. The History of Printing
2. How Does a Densitometer Work?
3. What is Dot Gain?
4. Understanding the Importance of Gray Balance
5. What is Ink and Water Balance?
6. pH and Conductivity

7. Plate Related Problem Guideline
8. Print Quality Assessment
9. An Introductory Guide to Rheology
10. The Role of the Blanket in Offset Printing
11. Factors Affecting Rub Off
12. Vegetable Oil Inks for Newspapers
13. VOC's
14. Water Quality for Fountain Solutions
15. What is Ink?

US Ink also offers, as a training guide, our own software developed for web offset no-heat trouble shooting. The program has been set up as a Windows help file and offers to the printer a comprehensive guide into the cause of the problems associated with the process, along with information into some of the theory and background about the process. This program is available on disk and, if printed, is approximately 250 pages in length. The topics are all interlinked so that the user can easily jump from one topic to another and back.

US Ink’s Press Doctor

Problem Solving

Unfortunately problems do occur in the pressroom. When they do occur, it is necessary to achieve a timely solution to these problems. US Ink provides a full range of technical support for both the preventative and troubleshooting side of the pressroom. We provide training seminars, help with print quality analysis, and press room audits to name a few areas of preventative help.

In case of a problem, US Ink has a wealth of technical expertise that we offer to our customer. The proper balance on press is a combination of all of the variables (ink, fountain solution, plates, paper, etc.). If the proper marriage is not achieved with these variables, lithographic printing quality will suffer. US Ink works with our customers to assist in achieving this delicate balance.

In addition to local support for a customer, US Ink's Corporate Laboratory is fully equipped to scientifically evaluate a wide range of problems. We provide comprehensive technical support using analytical, ink testing, paper testing, plate testing, and microscopic methods.

This list of capabilities are the focus and services that US Ink can provide. We will work with production sites to develop products that can improve the level of print quality. We have the best technical staff in the industry and can make these services work to your benefit.

Production Capacities

US Ink is organized on a regional basis. Each region contains at least one major factory for bulk black and one or more facilities for color production. Our St. Louis facility is uniquely equipped to produce large volume colors efficiently in 15 to 20 thousand pound batches. Total production capacity with current staffing is estimated at 200+ million pounds of news ink per annum. A significant increase in capacity (30-50%) is possible with additional labor.

US Ink Product Line

Super Standard is an improved news black with some low rub properties. It offers the user, typically a 30 to 40% rub reduction from a conventional black, with the same wide window of performance. Newspapers that use Super Standard comment that by utilizing this product most of their rub off complaints have been eliminated.

For the user that needs more rub reduction, US Ink offers our Low Rub Black. This product provides a rub reduction of approximately 40 to 55% and maintains excellent press performance. In addition, Low Rub offers low pipe roller build up with low page to page set off.

If you are looking for a premium low rub black, then RubPruf[7] is your answer. This black offers rub reductions of over 60% compared to a conventional product, while maintaining a wide latitude of performance on press. Users working with this product have reported excellent results and, in a number of cases, improvement in mileage.

Naturalith black is a more economical soy product that contains some soy oil but not enough to fulfill the soy seal requirements. It offers rub characteristics similar to our low rub products.

EcoSoy[7] Black is a low-rub soy alternative for newspapers and commercial printers, delivering 50% to 70% improvement in rub reduction over standard black. It performs well in a broad spectrum of pressroom conditions, providing the quality and efficiency you want with less than 4% VOCs. It helps you stay in compliance with the toughest EPA regulations at all levels and conforms to ASA Soy Seal requirements

UltraSoy[7] Black offers maximum rub resistance of 70% better than standard black. UltraSoy Black delivers sharp halftones, smooth solids with super density, plus unbeatable mileage. There is a minimum pipe roller buildup, lower maintenance with better quality, and maximum soy content. It far exceeds ASA Soy Seal minimums.

Beacon Black™ offers the performance and VOC characteristics of the UltraSoy black at a more economical price. This product contains some soy oil but not enough to meet the Soy seal requirements.

NAA APPROVED ADLITHO[7] COLORS

US Ink's petroleum colors are consistent performers. They offer excellent runability and printability characteristics. This set is available with all of the NAA Color book qualifications (AdLitho Volume 7 or 8).

ULTRASOY[7] ADLITHO COLORS

The UltraSoy color product line is a set of colors that conforms to the American Soybean Association (ASA) requirements. This set allows the user to utilize the ASA logo when printing their products. The UltraSoy set is available with all of the NAA Color book qualifications (AdLitho Volume 7 or 8). The UltraSoy colors offer excellent transfer and laydown characteristics for vibrant color.

Glossary

A B C D E F G H I J K L M N O P R S T U V W

US Ink's Press Doctor

A

Aberration

General term for various optical errors in photographic lenses which prevent the lens from giving good definition

Absorption

Optical term for the partial suppression of light in passage through a transparent or translucent medium or material.

Across The Grain

The direction opposite to that of the paper grain

Adjustable Idler

An idling roller that moves or can be adjusted, to control the printing web. A Pipe Roller

Agate

The name for a specific size of type. Length of columns of type is often measured in agate lines, equal to 14 lines per inch.

Ad-Litho Colors

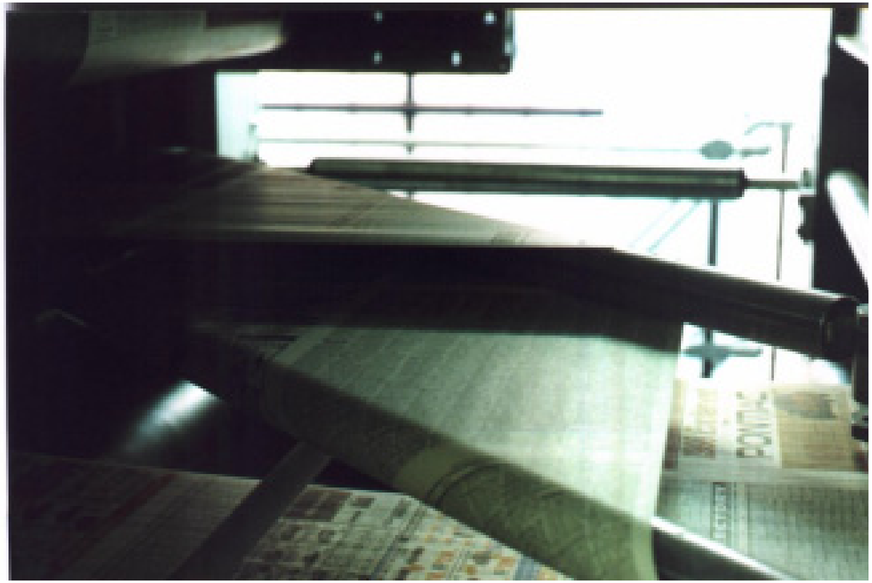
Standard color inks tested and approved by the Newspaper Association of America (NAA) for process and spot color reproduction.

AD DUMMY

Each day make-up is furnished a computerized printout showing the placement by page number of every ad to appear in particular issue. All ads are dummied by the name of the ad and the ad jacket number by which the ad was first entered into the Composing Room.

ANGLE BARS

A pair of turning bars used to transfer the web from one side of the press to the other.



Angstrom Unit

A unit of measurement of the length of light waves. It is equal to one ten millionth of a millimeter. There are approximately 254,000,000 Angstrom units to an inch.

ANTIOXIDANTS

Agents which retard the action of oxygen on drying oils and other substances subject to oxidation.

Aperture

A small opening in a plate or sheet. In cameras, the aperture is usually variable in the form of an iris diaphragm and regulates the amount of light, which passes through the lens.

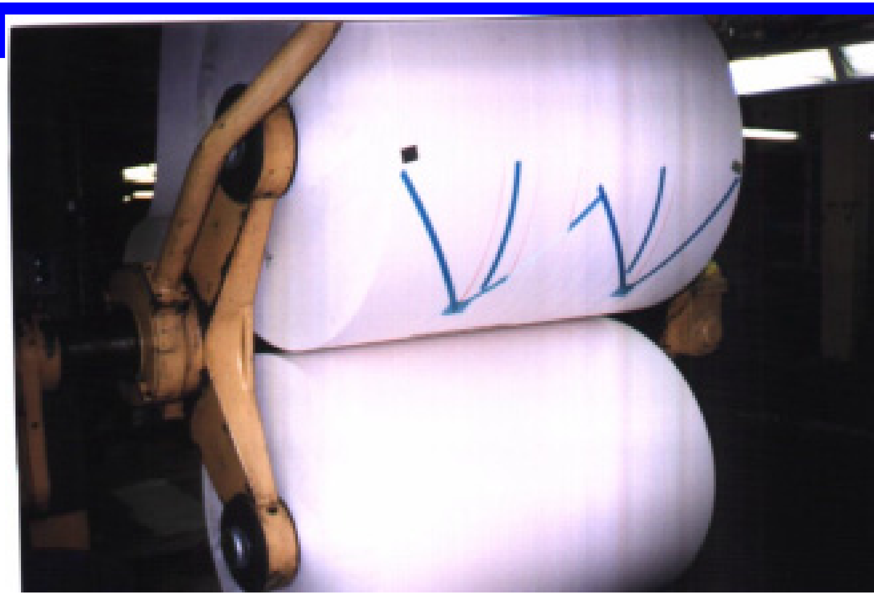
Arch

The general appearance of a unit type press which has inking rollers going from the floor up to the printing couples which form the top of the arch.

US Ink's Press Doctor

Automatic Paster

Attaching by means of special equipment a new roll of paper to an expiring web while the press is running.



US Ink's Press Doctor

B

BUFFERS

The ability of an aqueous solution to maintain its pH with the addition of either a base or acid.

BACKING-UP

Printing the other side, of a printed sheet.

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BASIS WEIGHT

The number of pounds per ream of paper of a stated size.

The weight of 500 sheets of 24 X 36 paper. The standard basis weight of newsprint is typically 28 to 30 pounds.

Basis Weight Conversions

To convert Basis weight to grammage multiply by 1.6275

To convert Grammage to Basis Weight divide by 1.6275

Grammage is the number of grams per an area of one square meter

Back Pressure

The squeeze pressure between the blanket cylinder and the impression cylinder. Sometimes called impression pressure.

Balloon Former

Former located above the regular former on a press. Also referred to as an Upper Former

Bare Diameter

The diameter of the impression cylinder without blankets, or the plate cylinder without plates.

Bay Window Leads

The web is lead to one turning bar and carried outside the angle bar frames to a bay window roller. The web then travels to a second bay window roller, then to another turning bar where it is turned over and positioned above the regular former with it's former nose rollers and nipping rollers.

Bearers

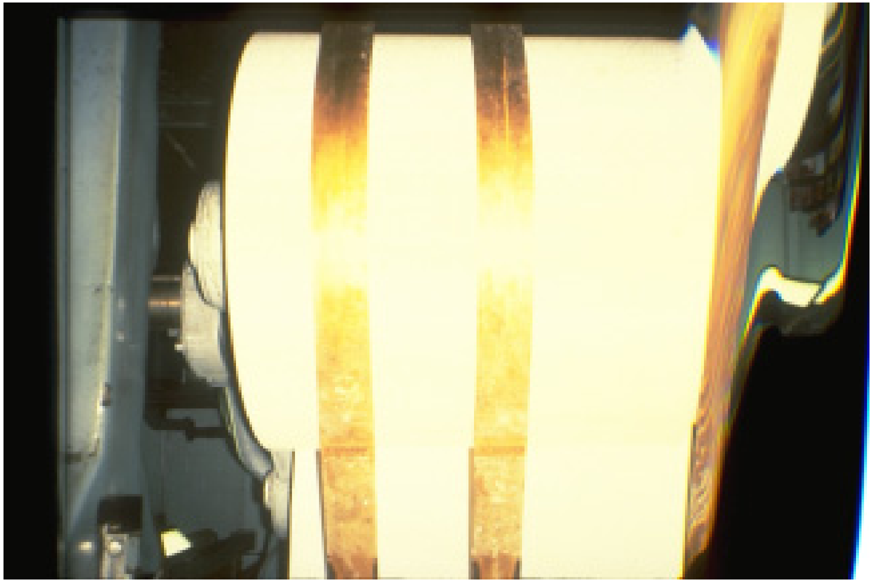
Bands at each end of the press cylinders, which in contact with each other to gauge or maintain the correct separation or Iron to Iron distance between the cylinders.

BEARER PRESSURE

The force with which the bearers of opposed cylinders contact each other.

BELTS

(1) Metal, leather or composition strips which bear against the outside of a roll of paper to act as a brake on the roll and thus increase the amount of pull, or tension, on the web. The belts may be fixed, static belts, or they may move at a speed slightly less than the surface speed of the web. These are called running belts. (2) Leather, fabric or composition strips used to guide the web through the press, usually known as tapes.



BIMETAL PLATES

Lithographic plates in which the printing image base is formed of one metal and the non-printing area of a second metal. Generally, the printing area is formed of copper, while the non-printing area may be nickel, chromium, or stainless steel. Some plates employ a third metal as a base or backing and could be regarded as trimetallic, multimetallic or polymetallic.

BLANKET

A fabric reinforced sheet of rubber used on a web offset press to transfer the image from the plate to the paper.

BLANKET CREEP

The slight forward movement of that part of the blanket surface that is in contact with the plate or paper.

BLEED

Printed colors that run all the way to the edge of a page. To accommodate the bleed, the printer must make the bleed area larger than the final trim size. The page is then trimmed right through the bleed area. This cannot be done on a normal newspaper run.

US Ink's Press Doctor

BLIND FOLIO

Page numbers are not printed on the page.

BLIND IMAGE

In lithography, an image that has lost its ink-receptivity.

BLUE LINE

A photographic proof for checking the accuracy of layout and position before the printing plates are made.

Blister

Raised spot on a blanket or the raised portion on a rubber ink roller.

Broadsheet

A full sized newspaper page. It has no standard dimensions but is between 12 to 16 inches wide by about two feet long. The actual size depends on the size of the web used and the cutoff of the printing press.

Bronzing

In process-color printing, the effect that appears when the toner in the last color often black) migrates to the surface of the printed ink film, causing a change in the spectral aspect of surface light reflection.

Bump Exposure

A brief no-screen exposure that supplements the main exposure when making a halftone. The effect is to compress the screen's density range without flattening tonal detail. The technique produces a full range of halftone dots from short-density-range copy and can also be used to expand highlight or shadow tonal separation, depending on whether negatives or positives are being made.

US Ink's Press Doctor

Butt Roll

A roll of newsprint that has been partially used.

US Ink's Press Doctor

Button Side

The operating side of a press.

CHEEKWOODS

Pieces of wood or fiber on both sides of the knife in the cutting cylinders. The cheekwoods press and hold the web against the rubber in the folding cylinder to permit the knife to make a clean cut.

Calendar

A set of rolls usually made of steel used to smooth a paper web at the dry end of a paper machine. Similar to ironing clothes

CHALKING

A lithographic term referring to the improper drying of ink; in chalking the pigment dusts off due to lack of binding vehicle; usually caused by too rapid absorption of vehicle into paper.

CHARACTERS PER INCH

The number of characters per inch that exist within a linear inch of a particular font.

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Chuck

A device for fastening a paper roll to a spindle or for holding a roll between the spider arms of a reel.

CIE

The International Commission on Illumination

Circumferential Register

The position of one plate in relation to another plate around a plate cylinder. A plate or cylinder can be moved or adjusted so that the printing object is moved in the web direction. As contrasted with side way or lateral register where the plate or cylinder is moved to shift the image across the web direction.

Clamp Bar

A metal bar which wedges or clamps the ends of a blanket into a cylinder slot.

CMD

Short for Cross machine Direction.

Cocking Roller

An adjustable idling roller that is fixed on one end and adjustable on the other end. Cocking idlers are usually located between the roll of paper and the printing couple. They are used to even or smooth the web after the paper leaves the roll. Sometimes known as a leveling roller.

Color Hump

Pressroom terminology for an auxiliary plate cylinder. The term is derived from the hump on the unit profile made by the cylinder and its associated parts.

Color Temperature

The temperature, in degrees Kelvin, to which a black body would have to be heated to produce a certain color radiation. 5,000 K is the graphic arts viewing standard. The degree symbol is not used in the Kelvin scale. The higher the color temperature, the bluer the light.

Lighting

Source	Color Temperature	Applications
D50	5000 Kelvin	Artificial daylight for color matching
CWF	4100 Kelvin	Typical fluorescent lighting for retail stores or offices
A	2700 Kelvin	Typical incandescent for home or business

Contrast

Differences between light and dark tones, including the visual relationship of the tonal values within the picture in highlight, middletone, and/or shadow tones.

COLLECT RUN

On a semi-cylindrical press only, a printing arrangement where one plate on the cylinder prints one page while the opposite plate prints another page. In a collect run, the folder is so adjusted one section of the paper is held back until the next section is ready to go with it around the folding cylinder, hence the term, collect.

CAMERA-READY

This is a special classification made for camera-ready ads, which require no work other than cutting, waxing and insertion into page.

COLUMN

Width measure for ads and editorial matter. Usually 6 or 8 columns per page.

CUTS

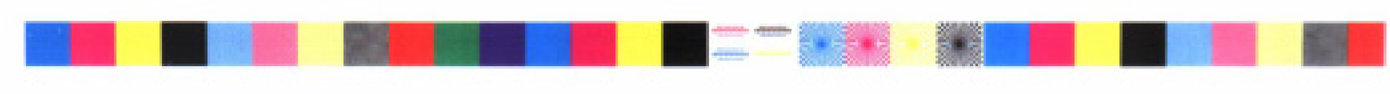
Veloxes of pictures and halftones.

COATED PAPER

Paper coated with clay, fillers, white pigments, and a binder.

COLOR BARS

Printed tonal scales of the process colors used to monitor ink density on proofs.



COUNTER ETCH

The first step in preparing to coat a grained offset metal plate. The purpose is to clean the metal of dirt and oxides without damaging the grain; a weak acid solution is used, such as 1 oz. Hydrochloric acid in a gallon of water.

CYLINDER JUMP

Deflection or movement of the plate and/or impression on blanket cylinders which result in alternate light and dark horizontal streaks in the printed design.

US Ink's Press Doctor

D

DRY BACK

The tendency of printed ink films to reduce density after printing

DEADLINE

Each edition carries a deadline by which time each page must have been sent to camera. There must be some very valid reason to miss a deadline.

DECK

(1)Two printing couples, with their associated mechanisms, arranged to perfect one web. (2) A style of press arrangement in which a number of decks are mounted in continuous framing, as contrasted to unit style.

DINKY

A common term used to mean a dinky or quarter roll of newsprint.
A sheet of newsprint one page wide, hence, the web that is one page wide.

US Ink's Press Doctor

DRIVE SIDE

Also known as gear side. The side of the press on which the drive shafts, horizontal and vertical are located and most of the drive gears are placed.

Direct Lithography

The method of printing lithographically by direct transfer of the ink from the plate to the paper

Double Truck

A design printed across the center pages of a newspaper section so that there is no center margin. The resulting ad will encompass two pages on a Broad Sheet.

Double Width

Pertaining to a newspaper press that is wide enough to print four broadsheet newspaper pages across the web.

Draw Down

A term used to describe ink chemist’s method of roughly determining the shade of a color. A dab of ink is placed on paper, typically with a reference standard, then spread out with a putty knife to achieve a thin film of ink.

Drum Scanner

A color scanner on which the original is wrapped around a rotary scanning drum.

D-Max

The area of maximum density (darkest area) on photographic material.

D-Min

The area of minimum density (lightest area) on photographic material.

Ductor Roller

On an Offset press, the roller in either the inking or dampening mechanism which alternately contacts the fountain roller and vibrating drum roller.

DENSITOMETERY

A method of measuring the depth of color based on the light modifying properties of colorants. Densitometers are used to measure the transmission or reflectance of specific colored light through or from transparent or reflective copy samples.

DESENSITIZE

(1) In lithographic plate making, to make the non-image areas of a lithographic plate non-receptive to ink through chemical treatment of metal. (2) In photography, a desensitizer is an agent for decreasing the color sensitivity of a photographic emulsion to facilitate development under comparatively bright light. The action is applied after exposure.

DUOTONE

Color reproduction from a monochrome original.

E

Elite

Formerly a standard size of type. Now used primarily to identify a style of typewriter producing 12 characters per inch.

Expansion Belts

Adjustable metal straps used to vary the effective diameter of a folding cylinder to adjust the folder for different thicknesses of product.

F

FLOW

The property of an ink to move or level out. The viscosity measurement techniques are used to classify the flow of an ink.

FLY PAGE

Also known as chasers, make-overs or re-plates. At times, between editions, editorial will get a story considered to be very newsworthy. In this event, the story is put in the paper and a fly page is called for, which means the press is to be stopped and this plate put on as soon as it's ready.

Foot Candle

A unit for measurement of light intensity.

Former

A triangular metal plate in which the web passes to receive its first fold, parallel to the web direction.

Fountain Blade

In an ink fountain, the blade that is supported over or under the fountain roller to control the amount of ink fed to the press.

Fountain Stops

Moveable strips of material which are placed to rest on the fountain roller of an offset system dampening system to cut down the amount of water supplied to the corresponding area of a press plate.

FANNING

Expansion of an offset press sheet across the back edge as it goes through press; caused by sheet not being flat due to edges drying and contracting.

FELT SIDE

The smoother side of the paper for printing. The top side of the sheet in paper manufacturing.

FOR POSITION ONLY

(FPO) For position only refers to physical or electronic images which are included on a hard copy or electronic mechanical to indicate only the position of the final artwork or scan.

US Ink's Press Doctor

G

US Ink's Press Doctor

Gear Streaks

Parallel Streaks appearing across the printed sheet at the same interval as the gear teeth on a cylinder. This can be caused by improper underpacking or defective press conditions resulting in different surface speeds between cylinders and pitch diameter of gears.

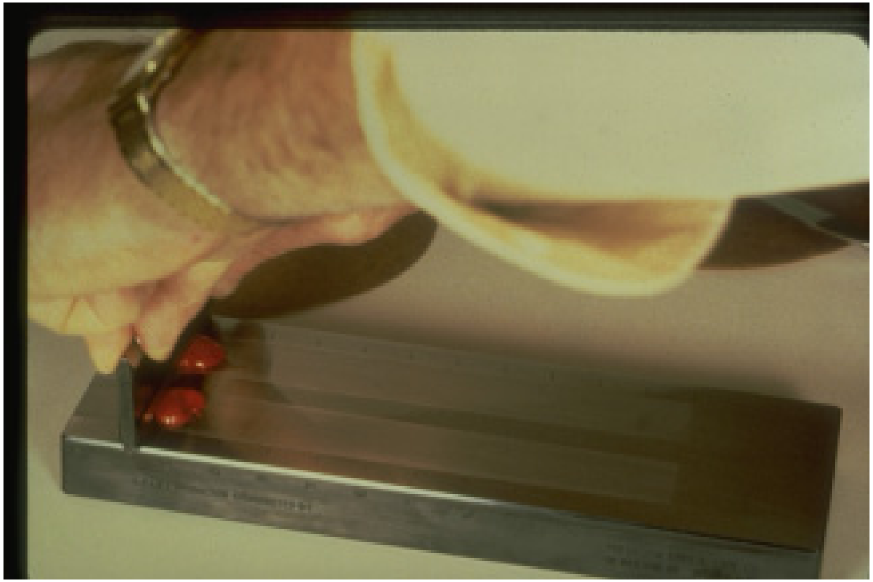
Governor Roller

A moveable idling roller, spring loaded or pneumatically loaded, located between the paper roll and the printing couple. It absorbs the shock of any sudden changes in demand for paper and with automatic tensioning systems provides corrective feedback to the tensioning device.

GREASING

Greasing is another term for scumming. please see
scumming.

GRIND



A term used is assessing the quality of dispersion in an ink.

Gripper Margin

The unprinted area between the edge of the sheet and the lead edge of the printed area., allotted for the press grippers to hold the sheet. Sometimes this is called the Gripper Bite

Gum Arabic

A gum obtained from either two species of Acacia trees which is used in the graphic arts. Gum Arabic solution are use to desensitize or remove any affinity for ink in the non-printing areas of a lithographic plate.

Gum Streaks

Streaks, particularly in halftones, produced by uneven gumming of a plate.

GUTTER

The inside margin of a newspaper.
On the plate cylinder, the space between the head and toe of the plate or plates.
On a tabloid plate, the space grooved for the inside margin, the center fold, of the paper.

GLAZE

On rollers, a hard, shiny appearance caused by improper cleaning.

GRAMMAGE

The weight in grams of a single sheet of paper with an area of one square meter.

US Ink's Press Doctor

H

Half Deck

An extra printing couple mounted above a unit.

HIGH SIDE

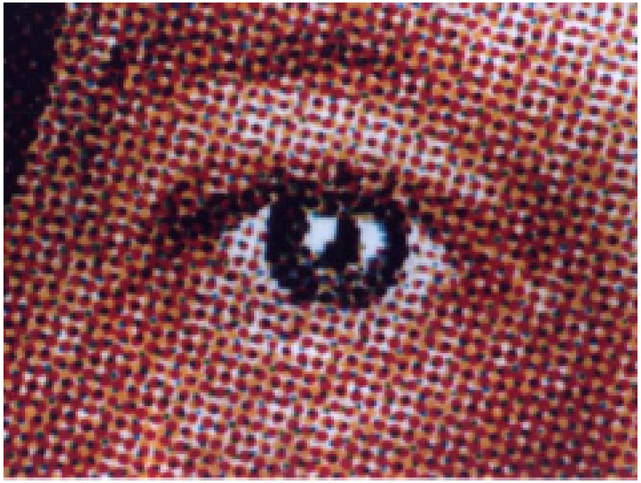
On the press, the side of the press on which the plates with the higher page numbers are placed, in most instances this would be the operating side.

On the plate cylinder, when plating the press for a collect run, the side of the plate cylinder on which the plates with the higher page numbers are placed. The opposite side of the plate cylinder is known as the low side.

US Ink’s Press Doctor

HALFTONE

A photo having a tone pattern composed of dots of uniform density, but varying in size



Hydrophilic

Water loving, prefers to be wet by water rather than oils.
Water receptive. The non-image area of a plate is typically hydrophilic.

Hydrophobic

Water hating, preferring to be wet by oils rather than water. Water repellent. An image area on a plate is typically Hydrophobic.

HICKIES

Hickies are (usually) small imperfections found (usually) on solid print areas. They have a characteristically sharp outline, are completely uninked, and have a solid inked mark in their center. Hickies are caused by hard particles adhering to the blanket, the particle itself prints (the solid center) while the blanket immediately surrounding it is held off from contacting the paper. Hickies may be caused by the ink, the paper, or by contamination of the press by foreign matter.

HIGHLIGHT

The lightest tonal areas in a halftone or color separation film and reproduction. (1 to 30 % dots)

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I

Idling Roller

A free turning roller used to guide and control a web through a press.

IMPRESSION CYLINDER

A large metal cylinder, the circumference of which is usually twice the length of the newspaper, on which is placed a packing of cork or felt, and rubber to permit the necessary depth and resilience for impression printing.

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INCH

To run the press very slowly. Used while preparing the press for the run.

INSERT

Extra copy, and the negative therefrom, which is to be inserted into a page negative before plates are exposed. In newspaper parlance, a separate printed product, usually an additional section of the newspaper containing advertising or feature material, which is assembled into the newspapers after they are printed.

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J

Jump Lines

JUMP LINES

These are placed at the end of a story continued on another page directing the reader to the page and column where the story is continued.

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K

KELVIN

In printing, a unit of measure used to describe the color temperature of a light source, such as the 5000K standard viewing condition.

Lighting

Source	Color Temperature	Applications
D50	5000 Kelvin	Artificial daylight for color matching
CWF	4100 Kelvin	Typical fluorescent lighting for retail stores or offices
A	2700 Kelvin	Typical incandescent for home or business

KICKER

A device, in the delivery section of a folder, which displaces a newspaper in the delivery stream to facilitate manual counting or stacking. Often designed to displace every 25th or 50th paper, or, if electrically controlled, may have provision for setting for other counts.

KISS PRESSURE

Kiss pressure is the minimum pressure at which proper ink transfer is possible.

KNOCKOUT

When type or line art is to be printed over a color background, the type is reversed out of the background. The reversal area is the knockout.

L

LOW SIDE

On the press, the side on which the plates with the lower page numbers are placed, usually the drive side of the press.

On the plate cylinder, the side on which the plates with the lowest page numbers are placed when plating for a collect run.

LAP

The slightly extended areas of printing color overprints, which make for easier registration of color.

LATERAL REVERSAL

Turning of a photographic image as to right and left position, achieved either with optical reversing devices, by “flopping” the negative for stripping, or by placement of the image in a transparency-holder during photography. Frequently used to get emulsion-to-emulsion in contact printing of lithographic press plates.

LEAD

(1) Lead and web are often used interchangeably. A lead is usually used to mean the beginning of the roll of paper, which is being threaded through the press. After the press has been threaded, the paper in the press in known as the web. However, after the press has started, a web break may be referred to as a lost lead; or threading the press may be referred to as webbing the press. (2) Sometimes used to mean the web or the web pattern in the press.

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M

Metameric Color

A color that changes hue under different illumination. If two colors match under one illuminant but differ under another, their spectrophotometric curves are different.

MAKE READY

The work done on a printing press before running a job. (IE. Wash up, Plates, Blankets, Registration, etc.)

MEMORY COLORS

The colors of familiar objects such as food, human skin, green grass, and blue sky.

MOLLETON

A thick cotton fabric similar to flannel, having a long nap, and used on dampening form rollers.

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Metamerism

The process where a change in illuminant will cause visual shift in a metameric color.

NAA

The Newspaper Association of America.
Formerly know as the ANPA.

Nanometer

Unit of wavelength of electromagnetic radiation. Equivalent to 10-to-9th power meters. Visible light wavelengths range from 400-700 nanometers.

NEWTON RINGS

An objectionable series of irregular colored circles caused by the prismatic action of interfacing different smooth surfaces together, such as in contact frames, and on other scanner cylinders.

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O

Operating Side

The side of the press in which most of the controls are located. Sometimes called the Button side or near side.

Overpacking

Packing the plate or blanket to a level that is excessively above the level of the cylinder bearer

OVERSHOT FOUNTAIN

An ink fountain where the fountain blade is above the ink reservoir.

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P

PAGINATION

Process by which full or partial pages are made up by the newsroom and come to typesetters already made up. Most of the time these are complete except for artwork.

PICA

Unit of measure used in printing trade. Six picas equal approximately one inch.

POINT

Each pica measure is broken down to 12 points per pica.

PAPER GRAIN DIRECTION

The alignment of fibers in the direction of the web travel.

PASTER

(1) A web splice, made in the pressroom, to join the end of one roll of paper to a second roll.
(2) The mechanism used to make a web splice.

PIN HOLES

(1) At the edge of a web press signature, the holes made by the pins of the folding cylinders. (2) Minute transparent spots in a developed photographic negative caused by dust, chemical impurities or air bubbles.

PRINTING COUPLE

In a rotary letterpress, the combination of a plate cylinder and impression cylinder which together provide one printing impression. Hence, in an offset perfecting press, the combination of a plate cylinder and its accompanying blanket cylinder.

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R

Reverses

Type elements that have been imaged by printing the background areas (non-type) with ink and leaving the unprinted substrate in the type areas.

Reel Tension Paster

The term used to identify the paper supply system that consists of a reel, an automatic tension system, and an automatic paster arrangement. Also known as RTP

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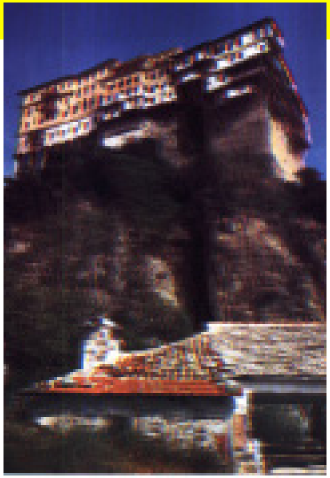
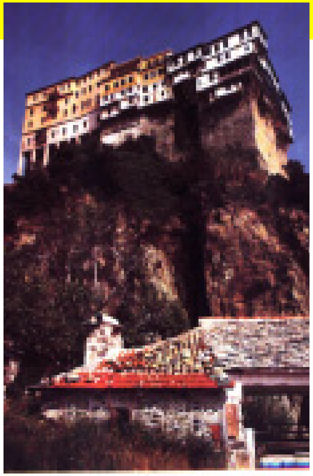
Register

Exact correspondence in the position of pages in color printing.

Out of Register In Register





Register Marks

Small crosses, guides or patterns placed on the originals before reproduction to facilitate registration of plates and their respective printing.

RESIN

A solid or semi-solid organic substance used as a binder in printing ink vehicles.

R.O.P.

Run Of Press Applies to color printing, indicating that the color is printed as part of the normal press run.

Roller Top of Former

The driven roller directly behind the top of the former on a folder. Also known as RTF

REVERSE LEAD

The web is threaded through a printing couple so the outside of the sheet is printed first and the inside of the sheet is printed second. Webs are reversed in order to obtain second impression printing on a page that would ordinarily receive a first impression printing.

RIDER ROLLERS

Metal or rigid plastic rollers in the inking mechanism that contact one or more soft (glue glycerine, rubber, etc.) Rollers and serve to break down, transfer and distribute the ink. Soft rollers are sometimes used as riders on large metal ink drums and serve to break down the ink.

S

SNAP

SNAP is SPECIFICATIONS FOR NEWSPAPER ADVERTISING PRODUCTION.

The goal of SNAP is to establish guidelines and provide background information about the non-heatset printing process. If these guidelines are used in a systems approach, a higher level of reproduction quality can be achieved.

Status T

A standard wide band densometric response specified in ANSI PH2.18 to be used for color measurements in the graphic arts.

Stoffer Scale

A continuous tone step wedge , used to monitor exposure levels on photosensitive materials

STET

Printing term meaning to let is stand, disregard prior remark, and make no changes.

STRAIGHT RUN

Each page printed on the web is the same as the preceding page, thus each revolution of the press produces two copies of the paper..

SPADEA

A type of advertising insert, often printed with Sunday comics but used with other products, that is designed to fold with and partially wrap around the front page of a product.

STANDARD ADVERTISING UNIT

(SAU) A copyrighted system developed by NAA, standardizes the size of advertising space.

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TF ADS

Ads which have a definite running date. In other words, the same identical ad may run Monday, Tuesday and Friday of every issue. They are only changed when a copy change order is received. TF refers to till further notice.

TABLOID

A newspaper with a page size one half or less the standard page size of the press.

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TACK

Tack is a relative measurement of the cohesion of an ink film which is responsible for its resistance to splitting between two rapidly separating surfaces

THREE-TO-TWO FOLDER

(3:2 Folder) A folder with a folding cylinder having circumference equal to the length of three newspapers and a cutting cylinder with a circumference equal to the length of two newspapers.

TWO-TO-ONE FOLDER

(2:1 Folder) A folder with the folding cylinder equal in circumference to the length of two newspapers and cutting cylinder equal in circumference to the length of one newspaper.

Ten Side

Left-hand side of a press unit when you are facing the operating side.

Tension

The amount of pull applied to a web, in the direction of travel.

Thirteen Side

Right hand side of the press unit when you are facing the operating side.

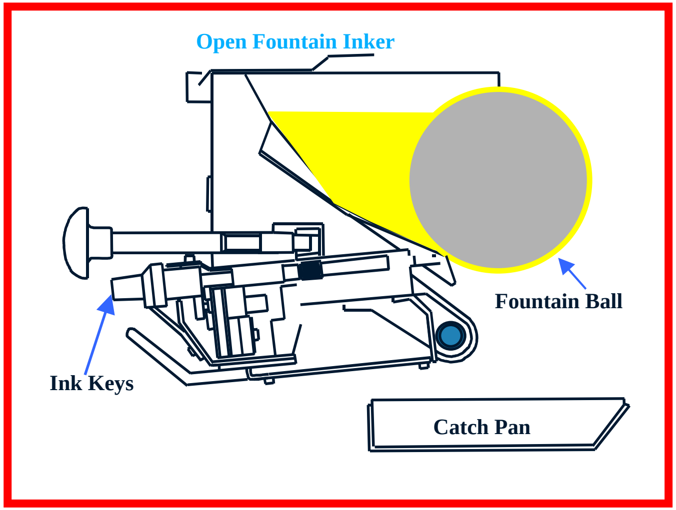
U

Undercut

In printing presses, the difference between the radius of the bearers and the radius of the cylinder body. This is the allowance for plate or blanket.

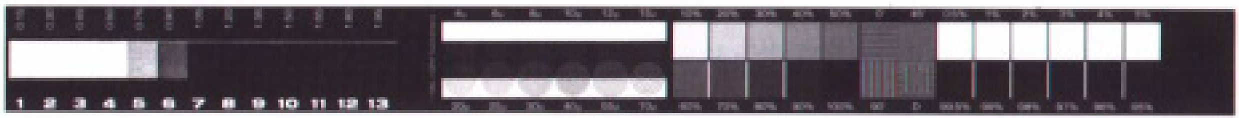
Undershot Fountain

An ink fountain with the ink fed from the bottom of the fountain. The fountain roller and a fountain blade whose edge in proximity to the bottom of the roller form the fountain cavity.



UGRA PLATE CONTROL WEDGE:

A test target used to control the platemaking process. The five elements of this target measure exposure level, resolution, minimum dot sizes, tone reproduction, and directional effects of imaging.



V

VELOX

Camera reproduction of original art to be used.

Vignette

A small decorative design or illustration of any kind on or just before the title page, or at the beginning or end of a chapter of a manuscript of book.

An original piece of copy. Halftone printing plate of impression in which the background or a portion of the illustration gradually shades off until the lightest tones or extreme edges appear to merge with the paper on which they are printed.

WIPE-ON PLATE

A lithographic plate on which a light sensitive coating is wiped manually, or applied by a coating machine, in the printing plant.

WIRE SIDE

In papermaking, the side of a sheet next to the wire of the papermaking machine; opposite from felt side (q.v.).

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Basic Reminders

RealColor Tips From US Ink

Conductivity Meter & Standard Solution

(1) Used to maintain conductivity as per manufacturer's recommendation.

(2) Keep the System Clean

Rollers

(1) To check roller hardness use a **DUROMETER GAUGE---TYPE-A**

(A) New Rollers

Ink Forms	New 26-28 Durometer Hard and out at 40
Ink Transfer	New 28-30 Durometer Hard and out at 40
Dampener Form	New 24-26 Durometer Hard and out at 35
Water Pick Up	New 22-24 Durometer Hard and out at 35

(2) Rollers should be washed --Weekly

(3) Rollers should be set------- Monthly

Stripe setting 1/16 of an inch times Roller Diameter

Blankets

To check New Blankets use a **Caddy Mike.**

(1) Be certain what is stamped on the blanket back agrees with your press requirements.

To check Blankets on Press use a **COBRA Mike or Blanket Packing Gauge.**

(1) Check Blankets on a weekly basis or after a smash in order to maintain proper printing height.

Torque Wrenches and Torque Recommendations

(1) Typically 45 in/lbs. Two Wide Presses

(2) Typically 45-50 in/lbs. Four Wide Presses

Consult your Press Manufacturer's Manual for exact settings.

Plate To Blanket and Blanket To Blanket Gauges

(1) Used for setting metal on plate to blanket and blanket settings, check every 6 months or after a smash. Foil or Parchment Paper are also used on bearer presses.

(2) Use Manufacturers recommended plate thickness to ensure correct printing impression substituting a thinner plate could dramatically affect Print Quality.

Clean Pressroom

(1) The Cosmetic appearance of a pressroom leads to Quality.

(2) Clean Water System-Weekly

(3) Wash Up Rollers-Weekly

Record Keeping

(1) Track all Materials and Maintenance Unit by Unit; Keep it simple accurate and be accountable.

Densitometer

(1) Check instrument calibration daily.
(2) Utilize clean and properly dated calibration plaques.

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About Press Doctor

US Ink's Press Doctor Was
Written and Programmed By
DENNIS CHEESEMAN

We would like to give special thanks to Paul Casey for his original inception of the concept

For details regarding any aspect of this program or about the inclusion of additional data, please contact

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Data

Press Doctor is comprised of a system of short data statements, which are dynamically linked together. Such a system of interlinkage is known as Hypertext. The aim of Press Doctor is that anyone should be able to learn to use the program within 2 minutes. Installation should be extremely simple, and quick, and should be possible on a wide range of different computer systems. Navigation around the system should be both logical and intuitive. The user should be able to abort a line of analysis and retrace his/her steps without losing a significant amount of time. Would you like further data on Press Doctor or to proceed with your analysis session.

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More data

Press Doctor is there to prompt thought and analysis , which can then hopefully assist in the linking of causes and effects, and thus contribute to the solving of problems or the answering of queries. Unlike an expert system, the user solves the problem while the software acts as a convenient reference. Select and return to Proceed?

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Please select and press return.

Appendix