

# TechLines

## Everything you need to know about ink-on-paper... with an emphasis on coldset/non-heatset printing

### Consider your daily newspaper...

That's your daily dose of coldset/non-heatset printing. The webs of paper do not go through ovens to "dry" the ink as is done with publications or catalogs on coated papers. You don't have to twist and turn the pages to eliminate any glare as you read the sports or check out how your stocks are doing. And have you noticed that your fingers don't get as black from your newspaper or magazines as they used to?

Advancements in inks have reduced the amount of colorant that rubs off of your hands.

#### Comparison of three kinds of printing

	<b>Coldset/ Non-heatset</b>	<b>Heatset</b>	<b>Sheetfed</b>
<i>Drying process</i>	Absorption & evaporation	VOCs flashed out of inks by heat	Ink pre-dried under IR lights, powder between sheets for evaporation
<i>Stocks</i>	Uncoated	Coated & uncoated	Coated & uncoated
<i>Dot Gain</i>	30%	18%	15% uncoated 20% coated
<i>Line Screens</i>	100 to 133	133 to 175	120 to 200
<i>Maximum ink density*</i>	260/offset 245/groundwood 235/newsprint	310	300 270 if UV coating

So how do we print catalogs, phone books and magazines without the ink smearing all over the place? First, we start with heatset presses running in a non-heatset environment. All rollers and other contact points within the press

are protected so inks do not collect. Then we use coldset inks that are formulated to "dry" by absorption and evaporation.

With this TechLines Sheet, we hope you can gain a broader understanding of what it takes to put ink on paper in the coldset/non-heatset process.

### Ink density: the thickness of the ink layer on the paper

In coldset/non-heatset printing, we cannot put as much ink-on-paper as can be done on a sheet press. Since the ink is still wet through the folder and takeoff equipment, we need to be concerned with smearing and set-off – where an image will transfer onto the facing page due to pressure.

\* This number represents the sum of the screen percentages found in the darkest area of a 4/color image. Also known as Total Area Coverage (TAC). If the sum exceeds this number, this thicker layer of ink can cause the image to transfer to a facing page.

**Density is directly related to paper.** On a sheet press with a coated sheet, the density could run as high as 1.80\*\* whereas on groundwood stock on a coldset/non-heatset press, 1.15 is about the limit. More density also leads to more “show-through” – appearance of the image coming through the back side of the sheet. The thinner the sheet, the more show-through you may see.

**Density directly affects tonal reproduction.** More ink means more dot gain which can lead to muddy, plugged halftones.

**Density is also a trade-off.** An ink formulated for less rub (less will come off on your hands) results in an ink that penetrates more. An ink formulated with greater rub results in more smearing but less show-through. These differing formulations can also create different problems on press equipment. Adding more resins to the inks so they setup on top of the paper (less show-through) can lead to ink build up on rollers and in the folder.

Here are two hints to ensure a successful coldset/non-heatset print run:

1) Adjust four color images to limit the total ink coverage. In Photoshop®, adjust **Maximum Ink Density** to the following setting based on stock: offset – 260; groundwood – 245; newsprint/directory – 235. Also, set the black limit to 90%.

2) If the front cover of a self-cover piece has heavy coverage and the back cover nearly none, we recommend adding a 10% tint screen of black or a Pantone® color to fill the back cover to mask set-off that occurs in takeoff equipment. *If you will be inkjet addressing, an unprinted “window” must be left. A typical address is 1" by 3" (8 lines by 30 characters) and requires a 1" by 4" window. A wider address, adding personal or constant messaging or adding endorsements requires a wider window. For more information, please request our TechLines Sheet entitled **Designing Your Mailpiece for Inkjet Addressing (M7)**.*

## Ink colors that can cause problems

Printing Pantone® colors with over 50% yellow or transparent white in their formulas is a little like printing with Crisco! If these colors are used as solids in order to tint stock or fill text boxes, the black or other colored ink that prints over the top will have a tendency to smear or set-off on the facing page since it cannot find its way to the paper in order to be absorbed. In some cases, we recommend a different ink color or work with the formula to reduce the amount of yellow or white. This will improve the final printed results.

**If you wish to tint your stock** with Pantone® 149 (a gold-ish color with a formula of 87% transparent white, 9% yellow and 3% red), our recommendation would be to use Pantone® 150 (with a formula of 20% white, 40% yellow and 13% red) and screen it at 60%. *The rule of thumb – select colors that have 50% or less transparent white in their formula.*

If you want to use a Pantone® color with over 50% of transparent white or yellow in its formula, it is best to refrain from using it as a solid fill in any text box.

**Pastels or other light colors** are difficult to accurately match on any uncoated stock because of the amount of transparent white in the formula. The color of the stock dramatically changes the

\*\* To monitor the amount of ink on paper, printers use a reflectance densitometer. Using an internal light source, the densitometer measures the amount of light that reflects back. The higher the number, the greater amount of ink being placed on the sheet.

### Get to know your Pantone® colors!

Underneath each color swatch in the Pantone® Formula guide you will find a formula - “the recipe” printers follow to create that specific color.

color. Even in the sheet press environment, we find we have to “push” the ink to get near the Pantone swatch. A great way to see this is to take a cup of white frosting and add a few drops of red food coloring – it’s a nice light pink, right? How much food coloring do you need to add to give the color any intensity?

Greens have proven difficult colors to print. The greater the amount of Pantone® Green in the formula, the harder it is to print a nice looking solid.

## Designing your project

There are some important things to consider as you design your page layouts whether for coldset, heatset or sheetfed printing.

This section includes items from the “Specifications for Newsprint Advertising Production” (SNAP). This document was created by the SNAP Committee – a group of coldset printers and suppliers dedicated to providing technical information and clarification of newsprint production issues. It was produced by the Newspaper Association of America and the Web Offset Association. To download a PDF of the most current issue, go to [www.naa.org/upload/snap%207-2006%20ver%205b.pdf](http://www.naa.org/upload/snap%207-2006%20ver%205b.pdf)



### Fine rules & small type

Rules that are 4 points or thinner – as well as small type – should be reproduced in one color only. Small type is defined as:

- sans serif type 7 point or smaller
- serif type 12 point or smaller
- fine-serif type, such as Bodoni, 14 point or smaller

*Sans serif type is the best choice for coldset reproduction.*

### Reversed rules and type – see Example 1 below

Type smaller than 12 point should not be reversed out of a four color background and type smaller than 10 point should not be reversed on a single color background. Serif type and fine-serif type should not be reversed at sizes smaller than 12 point. Even in cases of larger type, testing should be done to verify whether a printing 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 backgrounds.



**Example 1: Reversed type in black solid, numbers at left are point sizes. Gill Sans bold (a sans serif font) at left, Bauer Bodoni bold (a serif font) at right.**

### Trapping, rules and registration – see Example 2 on next page

There is natural variation in any printing process. In multi-color printing, colors can shift out of alignment due to image output, platemaking, paper movement and environmental conditions. This is known as mis-register. In order to mask this, elements of differing colors are “trapped” (overlapped) into each other. For example, if a colored screen fills a black bordered box, the screen is “spread” to extend, at most, halfway into the black border.



**No trapping applied.** Any white gaps are from press variation. The black border is .5 pt.



**40% black type spreads into the solid color background.** The solid color spreads into the 1 pt. black border.



**40% color background screen spreads into the black type and the .5 pt. black border.**



**40% color type spreads into the 40% black background screen.** The 40% black spreads into the 1 pt. color border.

**Example 2: Trapping is the overlapping of different colored elements to mask the variation inherent in printing. Trapping software compares the relative strength – luminance – of each color and uses the stronger of the two to define the image and spreads the lighter color into the darker. Borders were added to show why we recommend 1 pt borders where two colors touch.**

**Red and yellow = orange.** If magenta type is placed in a yellow solid box and trapping is not applied, the type will reproduce as orange. To prevent the occurrence of orange type, the yellow background is “spread” into the magenta type – the darker color (magenta) defines the image/shape while the lighter color (yellow) is trapped into the darker color. Standard trapping allowance is .005” or .33 pt. Upon close inspection, the magenta type will be seen to have a fine orange border.

**Special note:** When trapping is applied to 14 point or smaller type, the background color can overtake the type since the character is not wide enough to withstand the affect of trapping. We strongly recommend that 14 point or smaller type be set to overprint. Take great care when selecting the ink colors for your document – if the two ink colors combine, will you welcome the “third color” or will it be undesirable?

Trapping is also a concern when adding borders in multi-color projects, with black considered a color. We prefer borders or rules that touch another color be 1 pt. With a trap allowance of .33 pt., a .5 pt. rule is barely enough to mask press variation.

Also keep this in mind when placing a black & white halftone in a Pantone® color border - the halftone will be spread into the color border. Only do this if your spot color is strong enough to cover the halftone spread.

### **Screening type – see Example 3 above right**

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 greater will print as a solid.

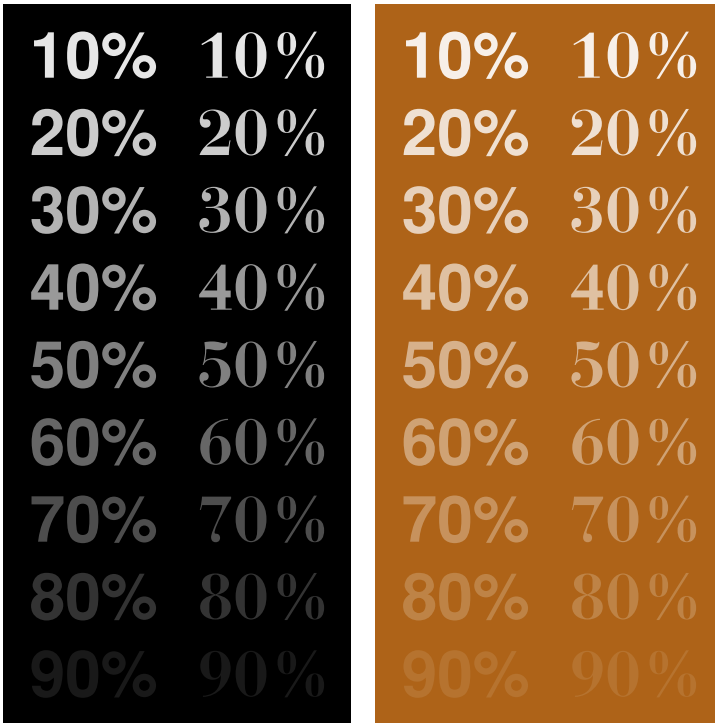
In order to keep definition when placing screened type or a screened art element in a same-color solid (whether black or a Pantone® color), limit the screening to 75%.

Our web presses are 36” wide. On the Goss G18 and the two Hantscho presses, there are 24 1.5” “ink keys” that span the 36” width. These “keys” are controlled from a console and can be opened and closed to change the amount of ink that enters the inking system and goes onto the paper.

### **Gutter spreads/Crossovers**

Commercial presses have automatic controls used to keep a single web or multiple webs in a consistent position before entering the folder. Even though these controls are set at zero, fluctuations in the web(s) cause these controls to constantly adjust the alignment of the web(s). Fluctuations can be caused by roll windings from the paper mill which vary web tension and directly affects register and alignment.

It is best to avoid running any text between two facing pages.



**Example 3: Screened type in black and Ripon's logo color solids, screen percentage same as example. Helvetica bold at left, Bauer Bodoni bold at right. Yes, both examples have a 90% sample.**

Break headline type at the center line – preferably between words.

**Ghosting – and not the friendly kind! – see Example 4 below**

Consider a page with a solid black or color border. The vertical sides of the border – and any interior vertical rule – will take all the ink that any press inking system can deliver. But the top and bottom of the border do not require as much ink and will appear darker than the sides of the page. This is known as ghosting – a phenomenon that can also be seen on a sheetfed cover with a front page picture surrounded by a full bleed background color – the background color appears darker in-line with the front page picture.

When the design “steals” ink as we have described, there is little that any printer can do without additional cost.

On a web press, the border color could be split to run out of two press units. On a sheet press – with its lesser registration vari-

ation, the border color could be “double hit” or printed out of two units.

**Limitations of the web press process**

There are some printing phenomena that are simply the nature of the beast.

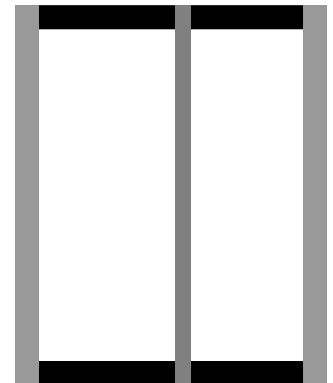
**Robbing Peter to pay Paul – see Example 5 on next page**

Setting ink – the amount of ink required as determined by the copy across the entire web – is a very delicate balancing act. As backwards as it may seem, pages with light coverage – a paperback book for example – are sometimes more difficult to set ink on than the pages in a product catalog which will have large headlines, product illustrations and possibly screened text boxes.

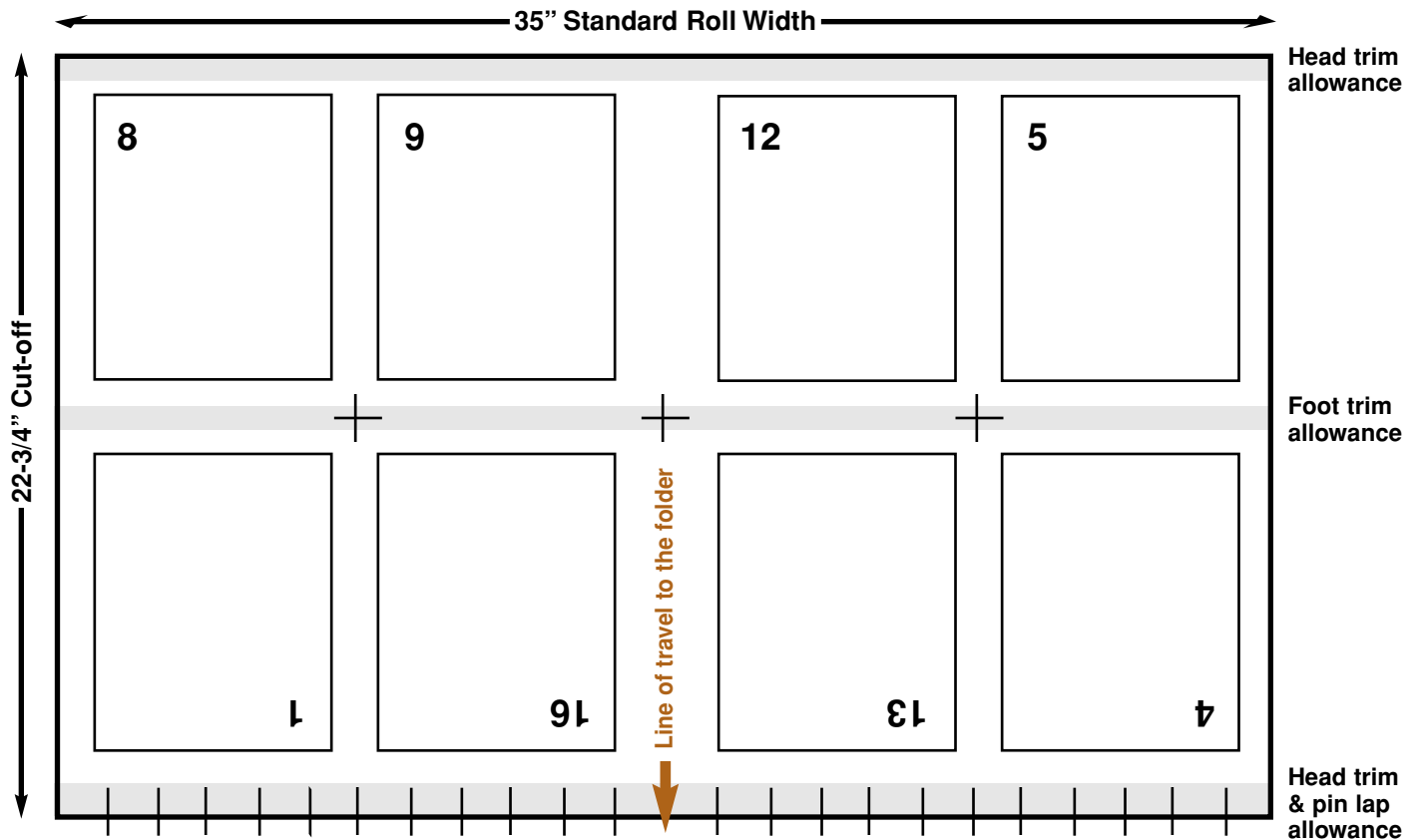
Making sure there is enough ink available to reproduce the copy is part of the art of printing. Light-coverage forms take only a small amount of ink from the inking system.

Once you start adding images and reverse blocks, setting the amount of ink gets a little easier. Depending on the page design, the press crew may have to make on-the-spot decisions about what is most important – a strong, consistent black solid bar may need to be sacrificed if a halftone prints dark in-line with the solid bar.

Running colors stronger leads to increased dot gain which then makes tonal reproduction poor.



**Example 4: An example of ghosting. If you design your pages with a black outside border, the left and right edges take all the ink a press inking system can deliver while the top and bottom edges only require a small amount. The top and bottom edges will appear darker.**



**Example 5:** An 8-page web press flat numbered as one-half of a 16-page signature jogging to the foot (closed head of the signature). The spaces between the small vertical lines along the bottom represent the 24 ink keys that control the flow of ink to the inking system. Page 1 prints in-line with page 8 – so copy, art and halftones on one page could affect the reproduction on the other.

### How one page can affect another?

This example is an 8-3/8" x 10-7/8" final trim size 8-page flat with pages imposed as one-half of a 16-page signature. The centerspread (pages 8 & 9) prints in line with pages 1 & 16. As with any pages that print in line with each other, a large halftone or large black solid vertical panel on page 1 would take ink away from a black solid on page 8.

Ink settings on one page directly affect the page that prints in-line with it. Awareness of the consequence in page layout and design is critical to good overall reproduction on the press.

Keeping all bleed tabs looking the same is another challenge. With bleed tabs at the face of your pages, they most likely are the only items printing out at the edges and center of the sheet and the only elements using ink in those areas.

### Reproducing accurate 4/color images

Printing 4/color process is an even more delicate balancing act. Our goal is "pleasing color," color as close to the color proof as possible. We focus on things we have seen in our lives – flesh tones, blue skies and water, red stop signs, green grass or logo/corporate colors of known companies.

Press crews make decisions on every page of a 4/color job. Focusing on accurately reproducing products can cause the color of background screens to vary. The product demands on one page may cause a shade shift on the page that prints in-line.

We strongly recommend you consider using a Pantone® spot color (running the actual Pantone®

color in a press unit by itself) as opposed to 4/color blending if your project includes a corporate color and a dominant accent color throughout. The limitations of our equipment and the demands of your design elements may conspire to vary a 4/color blend throughout a project. Our Goss G18 has six printing units so you can print 4/color process plus two Pantone® spot colors if needed. This is the best way to ensure the accurate reproduction of 4/color images and a consistent spot color throughout a project.

## The mystery of dot gain explained!

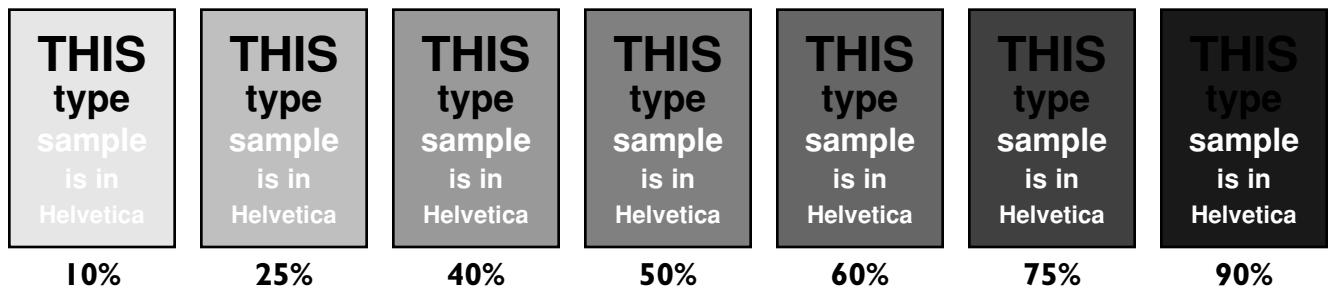
**Dot Gain** (also known as Tone Value Increase [TVI] in recent industry publications) is a phenomenon in offset lithography where the dots that make up halftones, 4/color separations and screen tints increase in size. It is composed of two elements.

**Mechanical (physical) gains:** occur during film generations, conventional platemaking, ink, paper and press/printing conditions.

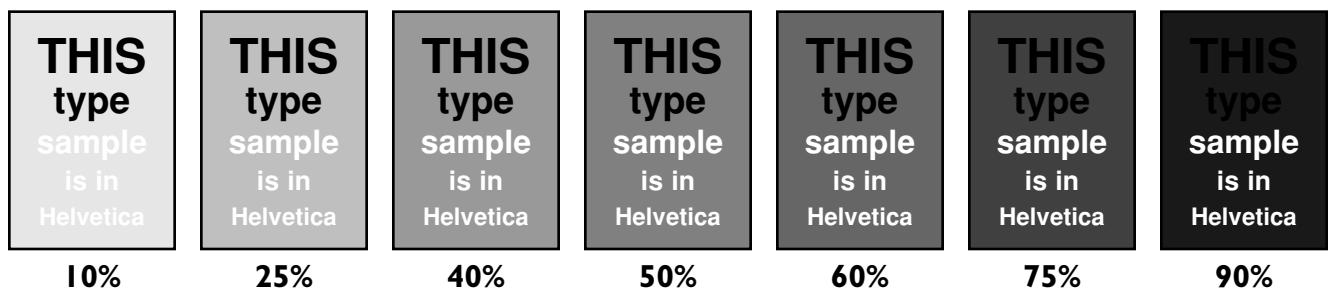
**Optical (visual) gains:** due to interaction between light and ink on paper. As refracted light enters the paper around and into the dots, the light that reflects back to the eye artificially increases the diameter of the dot, making it appear larger than it really is.

**Dot gain as related to dot percentage:** greatest amount of dot gain occurs near 50% dots and

### 100 LINE SCREENS



### 120 LINE SCREENS



### Dot Gain at work

These screen tint samples are live examples of dot gain at work. In printing this TechLines Sheet, ink settings were done to our target density, disregarding what might happen to the screens or the copy within them. If you have a printer's loupe, inspect the printed dot sizes and, if possible, compare to samples you may have of these specific percentages. Also note at what point the screen overpowers the black type.

## Computer-to-plate technology alters expected dot gains

As the electronic evolution continued, the introduction of computer-to-plate (CTP) directly effected dot gains. By imaging directly from electronic file to printing plate, the mechanical (physical) gain inherent in film-to-plate workflow is eliminated or reduced.

The printed pieces look cleaner. Tint screens – whether black, spot color or a 4/color blend – appear lighter than with the traditional film-to-plate workflow. Halftones will have more definition in the shadow (dark) areas.

in the range from 30% to 70% – right in the midtone of halftones.

**Dot gain as related to line screen:** the greater the line screen, the more it is susceptible to dot gain. There simply are more dots that can grow.

**Dot gain as related to press equipment:** since dot gain is affected by ink, paper and press equipment, it is important to question your printer about their dot gain requirements.

**Dot gain as related to solid ink density:** as the amount of ink being placed on paper increases, dot size also increases.

### Recommended line screens, dot gain allowances and maximum ink density...

#### Offset Stocks

Line screen: 133

Dot gain: 30% at the 50% dot

Under Color Removal (UCR)/Maximum Ink Density: 260% total ink limit, 90% black limit

#### Groundwood Stocks

Line screen: 120

Dot gain: 30% at the 50% dot

Under Color Removal (UCR)/Maximum Ink Density: 245% total ink limit, 90% black limit

#### Newsprint, Directory & Novel News

Line screen: 100 preferred

Dot gain: 30% at the 50% dot

Under Color Removal (UCR)/Maximum Ink Density: 235% total ink limit, 90% black limit