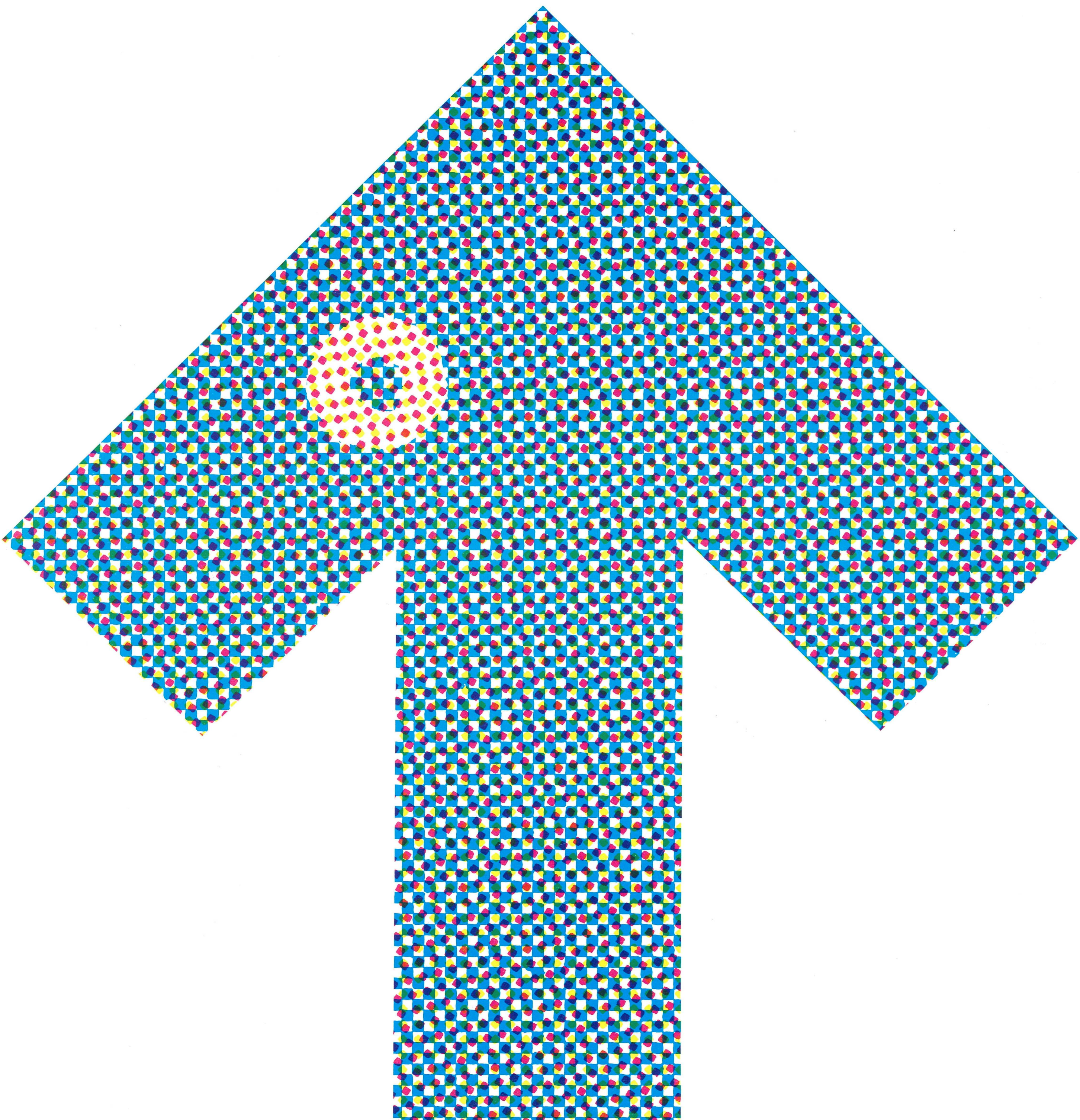
Bulletin No. 7

Specks in Printing



Contents

WARREN

How will it print?

This bulletin is issued by S.D. Warren Company for the purpose of aiding the graphic arts community in dealing with the complexities of the printing and lithographic processes. The information contained herein is a combination of the findings of scientists and the observations of experienced craftspeople. No true scientist will claim that existing knowledge is complete, and no sincere craftsperson will pose as a final authority, and therefore the text of this bulletin represents merely the considered opinions of experienced and thoughtful analysts.

Recognizing Specks in Printing

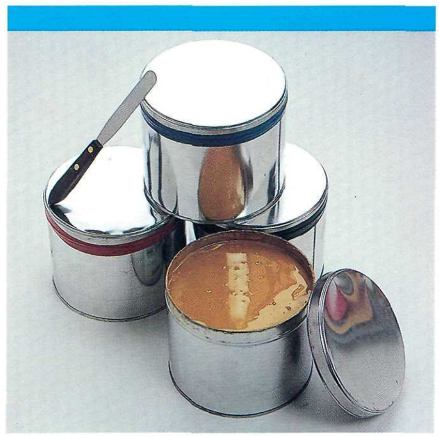
In both sheet-fed and web printing, *specks in printing* can occur from a variety of reasons. And in order to eliminate or minimize *specks* on press it is necessary to identify them and trace their origin.

This book is designed to:

1) *Define* a collection of *specks in printing.*
2) *Show the origin* of these *specks.*
3) *Outline the steps* to follow to troubleshoot *specks in printing* on press.
4) *List* the materials that must be collected to properly document a *specks* problem.
5) *Provide* a glossary of graphic arts terms commonly used today.

Specks in printing are caused by materials which enter the printing system and cause a mark or small non-print area in the printed image.

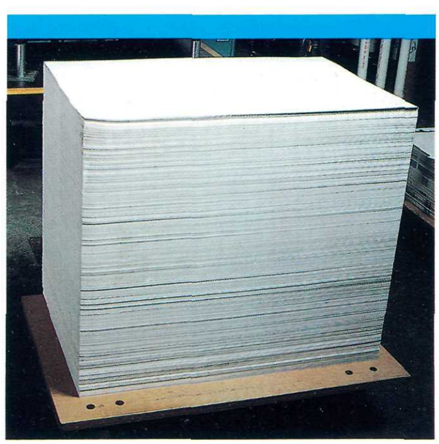
Specks can have one or a combination of origins: *Ink, Press,* and *Paper.*



▶ *Ink*
Ink can contain materials such as skin, dirt, or undispersed resin and pigments which could cause *specks.*

▶ *Press*
Defective materials on the press, or contamination from the pressroom can cause *specks.*

Most of the photographs in this book have been enhanced with enlargements which were done to simulate a printer's loupe at 12 times magnification (12x). In certain cases higher magnifications were used to illustrate the speck in detail.



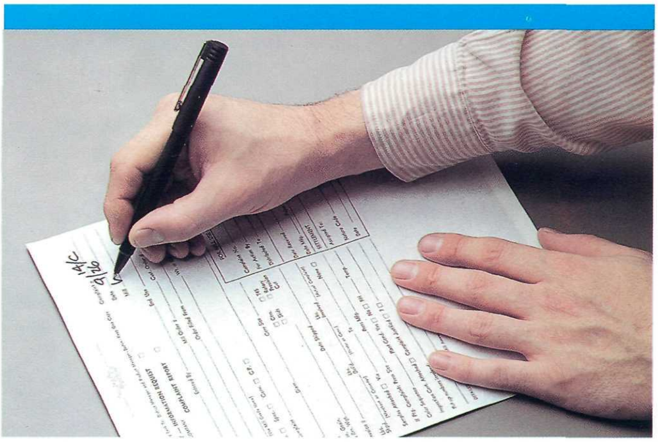
▶ *Paper*
Loose debris can be lifted off, or particles pulled from the paper's surface and cause *specks.*

Using This Book as a Guide

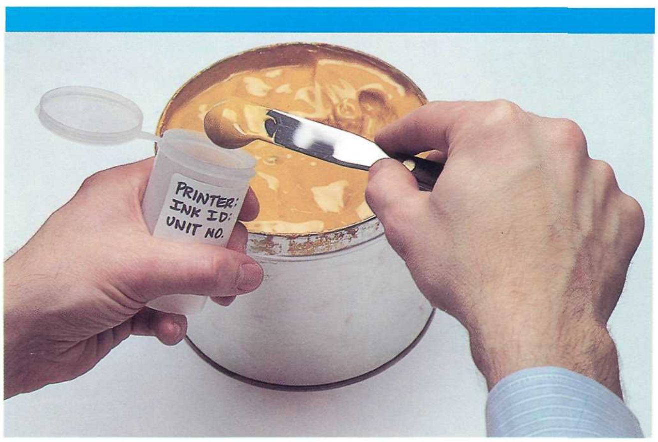
If you are experiencing *specks in printing* it is imperative to obtain physical evidence to accurately demonstrate the nature of the problem.

Throughout this book there is a series of picture codes that indicate the various materials required to document each problem.

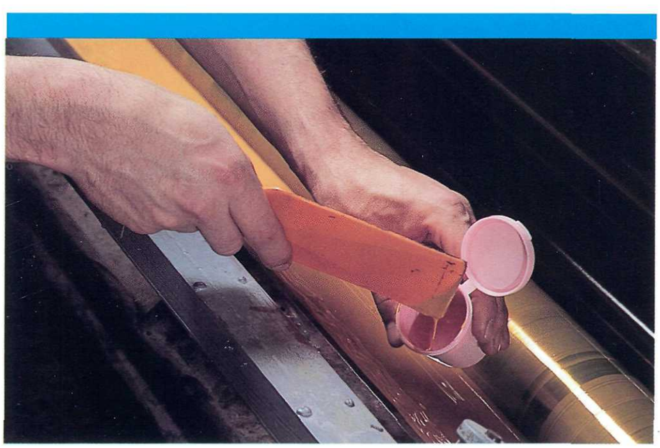
Below, each code is introduced with an explanation as to how this evidence should be gathered.

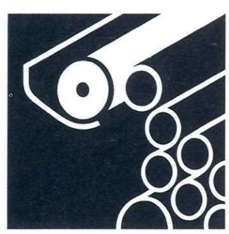


Information:
The information required by the mill should be filled in on the complaint form. Gather and record all mill order numbers. Identify press type, press size, printing sequence, blankets used, press speed, dampening systems, and room conditions. It is important that this information be noted while in the pressroom.

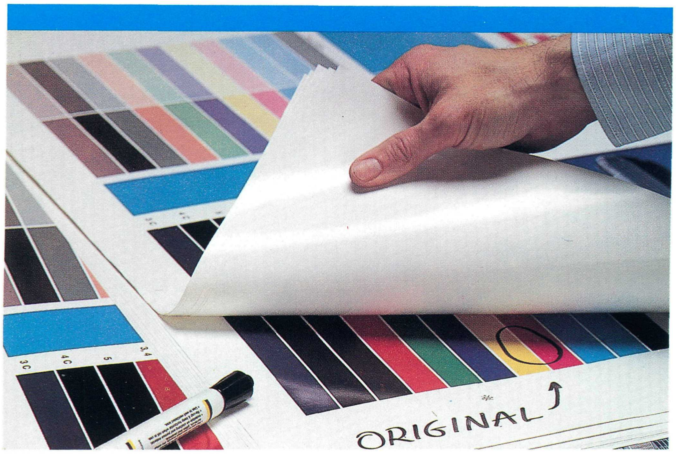


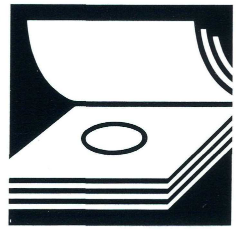
Ink from the Can:
A sample of the ink from the can (or its original container) will determine the condition of the ink as it was received in the printing plant. A sample of at least 4 ounces should be placed in an airtight non-porous container and sealed with vinyl or plastic tape. Each sample should be accurately labeled as to Customer, Ink Manufacturer, Batch Number, Date of Manufacture and Printing Sequence.



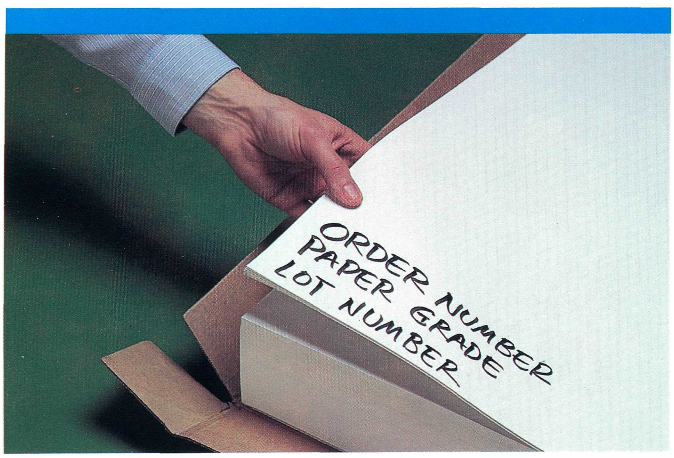


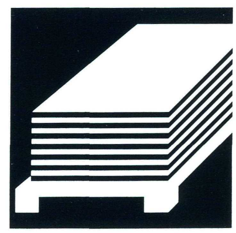
Ink from the Fountain:
A sample of ink from the press fountain, when compared to the can sample, can determine if any contamination or adjustments were introduced to the ink while in the pressroom. A sample of at least 4 ounces should be placed in an airtight non-porous container and sealed with vinyl or plastic tape. Each sample should be accurately labeled as to Customer, Ink Manufacturer, Batch Number, Date of Manufacture, and Printing Sequence.



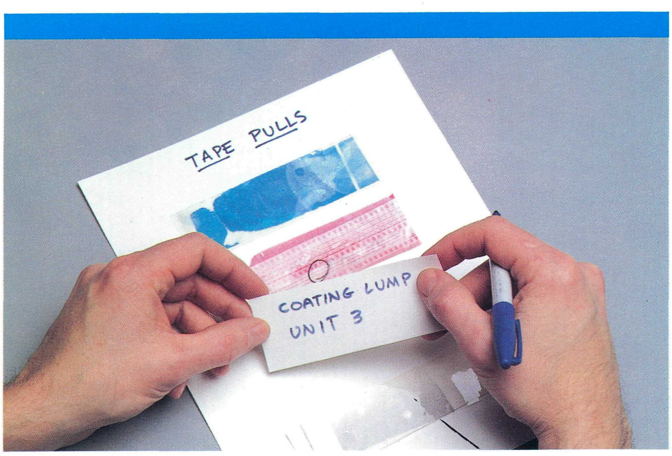


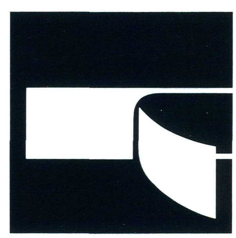
Printed Sheets with Original Defect:
It is imperative to obtain the press sheet, or signature, that contains the actual defect being described. This sheet will be referred to as the ***original.*** When obtaining printed sheets, be sure to collect at least 12 consecutive sheets, including several sheets before and after the ***original.*** Clearly identify the ***original*** by circling it, and staple the sheets together.



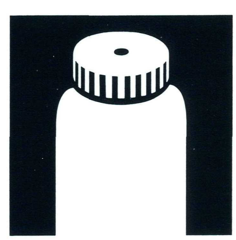


Unprinted Paper:
When necessary, obtain at least 12 consecutive sheets of unprinted paper that have not been through the press. Staple these sheets together and clearly label with all the appropriate order information. Unprinted paper is necessary to determine if the defect occurs in the paper before printing.





Tape Pulls:
When the ink rollers, plates, blanket or sheets become contaminated, it is necessary to retrieve this material for further analysis by the mill. A recommended tape pull material is Cleer Adheer laminating sheets.* A strip of this material can be removed from its release backing, used to retrieve the material from the press, and then joined again with its backing. The back of the strip should then be clearly identified as to where the tape pull was taken. (Unit #, plate, blanket, etc.)



Fountain Solution:
In certain printing problems it may be necessary to obtain a sample of the fountain solution from the press circulating tanks. Secure a sample in an airtight plastic bottle (8 ounces are adequate). Label the bottle as to the location of the sample. Also, include information on how the solution was prepared. For example: "the mix is 2 oz. etch per 1 gallon water, and 20 oz. alcohol." Be certain to list any additives that may have been added during the run to correct the problem.

**See inside back cover.*

Ink Hickeys

1

Example of how ink skin, adhering to the plate, prevents the ink from reaching the image in the surrounding area, creating the characteristic "donut" affect.

2

How an ink hickey would look through a printer's loupe.

3

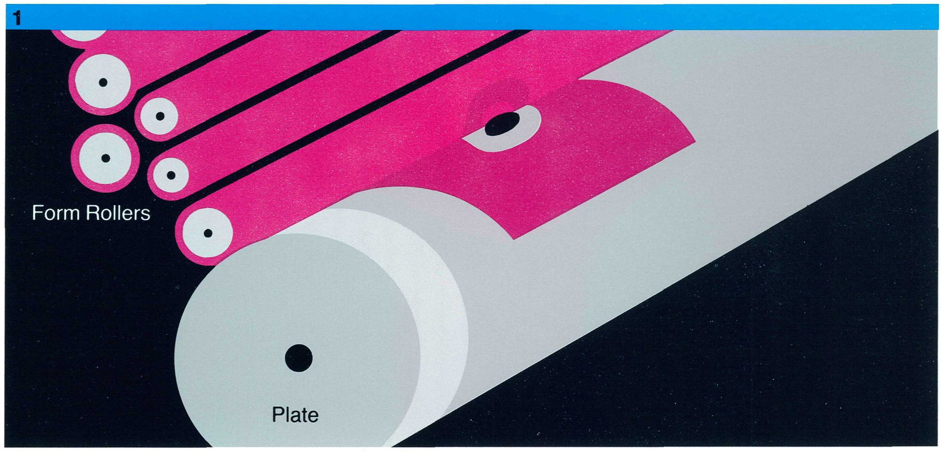
The characteristic "donut" affect.

Ink Hickeys are caused by material which is carried by the ink and are *not* particles which originate from the paper.

Possible sources of *hickeys* are pieces of ink skin, uncooked resin in the ink or roller fragments from a dry or deteriorating rubber ink roller.

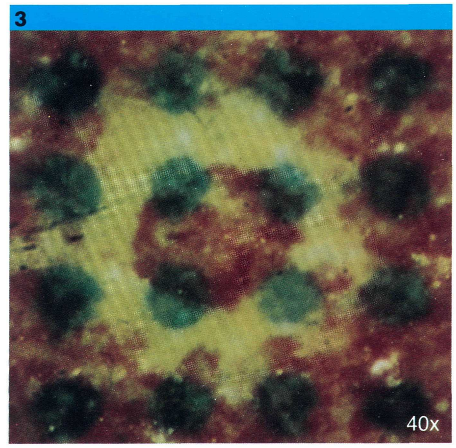
Ink skin, for example, will adhere to the plate and will reject water, but accept ink. Because of its thickness, the particle will be inked by the form roller(s) but it will prevent ink from contacting the plate in the surrounding area (Figure **1**). This "ring" around the particle will not print, creating the characteristic *"donut"* affect. (Figures **2** and **3**)

1



2

3



4

Ink hickeys on form rollers through a printer's loupe.

5

Taking a tape pull from the ink form roller.

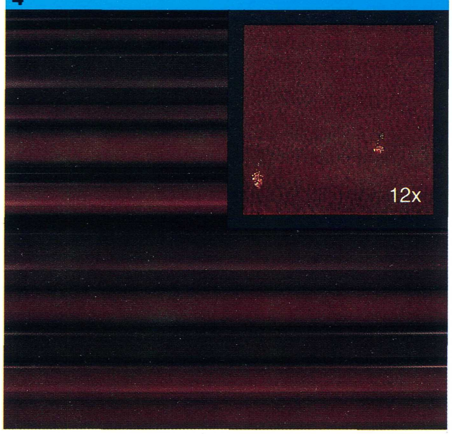
6

Ink hickeys on the plate through a printer's loupe.

7

Taking a tape pull from the plate.

4



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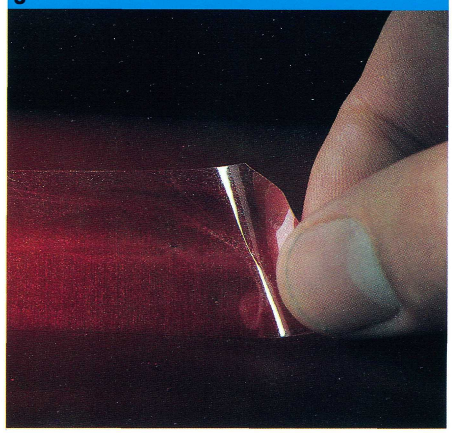

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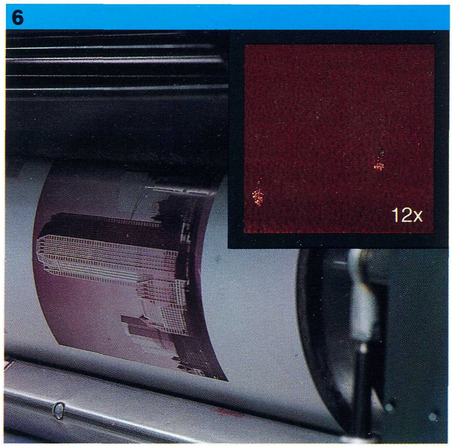

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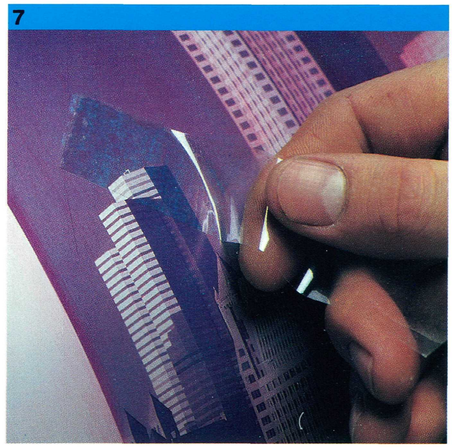


In order for a complete analysis to be done, the particle causing the speck must be removed from the press. For example, tape pull material can be pressed onto the ink former and the contaminate removed. (Figures **4** and **5**)

The material on the tape can then be photographed and tested to determine its origin (Examples on pages **6** and **7**).

Similar procedures can be used (Figures **6** and **7**) to remove the material causing the ink hickey from the plate.

If the material causing the specks is in the ink, the only possible solution is to remove the ink from the fountain and try a different batch. ***Caution:*** A clean-up of the ink system may not remove ***all*** ink hickeys. If the problem persists, form rollers may have to be removed, cleaned and checked for possible roller deterioration.

8

Tape pull of ink skin.

10

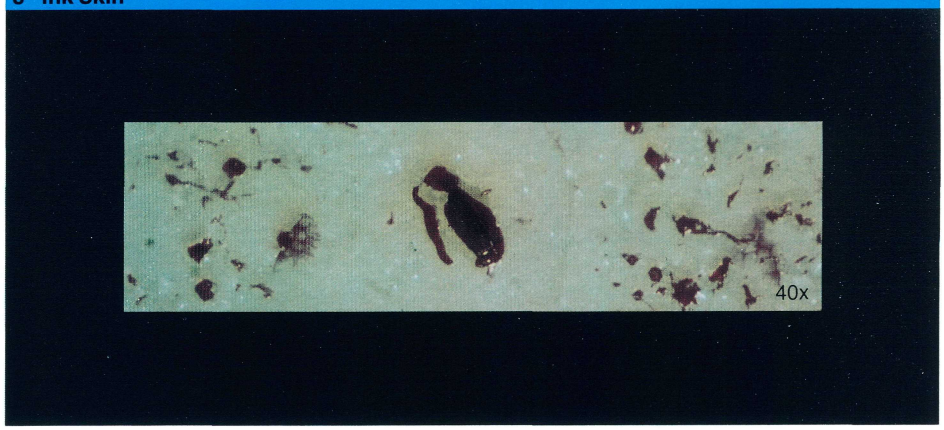
Tape pull of rubber roller fragment.

12

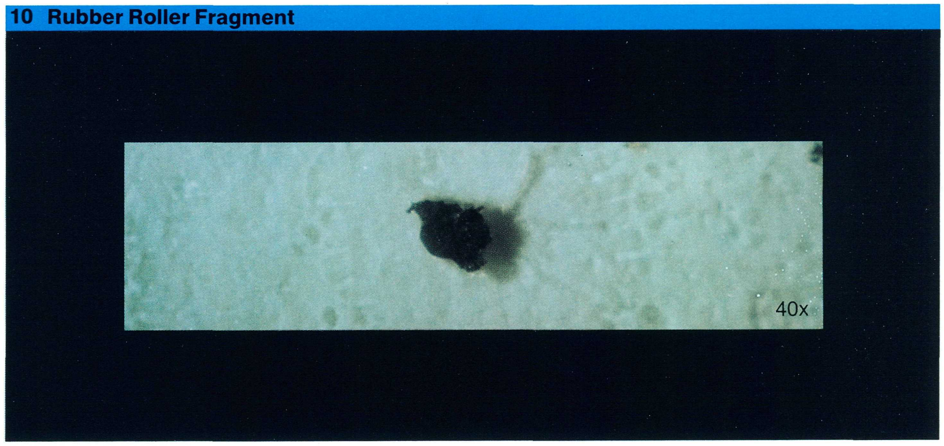
Tape pull of uncooked ink resin chips.

Visual Analysis of Tape Pulls of Ink Hickey Materials

8 Ink Skin



10 Rubber Roller Fragment



12 Resin Chip

9

Photomicrograph of ink skin.

11

Photomicrograph of roller fragment.

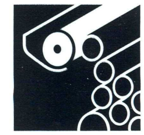
13

Photomicrograph of resin chip.

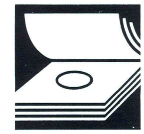
14

Chemical analysis of a rubber roller fragment.

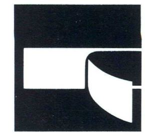
Ink: Can



Ink: Fountain

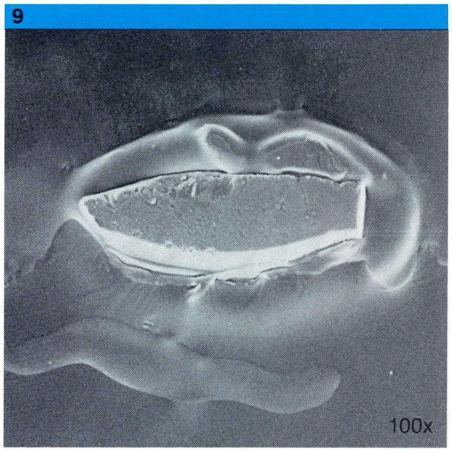


Original



Tape Pull

9



▶ *Ink Skin*

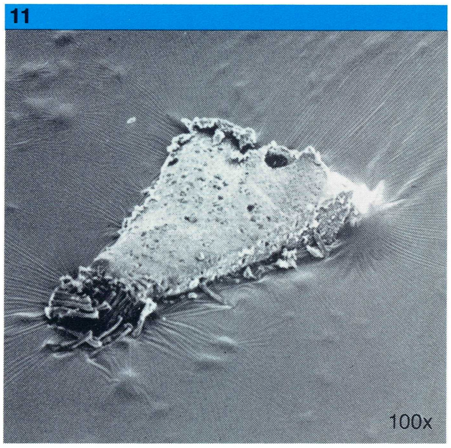
Tape pulls of the materials that may cause ink hickeys will be examined and analyzed in various ways.

The photos to the far left are examples of how some materials appear on the tape pull.

The corresponding photomicrographs to the right show the particle as it would appear under a Scanning Electron Microscope (S.E.M.).

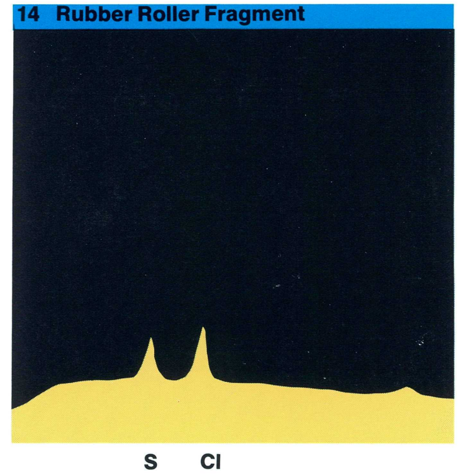
Further analysis can determine chemical content.

11



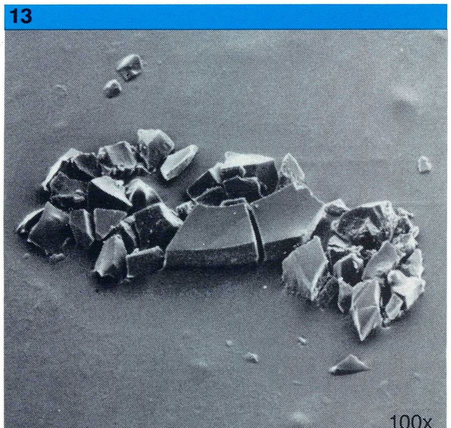
▶ *Rubber Roller Fragment*

14 Rubber Roller Fragment



Above is an example of a chemical analysis of a rubber roller fragment indicating the presence of S (Sulfur) and Cl (Chlorine). Note how this analysis differs from that of paper coating materials on page 9.

13



▶ *Resin Chip*

Pick-Outs and Coating Lumps

1

Coating lump being pulled from the surface of the paper.

2

Original

3

3rd sheet after original.

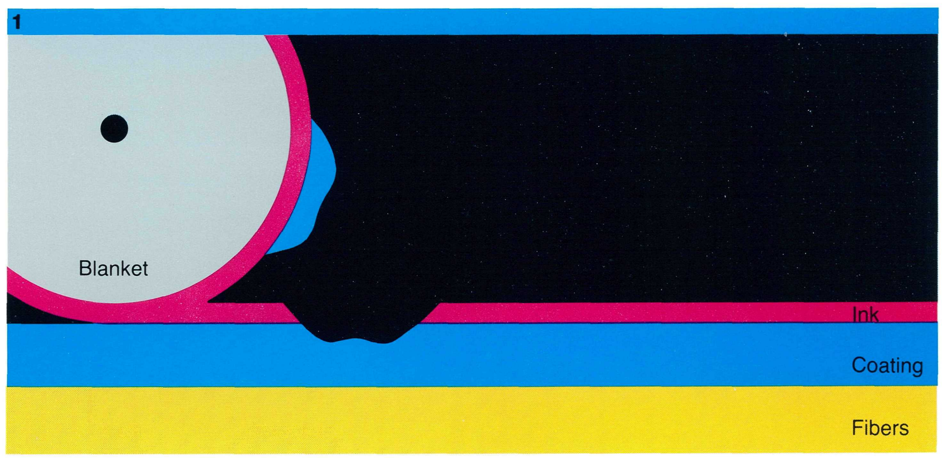
4

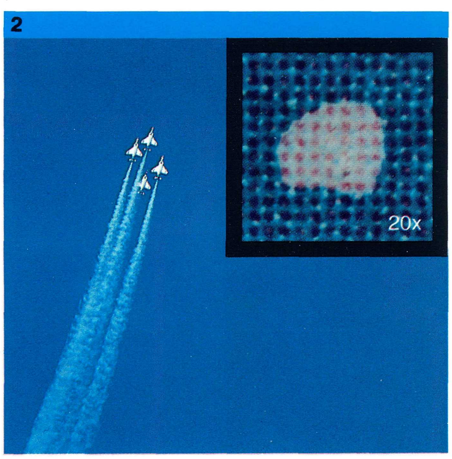
6th sheet after original.

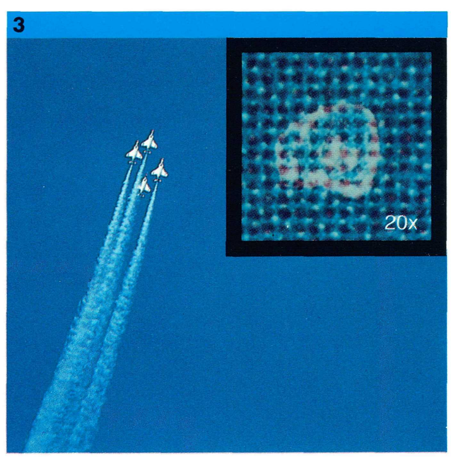
Pick-Outs and Coating Lumps are agglomerates of fiber or coating material that are bound into the paper coating or adhered to the paper's surface.

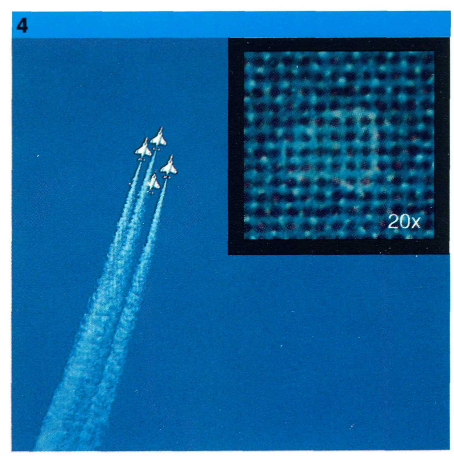
The tack of the ink, or inks, will lift the defect from the paper's surface (Figure **1**), and sometimes does *not* fracture the coating.

The white non-print speck on the original sheet appears on the unit where the lump lifts off, and the paper's surface below then becomes printed with the subsequent colors.









Eventually this lump of coating picks up ink and prints from blanket. The three prints above show the original sheet and the 3rd and 6th sheet after. (Figures **2, 3,** and **4**)

5

Coating lump visible through a loupe on the white paper before printing.

6

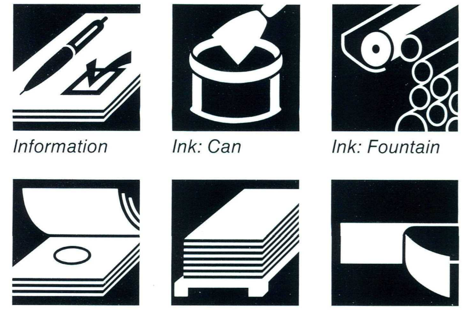
Tape pull of the coating lump from the blanket.

7

Photomicrograph photo at high magnification of the coating lump.

8

Chemical analysis of paper coating materials.



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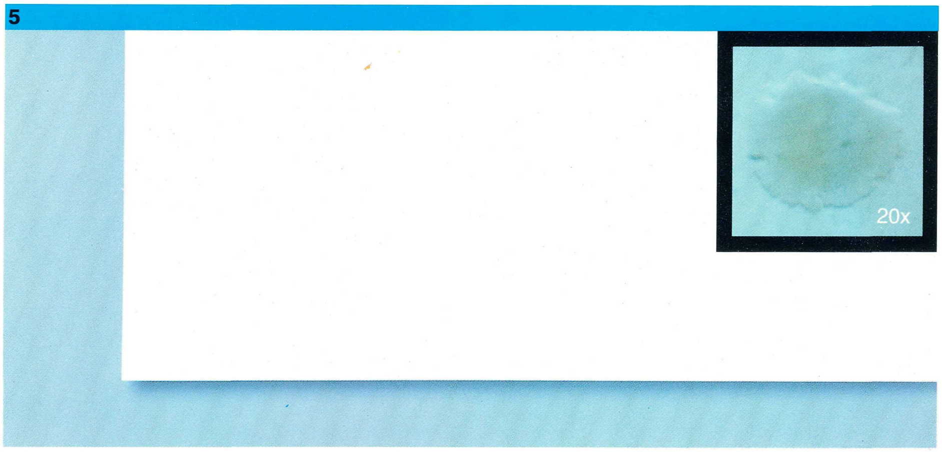
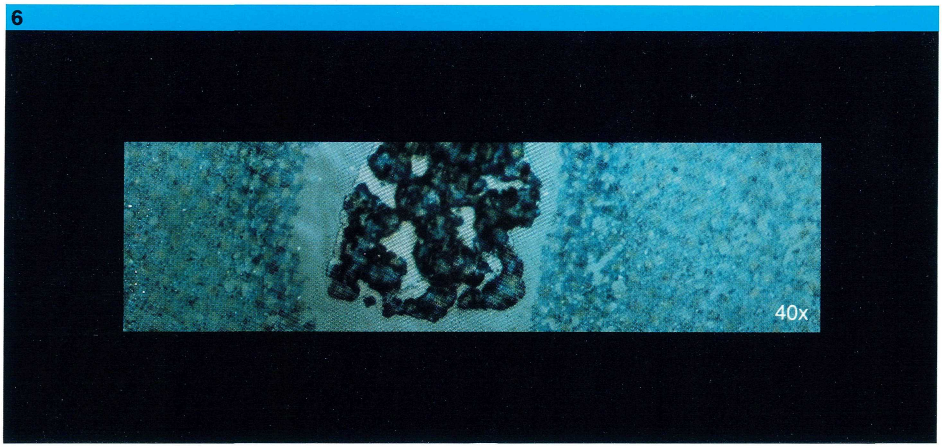


6



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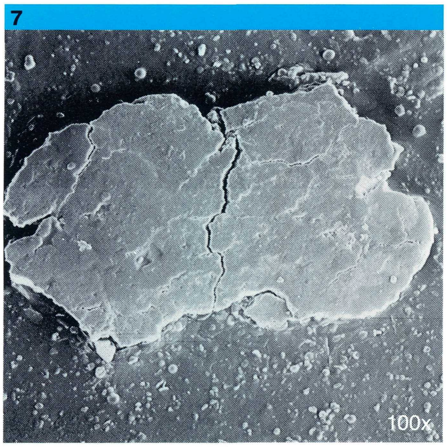
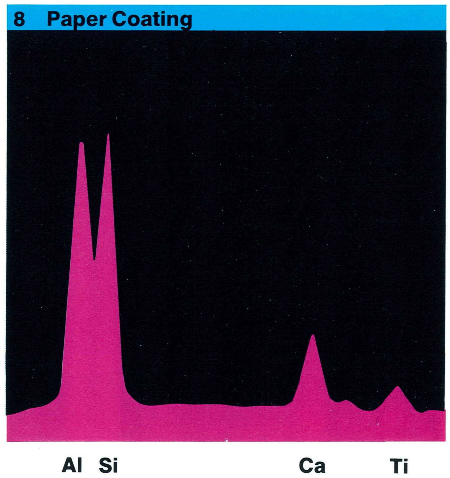


8 Paper Coating



This type of ***Pick-Out*** can vary in size from 1/32″ in diameter to the size of a quarter (which can result in a smashed blanket). White paper samples should be obtained for close examination. Some lumps can be seen on the white paper sheets before printing. (Figure **5**)

Tape Pulls (Figure **6**) from the blanket can be photographed and analyzed to confirm their origin. Even under the low magnification of a loupe, this material appears as a lump of white coating which has been printed.

Further analysis on an S.E.M. at high magnification will confirm the presence of coating materials (Figure **7**). Note that there are no fibers in these lumps (see page 10 on Coating Pick and page 12 on Wood Vessel Segments).

The corresponding chemical analysis (Figure **8**) indicates the presence of Al and Si (Aluminum + Silicon = clay), Ca (Calcium = Calcium carbonate) and Ti (Titanium Dioxide).

Picking

1

Drawing showing how the coating is picked from the surface of the paper.

2

Coating pick

3

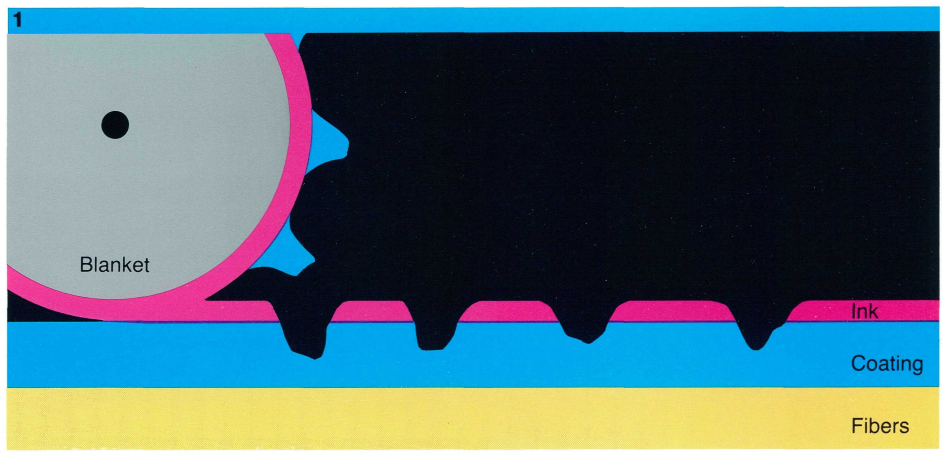
Coating pick which is concentrated at the tail of the image.

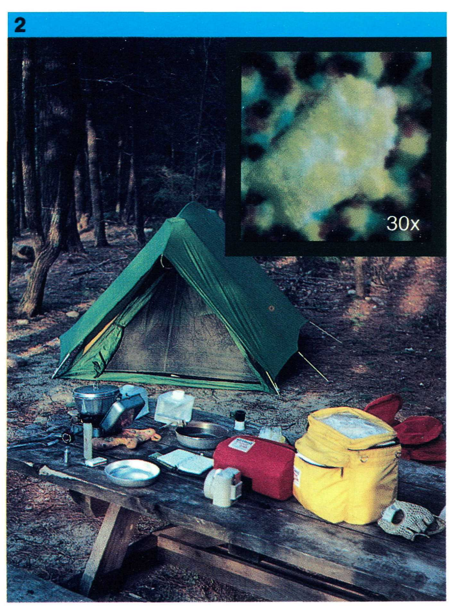
Coating Pick also referred to as "pepper picking" is the result of the tack of the ink exceeding the cohesive or binding strength of the coating materials. (Figure **1**)

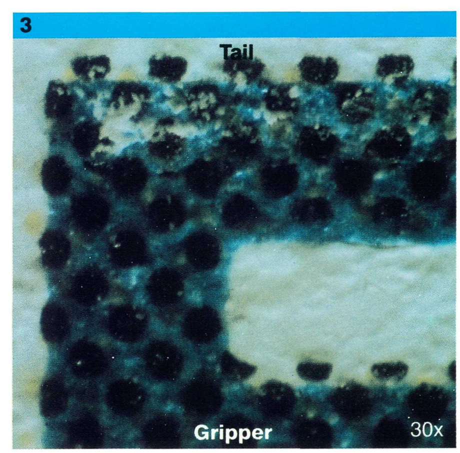
In both sheet fed and web printing, the ***tack of the ink on the paper*** goes up as the sheet passes through the multiple units on the press.

The coating can break apart, or pick off onto the blanket, if the initial tack of the ink is too high, if the paper coating is poorly bound, or if the setting speed of the ink and paper combination is too fast.

Coating pick normally occurs throughout the image area (Figure **2**), but can be more concentrated at the tail of the image. (Figure **3**)





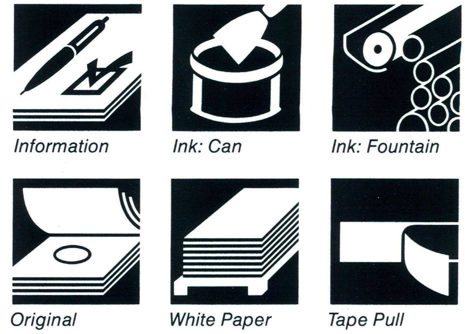


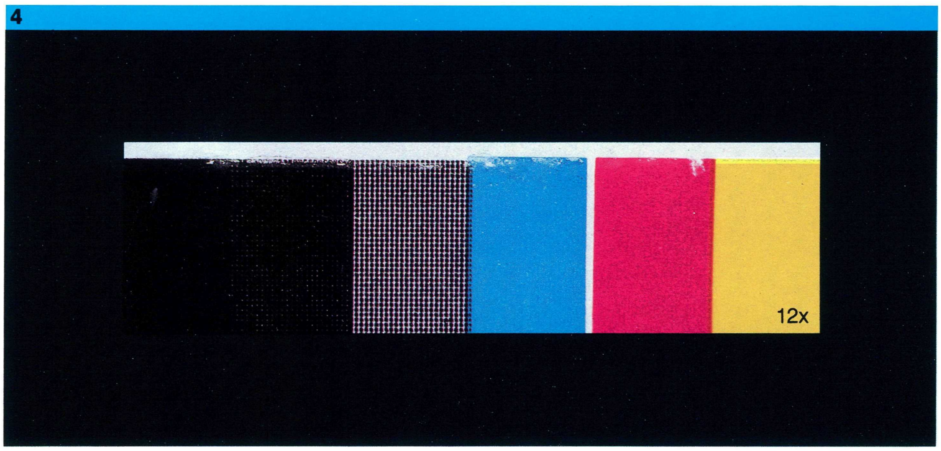
4

Tail pick in the color bars as seen through a loupe.

5

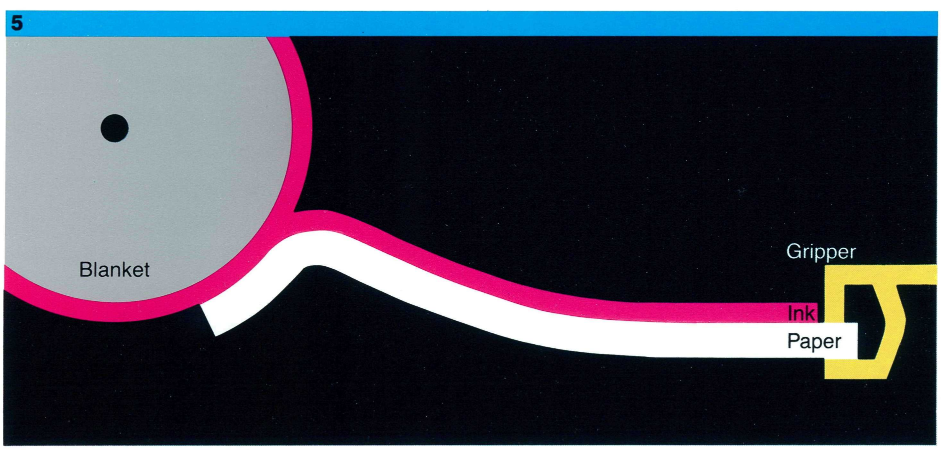
A drawing simulating how the image will adhere to the blanket before it is stripped away.





Tail Pick, also known in the industry as trailing-edge pick, is the result of the high printing forces which are generated at the end of an image area where it ultimately releases from the blanket.

Much like cracking a whip, the sheet bends conforming to the blanket cylinder and, when it is pulled by the grippers or proceeds to the next printing unit, the sheet snaps away and the high force will pick the coating just at the end, or tail of the image. This snapping can be clearly heard in the pressroom.



Wood Vessel Segments

1

Wood vessel segment being pulled from the paper surface.

2

Looking through a printer's loupe at a wood vessel segment that has been pulled through the sheet, but has not picked off onto the blanket.

3

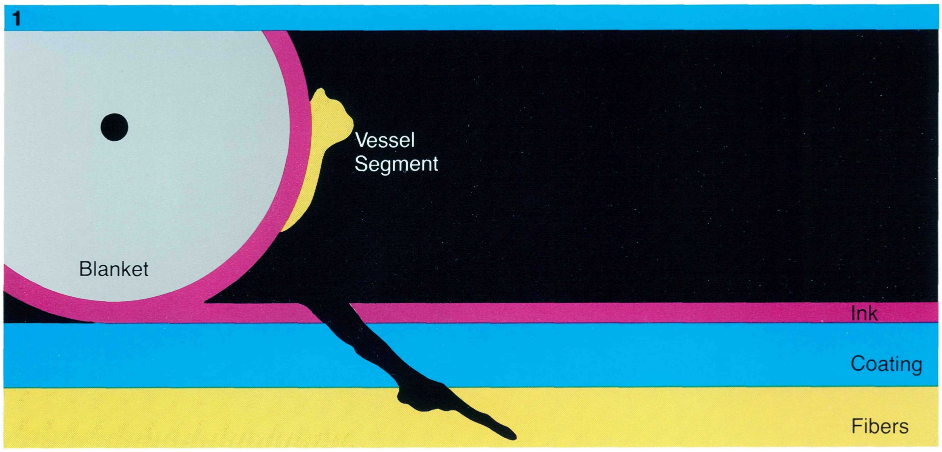
Photos at 30x which show the characteristic shapes of wood vessel segments.

Wood Vessel Segments are fibers which, because of their composition, are difficult to remove during pulping procedures, and tend to be poorly bound into a coated paper. (Figure **1**)

The tack of the ink could exceed the binding strength of these segments and pull them from the paper's surface leaving a ruptured speck. (Figure **2**)

Wood Vessel Segments have characteristic shapes and can quickly be identified under a low magnification glass by viewing the print. (Figure **3**)

1



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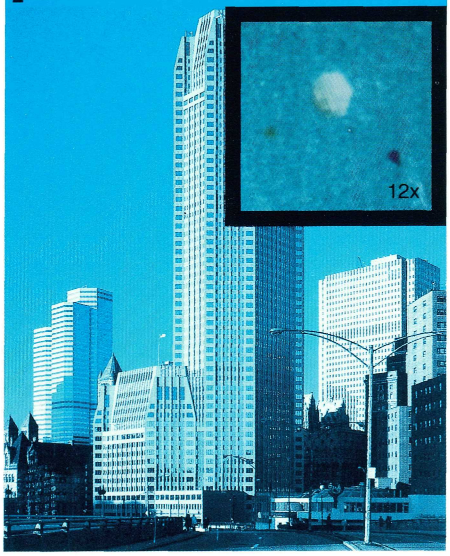

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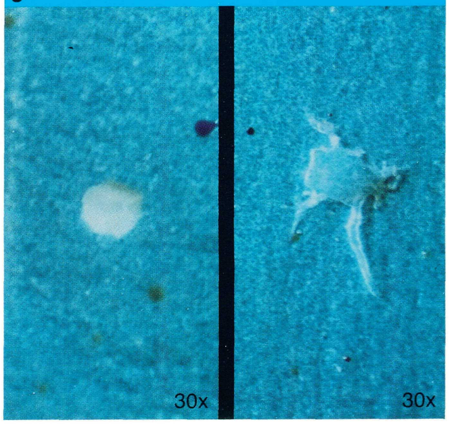
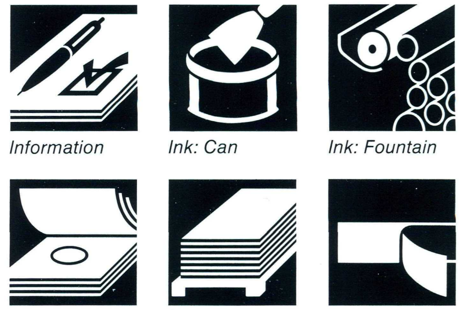


4

Debris on the blanket from wood vessel segments pulling from the sheet.

5

A tape pull of a single wood vessel segment.

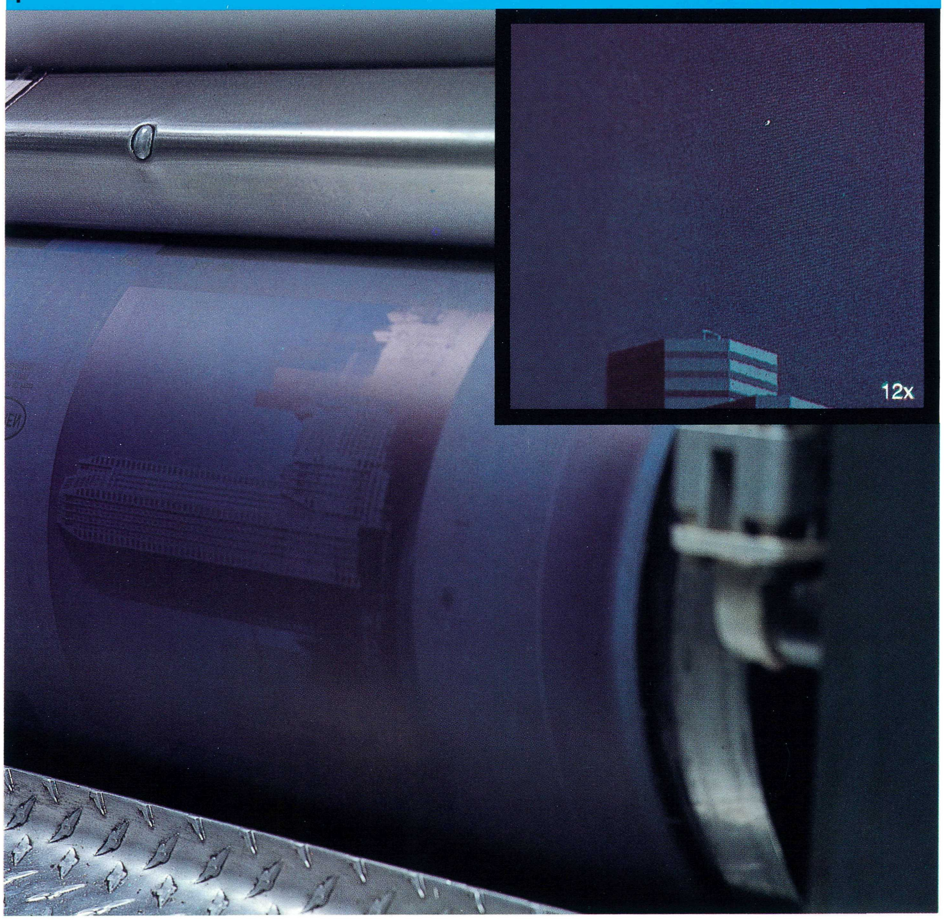


The first corrective measure taken should be to try a different lot of paper. If any ink changes are contemplated, the ink manufacturer should be consulted immediately.

Vessel segments will appear as white ***particles*** on the blanket. (Figure **4** inset)

A tape pull should be taken from the blanket which will reveal the characteristic shape of this wood fiber. (Figure **5**)

4



5

Fibers

1

Print interference caused by a fiber which is adhered to the blanket or plate.

Occasionally the print can be disrupted by *Fibers* which have contaminated the system.

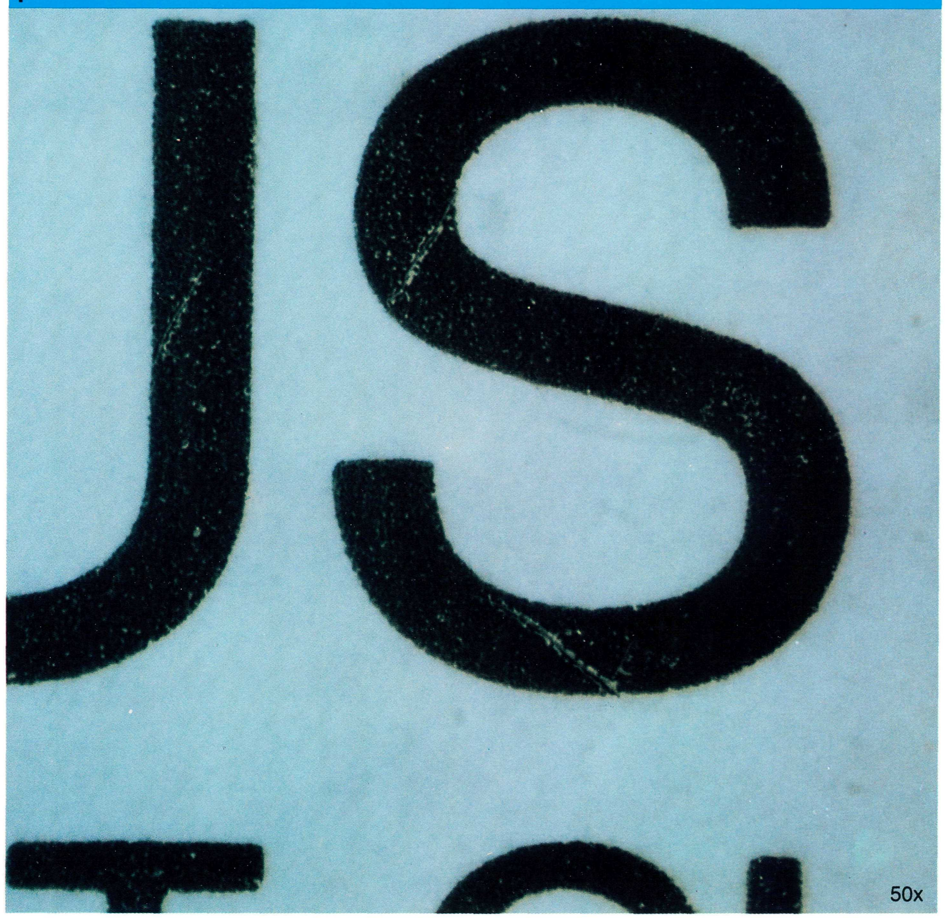
There are three common types of fibers which can be a cause of specks:

1) *Wood Cellulose* – from paper or kraft cartons
2) *Cotton* – from dampening rollers and rags
3) *Synthetic* – from fabric and hickey rollers and fountain roller sleeves

In general, fibers are water receptive and reject ink. These fibrous materials will adhere to the blanket or plate and accept water but will not take on any ink, and will therefore cause a speck in the print in the form of its own shape. (Figure **1**)

By retrieving the fibrous material, the tape pull can be examined to identify the type of fiber and then possibly determine its source.

1



2

Tape pull of paper fibers through a loupe.

...and how paper fibers appear at higher magnification.

3

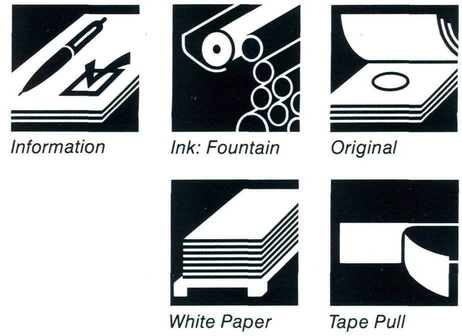
Tape pull of cotton fibers through a loupe.

...and how cotton fibers appear at higher magnification.

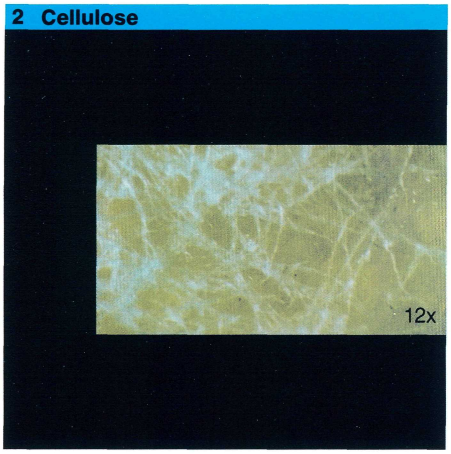
4

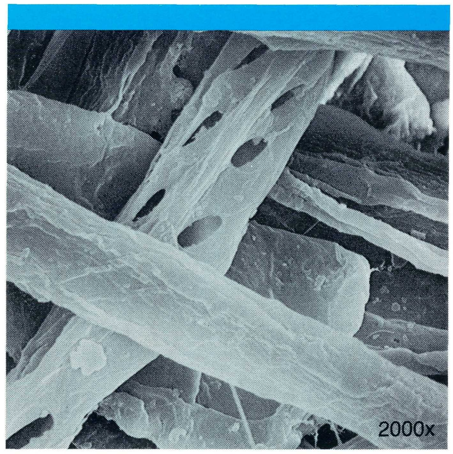
Tape pull of synthetic fibers through a loupe.

...and how synthetic fibers appear at higher magnification.

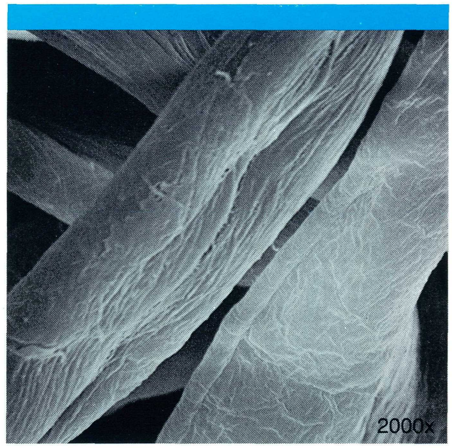


2 Cellulose

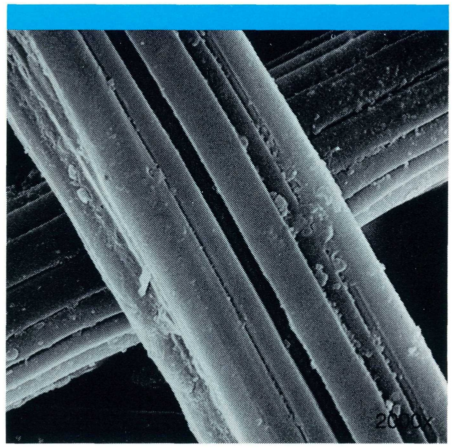




3 Cotton



4 Synthetic



Wood Cellulose:
If the fibers are cellulose paper fibers (Figure **2**), the sheets should be checked for possible fiber dust. This can be done by shining a low angle light (Note: See photo Figure **2** on page 18) across the unprinted sheets in the lift. If no loose surface dust is found, look through the printed sheets to find the original sheet upon which the defect begins, and look for possible fiber picking.

Cotton:
If the fibers are cotton (Figure **3**), there is a possibility that a portion of a cleaning rag could have been caught in the press, and the remnants have contaminated the ink. The ink fountain should be washed up and fresh ink placed in the fountain.

It is common practice in the pressrooms to use rags as "dams" to control the flow of ink to the rollers and rag fragments may break away.

Synthetic:
If the fibers are synthetic (Figure **4**), they may have two possible sources. As above, a synthetic rag could have contaminated the system, or the plastic bristles from a hickey-picker roller could be breaking apart.

Pits

1

Pit in plate.

2

A pit in the surface of an offset plate before inking.

3

The same pit in the plate after inking.

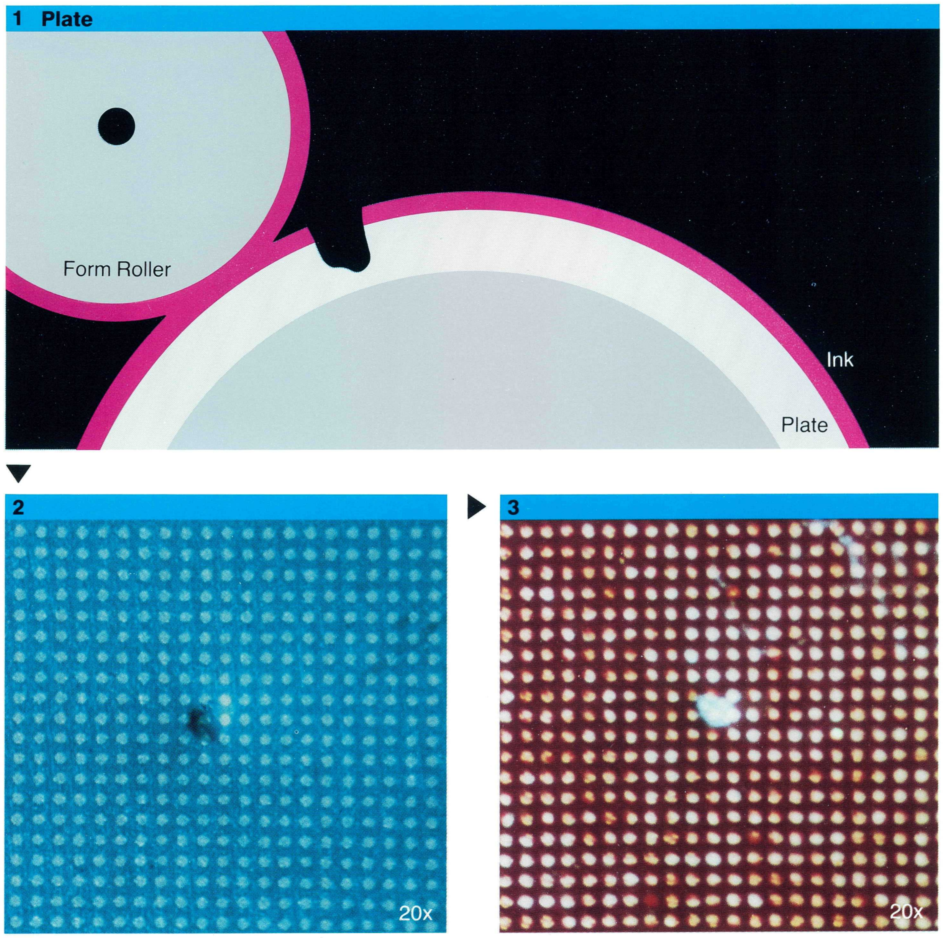
Pits may be described as indentations or wells in the surface of the *plate* or *paper*.

Plates

Pits in a Plate cause specks in printing because the ink form rollers cannot apply ink down into the pits. (Figure **1**)

The result is a white speck in the printed image. (Figures **2** and **3**)

It is relatively easy to determine the origin of a pit. In the plate, they will repeat on the printed sheets in a regular pattern. Sometimes these can be corrected on press by the pressperson filling in the hole.



4

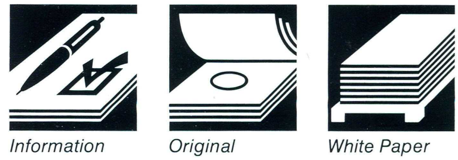
Pit in paper.

5

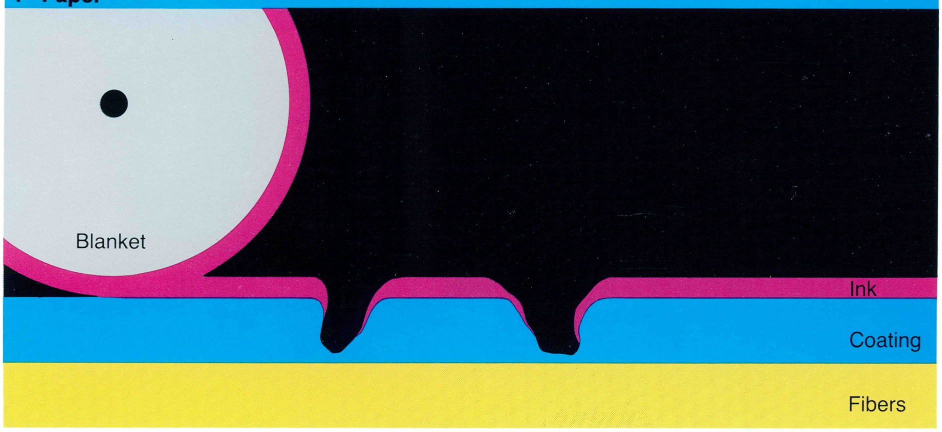
A pit in the surface of paper before printing.

6

The same pit in the paper after printing.



4 Paper



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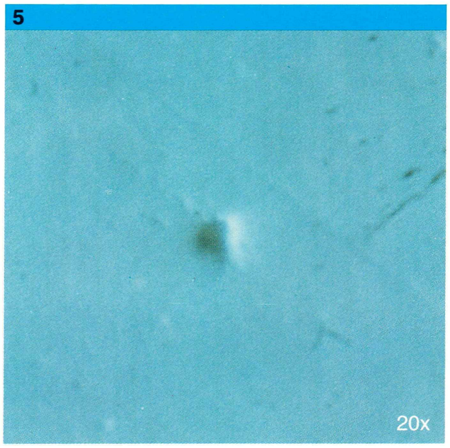

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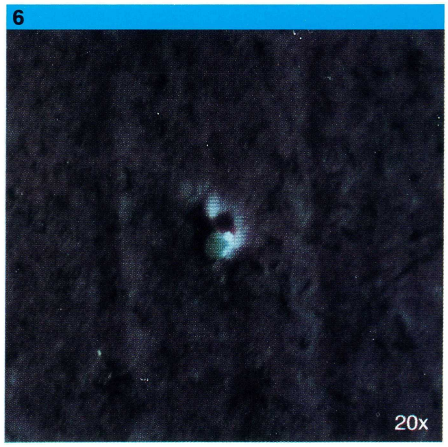


Paper

Pits in Paper cause specks in printing because the blanket cannot apply ink down into the bottom of the pit. (Figure **4**)

The result is a white speck in the printed image due to the pit not receiving any ink. (Figures **5** and **6**)

Pits in Paper are most commonly found in cast coated papers, due to their manufacturing process, and will occur randomly throughout the printed image.

Replacing the paper is the only sure method of eliminating these specks from the printed job.

Dust

1

Paper dust collecting on the 1st printing blanket.

2

Using a low angle light to look for dust particles on the surface of the white paper (inset).

3

A printed halftone with paper dust specks.

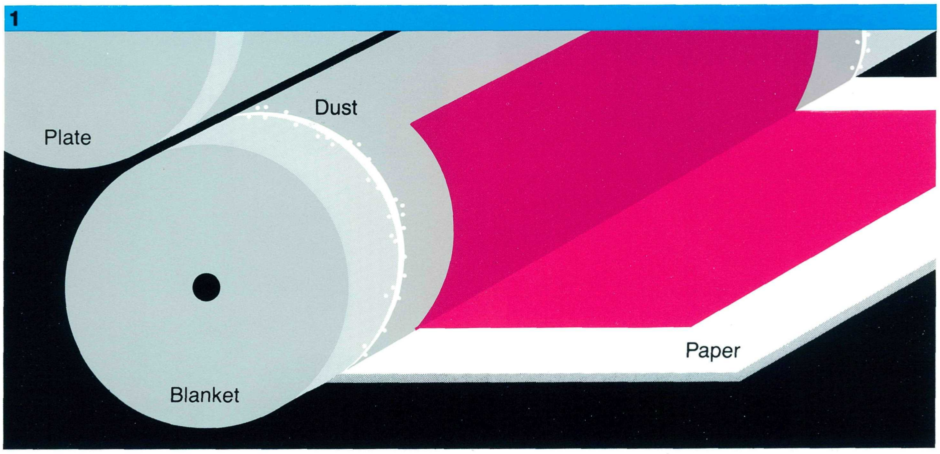
Loose *Surface Dust* on paper is a common cause of specks in printing.

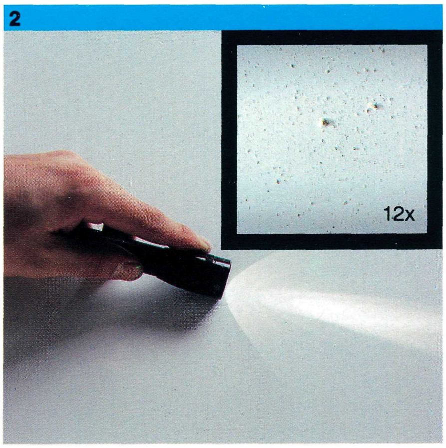
Dust is most likely deposited on the sheets during sheeting, cutting and trimming operations and can be composed of both fiber and coating materials that have been fragmented from the edges.

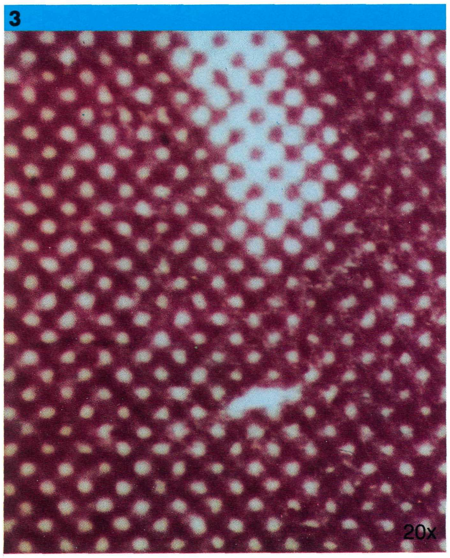
Once in the pressroom during stacking and feeding the dust can work its way towards the center of the sheet and interfere with the image area.

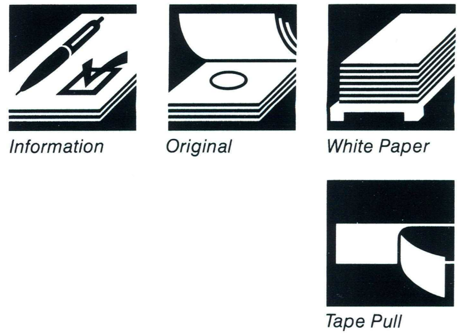
When the loose dust sets on the paper's surface, it prevents the ink from reaching the sheet and sticks to the blanket. (Figure **1**)

As the dust collects on the blanket, it will pick up ink and then print as dark specks in printing.









4

How the coating will fracture at the beveled edge of the blade.

5

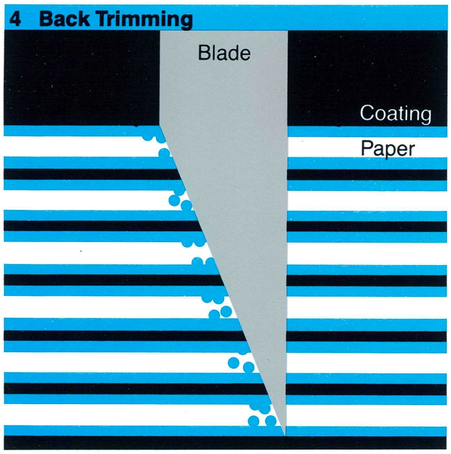
A rough cut from a dull slitter wheel will generate dust.

6

Rough cut from the beveled edge of the trimmer blade on coated cover.

7

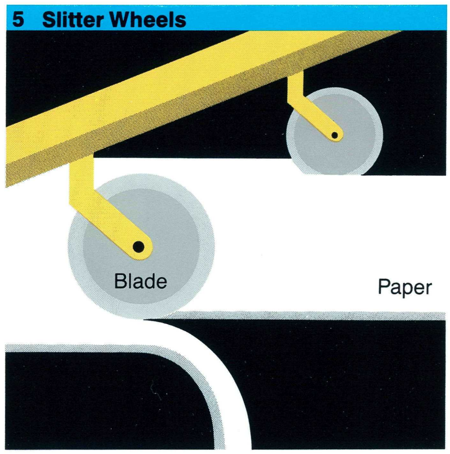
Smooth cut from the back edge of the trimmer blade on coated cover.

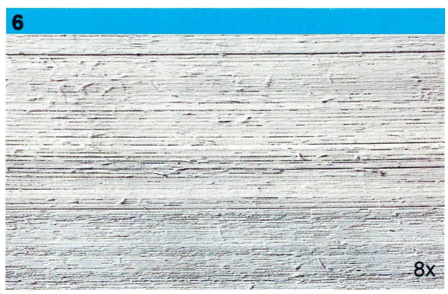


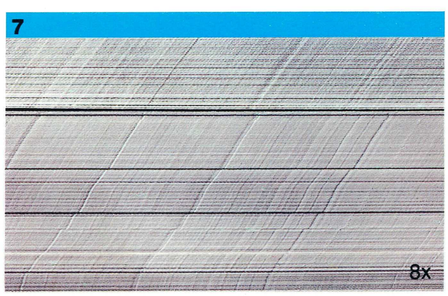
Paper trimmed by the back of the cutter knife will have clean edges. Paper edges cut by the beveled side of the knife will show dust and paper particles. All cuts should be planned to permit those edges facing the beveled side of the knife to be retrimmed with the back edge of the knife.

The trimming and slitting wheels on the mill's finishing equipment can create a rough cut which may generate excess dust.

The photographs to the right show the effect of paper cut by the beveled side of the knife (Figure **6**) versus paper retrimmed by the back of the knife (Figure **7**).







Proper Trimming

The necessary trimming of paper dislodges some of the fibers and pigments contained in it. Dust in the air will settle on exposed sheets of paper in mills and in pressrooms. Dust and fiber particles can accumulate on the press delivery systems and drop onto sheets that were spotless when they entered the press. Spray-fogged pressrooms are also a major source of dirt and dust.

The first corrective measure is to try a different lot of paper.

The best precautionary measures are:

1) Maintain a general cleanliness in the pressroom.
2) Keep cutting knives sharp.
3) Back-trim all coated papers cut down from a mill size and wipe with a black velvet rag before printing.

Water Interference

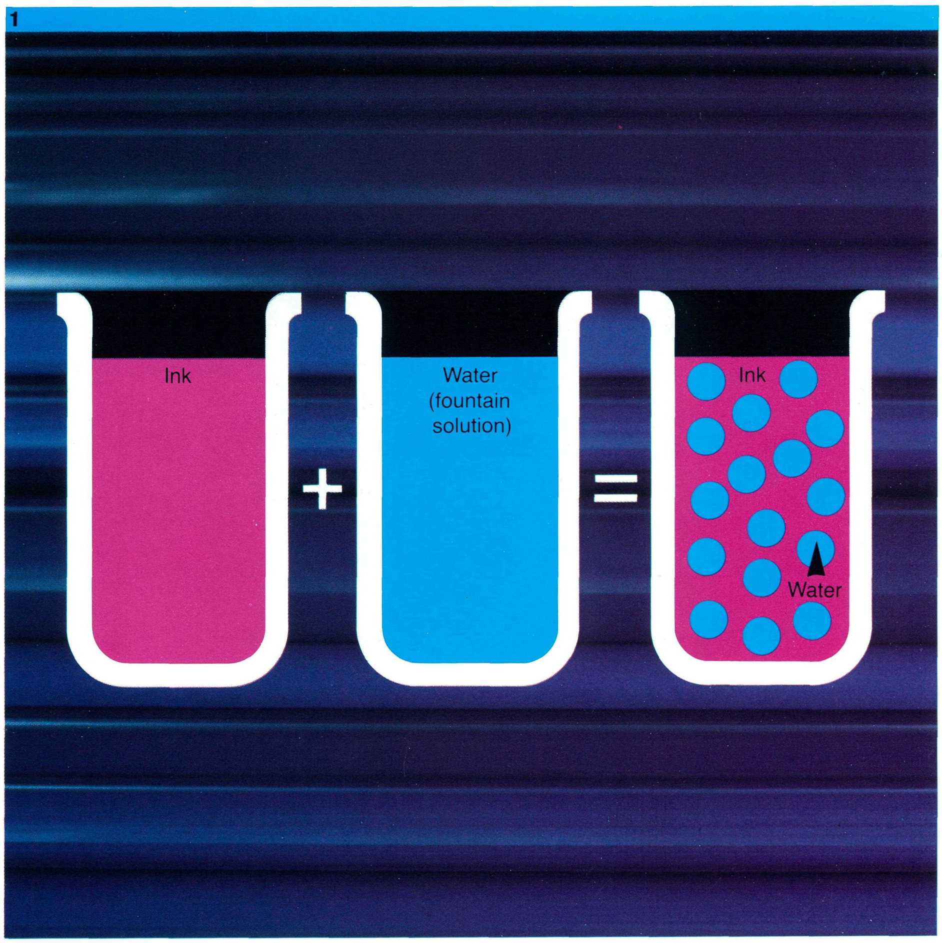
In both sheet fed and web printing, the interaction of ink, fountain solution and paper must be kept in proper balance or a printing defect will occur which is commonly referred to as *Water Interference.*

Water Interference manifests itself as white specks in printing, and can originate from three different sources:

Ink – Water Emulsification* Rates

Paper – Receptivity to Water

Fountain Solution – Wettability



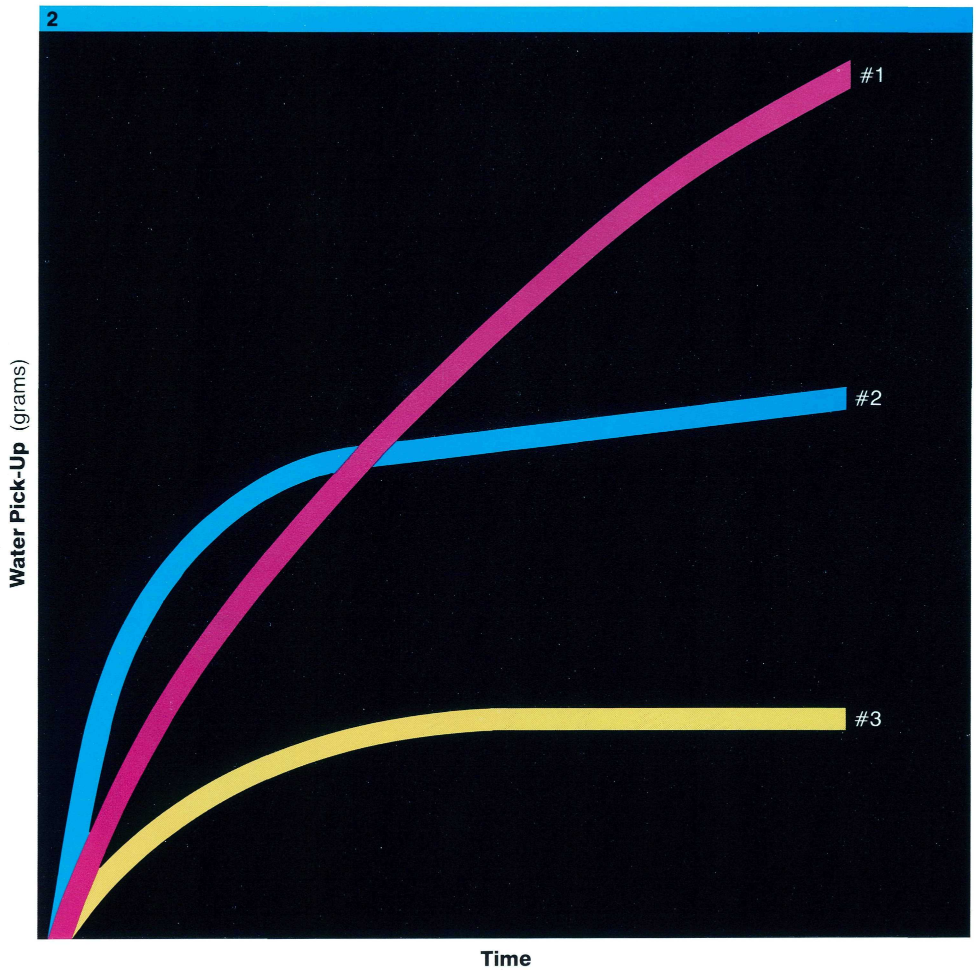
1

Ink and fountain solution mixing.

**There are some arguments as to whether a true water and ink emulsion is attained in offset printing. For the purpose of this discussion, we will be using the term "Emulsification" to describe ink and fountain solution mixing.*

2

The three characteristic water pick-up curves of ink, according to Surland. (Sun Chemical Corp.)



Ink & Water Emulsification

An offset ink is formulated to pick up and emulsify an amount of "water" that will:

1) Allow the ink and plate to print a sharp dot with minimal dot gain.
2) Allow a quantity of fountain solution to be run on press which will keep the non-image areas of the plate running clean and free of scumming and tinting.
3) Allow the ink to remain "lubricated" to run through the multiple units on a printing press.
4) Allow the ink to release the water for proper drying in the sheet fed lifts, or in the web ovens.

According to Surland (Sun Chemical Corp.), inks have three (3) characteristic water emulsification curves. (Figure **2**)

Ink #1 continually picks up water.

Ink #2 has what has been described as an "ideal" curve in that it picks up a volume of water initially, reaches equilibrium, and can print a sharp dot.

Ink #3 lacks the ability to pick up water. This ink will carry excess water on its surface and can result in ***Water Interference.***

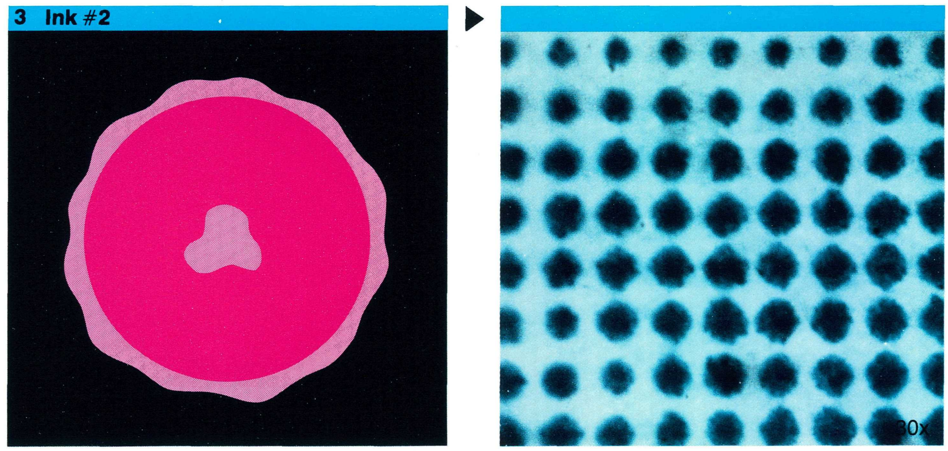
Ink's Effect in Water Interference

Since the ink and water hit the paper simultaneously in the image area, the paper must have the capacity to accept *both* ink and water.

Diagram **3** depicts *Ink #2* which picks up the ideal amount of water. This ink will carry water to the paper on its surface as well as water emulsified in it. This ink should produce a dot which is sharp and clear.

If the paper cannot accept water, or if the ink is carrying an excess of water, then the result will be white specks where the water hits the paper first, and the ink will not transfer.

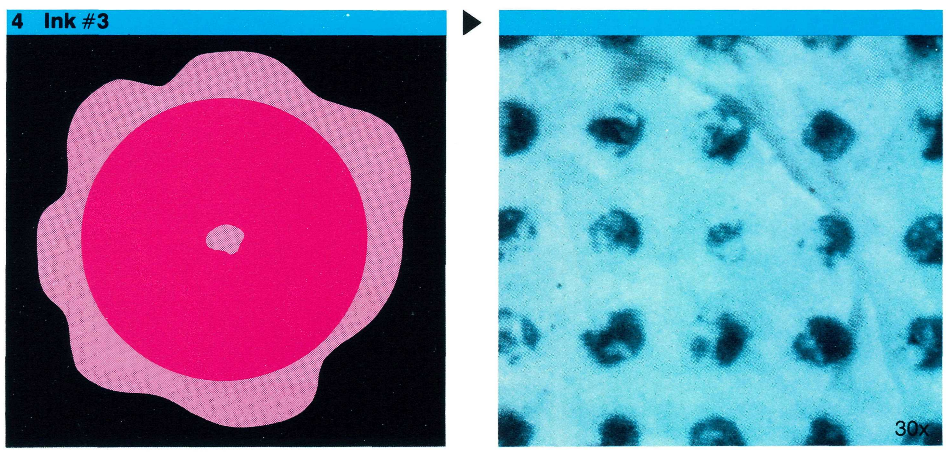
Diagram **4** depicts *Ink #3* which lacks the ability to pick up water. Instead, it carries too much "free" water on its surface and, when printed, results in broken dots and the appearance of white specks in the printed image.



3

Ink #2 which picks up the "ideal" amount of water.

How Ink #2 prints.



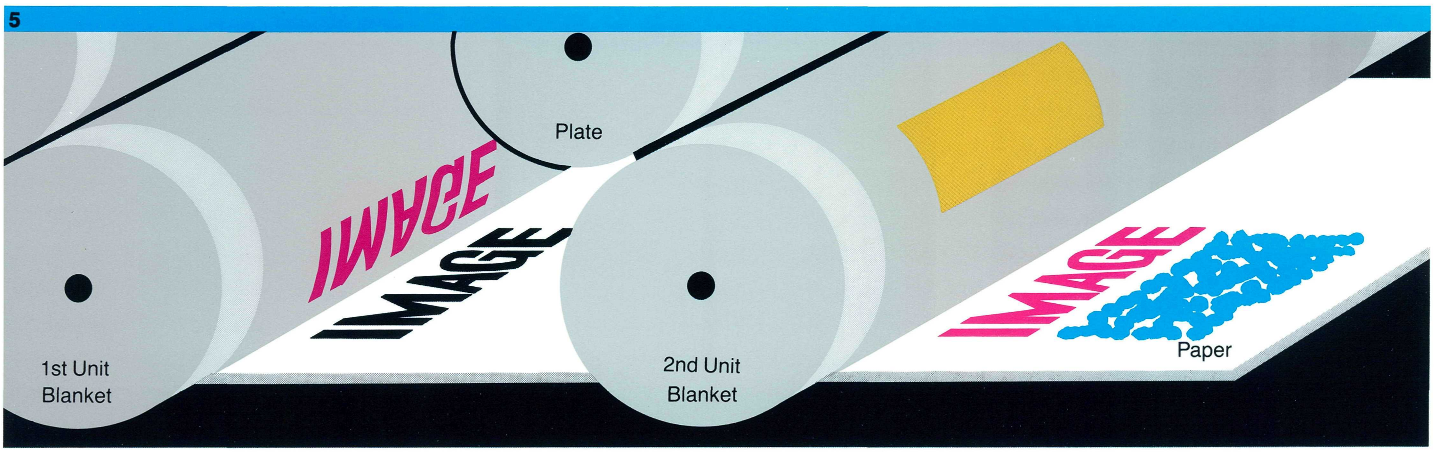
4

Ink #3 which lacks the ability to pick up water.

How Ink #3 prints.

5

Diagram showing how the fountain solution on the non-image area from the 1st printing unit can interfere with the transfer of the ink in the 2nd printing unit.



Paper's Effect in Water Interference

When the ink and water balance on press ***is normal,*** water interference can still occur if the ***paper is too water tight.***

That is, the water in the non-image area from a previous printing unit can remain in excess on the paper's surface, and then interfere with the transfer of the subsequent colors.

Figure **5** above demonstrates how the non-image area from the 1st printing unit (black) can remain on the surface of a water tight sheet and cause specks in the 2nd unit (cyan) print.

Running minimum fountain solution or increased isopropyl alcohol can minimize this problem, and running a different, more "water receptive" stock can often eliminate it.

Piling

Piling is a build-up of ink and/or paper material on the blanket during printing. (Figure **1**)

There are 3 common types of piling:

Image Area Paper Piling

Image Area Ink Piling

Non-Image Area Piling

In both sheet-fed and web offset printing, the ink film can lose its volatile materials as it passes through the printing units on the press. If the ink film reaches a "critical state" while the paper is still in the press, the ink may lift off (image area ink piling) from the sheet, or the tack of the ink can pull the fibers and/or coating from the sheet (image area paper piling).

An ink can lose these volatile, thin oils in the following ways:

- In the *Ink Train* (Figure **2**) a very thin film of ink can have prolonged exposure to the air. This can occur during a long makeready, or when running a light coverage form.
- When *Fountain Solution* (Figure **3**) is added, the ink's ability to retain its thin oils may change.
- On the *Plate*, an even thinner ink film is again exposed to the air while being mixed with the fountain solution.
- The surface of the *Blanket* can absorb these thin oils from the ink film. Blankets vary in their oil absorbency characteristics.
- When the ink film is printed onto the *Paper*, and then passes through multiple printing units, the surface of the sheet absorbs these thin oils from the ink film, and the printed film again contacts additional blanket surfaces.

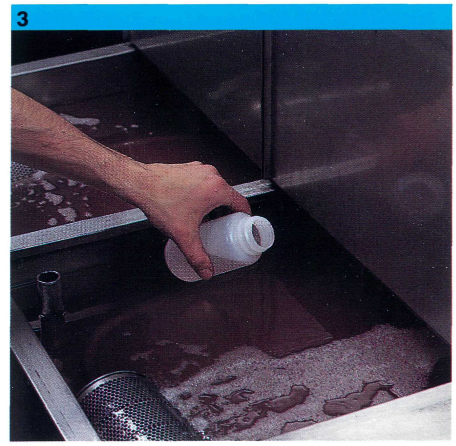
1

1 *Ink and paper material building on the blanket's surface.*

2

2 *A portion of the ink roller train of a magenta printing unit.*

3



3 *A sample of fountain solution being removed from the circulation tank of a press.*

4

The first down ink builds tack as it proceeds through the press, and causes coating pick on the last unit.

5

An ink which has lost its lubrication will split back to the blanket's surface.

Image Area Paper Piling

If the tack of the ink film has increased as it lost its volatile material, its "printing tack" may be considerably greater than its "can" tack. Therefore it now has the ability to pull up the paper's surface and result in ink and paper building up on the blanket's surface.

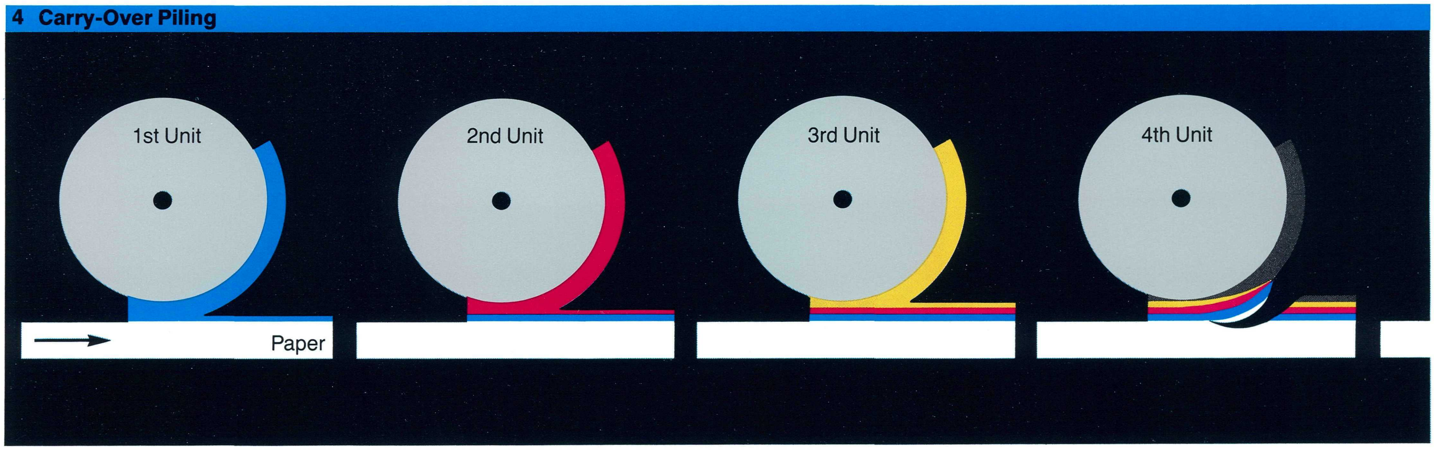
This type of piling can occur more severely in the last units on the press and at times may occur exclusively on the last printing unit. For example, the first down ink could be printed at a tack of 12 (at 800 rpms, 90° F). As the ink film builds tack on the paper and reaches the fourth printing unit, its printing tack may now be 18, which is high enough to pick the paper. This type of piling has been commonly called *Carry-Over Piling.* (Figure **4**)

Possible corrective measures would be: Reduce the tack of the ink. Add transparent white to the ink to reduce its color strength. (Running a thicker film should lower the printing tack, but a caution to watch dot gain.) Replace the paper. Replace the ink with a slower setting formulation.

Non-Image Area Piling

Occasionally ink, paper and fountain solution material will build up on the blanket in the non-image areas. This defect, seen most often in web offset printing, is not fully understood and can be removed by frequent washups. It was not documented for this publication.

4 Carry-Over Piling



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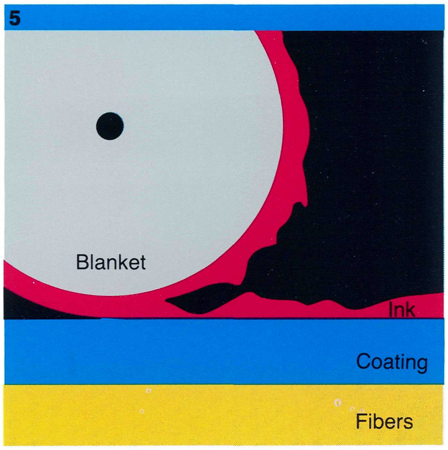


Image Area Ink Piling

If the ink film has lost a quantity of its thin oil and has become a "soft" and "doughy" material, and lost its lubrication properties it will not transfer to the paper properly and will build up on the blanket. (Figure **5**)

Corrective measures would be: to add petroleum/mineral oil to the ink (1/2-1 oz. per pound) to improve its lubrication, check the fountain solution to assure that minimum etch is present,* or try a new batch of ink.

**Check Glossary for comments on pH and conductivity.*

Anti-Offset Spray

1

A Scanning Electron photomicrograph of offset spray.

2

A drawing showing how offset spray separates printed sheets.

3

Job printed with normal amount of spray.

4

Job printed with excess amount of spray.

Specks in printing from *Anti-Offset Spray* (Figure **1**) occur in sheet fed printing. The technology of anti-offset sprays has progressed through recent years, and problems have been minimized with respect to their composition, application methods and ink rejection properties.

When specks do occur because of spray, it is usually due to the use of *too much* spray. This excess spray will interfere with subsequently applied ink.

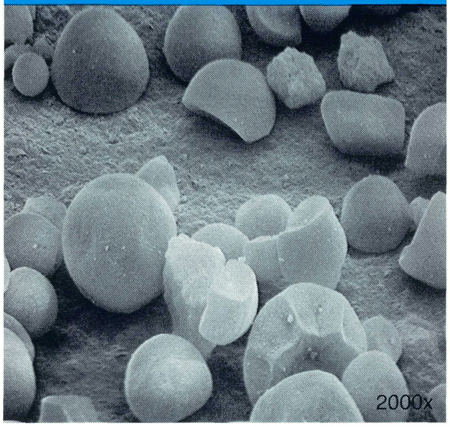
The function of spray powder is to create a physical gap between the printed sheets in a lift, allowing air to circulate to set and/or dry the ink film(s). (Figure **2**)

The amount of spray run is typically governed by the amount of coverage on the job and is left to the judgment of the pressperson. In addition, the ink film thickness required to obtain the desired printing density may vary among inks, and could have a significant effect on the amount of spray which must be run.

Figure **3** shows the amount of spray run on a job using inks which run at 'normal' film thicknesses.

Figure **4** shows the increased level of spray that was required to run a similar job but with 'weaker' inks which were run at high ink film thicknesses in order to achieve similar printing density.

1



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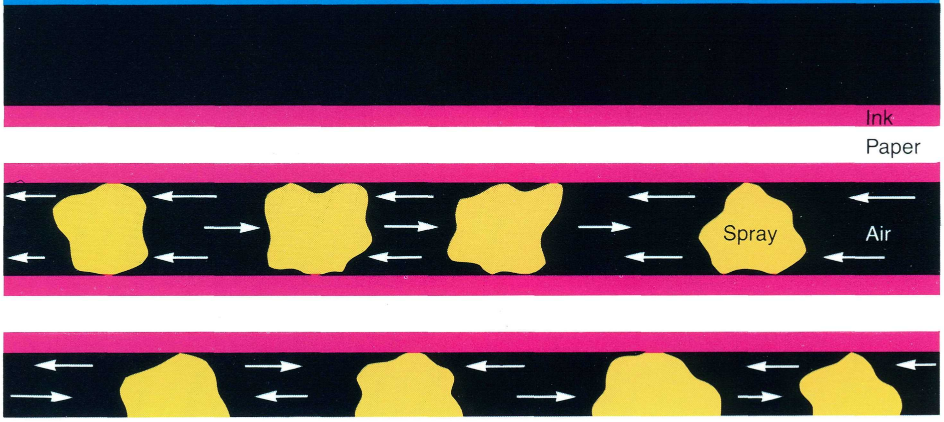
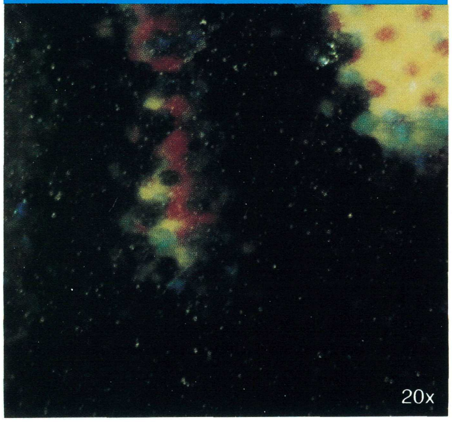
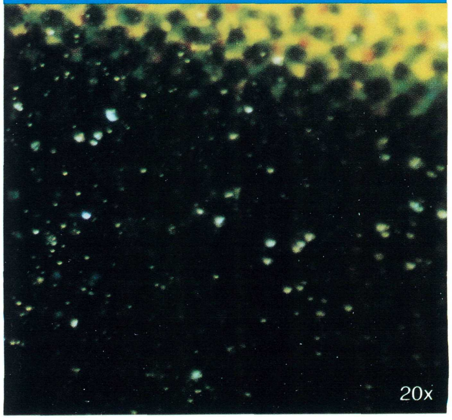


3 Normal



4 Excess



5

Spray on blanket.

6

Tape pull from blanket.

7

Scanning Electron photo of tape pull.

8

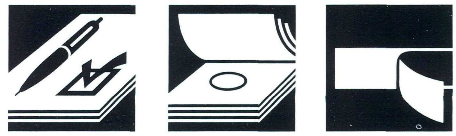
Press sheet with voids caused from excess spray.

9

Spray particles that caused the voids in Figure 9 are stuck to the opposite sheet.

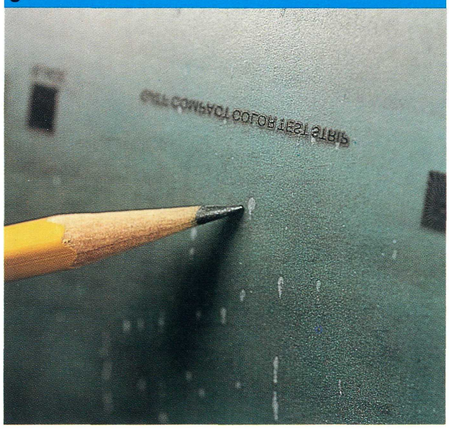
10

Scanning Electron photos of Figure 8 (left) and Figure 9 (right).



Information *Original* *Tape Pull*

5



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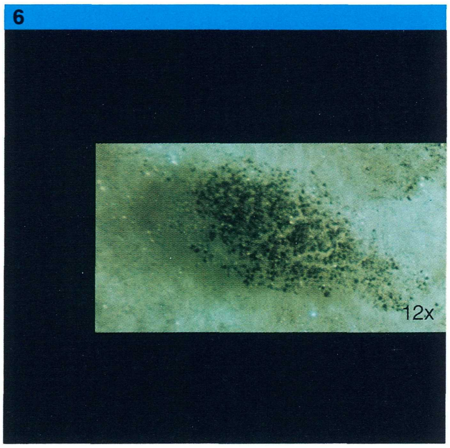

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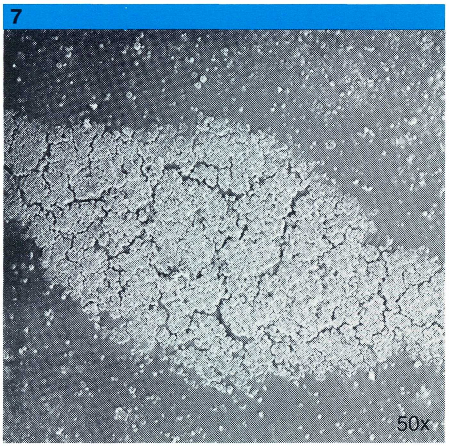

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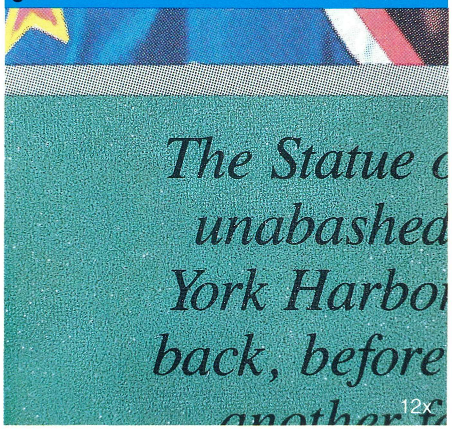

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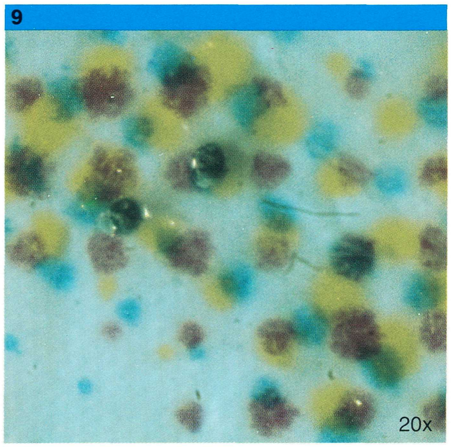

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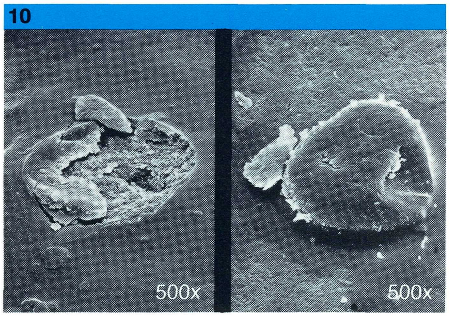

Here are two examples of how running too much spray can cause specks in printing:

1) *Too much spray when running the first printing pass:* This can result in the spray transferring onto the unprinted side of the sheet above. This spray can then contaminate the print during the second pass, and create voids where the ink being printed cannot contact the sheet. This spray will build up on the blanket (Figure **5**) and can be removed using tape pull material for verification (Figures **6** and **7**). The lift of sheets may have to be blanked through a bare blanket unit to remove the spray before the second side can be printed.

2) *Too much spray when printing the second side:* This can result in the spray particles from the second side being imbedded in or sticking to the ink which was printed on the first side. Because these sheets are now blocked together, when they are separated in the bindery, the spray particles can pull ink and paper material away from the surface, leaving white voids in the print (Figure **8**). Close examination will show that the materials which caused the void on one sheet will be attached to the sheet above it. (Figure **9**)

The photos in Figure **10** are S.E.M. photomicrographs of Figures **8** and **9**. The photo on the left shows the voids in the sheet from Figure **8** and the photo on the right shows the particle which left the void stuck to the sheet above as in Figure **9**.

Glossary

Additive Color
The primary colors of light which are Red, Green and Blue.

Anti-Offset Spray
The starch material which is sprayed onto the surface of the printed sheet in the sheet-fed printing process that separates the sheets so that air can circulate between the sheets for drying.

Back Trimming
The process of cutting all edges of the sheets with the back (non-beveled) edge of the trimming knife.

Blanket
The substrate which transfers the image from the plate to the paper. Construction varies, but a blanket is a series of layers of fiber-reinforced rubber, with a surface material which is uniformly ink and water receptive.

Carry-Over Piling
Paper coating failure caused by an ink printed in an early printing unit(s) that builds tack as it progresses through the press and fails or picks up the paper's surface on the last unit(s).

Cellulose Fiber
See fiber.

Coating Lump
An agglomerate of paper coating material which is poorly bound to the paper, and can be lifted off the sheet by a tacky ink during printing.

Coating Pick
The result of coating material lifting from the paper's surface, due to the tack of the ink during printing.

Color Bar
A series of control test solids, dots and targets which can be used to determine process variables while printing. These bars can be used to measure density, dot gain, % trap, slur etc.

Conductivity
A measurement of the electrically conductive materials in a fountain solution. This measurement is necessary in addition to the pH measurement when using today's buffered fountain solution concentrates as an indication of how much concentrate is present.

Dot
A single printed halftone image.

Dust
Commonly used to refer to the fractured pieces of paper coating and fibers which break loose from the edge of the sheets or rolls during printing.

Emulsification
The term used in this book to describe ink and water mixing in the offset lithographic process.

Etch
The term etch originally referred to the acid mixed into the fountain solution. Today, etch is often used to refer to the fountain solution concentrate.

Fiber
A term that is used to refer to the paper's cellulose tissue.

Form Rollers
The rollers in the ink and water systems which come in contact with the printing plate.

Fountain Solution
A mixture of water, acid, gum and sometimes isopropyl alcohol. The function of fountain solution is to keep the non-image area of the plate water receptive and emulsify into the printing ink. (Miscellaneous additives may also be present.)

Gum Arabic
The material which protects the non-image area of the printing plate, by remaining water receptive.

Hickey
A speck in printing caused by materials which have attached themselves to the printing plate, and prevent ink from being applied in the surrounding areas, resulting in the characteristic "donut" effect.

Hydrophilic
Water receptive.

Hydrophobic
Rejects water.

Oleophilic
Oil receptive.

Oleophobic
Rejects oil.

Original
The first printed sheet or signature to show evidence of a defect.

Pepper-Pick
A fine coating pick that occurs throughout the image area in print. (See Coating Pick.)

pH
A widely used method of stating the hydrogen ion concentration in dilute acids, bases and neutral solutions. If the pH is 7, the solution is neutral; if the pH is below 7, the solution is acidic; if the pH is above 7, the solution is basic.
Mathematically, $pH = \text{Log} \frac{1}{[H^+]}$
...which means a solution with a pH = 6.0 is *10 times* more acidic than a solution with a pH = 7.0.

Pick-Out
A void in a print caused by coating materials pulling out from the sheet during printing because they are poorly bound into the coating and/or paper.

Pigment
Ink pigments are the colored particles that contribute to the color and transparency of the ink. Ink pigments are chemically treated clays, calcium carbonates, carbon and organic colorants.

Paper coating pigments are normally white and are used to cover the fibers to create an improved printing surface. Typically, paper coating pigments are clay, calcium carbonate, titanium dioxide or synthetic (plastic).

Piling
The build-up of ink and/or paper materials on the blanket during printing.

Pit
An indentation in a plate or paper surface which is too deep for ink to transfer into, and normally results in a small non-print speck.

Plate
The surface which has the image which is to be printed. The offset plate has image areas which accept ink, and non-image areas which accept water. The image is transferred from the plate to the blanket, and then to the paper.

Printing Sequence or Rotation
The order in which inks are printed such as 1st down Black, 2nd down Cyan, 3rd down Magenta, 4th down Yellow.

Resin
The material in an ink which binds the ink together and contributes to its gloss and film hardness.

S.E.M.
A Scanning Electron Microscope has the ability to enlarge an image up to 200,000 times its original size. This type of microscope views an electrical image of the specimen, rather than the actual specimen through lenses as in an optical microscope.

Signature
A term used to describe a single printed sheet, folded down, ready to be bound.

Skin
A dried and hardened particle of ink.

Speck
A mark or small non-print in a printed image caused by materials which enter the printing system.

Subtractive Inks
The 4 process inks, which are Black, Cyan, Magenta and Yellow which subtract color from the printing substrate.

Surland Test
The test (developed by Mr. Aage Surland, 1980, Sun Chemical Co.) is a method of laboratory testing the water pick-up properties of an ink.

Tack
The measurement of the forces required to split an ink film. Its value is often measured on an Inkometer at a specified speed and temperature.

Tail Pick
Coating pick which is concentrated at the back edge of an image on the sheet or signature (opposite the gripper).

Tape-Pull
A piece of adhesive material which has been used to secure a sample of contaminate from a given surface, such as a plate or blanket.

Trailing Edge Pick
See Tail Pick.

"Water"
The term "water" is often used interchangeably with fountain solution, referring to the fluid in the water fountain on the press.

Water Interference
A term used to describe print interference and specks caused by excess "free" water in the printing system. Water interference can be caused by the paper, ink, fountain solution, or the press.

Wood Vessel Segment
Paper fibers which, because of their composition, are difficult to bind into the sheet, and can pick out during printing.

Warren Paper Merchants

Alabama

Birmingham	Dillard Paper Co.
	Sloan Paper Co.
Huntsville	Sloan Paper Co.
Mobile	Strickland Paper Co.
	Unijax, Inc.

Alaska

Anchorage	Zellerbach Paper Co.

Arizona

Phoenix	Zellerbach Paper Co.
Tucson	Zellerbach Paper Co.

Arkansas

Little Rock	Western Paper Co.

California

Fresno	Zellerbach Paper Co.
Los Angeles	LaSalle Paper Co.
	Zellerbach Paper Co.
Sacramento	Zellerbach Paper Co.
San Diego	Zellerbach Paper Co.
San Francisco	Zellerbach Paper Co.

Colorado

Colorado Springs	Dixon Paper Co.
Denver	Carpenter Paper Co.
	Dixon Paper Co.
	Zellerbach Paper Co.
Grand Junction	Dixon Paper Co.
Pueblo	Dixon Paper Co.

Connecticut

Hartford	Carter Rice
	Lindenmeyr Paper Corp.
New Haven	Carter Rice

District of Columbia

Washington	Stanford Paper Co.
	Virginia Paper Co.

Florida

Jacksonville	Palmer Paper Co.
	Virgina Paper Co.
Miami	Palmer Paper Co.
	Virginia Paper Co.
Orlando	Palmer Paper Co.
	Virginia Paper Co.
Tampa	Palmer Paper Co.
	Virginia Paper Co.

Georgia

Atlanta	Dillard Paper Co.
	Sloan Paper Co.
Augusta	Dillard Paper Co.
Columbus	Sloan Paper Co.
Macon	Dillard Paper Co.
Rome	Dillard Paper Co.

Hawaii

Honolulu	HOPACO
	Zellerbach Paper Co.

Idaho

Boise	Dixon Paper Co.
	Zellerbach Paper Co.

Illinois

Champaign	Crescent Paper Co.
Chicago	Bradner Smith & Co.
	Leslie/Chicago Paper Div.
	Hobart/McIntosh Paper Co.
	LaSalle Messinger Paper Co.
	Marquette/Jim Walter Papers
	Midland Paper Co.
Peoria	Tobey Peoria Paper Co.
Rock Island	Leslie Paper

Indiana

Fort Wayne	Taylor Martin Papers
Indianapolis	Crescent Paper Co.
	Ris Paper Co., Inc.
South Bend	Ris Paper Co., Inc.

Iowa

Cedar Rapids	Midwestern Paper Co.
Des Moines	Leslie Paper
	Midwestern Paper Co.
Sioux City	Midwestern Paper Co.

Kansas

Topeka	Midwestern Paper Co.
Wichita	Western Paper Co.

Kentucky

Lexington	Athens Paper Co.
Louisville	Athens Paper Co.
	Louisville/Southeastern Paper Co.

Louisiana

Baton Rouge	Butler Paper
Lafayette	Butler Paper
New Orleans	Palmer Paper Co.
	Unijax, Inc.
Shreveport	Butler Paper
	Western Paper Co.

Maine

Portland	Carter Rice
	C.H. Robinson Co.

Maryland

Baltimore	Baltimore-Warner Paper Co.
	Butler Paper
Savage	Wilcox, Walter Furlong Paper Co.

Massachusetts

Boston	Carter Rice
	The Century Paper Co., Inc.
	Lindenmeyr Paper Corp.
Springfield	Carter Rice
Woburn	C.H. Robinson Co.
Worcester	Carter Rice

Michigan

Detroit	Chope-Union Paper Co.
	Seaman-Patrick Paper Co.
Grand Rapids	Carpenter Paper Co.
	Quimby-Walstrom Paper Co.
Lansing	Copco Papers/Dudley Division
Saginaw	Copco Papers/Dudley Division

Minnesota

Minneapolis	Leslie Paper
St. Paul	Inter-City Paper Co.

Mississippi

Jackson	Sloan Paper Co.

Missouri

Kansas City	Midwestern Paper Co.
	Tobey Fine Papers
St. Louis	Distribix, Inc.
	Shaughnessy-Kniep-Hawe Paper Co.
	Tobey Fine Papers
Springfield	Midwestern Paper Co.

Montana

Billings	Dixon Paper Co.
Great Falls	Zellerbach Paper Co.

Nebraska

Lincoln	Carpenter Paper Co.
	Western Paper Co.
Omaha	Carpenter Paper Co.
	Western Paper Co.

Nevada

Las Vegas	LaSalle Paper Co.
	Zellerbach Paper Co.
Reno	Zellerbach Paper Co.

New Hampshire

Concord	Carter Rice

New Jersey

East Rutherford	Bulkley Dunton
Newark	Central Paper Co.
Rutherford	Lindenmeyr Paper Corp.
Trenton	Central Paper Co.

New Mexico

Albuquerque	Dixon Paper Co.

New York

Albany	Hudson Valley Paper Co.
Binghamton	Hudson Valley Paper Co.
	Seneca Paper Co.
Buffalo	Alling and Cory
	Seneca Paper Co.
New York City	Alling and Cory
	Baldwin Paper Co.
	Bulkley Dunton
	Lindenmeyr Paper Corp.
	Marquardt & Co., Inc.
Rochester	Alling and Cory
	Seneca Paper Co.
Syracuse	Alling and Cory
	Seneca Paper Co.
Utica	Alling and Cory

North Carolina

Charlotte	Caskie Paper Co., Inc.
	Dillard Paper Co.
	Virginia Paper Co.
Fayetteville	Caskie Paper Co., Inc.
Greensboro	Dillard Paper Co.
	Virginia Paper Co.
Raleigh	Dillard Paper Co.
	Virginia Paper Co.
Wilmington	Dillard Paper Co.
Winston-Salem	Dillard Paper Co.

Ohio

Cincinnati	Nationwide Papers
	Ris Paper Co., Inc.
Cleveland	Alling and Cory
	Millcraft Paper Co.
Columbus	Cordage Papers/Columbus Division
Cuyahoga Falls	Millcraft Paper Co.
Dayton	Ris Paper Co., Inc.
Toledo	Commerce Paper Co.

Oklahoma

Oklahoma City	Western Paper Co.
Tulsa	Mead Merchants
	Western Paper Co.

Oregon

Portland	Zellerbach Paper Co.

Pennsylvania

Allentown	Alling and Cory
Erie	Alling and Cory
Harrisburg	Alling and Cory
Lancaster	Lindenmeyr Paper Corp.
Philadelphia	Alling and Cory
	Lindenmeyr Paper Corp.
Pittsburgh	Alling and Cory
Scranton	Alling and Cory

Rhode Island

Pawtucket	Carter Rice
Rumford	The Rourke-Eno Paper Co., Inc.

South Carolina

Charleston	Dillard Paper Co.
Columbia	Dillard Paper Co.
	Virginia Paper Co.
Greenville	Caskie Paper Co., Inc.
	Dillard Paper Co.

Tennessee

Chattanooga	Sloan Paper Co.
Knoxville	Dillard Paper Co.
Memphis	Western Paper Co.
Nashville	Athens Paper
	Cordage Papers/Nashville Div.
	Sloan Paper Co.

Texas

Amarillo	Dixon Paper Co.
Austin	Monarch Paper Co.
	Olmsted-Kirk Paper Co.
Dallas	Monarch Paper Co.
	Olmsted-Kirk Paper Co.
El Paso	Dixon Paper Co.
Fort Worth	Monarch Paper Co.
	Olmsted-Kirk Paper Co.
Houston	Monarch Paper Co.
	Olmsted-Kirk Paper Co.
Lubbock	Dixon Paper Co.
San Antonio	Monarch Paper Co.
Waco	Olmsted-Kirk Paper Co.

Utah

Salt Lake City	Dixon Paper Co.
	Zellerbach Paper Co.

Vermont

Burlington	Hudson Valley Paper Co.

Virginia

Bristol	Dillard Paper Co.
Lynchburg	Caskie Paper Co., Inc.
	Dillard Paper Co.
Norfolk	Dillard Paper Co.
Richmond	Dillard Paper Co.
	Virginia Paper Co.
Roanoke	Dillard Paper Co.
Virginia Beach	Virginia Paper Co.

Washington

Seattle	Zellerbach Paper Co.
Spokane	Zellerbach Paper Co.

West Virginia

Huntington	Cordage Papers/Huntington Division

Wisconsin

Appleton	Universal Paper Corp.
Madison	Universal Paper Corp.
Milwaukee	Hobart/McIntosh-Bouer Div.
	Reliable Paper Co.
New Berlin	Universal Paper Corp.

Export and Foreign

New York, N.Y.	Moller & Rothe, Inc.
Canada	
Calgary	Barber-Ellis
Edmonton	Barber-Ellis
Montreal	Les papiers graphiques
	Lauzier Little, Inc.
Ottawa	Buntin Reid Paper
Regina	Barber-Ellis
Saskatoon	Barber-Ellis
Toronto	Buntin Reid Paper
	Graphic Papers
Vancouver	Barber-Ellis
Winnipeg	Barber-Ellis
Australia	Edwards Dunlop and B.J. Ball
New Zealand	B.J. Ball (N.Z.) Ltd.

Cleer Adheer laminating sheets, manufactured by C-line Corporation, are available through most local stationery and office supply stores.

Printed in U.S.A. on Lustro Gloss 100 lb and Lustro Gloss Cover 100 lb

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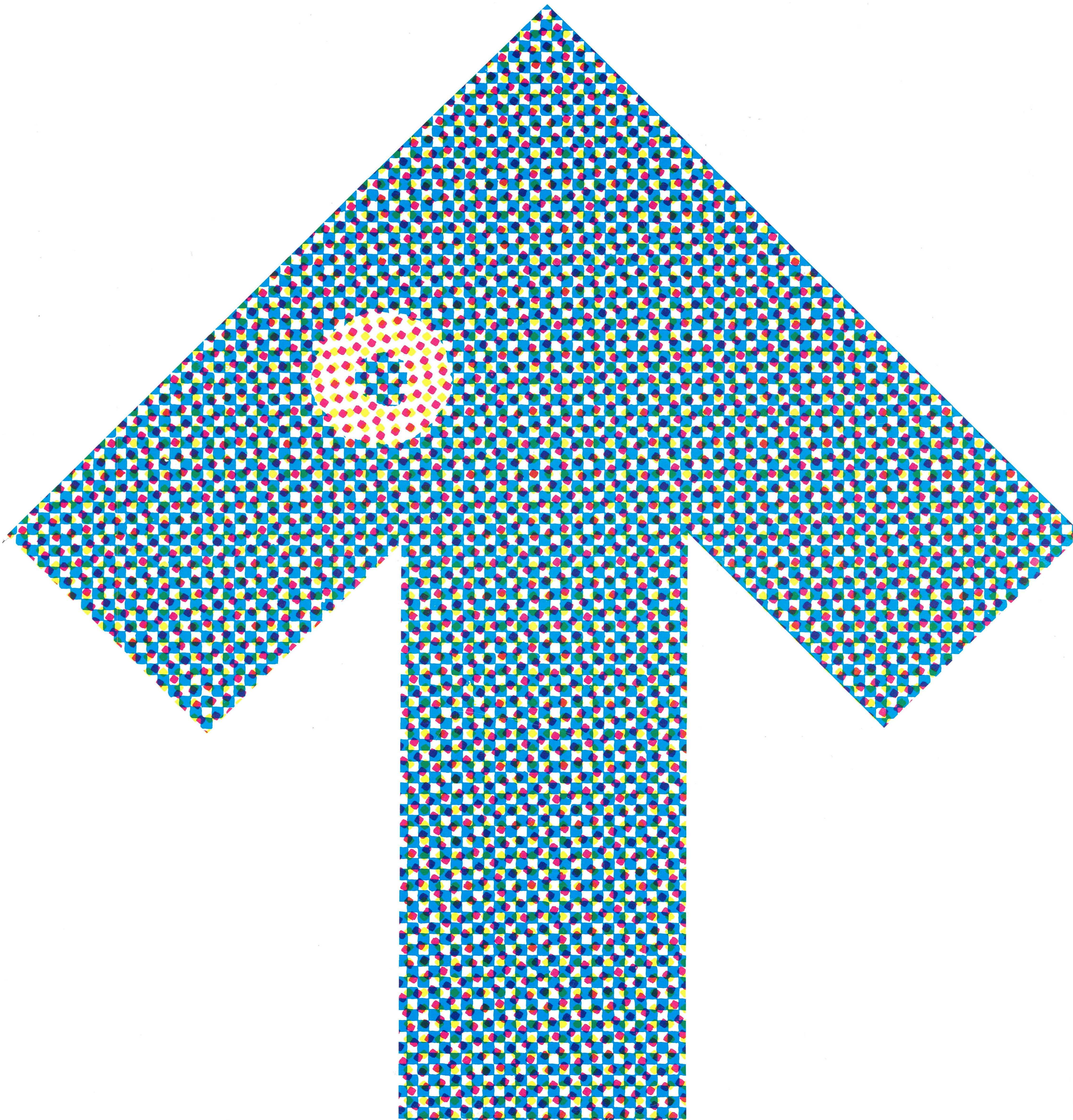
Boston, Massachusetts 02110



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