



Tech Talk From

Prisco®

Tech Talk #16

DRYING ISSUES

The term "drying" is becoming increasingly misused as today's sheetfed printers struggle to cope with reduced lead times, rush orders and shorter turn around times even as press speeds are continually increasing.

Strictly speaking, "drying" refers to a chemical change in which the ink vehicle, or varnish, turns from a liquid into a solid. This process, which can require up to 72 hours to complete, is called oxidative polymerization and is catalyzed, or speeded-up, by metallic dryers that are present in the ink.

Often, printers cannot wait 24 hours or more before they can handle their printed sheets. They must be able to back up, process and ship completed jobs within a very short time period. The ability to do this may be affected by a number of factors that are commonly grouped together as drying problems even though many are the result of other issues.

At Printers Service, the pressroom is our only business. Our sales and technical representatives are often consulted by printers who are experiencing what they feel are drying problems. In this Tech Talk we will share with you their experiences, accumulated through years of press-side trouble-shooting. We'll discuss the drying process in detail, and cover other issues, which may be confused with slow drying.

The Drying Process

In offset lithography an ink film, actually an emulsion of fountain solution in ink is deposited on a substrate, which may or may not be absorbent.

If the substrate is paper, fountain solution and ink solvent immediately penetrate into the surface, and the printed ink film rapidly increases in viscosity. Under ideal conditions, the sheet at this point can be handled further. For instance, it can be printed on the reverse side, or sent to the bindery to be trimmed. This is called ink "set". It is important to remember that at this point the ink film, while set, is still not dry, and that several factors affect how quickly the ink film sets enough so that the print can be handled further.

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With non-absorbent substrates like plastics and foil, fountain solution and solvent cannot penetrate into the sheet. Water must evaporate upwards through the wet ink film and the ink has to build in viscosity (change in rheology) for setting to take place. This process may take somewhat longer than with paper. It generally requires specially formulated inks having more drying oils, less solvent and superior adhesion properties to the substrate used. Regardless of the type of substrate, the set film then requires an additional 12 to 24 hours or more to fully polymerize and become dry.

Both setting and drying are augmented by the release of water emulsified into the ink during the printing process. Therefore, one of the keys to avoiding problems at this point is to minimize the amount of fountain solution in the ink film—in other words, printing as dry an ink film as possible. This is particularly critical when printing on plastics and foil, because none of the liquid will be absorbed by the substrate. The pressman can do this by using the lowest possible ink and water settings while maintaining good ink/water balance. At that condition the printing plate surface will have a light "sheen." Occasionally, a change in fountain concentrate and/or alcohol substitute, or a dosage adjustment may be necessary in order for the pressman to be able to achieve this. Your Printers Service sales or technical representative can help you with this.

The rate of ink polymerization is affected by the pH of the fountain solution. The minimum recommended pH for sheetfed printing in North America is 3.8. Running at a lower pH than this may mean incurring slower drying times than normal.

The Role Of Fountain Solution Solvents

Most modern fountain concentrates and alcohol substitutes contain solvents, generally glycols and/or glycol ethers. These perform several vital functions, including helping to lower surface tension, helping prevent paper piling and helping to keep other key ingredients in solution. Often, "drying" problems are attributed to the presence of one or more of these solvents in the fountain solution. If solvents are grossly overdosed they may negatively impact ink setting or plasticize the set film leaving it softer than it would otherwise be. It is highly unlikely that they would affect the polymerization of the vehicle as used on press. Fountain solution is over 98% water; only a portion of the remaining 2% or less is solvent. In most cases, these "drying" issues are due to problems with one or more of the other variables in the offset printing process – ink or paper, for instance – or to other factors such as ambient humidity, excessive water metering speeds, incorrect fountain solution dosage, etc.

Troubleshooting "Drying" Problems

The following charts cover drying issues as well as problems that are due to other causes. We urge you to use them as a starting point towards diagnosing and solving your "drying" problems. As always, your Printers Service sales and technical representatives are available to help you.

TROUBLESHOOTING DRYING PROBLEMS

Problem	Possible Cause	Suggested Remedy
Poor Rub Resistance – ink is dry but lacks rub (scuff) resistance	<ul style="list-style-type: none"> • Inadequate or incorrect slip agent in the ink 	<ul style="list-style-type: none"> • Consult ink company
Marking – ink remains fluid (does not dry) for too long and film is soft to the touch	<ul style="list-style-type: none"> • Ink too old – driers have become inactive • Excess Drier • Paper too acidic • Fountain solution too acidic (pH less than 3.7) • High ambient humidity (prevents evaporation of liquids from ink film) • Waterlogged/emulsified ink (too much liquid in ink film) • Paper too high in moisture content (retards liquid penetration) • Insufficient drier in ink • Ink film too thick • When using a two-step solution, alcohol dosage too high 	<ul style="list-style-type: none"> • Add drier or use fresh ink • Reduce/avoid use of separate driers in ink or fountain solution • Switch to less acidic paper • Switch to solution that gives pH in proper range • Re-print when humidity is lower • Reduce water metering speeds (adjust dosage or switch to different fountain solution) • Use paper with moisture content in correct range • Add drier or consult ink company • Switch to stronger ink • Adjust alcohol substitute dosage
Scuffing in the pile	<ul style="list-style-type: none"> • Ink lacks abrasion resistance • Excess driers – ink is becoming brittle • Abrasive paper 	<ul style="list-style-type: none"> • Consult ink company – may need more/different wax • Discontinue use of separate drier catalysts; consult ink company • Consult paper company
Setoff – freshly printed sheets mark adjacent sheets in the pile	<ul style="list-style-type: none"> • Emulsified or waterlogged ink • Ink picks up too much water • Paper has excessive ink holdout • Too little spray powder • Spray powder too fine • Pile height too high 	<ul style="list-style-type: none"> • Adjust fountain solution dosage or switch to different solution. • Consult ink company • Consult ink and paper vendors • Increase powder spray rate • Change to coarser powder • Use shorter lifts

TROUBLESHOOTING DRYING PROBLEMS

Problem	Possible Cause	Suggested Remedy
Blocking – sheets contact and glue themselves together	<ul style="list-style-type: none"> • Ink sets off, then polymerizes (dries) and glues the sheets together-see setoff • Ink solvent migrates from stock back into dried film, plasticizing (softening) it • Too much heat in pile 	<ul style="list-style-type: none"> • Generally, the same as for setoff • Consult ink company – may need less solvent or low viscosity oils in ink • Reduce dryer temperature and/or use shorter lifts
Chalking – ink rubs off in a dry, powdery film	<ul style="list-style-type: none"> • Quick-setting portion of ink absorbs too quickly, leaving unprotected pigment on the surface • Paper too absorbent • Fountain solution too acidic (pH less than 3.8) • Paper too acidic 	<ul style="list-style-type: none"> • Consult ink company or switch to ink with less quick-setting solvents • Switch to less absorbent stock • Change to less acidic solution • Change to less acidic paper
Poor Adhesion – ink is dry but does not bind to substrate	<ul style="list-style-type: none"> • Inadequate binding varnish in ink • Substrate has improper surface energy 	<ul style="list-style-type: none"> • Consult ink company • Consult substrate vendor

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As always, your local **PRINTERS' SERVICE** office is happy to answer your questions:

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