SecondSight

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Alcohol-Free Printing

by Lloyd P. DeJidas

Some 24 years ago, U.S. printers facing an oil embargo and a shortage of isopropyl alcohol struggled to maintain production using substitutes for this popular dampening solution additive. Subsequent environmental, health, and safety regulations added their constraints to using alcohol. Environmental concerns continue to put pressure on lithographic printers to reduce the release of volatile organic compounds (VOCs). Isopropyl alcohol is a source of VOCs, as are ink oil, adhesives, coatings, and cleaning solvents. This article reviews and updates information about using alcohol substitutes.

In offset lithography, the dampening system transfers a water-based solution to the printing plate as a way to make the nonimage areas of the plate ink-repellent. Isopropyl alcohol (isopropanol or IPA) has been, and in some parts of the world continues to be, a popular dampening solution additive because of the advantages it offers to the lithographic process.

IPA reduces the surface tension of dampening solution (making it "wetter" so it can spread more quickly) and also increases its viscosity. This allows a thicker film of dampening solution to interact with the ink and the nonimage areas of the plate. IPA readily evaporates from the ink train, so less dampening solution is applied to the paper. The evaporation of dampening solution and IPA also acts as a "coolant."

Alcohol-based dampening solutions have been credited with making the offset process more "forgiving," masking problems that can occur with an old press, a press that is not properly maintained, lack of operator skill, or settings not as accurate as they should be.

Why remove such a substance from the printing process? The initial reason was a severe supply shortage and the need to substitute something else. Today, the main impetus comes from environmental, health, and safety concerns and regulations.

Alcohol-free printing, however, offers benefits that circumvent the disadvantages of alcohol-based printing plus help operations. Alcohol-free printing offers lower ink and water settings along with the ability to print a given density using an ink film that isn't diluted by alcohol. The result is better quality printing with sharper dots and less tendency for emulsification.

Alcohol Substitutes

As one supplier likes to point out, in the early days of trying to print without IPA, printers looked for products with properties that could substitute directly for IPA, and so the first formulations were referred to as "alcohol substitutes." Today's more advanced formulations can more aptly be called "alcohol-free." This article refers interchangeably to alcohol-free and alcohol-substitute formulations.

Alcohol substitutes differ from IPA in several key properties, including their effect on the viscosity, surface tension, pH, and conductivity of a dampening solution. Alcohol-free products are not universal, and printers need to communicate closely with their suppliers to find the optimum dampening solution.

You can't change one aspect of the printing process without expecting to adjust others.

Several kinds of substitutes are available. They are composed of one or more chemicals from the glycol and glycol-ether families plus other additives that perform the functions of IPA. At first, a few substitutes were formulated to be combined with IPA, but today's formulations are intended to completely replace IPA in dampening solutions and to offer their own range of properties.

One-step and two-step alcohol-free products are available for both web and sheetfed presses. According to one supplier, web printers use the one-step concentrates while sheetfed printers tend to use two-step systems.

The trend toward considering the "total system" has led to the development of more all-in-one concentrates, in which all of the additives are formulated to work together. In general, one-step dampening solutions are deemed the most trouble-free.

Two-step products combine the dampening solution concentrate with a separate alcohol substitute and wetting agents. Some consider the two-step products more flexible because the first-step concentrate can be independently varied. Mistakes with two-step systems, however, are more unforgiving. For many years, only two-step products were available for sheetfed printers, but one-step concentrates for continuously dampened

sheetfed presses have been developed within the last five years.

It's important to remember that substitutes are used in far lower concentrations than IPA. A few ounces of alcohol substitute can do the same as 10 to 20 ounces of IPA in the same gallon of pressready solution.

Dampening Solution Properties

Viscosity

Viscosity is a measure of a fluid's resistance to flow. A high-viscosity fluid, like molasses, is said to be thick; a low-viscosity fluid, like water, is said to be thin. Adding IPA to dampening solution significantly increases its viscosity. Many substitutes, however, have little or no effect on viscosity, so the resulting dampening solution has significantly lower viscosity than a dampening solution with IPA.

Because of the decrease in viscosity with substitutes, less dampening solution is metered by the squeeze or metering roller used in most continuous-flow contact-type dampeners. The immediate effect is that the dampener speed must be increased, which leads many press operators to erroneously conclude that they must use more water to print with a substitute. One solution to partly offset the viscosity loss has been to cool the dampening solution, but there are negative side effects to overly chilling dampening solution.

Surface Tension

Fast plate wetting and the ability to form thin water films—two critical requirements for lithographic dampening solutions—are largely determined by the solution's surface tension. It is generally felt that low surface-tension dampening solution is better for printing at high speed, but there have been contrary reports from Europe. Today's alcohol substitutes can achieve the low surface tensions printers enjoyed with IPA.

Pure water has a surface tension of 72 dynes/cm. In dampening solution, an alcohol concentration of 10–25% reduces the surface tension to 35–45 dynes/cm, enabling the solution to spread over the plate rapidly in a thin continuous film. Alcohol-free dampening solutions use surfactants and solvents to reduce surface tension.

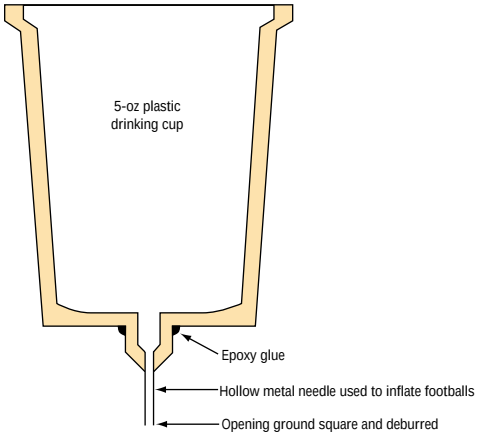
Surfactants, or surface-active agents, are organic chemicals that tend to concentrate at interfaces because of their polar molecular structures. When functioning properly, they travel to the amphoteric interfaces between the dampening solution and both the air and the ink on the image areas of the plate. At high press speeds, interfaces change rapidly, so surfactants must diffuse rapidly to replenish the new interfaces. The amount of surfactant in the dampening solution is important during the pressrun. Too much can contribute to ink emulsification.

During the ideal lithographic printing cycle, dampening solution is picked up rapidly by the ink, and a balanced running condition is achieved. During the balanced condition, small water droplets are dispersed in the ink as a water-in-ink emulsion in the ink train. The pressure between plate and blanket also helps emulsify the water droplets into the ink film. If there is too much water, "snowflakes" may appear in the print.

Printing Brightness and Gloss

Alcohol is a diluent that attacks the ink itself. It dulls ink gloss and affects the color, requiring press operators to carry a heavier ink film on the press rollers in order to achieve acceptable color. Because alcohol substitutes do not have this diluting effect on ink when used in proper concentrations, less ink and less water are needed for acceptable color. The result is sharper dots and less tendency for dot gain.

How Viscosity Varies with Percent Alcohol



Procedure: Maintain full level in glass and measure the time to collect 50 cc

Results:

Fluid	Temperature	Time/50 cc
water	70°F	49.7 seconds
25% alcohol/water mixture	70°F	71.5 seconds

Conclusion: Viscosity of 25% alcohol/water mixture is 1.4 times as high as plain water.

This experiment demonstrates that adding isopropyl alcohol makes dampening solution thicker.

Source: "Update on Alcohol in Dampening," John MacPhee, *Trends*, Heidelberg USA, April 1989, p. 21–24.

Dampening Solution Pickup with the Ink Film

Ink must be able to pick up a controlled amount of dampening solution to form a water-in-ink emulsion. The amount of dampening solution emulsified in the ink can influence ink density, drying, tack, viscosity, and ink transfer properties. Over-emulsification upsets ink/water balance and results in weak and washed out images.

With alcohol substitutes, over 98% of dampening solution is water. Water that varies in conductivity and pH may make it difficult for a printer to control the dampening solution. If the conductivity of the incoming water varies less than ±50 micromhos, consistent dampening solution can be mixed. Day-to-day fluctuations of 200 micromhos in incoming water, however, indicate that some type of treatment is needed to keep it consistent.

Conductivity and pH

It is important that conductivity and pH levels on press be consistent and dependable. It is the practice of GATF to measure conductivity and pH for every fresh batch of dampening solution and every four hours when the press is running. Readings are taken in the water pan at each printing unit and in the recirculator. Water pan readings can provide an early warning about a potential print problem.

Conductivity is the measure of a material's ability to conduct electricity. Pure water, which approaches a conductivity of 0 micromhos, is a poor conductor of electricity. The conductivity of water is directly proportional to the amount of ions in it. As ionic materials dissolve into water, it becomes more conductive. Thus, conductivity can be used as an approximate measure of water quality. Non-ionizable or partly ionizable materials such as alcohol are poor electrical conductors and usually lower the conductivity of dampening solutions.

Dampening solution conductivity should be measured before it is used on press. Unusual changes in conductivity may be caused by impurities from any source and justify re-checking the conductivity of the water and also the fresh dampening solution concentrate before assuming that the dampening solution was improperly mixed. It is normal for conductivity to increase during a pressrun since materials from ink and paper may contaminate the dampening solution.

Measure pH when you measure conductivity. pH is a measure of the hydrogen ion concentration in water. A pH of 7 is neutral; less than 7 indicates an acidic solution and higher than 7 indicates a basic, or alkaline, solution. Acid dampening solutions should generally have a pH of 4.0–5.0. For quality printing, it is important to maintain the optimum pH for the dampening solution you are using.

NOTE: The following explanation of pH levels is based on U.S. practices and products that work in the acidic range. European printers prefer products that work in a higher pH range. Note, too, that U.S. papers are mostly clay-filled while those in Europe use calcium carbonate. Use of calcium carbonate, in both coated and uncoated papers, is increasing in the U.S. Low pH has a detrimental effect on these papers and has been known to attack coatings.

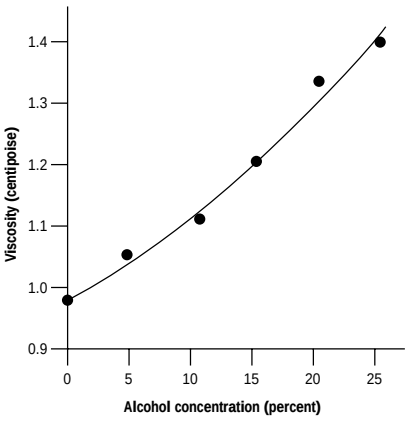
All acid dampening solutions are buffered to some extent so that, as the concentration increases, the pH initially drops and then levels off while the conductivity continues to increase in a straight line. Thus, conductivity is much better than pH for determining the amount of dampening solution concentrate contained in your solution.

Regardless of the concentration of dampening solution, with most acid solutions, the pH must generally be below 5.0 for good printing. Gum arabic used in most of these solutions will not effectively desensitize plates if the pH is above 5.0.

Because pH can change during the pressrun, re-check pH anytime there is a problem with tinting (ink emulsified in the dampening solution), plate blinding (the image on the plate does not take ink), scumming (ink adheres to nonimage areas on the plate), roller stripping (rollers do not hold ink), or when the ink is not drying properly on the paper.

If the pH is too high (above 5.5), the plates may scum. Excess water required to keep the plates clean could result in ink emulsification. If the pH is too low (below 3.5), plates may blind, inks may emulsify in the dampening solution, rollers may strip, and ink drying times may be excessive.

Today's systems are so well buffered that pH is not as changeable as it once was, but noticing a drift in pH can help avoid many print problems. Major changes in the conductivity of incoming water can sometimes indicate future pH problems.



This graph shows how viscosity varies with percent alcohol in an alcohol/water mixture. The data was obtained at 70°C (21°) using the device shown on the facing page.

Working with Alcohol Substitutes

There are two goals when running alcohol-free. The first is to manufacture a quality product while using safe materials. The second is to choose and use the alcohol-free product that will give the optimum results. This choice will differ depending on the press, the

Environmental, Safety, and Health Concerns with IPA

Considered a significant source of VOCs, isopropyl alcohol has received considerable attention from the U.S. Environmental Protection Agency (EPA) and state and local air pollution control agencies over the past 10 years. About 15 states and local air pollution control agencies have set limits on the amount of IPA permissible in dampening solution. These limits range from 3% by weight for new sheetfed presses in Los Angeles to 8.5% by weight for presses in Maryland. EPA has suspended working on a regulation that will set national limits, but its last draft is used to set state regulations and operating permit limits.

Alcohol substitutes offer an opportunity to dramatically cut VOC emissions from a press because substitutes are used in lower volumes on press than IPA and the low volatility of substitutes means that little is needed to replenish the dampening solution over the course of a day.

One risk with IPA is flammability. Pure IPA has a flash point of 53°F (11.7°C). When IPA is mixed in dampening solution flammability is reduced, but IPA solutions must still be handled with caution. IPA can also act as an irritant when present as vapors in the air. The Occupational Safety and Health Administration (OSHA) has set maximum exposure limits at 400 parts per million (ppm) over an eight-hour time-weighted average or 500 ppm for 15 minutes. Current information indicates that there are no long-term health effects associated with IPA.

Since the flash point of alcohol substitutes is greater than 100°F (37.8°C), flammability is not a major concern, and any adverse health effects depend on the substitute's chemical composition. Glycol ethers and glycols are generally recognized as safe when handled properly with adequate ventilation and personal protection. OSHA's permissible skin exposure limit for one glycol ether (known as Butyl Cellosolve® and used as a substitute or extender) is 25 ppm over an eight-hour time-weighted average. However, the National Institute of Occupational Safety and Health recently recommended a 5 ppm limit for Butyl Cellosolve® and butyl acetate. Studies performed on workers in printing have shown that the average exposure is 1–2 ppm because Butyl Cellosolve® is not very volatile.

dampening equipment, the water, ink, substrate, and even the job. Printing is an interactive process and printers can't expect to change one aspect (such as removing alcohol) without expecting to adjust others.

Pretesting Alcohol Substitutes

One approach printers can take with a new dampening solution (or any new material) is to test it before adopting it fully for production. (See sidebar "Benchmarking a Dampening Solution for the First Time.") One unit of a press can sometimes be a better laboratory than a room filled with bench testing equipment. Testing on one unit of a press under controlled conditions (keeping everything constant except the item being tested) can often provide the information needed to avoid problems during a production run.

"Controlled conditions" means working within measurable tolerances. When testing any product, the best approach is to begin by following the manufacturer's specifications precisely. If a tolerance in the form of a range or plus-and-minus specification is provided, start on the low side. Keep records to document the press setup and performance.

When using alcohol substitutes, it is important to establish optimum ink/water balance through press trials. Such simple testing can show that using alcohol-free materials may require adjustments from previous production conditions. However, in order to determine this, printers must first be able to quantitatively define their production conditions.

Mechanical Adjustments

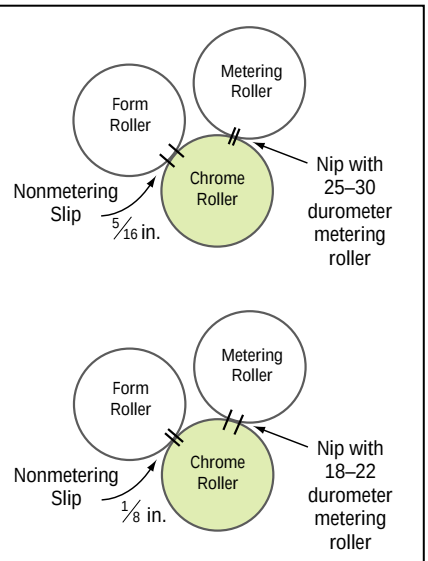
All the different makes and models of presses with different controls, roller configurations and dampening systems make it difficult to be completely specific about adjustments, but the following general information should be helpful.

One crucial point to remember when running alcohol-free is that maintenance, tolerances, and press practices are far more important than when printing with IPA. Tolerances are tighter and any problems or bad practices masked by using IPA will come to the fore. In fact, one suggestion for printers who want to make the transition to running alcohol-free is to decrease alcohol use to about 8%. If this level causes problems, the alcohol is covering up something that needs to be taken care of before a substitute can be run successfully.

The key to successful alcohol-free printing is the durometer and nip relationship of the dampening system rollers. Primary consideration should be given to the metering roller, which requires a somewhat lower durometer than when running alcohol. Metering rollers are normally supplied with a durometer of 25–30 and sometimes will harden further after being run on press. It is recommended that the durometer (Shore A) of the metering roller be reduced to 18–22 when running alcohol substitutes. Softer rollers tend to be more water-receptive. Their softness increases the width of the nip between the metering roller and the chrome roller without increasing the pressure, giving press operators more adjusting latitude.

Another problem that can be encountered when using metering rollers of normal hardness is water banding, or "ridging," on the chrome roller and metering roller, which results in around-the-cylinder print streaking. The increased nip created by the softer metering roller tends to smooth out the water film thickness on the chrome roller. A difference in speed between rollers has also been cited as a cause of ridging.

Another adjustment with alcohol substitutes is the need to reduce the nip stripe between the chrome roller and the dampening form roller. When running alcohol, this nip stripe will normally be $^{5}/_{16}$ to $^{3}/_{8}$ in. (8–10 mm) wide, depending on the diameter of the rollers. With alcohol substitutes, however, it may have to be reduced to as little as $^{1}/_{8}$ to $^{3}/_{16}$ in. (3–5 mm) to regain



These roller configurations illustrate the effect that roller durometer has on the nip. Reducing the pressure helps slippage to occur in the slip nip.

the thinned water film created by the increased nip between the metering and chrome rollers, and to induce slippage between the chrome and the form roller. Under normal conditions, the form roller is driven by the ink oscillator. If there is not enough slippage, the form roller tends to drive the chrome roller.

On one of the typical alcohol dampening systems, the metering and chrome rollers are gear-driven by the dampening system motor, and the form roller is driven by the press. If the form roller begins to drive the chrome roller, roller speed increases and dampening control is lost. As the dampening system rollers accelerate beyond normal conditions, water tends to build up at the roller ends, causing splashing or spraying. Excessive roller speed also creates undue stress on the dampening system motor, a common cause of circuit breaks and motor failures. Ideally, the dampening system should be able to run at the same speed (or slightly faster) with an alcohol substitute as with alcohol.

Another crucial adjustment is the speed of the metering roller. Higher dampening roller speeds are frequently needed to meter substitute-based dampening solutions (which can lead to slinging and an insufficient control margin at high speeds).

The skew or crowning of the metering roller is another consideration. Crowning, a feature on some presses, refers to a metering roller designed with a larger diameter in the center than on the ends to even the distribution of dampening solution across the plate.

Some alcohol substitutes work best with the metering roller skewed, while others require positioning the metering roller parallel to the chrome roller. This reduces pressure in the center of the roller.

The metering roller must usually be skewed when the form is running too wet in the middle and dry at the ends. Set the metering roller parallel to the chrome roller if the middle of the form is not receiving enough water. The optimum angle of the skew should be determined by experimenting, as it may vary depending on the alcohol substitute being used.

A good indication of ink/water balance is the scum line that forms on the bend at the lead edge of the plate. After the press has stabilized, stop the press and evaluate the scum line. This is best done at delivery load changes. Perfect ink/water balance yields a thin even scum line across the width of the plate. If the plate is too dry in an area, the scum line increases in width; if it is too wet, the scum line disappears.

Problems You Can Encounter

Printers who are switching from IPA to alcohol-free dampening systems or who find that an alcohol substitute they've been using suddenly doesn't work should consult their suppliers. Always tell your supplier what other chemistries you might use on press. Plate cleaners or drying stimulators might have more effect on an alcohol-free solution than one dependent on alcohols.

Benchmarking a Dampening Solution for the First Time

You can use the following procedure to benchmark an IPA-based or an alcohol-free dampening solution you've never used.

The relationship between conductivity and concentration is linear, so knowing the conductivity of different amounts of dampening solution concentrate in your water makes it easy to check the strength of your dampening solution. To do this, you need to plot the conductivity of your water and dampening solution concentrate mixed together at different concentrations.

Measure and record the conductivity of your water in a clean 1 gal (3.8 l) bottle. Add 1 oz (29.6 ml) of dampening solution concentrate, shake well, re-measure the conductivity, and record the figures. Then add another ounce of concentrate, re-measure, and record the conductivity. Repeat this until you exceed the manufacturer's recommended dampening solution concentration.

Plot these measurements to make your own charts with concentration on the horizontal axis and conductivity on the vertical axis. This would give you two curves—one with alcohol and the other without. Pure alcohol has little effect on pH, but does lower conductivity.

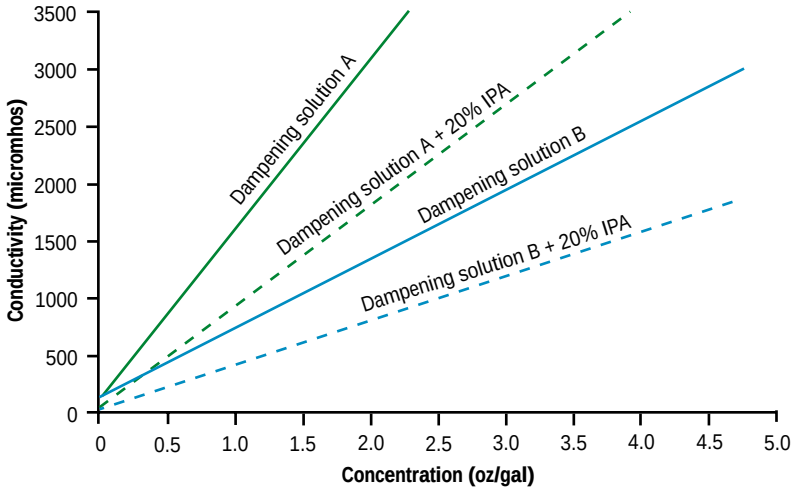
The same procedure can be done with alcohol substitutes. In the proper amounts, most substitutes will have little effect on pH or conductivity. Other dampening solution additives may have dramatic effects.

Later, when you want to determine the concentration of fresh dampening solution, measure the conductivity and read the corresponding concentration from your chart. Remember to check the water and fresh dampening solution occasionally to be sure they have not changed. Make new charts as needed (for example, when changing brands of dampening solution or after installing a water purifier).

Recommended conductivity may vary considerably with the brand of dampening solution. In any case, it is a good idea to adjust your solution to a conductivity that adds to the water supply's contribution but still leaves a reasonable operating window.

Successful Alcohol-Free Printing

1. ***Give*** a sample of your water to your dampening solution manufacturer for analysis. This sample will provide information for selecting the correct dampening solution and alcohol substitute chemistry for your dampening system and your plant's water characteristics.
2. ***Discuss*** your printing operation with your chemical supplier. Be specific about press models, dampening systems, inks, roller washes, blanket washes, and types of paper to make sure that they are totally compatible.
3. ***Check*** dampening roller pressure settings and durometer readings. This should include inking and dampening form rollers. Make sure plate-to-blanket pressure is also set properly.
4. ***Follow*** the manufacturer's mixing instructions. If the instructions recommend mixing between 3 and 8 oz/gal of water, start with the minimum of 3 oz. Take a pH/conductivity reading and record the information as a starting point reference.
5. ***Run*** this mixture of dampening solution and monitor its printability. For example, how does the plate roll up? How does the press start up after feeder trips? Does the plate run clean and open without feeding excess amounts of dampening solution? Communicate this information back to the dampening solution manufacturer.
6. ***Check*** your dampening solution regularly. Paper coating, ink bleed, and blanket and roller cleaners can contaminate dampening solution. Take temperature, pH, and conductivity readings after every three hours of press operation. Record these readings in the press logbook. Keep the solution at the mixture that you have found works best.
7. ***Observe*** the changes in pH and conductivity, as the pressrun continues. When they reach a point where printing problems begin, such as plugging or scumming, the dampening solution is probably contaminated. Record your finding in the press logbook and mix a fresh batch or solution.
8. ***Drain and clean*** your dampening system weekly.
9. ***Have*** the refrigeration system on your water circulation systems checked and serviced by a qualified technician regularly (after 1,000 hours of operation).



This graph visually indicates the differences in conductivity for two fountain solutions.

Metering Roller Sensitivity

As previously noted, alcohol substitutes may cause the metering roller to become sensitive to ink. The ink is first picked up by the chrome roller and then distributed to the metering roller. A solution to this problem is to contact the press manufacturer or to etch the chrome roller with undiluted dampening solution or a mixture of phosphoric acid and gum. Water-receptivity of the metering roller is maintained by applying gum or a coating.

Some authorities attribute the roller sensitivity to contamination of the dampening solution, citing water-miscible blanket washes and the fact that it takes only 1 or 2% of blanket wash contamination to ruin a good dampening solution.

Banding

Banding can occur when using an alcohol substitute with a metering roller with a 25–30 durometer (Shore A). The water banding on the roller results in fine light and dark streaks around the cylinders and on the print. The solution is to use softer metering rollers.

Some manufacturers offer a more hydrophilic metering roller with a surface that has longer filaments. This surface allows more water to be carried through the nip, and the softer covering provides press operators with a wider setting latitude for improved dampening control.

Maintaining Proper Concentration

The most important time to establish the proper dampening solution concentration is when it is initially mixed, but it is good practice to "benchmark" any new material you have never used before (see sidebar).

Most alcohol substitutes evaporate slowly from the dampening system, and there is some belief that, over time, this can increase the substitute concentration and cause problems with ink/water balance, ink lay, and even coating adhesion. Since there is no easy way to determine the substitute concentration, the system should be drained at least once a week.

Overcooling Dampening Solution

Cooling is important with increasing press speeds, but press operators sometimes tend to overcool the dampening solution. This increases ink tack and can lead to picking and piling problems. Too cold is when the unit freezes up or when the pans condense water that drops into the ink system or other critical press areas.

The proper temperature depends on ambient pressroom conditions. Set the refrigeration unit for dampening solution to 50–60°F (10–13°C), or as recommended by your supplier. It is normal for the temperature to increase slightly in the dampening solution pan, so you may need 50–60°F to maintain the proper temperature. Insulating the dampening solution pan and supply lines is recommended.

A thin scum line on the plate bend indicates good ink/water balance.

Organic Growth

Organic growth is not necessarily an expected phenomenon of alcohol substitutes. However, if the condition occurs regularly in the dampening solution recirculating system, a preventive measure is to clean the system at least once a week. This maintenance should include draining the fountain, refilling it with plain water, and redraining it.

Fungus arresters can also be used to prevent organic growth. A solution of 1–5% bleach and 95–99% water is often used to flush recirculators and pans at the end of the work week. Dampening solution suppliers can recommend cleaners for recirculators. Flush the system thoroughly to remove all traces of bleach or cleaners before refilling it with dampening solution.

Roller Stripping

Roller stripping sometimes occurs when the system is not thoroughly cleaned between uses of different alcohol substitutes. When stripping occurs, use the common procedure of copperizing the rollers for older presses with steel rollers. If the problem occurs on presses equipped with nylon or Teflon-covered oscillator rollers, flushing the ink rollers with warm water (after the ink has been removed with solvent) may correct the problem. Ask your suppliers to recommend roller washes and deglazers that work as a system to fight glaze buildup.

Flooding During Press Trip-off

If the feeder trips when running alcohol substitutes, it is a good idea to shut off the dampening system to prevent flooding. Flooding could be enhanced by the reduced nip between the chrome roller and form roller required for many of the substitutes. It is a good standard operating procedure to shut off the dampening system if the press must idle for more than a minute and a half or two minutes to keep the inking system from loading up with dampening solution.

Foaming

IPA is a good defoamer because it makes bubbles fragile. When foaming occurs in the dampening solution pan, foam buildup tends to hit the edge of the metering roller, which, in turn, causes splashing onto the press sheets. Foaming in the pan roller can cause the foam to act as as water barrier because it impedes water travel up the rotating pan roller. Printers with catalytic-assisted dryers need to avoid silicone-type defoamers that can "poison" the expensive catalytic beds.

Antifoaming agents can be used sparingly with alcohol substitutes. Also, some press recirculator manufacturers offer systems that are mechanically engineered to eliminate foaming.

Plugging

Plugging of halftone shadows or small reverse type can sometimes result if too little alcohol substitute is used (in other words, the water is not being made "wet" enough), but other causes of plugging, such as plate sensitivity and inks poorly formulated for a particular job or substrate, should also be investigated

Deposit on the Metering Roller

Some dampening solutions or ink and paper residue in the dampening solution tend to cause white material (salts) to build up on the metering roller. These deposits can be calcium from the paper stocks or also the salts and/or gums from the dampening solution if the pH becomes too high (neutralized). These white deposits can become sensitive and take on ink. The buildup usually occurs when a press stands idle overnight. To overcome this, back the metering roller away

from the chrome roller and wash it with the proper cleaning solutions to clean and desensitize it.

Excessive Water Feed

Mixing alcohol with a substitute sometimes leads to a tendency to run too much water, resulting in emulsification, poor performance of the dampening system, and related problems. A true alcohol substitute should require no alcohol at all.

Picking Resulting from Low Ink Film Thickness

Some alcohol substitutes require balancing ink and water at a lower point than operators may be used to in order to hold open shadows and fine screen tints. Ink film thickness may need to be reduced to as low as 0.15 mil, a deviation from the more familiar 0.2–0.4 mil (0.3–0.6 mil for web). Generally, thinner ink films produce more stress on the sheet, which results in greater picking. However, tests have indicated that some alcohol substitutes cause less picking at low ink film thickness levels than alcohol does. Because of the water film required, alcohol substitutes tend to improve blanket lubrication, giving better sheet release.

Summary

A good attitude and teamwork are key requirements for successfully printing alcohol-free. Sharing information between shifts—and even with other companies—is extremely valuable. Tell your dampening solution, ink, and plate suppliers what you are doing, and take advantage of their knowledge. It is vital to consider the compatibility of all products used on press and to follow the manufacturers' recommendations for each. ■

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Lloyd P. DeJidas, director of graphic services and facility manager at GATF, is co-author with Tom Destree of *Sheetfed Offset Press Operating,* published by GATF*Press*.