Tech Talk From Prisco®

Tech Talk #10

ALCOHOL-FREE PRINTING

Government legislation and environmental pressures in the United States caused heatset web and sheetfed printers to make the transition to alcohol-free printing. They found that eliminating alcohol resulted in several operating benefits including improved quality, lower costs and a safer pressroom. Reduced ink and water settings mean that you will be laying down a more concentrated ink film that isn't diluted with alcohol. This means that you can show your customers sharper dots and brighter color reproduction, while realizing reduced sheetfed drying times.

In this **Tech Talk**, we'll review how alcohol-free printing was developed, its printing advantages, and how **PRINTERS' SERVICE** products can help you be successful in removing alcohol from your pressroom.

Alcohol (isopropanol), as used in printing, has the following well-known properties:

- It reduces surface tension, making water "wetter" so it can spread quickly over the non-image area of the plate.
- Alcohol increases fountain solution viscosity.
- Alcohol evaporates very quickly.
- It has high toxicity levels. The OSHA limit for isopropanol is 200 ppm, a level easily reached in the average pressroom.
- Alcohol disinfects the fountain solution.
- It significantly reduces conductivity.
- Alcohol is expensive to use and requires constant replenishment, especially when percentages are higher
- Isopropanol is flammable: its 54^0 F (12^0C) flashpoint means that proper handling, storage and insurance are key safety issues.

Alcohol Substitutes

When printers needed products that could **substitute** for the useful properties of alcohol, the first generation of solvents they used became known as "alcohol substitutes". Today, we refer to "alcohol substitute type" fountain solutions, because some **Prisco**® fountain concentrates contain no solvents at all. We've designed all our **Prisco**® fountain concentrates to run alcohol-free, whether or not they contain "alcohol substituting" solvents.

Now, let's examine "alcohol substitutes" and how they compare with alcohol.

Flammability You'll realize improved pressroom safety, because the ingredients in alcohol substitutes have flashpoints which are much higher than isopropanol. Some of our **Alkaless**-type substitutes have no flashpoint at all!

Disinfecting To prevent algae, fungal and bacterial growth, all **Prisco**® fountain solutions contain biocides. This compensates for the fact that alcohol substitutes, by themselves, do not disinfect.

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Toxicity Because they are so much safer than isopropanol, many solvents used in alcohol substitutes have not even been assigned exposure limits by the U.S. government.

Conductivity On press, your conductivity levels need to be consistent and dependable. Because it evaporates, alcohol must be constantly replenished—but as it is, its percentage in your fountain solution varies. The more alcohol you add, the lower your conductivity becomes - but then it increases again as the alcohol evaporates. The resulting swing in conductivity can easily be greater than 500 micromhos.

In contrast, alcohol substitutes have a minimal effect on conductivity. You may experience some reduction in the conductivity of your diluted fount after adding the substitute, up to 100 micromhos. Your new conductivity will probably be higher than your normal levels before removing alcohol—but it will be consistent and easy to maintain.

Because alcohol is an operating "crutch", older versions of fountain concentrates were designed with low levels of gum, wetting, plate protectants, and buffer capacity. When used at low dosage with alcohol, the end result was low conductivity. When the alcohol is removed these older-style fountain concentrates fail.

Prisco® fountain concentrates, on the other hand, are designed to run without alcohol and therefore contain higher amounts of these crucial ingredients. They are used at slightly higher dosage levels and run at somewhat higher conductivity. Do not be alarmed at the higher conductivity! It is the natural result of special ingredients that ensure the longer plate life and extended reservoir life that benefit you, the printer!

Evaporation Alcohol substitutes evaporate more slowly than alcohol, and do not need to be replenished on a regular basis. We take advantage of this fact by increasing reservoir temperatures to 60^0F $\pm$ 5% (15.5^0C). Fountain pan temperature will be 10^0 F to 20^0 F higher, close to the temperature of the ink train. This avoids the "shock effect" of mixing very cold fountain solution with warm ink at the ink form – plate nip, and helps to minimize foaming and ink piling problems.

Cost Using alcohol substitutes is more economical than you think. Although they may cost more than alcohol, they are more effective than alcohol and require lower percentages. Because they evaporate far more slowly than alcohol, they don't need to be replenished. The net effect is a big cost saving for you. Our cost analyses show that depending on the price and percentage of alcohol, the cost for any needed rollers can usually be quickly recovered.

Why Have Previous Attempts to Remove Alcohol Failed?

You may have failed in your previous efforts to print alcohol-free. Because no fountain solution is "universal", more than one may have to be tested to achieve optimum results. **Prisco®** fountain concentrates and alcohol substitutes represent the latest in alcohol-substituting technology and have been proven to perform on press.

Surface Tension With alcohol substitutes, we can reach the same low surface tension that was achieved with alcohol. Each press and dampening system requires a specific surface tension level for optimum results. At other levels, printing becomes difficult—if not impossible!

Viscosity Unlike alcohol, alcohol substitutes do not increase solution viscosity. Using our pressroom experience, we've developed a step by step procedure that overcomes this difference. We'll share this with you!

We display test results here, comparing two fountain solution concentrates, used alone or with varying amounts of alcohol or alcohol substitutes:

Type and Quantity of Fountain Solution Concentrate	Surface Tension (Dynes/Cm)	Viscosity (Centistokes)
3 oz./gallon of Fountain Solution Concentrate A Concentrate A used alone, as a one-step	58.6	1.01
6 oz./gallon Alcohol added	47.0	1.18
12 oz./gallon Alcohol added	41.2	1.41
3 oz./gallon Alkaless P alcohol substitute added	39.9	1.04
3 oz./gallon Alkaless R alcohol substitute added	41.7	1.07
5 oz./gallon of Fountain Solution Concentrate B Concentrate B used alone, as a one-step	40.2	1.02

When alcohol is removed, the fountain solution viscosity drops—it becomes much thinner. On an unadjusted press, the dampening system can't supply sufficient fountain solution to the plate. The plate non-image area dries out resulting in plate sensitivity and scumming.

By using softer, lower durometer rollers and lighter stripes with less roll-to-roll pressure, we help the dampening system pass enough solution through. It is a common misconception that water-metering speeds must increase when alcohol is removed. In fact, just the opposite is true!

Alcohol dilutes ink, and when it's removed the printer needs less ink volume to achieve the desired color density. In our experience, water-metering speeds decrease or remain the same after alcohol removal, if we combine the correct **Prisco®** fountain concentrate with the appropriate roller, stripe setting and software changes. Because ink and water settings are lower, it is easier for the press operator to maintain ink and water balance. A more highly concentrated, thinner ink film leads to sharper dots and brighter color reproduction, which are important quality benefits. You'll also find that your sheets will dry faster because there is less liquid in the ink film.

Selecting the Right Alcohol-Free Fountain Solution

The web printing market uses, almost exclusively, one-step fountain concentrates. The sheetfed market tends to use two-step systems, combining a fountain concentrate with a separate alcohol substitute. Initially two-step products were the only products available for sheetfed presses. Alcohol-free one-step concentrates for continuously dampened sheetfed presses were developed by **Prisco** in the late 1980's and are now widely available.

Generally speaking, eliminating alcohol from sheetfed presses is easier with a two-step fountain solution; it is more flexible than a one step because you can independently vary the amount of first part concentrate, which contains the desensitizers, acids, buffers, and plate protectants, and the second part, which provides most of the alcohol substituting capability and wetting.

If your press has typical alcohol-dosing equipment, be aware that this equipment cannot accurately meter the second step alcohol substitute. More suitable metering equipment, such as a **PriscoTech® AquaMix® II or III** blender, will be necessary for optimum performance.

Fountain Solution pH Levels

European printers prefer products in the 4.8 to 5.5 pH range, while in the U.S. market, products have typically had an operating pH in the 3.5 to 4.5 pH range. **PRINTERS' SERVICE** manufactures fountain concentrates that perform throughout these ranges. When running alcohol-free, high quality printing can be done at a wide range of pH levels with the appropriate **Prisco®** fountain concentrate.

A Step-by-Step Guide to Alcohol-Free Printing

We've covered the basic technical aspects of running alcohol-free. Here are the steps that, if followed carefully, will lead you to successful alcohol-free printing:

1. Management and pressroom personnel must make the commitment to remove alcohol. Consult your **PRINTERS' SERVICE** salesperson and technical representative, and choose one press for conversion.
2. We'll ask you questions about your printing equipment and dampening systems, and we'll analyze your water. Using this data, we'll help you choose the correct **Prisco®** fountain concentrate for your application.
3. Thoroughly wash, de-glaze and de-calcify the roller train, and re-ink with fresh ink.
4. Clean reservoir with **Prisco® Royal Flush**. Drain and rinse the reservoir and water pans, and refill with freshly mixed **Prisco®** fountain solution. Replace all the filters. Reset the temperature to 60^0F $\pm$ 5^0F (15.5^0C $\pm$ 3) and re-start the recirculating pumps.
5. Rollers and roller settings are critical to successful alcohol-free printing. We recommend hardness of 22 to 25 Shore A durometer for the metering rollers, and 25 to 28 for water form rollers along with lighter settings at the dampening system nip points, and setting the water form slightly lighter to the plate. These specifications are designed to help the dampening system deliver adequate amounts of the thinner fountain solution to the plate. If the rollers are harder than this, and/or the stripes wider, the job becomes more difficult. Our guideline for dampening system stripes is 1/16 inch stripe width per inch of roller diameter.
6. After inking up the press, set ink form stripes to 1/8 to ¼ inch, making sure they are uniform across the plate.
7. Start the press, lower the dampening form rollers and make sure the plate is uniformly wet across its surface. Drop the ink form rollers, idle for 15 to 20 revolutions and then lift the ink and water form rollers. The lead edge scum line should be 1 to 2 mm and even.
8. Re-start the press. After 15 to 20 revolutions, lift the water forms. The plate should begin to scum evenly on both sides, working gradually inward to the middle.
9. Work with your **PRINTERS' SERVICE** technical representative to ensure that fountain concentrate dosage is set correctly.
10. Print!
11. In order to achieve good results it may be necessary to alter the press' software settings to provide more pre-dampening to the plate and to effect an overall increase in the amount of fountain solution being delivered into the press by the dampening system as the press' speed increases. The latter is sometimes called the "ramping" curve.

The Benefits of Alcohol-Free Printing

Thanks for letting us share our experience with you. We hope that this **Tech Talk** has been helpful in giving you technical knowledge and the confidence to make an important change in your pressroom. By running without alcohol, you will find that you can lower both ink and water settings. Your colors will be brighter. Your sheetfed drying times will be shorter. Your overall print quality will be much improved—and that will have a positive impact on your bottom line.

Please contact us so we can support your transition to alcohol-free printing.

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

Atlanta (800) 241-6049 • (404) 876-1234 • (404) 873-2917 Fax **Miami** (800) 432-5068 • (954) 385-1975 • (954) 385- 8875 Fax
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