



## Reduced-isopropanol/isopropanol-free offset printing and the problem of VOCs

When continuous-feed fount application systems were introduced in offset printing, experts realised fairly quickly that the fount solutions used in conventional fount application systems – which for the most part consisted of water with a simple fount solution additive – were not suited to these new designs.

Over the past decades, however, practically all conventional fount application systems have been replaced by alcohol fount application systems, since the latter offer a number of crucial advantages, such as:

- quicker response to control intervention
- quicker adjustment of the ink/water balance
- a reduced tendency to dirt.

In the search for alternatives, alcohols quickly came into the picture, above all isopropanol, in concentrations of up to 25%.

By developing fount concentrates that contained suitable wetting agents, it was possible to greatly reduce the amount of isopropanol required. Under normal conditions, no more than 8 to 10% isopropanol is required today – even if some users in the field frequently haven't really grasped this fact yet.

It is our declared aim, however, to further halve the amount of alcohol added or even to do completely without alcohol, without having to forego the advantages an alcohol fount application system offers.

### Why do we want to eliminate alcohol?

#### Several points speak against the use of alcohol

Isopropanol is a volatile solvent that for the most part evaporates during the printing process and consequently finds its way into the atmosphere where it contributes to summertime smog. The EU's Solvents Emissions Directive 1999/13/EC on the limitation of emissions of volatile organic compounds (VOCs) is designed to reduce solvent emissions by 50% compared with the level of emissions in 1990. Similar regulatory provisions already exist in other countries and parts of the world.

Isopropanol vapours also contaminate the air in the pressroom. Measurements do in fact show that the concentration of isopropanol does as a rule remain well below the MAC (maximum allowable concentration), but it is possible to lower the level of air pollution at the workplace even further by reducing the quantity of alcohol used in the process.

**Isopropanol**  
**Isopropyl alcohol**  
**2-propanol**  
**IPA**

**Physical data**

Density	0.785 g/ml
Boiling point	82.2 °C
Flash point	13.5 °C
Vapour pressure	41.6 mbar

**Toxicity and hazards**

MAC	200 ppm
	Irritating if it comes into contact with the eyes.
	Inhaling in high concentrations or oral consumption leads to a narcotic effect similar to that of ethanol (alcohol).

### How does isopropanol work in the fount solution?

1. The addition of isopropanol to the fount solution increases the solution's viscosity. This improves transfer over the bareback fount rollers and the delivery rate of the application system can be set lower.
2. Isopropanol reduces the surface tension of the fount solution and consequently ensures that a very thin but uniform and stable film of fount solution forms on the printing plate.
3. Isopropanol evaporates constantly on the rollers and on the printing plate and in this way helps cool the critical components of the press during printing. Thanks to this cooling effect, the rheological data and the fount solution uptake of the inks remain constant. This enables a reliable production run.
4. Isopropanol in the fount solution changes the emulsifying properties of the inks. It improves runoff from the plates, influences the fount solution uptake of the inks and consequently aids rapid adjustment of a stable ink/water balance. During printing, this makes itself apparent in the form of a wide effective working range between the catch-up threshold (i.e. the threshold to scumming) and water marks.
5. Furthermore, isopropanol is an effective agent in countering the reproduction of microorganisms in the fount solution system.

### How can the action of alcohol be imitated by a special fount?

Modern fount concentrates for reduced-alcohol or alcohol-free printing are employed in concentrations of 2 to 4%. In order to bestow upon the fount solution those properties for which an addition of 8 to 12% alcohol is otherwise required, the solution must contain special constituents that are effective when admixed in considerably smaller quantities.

SUBSTIFIX®-AF and REDUFIX®-AF, the **huber**group's fount concentrates developed specifically for reduced-alcohol printing, contain special surfactants and "alcohol substitutes" for setting the surface tension and for controlling the emulsifying properties.

The alcohol substitutes we use are low-volatility, water-miscible liquids that improve plate runoff and restrict the fount solution uptake of the inks even when used in very low concentrations.

They do not retard the drying characteristics of the inks and are not detrimental to health.

### What do you have to pay attention to when printing without alcohol?

#### Different transfer characteristics

SUBSTIFIX®-AF and REDUFIX®-AF have both been optimised with respect to plate runoff without the addition of alcohol. Nevertheless, faster fount pan roller speeds than is the case with alcohol may still be required in order to obtain smear-free print results. However, this does not mean that

more fount solution is applied to the plate. The reason for this is that, due to the different transfer characteristics without alcohol, the pan rollers have to rotate somewhat faster in order to transfer the same quantity of fount solution.

### **Overemulsification**

Inks that have good printing characteristics when used together with fount solutions that contain alcohol can behave totally different without alcohol. In such cases, there is a danger of overemulsification, especially when ink consumption is low. This can result in tinting, density fluctuations and a build-up of ink on the fount rollers

This problem can be remedied by changing to inks with more stable ink/water characteristics. It is also important that the fount system is set to run just above the catch-up threshold, that is, only slightly more fount solution is delivered than is absolutely necessary. In difficult cases, it is usually possible to bring about a great improvement by adding just 3 to 5% alcohol.

### **Cording**

On high-speed presses, the fount solution may sometimes be unevenly distributed on the rollers. This results in fine streaks in the print image along the running direction. This problem arises more frequently with alcohol concentrations below 5%. The reason for this are the altered flow dynamics of the low-viscosity, low-alcohol fount solution.

You can alleviate this problem by increasing the contact pressure of the pan rollers.

## **Recommendations for IPA-free printing**

### **Application systems**

In contrast to the USA, where fount solution is for the most part performed directly, most offset presses in use in Europe are fitted with indirectly working (integrated) units. Generally speaking, it is possible to print without the aid of alcohol with both types of unit. In the case of intergrated units, the ideal ink/water balance is obtained quicker, but the danger of overemulsification is greater.

### **Fount rollers**

Ceramic rollers have proven to be advantageous since they deliver thinner and more uniform fount solution films than chrome rollers and prevent cording. Special pan and fount rollers with hydrophilic rubber compounds improve transfer of the fount solution. Application systems that have been modified in this way are ideal for printing without alcohol. The quantity of alcohol added can then be reduced to 5% even when using standard fount solution additives.

### **Temperature**

The temperature of the fount solution should be kept as low as possible, without allowing it to fall below the dew point, which would lead to condensation forming. In most cases, a temperature of 8 to 10 °C is ideal (10 to 12 °C below pressroom temperature). You must ensure that the solution flows at a constant rate through the fount pan.

To obtain a stable temperature level, we strongly recommend that you keep the temperature of the ink distributors stabilised at approx. 28 °C.

Precise setting of the press, especially of the fount rollers, is imperative when printing with a reduced alcohol content in the fount solution.

### **Constant water quality**

If the quality of your tap water supply fluctuates, we recommend that you treat the water by means of osmosis and subsequently increase its hardness.

### **Precise metering**

It is also very important to precisely meter the quantities of fount concentrate and alcohol added. Many older systems are not in a position to keep alcohol concentrations of between 0 and 5% constant with sufficient precision. We recommend that you replace old equipment with new measuring and metering equipment (e.g. Alcosmart, Alcoprint).

### **Inks**

Inks used for printing without alcohol must be as water-resistant as possible. Not all commonly available inks fulfil this criterion. Some inks, e.g. metall-effect inks, will still not be able to be printed completely without alcohol even in the future due to their particular pigmentation.

If you have no experience of working with reduced-IPA or IPA-free fount solutions, we recommend that you begin – after first ensuring that your press is set precisely – by using the standard fount solution and reducing the alcohol content to 8 to 10%. Only then should you to begin working with SUBSTIFIX®-AF or REDUFIX®-AF and 5 % isopropanol. In this way, you can gain the necessary experience in printing with little alcohol. You can then progress to a third step in which you gradually reduce the alcohol concentration in the fount solution to 0%.

## Prospects

The aims of our development activities in the alcohol-free printing sector are to

- achieve an ink/water balance that is as stable as possible
- achieve plate runoff with as little fount solution as possible
- use as few “chemicals” in the fount solution additive as possible.

To this end, we are continuing development work not only into our fount concentrates, but also into our inks.

In the short run, it is possible to cut down on far more IPA if a large number of printers are able to print without any problem using 3 to 5% IPA than it is if just a few printers work with 0%. That said, the medium-term aim must remain 0% IPA for everyone.

Essential to achieving success in eliminating alcohol from the offset process are, above all things, the systematic pursuance of this aim and the co-operation of the printmen at the presses. Precise setting of the press and total concentration when working are the foundation stones upon which printing completely without alcohol and using advanced fount concentrates, inks and application systems will in time become a stable, standard process. In conjunction with slightly modified working practices compared with those employed today, this will enable the same high print quality and also offer the reliability in production and the scope for which it is currently still necessary to add small quantities of alcohol to achieve.

No printman will be able to escape the necessity to reduce his – or better said, his press’ – alcohol consumption over the coming years!

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Contact addresses for advice and further information: [www.hubergroup.de](http://www.hubergroup.de)

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