Whitepaper

Alcohol-free and alcohol-reduced printing
Prerequisites and potential

HEIDELBERG

Saves costs and is better for people and the environment

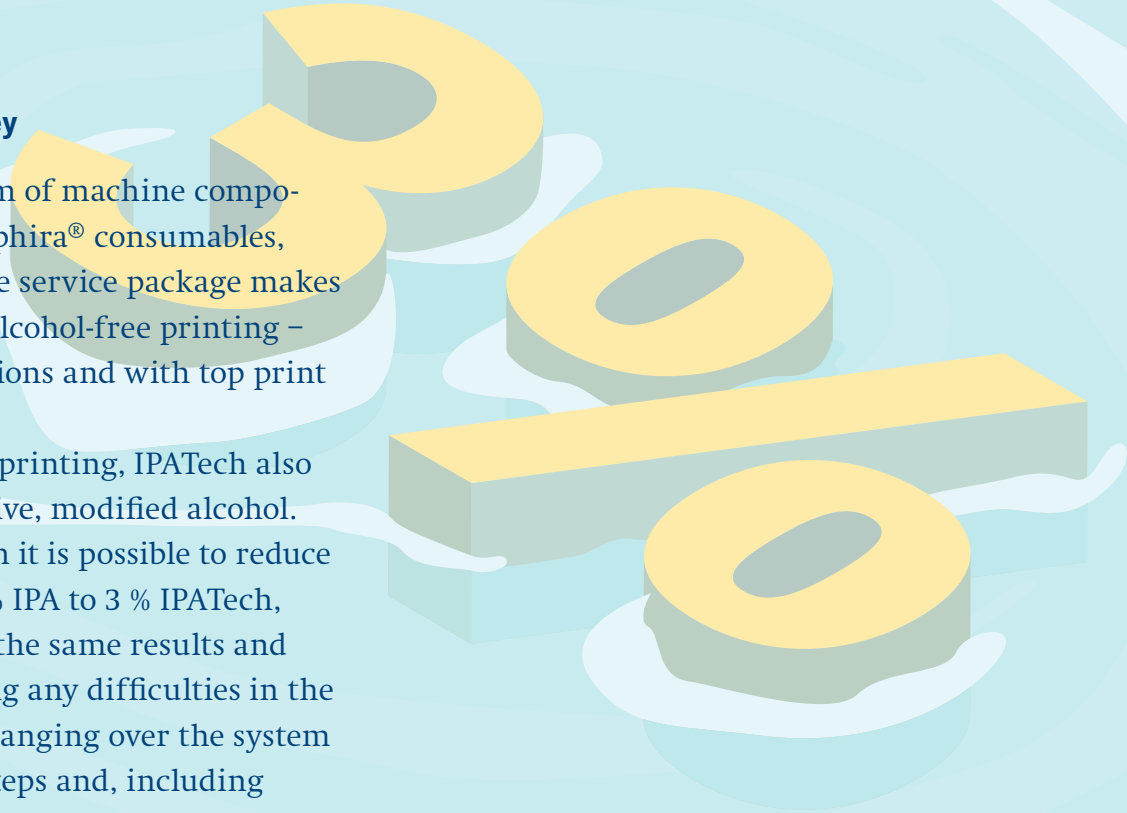
Alcohol-reduced and alcohol-free offset printing

Avoiding alcohol

Isopropyl alcohol (IPA) fulfills a number of key functions in offset printing. It reduces the surface tension of the dampening solution, ensures more effective wetting of the rollers and printing plate, and stabilizes the ink-water balance. And yet by eliminating alcohol not only can you save costs and avoid delivery problems, but also protect the environment, improve the climate in the pressroom, and reduce your CO_2 footprint. When making the switch to alcohol-reduced/alcohol-free printing, it is vital that other components take over the functions previously fulfilled by the alcohol. This is now easily possible, without compromising quality or process reliability.

The technology is key

A coordinated system of machine components, optimized Saphira® consumables, and a comprehensive service package makes it easy to switch to alcohol-free printing – without any restrictions and with top print quality.
For alcohol-reduced printing, IPATech also provides an innovative, modified alcohol. With a simple switch it is possible to reduce alcohol use from 8 % IPA to 3 % IPATech, while still enjoying the same results and without experiencing any difficulties in the printing process. Changing over the system involves just a few steps and, including training, can be completed in less than a day overseen by our system technicians.



Contents

Good for people and the environment

Reducing or entirely eliminating IPA consumption is good for resources, improves the climate in the pressroom, and lowers risks to health, safety, and the environment.

Focus on health

High IPA emissions can lead to headaches, nausea, and poor concentration. Reducing IPA is therefore also good for your employees' health. Almost all industrialized nations have therefore set occupational exposure limits (OELs) for IPA.

Focus on the environment

When IPA is degraded by sunlight, ozone is produced. IPA, like almost all volatile organic compounds (VOCs), therefore contributes to summer smog. It also contributes to global warning and thus to the increase in the greenhouse effect. Reducing IPA is thus good for the environment and reduces your CO_2 footprint.

Focus on safety

Pure IPA is flammable at 12 °C (53.6 °F). Dampening solution with 12 % IPA is flammable at 42 °C (107.6 °F). Reducing IPA lowers the risk of fire and explosion due to unfavorable conditions in the print shop or improper handling.

Focus on customer acquisition

Alcohol-free printing is a USP with environmentally aware customers. Reducing IPA thus enhances your image in the long term.

Focus on costs

The purchase of IPA is subject to market fluctuations, as the crisis during the COVID 19 pandemic has made painfully clear. Eliminating IPA reduces this dependency on supply chains and cuts costs.

Focus on quality and productivity

Heidelberg's IPA service package ensures consistently high quality and optimum process reliability.

Heidelberg IPA service package

Heidelberg makes it easy for you to switch to alcohol-reduced/alcohol-free printing with a special IPA service package.

The IPA service package includes:

- Optimized **machine equipment with CombiStar® Pro CAN** as the central dampening solution supply.
- **Special LotoTec water pan rollers** distributing sufficient dampening solution very evenly over the printing plate and ensuring a good ink-water balance.
- **Use of the correct Saphira dampening solution additive:** A wide range of dampening solution additives were tested over several years and optimized for problem-free use in day-to-day work.
- **Enhanced measuring technology** for optimum metering.
- Optional **Alcosmart system** for accurate, reliable measuring and metering of the alcohol, including for low IPA concentrations (for spot colors and non-absorbent substrates).
- **Service package for easy switching:** Alcohol-free printing requires changes in working methods, with employees receiving targeted training during the instruction phase. Our instructors provide you with support during the startup phase and respond to your application-related questions.

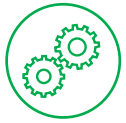
Make the change and gain independence

Alcohol-reduced/alcohol-free printing requires new, optimized processes. There are four key factors involved in switching without compromising process stability or quality.

What are the opportunities? What must be kept in mind?

The key factors

Water quality



Machine equipment

Working method

Switching and service

We show you the potential and benefits to be gained by switching.

01. Consistently good process water quality

Water quality is extremely important in alcohol-reduced/alcohol-free printing. Water hardness that is too low or too high is immediately noticeable in the print result. If water is too soft, the print process has a tendency toward emulsification. Water that is too hard can lead to lime deposits forming on the inking rollers. On top of this, the water quality can vary over time.

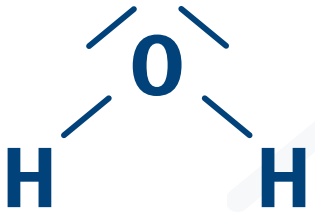
The first step: A water analysis

To achieve consistent water quality, the water must first be analyzed. A laboratory tests the hardness of the water – total hardness between 8 °dH and 12 °dH is required. This equates to a medium hardness range with approx. 1.4 to 2.1 millimoles of calcium carbonate per liter.

If this water hardness is not achieved or if the water quality fluctuates, the water should be treated using a hardening unit or reverse osmosis system before it is fed into the press as a dampening solution. The water's salt content should also be analyzed, since high salt concentrations may result in corrosion in the machine.

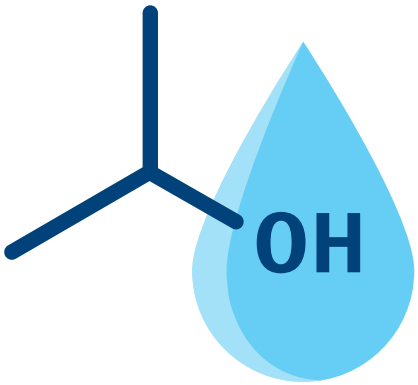
Saphira consumables

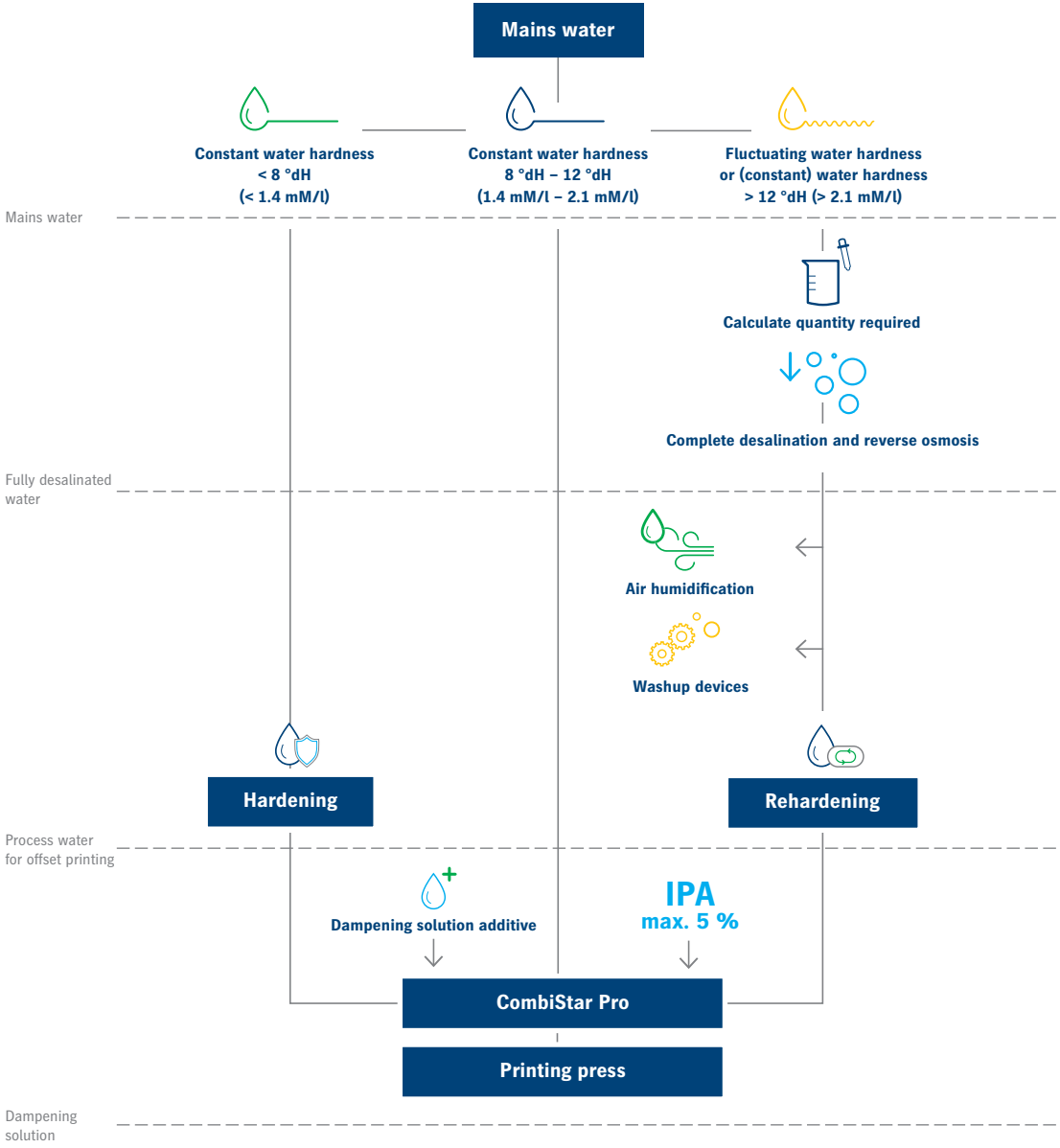
Another way of achieving exactly the desired water quality is using Saphira consumables. The Saphira Water Conditioner ensures soft or reverse osmosis water with a balanced blend of minerals and protective additives for consistent water quality – and thus a stable printing process.



Desalination and rehardening – the solution of choice

The most effective solution for consistently good water quality is to use a desalination and reverse osmosis system with subsequent water hardening. A positive side-effect of the system is that it lowers the buffer requirements for the dampening solution additive.





02. The central dampening solution supply

CombiStar Pro CAN is the central dampening solution supply with integrated fine filtration and inking unit temperature control, and thus the optimum solution for IPA-reduced/IPA-free press operation.

Good reasons for choosing CombiStar Pro CAN:

- Accurate digital metering of the dampening solution additive
- Trend analysis and consumption data display
- Free cooling of the inking unit (for water-cooled assemblies)
- Improved fine filtration of the dampening solution

"Digidos" meters with accuracy of +/-

0.1 %

Source: Heidelberg Research

Precise metering of the dampening solution additive with Digidos

A sufficiently large working window for IPA-reduced/IPA-free printing is only possible with consistent metering of the dampening solution additive.

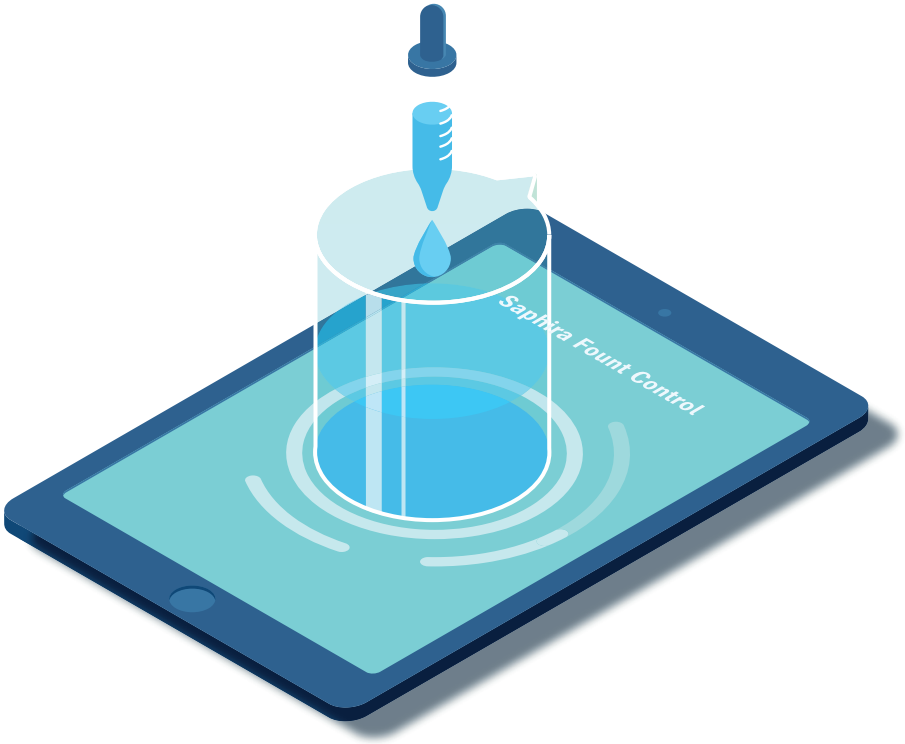
That's why CombiStar Pro CAN is equipped with "Digidos" digital metering technology. The dampening solution additive is metered depending on the process water used. A water meter measures the water requirement. Dampening solution additive is metered as a percentage of the quantity of process water. Each pump stroke transports a constant volume of additive, enabling very high metering accuracy (+/- 0.1 percent absolute) on a long-term basis.

Correct concentration of the dampening solution additive

Depending on the dampening solution, between three and five percent of dampening solution additive is required. You can calculate the required quantity quickly and easily in less than a minute using the Fount-Control Test from Heidelberg Saphira. You can find it online here:

http://www.fountcontrol.com/

Tested and certified. The dampening solution additives
Dampening solution additive is essential for alcohol-reduced/IPA-free printing to work correctly. Saphira dampening solution additives are certified by Fogra and, for packaging printing, ISEPA. They are used successfully worldwide in our customers' day-to-day print shop operations as well as in our Print Media Centers.



The dampening solution additive buffers the value to

5.0 pH.

The dampening solution is key

Saphira dampening solution additives have properties that promote wetting, maintain the pH value and physical properties of the dampening solution at a constant level, and counteract the reproduction of microorganisms. The dampening solution additives for packaging printing are ISEGA-certified and thus suitable for printing food packagings.

Conductivity of process water and dampening solution

Measuring conductivity in the dampening solution

Conductivity measurement measures electrical resistance in liquids and helps evaluate the quality and consistency of the dampening solution. If conductivity increases rapidly, the dampening solution is probably heavily soiled and its chemical and physical properties have altered due to the addition of other substances, e.g. from the paper or ink. However, the absolute conductivity value is not meaningful. A comparison with the conductivity of the freshly added dampening solution is of greater interest. Changing the dampening solution is recommended if a press-specific value is exceeded. The conductivity measurement is integrated into CombiStar Pro.

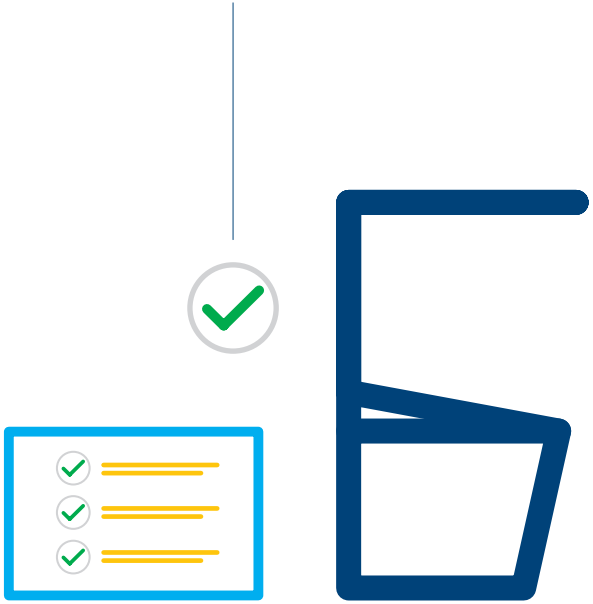
Measuring conductivity in the process water

To detect fluctuations in the process water quality (8 °dH – 12 °dH) before addition to the dampening solution circuit, an additional conductivity probe is integrated into the water inlet of CombiStar Pro CAN. Changes in water values are thus detected early on and the operator is notified in good time.

Trend analysis and consumption data display for monitoring on the control station

The Prinect Press Center® supports extensive monitoring of the dampening solution. Up-to-date data and previous values can be displayed and evaluated here.

The operator is shown the current status of the dampening solution by means of a graphical trend chart on the monitor. This makes it possible to display the profiles for temperature, alcohol content, conductivity, and pH value. The trend display can also show historical values (up to several weeks). Errors in the process or incorrect operator input on the unit can therefore be identified easily and eliminated in good time.

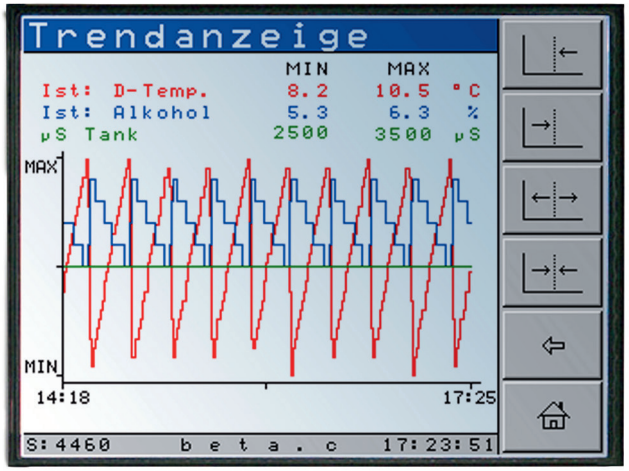


The **Prinect Press Center®** shows the current status of the dampening solution. A trend display shows the current profiles for temperature, alcohol content, conductivity, and pH value.

CombiStar Pro CAN displays water, alcohol, and additive consumption. There are three types of counter for this:

- Total meter that records total consumption starting from startup of the system
- Individual meter that is used for individual print jobs and can be set to zero at any time
- Historical meter, where values can be freely selected and displayed at intervals of 1 to 30 days

This information provides an exact overview of the consumption data and costs.



The optimum temperature thanks to inking unit temperature control

Using inking unit temperature control makes it possible to achieve constant printing conditions and ink distributors and fountain rollers are kept at a defined temperature. This maintains the dampening level, which tends to be higher for IPA-reduced/IPA-free printing, within a sufficient metering range. The inking unit temperature control expels heat from the inking unit via three cooled ink distributors and the cooled ink fountain roller.

Benefits of inking unit temperature control

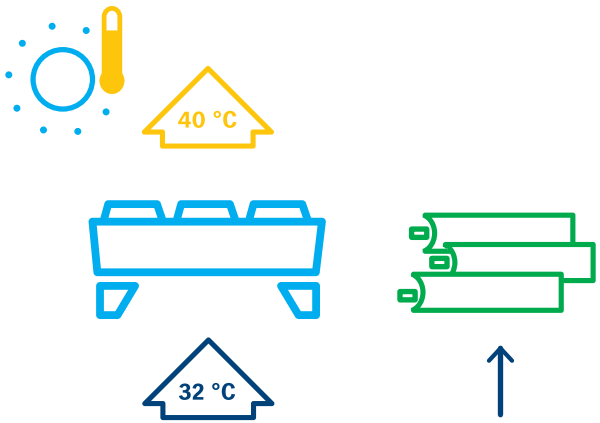
Ink zones and the quantity of dampening solution do not need to be adjusted as often. Your print process is more stable. The constant temperature of ink distributors and ink fountain roller is achieved through active cooling using refrigeration compressors. A closed-loop system keeps preselected temperatures constant during operation and in the event that printing is interrupted.

Free cooling lowers energy costs

The inking unit is cooled using a refrigeration unit, an effective but energy-intensive method. This is why CombiStar Pro CAN uses cool outside temperatures instead of the refrigeration units: not only is this more energy-efficient, but also more cost-effective.

This system is termed free cooling: for outside temperatures up to approx. 20 °C (68 °F), CombiStar Pro CAN employs the recooling function and uses the outside air for cooling without need for additional electrical energy. Free cooling is ideal for cooling inking units, since these generally operate at temperatures of 26 °C to 28 °C (78.8 °F to 82.4 °F).

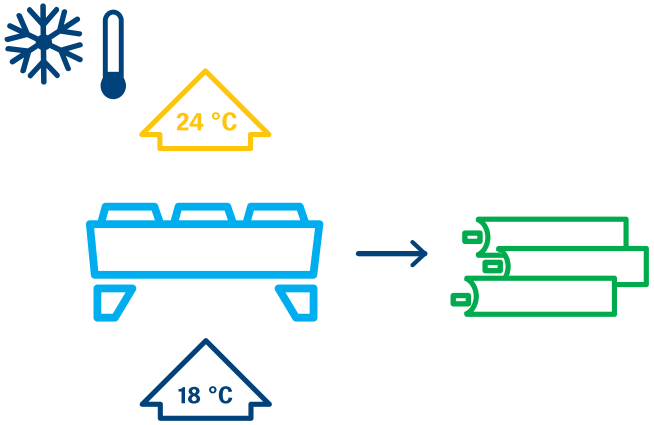
The dampening solution, on the other hand, is cooled using refrigeration units throughout the year, as dampening solution is generally kept at 8 °C to 10 °C (46.4 °F to 50 °F). For these low process temperatures, the options for using free cooling are very limited and therefore not cost-effective.



Free cooling is not used for temperatures above 20 °C (68 °F) and the inking unit is cooled conventionally using refrigeration compressors.

Less is more

With free cooling, you reduce your energy consumption and benefit from a noticeable reduction in operating costs.



For temperatures up to 20 °C (68 °F), the inking unit is cooled using free cooling, i.e. via the recooler of the water cooling.

FilterStar. Filtration of disruptive soiling

Impurities in the dampening solution circuit have a negative impact on the print process. These are mainly impurities from the substrate and ink. These impurities destabilize water transportation to the printing plate and the ink, thereby resulting in fluctuations in printing quality.

Impurities can be more noticeable in alcohol-reduced/alcohol-free printing. This is why CombiStar Pro CAN employs FilterStar® dampening solution filtration. The dampening solution's service life is doubled thanks to CombiStar Pro CAN. This filtration is also recommended when using critical inks that result in significant soiling, such as spot colors.

Oil and grease elements from inks and washup solutions also soil the dampening solution. This leads to deterioration in print quality and increased cleaning with reduced service life for the dampening solution and filters. Heidelberg developed an oil filtration system for this that removes oil from the mechanically cleaned dampening solution, thereby optimizing the dampening solution service life and quality. It is available as an option.

IPA measuring and metering Precision for minimum values

Spot colors and non-absorbent substrates can be difficult to print without IPA. Printing with 2-3 % IPATech is recommended in this case for optimum leeway in the offset process. The Alcosmart measuring and metering system enables you to respond flexibly to these requirements by ensuring the necessary precise metering by measuring the proportion of IPA in the gas phase.

IPATech makes it possible to print with just

2–3 %

alcohol.

Independent and precise

The Alcosmart measuring and metering system makes measuring independent of dampening solution temperature, the density of the dampening solution additive, the salt content, soiling level, foam, and gas bubbles.

03. The dampening system

In the dampening system, special water pan rollers apply the dampening solution to the printing plate. These are coated with LotoTec, and their optimized surface achieves the best possible results during alcohol-reduced/alcohol-free printing.

The water pan roller with LotoTec coating

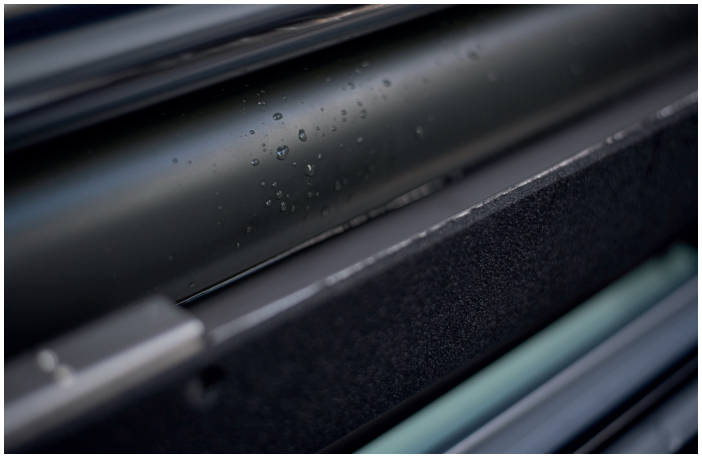
The LotoTec water pan rollers have been specially developed for alcohol-reduced/alcohol-free printing. What makes these rollers special is their surface materials and structures as well as their geometry, which have been modified in such a way that the dampening solution film spreads on them easily and evenly. This wets the rollers and thus the printing plate more effectively and evenly. The result? The ink-water balance can also be easily maintained without using IPA, thus making a switch to IPA-reduced/IPA-free printing much simpler.

Built to last

Further plus points are the easier cleaning of the LotoTec water pan rollers and their high durability. This is confirmed by extensive testing: the service life of the new rollers is comparable to conventional systems. Alcohol-free LotoTec XLT water pan rollers are installed as standard in all Heidelberg sheetfed offset presses produced in the Wiesloch plant.

All in the geometry

Water pan rollers with optimized geometry/convexity (or that are skewed in the case of the Speedmaster XL 106) are used in all Speedmaster presses to ensure optimum dampening solution transportation over the entire printing area.



Benefits of the LotoTec water pan rollers:

- More efficient dampening solution transportation
- Easier adjustment thanks to the matt/gloss effects on the roller surface
- Less ink build-up
- Easier to clean

04. The right working method

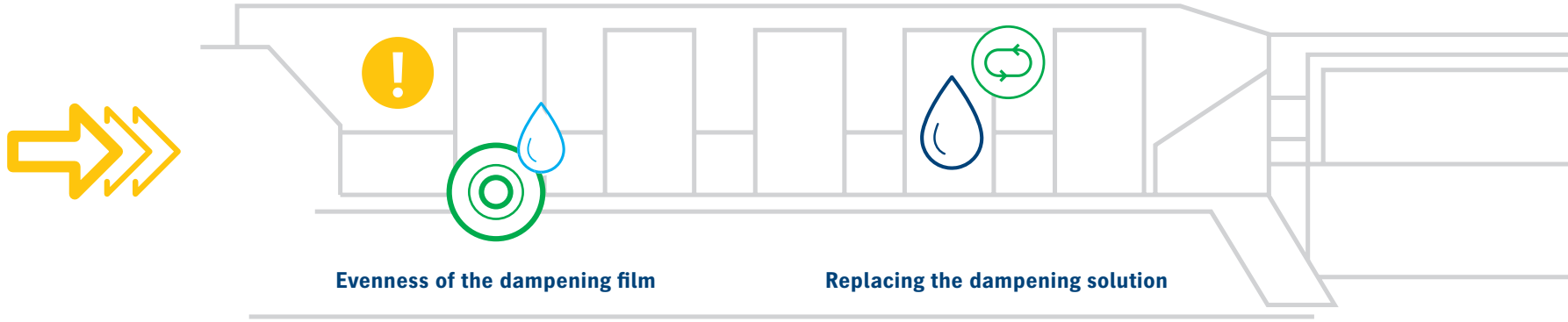
Alcohol-reduced/alcohol-free printing requires modified working methods. The reason for this is that the dampening level tends to be higher here. As a result, the dampening solution window may become narrower and this increases the quality requirements for the dampening solution. Defects such as faulty rollers, poor process water quality, soiled dampening solution, or incorrect settings impact faster on the print result.

Adjusting the inking unit and dampening system
Basically, the inking unit and dampening system is still adjusted according to the setting procedures set out in the operating instructions. Particular care is to be taken to ensure the dampening film is spread evenly over the entire printing width. The dampening system's settings should be checked and adjusted on a regular basis. The water pan roller speed frequently needs to be set somewhat higher for alcohol-reduced/alcohol-free printing than when alcohol is used.

Replacing the dampening solution
Replacing the dampening solution may be required more frequently for alcohol-free printing. The solution's conductivity serves as an indicator of this. To compensate for this, FilterStar significantly boosts the dampening solution's service life.

Easy cleaning and maintenance
The conditions for cleaning and maintenance do not change for alcohol-reduced printing with 2–3 % IPATech. The level of cleaning and maintenance is comparable with printing with 8 % IPA.

This is not the case for alcohol-free printing, where higher requirements for cleaning and maintenance require new working methods.



Source: Heidelberg Research

Cleaning and maintenance

Impurities on dampening rollers and in the dampening solution circuit have a higher impact on the print result in alcohol-free printing. Print shops should therefore pay particular attention to the performance of dampening and inking rollers and remove paper coating and ink deposits from these.

The water pan rollers recommended for alcohol-free printing must be treated with special cleaning agents to remove impurities on the rollers. Cleaning agents containing acetone can attack the surface structure. Hardened rollers, rollers with a smooth surface, or rollers whose dimensions have changed should be replaced.

Your staff need time to get used to the new system. If problems arise, they can be addressed and resolved in joint discussions. Documenting problems and their respective solutions in the machine log helps other staff especially in multi-shift operation.

Impurities
have a direct impact on the
print result.

Water pan rollers
are treated with special
cleaning agents.

The first one to two months after installation may see a slight reduction in productivity. The system will stabilize after this startup phase. To shorten this phase and prepare your staff for the switch, we offer a service to accompany you during this process.

Solutions for problems

Problem	Possible cause	Solution
Significant change in conductivity	Process water values outside tolerance	Check osmosis system/hardener
	Dampening solution soiled	Change dampening solution
	Faulty dampening solution metering device	Check/change dampening solution metering device
	Soiled/faulty conductivity probe	Check/replace conductivity probe
High dampening solution potentiometer* value	IPA-free printing	10–20 % for IPA-free is acceptable
	Dampening solution soiled	Change dampening solution
	Metallic inks	Adapt dampening solution characteristic curve
	Water pan roller unsuitable	Use hydrophilic water pan roller
	Dampening system incorrectly adjusted	Adjust dampening system in accordance with operating instructions
	Dampening system activation	Activate Vario
	Dampening solution temperature	Reduce temperature
	Dampening solution circuit soiled	Chemical system cleaning
Color fluctuations in spot color inks or metallic inks	Disturbed ink-water balance	Wash inking unit and then set scumming point
		Possibly also use 2 % alcohol for printing
		Possibly change dampening solution additive
		Optimize ink composition with ink supplier
Color fluctuations generally	Dampening solution potentiometer value too high	Set scumming point
	Dampening solution soiled	Change dampening solution
	Aging rollers	Replace rollers
	Deposits on inking rollers	Clean with special cleaner

Problem	Possible cause	Solution
Dot gain too high	Dampening solution potentiometer value too high	Set scumming point
	Dampening solution soiled	Change dampening solution
	Lime deposits on rollers	Clean with special cleaner
	Quantity of dampening solution additive too high	Check/adjust in accordance with specifications
Picture faming	Significant slippage of dampening form roller	Adjust dampening form roller to reduce pressure on plate
	Vario on	Switch off Vario
	Unsuitable dampening solution additive	Use different dampening solution additive
	Plate material	Use different plate material
Cording	Water pan roller speed too high (dampening solution potentiometer value too high)	Adjust water pan roller to reduce pressure on metering roller
		Adjust metering roller to increase pressure on dampening form roller
		Switch on Vario
		Change dampening solution additive
Significant change in pH value	Process water values outside tolerance	Check osmosis system/hardener
	Dampening solution soiled	Change dampening solution
	Frequent use of metallic inks	Change dampening solution and filter
	Soiled/faulty pH probe	Clean/replace pH probe

* Rotational speed of the water pan roller as a percentage

05. **Switching & service**

We simplify switching for you with services like our consultancy package or the “Saphira FountControl” calculation tool.

The “Cost Calculator” calculation tool

What is the benefit of switching to alcohol-reduced/alcohol-free printing? Your Heidelberg contact will discuss the opportunities and benefits for your print shop with you on site. This will include using the Cost Calculator to calculate the total cost of ownership (TCO), in other words the total costs involved in switching.

We will be happy to help you! Contact your local sales advisor.

Always good advice
Our instructors offer consultancy and support during the instruction phase and provide training for you and your personnel. As part of this process the press is tested and approved for IPA-reduced/IPA-free printing. If necessary, they check and optimize the characteristic curves for the process water, dampening solution, and water pan rollers.

For spot colors and special substrates, our experts provide support with production even after the setup phase and are on hand at all times to respond to specific questions and problems.

Metering with Saphira FountControl
The Saphira FountControl calculation tool makes metering easy.

Easy metering with the calculation tool

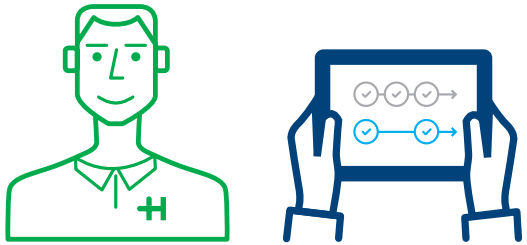
Saphira FountControl

Alcohol-reduced printing with IPATech

Saphira IPATech is a modified isopropyl alcohol that reduces alcohol consumption in the press-room to low concentrations without impacting on process stability and quality. Switching, training included, takes just one day.

With IPATech from Heidelberg, high-percentage alcohol concentrations in the pressroom are a thing of the past – with the same results and production efficiency. Using the modified IPA, alcohol consumption can be reduced from (over) 8 % to 3 %. IPATech therefore reduces your dependency on market fluctuations, your storage needs and your CO_2 footprint. Other benefits are lower costs and environmentally friendly production.

Changing over the system to IPATech is overseen by Heidelberg service technicians. It involves just a few steps and – including training – can be completed in less than a day. Dampening solution metering is simple and reliable thanks to a test kit and online calculation tool.



Changing over the system to

IPATech

is overseen by our service technicians.

References

Reducing alcohol in printing has many benefits – with no compromise on process stability and quality.

“In our PMC in Wiesloch, several of the presses in the Commercial division are alcohol-free. The Packaging division in particular imposes additional requirements such as alternating operation between UV and conventional, printing on a wide range of materials, use of metallic inks, etc., which demand a larger process window for a stable printing process.

This is why we still run a number of presses in the PMC with 2 % IPATech. This gives us the leeway we need and a larger process window than with conventional “8 % alcohol metering”. IPATech is easy to handle, we can use it for all demos and guarantee reproducibility.”

Michael Dischinger,
Head of Application Technology Print Media Center,
Heidelberger Druckmaschinen AG, Wiesloch

Simply get in touch

You and your company's success are our prime focus. To be able to realize this ideal, it is important for us to know your wishes and requirements. Only then can we offer you a customized printing solution that works perfectly for you.

We look forward to seeing you!
Get in touch with us for more information, a customized offer and everything else about Heidelberg you would like to know.

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