Alcohol-Free and Alcohol-Reduced Printing

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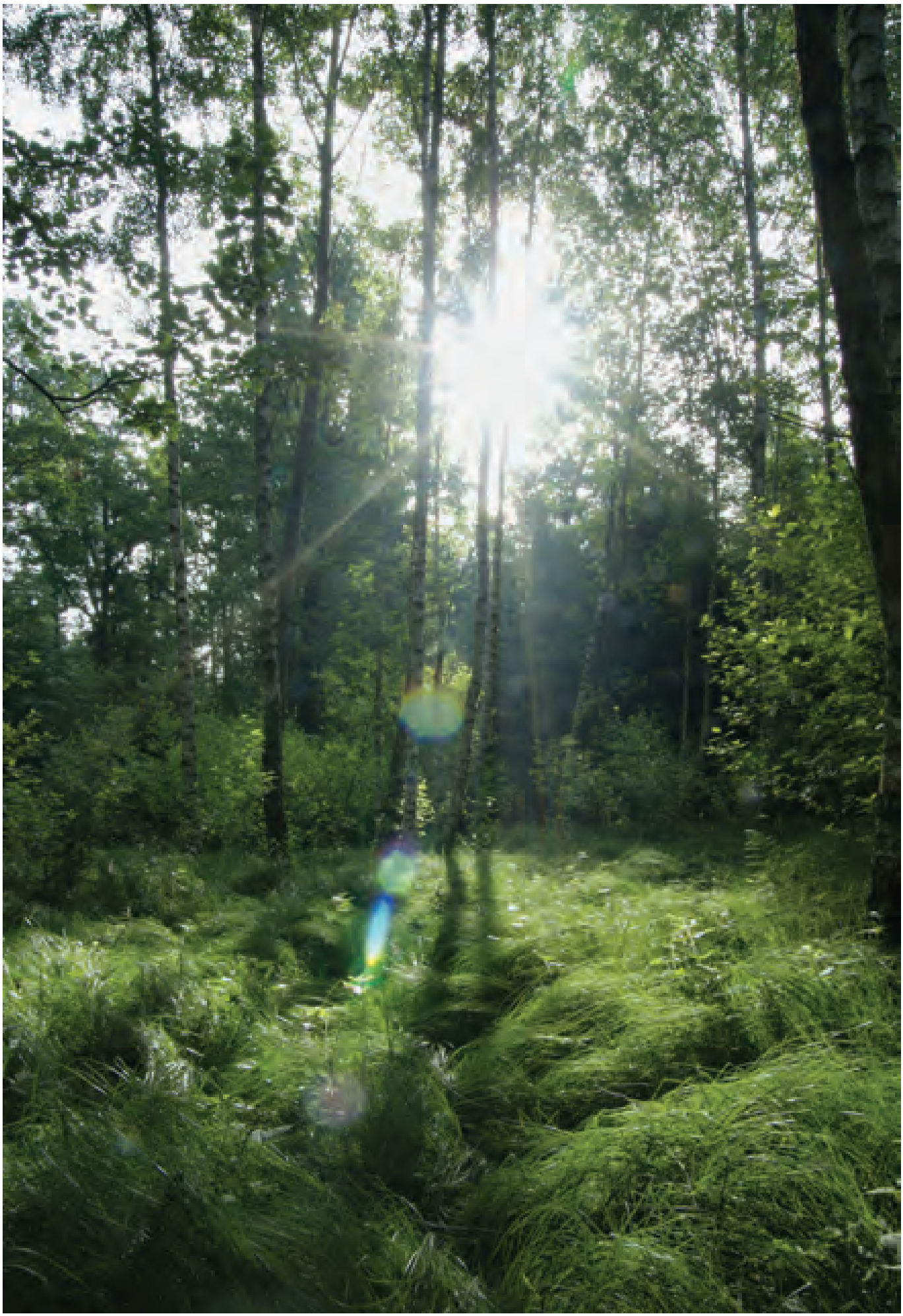


For Man and the Environment Dispensing with Isopropyl Alcohol in Dampening Solution

The Environmental Alternative Alcohol-Free and Alcohol-Reduced Production in Offset Printing

The composition of the dampening solution is a key factor in the printing process.

Avoiding alcohol. For more than 30 years, the printing industry has been continuously focusing on the question of how offset printing can be performed using less isopropyl alcohol (IPA). 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. However, using IPA in dampening solution has a negative impact on the environment and on the climate in the pressroom – and thus also on employee health – that cannot be ignored. Dispensing with IPA also cuts costs.

Technology is key. Continuous development enables print shops to switch to alcohol-free printing without any compromises, while still ensuring maximum print quality.

The solution for alcohol-free printing now features a coordinated system comprising machine components, optimized Saphira® consumables, and a comprehensive consultancy package.

This system includes the following components:

- Special dampening rollers that distribute sufficient dampening solution very evenly over the printing plate and ensure a good ink-water balance
- Enhanced measuring technology and 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.
- An optional system for accurate, reliable measuring and metering of the alcohol, including for low IPA concentrations

If water hardness fluctuates or is > 12 °dH, a reverse osmosis system is necessary, as water quality is crucial for a stable print process in alcohol-free printing.

People are a key factor for success. Another essential factor to ensure a successful changeover is the complete print-shop team. 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.

Equipment package:

For alcohol-free printing, Heidelberg offers optimized machine equipment in the form of the CombiStar Pro, special dampening rollers, a Saphira dampening solution additive optimized for the particular process, and a consultancy package for switching to alcohol-free operation.

Focusing on Health and the Environment Dispensing with IPA Conserves Resources and Improves the Pressroom Climate.

Correct filling of IPA

IPA-free printing cuts costs and lowers risks to health, safety, and the environment.

Health factor. In high concentrations, IPA can have negative effects on health. The more IPA that is used in the dampening solution, the more easily it evaporates. As IPA consumption rises, evaporation and therefore IPA concentration in the pressroom increases at a disproportionately high rate. High IPA emissions can lead to headaches, nausea, and poor concentration and therefore necessitate greater air exchange.

- Safety factor. Isopropyl alcohol has a relatively low flash point. Dampening solution with 12% IPA is flammable at 42 °C (107.6 °F) – pure isopropyl alcohol is flammable at 12 °C (53.6 °F).

Unfavorable conditions in the print shop or improper handling can result in an increased risk of fire and explosion.

Environmental factor. Isopropyl alcohol, like almost all volatile organic compounds (VOC), contributes to summer smog. IPA is degraded by sunlight. This process sees the creation at ground level of critical ozone, among other things. These VOCs also contribute to global warming and thus to the increase in the greenhouse effect.

Occupational health and safety. Almost all industrialized nations have set maximum occupational exposure limits (OELs) for IPA. Print-shop management is responsible for compliance with these limits. The average concentration measured in production must lie between 200 and 400 ppm (parts per million = milliliters per cubic meter), depending on the country. These limits may be exceeded due to unfavorable conditions such as a small pressroom, high ambient temperature, insufficient ventilation, and excessive IPA concentrations in the dampening solution.

Many states have now placed legal restrictions on using IPA. If specified limits are not complied with, the authorities can demand regular follow-up measurements or even shut down operation of the press.

Man and the environment. With alcohol-free printing, the beneficial consequences for man and the environment predominate. Harmful emissions are avoided and the ambient climate in the pressroom is improved – resulting in a significant benefit for employee health. Dispensing with alcohol also cuts costs, as purchasing the relatively expensive IPA can be dispensed with.

You can utilize alcohol-free printing as a USP in sales talks, thereby enhancing your image with your customers in the long term.

The benefits of reducing IPA at a glance:

- Improved occupational health and safety
- Lower odor levels in the pressroom
- Increased safety
- Access to environmental incentives and subsidies (country-specific)
- Potential for cutting costs
- Conservation of the environment
- Underpins the company's environmental focus
- Improves the print shop's image with environmentally aware customers

Consistent Water Quality Targeted Water Treatment Forms the Basis for Optimum Conditions.

Consistently good process water quality. Water quality is much more important in alcohol-free and alcohol-reduced printing than in conventional offset printing with IPA. 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.

Consistent, appropriate water quality therefore needs to be ensured. The first step is a water analysis. 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. 1.5 to 2.5 millimoles of calcium carbonate per liter).

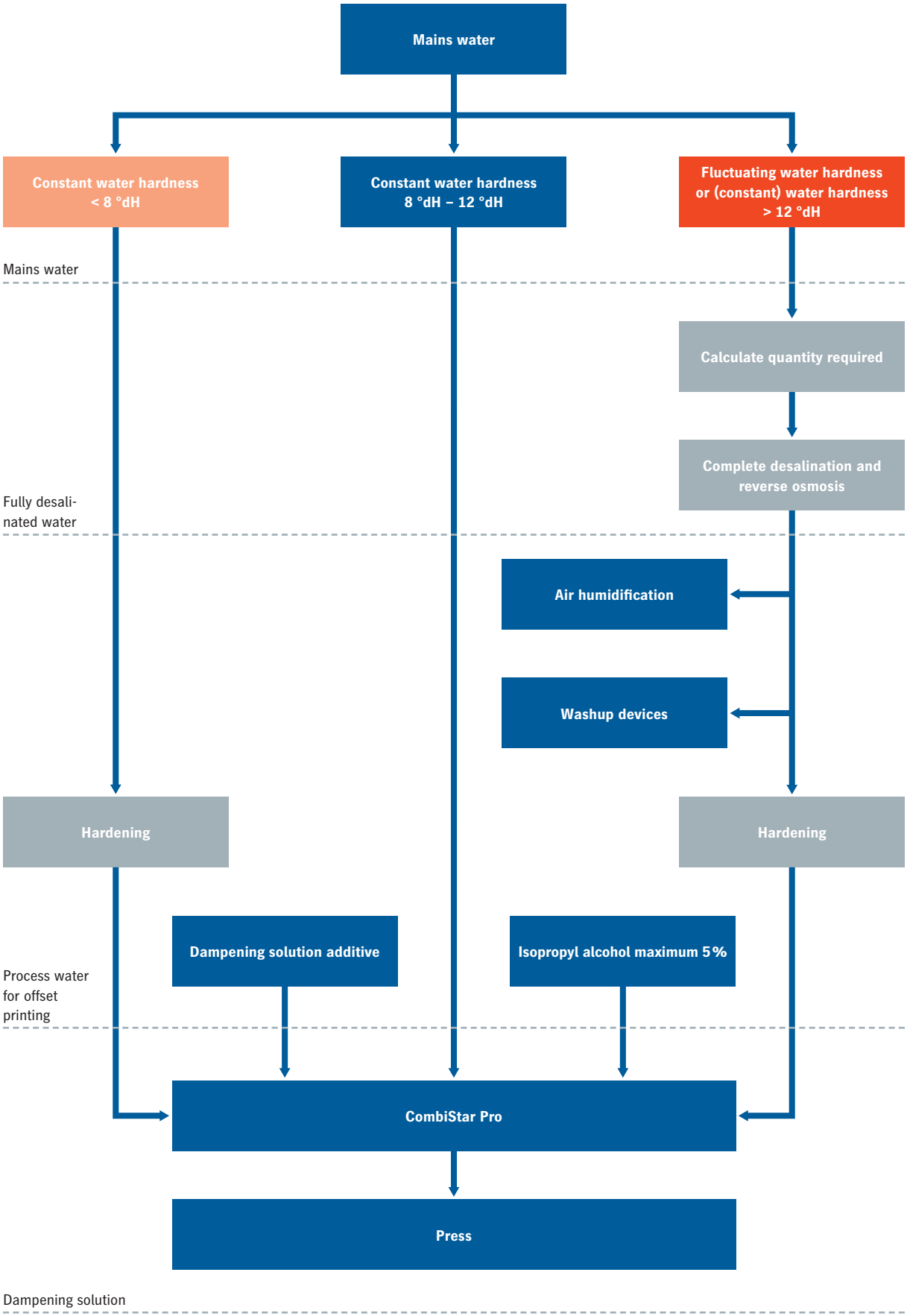
If this water hardness is not achieved or if the water quality fluctuates, the water should be treated using a hardening unit or reverse osmosis system before it is fed into the machine as a dampening solution. A laboratory should determine the water's salt content, which may result in corrosion in the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

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.

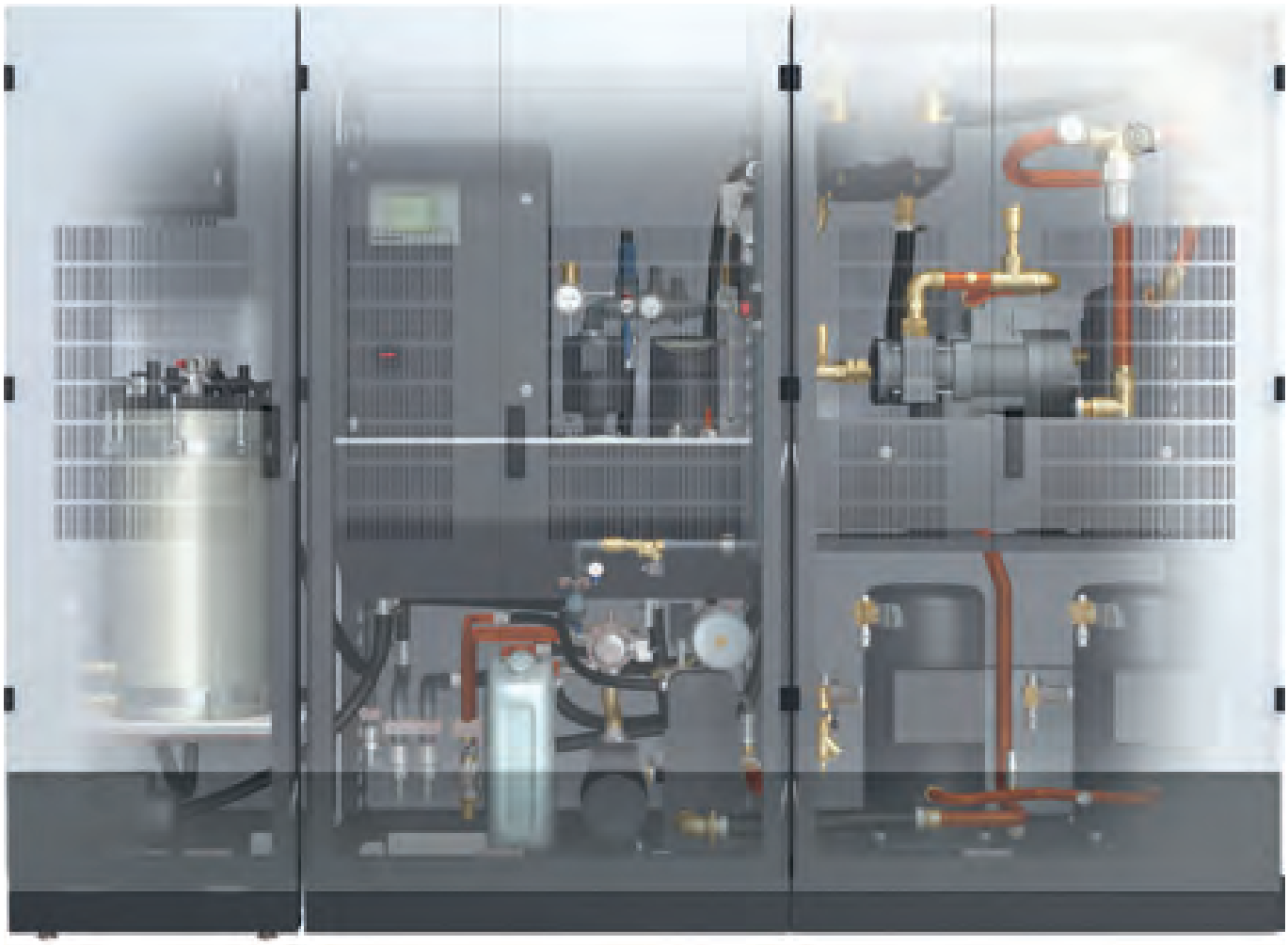
Practical experience shows that a reverse osmosis system is not essential for alcohol-free printing. In some print shops, the quality of mains water is consistently so good that alcohol-free printing is also possible with simpler water treatment or even none at all.

The diagram on the next page illustrates the options for treating water.

Water treatment



The Right Machine Equipment
CombiStar Pro



CombiStar Pro – the system for alcohol-free printing

Star technology. The central dampening solution supply with integrated fine filtration and CombiStar® Pro inking unit temperature control is the optimum solution for IPA-free press operation.*

The CombiStar Pro adds the following functions to the CombiStar:

- More 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

* Other solutions are also available depending on the format.

Metering of dampening solution additive

Precise digital metering of the dampening solution additive. A sufficiently large working window in IPA-free printing is only possible with consistent metering of the dampening solution additive. That's why CombiStar Pro 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 metered and measured 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. The required concentration of dampening solution additive is between three and five percent.

Dampening solution additive

Tested and optimized. Dampening solution additive is essential for alcohol-free printing to work correctly. Crucial improvements have been made in this area in the last few years. A wide range of dampening solution additives were tested over several years and optimized for problem-free use in daily operation.

Suitable dampening solution additive. The additive needs to 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.

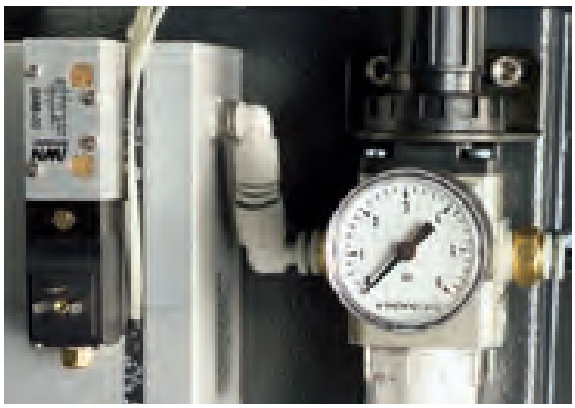
Approved dampening solution additives. The Saphira brand from Heidelberg® features a comprehensive range of Fogra-certified dampening solution additives for alcohol-free/alcohol-reduced printing that meet the various needs of commercial and packaging printing. These dampening solution additives are not only used at our demo centers but are also popular with print-shop customers worldwide in their day-to-day work.

Conductivity for 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 empirical value is exceeded. The conductivity measurement is integrated into the 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 the CombiStar Pro. Changes in water values are thus detected early on and the printer is notified in good time.

pH probe. An optional pH probe is used to determine the dampening solution quality in more detail. The dampening solution additive buffers the pH value to 5.0 pH. The optimum pH value is between 4.8 and 5.3. The pH value may fluctuate in the case of special applications and frequent use of matt-coated substrates. In these cases, the pH probe indicates when a change of dampening solution is required.

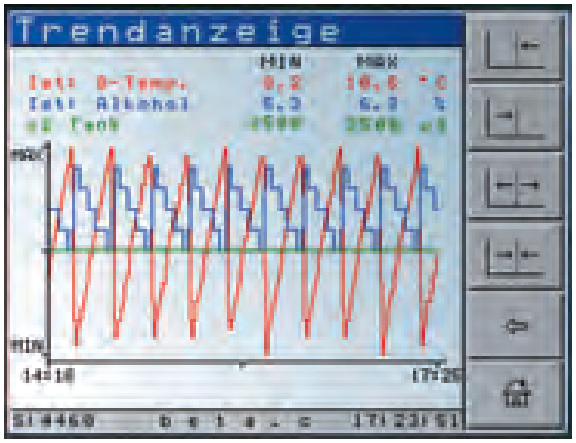


Digidos with precise metering of dampening solution additive

Trend analysis and consumption data display

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 printer 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.



Measuring consumption values. The CombiStar Pro can be used to display water, alcohol, and additive consumption. There are three types of counter for this:

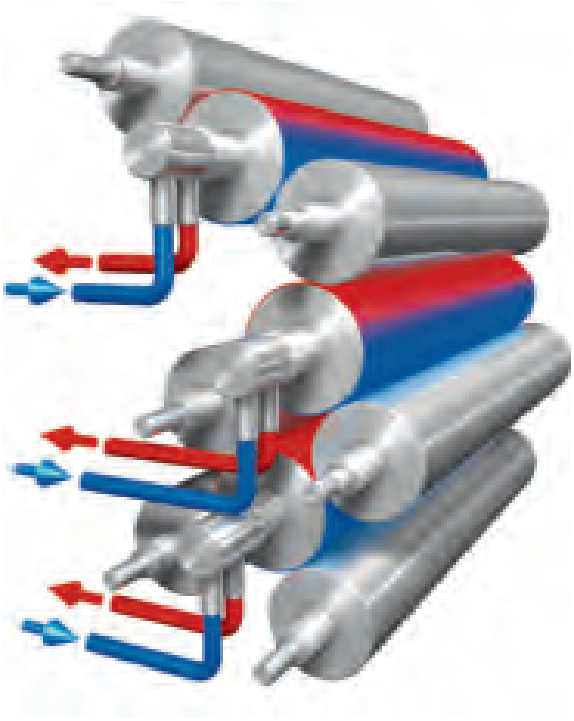
- Total meter that records total consumption starting from startup of the system
- Individual meter that is used for individual print jobs and can be set to zero at any time
- Historical meter, where values can be freely selected and displayed at intervals of 1 to 30 days

This information helps the printer to get a better overview of consumption data and therefore determine costs

Inking unit temperature control

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

The result. Ink zones and the quantity of dampening solution don't need to be adjusted as often and the print process is more stable. The constant temperature of the 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.



Cooled ink distributors

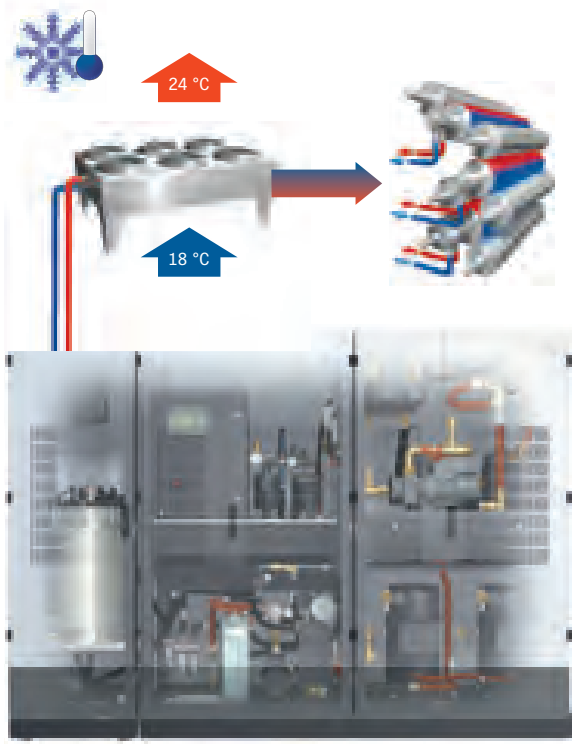
Free cooling

Lower energy costs. The inking unit is cooled using a refrigeration unit. Using cool outside temperatures instead of refrigeration units for cooling is more energy-efficient. With the CombiStar Pro, you benefit from this innovation. For outside temperatures up to approx. 20 °C (68 °F), it employs the recooling function and uses the outside air for cooling without need for additional electrical energy. This is termed free cooling. It 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 main advantage of free cooling is the high reduction in operating costs.

The dampening solution 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.

How free cooling works

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



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

FilterStar
Optimum dampening solution filtration

Perfect for 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-free printing than when using IPA. This is why the CombiStar Pro employs high-quality FilterStar® dampening solution filtration.

The dampening solution's service life is doubled thanks to the CombiStar Pro. 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. Oil filtration that removes oil from the mechanically cleaned dampening solution, thereby optimizing the dampening solution service life, is also available as an option.

Diagram illustrating fine filtration

IPA measuring and metering

Precision for minimum values. Spot colors and non-absorbent substrates can be difficult to print without IPA. IPA-reduced printing with 2-3 percent IPA is recommended in this case.

The precise metering this requires is performed using the Alcosmart measuring and metering system. This system measures the proportion of IPA in the gas phase, making measuring independent of dampening solution temperature, the density of the dampening solution additive, the salt content, soiling level, foam, and gas bubbles.

Alcosmart

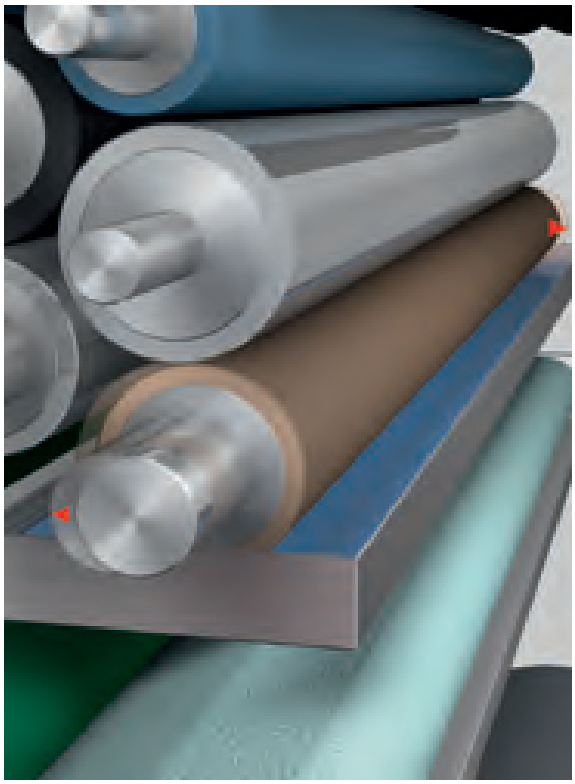
The Dampening System
Special Water Pan Rollers: Optimum Transfer of Dampening Solution to Printing Plate.

Dampening solution is applied at a uniform rate to the printing plate, where it quickly forms a homogeneous dampening film in the non-printing areas.

Special dampening rollers. A new feature of alcohol-free printing technology are the dampening rollers specially developed for this purpose. What makes these rollers special is their surface materials and structures, 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 ink-water balance can also be easily maintained without using IPA, thus making a switch to IPA-free printing much simpler.

Built to last. A further plus point is the endurance of the new rollers. This is confirmed by extensive testing of the new rollers by Heidelberg. The service life of the new rollers is comparable to conventional systems. Sheetfed offset presses in Heidelberg series from the Speedmaster® XL 75 onwards can be fitted with these alcohol-free dampening rollers ex works. They are an integral part of the IPA-free equipment package.

The geometry of the rollers. Water pan rollers with optimized geometry or that are skewed are used to ensure optimum dampening solution transportation over the entire width of the substrate.



Skewing of water pan rollers for the Speedmaster XL 105

The Right Method
Changes in Conditions Necessitate New Approaches to the Print Process.

Alcohol-reduced printing requires slightly modified working methods: The dampening level tends to be higher for IPA-free printing. The dampening solution window may become narrower and this increases the quality requirements for the dampening solution. Defects such as faulty rollers or incorrect settings impact faster on the print result.

Adjusting the inking unit and dampening system. The inking unit and dampening system do not need to be adjusted more than is normally the case. The setting procedures set out in the operating instructions apply. 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-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. FilterStar significantly boosts the dampening solution's service life.

Cleaning and maintenance. Impurities on dampening rollers and in the dampening solution circuit have a direct 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 IPA-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.

Print shop staff need time during the changeover to get used to the 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 in multi-shift operation, for instance.

The first one to two months after installation may see a slight reduction in productivity. The system will stabilize after this startup phase.

Consultancy package. Heidelberg instructors offer consultancy and support during the instruction phase and provide training in relevant topics. Test forms are used during this process to approve the press for 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, they provide support with production following the setup phase and are on hand at all times to respond to specific questions and problems.

Suggested solutions for print problems

Problem	Possible cause	Solution
Significant change in conductivity	Process water values outside tolerance	Check osmosis system/hardener
	Soiled dampening solution	Change dampening solution
	Faulty dampening solution metering device	Check/change dampening solution metering device
	Soiled/faulty conductivity probe	Check/change conductivity probe
High dampening solution potentiometer* value	IPA-free printing	10–20 % for IPA-free is acceptable
	Soiled dampening solution	Change dampening solution
	Metallic inks	Adapt dampening solution characteristic curve
	Water pan roller unsuitable	Use hydrophilic water pan roller
	Incorrect adjustment in the dampening system	Adjust dampening system in accordance with operating instructions
	Dampening system activation	Activate Vario
	Dampening solution temperature	Reduce temperature
	Soiled dampening solution circuit	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 the 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	Change rollers
	Deposits on inking rollers	Clean with special cleaner
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 is too high	Check/adjust in accordance with specifications
Picture framing	Significant slippage of the 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 the metering roller to increase pressure on dampening form roller
		Switch on Vario
		Change dampening solution additive
Significant change in the pH value	Process water values outside tolerance	Check osmosis system/hardener
	Soiled dampening solution	Change dampening solution
	Frequent use of metallic inks	Change dampening solution and filter
	Soiled/faulty pH probe	Clean/change pH probe

* Rotational speed of the water pan roller as a percentage

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Heidelberg, a tradition-based yet technology-focused pioneer, is synonymous with innovative, top-class products and services. Each solution is developed with one goal in mind – to boost the success of your business. Heidelberg solutions cover the entire process and value-added chain of sheetfed offset printing, from management and prepress to press and postpress. We ensure that you can improve your production processes, making them better, faster, more cost-effective, and more environmentally friendly. Our portfolio is designed to increase your productivity, flexibility, and quality – all crucial factors when it comes to satisfying your customers.

Products from Heidelberg promise peak performance in print quality, speed, and reliability in the format classes 35 × 50 to 121 × 162 cm. The ***Prinect*** printshop workflow integrates and optimizes all working processes in printshops, thus boosting the efficiency of production workflows, ensuring greater process transparency, and accelerating the entire job flow.

Heidelberg ***Systemservice*** offers you the widest range of services for your company – from technical service with state-of-the-art remote diagnosis and original service parts, to optimization of print results and process consulting. With ***Saphira*** consumables from Heidelberg, you can be sure that you are using process materials designed to perfectly match the requirements of your Heidelberg equipment. Heidelberg ***Financial Services*** provides you with the advice and support required to meet your financing needs. In addition, Heidelberg ***Business Consulting*** offers business management advice.

The ***Print Media Academy*** in Germany is the center of a worldwide network – currently covering 18 sites – and offers a comprehensive training program tailored specifically to the requirements of the industry. Intensive training courses have been designed to provide participants with in-depth information on Heidelberg products, technological innovations, and successful management.

We'd love to hear from you. If you would like more information on Heidelberg solutions to suit your needs, please don't hesitate to contact us.

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Heidelberger Druckmaschinen AG
Kurfuersten-Anlage 52–60
69115 Heidelberg
Germany
Phone +49 6221 92-00
Fax +49 6221 92-6999
www.heidelberg.com