

# TRANSFERRING SCREEN PRINT PRODUCTION ENVIRONMENTS INTO INKJET PRINTING PROCESSES. WHAT ARE THE LIMITATIONS AND SOLUTIONS?



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*Screen printing production environments exist for years and processes have been optimised over a long period of time. Also the inks have been undertaking optimisation and so became perfectly adapted for their future application. From decorative or functional printing onto papers and cardboards, textiles, plastics, metals and flat and hollow glass or wood, the application range has become widely spread. The main referred application in this article is decoration onto architectural glass with glues, masking liquids and primers. Inkjet printing has evolved throughout the years, from the graphical large format printing market into a true alternative industrial printing solution in all of above mentioned application areas. Newer printhead technologies, inks and substrates made it possible for inkjet to evolve to a flexible, short run, economic and industrial print solution. However, in order to implement this technology into an existing screen printing production environment and fulfil all its requirements, a lot of questions need to be answered.*

## LIMITATIONS: PRINT QUALITY VERSUS FUNCTIONALITY

Three main factors decide about the success of a print solution: substrate, ink, printhead technology. Only when these three are well adapted to each other, a reliable and industrialised print solution can be created.

In screen printing the selected mesh, the squeegee, the emulsion and the ink will define the print quality. For inkjet, these factors can be compared with printhead parameters and inks. For example, the emulsion border sharpness will define the

way the ink shares-off the emulsion and leaves a sharp edge. This will be defined (amongst other parameters) by the waveform in the printhead, defining how and when the tail is "cut off" from the main ink droplet causing satellites or not.

Inks make incredible things possible, but are a very limiting factor at the same time. For screen printing inks, there are almost no physical limitations toward viscosity, whereas this is a main criteria for inkjet ink development. Too high viscosity will cause the ink to behave differently during drop formation at the nozzle and during

flight or even on the substrate. Attention: in some industrial applications such as printing glues an extreme fine deposition of thin liquids is not required. In these cases viscosities of the inks cannot be modified without losing the initial properties. These types of liquids cannot be used in common piezo printheads, but need specific dispensing solutions. From a whole range of print technology suppliers it is best to consult an expert to support in finding the best suited for your application.

## SOLUTIONS WITH DIGITAL PRINTING

Due to increased demand for shrinking run lengths, production flexibility and quick job turnaround, automated pre- and post-press, variable data printing, or cheaper and shorter run productions (just to name a few basic arguments), many typical screen applications are being switched to inkjet printing production processes. What are the ways to get it right?

**Print technology selection and use of pre-treatment or primers.** Not all characteristics of screen inks can be reproduced in inkjet ink formulation.



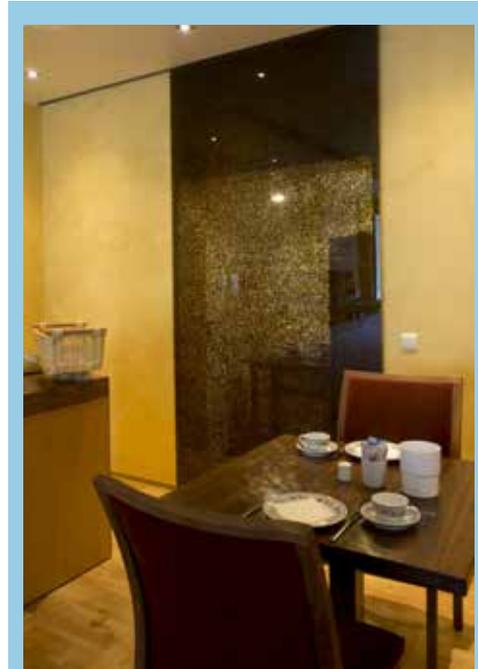
*Inkjet potential for glass decoration is prominently illustrated by the decorated glass walls for indoor use in bathrooms, saunas and pool areas. Hotel Excelsior Munich. Source: skara/ arbucomp*

One major reason for this is the extremely low viscosity of inkjet inks. Only at such low viscosity levels can they be used in piezo printheads. The difference in viscosities of several 1000s mPas cannot be compensated easily during ink development. Going through a raw material screening can offer an ink formulation with thinner viscosity, but will most probably not offer the initial performance requirements of the screen printing ink. A much easier approach will be to go through a print technology screening and find out which technology can be used with the existing ink formulation. Some inkjet print technologies are specifically developed for use with higher viscous liquids. This way the ink characteristics are not influenced, and the advantages of a digital print solution can be accomplished.

**Waveform.** If ink has been formulated but is not jetting perfectly at the very start, an optimisation of waveform

parameters can change the print quality. Investigating best suited piezo actuation parameters for each ink requires know-how and the right tools. Setting up a suited waveform will require modifying a whole set of parameters (firing frequencies, head drive voltages, temperature range to alter viscosity, shape of the applied waveform etc.).

**Available printer systems or a dedicated printer solution.** For certain applications, such as for example printing onto architectural glass, print sizes of recently up to 3.2 m x 15 m (used for the Apple Headquarter Building) are required. The maximum screen size however is limited to 3.2 x 8 m. Without generating enormous costs for screen making, there is no economical way to execute these tasks other than using inkjet. Existing printers were used to apply speciality liquids (other than colours) onto the glass and will now expand production capabilities to new businesses and new applications tremendously.



*Examples of new applications on architectural glass with metallic effects or sputtering were achieved by using digital printing technology. Hotel Straubs Schöne Aussicht, Klingenberg. Source: skara/ arbucomp*



*Result of masking liquids for sputtered mirror glass. Each glass sheet has different images.*

## CONCLUSION

Digital printing is continuously taking over parts of production volumes from analogue printing processes, such as screen printing, flexo and even offset. Thanks to the raised productivity of inkjet printing solutions, with the ever-growing print quality and the capabilities of automatable production workflows, as well as very quick job turnaround, it is becoming the preferred production process. In the graphics market already a big portion of the printed volume has

moved from screen printing to digital printing. However, there are still a lot of industrial screen printing applications left to transform to inkjet. These applications have not been shifted, since they have been extremely challenging toward ink- and printing system development. Many innovative solutions are coming to market for these special applications and I would like to discuss these with you during a meeting at drupa. I look forward to meeting you and talking about your desired future industrial inkjet printing solutions.

**JOCHEN CHRISTIAENS** is an expert in inkjet printing product development and offers support in chemistry development, setting up digital printing workflow processes, colour management and building reliable and efficient inkjet printing solutions. He works with a network of printhead manufacturers, systems integrators, software developers, institutes and speciality chemistry manufacturers for the development of a digital manufacturing process. With international customers in China, Japan, USA and Europe, Jochen has led product development projects and steered commercial as well as technical aspects with UV large format printer manufacturers. Current projects include architectural glass decoration, glues, primers, masking liquids, decoration and treatment of industrial foils, decoration and brushing of aluminium, and large format full colour printing onto various substrates.

**MEET JOCHEN CHRISTIAENS AT ESMA LOUNGE (HALL 3. B70) DURING DRUPA**