

Digitally Adding Value to Production Processes—

Digital printing technologies are well established in transforming industries requiring a print on a product. The adoption of digital printing is growing exponentially from mature markets such as graphic arts to strong growth areas including textiles and labels. On the back of these success stories, there is a further revolution, with inkjet printing ever more considered as the go to technology to deposit a functional or performance material onto a substrate within a production process rather than as a tool purely considered for decoration. Evolution of inkjet technologies is allowing users to trust the technique as a reliable and flexible solution capable of adding real value to businesses.

Digitally Printed Etch Resist

Acid etching is a widely used process for creating texture or features onto a range of metal-based substrates in industries such as flooring emboss plates and PCB manufacture. Etch resist processes were often considered as slow and inconsistent in their output. Digitally printing an etch resist ink can transform production speed and accuracy whilst reducing waste and manual interventions. Additionally this digital process will carry the widely accepted benefits of adopting digital printing technologies such as faster turnarounds, greater design freedom, extremely high flexibility and productivity. All of these factors contribute ultimately to a more efficient process, increasing value and saving money.

A critical factor to ensure success is managing the ink within a process. The way any ink or functional fluid works within a specific inkjet printhead and with the associated software is central to maximizing the image quality, accuracy and ultimate output of the finished product. This, in combination with the ink-substrate interaction, must be carefully controlled to a level that allows consistent and reliable production. Sensient's platform of SensiJet Pyrite is a functional etch resist ink designed to work in real production environments. SensiJet Pyrite has been optimized to offer excellent adhesion when printed onto stainless steel and other metallic substrates and can be tuned to meet specific application requirements. Pyrite shows excellent resistance to typical acid etches.

Added Value for Flooring Press Plates

Digital printing is a viable technology for the laminates industry and has already transformed industrial production. The next step is to match the quality of the textured finish to that of the natural effect design. Many wood laminates carry a generic texture to create the illusion of real wood. Digitally printing the texture pattern can also allow exact matching of the texture with the design offering a true match to a natural wood. Specially formulated UV curable inks are printed in the required design onto a large steel plate and cured instantly in-line allowing highly accurate details to be preserved. Once printed, the steel plate is immersed into an acid bath (typical acid etch solutions include sulphuric acid and chromic acid), where the metal is etched in the non-printed areas leaving the design as a surface relief. The ink can then be stripped using caustic soda leaving a highly valuable press plate. Such a plate is placed on top of a processed laminate flooring structure under high pressure to emboss a texture to the final product. Digitally printing the relief pattern takes the imaging step of the process from several hours (often days) to minutes with a greatly reduced waste and increased feature accuracy.

Digitizing PCB Production

Another industry ready to embrace digital printing on an industrial scale is manufacture of PCBs. Digitally printing an etch resist solution can substantially reduce the time taken to create the PCB circuit. Directly printing the etch resist onto the copper layer eliminates the need for a more commonly used photomask as well as their associated costs in development and storage. Removing the need for such a photo development process step has additional benefits in reducing consumption of water, energy, waste treatment processes and maintenance down time. In an etch and strip process in single or multi-layer PCB production, digitally printing the etch resist ink is a cost effective and more accurate solution and is compatible with traditionally used acid etch solutions such as ferric chloride and copper chloride. On completion of the etching process, the ink layer is removed, leaving the accurate pattern of copper track. Digital printing can open up the possibility for greater flexibility in production, with costs per piece being very similar for a one off as a run of thousands. This flexibility and on demand production has the potential to allow producers to explore the potential to offer additional value without compromising profits.

Further Possibilities

Digitally printed etch resists can open up further markets to exploit the significant benefits offered by this technology. Key beneficiaries could be those using conventional processes such as photochemical machining, etch masking or other processes to create products or intermediates manufactured using a chemical milling process. Digitization of the chemical etching process allows highly accurate chemical etching of sophisticated patterns and images of metal substrates in markets and industries, which will benefit greatly from the global trend for customization.

Transforming industrial production

Digital printing is a viable technology for many industries and has already transformed production processes in several markets. It is an established technology for the decoration of ceramic tiles and textiles and adopters are reaping the significant benefits that digital printing has to offer. Niche markets are now opening and growing rapidly due to the possibility for users to benefit from using digital printing to apply functional fluids and add real value to products and processes. The key to using an inkjet process successfully is managing and optimizing the ink solution to meet the specific application requirements. With the right ink and process, digital technology can transform many manufacturing practices

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