Innovations in Printing Plate Technology to Address the Challenges of UV Printing

Arguably one of the biggest changes affecting offset printing over the last couple of decades has been the trend toward UV. As the technology continues to develop and as more printers invest in UV presses, both challenges and opportunities have appeared.

This paper will discuss some of those issues with digital printing plates.

Brief Overview of UV Printing

CONVENTIONAL UV

UV curable inks were introduced as an alternative to solvent-based products to provide improved print quality and higher speed to a dry print. Conventional heat- and air-drying works by solvent evaporation, a process that shrinks the initial wet-coating and additionally can release environmental pollutants when organic solvents are present (VOCs). In UV curing, there is little or no solvent. Instead, the inks comprise liquid reactive components. These reactive components can be hardened rapidly through the application of UV light, which causes chemical crosslinking (or hardening). Because there is little or no solvent to evaporate, there is no volume lost from the wet coating, resulting in higher ink densities and higher gloss on the print. In addition, there are no environmental pollutants from any organic solvents. Through the use of photoinitiators, it has been possible to cure the inks using UV lamps.

Conventional UV lamps consume a lot of power, take up a lot of space and generate a lot of heat. Together these factors limit the application to print shops where the value of the print product would pay for the equipment and cost of running the UV.

LOW-ENERGY UV

More recently, with the advent of higher powered and cheap UV sources, e.g. Light Emitting Diodes (LEDs), it has been possible to provide the same amount of energy to the wet sheet but with a lot less power, heat and space. Equipment and running costs can now be reduced, and old presses can be more easily modified with the smaller equipment. The ink suppliers have been able to alter the ink compositions, primarily the photoinitiator system, to match the output of the new UV light sources. This less expensive, smaller system is allowing the use of UV curable inks in wider applications. Commercial printers currently using standard inks can now take advantage of faster turnarounds, less maintenance through use of less anti-setoff powder, a wider range of substrates and higher print quality.

ADVANTAGES OF UV

- There are fewer emissions of VOCs.
- Inks can dry on plastic and other non-porous substrates.
- Inks do not have to absorb into the stock / dry fast.
- If you can get it through the press you can print on it.
- Ink dots are left sitting on the substrate, reducing contamination and delivering more vibrant colour and detail.
- Higher gloss levels as well as superior rub resistance are possible.
- You don't need to use messy offset powder to stack sheets.

Challenges for Printing Plates

Switching to a UV system requires a complete review of all current components that go through the press. Not only will a printer be changing their inks, they must also look at compatibility with press chemicals, blankets, substrates and more. A UV system may require a change in printing plates, and plate manufacturers have had to take UV into account when designing new plates.

In order to understand the challenges that UV brings to the plate designer, it is important to understand a little of how a litho plate is made. The coating on a printing plate comprises from as few as 5 to as many as 15 different compounds, including colour dyes, infra-red absorbing dyes, binder resins and, surfactants. During the plate manufacture process, all these individual components are dissolved in a solvent mix to intimately mix them together. This solution is then applied to the web of prepared aluminium substrate, and the solvents are removed in a hot-air drying process to leave the 1-2 micron thick dry coating that the printer receives on a plate.

Once the plate is in the printer's hands, the primary function of this coating is that it accept ink on press!

SO HOW DOES UV INK PRINTING CHALLENGE THE PRINTING PLATE?

The liquid reactive components of the UV curable inks have different solubility properties to conventional inks. Downtime for cleaning on press costs money, and to remove these inks from the press quickly and efficiently, special blanket washes are required. Unfortunately, many of the earlier plate coatings used technology that was partially soluble in these special blanket washes. The result would be chemical attack of the plate and very short run capability.

The traditional solution to this problem was to bake the plate, prior to mounting it on the press. For instance, baking KODAK ELECTRA XD Plates gives them excellent chemical resistance on press. The extensive hardening that is promoted by the high temperature treatment prevents solubilisation by any solvent, including the blanket wash. However, the baking process adds cost and uses energy, and it is not even feasible in many smaller shops. In order to remove the necessity of post baking without compromise for UV printers, new plates were required. These new plates required a significant change in coating technology to address the types of press chemicals used in UV printing.

Plate Technology Innovations for UV

Kodak has two solutions to the challenges of these inks and their associated press chemistries, one for negative working plates, and another using a positive working technology.

PROCESS FREE PLATES - NEGATIVE WORKING PLATES

Kodak is leading the industry in process free plate technology, including suitability for UV applications. In 2020, Kodak launched the new KODAK SONORA XTRA Process Free Plate, which is capable of run lengths up to 100,000 impressions for UV applications. SONORA is a good fit with UV printing, not only because of the plate's high resistance to UV inks and washes, but also because it delivers consistent stable dots to press with a very rapid make-ready and minimal waste on press.

The challenge for the plate designers with negative working plates was to maintain the good chemical resistance of the crosslinked image while removing the compromises to suit the expectations of the commercial printer. Through careful design of resins and the initiating system used, Kodak has achieved a highly optimized negative working mainstream commercial plate that is suitable for all UV curing techniques.

POSITIVE WORKING PLATES

The technical challenge for positive working plates has been to develop new resins that are less soluble in the typical coating solvents previously used. Resins make up 70% or more of the positive coating and provide many of the key properties of the plate, including ink receptivity, developability in the processing chemistries and the physical resistance to wear on press. High chemical resistance to these challenging solvents is required for UV printing while making no compromises to any of the other features.

The ELECTRA MAX and SWORD MAX Plates are Kodak's latest processed plate offerings that provide a no-post bake, positive-working solution for printers using conventional UV and low-energy UV inks. ELECTRA MAX and SWORD MAX Plate users are now able to use a no-compromise, high-performance plate on their UV press, while reducing their environmental impact by eliminating post baking and using less developer.

CONCLUSION

The printing industry continues to evolve, and as improvements are made in one area, scientists are innovating to keep up with the changes and then push the improvements even further. Thus, we see that the improvements delivered by UV, such as faster drying times and better print quality, are joined by improvements in plate technology. By using the very latest SONORA Process Free plate technology, printers can take advantage of the many benefits of UV, plus eliminate the plate processor and post-bake ovens from their pre-press operation and deliver a more stable and consistent plate to their press.

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