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Processless offset printing plates

ABSTRACT

With the implementation of platesetters in the offset printing plate making process, imaging of the printing plate became more stable and ensured increase of the printing plate quality. But as the chemical processing of the printing plates still highly influences the plate making process and the graphic reproduction workflow, development of printing plates that do not require chemical processing for offset printing technique has been one of the top interests in graphic technology in the last few years. The main reason for that came from the user experience, where majority of the problems with plate making process could be connected with the chemical processing of the printing plate. Furthermore, increased environmental standards lead to reducing of the chemicals used in the industrial processes. Considering these facts, different types of offset printing plates have been introduced to the market today. This paper presents some of the processless printing plates.

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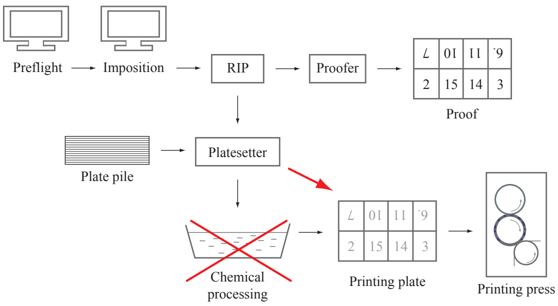
Introduction

Implementation of Computer-to-Plate (CtP) technology has increased the productivity and efficiency in graphic industry by reducing the printing plate-making process and automating the graphic reproduction's workflow. Printers that had changed their workflow from Computer-to-Film (CtF) technologies to CtP technology have decreased their costs and improved quality of printing plates but the amount of investment in a platesetter device and supporting workflow software could not be disregarded. One should have in mind that the only way of overcoming high demands of the market for shorter production time, reduce of prices and improvement of quality is to invest in new technologies and implement more efficient processes in their workflow. Furthermore, ecology standards are constantly higher and demand usage of different materials and implementation of processes that will diminish bad influence on the environment. One of the examples in the printing plate making process is the change from CtF to CtP technology that completely whipped out usage of the photographic materials and chemicals for its processing. Bad ecological influence of the plate making process is almost completely connected with chemical processing of the printing plate in the developing process (J Zarwan Partners, 2009). The next logical step in development of the plate making process was to eliminate the developing process.

Printers are nowadays exposed to a number of products presented on the market with new ecology friendlier solutions for offset printing plate's workflow. Two different types of plates have been developed. One of those is called processless printing plates and the other is called chemistry free plates. Both of them do not require standard off-line chemical processing with non-ecologically friendly solutions but they do require the usage of fountain solution or water for rinsing after the imaging process. Sometimes these plates are also denominated as on-press development printing plates.

Processless printing plates

Process free (processless) plates are plates that do not need to go through a plate processor before they are mounted on printing press. The workflow of these plates is almost the same as the regular plates (Figure 1), but one should not neglect that these plates are not print-ready at the time they are mounted on the printing press.



» **Figure 1:** *Processless printing plate workflow*

During the start-up of the press, the absorption of the fountain solution prepares the ink adsorbing coating in the non-image areas to be physically removed by the tack and shear of the ink. This enables a successful transfer of the coating from the plate to the blanket, and the coating is then carried out of the press, in almost all cases within the first several make ready sheets or newspaper copies. In the last few years Kodak Graphic Communications, Fujifilm and recently Agfa (Agfa Graphics) have presented their processless printing plates on the market (Agfagraphics, 2015; KodakGraphic Communication, 2012; Fujifilm, 2012).

Kodak Sonora XP Plates

Kodak Sonora XP Plates are process free plates, non-ablative, thermal, negative working (write-the-image) incorporating Kodak's press ready technology. The technology was introduced in 2012 (Brunner, 2014). The Sonora XP Plates enable the removing of chemistry, water, energy and waste from plate making processes. This has significant influence on the eco-friendliness of the printing plates as well as cost reducing. (Mattison, 2013).

» **Figure 2:** *Kodak Sonora XP printing plate*

They have electrochemically grained and anodized aluminium substrate, spectral sensitivity of imaging layer from 800- 850 nm, required 150 mJcm^{-2} laser energy on Kodak Platesetters with Kodak square spot Imaging Technology and 175 mJcm^{-2} on Kodak Achieve Platesetters, dependent on imager type, configuration and resolution. Photosensitive material has been ultrathin coated, just 0.9 g per sqm, and it does not use any of the hydrophilic resin that could lead to contamination of fountain solution as was seen as a problem in usage

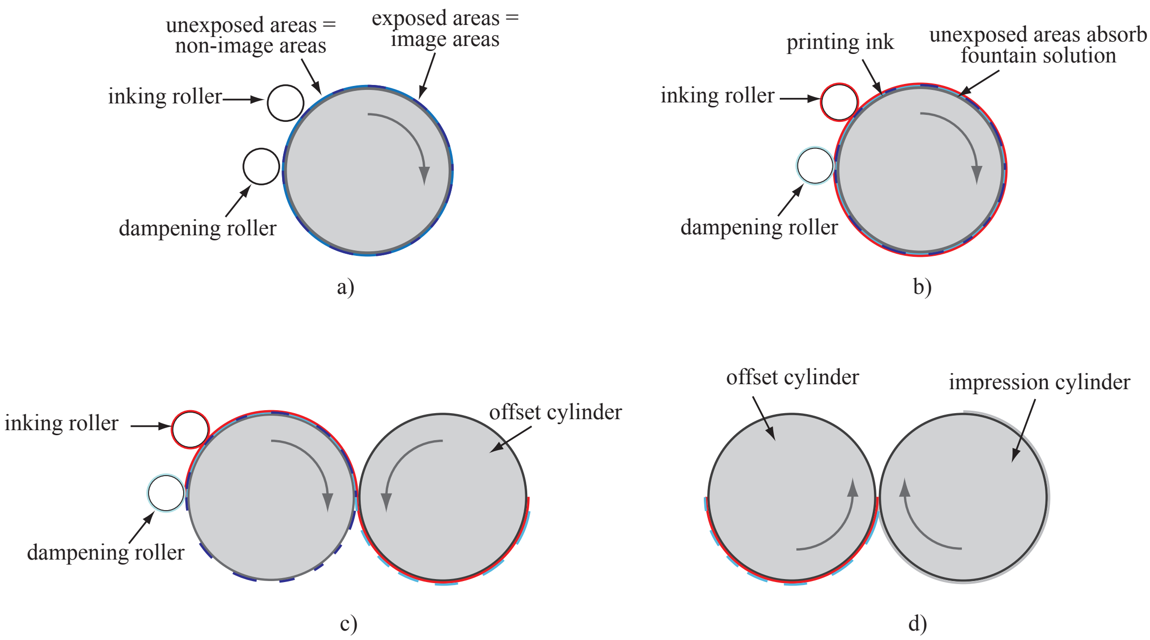


Figure 3: *Kodak Sonora XP plate printing procedure a) Printing plate is mounted on the plate cylinder, b) Fountain solution and printing ink are applied on the printing plate, c) Blanket pulls printing ink and unexposed imaging layer, d) Ink and unexposed imaging layer are transferred onto the printing substrate*

of the Kodak Thermal Direct plates (Mattison, 2013b). The coating layer is based on the particulate resin that can be removed from the non-imaged parts of the plate by printing ink, after 10th impression. During the imaging of the plate, the thermal laser writes the image, cross-linking the polymer resin to create a hardened, robust image area. The plate is then mounted on the press cylinder like any other offset plate. Figure 3 shows printing procedure of Kodak Sonora XP.

Although Kodak's ultrathin coating should eliminate fountain solution contamination issues, results provided by Kodak show that a slight change of the fountain solution's electrical conductivity occurs. (Mattison, 2013b). Kodak's particulate resin technology ensures that the coating from the non-image area is removed by the ink and transferred to press sheets without increasing make ready waste or time. The fountain solution is absorbed by the imaging layer on the non-image areas and prepares it to be physically removed. Through a purely physical interaction, the un-imaged coating is removed from the plate and transferred to the blanket from which it finally transfers onto the printing substrate as shown in Figure 3 (Digital Dots Ltd, 2014). This is a physical, rather than a chemical process, ensuring very wide latitude for press chemistry and press setup conditions, and eliminating the variability associated with traditional wet processing systems. Run length depends upon image resolution, press, and press chemistry, ink and paper conditions. For example, 20-micron stochastic screen will reduce run lengths. The run lengths go up to 200,000 impressions with heatset/commercial coldset web presses. The plate can be handled before and after imaging safely for: up to 1 hour under the white light; up to 8 hours under the C20 – UV Cut; up to 24 hours under the G-10 yellow light.

Image visibility on the plate after the imaging process is not as great as conventionally processed plates since the contrast between the imaged and non-imaged areas is low. Therefore the problem can occur because they cannot be visually controlled and measured.

Fuji Brillia HD PRO-T3

Fuji processless plate, Brillia HD PRO-T3 is the third generation of the processless plates, with the first generation coming on the market back in 2006 (Creasey, 2012) uses similar technology as Kodak's plates. Once the plate has been imaged in a platesetter, it is mounted directly on the press where the removal of the plate coating has been cleverly integrated into the start-up of the press. There is a complete elimination of the processor. The plate Brillia HD PRO-T3 is highly sensitive rated at 120 $mJcm^{-2}$.

PRO-T3 plates (Figure 4) are made up of advanced coating and micro-graining technologies: Multigrain V (MGV) technology (1), Rapid Stable Start-up (RSS) technology (2), photosensitive layer (3) and over coat layer (4).

» **Figure 4:** *Fuji Brillia PRO-T3 1. Aluminium base prepared using MultigrainV (MGV) technology, 2. Under coat layer - Rapid Stable Start-up (RSS) technology, 3. Photosensitive layer, 4. Over coat layer*

The MGV technology is a micro-graining process applied to the surface of the aluminium, guarantees the widest possible latitude in terms of ink/water balance on-press. It is a special technology in which aluminium anodic oxide film consists of three types of superimposed undulations, large in which wavelengths are in order of tens of micrometers, medium with the wavelengths in order of micrometer and small with the wavelengths of a submicrometer order (Tarawa et al, 2014).

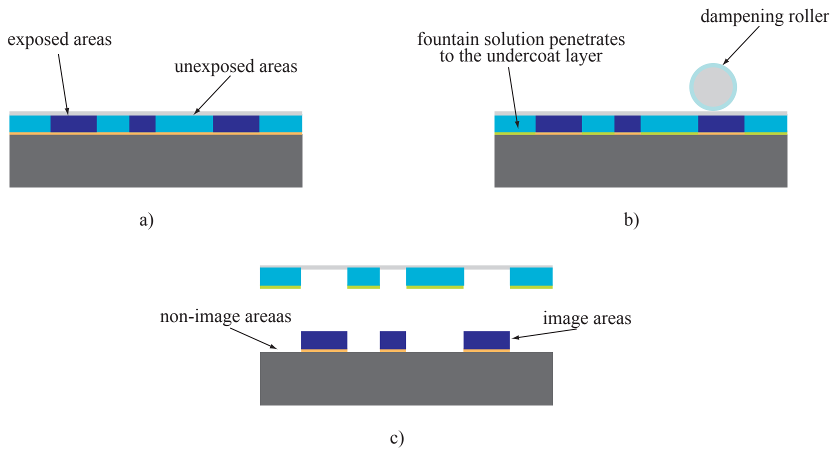


Figure 5: *Fuji Brillia PRO-T3 plate printing procedure: a) Exposed plate mounted in printing press, b) Fountain solution is applied and penetrates through unexposed photosensitive layer to the under coat and caused reduce of the coating adhesion on the aluminium base c) Removal of the coating by ink*

The second undercoat layer incorporates RSS technology that helps to release the coating from the surface of the aluminium when the ink is applied. The photosensitive layer contributes to PRO-T3's high sensitivity and productivity, using a new Fine Particle Dispersion (FPD) technology. FPD improves the rate the fount solution penetrates the coating, speeding up the on-press start-up routine and improving on-press performance. And finally, the over coat layer controls the diffusion of oxygen, ensuring optimum plate stability. The printing procedure is similar to the other processless printing plates. After the imaging, the plate is mounted on the printing press. First, the dampening system is applied to enable penetration of the fountain solution into the non-exposed (non-image) areas. Printing ink is applied next and the ink tack and shear pulls the coatings (overcoat, photosensitive coating and the undercoat (RSS)) to open the multi-grained aluminium-oxide layer.

Image visibility on those plates after the imaging process is low and as like by Kodak Sonora XP, the problem can occur because they cannot be visually controlled and measured. One of the reasons is a very faint image on the processless plate after exposing. This makes it difficult for press minders to assess the plate and stays an open problem of this plate. Fujifilm offers a solution to control the plate, but then it should be developed by hand using their plate finishing gum.

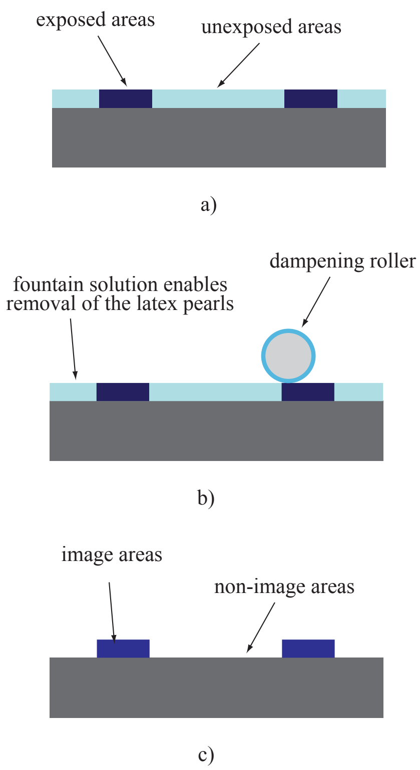
Agfa Graphics Azura TE

Agfa Graphics Azura TE plate was announced last year as a new chemistry-free direct-on-press printing plate. The Azura TE is in the same family as the Azura TS, which was the first step in reducing the bad ecological influence of the developing process. This plate is still on the market and is off-line developed in a less aggressive solutions (finishing gum). The Azura TE, opposed to printing plates mentioned above, does not have problem with image visibility thanks to its different technology. It is based to Thermochromic Dye technology which ensures easily visual inspection of the image. To ensure the possibility of measurement of the plate with standard devices, the plate should be cleaned with a damp sponge using only water.

Azura TE Plates have the sensitivity of 160 $mJcm^{-2}$ and have excellent daylight stability, if the plates cannot be mounted on the press immediately. They are compatible with all Agfa and non-Agfa platesetters, supporting up to 240 lines per inch with Sublima screening. They are suitable for commercial print, quick printing and book printing with run lengths up to 75.000 copies in standard sheet fed, and even for short run UV. Azura TE is based on the ThermoFuse TM technology, working with a single-layer water-based coating, containing ink-accepting latex pearls, small enough to deliver razor-sharp highlight reproduction.

» **Figure 6:** *The Azura TE printing plate*

During the imaging process, photosensitive coating absorbs energy from the 830nm. The latex pearls fuse to form the hydrophobic image part. They bond strongly to the grained and anodized aluminium base and form a solid ink-accepting image. By using a thermally switchable infrared dye an excellent image contrast is achieved during the imaging process. After the imaging process, the plates can be directly mounted on a press. As part of the press start-up sequence, the non-imaged areas are washed away by the action of ink and fountain solution on the press to be carried away with the first few sheets through the press (Agfagraphics, 2015b). Sellable prints are obtained after only a few copies.



» **Figure 7:** *Agfa Graphics Azura TE plate printing procedure: a) during exposure latex pearls fuse and bond to the aluminium surface, b) fountain solution enables removal of the infused latex pearls, c) latex pearls are removed by tack and shear of the printing ink*

Conclusion

Processes and materials in offset printing has over the past evolved in many aspects in order to improve quality of the printed material, shorten time of the reproduction cycle and in the near past to diminish bad ecological influence. The printing plates play a very significant role in the process and are keeping pace with the latest trends.

The processless printing plates are the latest step in reducing chemicals in the offset printing plate making procedure. This kind of offset printing plates are not entirely without developing process, they are finished in the printing press, and according to the producers, do not have significant influence on the printing process. The plate is developed in the printing press during the first few printed sheets, which are usually used to prepare the printing press. From the economical point of view, usage of these printing plates reduces costs of the processor, water and chemicals consumption. On the other hand, the poorly visible image on the imaged plate and uncertainty about the influence of the developing process on the printing press are the points against the usage of the processless printing plates.

To conclude, these printing plates are not yet widely used by the print houses as printers are not keen into changing their workflow without being sure that this will benefit them. Although there are number of papers proving the strong points about processless plates, they are usually provided by the plates' producers. With additional research of the processless printing plates behaviour in the printing press, which would be carried out by a independent research facility, and assessment of the printing quality, it is possible to expect higher market share of the processless printing plates in the near future.

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