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White Paper

"Why would I want to use my expensive press as a plate processor?

The promise of process free technology is older than digital platemaking. Its advantages are many: removing plate processors eliminates costly, time-consuming steps in platemaking, removes a major source of variation that could affect quality, and reduces environmental impact.

For years, however, printers have expressed concern about the potential for downtime if presses were used to clean out the non-image areas of a printing plate. Concerned about contamination of the fount solution or possibly material buildup on the rollers, they have asked "Why would I want to use my expensive press as a processor?"

This paper discusses the history of process free plate technology and shows how Kodak's Press Ready Technology has broken this "dirty press" paradigm, allowing printers to realize the many benefits of platemaking without a plate processor.

Process free plates are plates that do not need to go through a plate processor or clean-out unit before they are mounted on press.

The birth of process free technology: analog-UV plates

The concept of process free plates goes as far back as 1995, when 3M patented and then commercialized an analog-UV process free plate. KODAK POLYCHROME GRAPHICS DIRECTPRINT Plates, launched in 2001, were based on the same technology.

Driving these innovations were the same customer values that exist today: the desire to reduce costs, reduce time to a press-ready plate, and reduce environmental footprint. A small number of customers were prepared to accept the risks that come with any new technology, riding the wave of innovation as typical early adopters.

Unfortunately, these analog-UV plates showed fount contamination and roller build up, depending on press conditions and working practices. Many of the maintenance fears associated with process free plates stem directly from these innovative first-generation plates.

The next phase: digital thermal process free plates

When thermal digital imaging was introduced, a true process free plate was one of its early promises. Unfortunately, early low power imaging devices could not support a commercially viable process free plate. The first commercially available thermally imaged process free plate, the Agfa Thermolite Plate, was not a success. Ultimately its use was restricted to the highly-controlled environment of on-press imaging where fount choices, filtration, etc., could be carefully controlled.

Kodak R&D breakthroughs result in successful process free plates

Recognizing the value process free platemaking would bring to our customers, Kodak has invested in years of materials research and plate formulation development to break the design constraints that led to the press problems.

In 2005, Kodak launched the first commercially successful process free plate, the KODAK THERMAL DIRECT Non Process Plate. Eventually, over 2,000 sites worldwide were using this plate in daily production across a wide range of conditions: on sheetfed, heatset, and coldset presses; with integrated and non-integrated fount systems; and with alcohol founts, alcohol substitute founts, alcohol-free founts, process inks, Pantone inks, metallic inks and UV inks.

In 2012, Kodak introduced the next generation of plates which, due to expanded capabilities, made process free a reality for a larger population of printers. The KODAK SONORA XP Process Free Plate, designed for commercial and offset packaging applications, and the KODAK SONORA NEWS Process Free Plate, designed specifically for newspaper applications, took process free to a new level. In 2018, Kodak made another breakthrough with the SONORA X Plate, making process free possible for up to 80% of offset printers.

Why did Kodak succeed where others did not? Kodak succeeded by refusing to accept the assumption that a process free plate would contaminate the press.

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Kodak's Press Ready Technology Developments

Ultrathin, single-layer coating to prevent fount contamination

A fast plate technology is necessary to generate the crosslinked image areas that will both adhere to the substrate and resist press chemicals, yet still allow the non-image areas to be removed in the unique chemical and physical environment during press start-up. For the analog-UV plates the solution was a 2-layer negative working, photopolymer technology. The top layer was necessary for fast imaging but contributed directly to fount contamination problems for a couple of reasons.

Firstly, two layers meant a high coating weight. The DIRECTPRINT Plate had a total coating film weight of 1.4 g / m^2, and so there was a lot of material to remove during start-up. Secondly, the top layer resins were very hydrophilic, i.e. water-loving. During press start-up, the top layer could dissolve in the fount with the potential to disturb the fount system and cause buildup of materials on the rollers.

Kodak chemists developed proprietary materials to provide the required imaging speed within a single, ultrathin layer. At 0.9 g / m^2, the coating of SONORA Process Free Plates is 36% lower than the DIRECTPRINT Plate coating, and it does not use any of the hydrophilic resin that led to contamination.

Stress-testing fount solutions with SONORA Plates

Within Kodak's technical testing facilities, many tests are completed during the development of a new product to ensure it meets our customers' demanding requirements. In many cases, the test conditions are "stressed" to force failures that may occur under unique conditions of customer use. For our process free plates, these stress tests include cycling plates on the press and closely monitoring the press systems.

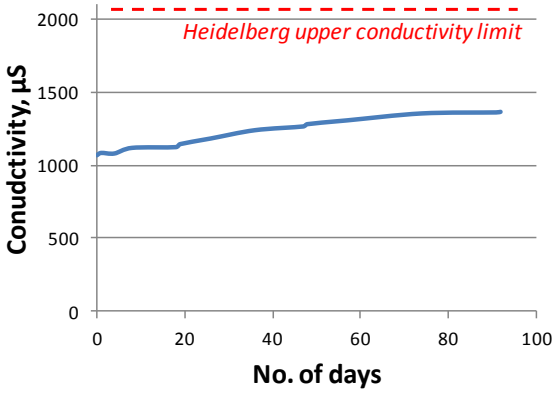
The cycling stress test for SONORA Plates was completed on a Heidelberg SM74 4-colour press. A number of conditions were set to stress the system:

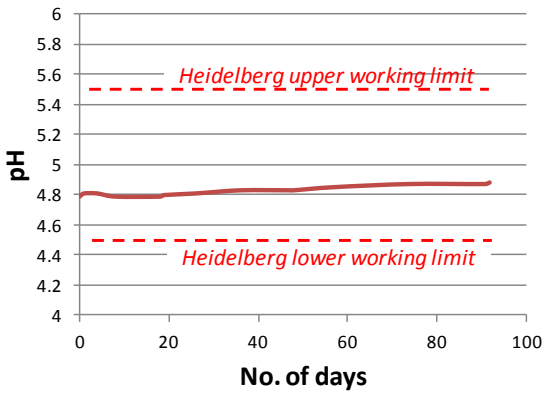
- The fount solution was not changed for 92 days, far above the recommended 14-day recommended renewal, which increased any potential contaminant concentration 6 times.
- The plates had only 10% image area, increasing the amount of non-image area to be removed from the typical 70% to 90%.
- The press was run in non-integrated mode to force potential fount contamination.

- The fount volume was reduced from 77 to 67 liters, increasing the concentration of any potential contaminant by 15%.
- The multiple runs were all short.

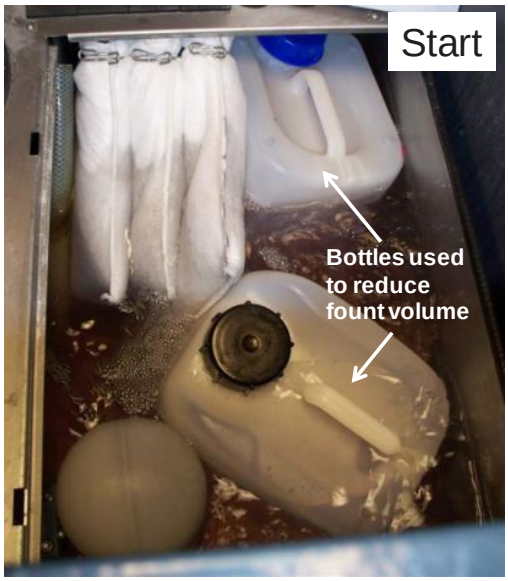
These stress conditions more than doubled the potential effects of any contamination. A total of 220 4-colour sets were completed—three to four sets every working day for 92 days.

Over the period of the test, fount conductivity increased only 300 µS—well within the 1,000 µS limit that Heidelberg recommends for a fount change. This increase is similar to the change seen with wet processed plates on the same press. The pH changed 0.1 units, well within the 0.7 unit operating range recommended by Heidelberg.





In addition, there was no unusual buildup of materials in the fount reservoir, filter bags or fount rollers.



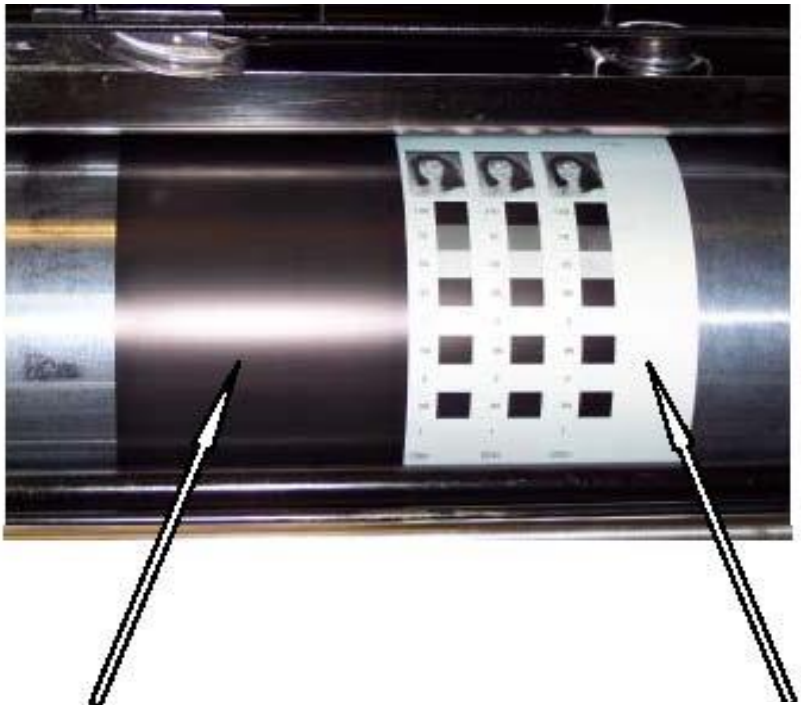
Particulate resin design to remove coating from the non-image areas

Having removed the pathway to fount contamination, Kodak had to take the next step, which was to ensure the clean removal of the coating from the non-image areas of the plate.

In a traditional wet processed plate, the coating is removed in the processor by manipulating the chemical structure of the resins and dissolving the coating with the aqueous processing chemicals. However, a process free system cannot use the aqueous fount on the press to remove the coating because the fount will become contaminated.

Kodak's scientists were able to find a new method to remove the non-image areas via the ink. The key invention was a new resin in the form of particles.

The image below shows the dramatic effect of particulate resin design after make-ready. On the left is the makeready of a plate with the resin homogeneously dispersed in the coating. On the right is the makeready of a plate with the same resin in particulate form. During start-up, the aqueous fount did not remove either coating, demonstrating that the coating was not being removed by the fount. Then, during the roll-up the ink has removed the non-image area only of the particulate resin plate, the plates are pictured below after the 10th impression.



Distributed

Particulate

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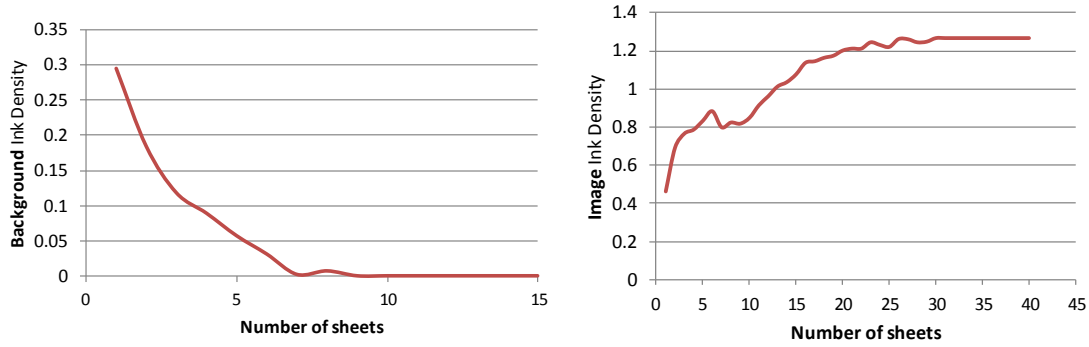
A look at the makeready sheets of a typical SONORA XP Plate start-up illustrates where the non-image area coating goes. The background density on the first sheet is not zero, as you would expect from a wet processed plate, but instead shows the result of the ink transferring the coating from plate to blanket to paper. The background ink density reduces to a clean background, indicating that all the non-image area coating has been removed from the plate, *before* maximum ink density is achieved and makeready is complete.



Overview of the Image Preparation Process

The clean out of SONORA Plates utilises the combined elements of the offset printing process, in that the coating in the non-image areas is removed by the tack of the ink after the coating has been prepared by a small amount of fount solution.

Step 1	After the plates are mounted on press, during the normal pre-dampening process, the fountain solution swells the coating. To prevent removal of the coating, the pre-damp ***must*** be kept to a minimum.
Step 2	When the inking rollers are engaged, the non-image area coating is “stripped” from the plate by the tack and shear of the ink. This process is physical, rather than chemical, ensuring a very wide latitude for press chemistry and press setup conditions. Note that the background on the plate is clean almost immediately—some customers are surprised when they see the clean background and make the **incorrect** assumption that the coating has been dissolved by the fountain solution and is now in the fountain system.
Step 3	As the paper feed is engaged, the coating is carried away, with the ink, on the substrate. Typically, within the first few sheets the ink has carried away all the coating.
Step 4	Registration and colour are then adjusted like with any other plate.

The Question of Press Contamination

Before considering SONORA Plates specifically, it is worth noting that there are many components in the offset printing process that *could* be considered as contaminants, but which only become problematic *if the levels are excessive or uncontrolled*. Potential contaminants often include a combination of components from the paper (fibres, sizing, fillers, etc.), the ink (pigments, oils, thinners, etc.), the press (cleaners, spray powder, etc.) and even the gum from the plate.

Thousands of printers using many different presses, fountain solutions, inks and substrates use SONORA Plates successfully. However, some printers have tried to "improve" the image preparation process by changing their press settings, and this practice could cause problems.

Printers that don't understand how the image is prepared on SONORA Plates sometimes think that they need to increase the pre-damp to "develop" the plate on press, particularly if these printers have had experience with inferior process-free plates. However, excessive pre-dampening can cause contamination of the fountain system. After a proper level of pre-dampening, the coating is still on the plate.

Transfer of the Coating with the Ink to the Substrate

So, if not into the fount, then where does the coating go? The answer is that the coating is stripped from the plate by the ink and transferred, along with the ink, to the blanket and then onto the press sheets. Because the coating of SONORA Plates is ultra-thin, this transfer occurs very quickly, in the first few make-ready sheets.

Because of improvements to the plate technology, the background on SONORA Plates is usually clean almost immediately after the ink is applied. Some customers have become concerned after seeing how quickly the background is clean, and they ask if there could be problems from ink contamination. There have been *no reported complaints* of ink contamination, so it is fair to say that ink contamination is not a problem for the customer.

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Delivering on the promise of process free

With Kodak's Press Ready Technology, the problem of press contamination has been resolved. Ultrathin coatings have eliminated fount contamination issues, and 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 makeready waste or time.

The worldwide acceptance of KODAK SONORA Process Free Plates confirms that Kodak's Press Ready Technology has overcome the issues of previous generations of process free plates. So rather than ask "Why would I want to use my expensive press as a processor?" printers should be asking themselves "Why would I want to continue to waste time, money, and environmental resources on an unnecessary plate processor?"

About Kodak

Eastman Kodak Company is driving innovation and change for customers in commercial, packaging and functional printing, and enterprise services markets with one of the broadest portfolios of technologies, products, and services in the graphic communications and commercial printing markets. Solutions from Kodak offer exceptional quality, streamlined production, and scalability to grow with our customers' businesses, and only Kodak provides digital and conventional solutions within a unified workflow. We are a worldwide team that performs with excellence, works with customers to help them succeed, and brings innovative solutions to market. For more information, visit graphics.kodak.com.