

Computer-to-Screen Update

Explore the direction that computer-to-screen imaging is taking and how you can best take advantage of it in your operation.

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As I write this, I am on way my home from the FESPA 2005 show in Munich. In my opinion, this was one of the best shows in a long time. Visitor traffic was strong, and there was a very positive buying atmosphere. Almost all the stands I visited were swamped, and it was difficult to get attention and time of manufacturer representatives. Be that as it may, there were a number of new developments and some significant improvements in technology. Among the most impressive were advances made in computer-to-screen (CTS) imaging, which I'd like to address in this month's column.

For the sake of perspective, the offset lithography community has been well into the transition to computer-to-plate (CTP) technology for a number of years now. Initially the cost was in the \$500,000 range for a 28 x 40-in. platemaking system. Several systems have been introduced in the past year that bring the cost of the technology below \$30,000, which makes CTP a viable and natural extension of the digital workflow. These new entries, and the competition they bring, have prompted companies like Agfa and Linotype to no longer make film-based imagesetters. This has direct repercussions for those of us in the screen-printing industry.

While CTP is a known fact of life in the litho industry, some may question whether CTS is ready for prime time in the screen-printing industry. After reviewing the CTS offerings from 15 companies that exhibited at FESPA, I would say maybe. We are certainly approaching the tipping point where it will become a common reality in screen printing, and there are several key reasons why we can expect this to happen.

The first reason is that imaging systems are quickly getting better. I will go into much more detail about the main types of imaging engines shortly. Both the speed and resolution of the heads are improving. There were systems on display at FESPA that offered resolutions from 600 to more than 2500 dpi. Many of today's CTS systems have a decided resolution advantage over conventional film-based stencilmaking, and even apparently low-resolution CTS devices are delivering excellent, high-quality images.

At the core of CTS technology is some type of digitally controlled head that images directly onto unexposed emulsion. Some systems are inkjet based and print the positive image directly onto the coated screen. With these systems, as the head density increases, costs drop, and reliability improves, the economy of the technology becomes very attractive. The alternative to inkjet-based

systems—units that use digital light processors to directly expose image on screens—also are delivering greater economy.

Another reason why we can expect CTS to gain more momentum in screens shops is that the digital workflow can provide as few as four steps from finished design to image on the screen, whereas an analog film workflow typically has 14-16 steps, along with the associated transport time and the requirement to store large volumes of film for long durations. The analog approach can compromise the image and job integrity as film degrades in storage or becomes lost or damaged over time.

The final reason why CTS is likely to become more popular is that the price of plotter technology is dropping quickly and its reliability is improving. As more and more digital flatbed plotters appear, in any configuration, we can expect to see further reductions in CTS equipment price.

Main technologies

Head technology falls into three main categories. These are inkjet, digital micromirror devices (DMD), and violet-blue diode laser. I've presented each of these here in terms of the relative investment, from least to greatest.

Inkjet systems The first commercially available CTS systems were all inkjet based. There were two configurations: direct opaque ink and opaque thermal wax. Currently there are multiple systems using conventional ink, employing Epson heads, and offering resolutions in the range of 720-1440 dpi. This is certainly adequate for most screen-printing jobs, especially large-format work meant for viewing distances that are greater than a couple of feet. Plotting speed on these systems is improving, but it is still not as fast as conventional laser-imageset film. Costs for the conventional ink CTS systems range from about \$60,000 to almost \$200,000 depending on the screen size supported by the device.

The JetScreen wax inkjet system from Lüscher was one of the first on the market several years ago. At that time, a medium- to large-format system cost in the neighborhood of \$350,000. Today, these systems are technologically mature and proven with a solid installed base of almost 300 units worldwide. The wax is water soluble and comes as a tablet that is melted and jetted through the system's printheads. The hot wax solidifies on contact with the coated screen, delivering an exceptionally sharp halftone dot at relatively low resolutions. The Lüscher CTS systems are based on Spectra inkjet heads, and they are available in 600, 900, and 1000-dpi units.

Lüscher produces and markets a version of their device for large-format graphics, and the company also has licensed the patents to KIWO for a textile version. The 600-dpi iJet has a list price of \$75,000 and supports screens with

frames up to 25 x 36-in. The speed is impressive, and the image quality is very good. What is significant about the KIWO version is that KIWO has abandoned an older, more technologically challenged head vendor for one with proven reliability. The fact that the plotters are being built by one of the most well known prepress suppliers in the litho industry makes the iJet a solid entry in the field of CTS equipment.

DMD systems The natural extension to inkjet is a more advanced technology that relies on digital micromirror device chips. Texas Instruments is the largest supplier of these special chips. Each chip surface is composed of 800,000-1.3 million individually controllable micromirrors. The LCD projector market is the primary target for these devices. Almost 6 million of these projectors are in circulation, and the technology is mature and working very well. DMDs support output resolutions of 1270, 1800, or 2540 dpi. In CTS systems, they work by reflecting UV light from a conventional metal-halide lamp directly onto the emulsion surface. The mirrors act as pixels and switch on and off to either direct the light to the emulsion or deflect it away.

The DMD is housed in a plotter head along with the UV lamp. There are two different approaches to moving the head. In KIWO's ScreenSetter, the head is stamped across the screen surface. With a repeatability of ± 2 microns, there is virtually no visible overlap in the image mosaic. This configuration of the DMD approach starts in the \$190,000 range and goes up based on size.

Two other manufacturers also showed DMD technology. They were CST (Colour Scanner Technology) and Signtronic. Signtronic would not reveal its approach to head imaging specifically, but the company did indicate that it's not using the Texas Instruments chip.

CST introduced what it calls a data scroll. The best way to consider the approach is to think about the news banner in Times Square, in which the headlines scroll around the building. In the CST model, the data are scrolled in synchronization with the head plot. This makes for very quick imaging. CST reports imaging speeds in the range of 215 sq ft/hr. Signtronic reports top speeds of 280 sq ft/hr.

Image resolutions are selectable on the CST machines and range from 500-1500 dpi. The Signtronic machine is fixed at 1270 dpi. Generally speaking, the lower the resolution, the faster the imaging speed.

Laser systems The final category of CTS system are devices that use violet-blue laser technology. SaatiPrint and Kammann Machines both have systems based on this technology that are designed primarily for the CD market. Saati is also working on a version for garment printers. The violet-blue laser is relatively new technology. The first commercial diode was made by Nichia of Japan and was released in Sept. 1999 in a 5-mW version. This is really low power and not applicable for any kind of imaging. Thankfully, development has been very rapid,

and the technology is now a growing and maturing segment of the market. This same laser technology also is used extensively in the production and reading of consumer DVDs.

Direct-to-screen laser exposure units use the Sanyo violet-blue solid-state diode laser with output at 405 nm and power around 50 mW. These diode lasers have an estimated life of 10,000 hours, far in excess of any exposure lamp currently on the market.

Resolution is stated a 2540 dpi for the Saati machine and 1200 dpi for the Kammann model. Production speed per hour was not specified. Since power density is an issue, I would not expect this to be the fastest solution, although it has the potential to be the highest in terms of print quality.

Proper exposure on laser CTS systems comes from a combination of a correctly balanced UV-light frequency and adequate depth of cure. That's why SaatiChem formulated a special high-speed photopolymer capillary film to maximize the potential of this technology. This new film delivers a fast exposure and low Rz stencil surface that is ideal for printing on CDs.

It should be noted that the two main approaches to direct to plate in the litho industry are violet laser and thermal. Since thermal is not an option for us, violet laser is a logical extension. This relatively young technology was an elusive area for laser designers. But ever since Nichia eliminated the barriers in 1999, blue and violet-blue lasers have become increasingly common. Development continues, and diode laser power ratings are approaching more than 100 mW today. Pricing on the violet laser systems was not readily available, but it is estimated to be comparable to the costs of the DMD devices.

Summing up CTS today

So where do we stand? After looking at all of the offerings and sorting through the usual marketing vs. reality issues, inkjet-based CTS technology is clearly viable for medium to large operations, especially for graphics screen printers. Having carefully examined screens that were exposed with both conventional and wax, I lean toward the wax systems. However, in the long run, the future is with DMD. Resolution is higher, speed is getting very good, and cost will continue to go down.

Back in 1991, I bought my first laser imagesetter. It produced positive images up to 15.7 x 22 in. and cost \$125,000. Today, we can pick up great used imagesetters like that for \$3000, often with a RIP and processor included. When we look at inkjet CTS technology in the \$50,000-75,000 range, the elimination of chemicals, and the reduction in film consumption, the economics clearly point to this technology for any shop that produces 25-40 screens or more per day.

I believe that more screen printers will add CTS systems to their prepress departments as the technology grows and the costs shrink. If the developments continue as they are, there may soon be a CTS solution to fit any budget.