The Digital Revolution—Hi Tech P2

By Sherry Davis
Pollution Prevention Institute

The printing industry has been greatly affected by increasing technological advances in electronic imaging and its capabilities. The digital revolution has changed the jobs of many graphic artists and prepress operators in the printing industry. The term digital technology actually represents two areas of technology substitution for traditional prepress processes used in printing—although both involve imaging processes. The first area is that of photoprocessing and copy work; the second area involves production or substitution of the image transfer system—in lithography this is called computer-to-plate and in screen printing direct-to-substrate (DTS).

Although the screen printing industry has been slow to adopt digital technologies, direct-to-substrate (DTS) screen printing has been used in the textiles industry for about 20 years. As a result of recent technological developments, however, digitalization of the prepress process to the point of producing a digitally generated positive for imaging the screen is currently within reach of the average screen printer, both technically and economically.

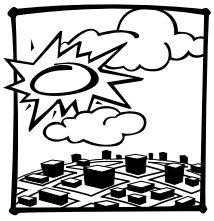
Screen printing begins with either a hard copy or computer file of art work, text, or other image. The images are transferred to film using graphic arts photography. The film is developed and a proof is made for the customer to review. An image positive is then used to make a stencil for transfer to the screen. The stencil allows ink flow-through where the image is. Separate stencils are made for each color in the image.

The Digital Revolution

For screen printers, adoption of digital technologies is seen mostly in the prepress area, involving generation of the proof and the positives for image transfer to the substrate. The positives are then printed on the stencil material, usually a vellum substrate, which transfers the image to the screen.

The components of a digital imaging system may be either separate devices or processing steps within a computer system. They are discussed in their conventional order of use and include the following:

- Acquisition image processing—the process of "getting" the image into the computer system and altering the appearance of an image; may involve a scanner, image setter, or a digital camera.
- Compression—the ability of the computer to compress information in the image file to reduce the number of bits that must be stored or transmitted.
- File formatting and storage—the mechanism should be flexible, powerful, able to accommodate a wide range of image formats and compression techniques, nonproprietary and widely supported by computer software applications.
- Display—currently, two technologies dominate the display of color images—shadow-mask cathode ray tubes (CRTs) and liquid crystal displays (LCDs).
- Printing—systems can be categorized into two types:



1) those that are able to control the density of ink deposited at each ink dot; and
2) those that can produce ink dots only of a consistent size and density but that can change the frequency of occurrence of the dots.
The first category can be termed continuous-tone printers, the second, half-toning printers.

Some of the problems shops encounter when going digital is software compatibility, resolution of the digitally created positives, compatible printer and stencil substrates to generate adequate image density, and limited size formatting. However, many of these technology limitations are quickly disappearing as equipment manufacturers improve their products.

Hi-Tech P2

Pollution prevention advantages offered by digital prepress capabilities are varied depending on the company's state of transition to the digital system. The following benefits are associated with digital prepress technology adoption:

- Reduce or eliminate the cost and storage of chemicals, and reduce labor involved in the photo-developing processes.
- Reduce or eliminate silver-bearing hazardous waste from spent fixer solutions and waste film—for screen printers this reduction in their hazardous waste generation rate could mean a change in generator status and record keeping requirements.
- Reduce hazardous waste costs associated with waste fixer. For companies generating five gallons of silver-rich fixer per week, that could represent a yearly savings of about $1000/per year, if the fixer was previously disposed as a hazardous waste.
- Reduce labor associated with photo-developing processes; many shops have been able to reduce staffing requirements.
- Reduce turn-around time to generate "soft proofs" for customer approval.
- Potentially greater productivity; digitally produced positives can be made in a fraction of the time required to produce hand-cut positives.
- Graphic flexibility for quick, painless text and design changes without costly re-makes of proofs.

Case Study

A large graphic arts printer produces 396 gallons of spent fixer a month. The company installed an electrolytic silver recovery unit and two metallic replacement canisters downstream of their photoprocessor. Total unit cost was $4790. The company achieved a 90% recovery of silver from their fixer and wastewater from the photo-processing department. Although it cost the company $1,250 to operate and maintain the equipment yearly, it generated an income of $9,980 on the recovered silver, which resulted in a net gain of $8,730 the first year. The company was also able to achieve the wastewater effluent standards required by the local POTW.

Resources

http://www.sgia.org/index.cfm (Screenprinting and Graphic Imaging International Assn.; for technical assistance call 1-888-385-3588)

http://www.rlg.org/visguides/visguide3.html#components (from Digital Federation Library: *Imaging Systems: The Range of Factors Affecting Image Quality*)

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