PaperWise™

Smurfit-Stone
Board Sales Division

*Your Paperboard Solutions Company*

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# What is Digital Printing?

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Over the last 10 years, the hype over digital printing has fluctuated between near euphoria over the possibilities and dismay over the impracticality of the process. With the recent advancements in inkjet printing technologies, digital printing has re-emerged as a viable alternative to conventional printing methods. To understand the potential of this technology, it's important to know the terminology, as well as understand the idea that digital printing describes various methods of transferring an image. But, many of the digital print technologies are not suitable for printing on corrugated. Corrugated package printing does not always provide a nice smooth, flat surface for printing. Inkjet (digital) printing, however, has proven to be the most versatile and effective method of digital printing for the packaging market. So, back to the original question, what is digital printing and why all the hype?

## Background

Digital printing is best described as a computer-controlled method of transferring an image. Inkjet printing is a non-contact method of digital printing, in which ink droplets are sprayed in a very controlled pattern to reproduce an image.

Inkjet printers are everywhere. You may even have one sitting in your office or in your home. However, inkjet printers for the packaging market are much larger and are called **wide format flatbed printers**, which provide a print area over 60 inches wide. The ability to print a larger area was one of the critical factors for this technology to break into the corrugated packaging market. The printheads used on these wide format printers is probably the most significant leap forward for this technology.

## Benefits of Digital Printing

Digital printing provides numerous benefits for packaging and consumer products companies:

- Each individual package can be customized. This allows consumer product companies to begin truly moving toward individualized marketing without the significant costs associated with the conventional printing processes.
- There is the potential to move even closer to just-in-time inventory.
- The process drastically shortens the lead time to get new products to market for promotional releases, while providing a considerable cost savings.
- It provides higher graphics resolution, allowing truer product representation on the package.

## Print Heads

There are several types of inkjet printheads on the market such as continuous flow inkjet, thermal inkjet or bubble-jet, and piezo drop-on-demand (DOD). Of these, piezo printhead technology has had the most significant impact on advancements in digital printing for packaging. It offers several different methods of ink delivery to the substrate, so let's begin with the basics.

Piezo DOD printheads use piezoelectric crystals that make up the walls of an ink chamber within the printhead (Image 1A). Each ink chamber carries a given amount of ink and when these piezo crystals are electrically charged, they deflect or change dimension (Image 1B). This deflection creates pressure in the ink chamber that causes

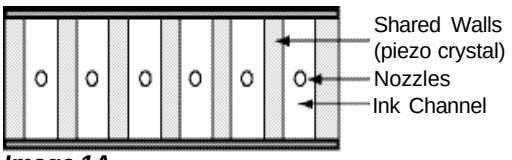


***Image 1A***

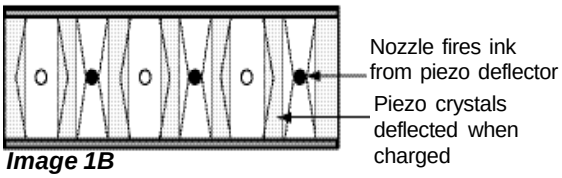


***Image 1B***

the ink to eject from the chamber, through a nozzle and onto the substrate (Image 2). Piezo printheads can have up to 512 nozzles per head and take up a 2" X 4" area. The computer tells each printhead whether or not to perform the operation described above, over every inch of the substrate. The four printheads per color, with four to six colors per machine, all fire simultaneously. The complexity

of this process requires a great deal of computing power, but the printing speed of these presses is similar to that of a big desktop printer. Advancements in computer technology, along with previously mentioned advancements in printheads and increased image area have helped to increase the viability of this equipment for package printing.

***Image 2***

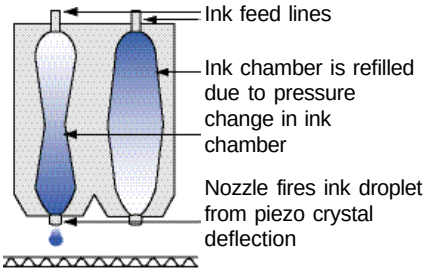


**Image is intended to provide a general illustration of the function of a piezo electric printhead.*

## Ink Options

Ink options for inkjet printers range from conventional water-based inks to water-based ultraviolet (UV) inks. When printing on corrugated substrates, ink is partially absorbed by the paper. Standard water-based inks for piezo printheads can not provide enough ink to the surface of the substrate to achieve acceptable color strength, so these inks require a pretreated substrate. The digital pre-treatment process allows the ink to remain on the surface of the substrate which improves color strength. Without this coating, colors appear washed out. Substrates can be pre-treated on press utilizing a spray attachment, but this slows down the press throughput. You can also purchase roll stock that has been pre-treated. While pre-treated substrates are a viable option, printers need to be aware that only a few linerboards have been approved for the pretreatment process. This should not pose a problem unless you are using two different printing processes on the same job. For example, if you produce a display base with one substrate using conventional flexo printing and produce the display header with a different pre-treated substrate using a digital printing process, then the display may not have the consistent look desired.

Recently, water-based UV-curable inks were introduced to the digital inkjet market. These inks can print on any substrate from Kraft paper to clay coated paper and do not require a pretreated surface. The UV inks are applied just like conventional water-based ink, but a UV lamp is passed over the printed area, to polymerize or harden the ink.

Another type of UV ink is now available that solidifies or sets up when the ink is applied to the substrate. The ink setting prevents multiple ink droplets from running together before being cured with the UV lamps. This area of UV digital printing may hold more promise for digital printing in the packaging market since UV inks print on any material. This resolves any substrate compatibility issues that can occur between the flexographic and digital printing.

UV printing typically provides more saturated colors, and the image can be printed using a broader color gamut than typical flexo process. To balance this color variation, press operators need to embrace the process of color management. The corrugated flexo presses and the digital presses used by a packaging company will have to be profiled regularly to be certain that a package being printed digitally doesn't drastically surpass a similar image being printed in flexo.

## Substrates Certified for Digital Printing

While only a few substrates have been officially certified as "Digital Approved", linerboard manufacturers, such as Smurfit-Stone have taken an active role in moving this process forward. Substrate manufacturers, box plants and digital print suppliers are evaluating liners for both U.V. and pretreated applications. In fact, several Smurfit-Stone liners have already been used successfully on digital printing jobs. However, advancements in digital print methods are quickly progressing, so this requires a broad evaluation of the technologies, their potential and the substrate's role in the process.

## Conclusion

While the potential for digital printing looks good for the packaging industry, there are still many variables of the process that have to be worked through over the next several years. New developments in digital printing have reached a point that the process limitations are being overcome much more quickly, and with rapid advancements being made in computer technology, it should only be a matter of a time before the impact is felt in our industry. Improving the chances for this technology are the new players that are beginning to funnel money into the development process. As consumer products companies begin to drive the interest in this area, packaging companies have to learn to integrate digital printing to deliver a more complete package of solutions to their customers. *Paperwise* will continue to watch this new technology and will keep our readers abreast of new developments as they emerge.

*If you would like more information on digital printing or other technical topics, contact your Smurfit-Stone Sales Manager or call us toll free at 1-877-785-7835 or e-mail us at* ***paperwise@smurfit.com***