

An Integrated Digital Printing and Finishing Solution for the Label Market

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Abstract

For digital printing to be successful in the label market, the technology needs to include all the converting flexibility for which narrow web in-line presses are well known. The technology needs to be truly integrated into converting equipment that the label industry currently uses. It needs to have the capability to lay down spot colors and varnishes, diecut, strip the waste, foil stamp, etc. A successful solution will treat digital printing just like another printing process – and not have to run many off-line operations to finish converting the label. The key is to provide digital printing as added flexibility on current converting equipment, allowing it to print an even wider variety of labels. Thus eliminating the investment of off-line technology to provide the low-cost answer to short runs and variable information.

Inkjet systems use an array of heads to spray UV curable inks exactly where needed – directly onto the web. Since there is no contact with the web, inkjet systems can print on virtually any substrate – even very thermally sensitive or lightweight filmic materials. There are few moving parts, so there is very little maintenance and calibration required. Using an industrially designed inkjet printing system as an additional process on an in-line press gives great flexibility for the label producer. It allows them to diecut, foil stamp, sheet or rewind – all in-line. These capabilities really enhance the narrow web concept of digital printing.

Introduction – Digital Printing in the Narrow Web Label Market

Digital print capabilities have been emerging within the narrow web label market and Mark Andy has been investigating them for many years. We have seen several technologies introduced over the last couple of years that appear interesting and appealing on the surface, but through our diligence, we have found that some are not really suited for the label market.

After spending a lot of time investigating the various digital printing systems, we now have a technology under development that is particularly tailored to the special requirements of label printers. We have partnered with Barco to develop an ink jet printing system. Barco brings lots of experience with the pre-press and front end of the industry, and Mark Andy brings the ability to integrate the printing technology into a working system that can produce labels.

Philosophy – Our Vision of Digital Printing

Our philosophy over the last several years has been to research the various emerging technologies and find one that most closely supports the label market. Mark Andy has taken a cautious, responsible approach with regard to a digital printing solution. Our customers trust us, and expect us to incorporate a digital printing technology that will allow them to be successful.

We have seen other companies introduce technologies without really understanding what it takes to produce labels. They have taken what is designed primarily for the commercial printing markets and tried to transfer it to the label markets. They have touted that their technology will “revolutionize” the industry and completely replace flexo printing. With all this hype, we have seen digital printing develop very slowly in the label markets – and for good reasons.

Mark Andy believes that digital printing does indeed have a place in label printing. It can be used effectively for very short run jobs. It can save money in eliminating the process of making a printing plate and reduce the amount of time to turn around a job. It can also be used for printing variable information or personalization, however this is a market that still really needs to be developed.

But there are particular needs that a digital printing solution has to meet, for digital printing to be successful in the label market. It needs to be a system that is easy to use and requires very little maintenance. It really needs to be industrially designed. We feel that label printers are going to have the normal press person operate this equipment, so it needs to be similar to the equipment he or she currently operates. It is not realistic in the label printing environment to require a high amount of regularly scheduled maintenance and the operators will not be expert pre-press or computer repair people.

Lastly, we believe that for digital printing to be successful in the label market, the technology needs to include all the converting flexibility for which narrow web in-line presses are well known. The digital printing technology needs to be truly integrated into converting equipment that the label industry uses. It needs to have the capability to lay down spot colors and varnishes, diecut, strip the waste, foil stamp, etc. We will be successful when we treat digital printing just like another printing process – and not have to run many off-line operations to finish converting the label. The key is to provide digital as added flexibility on current converting

equipment, allowing it to print an even wider variety of labels. Thus eliminating the investment of off-line technology to provide, what is perceived as, the low-cost answer to short runs and variable information.

Why Ink Jet?

The ink jet technology Barco and Mark Andy are developing eliminates all the problems inherent with toner based technologies. Problems exist in toner based systems, such as the fact that the equipment is too large to be integrated into an existing press. Other issues include toner drums that can be messy, cumbersome daily maintenance, slower speeds when printing multiple colors and limited paper stock flexibility.

Ink jet uses an array of ink jet heads to spray the UV curable inks exactly where needed – directly on the web. The array can be configured to print in any width, and in up to six colors. The system as we now have it can print four colors at up to 70 fpm, without effecting web tension at all. We plan to introduce two more colors soon – an orange and a green – to allow a hexachrome screening.

Since there is no contact with the web, it can print on virtually any substrate – even very thermally sensitive materials. There are few moving parts, so there is very little maintenance and calibration required. When the heads need replacing, the operator simply removes the old one, snaps another one in place, and sends the old head back – the price of the heads is included in with the ink as a consumable.

Other advantages include the fact that since the inks are UV curable, they are light-fast and won't fade. They are also easy to cleanup, and won't dry in the heads. Because the inks are less costly to manufacture than the toner systems, it translates into reduced operating and consumable costs.

Ink Jet Technology Details

In partnership with Barco, the ink jet technology we are using is a piezo electric "drop-on-demand" system. The key point here is that the ink only prints where it is needed. There is no wasted ink. By comparison, with a continuous inkjet system, the ink is constantly flowing, and the ink that is not needed is just wasted.

The Xaar technology ink jet head is capable of outputting 360 dpi with 8 levels of grayscale. They accomplish this grayscale by jetting between zero and seven "droplets" that combine into one drop – before it hits the web. This ability to vary the size of the dot gives an apparent resolution that is equivalent to 1080 dpi.

Each of these ink jet heads is 70 mm wide. We take these 70 mm wide heads and electronically stitch them together to make the image wider. We are currently targeting a 320 mm wide total print width, using 5 ink jet heads per color. These "color bars" are very easy to take out of the printer for head replacement and fit back into a precisely machined fixture to assure proper alignment.

Once the ink is applied to the substrate, it is cured using a UV lamp. The web wraps around a chill drum to cool the web, so too much heat on the substrate is not an issue.

At regular intervals, the ink jet nozzles need to be purged and cleaned to prevent any blocking by ink or dust particles. This is accomplished automatically with a device that precisely wipes the face of the ink jet head. After only a few minutes, the operator is ready for production again. This is virtually the only regular maintenance required.

Integration

One of the best features of this ink jet system is that it is a much smaller package than other technologies. It can be mounted into an existing narrow web in-line press. The advantage this gives is that we can still have all the various converting capabilities that label printers are used to - along with the digital printing capabilities.

The ink jet head rack can be simply designed onto an extension in the middle of a flexo press. This gives the ability to flexo print a spot color or maybe a white background first, then ink jet print, then print another spot color or varnish. We can also diecut, foil stamp, sheet or rewind – all in-line.

These capabilities really enhance the narrow web concept of digital printing. Mark Andy is prepared to supply an industrial printing press with digital printing using ink jet as just one more innovative process for the narrow web converter.

Existing Technologies

Some units use a dry toner based technology. They have five photoconductive drums that are activated by an LED array to accept the toner particles where required. Each drum prints a different color toner and transfers the toner to the web. Once all the colors are on the web, the toner is fused to the web.

The systems can print up to 600 dpi with variable dot density. Exact settings are imperative for consistently good quality. Because it uses electrical charges to hold the toner on the web until it can be fused, the system is highly dependent on the web being the proper consistency - in terms of moisture content, thickness, and any other quality that would effect the electrical conductivity of the web. The web is limited to a certain width and thickness, and can not be a material that won't conduct electricity. In addition to these limitations, a toner unit takes a lot of regular daily maintenance and upkeep.

Other systems available use toner mixed with a liquid carrier, and spray it onto a photoconductive drum. Each color sprays a layer of charged liquid toner onto it's own drum then cleans off the excess where the drum has not been activated. Once the drum has the proper ink laydown, each one transfers the ink to a single rubber offset cylinder. Once all four colors are on the offset cylinder, it transfers the ink onto the web.

One disadvantage to this system is that no matter how much copy is on the label, the same amount of ink is consumed, which can be costly for minimal coverage jobs. Another is that to print four colors, the web has to stop while all four colors get sequentially transferred onto the offset cylinder. The system can print fast when only printing one color, but slows down dramatically when printing multiple colors. The substrates the liquid toner is applied to have to be pre-coated to get the ink to adhere properly. This requires an additional operation, or buying a pre-coated stock that can be very expensive.

The toner style units print good quality. The limitations of substrate, high maintenance, and especially the inability to integrate them easily into label finishing equipment, make them unsuitable for the label markets.

As stated earlier, each of these existing technologies are very complex and require a large amount of consumables and usage parts.

Future Developments

As ideal as the Mark Andy / Barco ink jet system sounds, it is still under development. We are well on our way to perfecting the digital system and the UV inks to get the quality label printers demand. We are also in the process of developing a better method to clean and maintain the ink jet heads. Refined plans and designs are in progress now, and we are projecting to have equipment ready to sell by mid year, 2001.

The next few years hold even more promise. The inks will continue to be developed, and the prices will become more competitive. The ink jet heads will become better quality, and their prices will reduce. Development is already taking place to improve the speed at which the heads can print.

Mark Andy is committed to the future of digital ink jet and the narrow web market and will continue to pursue the optimal system to support today's converter.

Summary

Digital printing has been discussed and watched for several years now. Mark Andy has taken the responsible and prudent approach to finding a technology that will provide a feasible and realistic digital option to our customers. Our new partnership with Barco will produce an ink jet printing system that has all the qualities our customers require. This system will provide a quality product, while giving the converting flexibility that label producers need.

Biography

Ken Daming has been with Mark Andy for 15 years in various position, including design engineer, service manager, and custom equipment business manager. His education includes an Engineering degree and an MBA. He is currently Mark Andy's Product Manger for digital printing.