Hybrid & Digital
Evolution of Printing Machines

Will drupa 2008 be the inkjet drupa? The main message is that inkjet has arrived as a technology for opening up new applications for digital printing, particularly in the industrial printing area.

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Drupa 2008 will be the fourth drupa event in which digital printing has been one of the major technologies shown. From one drupa to the next, we have seen significant developments that move forward both the state-of-the-art of digital printing and customers' perceptions of what digital printing can do for them. At drupa 1995, despite the tremendous innovations of both Indigo and Xeikon, digital printing for most printers was not a relevant technology and few printers took it seriously. In fact, they took the concept of DI (direct imaging) printing with on-the-press CTP far more seriously at that time.

At drupa 2000, the arrival of the Xerox Docucolor 2000 series changed the perception of digital printing in the eyes of many printers and really started the move of digital printing into many offset houses. At drupa 2004 printers' concerns about quality were largely dissipated with the quality being shown from HP Indigo, Kodak Nexpress and Xerox iGen3. Océ also indicated its way to the future with its Variostream 9210 monochrome printer as its future platform to grow into a four-color continuous feed printer.

In the inkjet area, the speed of the Kodak Versamark indicated likely developments for the future. Agfa's Dotrix continuous feed inkjet printer showed the opportunity of moving inkjet into the flexo markets previously not covered by digital printing and also showed how UV curable inks could open up new opportunities for inkjet printing.

Perhaps the most interesting product at drupa 2004 that showed how the technology could change the future market was the Riso HC5000 inkjet printer. This amazing product was the fastest sheetfed color digital printer at the show as well as being one of the cheapest.

It has already been said that drupa 2008 will be the "inkjet drupa." Up to now inkjet printing has had a major impact in the wide- and superwide-format areas, taking work predominantly from screen-printing. In this market companies like VUTEk, HP Scitex, Nur, Inca and many others have changed the face of display, poster, billboard and point-of-sale printing. In this we have seen a whole new range of printed products that previously were not available, such as building and bus wraps. This form of digital printing using inkjet has largely taken over in the markets in which it is used.

There will still be more developments of this at drupa with faster and higher quality printers, but we also will see major ecological pressures in this area as aqueous, UV curable and other eco-friendly inks take a share of the market from solvent inks. We can also expect further developments of this technology into the packaging area with equipment for printed corrugated and folding cartons at, or close to, the manufacturing locations for the products they are to package. The key developments, however, at drupa 2008 will be in the up to 50 cm wide digital presses where the battle will be between inkjet and xero-

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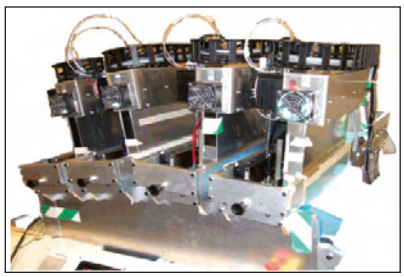
graphic technologies. (I include HP Indigo's presses in the xerographic area as their "Electrophotography" technology is a form of xerography and their Electroink is liquid toner.)

In the sheetfed digital printing area that will predominantly stay xerographic, we will get digital presses going a little faster than today. I would, however, be surprised if any sheetfed color printer exceeds a speed of 150 A4 pages per minute. In this market the battle is much more about quality than speed; and having more than four colors may prove to be a key selling message providing it does not impact too much on speed. Somewhat surprisingly, I don't expect to see a 50 cm wide sheetfed digital color press. The key battles in this area will be in quality and cost. In the cost area, we will see even more aggressive competition in the sub €50,000 market. Here the speed level for this price should get up to 70 A4 pages per minute or more. I also expect to see HP introduce its Edgeline inkjet technology into this area. I would also not be surprised to see a higher quality version of the Riso inkjet than the current HC5500 model.

The main area for inkjet technology, however, will be in the continuous feed color presses. At the last drupa we only had three products in this area—the Kodak Versamark, the Miyakoshi and the Agfa Dotrix. This drupa there will be many more. We already have the Dainippon Screen Truepress Jet 520 and the IBM Infoprint 5000 that uses the same print engine as the Truepress Jet520. These use Seiko Epson printheads and aqueous inks and a single engine will produce around 450 A4 color pages a minute.

The reason we are now starting to see high-speed inkjet printers is due to ongoing developments in printhead technology that allow printer manufac-



Structure of a single-pass inkjet print engine

turers to create full machine width print arrays that allow for the ink to be laid down in one pass of the paper under the head. In most wide-format and desktop inkjet printers, the printhead has to make multiple passes over the paper to lay down the ink. At the recent LabelExpo exhibition in Brussels in September 2007, there were a number of new inkjet presses that show how future inkjet presses may look. One of these is the Nilpeter Caslon press co-developed with FFEI. In the Illustration above, Caslon's four-color inkjet printing system shows some of the characteristics of a single-pass inkjet print engine.

In this, the web substrate is moved from left to right over the curved print platen under the four print assemblies. Each assembly in the case of this 33 cm wide printer has five Xaar 1001 printheads that are physically and optically aligned (stitched) to give a full 33 cm wide print array with a resolution of 360 dpi with 8 gray levels. The web speed at this resolution is 25 meters per minute. It can run at up to 50 meters per minute with four gray levels, which give a lower quality image. In terms of A4 images, 25 meters per minute is the equivalent of 115 A4 images per minute. The ink in this print engine is UV curable ink and the curing takes place between each color and after all the colors have been printed. UV curable ink allows inkjet printing on a wide range of substrates and also is ecologically friendly.

Currently, the Caslon print engine is offered with imaging widths of 33 and 42 cm. In the latter case, the print array has seven printheads stitched together. Later there are plans to produce Caslon print engines using an array of eight stitched printheads per color. All of these would have the same imaging speed of moving the web at 25 meters per minute, however, in terms of A4 pages per minute this would increase to the speed to around 160 A4 pages per minute.

The speed of inkjet printers is, therefore, based upon the linear imaging speed of the printhead. The speed of the head is based upon the technology used. Currently the fastest printheads are the continuous inkjet technology heads used in the Kodak Versamark V-Series product range. These heads, however, do not produce as good a quality as drop on demand (DOD) piezo printheads. In the piezo DOD area there are a number of different printhead approaches and this affects the quality of printed image and speed of operation of these heads.

VX5000E - Kodak Versamark press

The fastest DOD heads are the Seiko Epson and Panasonic heads but these only produce a binary (1 gray level) 600 dpi ink dot. The heads also use a piezo thin film actuator technology that limits the printer to using aqueous inks. This also limits the type of substrates that can be used. Most DOD printheads used with solvent inks for the superwide-format printers and for the presses using UV curable inks use a shear mode technology that allows either a binary (1 bit) or a variable drop size (multiple overlapping drops), but don't run as fast as the thin film heads. The basics from this is that of the new inkjet presses that will be seen at drupa they will either have a linear imaging speed of around 25 meters per minute with excellent quality or speeds in excess of 50 meters per minute with lower quality and limitations on substrates that can be used.

These new inkjet print engines will be available in most cases as standalone printers in either single or dual engine mode that allows for single-pass duplex printing. There will, however, be the start of the market for hybrid systems where the inkjet print engine will be added to an existing press or finishing system. We saw the first such product at IPEX in 2006 when Muller Martini and Kodak worked together to add Versamark printheads onto a Muller Martini offset press. In this situation the offset press would print the static data and the inkjet engine would add the changeable data. The Agfa Dotrix print engine had also been used to create a hybrid press when it

was added to a Mark Andy label press. This project never succeeded and was dropped. At LabelExpo Nilpeter introduced a hybrid label press by adding the Caslon inkjet print engine to a Nilpeter label press. The development of inkjet print engines such as Caslon with its range of imaging widths is likely to start up a new market in hybrid presses when added to existing presses or even to print finishing systems.

In terms of new inkjet presses that I expect to see at drupa almost all of these will use DOD rather than continuous inkjet technology. Kodak has a new development under way called "Stream" that is expected to move continuous inkjet to a new level of quality, flexibility and speed. This is likely to be previewed at drupa but I don't expect to see a high-speed color press product probably until 2010. In the DOD area the fastest product will probably be running at a speed in excess of 1,000 A4 pages per minute in simplex mode. This is the same speed as the fastest Kodak Versamark at present. The quality of such a press, however, will be higher than that of the Versamark.

In the DOD inkjet area, there is another technology called thermal inkjet and this is the technology used by Canon, HP and Lexmark. This is a cheaper technology than piezo DOD inkjet but it is not as flexible. The technology of thermal inkjet is for the ink to be heated and as it boils it is expelled from the printhead. This technology can only use aqueous inks. The technology allows for high resolutions and the latest printheads allow for a large number of nozzles in the head. Unlike piezo based DOD printers the printheads have a limited lifespan and need regular replacement.

For the printer market, the new HP Edgeline printheads are likely to have a major impact on the office and possibly graphic arts markets. The first products using these heads are a 6-color photo printer with three printheads and a 4-color printer with four printheads with a speed around 60 A4 pages per minute. Potentially, HP can build a range of products using Edgeline printheads and these could be of a wide-format for display printing or be built into wide print array for either sheet and continuous feed printers. I would expect to see some HP Edgeline developments at drupa.

From the above outline of developments in printers one might imagine that there are only future developments using inkjet technology. This, however, is not the case and there will be a large number of

Xerox 400/90 Business Color Press

new products using xerographic based technology. At present in the "light" color market of products running up to 70 A4 pages per minute this is currently an almost 100 percent xerographic market. Only HP and Riso have inkjet products in this area. This is the area of the market that in the past two years has exploded with huge sales. It is where the entry-level products for digital printing will be found for printers still to enter the digital market. This area of the market is very competitive with products from Xerox, Ricoh, Konica Minolta, Canon and HP. We can expect a range of new products in this area that offer higher speeds, greater functionality and better quality. With the exception of HP, and possibly Riso, this will remain predominantly a xerographic area.

In the production color area, again I believe this will remain a xerographic area. In the speed area of 70-200 A4 pages per minute where offset equivalent quality is the primary requirement, xerography will continue to produce a higher quality than inkjet printing. I would expect that in the sheetfed area the fastest products will be approaching 150 A4 pages per minute. In the offset quality continuous feed market, I expect to see products approaching 200 pages per minute. These engines are not imaging any faster than the sheetfed engines; in fact, they are slower but use two print engines printing both sides of the web concurrently. Also, the engines from Xeikon and Océ print a 50 cm wide web so they can print more pages across the web. It still surprises me that there is no 50 cm wide sheetfed color printer and I don't expect to see one at drupa.

There will, however, be a faster xerographic printer at drupa, but this will be printing what is being referred to as business color. I expect the highlight of the Xerox stand to be their new continuous feed color press, the 490/980. This produces a quality that is similar to that of the high-speed DOD inkjet printers and is suited for transactional, direct mail and newspaper applications. This product sets a new price level for

xerographic printing, however, at a speed approaching 1,000 A4 pages per minute and at a lower print cost than other xerographic color printers. This will challenge the new high-speed inkjet printers in opening up new markets for digital printing.

So will drupa 2008 be the inkjet drupa? Well the answer to that is both yes and no. In terms of yes, it will be the arrival of a large number of new inkjet printing solutions that will develop and expand their role in the market over the next few years.

They will not, however, at this time challenge the existence of offset or flexo printing as some have claimed. As yet, the printheads are not good enough in terms of quality or speed to challenge conventional printing. In the quality area, inkjet as yet will not be competing against xerographic approaches for offset and better than offset quality applications. It will expand its role in the wide- and superwide-format applications area and will open new markets for on-demand packaging applications.

In the new area of high-speed transactional business color we will see inkjet and xerography competing against each other with similar performance and quality. The main message of drupa will be that inkjet will have arrived as a technology for opening up many new applications for digital printing, particularly in the industrial printing area. Perhaps drupa 2012 will be the real inkjet drupa. IPA

Helpful Tips for drupa 2008

Soon all of Düsseldorf will be decked out in the season's color—drupa red. That's because from May 29-June 11 the metropolis on the Rhine River will become drupacity and welcome hundreds of thousands of international guests.

Going to a trade show in Germany is a unique experience. Following are several helpful tips for visitors and exhibitors at drupa 2008 for their stay in the city of Düsseldorf and at the fairgrounds.

Getting to the fairgrounds: Public transportation is recommended to get to the fairgrounds. From downtown Düsseldorf, Tram No. U78 goes to the North Entrance, Tram No. U79 to the East Entrance and Bus No. 722 serves the East and South Entrances. From the airport, Bus No. 896 connects to all fairgrounds entrances. Visitor, exhibitor and press entrance passes to the show allow free use of all public transportation with the Rhine-Ruhr (VRR) and Rhein-Sieg (VRS) transportation network on all days of the event.

Taxi fares are a basic flat rate plus a charge per kilometer; fares are generally higher than in the United States; round up tips to the next full Euro amount (maximum 10 percent). Taxis must be boarded at taxi stands.

Rental cars are available from Autohansa, Avia, Europa Service Hertz, Sixt-Budget and others; offices are located at the airport, the main train station and several downtown locations. On the main streets in Düsseldorf, *Messe Düsseldorf* signs show the way to the fairgrounds.

At the show: Entrance passes and show directories can be purchased at **www.drupa.com** in advance of the show or at the fairgrounds; the cost is greater if purchased at the fairgrounds. Generally, visitors do not register at German trade shows.

The KATI computerized catalog display system makes it easy to find the location of every exhibitor and product category; KATI terminals are located in every hall.

The exhibit halls are linked by protected walkways, moving sidewalks and shuttle buses. Located in the middle of the fairgrounds is a Service Center with a shopping arcade, post office, bank, travel service and train reservation desks.

Important German signs at the fairgrounds and their English translation are: *Messe* - Fairgrounds; *Eingang* - Entrance; *Ausgang* - Exit; *Notausgang* - Emergency Exit; and *WC* - Restroom.

Germany in general: Shops are generally open from 9:00 a.m. to 6:30 p.m. Monday through Friday and from 9:00 a.m. to 2:00 p.m. on Saturday. Larger department stores are often open until 8:00 p.m. on weekdays and until 6:00 p.m. on Saturday. All stores are closed on Sunday.

Banks are generally open from 9:00 a.m. to 1:30 p.m. and from 2:30 p.m. to 4:00 p.m. (Thursdays until 5:30 p.m.); the Euro is the single currency for the European Nations, including Germany.

Asking for quick service in a non-fast-food restaurant is considered rude; water does not accompany the meal but can be ordered by the bottle. With regard to tipping, a service charge is included in the bill (a small tip should be handed to the server directly).

A brochure about German business customs and practices can be ordered from Messe Düsseldorf North America free of charge.

For further information, please contact Messe Düsseldorf North America; email **info@mdna.com**; visit the website at **www.mdna.com**; or phone 312-781-5180.