New Products and Technologies at drupa 2000

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Abstract

Drupa is a landmark within the printing industry for the introduction of new production printing systems. However Drupa 2000 may well be the first Drupa to witness the launch of more in-press imaging printing systems and electronic printing systems than conventional printing presses. Since nearly all content that is created and prepared for publishing, has been processed in a computer system, a computer-to...output device is now the method of choice.

In addition to advances and adaptations of existing technologies, several new technologies will be presented for the first time; with the potential of having a big impact on the printing and communication industry. Certain production requirements can be addressed and new fields of application created, depending on the technology applied by using a permanent master or a variable image carrier. Among the many novelties we will see, are tools to support the trend towards integration of the whole print production process. This paper will discuss some of the prominent technological developments exhibited at Drupa and their implications on future markets.

Introduction

In the printing world, there is no fair in terms of visitors, floor space and especially product announcements as the German trade show drupa. The name stands for "Druck" and "Papier" – print and paper, and the show evolved from modest beginnings as a mainly national fair, into the world major presentation place for all kind of printing equipment and auxiliary services for the graphic arts industry. It is also the showcase for the latest technologies and concepts and sets the pace for the implementation of new technologies in the years to follow. The fair is held every four or five years and the last drupa took place in May 2000. After the two-week event ended on 31 May, 413,500 visitors from 171 countries attended the biggest fair for the printing industry. One in two visitors came from outside Germany, no fewer than 28 percent of whom travelled to Düsseldorf from overseas. 1957 exhibitors covered a space of more than 160.000 m². The prime focus of the fair is still the printing industry and the associated businesses of post-print processing, paper converting and package production, together with the associated consumables. But digital printing, new media, pre-press and pre-media constantly gained importance and are today only second to printing presses itself.

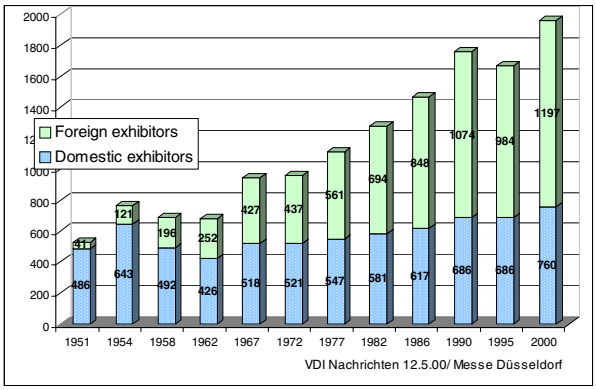

Figure 1. Number of exhibitors at drupa

As expected with the record number of exhibitors and exhibition space many product announcements have been made on drupa. And due to the great number of digital output devices the trade press declared drupa 2000 the "digital drupa". There have probably never been so many exhibitors in one place showing digital printing devices.

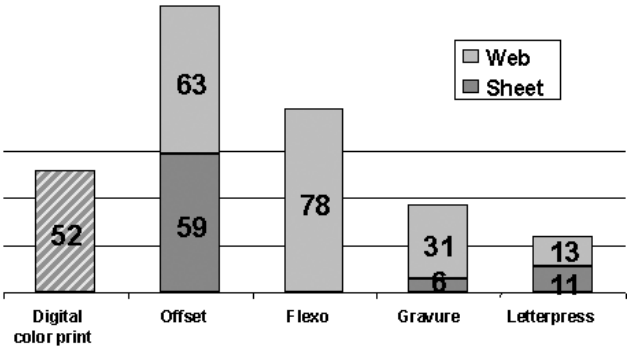

Figure 2. Number of companies presenting printing systems on drupa 2000, according to the process

One year after drupa it is time to have a second look at some of the new introductions, which have been presented there and how they performed on the market. In terms of new technological announcements, there have been few since drupa, as every company tried to showcase their latest developments there. Some of the products and concepts will be presented in this paper, to illustrate the transformation of drupa from a printing press oriented show to an exhibition place for all kind of hardcopy output systems.

Visual Publishing

There is hardly any industry, that is so defined by its output channels like the printing industry. This might be caused by the hundreds of years of tradition, where print was the by far most important information distribution technology. Today, print is one of many information distribution channels and has to be seen its broader context as an output channel for visual publishing. The output media for visual publishing can be grouped into three columns or core technologies, which form the basis of the related industry: the conventional printing processes, non impact printing, also comprising office printing, and the display technologies. While the first two technologies display static information and are also called hardcopy technologies, the latter is mainly used to display dynamic content. This paper will focus on the latest developments in both hardcopy technologies and derived hybrid technologies.

Hardcopy output has a much longer tradition than softcopy output and went through many changes since. Especially after the advent of digital technologies, and the convergence of copying, office printing sector with the graphic arts industry, the speed of development has been tremendous. But the presentation of new technologies and products for hardcopy publishing is still not a steady stream of announcements, rather it is triggered by big fairs like drupa.

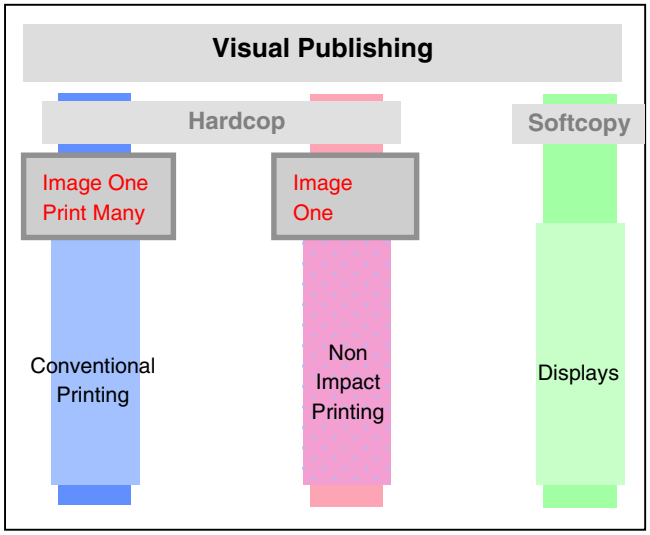

Figure 3. Visual information output processes

Non Impact Printing

The presence of non-impact printing systems and manufacturers on drupa 2000 increased by a great number and digital printing is now an accepted hardcopy production method within the graphic arts industry. Not only for proofing, but also for production printing. Major surprises and breakthroughs have been scarce, but the real significance is the fact, that the number of presented systems more than doubled. Also issues about consumables cost and reliability has moved much more into focus, than on previous shows. This trend continued in the 12 months that followed drupa.

As manufacturing companies of traditional presses, office system suppliers and even some start-up companies moved into colour production printing, distinguishing between office and production printing becomes increasingly difficult. In general the printing speed and the quality level are the main distinction factors, but also issues like paper, finishing, connectivity and data formats predestine a system for the graphic arts industry or for other environments. Of course this distinction can not be very sharp. And grouped together as a cluster printing system with a common print server, as TR Systems offers for example, copiers and office type output systems can reach a considerable speed. They even offer a scaleable approach to print productivity, as you can add more and more black and white or colour printers of different speeds to the system.

But in general, there is still a big productivity gap between non-impact and conventional printing systems. Only the fastest non impact production printing systems can barely match the speed of an average offset lithographic printing system and no production printing systems can match the quality level yet.

Table 1. Speed comparison of different printing systems and processes

	Type of system	A4 full colour images per min
CLC 5000	Electrophotographic	50
DICOpress	Electrophotographic	130
Versamark	Ink-Jet	1000-2000
DICOweb	CtPress Webfed Offset	2600
R 700 – 8 unit	Sheetfed Offset	3200
Lithoman 64	Webfed offset	42.000
TR 10	Gravure	110.000

* A4 images at maximum speed

There has always been a lot of discussion about the break-even point between offset and non-impact presses. Basing the calculation on the relatively low productivity and high consumable cost of the digital printing systems, they become quickly uneconomic with higher print runs. Depending on the application, these break-even points are usually around a few hundred copies. The main flaw of this calculation is, that they solely take the printing cost into account. But visual publishing is much more than just printing, it has to take the complete production process into account, from prepress to postpress and distribution, as well as other processes or approaches to satisfy the communication need, which can be more beneficial than the conventional print workflow. An important aspect for the relation of non-impact printing systems and conventional printing presses is, that they have different advantages and applications. Especially the unique advantages of digital printing, the variable data capability and the instant availability of the print, are features not completely understood by most traditional printers and print buyers. Judging systems

according to the cost per copy calculation and determining the break-even to offset printing presses will not does not reach all benefits of digital print. Creating the markets, discovering special niches and complementing the strengths of both process will determine the speed of the introduction of non-impact printing processes.

Table 2. Colour production digital printing systems (>25ppm)

Vendor	Resolu-tion	Grey-levels	ppm*	Process
Aprion	600	N		Ink-Jet
Barco/Xaar	360	Y	12-220	Ink-Jet
Canon	400 x 800	Y	31-50	Electrophot.
Elcorsy	400	Y	1700	Elcography
Nexpress	600	Y	70	Electrophot.
IBM	600	Y	130	Electrophot.
Indigo	800	N	33-266	Electrophot.
MAN Roland	800	Y	32-130	Electrophot.
Minolta	600	Y	32	Electrophot.
Océ	400x1600	N	25	Electrographic
Scitex	300	Y	1000-2000	Ink-Jet
Xeikon	600	Y	32-130	Electrophot.
Xerox	600	Y	40-130	Electrophot.

* Letter-Size images in 4-color at maximum speed

Barco/Xaar/Metronic

One interesting product came out of a co-operation of three manufacturers with totally different background. Barco, a pre-press company, also well known for their platesetters and displays; Xaar, a manufacturer of ink-jet heads and Metronic, a manufacturer of small printing presses.

Presented on the Barco booth as “the.factory” and exhibited on the Metronic booth as well, the system is a roll to roll ink-jet printer. It is very compact, with a footprint of 2 x 2.4 m. The ink-jet print heads are manufactured by Xaar. The heads use the drop on demand principle with PZT actuators. A shear mode deformation of shared walls between the ink nozzles causes acoustic waves in the ink. The pressure wave created by the deformation of the Piezo crystals then releases the ink droplets from the nozzle at very high speed. The droplets merge to produce a single dot with multiple gray levels. The Xaar print head is capable of jetting 5000 droplets per second with 8 gray levels (1). Each Ink-jet head is only 70 mm wide, but multiple heads can be stitched together in “the.factory”. Up to 6 different colours can be used and the inks are UV curable, which allows a great number of different substrates. The system base is manufactured by Metronic and has a scaleable architecture. Up to 9 print heads for each colour can be mounted to cover the maximum printing width of 630 mm or 25”. The printing speed on the fair has been limited to 5 meters per minute but 21 meters per minute is the aim until the commercial introduction in 2001. The press is driven by an front-end system from Barco and can be addressed as any other output device supported by Barco. There are three pilot customer installations planned for this year, the first shipment is scheduled for Q2.

Indigo

An interesting example of versatility and modularity are the printing systems presented by Indigo. The Series 2 print engines offer some advancements in the unique Indigo unit design. The photoconductor plate has now double the diameter and takes up two colours at one revolution. But main features, as imaging resolution, to use of liquid toner for multiple colours in one printing unit and the heated intermediate for toner transfer are still unchanged.

Based on the traditional design of the imaging unit and the new type of imaging unit design, 13 products have been presented on drupa 2000 in different configurations. Available are sheet-to-sheet, roll-to-sheet, roll-to-roll and versions for special substrates. The number of offered colours per press configuration can range from 1 to 7. Also memory and personalisation capability vary according to the desired level.

Indigo gained quite some attention as it announced the investment of 100 Mio. US$ from HP last year. First products are expected this spring and will be targeted somewhere at the lower end of the graphic world and the upper end of office printing.

Nexpress

As the first result of the joint venture with Kodak, Heidelberg showed the Nexpress 2100. Still in a special cabinet for sleeted audience on drupa, it was shown printing on the OnDemand show this year. The press received much acclaim in advance. Commercialisation is planned for end of 2001.

Canon

One entrant approaching the graphic industry from the lower end is Canon. The latest product is the CLC 5000, featuring an increased resolution of 400 by 800 dpi and print speed of 50ppm (simplex, good paper), this product could gain interest from production printing companies. With a similar design and footprint as the previous CLC models, the CLC 5000 has been completely redesigned. After first announcements on drupa 2000 the printing system is available now.

Black and White Systems

Though most of the attention on graphic arts exhibitions is spend on colour printing systems, also monochrome printers have to be mentioned. The demand for monochrome printers has been fuelled largely by in-house printers, copy shops and document printers. For that reason the big success of the Xerox DocuTech series took place nearly unnoticed by the traditional printing world. But production methods and business models are

starting to change. According to CAP ventures, the system sales increased by 20% last year and every third DocuTech is installed in a printing company.

The distinction line between office printers and black and white digital production printers is especially difficult to draw. In most cases it is an somewhat arbitrary line between 55 and 90 pages per minute, depending on the source. Most systems now offer a print resolution of 600 dpi, only for the very high speed systems, over 200 ppm, the resolution is lower. Similar systems are usually offered over a wide range of printing speeds, for example DocuTech systems are available in 6 different speeds from 65 ppm to 180 ppm. Printers with add on capabilities, for example duplexing, accepting data formats, spot colour, magnetic toner, with scanner, finishing,... are also frequently renamed and add to the long list of available systems.

Table 3. Manufacturers of monochrome digital printing systems

Manufacturer	System speed in ppm*				Paper supply
	< 100	100-200	200-500	>500	
Canon	X	X			S
Dainippon Screen			X		S
Indigo		X			S
Heidelberg		X			S
Océ	X	X	X	X	S/W
IBM	X	X	X	X	S/W
Scitex				X	W
Xeikon (Nipson)		X	X	X	W
Xerox	X	X	X	X	S/W

* letter size images per minute

Also traditional manufacturers from the press and pre-press business are joining the monochrome market. After the acquisition of the digital printing division of Eastman Kodak, Heidelberger Druckmaschinen now manufactures a monochrome printing system, the Digimaster 9110. Similar in the features to the DocuTech, the system has a slightly slower speed with 110 ppm. The Digimaster is also sold by IBM, Canon and Danka and had quite some success on the market so far. Another new entrant to the monochrome market is Dainippon Screen with the TruePress V200. Similarly named to the direct imaging offset presses, the TruePress V200 is an electrophotographic dry toner system with two imaging system for duplex printing. The resulting speed of 400 ppm is quite impressive for a sheetfed monochrome printer.

Both well known colour non impact printer manufacturers for the graphic arts industry presented new monochrome printing systems. Indigo introduced the Ebony as a monochrome printer. It is based on the same unit design as the e-print, but without colour capability. After the acquisition of Nipson by Xeikon in 1999, the former Nipson presses have been presented under the new company name and with new design. Magnetographic printing, the process applied by these systems, is still the speed record holder for toner based printing with over 1600 pages per minute.

A dominant player in the sheetfed black and white market, Xerox made a move into producing their own webfed systems by buying the French company SET Electronique March 1999. The new model, Docutech 500 CF, first presented on OnDemand 2001, is only available in Europe.

Hybrid Technologies

Hybrid technologies are supposed to close the gap between conventional printing and non-impact printing. They link technologies of the conventional printing world with technologies of the non impact printing world. In all cases digital data are used to produce a material output, i.e. a permanent printing master, which is not the commercial product itself, but is used to finally generate the desired end-product(s). The final step to produce the hardcopy output is done by a conventional reproduction method.

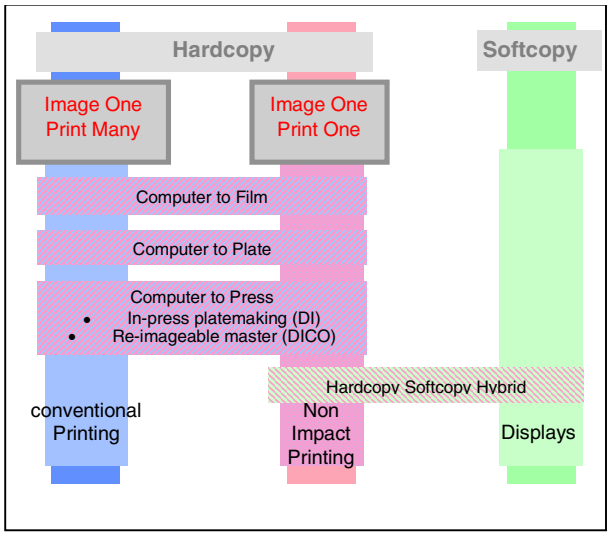

Figure 4. Overview of hybrid technologies

Altogether four technologies connecting the conventional printing world and the non impact printing world can be distinguished:

- Digital proofing
- Computer to film
- Computer to plate
- Computer to press

It is interesting to see, that each of the last drupa fairs marked the breakthrough of one of the technologies. The first widespread presentation of digital proofing systems and digital film output came on drupa 90. The drupa 95 was widely acknowledged as the drupa of the computer to plate systems. Drupa 2000 has been the drupa of the computer to press equipment. While always the previous drupa saw one or two forerunner products of each hybrid technology, for example on

drupa 95 the first direct imaging press has been presented, the next fair has been the place of a widespread introduction from a substantial number of suppliers and for a wide range of target applications. Although a larger distribution at customer sites usually takes another two or three years, the drupa sets up the orientation point for the all manufacturers and potential users of the technologies.

Computer to Plate Technologies

By the time of drupa 2000 the computer to plate technology or platesetter technology has been a widely accepted, although not as widely adopted technology.

As expected the products became more reliable, easier to use and more cost effective. The most interesting trend and a real driver for this product group has been the violet laser technology. The trigger for this development did not origin within the graphic arts industry, but from a completely different sector: DVD-players; coincidentally a technology for storing and retrieving primarily dynamic content. Manufacturers, offering a violet laser platesetters, amongst other laser types, report, that violet laser platesetters accounted for about 80% of their sales. Despite the fact, that plate sources are still very limited.

The driver of the demand has not been the desire for higher quality, although violet light permits the exposure of much smaller spots than IR light sources. This feature has not been implemented yet. And also the plates, at least for the near future, are not less expensive than other plates for use in platesetters. The main driving force is the price and availability of violet lasers. Thermal laser have a limited life expectancy due to their high power output and the replacement of the laser imaging system is relatively expensive, since the complete imaging heads are proprietary developments of graphic arts suppliers. Violet lasers on the other hand are expected to be a commodity in the DVD-player market and even the adaptation for graphic art applications will not make them overly expensive.

Still thermal imaging technology offers benefits, violet laser technology can not offer, especially the potential of processless plate generation. Depending on the application this can be one of the most decisive factors. Therefore the race is open and it is up to the market to decide which technology will be applied.

The ingenuity and creativity of especially smaller companies found its way into some interesting products.

Basysprint uses an UV light source to expose conventional, cost effective and readily available printing plates. To image the printing information, a mirror chip with 800.000 discrete elements is used to expose an area of 2 cm² or 0,3 square inch. In a step and repeat process, the area of the printing image is covered. Areas without printing image can be spared out.

Another smaller manufacturer is the Swiss company Lüscher. The 4Page! images printing plates like a CD-writer. The plate is clamped on a sort of turn-table and spins around its centre, while the laser moves on a linear path from the centre to the outside, writing a spiral. This results in a very simple design of the computer to plate device.

Computer to Press

The most apparent trend on drupa 2000 was the advent of a great number of direct imaging printing presses. In essence, digital data are transmitted to the printing press and a permanent master is produced inside the press. The master is used to reproduce the desired number of identical copies in a conventional printing fashion. So far all direct imaging presses use the offset lithographic printing process, and are either equipped for waterbased offset printing or waterless offset. This determines the type of inks used, which is otherwise inks used in the same type of conventional press. The paper requirements are like in conventional offset printing as well. The advantage of this hybrid technology is, that it utilises ink and paper types already used in a large number of printing presses. The relative simple requirements and the fierce competition of the consumable manufacturers keep the cost per copy down. If multiple copies of a document are required, these type of presses become quickly less expensive as non-impact printing systems, despite the required set-up cost. The reason behind is the low consumable cost and the high productivity of the presses. On the other hand, computer-to-press systems are more cost effective than conventional presses for shorter runs, as they rationalise and speed-up the change-over process. Only for long runs, conventional presses with external plate making are more cost effective, due to the deadlock costs of the imaging equipment, which is idle during long press runs. The break-even points between the three basic designs: non-impact printing – computer-to-press – conventional printing are blurry and subject to change. The break even points are influenced by technical factors as: consumable prices, speed and investment cost; and by production aspects as: cost of labour, end product requirements, finishing, quality level, logistics and turnover time.

In total 11 computer-to-press systems have been presented live at drupa 2000. In general two types of machines can be distinguished:

1. In-press imaging using a plate or similar permanent carrier (10 presses)
2. In-press imaging processes with an erasable printing surface (1 press)

In case one an image forming-layer linked to a form carrying material, commonly called plate, is used. The image-forming layer does not contain any printing information when fed into the press. Inside the press, the form can be imaged first and then moved to a position for production printing, where inking of the form and transfer to the blanket takes place; or can be moved to the latter position first and be imaged there. In both cases, a plate or other carrier material gives the printing image its stability during the print run. After the print run the image-forming layer, and with it the carrier material, has to be discarded.

Table 4. Computer to press systems

Manufacturer & Type of press	Type of master*	Paper supply	Max No. of colour	ppm**
Adast 547 DI	Thermal plate	Sheet	5	400
Adast 745 DI	Thermal plate	Sheet	6	667
Dainippon Screen TruePress 544	Light sensitive plate	Sheet	4	133
Dainippon Screen TruePress 744	Light sensitive plate	Sheet	4	533
Heidelberg Speedmaster 74 DI	Thermal plate	Sheet	6	1000
Quickmaster DI	Thermal plate	Sheet	4	333
Karat 74	Thermal plate	Sheet	4	667
Komori Project D	Thermal plate	Sheet	8	2000
MAN Roland DICOweb	Plateless erasable	Web	Not limited	2667
Ryobi 3404 DI	Thermal plate	Sheet	4	233
Sakurai Oliver 474 EPII-DI	Thermal plate	Sheet	6	867

* method of producing the permanent master

** 4 colour letter size images at maximum speed

In case two the image forming components do not have a base material or they do not have an intermediate carrier which is suitable to be directly printed from. During the imaging process the image forming substances are transferred to the form cylinder surface, where later on the printing process takes place. The printing image resides directly on the form cylinder surface. The dimensional stability of the printing image during the print run is achieved by the form cylinder itself. After the print run is completed, the image forming substances have to be removed or covered.(2)

There are many printing systems available and some more are announced, but surprisingly only three suppliers of imaging lasers exist. These are Presstek, CreoScitex and finally Dainippon Screen, which are only used in their own systems. All other press manufacturers use the thermal heads either from Creo/Scitex or Presstek. Although the imaging head play an important role in computer to press operation, plate material used and the integration of the imaging system in the press might have more influence on the field of use, quality, pre- and postpress connection and finally the profitability of the press system.

The discussion about printing quality of computer to press devices became less of an issue recently. So far the public view has been influenced by the output quality of the first on-press printing systems. But it has to be considered, which factors influence the print quality and not everything can be attributed to the imaging system itself. And with the quality of the imaging heads having reached the standard levels of computer to plate devices, the inherent quality potential of on-press imaging is even higher than that of externally produced plates. But one should never forget, that all these presses have been designed for printing predominantly short runs. For short runs, print waste and set-up time are increasingly important issues. As in most cases trying to reach the highest print quality level dramatically increases the amount of waste, we may rarely see the full quality level in day to day operation. More important is an easy, reliable and fast set-up of the complete press to reach the desired quality level.

Platebased Printing Systems

Most products using direct imaging today, use a precoated plate as permanent master. Two types of press design can be distinguished in that area:

- Presses designed especially for in-press imaging
- Traditional press designs with add-on plate imaging

Presses designed specifically for in-press imaging have a very compact design and take advantage of the fact, that a computer-to-plate press does not need some features, normally present in lithographic printing presses. In general, they have a high level of automation and need less manning. On the other hand all available systems are limited to 4 colours, single sided printing and can not use externally imaged plates. Presses in that category are the Karat 74, the Heidelberg Quickmaster DI, the Ryobi 3404 DI and both Dainippon screen presses. Except for the Dainippon Screen presses, all systems are waterless. The feature special arrangements of the cylinders and all have at either double sized plate cylinders or multiple size impression cylinders or both. An example for that type of press is the Karat 74, which has two plates for two process colours on each plate cylinder. There are two inking systems for each plate cylinder, which touch alternatingly the respective plates. The paper sheets are clamped on a triple size impression cylinder and hit each plate cylinder, twice to pick up all four colours. There are now more than 30 installed Karat presses on the market.

Traditional presses with add-on plate imaging are adaptations of existing sheetfed presses. They require some integration of a plate imaging equipment. They can nearly be as modular as conventional sheetfed presses and can use externally imaged plates in most cases as well. Each colour is printed in a separate unit, therefore these presses have a much larger footprint. They also need some adaptation to take in the imaging system and access some parts of the press can be difficult. A major challenge of combining a traditional press with an on-press imaging device is finding a place for the laser imaging system, while the operator accesses plate cylinder and other parts in the printing unit. Different ways of swinging or lifting the imaging head have been

shown. Examples of this press design are the Adast 547 DI and 745 DI, Heidelberg Speedmaster DI, Komori Project D and Sakurai Oliver 474.

Xerox made the first entry in the computer to press market, or in the offset printing press market altogether. The systems are offered as DocuColor 233 and Docucolor 400, sourced from Presstek and manufactured by the traditional press makers as Adast and Ryobi. First shipments have been made this spring. The Xerox branded presses can be driven by the Xerox Digipath front-end, just as an electrophotographic printer. This can also be seen as another sign of the convergence of the office and graphic arts printing world.

Erasable Printing Surface

There are quite some ideas around plateless offset printing, but few made it to demonstrations yet. After presenting only the concept on drupa 2000, Creo showed a working press with their spray-on-polymer as a technology demonstration at Graph Expo later that year. In this process a special substance is sprayed onto the forme cylinder which is dried afterwards. Using thermal laser energy, the surface properties can be switched from water to ink receptive. After printing the complete run, the remaining polymer is removed and the cycle can start again, Komori announced that it plans to use the spray-on-polymer on the Project D press, which is using plates so far. There has been no date for availability set yet, but commercialisation is not expected within the next two to three years.

The first and so far only product with an erasable permanent master has been presented on drupa 2000, the DICOweb by MAN Roland. The applied technology is called the thermal transfer process. The process comprises of three major steps

Step One:

The imaging material is a thermal transfer polymer coated on a ribbon. This ribbon is brought into close contact with a form cylinder surface. As the form cylinder spins, the ribbon is unwound from a cartridge. A high power IR-laser heats the thermal transfer ribbon according to the desired image. The polymer is transferred to the cylinder surface and adheres to it. Ribbon and laser traverses the cylinder width to cover the complete printing area. The transferred polymer is ink receptive, the uncovered cylinder surface is water receptive.

Step Two:

After imaging a fixing and conditioning step is applied to improve the printing conditions. A contactless heating element heats the form cylinder and the transferred polymer. During the conditioning process a conditioning liquid is applied to improve the water receptivity of the image-carrying cylinder and to ensure excellent printing conditions. Afterwards the printing process can start using conventional wet offset inks. All copies of the run are identical, since the imaging process only takes place between print runs,.

Step Three:

After the desired number of copies has been printed, the press is stopped. Residual ink has to be removed with an organic solvent. Than a de-imaging liquid is sprayed onto a cleaning cloth. The cloth removes the polymer from the form cylinder surface, similar to a blanket-washing device After the de-imaging step, the surface of the form cylinder is totally clean and ready to be re-imaged.

Press Design for Erasable Form Production

The application of an erasable forms production also permits a completely different printing unit design. Many restraints in printing press design are caused by the necessity of frequent exchange of plates. With this in mind the DICOweb has a completely new design based on the erasable imaging process. In the linear movement concept the cylinders have bearings on both sides, however instead of having bearings built into a sideframe, they are mounted on linear slides and can move up- and downwards. This approach has been made viable by using gapless cylinders for both, forme and blanket cylinder, which would not have been feasible by using plates

To change the sleeves for blanket and forme cylinders, the operator can unlock the bearings on one side and can slide off the sleeve through a wide access gap on the operator side of the sideframe. The cylinders can be in separate positions for imaging and printing, where all cylinder are required to have contact. Also for maintenance or sleeve exchange, the cylinders can be positioned to give optimal access.

Furthermore, since the distance of the axis of each cylinder in the printing unit is not fixed, the linear movement concept has the capability to change the printing format. This can be achieved by exchanging sleeves with different wall thickness' or by exchanging the cylinders. An exchange of sleeves is relatively easy to perform, as they can be made out of light weight materials, but the maximal wall thickness is limited (to a maximum cutoff 200mm larger than the core cylinder format). The components in the printing unit, e.g. inking and dampening, have to be positioned according to the new position of the cylinders. Other components (e.g. the imaging device) can be arranged in a distinct position while the cylinders has to be moved to the position of that device. In fact it can be advantageous, to keep different functions spatially apart (e.g. imaging and printing). Additionally it enlarges the space in which components can interact with the cylinder inside the printing unit. Of course additional actuators for the components are needed and the requirements relating to the press control concept are higher.

In the linear movement design the sideframe act more like a framework or suspension for the cylinders, than like a fixed case in the conventional design. The components inside the printing unit do not need to be mounted into a massive sideframe structure. It is possible to put all components between the frames and have variable connection points or slides like in a drawer to

the sideframe. For example the inking can sit on a horizontal slide and does not need to be integrated into the sideframe. This is the basis for the modular printing unit concept of the DICOweb. It allows to fit different components in different positions and to exchange them. It is additionally important for components with short innovation cycles, like the imaging system, where a new and more powerful generation can be integrated relatively easily. (2)

Digital Print One Year After drupa

One year after drupa there are substantial sales for both, computer to press devices and electronic printing systems. News are not about the introduction of new systems, but about installations. One example for the maturing market for computer to press systems is the Heidelberg SM74 DI, which now has over 50 installations worldwide and reportedly another 20 on order, or the 74 Karat, which has around 30 installations. After Scitex withdraw from the joint venture, all Karat activities are now in the responsibility of KBA. Both machines have announced first in 1998. Also presses presented the first time on drupa 2000 have their first installations. The first DICOweb has been installed as well as the first Xerox Offset presses.

Having a look at these sales figures, many sources predict a fast increase of the market share for digital printing. PIRA predicts a rise in the market share of digital print from 9 to 20-25 % by 2010. And an NAPL report shows, that if a printer is asked what single service he would like to add to his portfolio in the next 2 years, it would be digital print in 48% of all cases. But will offset printing disappear that quickly? These projections have already been made as the first systems have been introduced. So far most projections overestimated the growth and sometimes it seems that more predicted a revolution is, like the replacement of offset by digital print, the longer it takes. In comparison, few people predicted the rise of the Internet a couple of years before, which has truly revolutionised the communication world. There is no doubt that the share of digital print will increase. But in the printing world, there is still ample space for offset printing, especially with more competitive presses including on-press imaging.

The business model for printing companies has to be expanded as well, to make especially digital print profitable. Print should not be the only service a printing company offers. The more digital data is used, the better is the chance for a printer to become the complete outsourcing solution for his customer. This could comprise storing, processing and outputting data of corporate customers for any kind of visual publishing channel. RR Donelly plans to increase their turnover from non-print services from 25% in 2000 to 50% in 2005 of their total revenue. This all in one service approach, offering a complete solution, including offset and digital print, might be the biggest growth sector for the graphic arts industry.

Trends Towards Media Integration

E-commerce

In an industry so much dependent on digital information, the advent of e-commerce in the graphic arts has been surprisingly late. After substantial presence on US shows and conferences in the year before drupa, the presentations on drupa have been more discreet. Undoubtedly, electronic job submission and communication has a high potential of saving production cost and avoiding errors is in the production process. But reactions from printers are still mixed and as long as the fear of decreasing margins in a competitive brokering environment is not sorted out, adoption from printer side will be slow. The dot-com slump of the new economy also slowed down the introduction rate. Finding enough funding for start-up companies became very difficult. Most companies scaled down their activities and focused on some key areas, or even went bankrupt in the last six months. This does not change the need for a more effective communication between print buyer and printer. Without making the whole production process more effective, print will decline altogether, even with the best printing systems on the market. We hope that at the end of the year after some merging and consolidation, the most innovative companies with best business plans will survive and start to thrive.

Electronic Paper

Although or maybe because it might change the entire printing industry, one presentation happened without being noticed by most attendees of the fair. In a quite restrained manner, Xerox presented two pieces of electronic paper, of which one disappeared during the show.

Xerox's e-paper technology is called Gyricon. It's a rubberised, reflective substance made entirely of microscopic beads that are half black, half white. The Gyricon material is laminated between two sheets of plastic or glass and has the thickness of about four sheets of traditional paper. Before it can be used, Gyricon is filled like a sponge with oil. This creates a cavity for each bead, allowing it to rotate.

When an electronic charge is applied through a computer or wireless radio wave, the beads rotate into place. Some turn black side up, others black side down. A pattern emerges and words appear. Once the beads are in place, they hold their position. The words don't disappear until another electrical charge is applied. Desktop computers, which use liquid crystal displays, or LCDs, require 60 to 70 electrical charges per second to maintain the images on the screen. But Gyricon uses almost no electricity. Unlike desktops, it has no backlight, no hardware behind the screen. Gyricon can receive its electrical charge by being printed from a computer or when a handheld wand is passed over the material like a scanner. According to Xerox, e-paper will be durable, flexible and light. It will come in a variety of sizes - similar to traditional paper. Meanwhile Xerox

spun their E-paper activities off, as a separate company and the future of this approach is somewhat uncertain. Again, one year after drupa the situation is still uncertain.

Another company, called E-ink, is working on a similar kind of electronic paper and just received an investment of 7.5 Mio. US$ from Philips. The first products on the market, used as displays for handheld devices, are expected in 2002.Some field testing for supermarket displays is already taking place. With the whole potential still not completely recognised, this technology might change the way hardcopy output is produced. Although still far from commercialisation, CAP ventures predicts another 5 years for graphic arts related applications, this is a technology to monitor in the future.

Summary

It seems that with drupa 2000 trade shows the cycle of digitalisation of the print output became complete, all hybrid technologies are now available in a wide variety of products. User have the choice of the degree of digitalisation, up to a fully digital workflow with digital printing or digital imaging in a printing press.

The feeling of insecurity about the future of print among user waned and found its way into a buying rush for new equipment. Many manufacturers found their sales expectation more than exceeded. The fair also proved, that print media are bigger than ever and print will be around us for quite some time. Technological advancements are the engines driving greater topicality, the increased use of colour, in daily newspapers, for instance, more customised printed matter, e.g. in the field of direct mailings, and greater economic efficiency. In devising predictions about the viability of print, especially about the role of conventional printing, the progress in print equipment has frequently been underestimated.

Most visible on drupa 2000 was the enlargement of the choice of output devices from conventional to digital printing systems. The trend towards media integration became also more acknowledged. On one side the vertical integration over the whole production flow from content creation to finished product found its way into the “solution” presentations. On the other side, to facilitate horizontal integration, over different types of media, tools for the technical integration became also available to some extent. Undoubtedly both areas have still a high potential for efficiency improvements. Probably the area of production flow support and transaction management software, will be the emphasis of the next drupa.

References

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