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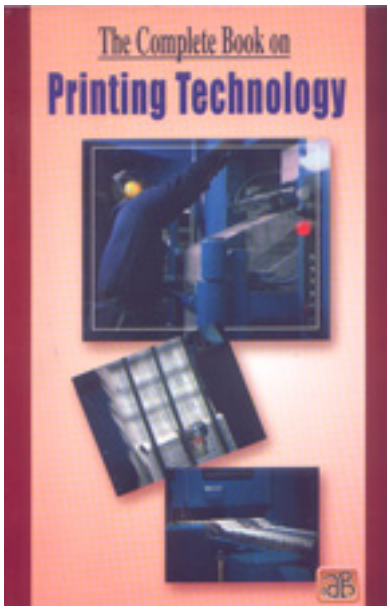
The Complete Book on Printing Technology



Code:	ENI111
Format:	Paperback
Indian Price:	1100
US Price:	125
Pages:	742
ISBN:	8178330520
Publisher:	Select

Printing Industry generates a wide range of products which require in every step of our everyday life. Starting from newspapers, magazines, books, post cards to memo pads and business order forms each are the products of printing industry. Printing is a process for reproducing text and image, typically with ink on paper using a printing press. There are various types of printing process for example offset printing, modern printing, gravure printing, flexographic printing etc. Offset printing is a widely used printing technique where the inked image is transferred from a plate to a rubber blanket, then to the printing surface. When used in combination with the lithographic process, the offset technique employs a flat image carrier on which the image to be printed obtains ink from ink rollers, while the non printing area attracts a film of water, keeping the non printing areas ink free. Gravure printing is a printing technique, where the image to be printed is made up of small depressions in the surface of the printing plate. It is divided into three broad product areas; packaging printing, publication printing and speciality printing. Printing technology is often carried out as a large scale industrial process, and is an essential part of publishing and transaction printing. This is the age of hi fi, jets and computers. Rapid advancements in science and technology have made their impact on the printing industry of the world too. The old techniques of printing have become obsolete and made way for the new technology. The printing industry is just one example of an entire industry movement that is changing while keeping up with the development of new technologies. The proliferation of emerging technologies has dictated a rebirth of the printing industry. The Indian Printing Industry is well established and presently growing at 12% per annum.

This book majorly deals with typographic technology, photo scanning systems, sequence of steps in the printing processes, size and scope of the printing industry, high volume printing technologies for the production of polymer electronic structures, inking system, film high contrast printing, principle of planographic printing, modern printing process, ink jet etc.

The book contains the latest printing processes like web, gravure, flexo, security and offset printing. This book is an invaluable resource for new entrants, technicians, craftsmen and executives working with printing industries.

Tags

Application of Screen Printing, best small and cottage scale industries, Business consultancy, Business consultant, Business Plan for a Startup Business, Business start-up, Flexible Packaging Printing Processes Overview, flexographic printing business plan, flexographic printing process pdf, Flexographic Printing: Technical Process, Flexography Printing Process, gravure printing process, gravure printing technology pdf, Great Opportunity for Startup, halftone process: printing, how much does it cost to start a printing business, How to Make a Screen Print, how to set up a printing press business, How to Start a Printing Business, How to Start a Printing Press Business - Startup Business, How to Start a Successful Printing Press Business, How to Start and Operate a Printing Press Business, How to Start My Own Small Printing Business, How to Start Printing Industry in India, How to Start Up a Printing Business, Modern Printing Technology, modern small and cottage scale industries, Most Profitable Printing Business Ideas, new small scale ideas in Printing industry, NPCS, offset printing press business plan, Offset Printing: Start Your Business, Opening a Printing Press Business, Printing Based Small Scale Industries, printing business equipment, printing business ideas, printing business ideas in india, Printing Business, Printing Industry in India, printing press business ideas, printing press business plan, Printing processes: Offset, Flexo, Gravure, screen, Printing Technologies –Flexo Printing –Gravure Printing, Printing Technology book,

Process technology books, profitable small and cottage scale industries, Profitable Small Scale Printing Business, project for startups, Rotogravure printing - Rotogravure printing process, screen printing process, screen printing tutorial, Setting up and opening your Printing Business, Setting up of Printing Business, Small Start-up Business Project, Start up India, Stand up India, Starting a Printing Business, Starting an Offset Printing Press, Start-up Business Plan for Printing Process, startup ideas, Startup Project, Startup Project for Printing Business, startup project plan, What Equipment Do I Need to Start a Printing Business?, Offset Printing Machines, Web Offset Machines, Gravure Printing industry, Modern Printing Process, Sheet-Fed Offset Machines, Film High contrast Printing, Paper Technology, Barcode Printing & Thermal Label Printing, Barcode Printing, security printing techniques, Security Printing and Integrated Forms, Security Printing, Beginning of Printing, Printing and paper Technology

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MODERN PRINTING PROCESS

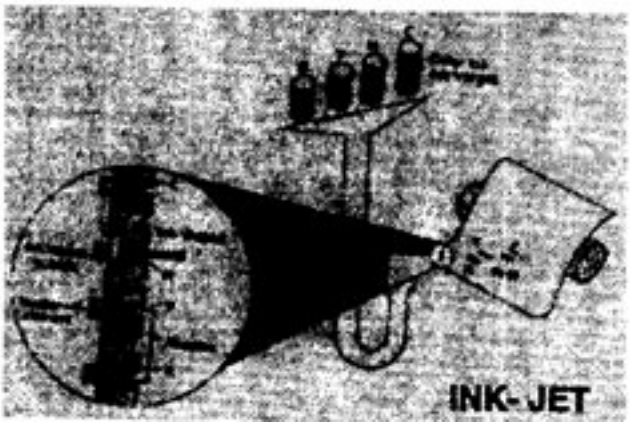
INK-JET

In the past, the quality of- ink-jet printing has not been good enough to prevent the recipients of direct mail products from throwing them unopened into the dust bin. If the mailshots are accompanied by the wrong name, house number, or post code, one can hardly expect a positive response to the advertising messages contained there in. No wonder then, that the main experts (technologists) in ink-jet systems for graphics arts applications, including Domino, linage. Scitex Digital Printing and Videojet, are Constantly striving to improve speed, quality & accuracy.

Now-a-days, the majority of personalised direct mail ink-jet printing, has been in mono with the occasional use of spot colour. However Scitex Digital Printing, is emerging as the pacesetter for developments in highspeed, high quality, four-colour ink-jet technology. The other manufacturers are showing evidence of lower-cost developments.

Scitex Digital Printing demonstrated a prototype full-colour (CYMK) digital press, based on continuous-flow ink-jet imaging. This technology will result in full-color 100% variable printing systems, that will provide fast set-up, quick turnaround, letter quality, direct-to-paper digital printing with variable output.

Colour images are produced by printing droplets of Cyan, Magenta. Yellow and Black on top of each other. This technology prints with multiple dots, at each pixel location, giving exact control ot colour and density.



Colour depth and saturation are also said to be enhanced by this process. A potential single row of jets is provided to enhance edge definition, registration and positioning.

Suppliers have already promised for a device with low operational costs and speeds, That will considerably exceed the 200ft./mm. demonstrated Development is in the early stages.

Benefits include complete variability of layout, contents and graphics, compatibility with industry standards for page layout and data transfer; the flexibility to set up and print jobs, ranging from short runs to high volumes on the same equipment. In addition, it gives the ability to personalise every document and to offer high-volume production at a low cost per page.

However, not every one will have a requirement for four-colour ink-jet print, nor be able to afford the press, which is expected too costly. Of greater concern the other ink-jet suppliers is improving the speed, resolution and flexibility of existing technology.

Until the new press is available, ink-jet equipment prints only black-and-white or spot colour. It serves the commercial printing, business fon-ns, direct mail, promotional graphics, catalogue magazine, lottery and gaming industries, as well as inplant printing and mailing operations. This is taking white paper at one end

of the production line and transforming it into a full-colour, personalised and innovative leaflet or mail shot. Because -this takes place in one continuous operation, optimum cost-effectiveness is achievable.
The ink-jet print head have been added to Zirkon eight-page four & five-colour mini-web presses. Digital printing offering customers the benefit of two komori 16-pages web presses able to personalise products, as well as an 8-pages Heidelbery-Harris. It is able to print, personalise and inline finish in excess of 45000 products an hour, all in one pass. The three systems can all personalise in red & blue as well as black on both sides of the web. Most continuous stationery producers tend to personalise on just one side, due to cost implications and finish as a separate operations.
Ink-jet had come a long way from its original application for straight forward product identification. Ink-jet is no longer confined to Coca-Cola bottles. The technology has left this market and is offering versatility and creativity to markets previously not involved in ink-jet. With the capacity to print upto 40 inch width from a combination of one and 4.25 inch heads at speeds of 1000 ft. a minutes the quality and flexibility can now offer is out standing.
Magazine publishers are now able to personalise their products on the outer wrapper and inside and have a full-selective capability. Postal codes and addresses are printed on the wrapper, while two personally-addressed coupons are added to the back cover containing e.g a 10% discount on any tickets and a special offer for a Sunnyâ€™s cricket bar.
Such capabilities could also be of benefit for subscription renewals or to encourage a higher reader response to advertised products, by supplying a ready printed card containing readers details so that they donâ€™t need to spend time filling it in themselves.
This level of sophistication is only possible through powerful control systems, which operates ink-jet printers to provide inside/outside addressing, personalisation, numbering and postnet bar coding.
Suppliers also offer the smaller editor 2 multi-position ink-jet controller for up to 24 print-heads, providing upto 48 lines of print, An extensive range of fonts and graphics is available, enabling numerous messages to be printed. One of its advantages is the ability to control multiple print heads located in different areas of the production line.
Ink jet print-head can be used to reproduce a veriety of bar codes, fonts, usergenerated graphics, logos and photographs.
Image also acknowledges that the way forward for addressing or using ink-jet, is to achieve higher resolutions, and multiple fonts, readable in postal, equipment, which are becoming essential with the higher speeds of mail handling system
As ink-jet improves in accuracy, resolution and speed, of mail handling system the only limitation to its wider use in commercial printing applications is the imagination of.the end-user.

Ink-Jet

Image sprayed on to the paper with water based inks.
Many different ink formulations including inks with etching or acid bases for printing on coated stock.
Problems: since they are water based, the images will smear if they were to get wet.
Since ink is water based, sometimes it is absorb ed into the paper, resulting in a weak image.
Since ink jet produces bar codes through a sprayed image, bars formed at higher densities (closer together) become more difficult to read correctly. Upto700sfm.

Laser

Light impacts on photo-sensitive, hollow cylinder or drum. Laser beam hits and comes off a 6 or 12 sided prism and rotating mirror.
The beam of light rotates to the drum, swinging from the operators side to the gear side for one full, line of image, usually 240 dots per inch in both height and width.

The image, exposed to light, is on the drum. Drum rotates to a hopper containing toner with developer, then rotates to the paper, and, usually1 a corona wire (on the reverse side of the papei-) pulls the image off the drum onto the paper.
Image is then treated by heat (either a pad from the back side or infrared light above the printed image).
Images are usually more on the gray side. Image sits on top of the paper and does not impregnate the paper.
To protect image, coating the bar code is recommended.
The printed image is light black or gray. The larger the image, the grayer it will be because of the inherent nature of the photo sensitive drum.
Average, speeds from 90 to 130 pages per minute.

Ion Deposition

Image cylinder holds the image to the surface with an electrical charge.
The image head is a-hollow tube or chamber, with a small hole in the bottom. The air in the Chamber is electronically charged separating plus and minus Ionâ€™s. The minus or negative Ionâ€™s leave the chamber through the hole in the bottom.
The (-) negative ionâ€™s, place strokes or images on the image cylinder to create a negative image.
The image cylinder rotates to a hopper containing toner. The negatively charged ionâ€™s attract the toner to form the image.
The image cylinder rotates and transfers the image to the paper as it passes by.
1.Under pressure: 200 Ibs per linear inch.
2.Shears: There is 1 degree angle between the impression cylinder and the image cylinder, so that the character image is sliced off on to the paper.
3.As in the laser process, the image sits up on the paper and should be coated for protection.
Speeds run from 90 to 130 pages per minute and much slower.

Manography

Honey well bull engine is the hardware Print head (Coil) generates a square spot on a drum which rotates to a chopper containing toner.
Toner is then magnetized in the hopper and applied to the image on the drum.
The drum then rotates to the paper, at which point a corona wire with an opposite charge will pull the image off the drum on to the paper. It is then heat set.
Problems: When the toner is fused, it will fuse to itself.
The image sits up on the paper and will not impregnate the paper itself.
Image can chip or break off.
Sometimes there is teflon in the toner to help in the fusing process. This prolongs the life of the print head, but the chemical reaction harms the corona wire.
Finish the form with a protective coating. 90 pages per minute (approx. 82.5)

Led

Led-Light emitting diodes
Similar to the laser. Has a photo sensitive drum. Image head is similar to a bar print head with pins or grids, The diodes light the readout in a sequence as the drum passes by.
Image cylinder sees the image and takes it off the drum. Voltage is either increased or decreased. The cylinder rotates to a hopper with an electrically sensitive toner, which is attracted to the image charge.
It transfers the image to the paper using a corona wire with the opposite charge. It is then heat set.
Very slow. Only one company (Japanese) selling in the U.S. Breaks and chips. Only 5 to 7 pages per minute.

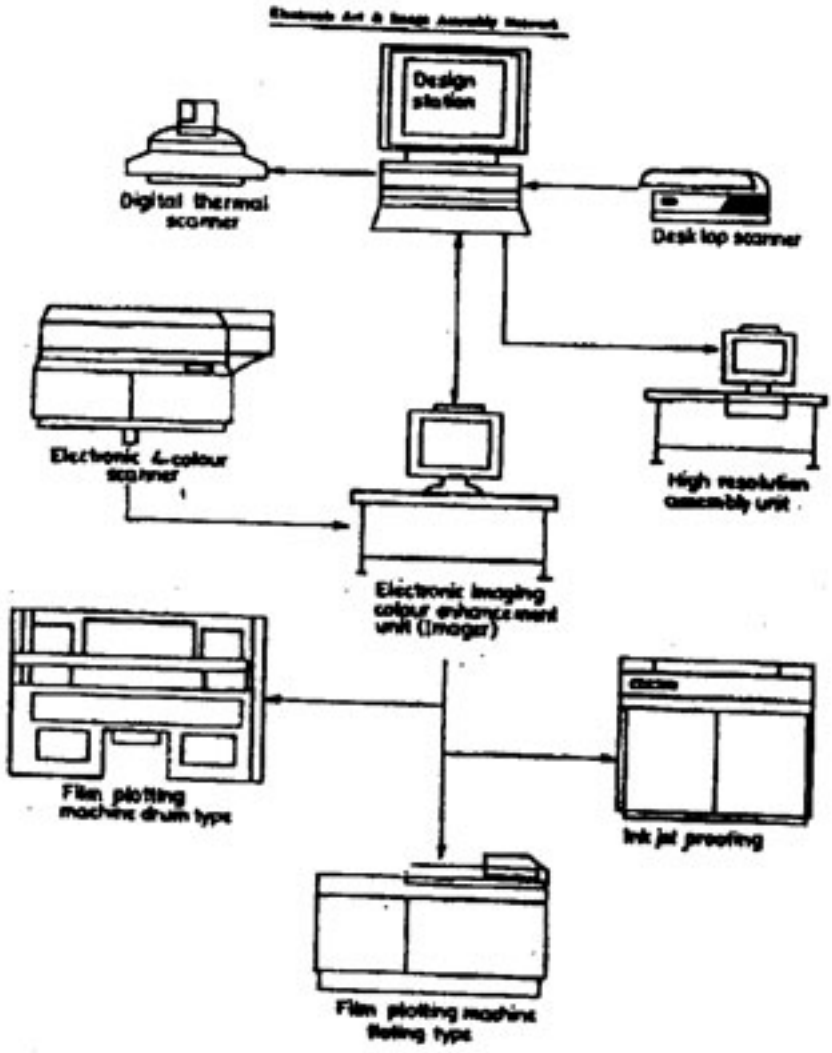
Thermal Direct

Special heat sensitive paper. Print heads are a series pins that heat up and once heated, the pins impact on the paper burning a black dot where they touch the paper.

1.Customer/Lose time heating the pins in the print head.

2.Only a narrow imaize area (Approx. 4").

Thermal Transfer



Uses a wax or poly-based ribbon. Normal papers can be used. The image head is heated and image released to the paper from the ribbon.

Advantage over thermal direct is the lower cost of paper and its shelf life. Very, Very Slow; Much slower than the laser.

Film Plotting Machine

This is the final station of the process. Once the design is approved for.printing, plate film must be created. This machine uses a small laser beam to expose film a resolution of 2,540 lines per inch. It produces negatives upto 34" x 48". Digitized information from the electronic imaging unit is networked to the, film plotter, where it exposes each negative to produce each colour of the design. This is the first point at whicfifilm has been created throughout the entire process.

Basically there are two types of plotters: (1) flatbed plotters, where film is laid flat and then electronically laser exposed and (2) drum type platters, where film is hung and then wrapped around a large drum that spins and is laser exposed while turning.

Each of these electronic stations, when net worked, form a complete design-to-platcready film system. Suppose a customer has an idea for a design. The customer can draw a rough sketch. If the customer is in Calcutta or Varanasi and the engraver is in New Delhi, the customer can fax the sketch to the engraverâ€™s electronic art station.

Fax in hand, the design station operator can scan the black and white fax into the electronic art system of the desk top scanner and send it to the design station. The image is now on the screen in a matter of minutes. The operator now can smooth rough edges, set type and position the type in the right places. Type can be curved, wrapped around irregular shapes or set flush left or right.

Once all the copy is in position on the screen, the operator assigns colours to the elements. The screen on the design station has all colours available to it. A colour wheel can be displayed on the screen, allowing the operator to mix and match his own colour.

Once colour are assigned, the design is ready to be proofed. The digitized information is sent from the design station to the digital proofer, where a proof is generated depending on the complexity of the design, this can be done in less than an hour.

The customer has a colour proof very quickly, with a minimum of time and money invested because no film, stripping or separation have been made.
Another benefit of the electronic art system, is the ability to design on 3,1/2" floppy disks. If a design requires promotion or revision, the previous version can be called upon the system, revision made and either proofs or plate-ready negatives created.
Once the proof is approved, we can begin to create a high resolution file on the computer. Remember that what we scanned in on the desktop scanner was low resolution and only for design.
Now we can scan in transparencies or reflective art on our high-resolution, four colour, scanner. The scanner then networks the colour separation to the electronic imaging unit, where itâ€™s colour enhanced. The separating is then sent to assembly unit, where it is electronically stripped together with the type and art created on the design station.
Black & White mechanical elements that were low resolution scanned for design on the desktop scanner e.g. company logos, must now be scanned in on the high-resolution scanner and net worked too the assembly unit for positioning in the design.
The design is now ready to be digitally networked too the ink jet proofer. The important thing is that now we have made a proof of four-color process and line copy without generating any negatives. If changes are required, we simply manipulate computer information and can then generate another proof. Once the proof is approved, the design is ready to be made into film negatives. The design is now networked to the high resolution computer film plotter.
Some customers are setting up low resolution design stations in their own plants and through a telephone and modem are looking into the trade shopâ€™s high resolution electronic imaging system. This technology allows the printers to do their own design in the shop, by using the inexpensive desktop scanner and design station.
The best thing about the electronic system, is the ability to hook up low resolution, front and equipment that is cheaper to run rather than the very expensive, high resolution computers and film plotters.
This systems takes a lot of the graphic burden off the high-resolution equipment and puts it on the front-end, low-resolution equipment, where designing is cost efficient.

COMPUTER TO PLATE TECHNOLOGY (CTP)

Today big printers are investing in computer (CTP) systems that by pass film entirely. With electronic imposition of complete flats, it makes sense to go a stage further and expose plates instead of film, eliminating several prepress production stages.
Imaging directly to plate also does away with the distortions introduced in film-based plate making. It is possible to resolve fine image detail more consistently, which is a special benefit with frequency-modulated screening where very small spots are being imaged.
Offset plates are quite thin. If the base material is flexible enough, they can be loaded in an imagesetter in roll form and exposed. Alternatively, dedicated plate exposure units commonly known as platesetter can be used for metal plates. These systems can in corporate automatic register punching.
Sometimes CTP loses out to conventional film-based platemaking due to the speed and low capital costs of conventional platemaking equipment. e.g. When duplicate plates or reprints are needed, a CTP system has to repeat the imaging process, while a conventional platemaking system has only to re-expose the film.
Film is a convenient storage medium that is cheaper than archiving rasterized data on magnetic media.
Proofing can also be a problem unless digital proofs are accepted as contract proofs.
It is not possible for every element in a job to be supplied a digital form, and then it is necessary to combine film produced conventionally with the digital data.
The platesetter receives the imposition instructions and exposes the digital information, masking the areas

that are missing. The device then uses the register marks as a guide to position the films & expose them conventionally.

Computer-to-plate technology (figure Y) eliminates the film output and stripping stages (Figure X) in the production workflow.

Alternatively, film or artwork can be scanned and converted into digital form, Very high resolution scanners are used to avoid image quality loss on line artwork, such as type with fine strokes and to avoid the need to descreen halftones, which risks changing color values. One type of scanner designed for this purpose converts the scanned data directly in postscript code, which can then be inserted into a postscript CTP workflow.

Film is a convenient storage medium that is cheaper than archiving rasterized data on tapes or optical discs.

When alternations are required the new matter is either stripped inmanually or the films are re-output. It is more or less impossible to edit rasterized CPT data. Changes must be made to the customer files and new plates produced whenever alterations are required.

Platesetters are usually very large as they must be able to handle the full plate size for a given job plates cannot be assembled from strips like films). Some models incorporate automatic plate handling mechanism ana can accept plates upto 48 x 66 inch i.e. 1200 x 1650 mm. They ay incorporate work flow management, including queing in and preparing files while the previous job is being exposed, automatic compensation for shingling and placement of colour bars, register marks and fold and trim marks. These systems at the very end of the prepress production workflow, are installed at printers or occasionally at larger trade shops.

In contrast to conventional photographic method in which the whole plate is exposed from film simultaneously, in direct - to plate system must be more sensitive. Such containg are to sensetive to handle in daylight and unlike convention plates, they must always be handled and loaded in the dark.

By using high-sensitivity plates and multiple blue laser exposure heads, exposure at 4000 dpi can be similar to those for conventional diazo and photopolymer plates.

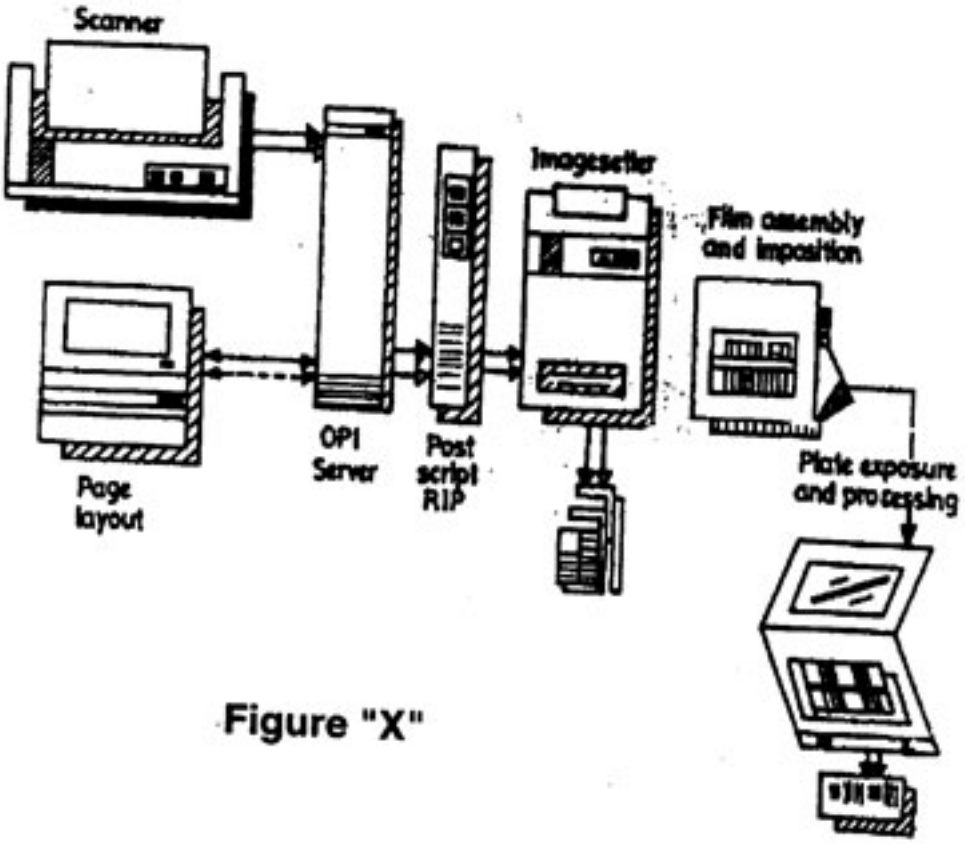

Scanner
Imagesetter
Film assembly and imposition
OPI Server
Post script RIP
Page layout
Plate exposure and processing

Figure "X"

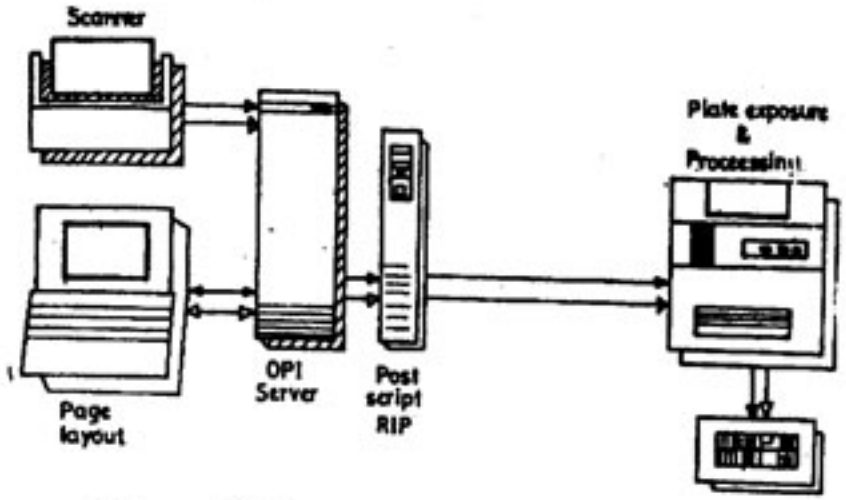


Figure "Y"

Computer To Plate

It is not all that long ago since publishers supplied manuscript Or typescript for the typesetter to re-key. Indeed some still do - but with the advent of Computers and universal languages like Postscript an increasing number of authors and publishers do their own key-stroking and page make-up and supply the printer with a disk for outputting on to bromide or film.

A number of prepress houses are now able to offer a CTF (computer. to film) facility which involves outputting eight pages of AS on one piece of film already imposed with correct heads, backs and gutters. Four of these are then exposed on a Stoesser print down frame for platemaking in very quick time. Some imagesetters are able to go from disk direct to 70mm film for automatic imposition. One of the problems are the moment is that generally speaking image setting film is much more expensive than negative film for platemaking. However, that situation is unlikely to continue. The aim has got to be to avoid the use of film altogether.

This brings us to a consideration of CTP (computer to plate) and as the technology evolves so some platemakers are struggling to keep up. CTP involves the customer supplying an electronic disk in Postscript or similar so that the prepress supplier can use this to go direct to plate thus avoiding the use of bromide and film altogether (see Figure 1).

TABLE I Krause Laserstar - technical data

Model	LXI10	LXI70
Maximum Plate Size :	950 x I 100 mm (33.5' x 43.3')	1400 x 1700 mm (55.1"x66.9")
Maximum Image Size:	780 x 1106 mm (30.7"x43.3")	1250 x 1700 mm (49.2" x 66.9")
Resolution(Variable):	400 - I 000 lines/cm (I 0 16 - 2540 lpi)	
Exposure Speed @ 400 lines/cin: or(@ 10 1 6 dpi)	286mm/min (I 1.2"/min)	174mm/,min (6.8"/min)
Exposure Speed @ 500 lines/cm or(@ 1270dpi):	182 mm/min (7.2"/min)	174 mm/min (4.4"/min)
Exposure Speed @ I 000 lines/min or (@ 2540 dpi):	45.6 mm/min (1.8"/min)	27.6 mm/min (1.1"/min)
Data Transfer Speed:	6 MBit/sec	

TABLE 2. Krause Laserstar - plate exposure times

Plate Size mm	Image Size mm	Image length mm	Model	Exposure Times @ 400 l/cm (1016 dpi Minutes	@ 500 l/cm (1270 dpi) Minutes
OB605 x 730	510 x 720	720	LXI 10	2.5	4.0
2C740 x 925	630 x 915	915	LXI 10	3.2	5.0
3B795 x 1030	7 1 Ox 1020	1020	LXI 10	3.6	5.6
51035 x 1270	880 x 1260	1260	LXI70	7.2	11.3
61140 x 1410	990 x 1400	1400	LX 170	8.0	12.5
7B1325 x 1610	II 90 x 1600	1600	LXI70	9.2	14.3

There are at least two solutions available on the market that address large format press sizes and these are from Krause and Misomex. Interestingly they approach the problems in quite different ways. The essence of such solutions is that the disks supplied should be as Postscript files created using QuarkXpress, PageMaker, Ventura and other software packages. When disks are supplied they should be accompanied by laser proofs to ensure there are no conflicts between systems and no surprises when the job is printed. No doubt, as confidence in CTP grows laser proofs will be redundant and publishers will use unaccompanied data transmission â€œover the wiresâ€.

The Krause solution involves RIPing individual rates and storing the subsequent bitmap on the PSU (page storage unit). At that point the information is read onto exabyte tapes each usually containing one complete

book. The tape is then kept until the plates are required at which point it is read onto the IPU (imposition processing unit). Once the imposition parameters have been installed the plates are loaded onto the platemaker and the plates exposed and processed ready for use on the press. The exabyte tape can be stored in a tape library for future use as required for reprints.

Nervous publishers will be able to see a proof before plates are made but obviously this will slow down the whole process and the use of a large plotter is necessary to produce the proofs.

The approach taken by different manufacturers in exposing the electronic bitmapped data direct to the printing plate is interesting. The Krause solutions involves a large and heavy platesetter with about 5 tons of granite in the framework to give stability to the laser. The plate, up to SP65 size, is loaded on the concave bed and slowly moves underneath the laser which exposes the image through a prism onto the plate. The technical data and plate exposure times for the Krause Laserstar are presented in Tables land 2 respectively.

The Misomex solution is based on their step and repeat system. The laser head is clamped by vacuum on to the plate and four A5 pages can be exposed at one time. The head then moves (rather than the plate) andexposes the next four pages. There are of course pros and cons for each solution but at this stage Misomex claims that their system is almost twice the speed of the Krause system. That of course is not the whole story Misomox are working with Cascade in developing pre-platemaking protocols and hope to have an actual system to show shortly, while of course Krause already has systems in the USA and Europe working in printing plants.

ERROR: Infinite table loop

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