DIGITAL PREPRESS
PREFACE

This book of Digital Prepress covers all the topics in a clear and organized format for the Third year Diploma in Printing Technology students as prescribed by the Directorate of Technical Education, Chennai, Tamilnadu. It is confidently believed that this book furnishes the students the necessary study material. The topics covered were neatly illustrated for better understanding of the students.

The book is prepared step-by-step lessons in large, eye pleasing calligraphy make it suitable for both direct one-to-one tutoring and regular classroom use. The highlight of this book is its simple English with clear and easy explanation of each topic.

All the topics are explained with supporting diagram for diploma level students to understand effectively.

This book majorly deals with Introduction to Digital Prepress, Digital Photography & Digital Proofing, Digital Image Assembly and Data Formats, Colour Management and Computer to Plate systems etc.

M.Pugazh, Lecturer (SS) / Print. Tech
S.Uthanu Mallayan, Lecturer / Print. Tech
Arasan Ganesan Polytechnic College
Sivakasi
# DIGITAL PREPRESS
## DETAILED SYLLABUS

Contents: Theory

<table>
<thead>
<tr>
<th>Unit</th>
<th>Name of the Topic</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>I</strong></td>
<td><strong>Digital Prepress – Introduction</strong></td>
<td>13 Hrs</td>
</tr>
<tr>
<td>1.2</td>
<td>Dot Shape – Round, square, elliptical and composite shapes, Amplitude Modulation /Frequency Modulation Screening - Difference between AM and FM screening and Benefits of FM screening.</td>
<td></td>
</tr>
<tr>
<td>1.3</td>
<td>Input and Output Resolution - Scanning Frequency, Picture element and Scanning frequency formula. Image - dependent Effects and Corrections – Spreads and Chokes, Trapping, Moire and interference of dot pattern.</td>
<td>13 Hrs</td>
</tr>
</tbody>
</table>

| **II** | **Digital Photography & Digital Proofing** | 13 Hrs |
| 2.1 | Image capturing with Digital camera – Special features of Digital Camera – Tone Value Quantization, Focal length of lens and Aspect Ratio and Link up to a Computer. | |
| 2.2 | Charge Coupled Device and Complementary Metal Oxide Semiconductor - Definition and difference between CCD and CMOS. | |
| 2.3 | Scanner designs and models, Flat bed Scanners - Diagram, functions of scanners and advantages of flatbed scanner. | |
| 2.4 | Digitizing and Redigitizing - Various Redigitizing Techniques - Copy dot, Descreening and mixed mode. Digital Proofs and Press Proofs. | |

<p>| <strong>III</strong> | <strong>Digital Image Assembly and Data Formats</strong> | 13 Hrs. |
| 3.2 | Full Sheet Output, Full sheet production in the workflow, Imposition through Software and Full sheet production workflow. | |
| 3.3 | Imposition Workflows - Types of Imposition programs, Imposition sheet, demands on Imposition programs and Imposition workflows and considerations for impositions. | |
| 3.4 | Raster Image Processor (RIP) - Workflow diagram – Interpreter, Renderer, Rasterizer and Bitmap. File Formats - Postscript, TIFF, JPEG, GIF, LZW, EPS, PDF,PPF, 1 bit TIFF and JDF. | |
| 3.5 | Data Formats - Bitmap &amp; Vector, Applications of storage media - Data distribution, Archiving and Backup or transport. | |</p>
<table>
<thead>
<tr>
<th>Unit</th>
<th>Name of the Topic</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>IV</td>
<td>Colour Management</td>
<td>13 Hrs</td>
</tr>
<tr>
<td></td>
<td>4.2 - Colour measuring instruments, Colorimetry and Densitometry – Densitometer, Spectrophotometer diagrams and functions.</td>
<td></td>
</tr>
<tr>
<td>V</td>
<td>Computer to Plate systems</td>
<td>13 Hrs</td>
</tr>
<tr>
<td></td>
<td>5.1 - Types of Computer to Plate Systems – Image register and Alignment, Types of CTPs, Advantage of CTP, Components of Computer to Plate system, Different Configuration of CTPs - Flatbed, Internal Drum and External Drum.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5.2 - Workflows - PDF and JDF - Portable Document Format, Job Definition Format and their advantages. Preflighting - Preflighting techniques, the process and preflighting checks.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5.3 - Computer to Plate workflow, Types of Lasers – UV, Violet, Thermal and Computer to plate technology for flexography, gravure and screen printing processes.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5.4 - Printing plates for Digital Imaging - Types of Plates used in CTP - Silver halide plates, Photopolymer plates, Thermal plates, Inkjet plates - Automatic plate processor diagram and its functions.</td>
<td></td>
</tr>
</tbody>
</table>
UNIT - 1 : DIGITAL PREPRESS – INTRODUCTION

1.1 DIGITAL DESCRIPTION OF THE PRINTED PAGE

A good example of this is the use of efficient workflows. In these, the data that have already been edited once need not be edited again. Rather, the existing data file can be directly transmitted to different media.

The basic stages in the creation of a digital page and a complete digital print sheet.
Text

The method of working has not been changed by the introduction of digital production, only the place of execution has changed in most cases: that is from the departments of typesetting and reproduction to the corresponding departments at the customer’s or at the agency.

The text data are primarily prepared in “Word” format, which has virtually become the word processing standard, since it is most widely used and offers many professional tools. The text data are very rarely edited directly in Word; instead they are positioned and typographically edited in a layout program (e.g., QuarkXPress, InDesign, or PageMaker).

Images

The picture objects of a printed product are usually available as photograph, slide, or reflection copy, and are scanned in, or digitized, for publication. The digital data are then available at a workstation for further processing (i.e., corrections of the image contents or geometry). In the mean time, further alternatives have been added to this classical procedure: for instance the principle of the Photo CD. This procedure still includes the use of a camera and the development of the film. However, very often the result is not a slide, but a data file, for example stored on a Photo CD, containing original pictures that are already digitized. As for the scanned image, these data can also be processed directly onto the workstation.

Another alternative for image capturing is digital photography technology also avoids the traditional procedure of film development and image scanning. As soon as the data have been recorded into a digital camera, its contents can be processed at the workstation.

Further, it is also possible to input image data directly from image archives (PhotoDisc, Bavaria, Image Bank, or Mauritius, to name just a few). These image archives have hundreds of thousands of pictures available and, increasingly, deliver the archived slides in digital form.

All these picture data are generally saved in TIFF format or – to save data transfer times – are compressed in JPEG format. In many cases, a proof of the set of image data is already prepared to check the reproduction quality before the generation of the full page.

Graphics

Graphics constitute the third main element of a printed page. They are generally generated in so-called illustration programs such as Freehand, Illustrator, or CorelDraw. These data are usually saved in the form of vector-based data files, which cannot be edited or positioned in a layout program. Therefore, these software programs offer an opportunity to save graphics or drawings in EPS format and make them available in the layout for geometric processing (scaling, cropping).

Layout

Layout programs are software packages allowing for flexible, creative work and for integrating the elements (text, images, and graphics) on pages or a sequence of pages, or to position them on the page depending on the current job. Thus they have taken over a significant function of production. One particular layout program has virtually become a standard application: QuarkXPress. In 1999, a competitor appeared on the market: InDesign from Adobe.

Another popular layout program is Page-Maker (formerly by Aldus, today Adobe), which is mostly used in offices. The page components text, images, graphics, and layout, must be prepared and organized for further stages in processing (e.g., film production, platemaking, or printing), in order to avoid errors or breakdowns in the workflow. Although it is very important for the layout program to
display all the components of the page (low resolution is sufficient), it is particularly vital for the system to be able to access the original resources for imaging.

1.2 DOT SHAPE - ROUND, SQUARE, ELLIPTICAL AND COMPOSITE DOTS

With conventional amplitude-modulated screening the dots can be given a particular shape so that they begin to touch at different values (= first and second dot contact). The resulting tone value steps in the print can be shifted into the three-quarter tone by giving the dots a particular shape. Good reproduction results of light motifs can be achieved with screens of this type, but they are not suitable for general use. The reason is that these screens produce undesirable effects, such as the formation of a line screen. Line screens are extremely direction-sensitive, and they are prone to abnormal dot gains. Figure shows a screen with diamond-shaped dots that meets these conditions: first dot contact at 50% and second dot contact at 60%.

Circular halftone dots are prescribed for facsimile reproduction in newspaper printing and for print control bars. Since the tone value somewhat depends on the dot shape, all types of control bars should use the same dot shape (i.e., circular) in order to maintain comparability.

This shape has the advantage that it can be checked by simple means, it also shows the lowest dot gain. The dot contact does not play a role since control bars should not be used for the recording of print characteristic curves. These strips are rather intended for monitoring certain tone values during the production run.

For flexography and screen printing, the first dot contact must not be under 35% and the second not above 60%. The dot contact phenomenon does not exist in gravure printing, accordingly there are no such specifications for reproduction. For printing technologies that do not require a printing plate such specifications do not yet exist.

AM Vs FM Screening Difference

- Amplitude means ‘size’ – AM Screening breaks up an image into dots of varying sizes to simulate the original image.
- FM Screening keeps the dots the same size and varies the frequency, or number of dots and the location of those dots (micro dots) to simulate the original image.
- In FM Screening, the concept of screen angle and frequency no longer apply. Because the dots are randomly placed, there is no direction to the dots.
- The variable spacing of the dots means there is no fixed spacing, and therefore there is no screen frequency.

The benefits of FM Screening

3
Successful control of print production – application in News papers, Magazines, Commercial Printers.

High Quality Commercial Printing – 600 lpi equivalent definition without going to waterless printing.

No moiré, No Angle.

Easier Registration – No rosette structure – more tolerance of press misregistration.

High Quality at Low Resolution.

The very small dot precisely renders edge differences that may be lost or blurred with a larger, traditional halftone dot.

Fine Level of Detail due to micro dot structure – rendition of fine detail in hair, skin texture, fabric patterns.

Smooth Tone Rendering – since the dots are of uniform size and randomly placed they do not change shape or necessarily touch at different densities.

**Stochastic Screening**
Stochastic means "Involving a random variable" – also known as FM Screening, keeps the dot size the same and varies the number of dots used.

1.3 INPUT AND OUTPUT RESOLUTION

One obvious quality feature is the image definition, which can be determined at a deliberately low level in the original for artistic reasons, or it is limited by the resolution when scanning the original and transferring it to the film, plate, or substrate. Either a digital camera or an input scanner scans the original. The image information is not transferred entirely, but only in accordance with a scanning pattern of a specified resolution and number of tone value levels or gray levels.

The pattern consists of the smallest image elements resolved by the scanning device, the pixels. This word is a neologism created from “picture” and “element.” In a similar way to radio and television, where the number of vibrations per second (i.e., a time frequency) is specified, the resolution of the pixel pattern can be specified by its (spatial) frequency, that is, the number of pixels per centimeter or inch. This is the scanning frequency (spatial frequency), also known as scanning resolution.

The pixel pattern must be noticeably finer than the image detail. There is another important aspect for the selection of scanning frequency: the image data should use the minimum of memory space. It is a waste of time and money to pass unnecessarily large quantities of data through the production process. Doubling the scanning frequency quadruples the size of the file. A good compromise is reached between the reproduction of fine details and the size of the file, if the factor F in the following equation is given a value of two:

\[
\text{Scanning frequency (fs)} = F \times \text{magnification factor (M)} \times \text{screen frequency (L)}.\]

If, for example, a 5.3 cm \(\times\) 8 cm diapositive is to be printed the same size with a 60 lines screen (i. e., with a screen frequency of 60 lines/cm), the resultant scanning frequency (resolution) will be \(fs = 2 \times 1 \times 60/cm = 120/cm\) (approx. 300 dpi).

1.3 IMAGE-DEPENDENT EFFECTS AND CORRECTIONS

Chokes/Spreads (Trapping)

When a substrate passes through the press at high speed, paper distortions, register differences, or other factors may cause “geometric, local shifting” of separated colors, which become
visible to the human eye as unsightly “white gaps”. On sharp contours in particular (e.g., a red dot on a black background or in a black surrounding) this may lead to the white substrate showing through. These “gaps” are not a problem specific to printing, but to prepress. Whenever colored elements with a sharp edge definition are combined, this effect can occur. For this reason, the adjacent color areas are spread (made larger). It is usually the lighter form that is spread. The programs used here draw a (virtual) line around the object. Since the extent of spreading needed also depends on the substrate and screen used, the values mentioned below can only be approximate values. With a 60-lines/cm screen, trapping should be between 0.1 and 0.2 mm, with a 33-lines/cm screen between 0.2 and 0.4 mm. Since the extent of trapping depends on the respective printing conditions, it should take place as late in the process chain as possible.

Trapping must unconditionally not be done twice, once in prepress or at the customer’s and a second time at the printer’s. Fine elements would fill in and detail rendering would be impaired.

Choking is used when the background is lighter than the foreground. To make a black area appear “deeper,” the black area is often printed on a 40% cyan screen. If this area is broken by a reverse type (white on black), cyan might become visible in the edge areas. To counteract this effect, the corresponding area is “choked”; that is, the cyan area is made smaller. The term “trapping” is also used to describe the ink acceptance behavior when printing one ink film on top of another ink film.

Moiré effects can occur wherever two or more periodic screen patterns are unfavorably superimposed resulting in coarse regular patterns. One of the most common reasons is that a regular structure was already present in the original, as is the case with already screened originals or the patterns of fabrics (from which the word moiré originates). These interference patterns are avoided by selecting a suitable angle during the screening process or by using special filters when editing the image. However, moiré effects may also occur during exposure, depending on the screening program used. Usually the latter shortcoming has nothing to do with the data supplied but must be attributed to the output unit. With frequency-modulated screening no moiré effects occur.

1.4 UNDER COLOUR REMOVAL AND GRAY COMPONENT REPLACEMENT

Both UCR (Under Color Removal) and GCR (Gray Component Replacement) are methods of replacing the color inks (Cyan, Magenta, and Yellow) with black inks. The UCR method will only replace CMY with black in the neutrals. The GCR method is more aggressive and will replace CMY with black in some color areas as well as in the neutrals.

UCR vs GCR & Difference

Restricting black replacement to neutrals is what UCR is all about. GCR came along later and extended this technique beyond the neutrals and into the colors. If done correctly, GCR can be very effective and improve image quality. Early GCR didn’t always work as expected and many fell back to UCR for safety. GCR is now at the point where it is reliable and effective, and UCR is falling out of use. As the function of UCR is a special case of GCR (dark neutrals only), I expect the term UCR will fall out of use and we will refer to all black replacement as GCR.

A big part of output profile generation involves the setting for Black using a processes called Under Color Removal (UCR) and Gray Component Replacement (GCR). Each printing ink controls one third of the spectrum: cyan controls red, magenta controls green, and yellow controls blue. It is possible to reproduce all colors using only cyan, magenta, and yellow ink. The forth color in printing is black and though we don’t have to use it, in theory, it is used for colorimetric and commercial advantages. We can create the same color using a lot of cyan, magenta and yellow, and just a little black. Or, we can use a little cyan, magenta, and yellow, with a lot of black. Since black is not needed, its use is redundant. The GCR/UCR process is used to reduce the process colors of cyan, magenta, and yellow, and replaces them with an equal amount of black ink.
There are several advantages to this:

1. Too much ink can cause problems with a printing press. Black ink reduces the overall ink coverage, which in turn helps with drying problems and in printing on paper such as newsprint.

2. Using less amounts of process colors makes printing presses more stable because there is a lower level of colorants, which minimizes their efforts if they may vary slightly.

3. Black ink is less expensive to use than colored inks.

4. The addition of black ink extends the density in the shadows, providing deeper blacks.

5. Using black ink provides crisper, cleaner, and more neutral blacks than mixing cyan, magenta, and yellow.

Unsharp Masking

The Unsharp Mask sharpens an image by increasing contrast along the edges in an image. The Unsharp Mask does not detect edges in an image. Instead, it locates pixels that differ in value from surrounding pixels by the threshold you specify. It then increases the contrast of neighboring pixels by the amount you specify. So, for neighboring pixels the lighter pixels get lighter and the darker pixels get darker.

In addition, you specify the radius of the region to which each pixel is compared. The greater the radius, the larger the edge effects. The degree of sharpening applied to an image is often a matter of personal choice. However, oversharpening an image produces a halo effect around the edges.

The effects of the Unsharp Mask filter are more pronounced on screen than in high-resolution output. If your final destination is print, experiment to determine what settings work best for your image.
Examples of determining the color separation for black using the multicolor printing of brown as an example.

a. Chromatic composition;

b. Chromatic composition with under color removal (UCR)

c. Achromatic composition (or GCR: gray component reduction);

d. Achromatic composition with chromatic color addition (UCA)

Note: The chart serves to explain the principle and does not represent a metrologically accurate reproduction.
Unit - I

Two Mark Questions

1. Name the elements of digital description of printed page.
   Image, Text, Graphics and layout.

2. How resolution of an image is calculated?
   Scanning frequency (fs) = f X Magnification factor (m) X Screen frequency (L)

3. What is AM Screening?
   Amplitude Modulation Screening.

4. What is FM Screening?
   Frequency Modulation Screening.

5. Name the halftone dot shapes used in printing.
   Round, Square, Elliptical and composite.

6. Name any two image dependent effects.
   Spreads & Chokes.

7. What is Moire?
   Interference of dot pattern.

8. What is OCR?
   Optical Character Recognition.

9. Expand UCR.
   Under Color Removal

10. Expand GCR.
    Gray Component Replacement.

11. What is USM?
    Unsharp Masking

12. What is UCA?
    Under Color Addition

13. What is OCR Software?
    OCR Software enables the translation of images of handwritten/typewriter or Printed text into machine editable text.

14. State the advantages of UCR.
    UCR Saves ink consumption by process colors and reduces setoff problem.

15. Expand Pixel.
    Picture Element.
10 Mark Questions

1. Explain digital description of printed page with workflow diagram.
2. Explain AM and FM Screening with diagram and state the advantages of FM Screening.
3. Explain about UCR, GCR and UCA with diagram.
4. Explain image dependent effects and trapping with diagram.
5. Explain about input and output resolution.
6. State advantages of UCR, GCR and UCA.
7. Explain about different dot shapes with diagram.
UNIT - 2: DIGITAL PHOTOGRAPHY

2.1 IMAGE CAPTURING WITH DIGITAL CAMERA

Digital camera

A digital camera (or digicam for short) is a camera that takes video or still photographs, or both, digitally by recording images via an electronic image sensor.

The Parts of a Typical Digital Camera

If you’re new to digital cameras, you might be wondering what all those parts — the buttons, LEDs, and windows — are for. Here’s a quick introduction to the key components of the average non-SLR digital camera:

- **Shutter button**: Press this button all the way to take a picture.
- **Control buttons**: Adjust various camera settings.
- **Shooting mode dial**: Change among different scene modes, adjust exposure choices, and so on.
• Microphone: Capture audio for movie clips and voice annotations, or even activate a sound-triggered self-timer.

• Focus-assist light: Helps the camera focus in dim lighting conditions.

• Electronic flash: Provides additional light to your scene.

• Optical viewfinder: To frame and compose your picture.

• Zoom lens and control: Magnifies or reduces the size of the image.

• Tripod socket: Allows you to attach the camera to a firm support.

• Docking port: Can be used to transfer photos, recharge the batteries, make prints, or perform other functions.

• Battery compartment: Contains the cells that power the camera.

• Power switch: Turn the camera on or off.

• Indicator LEDs: Show the camera’s status.

• LCD (liquid crystal display) panel: The camera’s display.

• Display control/Menu button: Controls the amount of information shown in the LCD and menus.

• Picture review: Press this button to review the pictures you’ve already taken.

• Cursor pad: Navigate menu choices.

• Set/Execute button: Activate a feature or set a menu choice to the current selection.

• Memory card slot: Accepts digital memory cards.

• USB port: Access for a USB cable.

• File-save LED: This light usually lights up to indicate that an image is being saved to the memory card.

Many compact digital still cameras can record sound and moving video as well as still photographs. In the Western market, digital cameras outsell their 35 mm film counterparts.[1]

Digital cameras can do things film cameras cannot: displaying images on a screen immediately after they are recorded, storing thousands of images on a single small memory device, recording video with sound, and deleting images to free storage space.

Digital cameras are incorporated into many devices ranging from PDAs and mobile phones (called camera phones) to vehicles.

**Special Features of Digital Cameras**

**Tone Value Quantization**

Alongside resolution, the tone value quantization also has an influence on the potential image quality. The lower limit for a good *tonal graduation* for the image capture is 256 gray levels, corresponding to 8 bits. With the availability of faster computers and better storage capacity, cameras with a higher tonal range are also offered.

**Focal Length of the Lenses**
In conventional photography the focal length of the lenses is normally set to the format of the film. With 35 mm cameras the shot area is 24 mm x36 mm, 50mm is viewed as a standard focal length. Mathematically, this corresponds to the shot area diagonal multiplied by a factor of approximately 1.2. Many digital cameras in the lower price category possess an area sensor with a diagonal of less than 10 mm. The standard focal length of these cameras is then less than 12 mm. At the other end of the focal length scale are cameras with an attached digital unit, whose standard focal length can be in excess of 70 mm.

**Aspect Ratio**

Having used 35 mm cameras, most people are used to the aspect ratio of 2:3. Yet many digital cameras, especially those in the lower performance bracket, tend to use the television format of 3:4. With higher resolution cameras (over a million pixels), however, there is virtually no standard aspect ratio. Several manufacturers use sensors with an aspect ratio of 1:1 while others offer the photographic format of 2:3. Between these two, practically every permutation is available, including the television format of 3:4.

**Link-up to a Computer**

The clear advantage of digital photography is that the image data can be digitally processed immediately. This means the data must be transferred to a computer, either directly when taking the picture or at the latest for processing. There are two basic possibilities here, either intermediate storage on a data carrier fitted in the camera or direct transfer to a computer after each shot. The PCMCIA card (Personal Computer Memory Card International Association) has become established as a good means of data storage for cameras. It is an electronic storage device in the shape of a credit card with a standard interface for transmission to the computer. For direct transfer, a standard interface such as SCSI (Small Computer System Interface) or a plug-in card is suitable. A serial interface offers a slightly slower data transfer.

**2.2 CCD VS. CMOS & DIFFERENCE**

CCD (charge coupled device) and CMOS (complementary metal oxide semiconductor) image sensors are two different technologies for capturing images digitally. Each has unique strengths and weaknesses giving advantages in different applications.

Both types of imagers convert light into electric charge and process it into electronic signals. In a CCD sensor, every pixel’s charge is transferred through a very limited number of output nodes (often just one) to be converted to voltage, buffered, and sent off-chip as an analog signal. All of the pixel can be devoted to light capture, and the output’s uniformity (a key factor in image quality) is high. CCD became dominant, primarily because they gave far superior images with the fabrication technology available.

In a CMOS sensor, each pixel has its own charge-to-voltage conversion, and the sensor often also includes amplifiers, noise-correction, and digitization circuits, so that the chip outputs digital bits. These other functions increase the design complexity and reduce the area available for light capture. With each pixel doing its own conversion, uniformity is lower. But the chip can be built to require less off-chip circuitry for basic operation.

**Complementary metal–oxide–semiconductor** (CMOS) is a technology for making integrated circuits. CMOS technology is used in microprocessors, microcontrollers, static RAM, and other digital logic circuits. CMOS technology is also used for a wide variety of analog circuits such as image sensors, data converters, and highly integrated transceivers for many types of communication.
2.3 SCANNER DESIGNS AND MODELS

Scanners

For years, and almost decades, the choice of scanner for the graphic industry was limited to *drum scanners*. Today there is a range of technologies available. *Flatbed scanners* predominate in terms of number, and increased demands have resulted in a renewed proliferation of scanners. Today there are good value flat-bed scanners for DIN A4 format, powerful flat-bed scanners for formats significantly larger than DIN A3, drum scanners ranging from table-top units to high end vertical scanners, as well as so-called “copy dot scanners” for redigitizing analog and screened originals. Besides these there is an increasing number of special scanners for transparencies (slides and larger format transparent originals) and OCR scanners (Optical Character Recognition) for reading in text data. Scanners may therefore be differentiated according to design and technical performance as well as special functions.

Scanner Types

- Drum scanners (horizontal, vertical, or inclined drum arrangement)
- Flat-bed scanners (desktop scanners, XY scanners)

Functions

- Color scanners
- Slide and APS scanners (Advanced Photo System)
- OCR scanners (OCR Optical Character Recognition)
- Redigitizing scanners

Flat-bed Scanners

*CCD elements* (charge-coupled semiconductor elements) are used in flat-bed scanners. The performance of these elements is so high that flat-bed scanners are beginning to achieve the quality of drum scanners. Up until just recently flat-bed scanners were clearly at a disadvantage compared to drum scanners, particularly in converting high density values. Flat-bed scanners can easily satisfy the quality and productivity requirements of many applications.

![Flat-bed scanner](image)

Flat-bed scanners contain a linear CCD array consisting of several thousand CCD elements (e.g., 8000 per color channel) arranged on a chip. The originals to be scanned are placed on a copy glass and illuminated with a fluorescent or halogen light source. Transparent originals are illuminated evenly from above, while opaque originals are illuminated from below. When scanning with flatbed scanners, the light source and sensors move across the image in order to measure and record the
color values. The scanned line of the image is projected via optical elements (lens systems) onto the light sensitive CCD array and recorded. Powerful flat-bed scanners for the professional market function according to so-called XY technology. This means that the projection characteristics of the optics are adjusted to the size of the original to make maximum use of the receiver unit in the CCD so that the best possible resolution is achieved.

CCD flatbed scanners are used for both DTP applications and professional prepress. Apart from placing the originals in the scanner, the operation of a flatbed scanner involves using a standard image-editing program or a special workstation containing the scanner software. Operator-friendly software user interfaces for controlling flat-bed scanners require only minimal training, since the optimal color balance and image density are calculated automatically.

High-end flat-bed scanners are available with a wide range of performance and can capture both opaque and transparent originals, while simpler equipment often requires peripheral devices in order to scan transparent originals. An important advantage flat-bed scanners have over drum scanners is that originals on rigid materials of any thickness may be scanned, such as books or page layouts mounted on board.

2.4 DIGITIZING AND REDIGITIZING

Digitizing

Digitization is a means of creating digital surrogates of analog materials such as books, newspapers, microfilm, and videotapes. Digitization can provide a means of preserving the content of the materials by creating an accessible facsimile of the object in order to put less strain on already fragile originals.

Redigitizing

Scanners play a central role in all digital processes in prepress. The redigitizing scanner is particularly important in computer to plate workflow since it is only with the aid of such scanning systems that existing analog films can be converted into data files for digital processing.

It is true that redigitizing is an additional expense requiring the utmost precision, yet the customer does not normally appreciate it. So that this processing step, which is absolutely essential for end-to-end digital production, is cost effective, it is mainly businesses with mixed production that use color separation scanners (drum and flat-bed) with a special added function. Often films for possible repeat jobs, which were produced with computer to film units, are archived, and the data are no longer available. In this case scanners are used to digitize these analog data carriers, for example to drive a computer to late unit or to amend the content at a workstation.

Various redigitizing techniques are employed for the different types of film masters supplied:

- *Copy dot* gives a high-resolution scan for line structures, where the halftone dots present in the master are scanned 1:1 as a bitmap. Manipulations of the image content are not possible with this technology.

- *Descreening* is reverting a screened master into a continuous-tone file. This method gives good color quality and allows corrections to be made to color and content. It must be noted that the edges of text or graphics in the design tend to appear unclear.

- The so-called *mixed mode* allows the two processes above to be combined: the color information for the cyan, magenta, and yellow is stored as a continuous-tone file, while the black separation, which gives the contrast, is computed at the output stage as a bitmap file.
• Both drum and flatbed scanners are used for redigitizing.

**Digital Proofing**

**Color Proof**

A Color proof is a colored and color faithful proof and is produced using high-end inkjet printers or thermal sublimation printers in conjunction with powerful color management system. The color proof is mainly produced in the format of the printing press. This proof is a continuous-tone proof without screen simulation.

**Raster Proof**

A raster proof, also known as true proof, is a colored or color faithful proof. This proof contains the screening parameters which are also used subsequently for the print. In order to reproduce the same halftone dot structure in the proof, it is essential for the RIP of the imagesetter, platesetter or computer-to-press system to also control the proofer. This guarantees the same dot shapes and screen angling. This makes the proof pintout and the print form the printing press very close and allows all possible problems associated with screening, such as breaks in vignettes or moire, to been seen before commencing print production.

**Soft Proof**

In the soft proof process the customer receives the file, for example, the PDF document, which he views on his calibrated and profiled monitor. This process is very cost effective but has the disadvantage that many customers feel that this proof produced by the monitor using light colors varies from the print produced object colors. There is also the fact that the customer would usually like to initial a printed proof.

**Blue Print**

A blueprint is generally a simple black and white print produced with a laser printer. The name blueprint comes from conventional platemaking where a so-called diazo copy was produced after assembly and which was bluish as a result of the process. The blueprint was used to check completeness, the register and the imposition layout. This proofing process is becoming more and more rare.

**Form Proof**

A form proof is a colored but not color faithful proof. It is usually produced using cost effective large format inkjet printers.
Unit - II

One Mark Questions

1. Expand CCD.
   Charge Coupled Device.

2. Expand CMOS.
   Complimentary metal oxide semiconductor

3. Name any two parts of digital camera.
   Lens and Cursor pad.

4. Expand LCD.
   Liquid crystal display

5. Name the special features of digital camera.
   Tone value quantization, focal length of lens, aspect ratio and link-up to a computer.

6. Name the types of scanners.
   Flatbed and drum scanner.

7. Name the redigitizing techniques.
   Copy dot, Descreening and mixed mode.

8. What is a digital camera?
   A digital camera is a camera that takes video or still photograph or both digitally by recording images via an electronic image sensor.

9. State the advantages of digital camera.
   Displaying images on screen, storing of thousands of images, recording video and deleting images to free storage space.

10. What is digitizing?
    Digitizing is a means of creating digital surrogates of analog materials.

11. What is redigitizing?
    Redigitizing is a technique of converting of analog film into data files for digital processing.

12. What is meant by Raster proof?
    Proof which contain screening parameters and it is a faithful proof.

13. What is soft proof?
    Proof viewed on color monitor.

14. What is blue print?
    Black and white print produced using laser printer.

15. Name some of the digital proofs.
    Inkjet proofs, Raster proof, Blue print and form proof.

12 Mark Questions
1. Draw the diagram of digital camera and explain their parts.
2. Explain on special features of digital camera.
3. Explain on CCD and CMOS and state the difference between them.
4. Explain flatbed scanner with a diagram and state its functions.
5. Explain on digitizing and redigitizing. Briefly explain the redigitizing technique.
6. Explain on digital proofing with their types.
UNIT - 3 : DIGITAL IMAGE ASSEMBLY AND DATA FORMATS

3.1 PAGE ASSEMBLY AND IMPOSITION

The manual assembly of a sheet from page sections and page elements, as well as the combining and positioning of several pages on a print sheet in the format corresponding to the press, is a time-consuming, cost-in-tensive, and sometimes uncertain stage within the production chain from conception to print. Cost-efficiency and a high level of production certainty are important in all areas of printing production. The move from the manual light table to sheet assembly on the digital screen, assisted by imposition software, should both reduce costs and streamline the Workflow. It makes no difference to the workflow whether the imposed pages are then placed on a large format film image setter or transferred directly to image an offset printing plate (computer to film or to plate).

IMPOSITION

Imposition, also sometimes referred to as stripping or image assembly, is the process of laying out the various components of a page before printing and arranging them so that they will fold correctly. Imposition might be described as the brain teaser of print production. You must not only consider product size with paper stock, paper thickness, press sheet size, signature size, equipment capacities, and image registration, but you must also position and orient the pages to read right-side up and in the correct sequence after the book is finished.

Imposition is an important part of planning any book, booklet, magazine, manual, catalog, etc. How you design and produce a book will depend upon the choice of imposition-a choice that, in turn, will be limited by the capabilities of printing and bindery equipment. Some of the production variables that influence the choice of imposition for books of four or more pages include product size, page count, and paper size.

IMAGE REGISTER AND ALIGNMENT

An imposition plan should consider the mechanism of sheet travel through the press. Lithographic presses, which are more precise than offset duplicators, align sheets against the leading edge and one side. This alignment can be critical to image registration and alignment, particularly if the paper is not precisely square.

Gripper edge. Before each sheet passes between the press cylinders, it is stopped momentarily and its leading edge is aligned with the press grippers, which pull the sheet into the press. The leading edge of the sheet is therefore called the gripper edge and is the most precise line of head-to-tail alignment. Due to its importance to registration and alignment, printers commonly mark the gripper edge on imposition diagrams with an “x.”

Side guide. As the sheet passes from the in feed toward the gripper edge, it is jogged toward one side of the press against a side guide, the most precise edge of side-to-side alignment on the sheet. Printers commonly mark the side guide edge with a short straight line.

IMPOSITION PLANS

In production planning, consideration must be given to a number of possible scenarios, starting at the press, which will affect both post- and prepress planning:

- Is the sheet flipped side-to-side or top-to-bottom when it is backed up?
- How many plates, or forms, will be required to print each press sheet on the front and back?
• How many copies are printed at one time on each press sheet, whether two at a time (two-up), four at time (four-up), and so on?

• How many passes through the press (impressions) are required to print the job?

SHEETWISE

With a sheet wise imposition, the press operator has a separate set of plates for the front and back of each press sheet; hence, two plates are required for each printing unit. After printing the first side, side “A,” the operator must back up the sheets, turning them upside down by flipping them from side to side. Then side “B” is printed with the separate set of plates. The gripper edge remains the same when the sheets are backed up. With single side-guide presses, however, the side guide ends up on the opposite side of the sheet.

A press sheet can be imposed sheet wise, one-up or more. With a two-up imposition, the press sheets would need to be cut in half after the pressrun, but only half the press sheets and printing impressions would be required, which would save press time. This imposition is generally used if the front and back of a piece are dissimilar, as with a four-color front and a one-color back, or if any special treatments, such as varnishing or coating, will be done to one side only.

WORK-AND-TURN

Work-and-turn is a clever, if puzzling, imposition allowing the printer to print the front and back and get two-up signatures all from one set of plates: side “A” on the right, side “B” on the left. When the sheets are flipped side to side and backed up, front side “A” gets backed up with side “B”; front side “B” gets backed up with side “A.” The press operator winds up with two identical, backed-up images. As with sheet wise imposition, the gripper edge remains the same, but the side guide moves to the other side.

This imposition generally saves time and materials, since separate plates for front and back are not needed. Generally, this imposition is also the fastest in the pressroom, since adjustments to
the press after the first pass are minimal. One of the drawbacks to this imposition is that the ink must be dry enough before the sheets can be run through the press again.

**WORK-AND-TURN**
(Also called print-and-turn).
- Print both sides with one plate; sheet will have 2 units, each one-half sheet; cut apart after printing
- Gripper edge remains the same
- Side guide moved to other side

**WORK-AND-TUMBLE**
(Also called print-and-tumble, work-and-roll, work-and-flap).
- Print both sides with one plate, as in work-and-turn
- Gripper edge is changed when backing up
- Side guide stays on same side

A variant of work- and-turn, the work-and-tumble imposition involves flipping the press sheets from head to tail before backing them up. This allows the side guide to remain the same but switches the gripper edges.
For this imposition, an extra allowance of paper must be factored in since the gripper edge changes head-to-tail. This is the imposition usually required for perfecting presses that can print both sides of the sheet with one pass through the press.

**Full-Sheet Output**

Modern imposition programs offer virtually any imposition pattern in prepress. Producing entire sheets through large-format laser imagesetters is not only of technological interest but is also of economic significance as a result of rationalizing the workflow and saving material. For example, when printing eight made-up pages it is not necessary to expose the individual pages. The use of material is consequently more effective and more economical.

The ability to image entire sheets onto film or plate raises questions not only of technical feasibility but also of economically viable production methods. It will be some time before computer to…systems and technologies become fully established in the market, since it is the organizational problems, and not technical feasibility, that play the decisive role in the restructuring of workflows. It is not so much the reluctance of businesses to use the computer to plate technology but rather the inconsistency of the workflow that is holding up the process.

Computer to plate and computer to press require a completely digital workflow but the original copies are still being delivered to the industry in different forms and formats and only very few in digital form.

**Full-Sheet Production in the Workflow**

For businesses that are in a position to set up a digital or analog/manual workflow and have an influence on the nature of the original copy, there is potential for rationalization. By employing powerful multi-page imagesetters it is possible to adopt the method of using impositioned films or imaged printing plates.

In view of the wide variety of equipment and materials available, businesses have to decide which technologies to invest in for the short or medium term:
• Large-format film image setters (*computer to film*), which require the use of film material and the necessary chemicals: With this system only complete sheets are made up and copied onto the printing plate.

• *Computer to plate* systems (CIP), where film developing and assembly are not necessary.

Most manufacturers of imagesetters (computer to film systems) and computer to plate systems have made it their job not to offer the output units as an isolated system, but rather to configure the imagesetter (whether as film or platesetters) as a complete system. However, they often abandon the ready-prepared and targeted standard solutions in order to make their systems faster, more stable and, above all, more economical.

Some imposition workflows are described in more detail in the following:

**Apogee (Agfa)**

Apogee-Workflow is a system that uses the *PDF format* (Portable Document Format) and consists of the Apogee Pilot Production Manager, a PDF-RIP, and the Apogee Print Drive Output Manager. In contrast to systems that convert the PDF format into their own formats during processing, the PDF format is maintained in the Apogee system. As a result, all PDF performance features can be used, editing can still be done and page independence can be maintained. Apogee optimizes the output because completed jobs are automatically stored, managed, and made available for output on different media. The system also has at its disposal functions for last minute corrections and an imposition tool before output to film or plate.

**Impose (Barco)**

The imposition programs Impose! and Auto-impose! are part of the fast-lane concept in which the imposition of pages also takes place. The imposition data files only contain the relevant data for imposition. The pages and pictures themselves are on a separate server. The creation of a ready-to-process imposition data file can consequently be postponed until the last minute before the exposure. This offers the advantage of incorporating correction of data files and inclusion of page sections that arrive late until just before exposure. The program also checks at regular intervals which pages of a job are available. If the pages of a particular imposition sheet are ready, the signature (full-sheet) data file is generated.

**Signastation (Heidelberg)**

After selecting a defined imposition layout for the print job from the library and the input of the corresponding printing parameters, the required number of sheets including all marks and symbols are automatically calculated. Creeping and bottling for the whole printing process is also taken into account. The user can also produce individual folding schemes with an editor. To optimize the workflow, Signastation supports OPI. The high-resolution image data, which is stored on a server, will only be used for exposure in the full sheet assembly. For a form proof or reduced-size printout on an electro photographic or ink jet printer, lower resolution versions are used. Signastation processes PostScript-data files from different applications and also takes the “Delta lists” into consideration in connection with *Delta-Technology* (Heidelberg). These have already been through the RIP-process and are page-independent. Signastation is also used in the PDF workflow *Prinergy*.

**Bit-Impose (Scangraphic)**

The Scangraphic imposition program is part of work-flow-management system’s *Scan text Combo*, a combination consisting of file and print server, software RIP, imposition software, and output
control. PostScript data files of any application (Adobe Document Structure Convention required) are fed into Bit-Impose without using special drivers or filters. They are analyzed and checked for completeness by the program. The page displays that are produced are attached to the imposition scheme; the sheet is imposed and stored for exposure. The sheet assembly itself takes place with access to the low-resolution files produced by the RIP with Bit-Impose. Finally, Bitmap Control checks whether the high-resolution bitmaps needed for the exposure are present or still need to be produced by the RIP. If all bitmaps of the pages are present, Combo automatically starts the output process, which then always runs at the maximum imaging speed of the output device.

**Brisque-Impose (Scitex)**

Two different procedures are offered here for the production of digitally imposed signatures/sheets and to image them on Scitex image setters. There is the ScenicSoft Preps imposition program, which has already been mentioned, and in addition the qualities of Preps have been combined with Brisque technology to produce the imposition solution Brisque-Impose. It is a part of Brisque-Workflows. Individual pages or parts of a job run through a preflight check, the OPI, and the RIP process, as well as trapping, and are stored on hard disks. Finally they can be proofed on an ink jet proof system (Iris-Realist). If the pages are ready and the imposition is set, Preps is used for positioning the sheet layout. Since the pages available on Brisque-Impose are already ripped, the information where the relevant data files are is enough for the imposition program. Since the RIP’d data files are available as individual pages, only the changed sheet has to be RIP’d again when a page is amended. All other pages remain unaffected by this.

**The Imposition Sheet and the Imposition Layout**

Imposition means the correct assembly of pages for a layout with, for example, 4, 8, 16, or 32 pages. Two basic working materials are required to manufacture the printing plate: the imposition sheet and the imposition layout, which depends on the type of folding to follow. The imposition sheet and the imposition layout can only be employed when the most appropriate production method from a technical and economic viewpoint has been determined.

![Fig. 3.2-37](image)

*Fig. 3.2-37 Imposition sheet for 8 pages with information on page orientation, later printing, and finishing*

The imposition sheet shows the positions of the sections to be printed, the distances between the pages, from the middle of the sheet, from the binding edge (fold), and from the edges of the sheet. It also takes into account information such as the position of the gripper edge and shows where the different markings should be made that are needed for printing and subsequent sheet finishing, such as lay markers, signature titles, collating marks, or cutting marks as well as the register marks and
print control strips that are required for printing. The imposition sheet must sometimes also contain information on the position of a numbering unit or perforation.

Signatures and collating marks are indispensable for processing book blocks, to produce the correct sequence of sheets, sheet sections and binding sections. The alignment/lay marks are particularly important because they mark the direction in which the sheet runs into the folding machine. This establishes the location, alignment, and direction of the first fold and all the subsequent folds it is also important for electronic imposition for the imposition sheet to contain all the information on measurements.

The imposition sheet is the basis for preparing the print of a sheet. It is provided with information about the imposition layout, which establishes the division of the printed sides onto the front and back of the sheets and gives an overview of the number of printing plates. While the imposition sheet establishes the position of the pages on the printed sheets, the imposition layout shows how the total number of pages of a printed product should be divided up. It also indicates how often and in which way individual sheets have to be folded. The imposition layout shows how a printed sheet in a format of 70 cm ¥ 100 cm, for example, is folded into the required final format. In this respect the imposition layout adds to the imposition sheet and is the result of optimization by a number of factors, such as:

- the number of pages in the printed product,
- format of the printed sheet,
- paper composition and grain,
- format of the printing press,
- format of the finishing machines (cutting and folding machines),
- final format,
- type of binding (perfect binding, thread or wire stitching).

Types of Imposition Programs

The software tools that have become known as imposition programs also have to fulfill the requirements mentioned above. They are divided into two categories:

1. Programs that are designed to be device-independent and can be used with every publishing equipment/system.
2. Programs that have been integrated by the manufacturers of prepress systems into their own workflow.

The first category contains programs such as: Imposition (DK&A), Imposition Publisher (Farrukh Systems), Press wise (Scenic Soft), Strip It (One Vision), Preps (Scenic Soft), and Impostrip (Ultimate). The second category of imposition programs are those that are offered by companies such as Agfa, Barco, Heidelberg, Krause, Scangraphic, and Screen as part of their workflow management in a product line. These programs include hardware configurations such as servers, imposition stations, RIP, and film image setters (CtF) or CtP systems. There are also solutions available from companies such as Scitex, which has integrated a standard program (Preps by Scenic Soft) into its own workflow. Heidelberg also enables the integration of the software mentioned above into the Prinergy workflow as do the firms Creo, Fuji, Intergraph, Scitex, and Xerox. Businesses that decide on the last two variants know for certain that the workflow will follow a logical concept. One party also
then controls the responsibility for the individual processes. Otherwise, companies have to implement the digital sheet assemblies by themselves and adapt it to the existing configuration.

### 3.4 RASTER IMAGE PROCESSOR (RIP)

Raster Image Processors (RIPs) have been around for as long as there has been digital, electronic prepress. There have also always been (very diverse) page description languages in the digital world with which the information from the application program is brought via the interpretation to the page. Practically every manufacturer had his own page description language and therefore also had an RIP set up to handle this.

![Raster Image Processor Diagram](image)

**Fig. 3.2-44**
PostScript-RIP in the prepress workflow

The term “Raster Image Processor” (RIP) has come to be very closely associated with the PostScript page description language. To run computer programs that have been written in a higher programming language such as C, Pascal, or PostScript, the language must be translated into the individual, binary program structure of a computer system. Modern computer technology uses two basic principles: in the first, the command written in the higher programming language can be translated into a machine-compatible binary structure by a “compiler” immediately after program generation. In the second, the program can remain in the higher language and is transferred into the machine-compatible code on the final computer system by an “interpreter.” The advantage of the interpreter-based system is that the computer program remains coded regardless of which computer system is later used while remaining universally compatible.

### File Formats

A **file format** is a particular way to encode information for storage in a computer file.

Some file formats are designed to store very particular sorts of data: the JPEG format, for example, is designed only to store static photographic images. Other file formats, however, are designed for storage of several different types of data: the GIF format supports storage of both still images and simple animations, and the QuickTime format can act as a container for many different types of multimedia. A text file is simply one that stores any text, in a format such as ASCII or UTF-8, with few if any control characters. Some file formats, such as HTML, or the source code of some particular programming language, are in fact also text files, but adhere to more specific rules which allow them to be used for specific purposes.

**Postscript**

Postscript is a page description, programming and printer controlling language. It was marketed in 1985 by Adobe. PostScript is still the most commonly used file format for output of files on printers and imagesetters. PostScript is a document format.

PostScript is a page description language fromAdobe
PS achieved its breakthrough with the launch of the first RIP (raster image processor) by Linotype in 1985 for the Linotronic300 from Linotype-Hell AG.

Important PostScript components are e.g. the programming language, the printer driver, and an interpreter (RIP) as well as Type 1-fonts.

**EPS**

The Encapsulated PostScript format is based on the PostScript page description language. An EPS file can only describe a single page or parts of a page. An EPS file is a file format and not like PostScript which is a document format.

**PDF**

The PDF format was marketed by Adobe in 1993. It is based on PostScript and is the realization of the platform and device independent document format for the exchange of documents. PDF document can be created by a lot of software application. For every hardware platform there is a PDF viewer with which you can display the document.

- PDF is a page-oriented PostScript data format which can easily be produced (PDF-writer/printer driver), in which superfluous command and definition structures are eliminated (lean PS) and which can be represented and –to a limited extent – edited with simple tools (Adobe Acrobat Reader, Freeware) across different platforms.
- It even simulates missing fonts with an approximate character width and approximate font characteristics.

**TIFF**

The Taggett Image File Format (abbreviated to TIFF) is a format which is independent of program and platform and was introduced in 1986 in its first official specification by Aldus - now known as Adobe - in co-operation with Microsoft and some scanner and printer manufactures.

**JPG**

The JPEG is a file format which was developed by the Joint Photographic Expert Group. The JPEG file format uses very high data compression mechanisms which makes it lossy. This is why the file size of color and grayscale images is very small in the JPEG format. First used on the internet, it is now also used in printing using a lower compression rate. The big advantage is the small file size in relation to the picture size.

**GIF**

The GIF format is a platform-independent format for the transmission of halftone images. It was introduced by Compuserve in 1987 and is one of the standard formats for publishing on the WWW. It is very compact because of the limitation to 256 colors and the use of the LZW compression algorithm.

The three most common image file formats, the most important for printing, scanning and internet use, are TIF, JPG and GIF. However, TIF cannot be used in internet browsers.

**Best file types for these general purposes:**

27
3.4 DATA FORMATS

The Bitmap

- The digital, geometric representation in a kind of chessboard pattern is used with image data (scanners, digital cameras) and for controlling printers and exposure units.
- This format of digital representation is also called bitmap. It is a map consisting of bit (or byte) data, i.e. of pixels or picture elements.
- The fineness or resolution is expressed in dots per inch (dpi).

<table>
<thead>
<tr>
<th>Properties</th>
<th>Photographic Images</th>
<th>Graphics, including Logos or Line art</th>
</tr>
</thead>
<tbody>
<tr>
<td>For Unquestionable Best Quality</td>
<td>TIF or PNG (lossless compression and no JPG artifacts)</td>
<td>PNG or TIF (lossless compression, and no JPG artifacts)</td>
</tr>
<tr>
<td>Smallest File Size</td>
<td>JPG with a higher Quality factor can be decent.</td>
<td>TIF LZW or GIF or PNG (graphics/logos without gradients normally permit indexed color of 2 to 16 colors for smallest file size)</td>
</tr>
<tr>
<td>Maximum Compatibility (PC, Mac, Unix)</td>
<td>TIF or JPG</td>
<td>TIF or GIF</td>
</tr>
<tr>
<td>Worst Choice</td>
<td>256 color GIF is very limited color, and is a larger file than 24 bit JPG</td>
<td>JPG compression adds artifacts, smears text and lines and edges</td>
</tr>
</tbody>
</table>

The Vector Format

- Besides the bitmap format for pictures, there is the so-called vector format for line art and text in which all elements are defined by geometric formulas, e.g. Bezier curves.
These vector data are not converted into the known bitmaps until the output on a printer or exposure unit.

The advantage of vector data is that they are independent of size and resolution, e.g. with typefaces, smaller quantity of data.

**Storage Media**

Prepress places particular demands on storage media. Such demands do not only result from the constant need for increased data storage capacity when producing printed matter; memory also is of extreme importance for the regular backup of data within networked work stations, and for the secure transportation and archiving of data. In spite of the increasing possibilities for data transfer via public networks or the Intranet, storage media will continue to play a significant part in the exchange of data between the customer and the print shop.

The following applications represent three possible uses for storage media:

- data distribution: pre-recorded media such as the CD-ROM or DVD-ROM;
- archiving: once-only recordable media such as the CD-R or DVD-R (R recordable);
- Backup or transport: rewritable media such as floppy disks, hard drives, MOs, CD-RWs (RW rewriteable), and tapes.

These are not the only choices, but they are good and reasonable choices.
Web pages require JPG or GIF or PNG image types, because that is all that browsers can show. On the web, JPG is the best choice (smallest file, with quality being less important than size) for photo images, and GIF is common for graphic images. GIF was designed for modems by CompuServe, for earliest 8 bit video, and so GIF contains no printing dpi information, and is out of date for 24 bit photos now, but GIF still works quite well for video graphics on the internet.

Other than the web, TIF file format is the undisputed leader when best quality is required (when less than maximum quality is not a consideration). So TIF is very common in commercial or professional printing environments.
Unit - III

Two Mark Questions

1. What is meant by imposition?
   Imposition means the correct assembly of pages for a layout.

2. Name the types of imposition programs?
   Device-independent and integrated by manufacturer.

3. What is RIP?
   Raster Image Processor.

4. Name some storage media?
   ZIP, JAZ, CD, DVD, Hard Disk Drivers, Pendrives.

5. State the applications of storage media?
   Data Distribution, Archiving and Backup or transport.

6. What is file format?
   A file format is a particular way to encode information for storage in a computer file.

7. Expand EPS.
   Encapsulated Postscript.

8. Expand PDF.
   Portable Document Format.

9. What is digitizing?
   Digitizing means creating digital surrogation of analog materials.

10. Name the data formats.
    Bitmap and vector.

11. State the advantages of digital sheet assembly.
    Higher register precision, avoid mistakes, increases the quality of print production, reduces cost of material, space and machines.

12. Name some of the imposition workflows.
    Apogee (Agfa), impose (baxo), Signastzhor (Heidelberg), Bit-impose (scangraphic), brisque-impose (Scitex)

13. Name the parts of raster image processor?
    Interpreter, renderer and rasterizer.

14. Expand TIFF.
    Tagged image file format.

15. Expand LZW.

10 Mark Questions
1. Explain the imposition plans with neat sketches.
2. Explain the imposition through software in detail.
3. Draw the 8 page imposition sheet assembly and explain in detail.
4. Draw the diagram of RIP and explain the same.
5. What are the imposition programmes and state the demands on imposition programmes.
6. Explain different file formats used in prepress.
7. Explain on the classification of storage media and their categories viz., methods and design.
8. Explain data formats with diagram.
UNIT - IV : COLOUR MANAGEMENT AND DIGITAL PROOFING

4.1 DEFINITION OF COLOUR

Color is an optical phenomenon, a sensory impression conveyed by the eye and the brain. Color is not a physical variable; accordingly it has no physical unit. An object is not colored per se, but the sensation of color is produced as a result of irradiation by light. Sunlight, which appears to be white, radiates onto an object and is partially reflected. Consequently an object that reflects the red area of the visible spectrum appears colored. An object that reflects completely in the entire visible spectrum usually appears to be white and a completely absorbent body appears to be black.

A color measuring instrument (colorimeter, spectrophotometer) primarily measures only the chromatic stimulus, from which the color stimulus specification and possibly also the color perception can then be deduced numerically by means of suitable interpretation models. These may, for example, be the standard color spaces defined by the CIE: CIELAB, and CIELUV.

What is a color management system? and its needs

A system that transforms data encoded for one device (such as scanner RGB) into that for another device (such as printer CMYK) in such a way that it reproduces on print the same colours as those scanned. Where exact colour matching is not possible the result should be a pleasing approximation to the original colours. In general the term colour management system is usually reserved for those systems that use the internationally accepted CIE system of colour measurement as a reference.

Color terminology

What is the definition of a color?
Colour is the sensation produced in response to selective absorption of wavelengths from visible light. It possesses the attributes of Brightness, Colorfulness and Hue. An international standard developed by CIE can be used for measurement of these attributes for any colour.

**CIE Chromaticity Diagram**

![CIE Chromaticity Diagram](image)

*Fig. 1.4-16 Color gamuts in the CIELAB system for different reproduction processes.*

a. Color photograph (diapositive);
b. High-quality offset printing;
c. Newspaper printing

The CIE color diagram contains all colors. The colors described in the CIE system is plotted on a chromaticity diagram. The diagram is the horse shoe shaped “spectrum locus” (the line connecting the points representing the chromaticities of the spectrum colors). The two dimensional map of color obtained is known as Chromaticity diagram. The wavelengths of the visible spectrum are plotted on the outside. The x and y axes designate two of the three standard color value ratios in relation to the eye of a standard observer. Only a certain number of the colors that occur in nature can be reproduced in printing using the four process colors of CMYK. The colors produced in four color offset are within the polygon. Compare also the color spectrum of a positive slide and the spectrum used in newspaper printing. The vertical from the achromatic center of the color triangle represents the luminance axis ‘capital Y’. If the luminance axis is also plotted, we talk about the CIE color space.

**Spectral Reflectance curves**
Fig. 1.4-22 Spectral distribution (degree of spectral reflection) of printing inks for multicolor Printing.

**Densitometer**

Fig. 1.4-17
Measurement of color density (optical density) by densitometry (measurement method)

**UCR an GCR**
4.2 COLOR MEASURING INSTRUMENTS

What is spectrophotometry?

Spectrophotometry is the measurement of the reflectance or transmittance of a sample at discrete wavelengths. Spectrophotometers usually provide illumination of the sample by white light and then contain a diffraction grating to refract the reflected light and enable measurement of the amount of light reflected at discrete wavelengths.

What is a colorimeter?

The word colorimeter is normally used for a device which uses three or more filters to produce a response similar to that of the eye, as opposed to a spectrophotometer which measures the amount of light reflected or transmitted at each wavelength. Both colorimeters and spectrophotometers can give the same tristimulus values though the spectral method is usually more accurate.
What is the CIE system of colorimetry?

A. Colour is the sensation achieved when light falls on the retina of the eye. In the retina colour sensitive receptors are ‘triggered’ to produce electro-chemical signals, which are sent to the brain to produce the sensation of colour. The light reaching the eye is the product of the light reflected at each wavelength by the sample and that of the illumination source shining on it.

The three types of receptor each peak in sensitivity at different wavelengths - one at short wavelengths, one medium wavelengths and one at slightly longer wavelengths. This means that any colour can be reproduced by just 3 coloured dyes, pigments or coloured luminous stimuli - so long as their peak absorption or emission wavelengths are also separated. It also means that colours can be seen to match despite having different spectral composition - a phenomenon known as metamerism. Such a match will generally fail when the light source shining on the sample is changed.

Colour (whether coloured light or print) is traditionally measured by specifying the amounts of Red, Green and Blue lights which would be needed to match it. Based on experiments in which observers were asked to match various colours by mixing three coloured lights, the international colour standards body International Commission on Illumination (CIE) defined a ?standard observer? as the average of these observers for a specific set of ?lights?. They then defined a system of measurement units and measurement procedures which enable any colour to be specified in terms of the amount of the three standard lights that would be needed to match it. These are the CIE XYZ values, and other quantities such as CIELAB are calculated from them.

**Implementing color management**

**Color Management is based mainly on international standardization**

**Commission Internationaled’Éclairage(CIE)**

- Specification of the Lab color space 1976
- Device-independent,
- Based on human color perception
International Color Consortium (ICC)
- Specification of the ICC profile format 1994
- Computer-independent,
- Manufacturer-independent

*We must have a common order!*

4.3 PROFILES FOR MONITOR, SCANNER AND PRINTER

**ICC profile:**

ICC profiles help you to get the correct colour reproduction when you input images from a scanner or camera and display them on a monitor or print them. They define the relationship between the digital counts your device receives or transmits and a standard colour space defined by ICC and based on a measurement system defined internationally by CIE. Thus, if you have a profile for each of your scanner, camera, display and printer, the fact that they refer to a standard colour space lets you combine them so that you obtain the correct colour as you get images from the scanner or camera and print or display them.

An ICC profile is one that conforms to the ICC specification. By conforming to this specification profiles may be exchanged and correctly interpreted by other users. The two main types of profiles are source (input) and destination (output) profiles and essentially consist of tables of data that relate the device co-ordinates to those of the standard colour space defined by ICC.

*How do I make ICC profiles?*

The main requirement is a software application that will generate profiles from measurement data. For output profiles, you also need a measurement instrument to measure your prints or display.

*What is a rendering intent?*

A rendering intent defines how the gamut of colours which can be achieved on one media is modified when reproduced on a media with a different colour gamut. Each profile contains three of these rendering intents and which should be used depends on the colour gamuts of the original and reproduction media.
**Rendering intents**

Scanned natural photographic images reproduced on prints or displays will usually use a **perceptual** rendering. This takes account of the fact that the range (gamut) of colours on a print or display is often lower than the original although for high gamut printing a **colorimetric** rendering (which attempts to produce an exact colour match) may be appropriate.

However, many other cases (such as proofing - simulating one device on another such as a print on a display) require a **colorimetric** intent when there are no colour gamut mis-matches. The **saturation** rendering intent is often used for business graphics and produces a maximum colourfulness on the print.

**Integration into the workflow**

Every device used in an open, digital color management workflow portrays color in its own specific manner. Monitors for instance use different light sources and CCDs; and proof printers use different inks, laminates and papers. Monitors and scanners work in the RGB color space, proof printers work in the CMYK color space.

In order to integrate all these devices into a properly functioning color management system, it is necessary to ‘fingerprint’ each of them so the system can know how each device ‘sees’ or portrays color. This ‘fingerprint’ is also called the individual device profile – this is a table, which shows the actual values of the device that differ to the theoretical nominal values. With each portrayal or color space transformation, the fingerprint of each device is needed for print simulation whilst taking the print standard (output profile) into account. A variety of manufactures can provide measuring devices and ICC compatible software for generating fingerprints.

**Monitors**

There are several different approaches for generating monitor profiles.

- A spectrometer is mounted on the screen and after the screen is calibrated the spectrometer compares the color generated by the screen with reference data and calculates the difference, which is the monitor profile. Which spectrometer can be used depends on whether it is supported by the profiling software. This method is intended for professional terminal workstations such as those be found in repro studios.
- GretagMacbeth has developed a method that enables the monitor colors to be visually matched with the aid of calibrated color foils. The monitor profile as ascertained in this way also takes ambient influences into account, which purely measurement profiling does not. The GretagMacbeth method does not need to measure with spectrometers, and includes monitor calibration and profiling. It is effective, very reasonably priced and is mainly intended for agencies and layout studios.
- Adobe Gamma from the Adobe Company is a monitor-matching program at the operating systems level that Adobe offers with their products. Adobe Gamma also generates an ICC profile that contains monitor calibration, but not profiling in the real sense.

**Scanners**

Manufacturers of high-end and mid-price scanners offer the possibility to scan in an IT8 reflective test chart for the calibration, and the scanner profile is calculated by comparing the ascertained colorimetric actual values with the theoretical nominal data of the test chart. If the scanner is also suitable for transparent copy, the same procedure can be followed with an IT8 transparent test
chart. External scanning programs or plug-ins that permit calibration via IT8 are also available for many scanners. Prior to generating the scan profile, the operating sequence and the scan parameters must be determined (e.g. linear scanning, highlight and shadow settings). The purpose of a profiled scan is always to reproduce the scanned copy as identically as possible.

Proof printers

In principle, device profiles of proof printers are generated in exactly the same manner as output profiles for print standards. However, fingerprinting proofers is very complicated since digital proof printers seldom work in a linear fashion. It helps when the proof software for the basic calibration permits linearization of the proofer via gradation curves and also allows maximum inking to be produce better profiling results. If there are any last-minute changes to the whiteness of the substrate to be printed, these changes to the existing ICC profiles can be optimized to a certain extent by profile editors. This does not require a test chart to be printed or measured.

4.4 IMAGE REPRODUCTION PROCESS

How to implement ICC colour management?

To apply colour management, you need a profile for each of your scanner and/or digital camera and another for your monitor and/or printing device. Each of these relates the device colour data to the standard colour space which allows them to be combined to produce an overall transformation.

To combine profiles you need a Colour Management Module (CMM). At its most basic this is nothing more than an interpolation engine for combining LUTs. ICC do not specifically recommend a single CMM as some CMMs attempt to 'add value' for specific applications by picking up private tag information in the profile.

Many colour management-aware applications such as high-end RIPs and Adobe Photoshop contain an internal CMM. CMMs are also built in to the OS on the Mac (ColorSync) and Windows (ICM and WCS).

THE “THREE Cs” OF COLOR MANAGEMENT

Many people use the term "calibration" to mean all steps necessary to achieve accurate color during the production process, perhaps implying that reproduced colors are "calibrated" to match the original. "Color management" is a more meaningful term for matching color on different input and output devices, since the calibration of each device is only the first of three steps necessary to achieve accurate and consistent color throughout the reproduction process.

Calibration ensures that all devices (scanner, monitor, and printer) perform to a known specification, be it RGB illuminance, CMYK density, or CMYK dot area.

Characterization is a way of measuring and quantifying the color space, color gamut, or color behavior of a particular device under known conditions. It is a way of determining how an input device captures color or an output device records color when it is calibrated.

Conversion (also known as color transformation or color correction) refers to translating a color image from the color space of one device to that of another under known conditions. Color conversion can be done by manually correcting the image or automatically by using color management software.

To achieve the goals of color management, calibration, characterization, and conversion must be done in this sequence. Calibrating a device to specification serves as a foundation for char-
acterization and conversion, and a device must be characterized before color data can be converted for accurate rendering.

**CALIBRATION**

Color management is based on the assurance that all devices in a color reproduction system are performing to specification. Calibration alone does not guarantee color matching; it simply ensures that the scanner, monitor, and printer are performing to their respective specifications, and provides a way of ensuring they will be consistent over time.

Scanner calibration means that when a specific light level is measured from a film or paper target, the scanner consistently records a corresponding digital value in the image file for that spot on the original. Monitor calibration means that the display card consistently displays a pixel corresponding to the specific digital value received from the file. Other items that require calibration include the color printer/proofer and the platesetter.

**CHARACTERIZATION**

After devices are calibrated, they must be characterized. Characterization defines the color gamut, or set of reproducible colors, that an input device can capture or an output device can record. Device characterizations are stored as profiles, digital files of data describing the color gamut of a device. In page-layout software, color management systems keep track of the input, display, and output devices the user has specified using tags or data appended to color files.

A variety of models can be used to characterize input and output devices, including RGB color space, CMYK color space, and CIE color space, which includes two models based on the dimensions of hue, chroma, and value. These are the CIExY and CIELAB color spaces. In both models, hues are arranged around the perimeter of the color space, saturation increases from center to edge, and value varies along the third color space axis.

Scanners are characterized by software that measures the values in a scanned ITS.7 target and compares them to corresponding values in a reference file. The ITS.7 target is the internationally standard input target developed by the ITS subcommittee of the Committee for Graphic Arts Technologies Standards. The basis of the ITS.7 target is the Q60, a series of photographic film and paper test images for characterizing the gamut of input devices developed by the Eastman Kodak Co.

The printer must also be characterized. Output targets are measured with a spectrophotometer in CIExY and/ or CIELAB color space to characterize the color gamut of an output device. As with scanners, the characterizations are stored as device profiles.

Profiles for commonly available monitors are offered by the developers of color management software, although they are valid only when the monitor is performing to manufacturer’s specifications. Some software allows users to characterize their own monitors; other systems have built-in calibration.

**CONVERSION**

Conversion refers to translating color-image data from the color space of one device to that of another under known conditions. Color conversion is necessary so that a scanned image reproduces as a believable representation of the original on both the screen and the printer. Since output devices typically have smaller color gamuts than originals, scanners, and monitors, colors in the original must be fit into the gamut of the device, a process known as gamut compression.
Color management software converts or translates color from one space to another: from scanner to monitor, from monitor to printer, and from scanner to printer.

Once color management profiling software has been used to characterize the scanner, monitor, and printer, it is necessary to apply the profiles to the image according to the desired “matching” objectives.

Three methods of color conversion are used—one for photographs, one for spot colors, and another for business graphics. Perceptual rendering, used for continuous-tone photographs, maintains the relative range of colors in a photograph. It causes the white portions of an image to have no ink on the paper, and the black portions to have the darkest color that the device can print.

Colorimetric rendering, most effective for spot colors, maintains an absolute color match. It renders colors that are within the device’s gamut identically, and brings colors outside the gamut to the closest color the device can print.

Saturation rendering is appropriate for bright saturated illustrations and graphs like those used in business presentations. This rendering style produces pure, saturated colors in print according to the printing device’s limitations. It does not try to precisely match printed colors to those on the monitor.
To be completed.
15. What is meant by L*a*b*

   L- Lightness
   a*- Position on red, green axis
   b*- Position on yellow, Blue axis

10 Mark Questions

1. Draw the diagram of CIE chromaticity and explain and draw the spectral repectance curves.
2. Draw the diagram of densitometer and explain.
3. What is color management system and explain with workflow system.
4. Draw the block diagram of color perception and colorimetric description of color and explain or color management.
5. How to generate ICC device profile for monitors, scanner and prints.
7. Explain 3c's of colour management.
8. Explain the functions of spectrophotometer with a neat sketches.
UNIT V: COMPUTER TO PLATE SYSTEMS

5.1 TYPES OF COMPUTER TO PLATE SYSTEMS

“Computer to plate” is the term used to describe the computer-controlled direct imaging of printing plates from digital data. It refers to the production of printing plates for offset printing as well as to the production of plates for flexographic printing.

The trend in printing is toward shorter run lengths, which means changing plates more often. CTP seems to be the primary method for conventional printing to cope with the continually growing demand for short-run printing and increased productivity. Potentially, investing in CTP can provide the following benefits (Advantages of CTP):

- A reduction in the amount of supplies—such as film, carrier sheets, film chemicals, tapes, and adhesives—that need to be purchased.
- A reduction in the number of personnel needed, specifically in the areas of stripping, film/plate exposure, retouching, and processing.
- A reduction in prepress costs by the elimination of various equipment, such as that used in film/plate exposure, film processing, and maintenance.
- An increase in floor space of up to 50%.
- A savings in production time (from digital file to plates).
- Improved workflow due to a more streamlined operation.
- Improved quality due to greater predictability in using first generation digital data.

There are three types of computer-to-plate systems currently in use:

- Plates or image carriers for gravure and flexography on which the images can be produced by etching with high-powered lasers or electromechanical engraving devices.
- High-speed light-sensitive plates for offset with coatings that have light sensitivities on the order of film and that can be exposed with low-power visible lasers.
- Non-light-sensitive plates for offset with coatings on which images can be produced by heat (infrared) radiation rather than light.

5.1 COMPONENTS

Components of a computer-to-plate system include a raster image processor, or RIP; a plate-holding area; systems for slip sheet removal, punching, and loading and unloading plates; a platesetter; and a post-processing system.
DIGITAL FRONT END OR RASTER IMAGE PROCESSOR

The DFE, or RIP, prepares a screened believe bitmap for each color separation, which drives the imaging system to image each plate.

UNIMAGED PLATE-HOLDING AREA

Plates are stored in a light-tight loading area, usually in special cassettes; although, some plate suppliers will offer packaging that does not require re-handling of plates. If the automatic plate-handling option is not selected, the plate setter must be installed in a darkroom if light-sensitive plates are used. New thermal plates require yellow light conditions or may operate in daylight.

SLIP SHEET REMOVAL

Automatic systems must deal with slip sheets. All of them have developed approaches that sense the difference between the slip sheet and the aluminum plate and thus can deal with the sheet and then select the plate. Automatic plate handling contributes to overall productivity. Plates supplied come with intend between each plate.

PLATE-LOADING MECHANISM

A mechanical system must sense the interleaf sheet and remove it, then “grab” the plate and transport it to the plate-imaging area. Usually some sort of suction system is used.

PUNCHING MECHANISM

There is still debate over whether to punch the plate before or after exposure. It usually cannot be done in the imaging area because of the delicacy of the optics.

PLATE-IMAGING AREA

Your selection of a platesetter will depend upon the size of plates you want to expose using CTP, but generally speaking, the larger the format and the higher the resolution required, the more money it is going to cost. We can categorize systems as:

- 66X82 inches very large format
• 55X67 inches large format
• 41X52 inches format.
• 32X42 inches format.
• 22X28 inches format

Platesetter models are internal drum, external drum, and flatbed. The fundamental differences among platesetters are the plate-holding method and the exposure source.

5.1 Different Configurations of CTP

Flatbed. Flatbed configurations offer the simplest handling of plates and pin registration systems. Imaging methods involve complex optics. A rotating mirror scans a laser beam across the width of a plate with the laser scan limited to less than 22 in. by optics considerations. A plate, on a flat platen, moves perpendicularly to the laser scan direction, one bit position per laser scan. Special lenses are used to compensate for the change in focus as the laser beam is scanned across the flat surface, limiting the resolution. Very-high speed imaging is possible. Makers of flatbed systems use multiple imaging heads or mechanical scanning methods. The matching (stitching) of the adjacent exposure areas is difficult, and the naked eye can often see a distortion pattern caused by an error a micron or smaller in size.

Overall, for flatbeds:
• Plates are easier to handle.
• A single-beam laser is used, and in some systems is only a short distance from the plate.
• Spot distortion across the image area from the laser beam starts to become a problem with image sizes greater than 22 in.

Internal drum. An internal-drum configuration mounts the plate on the inside surface of a partial cylinder, usually open at one or both ends. Physical loading and unloading of the plates is complicated, especially in the accommodation of registration pin sets. The configuration provides a
A spinning deflection mirror moves along the axis, one bit space per revolution. This mirror deflects the laser, perpendicular to the axis, to the plate on the internal surface of the cylinder. A focusing element on the rotating mirror assembly projects the collimated beam onto the surface of the plate at the desired spot size. As the beam is scanned around the partial circumference of the drum, the distance from the focusing lens to the plate surface is constant, and the beam stays in focus without complex optics. A bit stream from the RIP-produced bitmap modulates the laser beam. With each rotation, the beam images a track across the plate. The mirror assembly moves one bit position per revolution, so successive tracks are written one bit position apart. Harmonic vibration in the mirror assembly motion may cause "banding" on the plates as tracks are written close together, then far apart. All internal-drum designs use a single beam to expose the plate. The spinning mirror rotates at very high speed for high-speed imaging. Thus, the exposure spot dwells on a bit position for a very short time. The short imaging time per bit affects or is affected by the exposure characteristics of the plate. Ablative plates respond well to high-power, short-pulse exposure, but polymer materials respond better to a longer exposure pulse.

**Overall for internal drums:**
- Plate exposure is roughly the same size as the film it exposes.
- With single beam laser addressing, the plate bed remains static, keeping the plate firm.
- The single laser beam works at only partial efficiency. To compensate for this, the mirror used rotates at 18,000 rpm.

It is difficult to register to pins on an internal device.
External drum. An external-drum configuration mounts the plate on the outside of a rotating cylinder, almost like a plate being mounted on a press. Plate handling is complex as in all drum designs, and pin registration system configurations are limited. The laser beam(s) are perpendicular to the axis of the cylinder and focus on the surface of the plate. The optical path remains constant as the drum rotates. The exposure head moves on a track parallel to the cylinder axis. Multiple exposure beams can be used to speed imaging. There are a number of multiple beam interleaving methods. The laser head advances and each beam writes one of the tracks. Optronics, Presstek, and Barco Graphics systems apply a different method of interleaving multiple beams. The weight or mass of the plate limits the rotation speed of the drum. This low rotation speed allows the spot dwell time to be longer than an internal drum. The external-drum optics are simple, but slow rotation speed makes multiple beam designs essential for speeds that compete with internal drums and flatbeds.
Overall for external drums:

- The laser address source can be close to the plate.
- Because the image setters are used for both film and plates, there have been inherent physical problems with ensuring that the plate is secured to the drum. Film is normally secured by a pin system which is inappropriate for a plate, so various clamping methods are improvised.
- External drums are not efficient if addressed by a single laser beam, or else the drum has to be rotated at very fast speeds to accept the exposure, leading to potential problems with stability once the plate is loaded.

Fast-spinning external drums potentially offer a hazard if the plate comes loose during imaging.

5.2 WORKFLOWS - PDF

The Portable Document Format (PDF) was developed by Adobe in 1993. The original concept focused on bypassing paper and creating a digital document viewable and annotatable by many and independent of specific application software, font, or operating system. It was not originally designed to handle high-end printing need involving color separations. But the publishing industry saw the potential for this type of file format in the early stages of digital workflow development and Adobe pursued a path that has resulted in robust and comprehensive file formatting that addresses numerous needs.

The basic components of a PDF file are a view file displays the as created, embedded type, graphic objects, and link to other types of data, including job ticket information.

One of the main benefits of PDF in digital workflow is that it produces more manageable file that maintains integrity and yet can be edited, is page independent (individual pages can be accessed, which cannot be done in postscript, and can be output at a variety of different settings. For many of the following reasons, PDF is becoming an integral part of the printing and publishing workflow.

- Ability to incorporate numerous data formats such as bitmap or raster images, vector based artwork, and text while remaining platform independent (not independent on any one operating system.
- Compactness of file. There is approximately a 10:1 compression factor between the original file and the PDF file.
- Eliminates the variability of postscript. The interpretation and display list functions normally handled in the RIP are executed during distillation. This creates a file with only the essential information needed and therefore a much cleaner postscript output to the imaging device.

Job Definition Format

The JDF is an industry standard designed to simplify information exchange between different applications and systems in and around the graphic arts industry. To that end, JDF builds on and extends beyond pre-existing partial solutions, such as CIP3’s Print Production Format (PPF) and Adobe Systems’ Portable Job Ticket Format (PJTF). It also enables the integration of commercial and planning applications into the technical workflow. JDF joins the growing number of standards based on XML, ensuring maximum possible portability between different platforms and ready interaction with Internet-based systems.
JDF is a comprehensive XML-based file format and proposed industry standard for end-to-end job ticket specifications combined with a message description standard and message interchange protocol.

- JDF is designed to streamline information exchange between different applications and systems.
- JDF is intended to enable the entire industry, including media, design, graphic arts, on-demand and e-commerce companies, to implement and work with individual workflow solutions.
- JDF will allow integration of heterogeneous products from diverse vendors to create seamless workflow solutions.

The most prominent features of JDF are: **Job Definition Format**

The JDF is an industry standard designed to simplify information exchange between different applications and systems in and around the graphic arts industry. To that end, JDF builds on and extends beyond pre-existing partial solutions, such as CIP3’s Print Production Format (PPF) and Adobe Systems’ Portable Job Ticket Format (PJTF). It also enables the integration of commercial and planning applications into the technical workflow. JDF joins the growing number of standards based on XML, ensuring maximum possible portability between different platforms and ready interaction with Internet-based systems.

**PRE-FLIGHTING TECHNIQUES**

**Pre-flighting** is a term used in the printing industry to describe the process of confirming that the digital files required for the printing process are all present, valid, correctly formatted, and of the desired type. The term originates from the pre-flight checklists used by pilots.

In a common digital prepress workflow, a collection of computer files provided by clients will be translated from an application-specific format such as Adobe InDesign or QuarkXPress to a format that the raster image processor (RIP) can interpret. But before this rasterization occurs, workers in the prepress department confirm the incoming materials to make sure they are ready to be sent to the RIP. This is an important step because it prevents production delays caused by missing materials or improperly prepared materials. Once the incoming materials have passed the pre-flight check, they are ready to be put into production and sent to the RIP.

**The pre-flight process**

The process of pre-flighting a print job helps reduce the likelihood of rasterization problems that cause production delays. Page layout software applications, (which allow users to combine images, graphics, and text from a variety of formats,) automate portions of the pre-flight process. Typically, client provided materials are verified by a pre-flight operator for completeness and to confirm the incoming materials meet the production requirements. The pre-flight process checks for:

- images and graphics embedded by the client have been provided and are available to the application
- fonts are accessible to the system
- fonts are not corrupt
- fonts are in a compatible format
- image files are of formats that the application can process
• image files are of the correct color format (some RIPs have problems processing RGB images, for example)
• image files are of the correct resolution
• required color profiles are included
• image files are not corrupt
• confirm that the page layout document size, margins, bleeds, marks and page information all fit within the constraints of the output device and match the client specifications

confirm that the correct colour separations or ink plates are being output.

5.3 COMPUTER TO PLATE WORKFLOW

There are three types of computer-to-plate systems currently in use:
• Plates or image carriers for gravure and flexography on which the images can be produced by etching with high-powered lasers or electromechanical engraving devices.
• High-speed light-sensitive plates for offset with coatings that have light sensitivities on the order of film and that can be exposed with low-power visible lasers.
• Non-light-sensitive plates for offset with coatings on which images can be produced by heat (infrared) radiation rather than light.

5.4 TYPES OF CTP PLATES

A number of high-speed light sensitive lithographic plates are available that can be imaged by lasers directly from computerized digital data without the need for intermediate films. These are of six types: plates with silver-halide coatings on film and metal bases; high-speed photopolymer plates with dye-sensitized coatings on aluminum; hybrid plates; thermal-based coatings; inkjet; and electrophotographic plates on an aluminum base.

SILVER HALIDE PLATES

Silver-halide plates are very light sensitive and easy to operate, but have so far suffered from lower run lengths. These plates are positive-working plates. Silver halide plate processing involves two stages: an activator and a stabilizer. In the activator stage, a strongly basic solution dissolves the unexposed silver halide in the emulsion layer, after which it diffuses into the positive layer. In the positive layer, centers of development cause silver to precipitate, leaving metallic silver on the plate surface. After the development is complete, the plate enters the stabilizing tank where the weakly acidic solution neutralizes the alkali in the emulsion layer of the plate and stabilizes the precipitated silver.

PHOTOPOLYMER PLATES

The disadvantage of photopolymer is that it requires light-sensitive developing solutions that have a tendency to foam. In addition, the plate has to be heated after exposure and yet does not offer the best light sensitivity. On the other hand it has very good run lengths and print characteristics:

Photopolymer plates are negative-working plates exposed in “write black” mode. Photopolymer is a light-sensitive plastic. During processing, unexposed emulsion is dissolved by the developer, leaving exposed photopolymer behind to form the image areas of the plate.
HYBRID PLATES

Hybrid plate technology is unique in that it uses two separate and distinct photosensitive coatings on the metal plates. The top coating is a silver-halide emulsion whose light sensitivity can be varied to handle a full range of speeds from contact to film speed and a full gamut of spectral responses from UV to visible blue, green, red, and infrared lasers. The bottom coating is a photopolymer known for good performance on the press. The top coating provides a wide gamut of light sensitivities to accomplish imaging for contact, projection, camera, or CTP printing with controlled dot gain and image contrast. The bottom coating provides ease of printing characteristics that result in high productivity and consistent quality such as plate life, durability, ease of make ready, and maintenance of ink-water balance, ink transfer, register, and other running controls on the press. The advantage claimed for silver-hybrid technology is that the finished plate is indistinguishable from a conventional plate by the time it gets to the press and as a result is immediately accepted by press operators.

THERMAL PLATES

Thermal plates are true digital plates. Once imaged, the dot size conforms to the size of the laser’s imaging spot, and it doesn’t change if the plate is processed. They can hold very fine dot structures; they are environmentally clean with no chemical processing and can be handled in either yellow safelight or controlled-daylight conditions; and they have the same handling characteristics as conventional presensitized plates.

INKJET PLATES

A new approach to CTP is the use of inkjet compounds deposited on grained aluminum. The Polychrome approach uses the inkjet ink to create a mask for light exposure and a processing wash; and the Scitex Iris approach creates a positive image on each of four plates for process-color printing. The Polychrome system has been used by book printers. The Iris system is being configured for small to medium printing firms.

ELECTROPHOTOGRAPHIC PLATES ON METAL BASES

The first of these plates was the Kalle Elfasol plate, used with argonion lasers in EOCOM laser platemakers. This and other electro photographic plates by Howson-Algraphy and Chemco (now Konica) were developed mainly for the newspaper market. The DIC/Polychrome electro photographic plate uses an organic photoconductor (OPC) and liquid toners to obtain quality suitable for the commercial printing market.
Unit - V

Two Mark Questions

1. What is CTP?
   Computer to Plate.

2. Name the types of CTP’S.
   Violet, Thermal, UV, UVCTCP.

3. Name some components of CTP?
   RIP, Plate holding area, Punching, Plate setter.

4. Name the configuration of CTP?
   Flatbed, Internal Drum and External Drum

5. What is CTPP?
   Computer to polyester plate.

6. Expand PDF
   Portable Document format

7. Expand JDF
   Job Definition format

8. What is preflighting?
   The term used to describe the process of confirming that the digital files required for the printing process are all present, valid and correctly formatted.

9. What is portable document format?
   A comprehensive file format is page independent, ability to incorporate numerous data formats such as bitmaps, vector and text is a platform independent and it is compact.

10. What is job definition format?
    Designe to simplify information exchange between different application and systems. It is a comprehensive XML based file format and industry standard for end-to-end job ticket specifications.

11. Name the type of CTP Plates?
    Silver halide plates, thermal plates, inkjet plates and photopolymer plates, UV Plates, Violet Plates.

12. Name the types of lasers?
    Helium-neon, Argon-ion.

13. Expand LASER.
    Light Amplification by Stimulated Emussion of Radiation.

14. What is an automatic Plate Processor?
    Machine which develops and dries the plates automatically using tank processing.

10 Mark Questions
1. Explain the CTP system with a neat sketches? State its advantages.
2. Explain the different configuration of CTP system with a neat sketches.
3. Explain about PDF and JDF Workflows.
4. Explain about preflighting and state the preflighting checks.
5. Explain about computer to plate technology for flexo, gravure and Screen Printing.
6. Explain about types of plates produced using CTP’s.
7. Explain about automatic plate processor with diagram.
8. Explain about computer to plate workflow with diagram.