Unit 304 Digital Pre-Press Processes 3

Rationale

This unit is concerned with developing a clear understanding of controlling digital pre-press, including hardware devices, software applications, conversion of originals to digital files, preflighting and ripping of files, digital creation of image carriers, and digital proofing. Candidates will be expected to cover this unit in the context of their chosen production process e.g. lithography, gravure, flexography, screen etc

Outcomes

There are six outcomes to this unit. The candidate will be able to

1. describe the operation of hardware and software systems typically used in pre-press
2. explain the systems and processes for converting originals into digital files
3. explain the principles of layout and imposition including the use and placement of marks and control guides
4. describe the principles for the production of the image carriers
5. describe the principles for the production of digital proofs
6. identify the procedures for pre-flighting and ripping files in digital pre-press.

Connection with other awards

This unit contributes towards the knowledge and understanding required for units 112, 113, 115, 116, 117, 118, 119, 219 and 229 of the Level 3 NVQ in Printing.

Assessments

This unit will be assessed by means of a short written answer test covering the six outcomes.

Outcome 1: Describe the operation of hardware and software systems typically used in pre-press

Underpinning knowledge

The candidate will be able to:

1. describe the range of hardware used in digital pre-press as including:
   a) computer platform, e.g. PC, MAC
   b) display (screen or monitor)
   c) graphic pen tablets
   d) low resolution printers, e.g. desktop inkjet or laser, black and white or colour
   e) high resolution printers, e.g. proofing printers
   f) imagesetters/film recorders/CTP systems
   g) scanners - flatbed/drum
   h) removable storage media
   i) modem (internal/external) - Analogue/ISDN/ADSL service, router, firewall
   j) hardware Raster Image Processor (RIP)
   k) network hub or switch
   l) calibration measuring devices, e.g. transmission/reflection densitometers or dot meters

2. describe the range of computer software used in pre-press as including:
   a) word processing
   b) graphic image/illustration/drawing - bitmapped and vector systems
   c) page make up
   d) scanning
   e) colour management
   f) electronic imposition
   g) OPI – for substituting high/low resolution images
   h) Portable Document Format (PDF) creation
   i) software RIP
   j) pre-flighting
   k) e-mail/Internet/ISDN transfer
   l) operating systems software, including servers
   m) archiving and digital asset management
   n) management information system

3. explain that problems of compatibility between software and hardware elements in digital pre-press include:
   a) incompatibility of computer operating systems/platforms (Mac/Windows/Unix)
   b) different software versions used by customer and pre-press
   c) incompatibility of some fonts and image file types between platforms

4. state that there are software products available which will solve many of the issues of compatibility by different methods which include:
   a) allowing different platforms to communicate across networks
   b) converting fonts and images for use on different platforms
   c) creating PDFs which can be opened on any platform

5. state that the primary function of colour management software is toneable consistent interpretation and reproduction of colour on any hardware device by:
   a) determining the standard and meaning of colour objects in an original document
   b) translating the colour values of each object to values that give the same appearance when displayed or printed on different devices
   c) maintaining files containing the colour characteristics or profiles of different devices and using the information contained in a device profile when printing or displaying to that device

6. state that the elements of a pre-press system that need colour management include:
   a) computer display
   b) scanner and separations software
   c) printers and imagesetters and their RIPs or printer drivers
   d) page make up and graphics software

7. state that it is not uncommon for individual printing presses to have profiles created for them using colour management software

8. state that hardware calibration is not the same as colour management, that most pre-press hardware will need to be calibrated from time to time and that hardware calibration should be carried out before any colour management software or profiling is configured

9. state that colour is usually displayed on a screen using Red, Green and Blue (RGB) colour but is often printed using the Cyan, Magenta, Yellow and Black-Key (CMYK) colour mode and that the conversion between these two modes is a critically important function of any colour management software

10. explain why, irrespective of the display, the high resolution colour images in digital documents may exist in either RGB or CMYK mode and may be composite or separated

11. explain that the colour separation of original images and conversion to CMYK mode can take place:
    a) when the original is scanned
    b) during or after any retouching using graphics software
    c) at the output stage from page make-up software
    d) when the document or file is sent to a colour printer
    e) when the file is ripped for printing to an imagesetter or CTP system

12. explain that it is critically important for reliable and predictable colour reproduction that the pre-press operator knows where any colour separation or colour mode conversion is taking place within the workflow, and that the colour management profiles and software colour settings are properly configured at that point.

Outcome 2: Explain the systems and processes for converting originals into digital files

Underpinning knowledge

The candidate will be able to

1. state that the terms used in digital image reproduction include:
   a) screening - the process by which the tonal variations of a continuous tone image are simulated by a pattern of dots (which may be regular or irregular, square, round, eliptical or other shape) in an image prepared for print reproduction
   b) screen angle - the angle at which the screen ruling lines in conventional screening patterns, the purpose of which is to prevent moiré patterns
   c) screen ruling - the number of lines in a given distance in conventional screening patterns- lines per inch (lpi) or lines per centimetre (lpc)
   d) hardware resolution – a measure of the ability of a hardware device e.g. a scanner, monitor or printer, to obtain, display or print digital information, usually expressed as 'ppi' or pixels per inch
   e) image resolution – the amount of information contained in the image, usually expressed as dots per inch (dpi)
   f) stochastic or 'FM' screening – a screening pattern made up of very fine irregular shapes creating moiré free images
   g) bitmap – a digital image made up of dots or pixels
   h) vector – a digital image made up of lines or curves

2. state that:
   a) as a rule of thumb, an image resolution needs to be twice the screen ruling that will be used to print the image (e.g. 150# screen requires 300dpi image resolution)
   b) for a bitmap image, the total amount of information contained in the file will determine the maximum size that can be printed at any given image resolution
   c) for a bitmap image, increasing the size of output will reduce the image resolution and vice versa
   d) for a bitmap image, enlarging the image beyond its maximum for the required image resolution will result in a poor quality image, usually described as pixelated
   e) for a vector image, the image is defined mathematically as lines or curves and the image can be enlarged without reducing its quality

3. state that the number of grey levels that can be printed by any particular device depends on the resolution of the device and the screen ruling used to print the image and can be expressed by the formula:

$$\text{No. of grey levels} = \left(\frac{\text{printer resolution}}{\text{screen ruling}}\right)^{\text{squared}}$$

4. identify that:
   a) using too few grey levels will lead to banding in the printed image, as the change from one grey level to the next is too great
   b) the usual number of grey levels in high resolution printed work is approximately 256, and the human eye cannot distinguish between more grey levels than this

5. state that prior to commencing any scanning which requires faithful colour reproduction, the scanner must be calibrated and an accurate profile for the device correctly configured in the scanning software

6. state that the dynamic range of a scanner will indicate the range of detail that can be obtained from the original and converted into digital format

7. identify that scanners may scan images in RGB format and then convert the information to CMYK prior to displaying the image on screen, or may leave the scan in RGB and be converted at a later stage of processing

8. identify that if a colour reproduction is intended to be viewed on a monitor and judgements made about the colour values or retouching work undertaken based on the visual display, the monitor must be colour calibrated

9. identify that if a colour reproduction is intended to be printed using CMYK colour separations, the display on any calibrated monitor may need to simulate the CMYK output, as RGB colour space is larger than CMYK colour space

10. explain that it is usually possible to obtain the CMYK values for any particular colour in an image displayed on a monitor and that these values can be used to see how the colour will print by reference to a printed CMYK colour chip or chart

11. identify that retouching of colour images after scanning is normally undertaken in the LAB colour mode and then converted to RGB or CMYK mode

12. state that the values when calibrating a monitor include:
    a) ambient lighting - the type and level of lighting in the area of screen location
    b) monitor settings - available from software settings to set optimum monitor gamma values and the setting for brightness and contrast
    c) screen age and warm-up time - these factors provide visual errors for reliable colour reference

13. state that the characteristics of a computer monitor include:
    a) the chromacity - the hue and saturation levels of a monitor
    b) the white point - the quality of pure white on a monitor
    c) the monitor gamma -a measure of the intensity of the monitor display, that takes into account the relationship between brightness and contrast

14. state that the factors to be considered when correcting an image include:
    a) tonal value range – does the image have a compressed range of grey or colour values and does the limited number of greys or colours produce a false appearance
    b) image sharpening – does the image appear out of focus
    c) colours cast – does the image contain a distinct overall tint; a cast may be caused by using an incorrect film when originally produced
    d) under exposed or over exposed – does the whole image or portions of it look too dark or too light (an original with good exposure may look under exposed or over exposed after scanning)
    e) improper saturation – does the image looks washed-out and dull due to low colour saturation or vivid and unnatural as a result of too much saturation
    f) hue shift – does the entire colour spectrum of the image need to be shifted

15. identify the impact on the tonal values of an image as result of an adjustments as:
    a) highlight is too low - details in light areas are distracting
    b) highlight is too high - details are lost in the light areas
    c) mid tones are set too high - colours are pale but there is good detail overall
    d) shadow is set too low - details in dark areas are lost
    e) shadow is set too high - to much detail in the shadow

16. identify the meaning of the terms ‘brightness’ and ‘contrast’ of an image as:
    a) brightness - refers to the overall lightness of an image of selection
    b) contrast - the difference between the lightest and darkest portion of an image

17. explain the following terms and their relevance to colour separation:
    a) total ink content
    b) Grey Component Replacement (GCR)
    c) Under Colour Removal (UCR)
    d) Under Colour Addition (UCA)
    e) SWOP coated
    f) colour gamut
    g) dot gain.

Outcome 3: Explain the principles of layout and imposition including the use and placement of marks and control guides

Underpinning knowledge

The candidate will be able to

1. identify that the imposition of images will normally be undertaken using:
   a) manual systems, or
   b) imposition software

2. state that the purpose of imposition is to optimise the printing and post-printing processes, to achieve the most efficient and/or cost-effective use of materials and to provide aids to achieving and maintaining quality in the subsequent processing operations

3. list the factors to be considered when preparing imposition schemes or templates, including:
   a) the substrate sheet size – which may be a standard size or a special sheet size for the job
   b) the finished page or image size
   c) the printing machine size – which may be fully used in the processing of the job or determined by the substrate sheet size in use
   d) the post press processing affecting page order and/or orientation, e.g. folding, die-cutting, punching, binding
   e) the extent of any bleed and the effect of creep
   f) the grip, lay and pitch edges when the sheet is printed and folded
   g) the material to be used - paper, board, glass, metal

4. state that the purpose of preparing a template is to identify the various image positions as they will appear on the printed sheet

5. state that the items to be taken into account when preparing the template include:
   a) the image dimensions
   b) allowances (clamp, grip and trim) for use during subsequent printing and finishing operations
   c) image arrangement for printing or trimming
   d) image arrangement for post press requirements

6. state that the term ‘plate clamp allowance’ refers to the distance from the leading edge of the plate to the first allowable position of the image that will fall beyond the machine plate clamping mechanisms

7. state that the term ‘grip allowance’ refers to the distance from the leading edge of the sheet to the first allowable position for the image that will fall beyond the machine gripper transfer mechanism

8. state that the term ‘grip edge of the sheet’ refers to that edge of a sheet which will be held in the printing machine’s gripper mechanism

9. state that the term ‘lay edge of a sheet’ refers to that edge of the sheet that is at right angles to the gripper edge and is used to maintain accurate registration of the image from side to side

10. identify the areas to be calculated when preparing an imposition lay down sheet as being:
    a) the plate clamp and sheet grip allowances
    b) the centre line
    c) the page dimensions
    d) the trim, bleed, creep and fold allocations

11. state that the factors to be considered when planning a multiple page imposition for folded work include the specification of the folding machine on which the sheet will be folded, particularly the number of folding plates, configuration of folding units and direction of the sheet infeed

12. state that for multiple page imposition folded work, there may be several possible impositions to choose from to achieve the required folded section and that the actual choice will usually depend on the specification of the folding machine being used

13. list the factors to be considered when planning irregular shape or size of images as including:
    a) ensuring the full economic use of the sheet size
    b) determining whether the method of cutting should be straight cuts, or additional punching or die cutting services
    c) how the shape will be held in the sheet and/or transported to the delivery during die-cutting operations
    d) how the shape will be removed from the sheet after die-cutting operations

14. list the factors to be considered when planning step and repeat images, including:
    a) that all repeat images are identical
    b) that all repeat image are positioned accurately

15. identify the imposition marks commonly used to indicate cuts, bleeds, folds, perforations, registration of colours, side guide, centre guide, collating

16. identify the usual position and commonly used types of colour control strips incorporated into imposition templates.

Outcome 4: Describe the principles for the production of the image carriers

Underpinning knowledge

The candidate will be able to

1. state that the systems available for the production of an image carrier include:
   a) automatic surface preparation systems
   b) manual surface preparation systems

2. state that the range of image carrier systems available for digital pre-press include:
   a) lithographic plate making
   b) gravure cylinder preparation
   c) screen process stencil
   d) digital file output

3. list the factors to be considered when selecting an appropriate image carrier, including:
   a) shelf life of the image carrier
   b) production time to produce the image carrier
   c) the degree of operator skill availability to produce the image carrier
   d) cost of production
   e) image resolution requirements

4. identify that the factors impacting upon the cost of producing an image carrier include the:
   a) number of original image masters (plates/cylinders/screen) required
   b) cost of image carrier substrate and any surface preparation
   c) cost of imaging and processing the image carrier

5. state that the image resolution considerations include the:
   a) screen ruling to be used and thinnest line to be reproduced
   b) capability of the image carrier itself

6. describe the methods and instruments commonly used to verify that finished image carriers are fit for purpose, including:
   a) visual inspection
   b) measurement.

Outcome 5: Describe the principles for the production of digital proofs

Underpinning knowledge

The candidate will be able to

1. explain the purpose and use of colour profiles in relation to both hardware and software when producing colour digital proofs

2. describe the instruments and aids available for calibrating digital proofing devices, including:
   a) colour measurment devices
   b) colour reference guides

3. explain the principles of colour management software when producing digital proofs, including:
   a) printer driver colour handling
   b) operating system colour handling
   c) printer hardware colour handling

4. describe the limitations of simulated CMYK and RGB on-screen proofing

5. explain the principles of RIP technologies and their relevance to digital proofing

6. explain the term ‘RIP once, output many’ and its relevance to digital proofing.

Outcome 6: Identify the procedures for pre-flighting and ripping files in digital pre-press

Underpinning knowledge

The candidate will be able to:

1. state that the elements to be defined for production of a digital pre-press document include:
   a) final size reproduction
   b) font list
   c) page listing
   d) filenames and location of images
   e) number of colour separations
   f) software and version number used to create the native file
   g) platform and operating system used to create the native file
   h) any special instructions from the customer

1. state that the purpose of flight checking files before imaging includes:
   a) identifying material intended for printing
   b) identifying any components or settings that may prevent the document from correctly imaging
   c) identifying any components or settings that may prevent the job from being printed and finished correctly

2. list the elements to be checked in digital pre-press files, including:
   a) checking that all pages of the job are available
   b) checking that all fonts for printing are embedded or available in the correct format
   c) checking that all page layouts match any supplied proof
   d) checking that all the image files are linked or embedded
   e) checking that all image files are at a suitable resolution for outputting
   f) checking that all image files are in a suitable colour mode and format for outputting
   g) checking that the document settings are appropriate for the final device
   h) checking that all the colours are defined and named correctly
   i) checking that all the bleeds and trap specifications are correct
   j) checking that the total ink content used in any part of the document does not exceed the total recommended for the substrate and printing processes

4. identify the meaning of the terms ‘Postscript’ ‘PDF’ and ‘RIP’ as being:
   a) Postscript - a page description language invented by Adobe which, when translated through a RIP, forms the desired image on an output device
   b) PDF - Portable Document Format - a file format designed to allow documents to be opened on any computer and retain their original appearance
   c) RIP - Raster Image Processor – (Raster = bitmap) the hardware and software configuration in an output device driven by a page description language to generate a bitmap made up of dots or pixels to describe the page

5. state that postscript language has developed over time, that there are different levels e.g. PS Level 3, and that the features available and capability of a RIP to process postscript files depends on its postscript level compatibility

6. state that postscript files can be distilled into PDF format and that this process will:
   a) give the opportunity to reduce the resolution of images and line art in the original document to a specified size
   b) significantly reduce the overall size of the file
   c) generally ensure that any subsequent use of the PDF (e.g. printing to a PS Level 3 RIP) is reliable
   d) provide a file which may be small enough to send as an e-mail attachment for proofing by the customer

7. describe the elements to be checked after ripping a file, including:
   a) page orientation
   b) presence and position of printers marks
   c) colour separation into correct number of colours
   d) colour separation of any composite images separated at the RIP
   e) right/wrong-reading
   f) positive/negative
   g) correct fonts
   h) resolution of images
   i) colour overprinting/knockout and trapping
   j) banding in tints or images.