

- Q. What signs of poor quality can be seen on the print?  
A. Pinholes, orange peel appearance, streaks and mottle (speckled or spotted)

## TYPES OF PRINT DESIGN

Classifications:- Line work : Tone work : Process work  
Line work is a design which contains type, lines or solids  
Tone work is a design which has one or more colours printing a pattern of uniform sized dots i.e.:- black printed with 10% dot pattern (small dots) will appear as a light grey, whereas a 50% dot pattern will appear as a darker grey.

Process work is the reproduction of a coloured picture by breaking down into dots which change in size, and which are printed in four colours. Light coloured areas use small dots, and dark coloured areas large dots.

- Q. What four colours are used for process work?

A. Yellow, magenta, cyan and black (not necessarily to British Standard shades) Can be modified to use warmer yellows and reds)

## PRESS SET-UP

- Retract print rollers and check cleanliness
- Insert print rollers and gears
- Insert clean ink duct and splash guides
- Move printing unit into gear
- Pre-register printing unit
- If applicable position doctor blade
- Circulate ink and adjust viscosity
- Adjust anilox, inking roller and doctor blade to give correct metering
- Adjust plate cylinder to impression roller (drum)
- Insert substrate into unwind and select tension
- Select correct drying temperature
- Insert reel bars in rewind and select winding tension
- Set-up the print units with substrate to be printed
- ★ Start press at slow speed, and starting with the first unit, bring anilox roller slowly in contact with the plate cylinder until ink film appears
- ★ Adjust plate cylinder evenly in contact with the substrate, and once even impression is achieved, wind back anilox very slightly until ink starts to miss the plate in one or two areas. The anilox is then wound back again until ink is evenly applied over the plate (kiss impression)
- ★ The plate cylinder is then retracted slightly from the impression roller (drum) until part of design is missing. The impression is then wound back until the missing areas of print are evenly visible (kiss impression)
- Follow procedures marked by ★ for all printing stations
- Registration should now be set
- Press in close register should be run 70 - 80 metres per minute and print sample taken for QC
- Increase speed for production with final check on unwind and rewind tensions.

## PRINTING TIPS

### Nitrocellulose coated cellophanes

They are relatively stable but a web temperature of 90°C is required to ensure good adhesion

If pinholing occurs add 2 to 3% of anti-pinhole compound  
Excessive web temperatures and tension at the rewind can cause "ghosting" in the printed rolls, which is a faint image of the design appearing in the un-printed area. It can only be removed by re-heating the film web, causing the coating on the cellophane to re-flow.

### Polyethylene

The treatment level of the P.E. is vitally important to ink adhesion and performance, and therefore a treatment pen should always be at hand to establish firstly which side of the web is treated, and secondly whether the treatment level is to standard. The treatment pen when drawn across the web provides a continuous blue line if treatment is standard. If line is broken, the treatment level is low or non-existent. Treatment should be in the range of 34 to 38 dynes. Polyethylene which is treated on both sides of the web may cause printing problems because of a tendency for treated surfaces to block to each other in the rewind reel.

Polyethylene film has a low tensile strength, and it softens with little heat, so operating tensions must be light and constant, and drying temperatures should be kept low.

### Polypropylene

The major part of polypropylene, both co-extruded and coated is printed with modified nitrocellulose or propionate/acrylic blends. Some coated polypropylene films are prone to retain some ester solvents, namely iso butyl acetate and therefore the correct balance should be advised and maintained.

Polypropylene film has a greater tensile strength than polyethylene, and therefore higher tensions can be used at unwind and rewind stations.

The treatment level on uncoated polypropylene may decrease with aging, therefore long storage periods should be avoided.

### Market share

What is the market share of Flexography in Western Europe?

% Share of printing techniques	% Share in packaging printing	
	1990	1995
Litho	41	39
Gravure	20	18
Flexography	26	30
Letterpress	5	4
Other	8	9

The European Flexographic Technical Association is a non-profit making organisation created to promote flexography in the U.K. More information about the Association can be obtained from:-

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EUROPEAN FLEXOGRAPHIC  
TECHNICAL ASSOCIATION

# EFTA

Understand the building  
blocks of the Flexographic  
printing process



## FLEXOGRAPHIC OVERVIEW

The flexographic printing process begins with the ink duct, which supplies ink to the rubber inking roller, which in turn supplies ink to the metering or anilox roller. Ink is then transferred from the cells in the anilox to the surface of the printing plates, which are mounted on the plate cylinder. The substrate being printed passes between the plate cylinder and the impression roller (drum).

## FLEXOGRAPHIC PRESSES

(CENTRAL IMPRESSION STACK: IN-LINE)

Q. What are the four sections of the flexo press?

A. Un-wind (in-feed) : Printing station : Drying : Re-wind (out feed)

Q. What is the difference between the C.I. and stack press?

A. The C.I. press utilizes one impression cylinder (drum) with each printing station positioned around this drum. The stack press has printing stations placed on top of each other in "stacks". Each printing station is equipped with its own impression roller. In-line presses are stack units placed horizontally in line, similar to gravure.

## PRINTING STATION

Q. What three components make up the printing station of a press?

A. Inking system : Plate cylinder : Impression roller (drum)

Q. What is the function of the anilox roller in the inking system?

A. To meter the ink onto the printing plate

Q. What kind of coatings are used on anilox rollers?

A. The steel roller is coated with chrome or ceramic

Q. What are the necessary anilox cell counts used in flexo?

A. Solid line colours usually require a coarser anilox roller, such as 180-200 cells per linear inch. Process colours need a much finer cell configuration 400-500 cells per inch. A finer anilox meters less ink and prints the dot more crisply.

Q. Why is the cell volume important?

A. Cell volume dictates the amount of ink or coating which can be held in each cell. The most popular cell shapes are "pyramid" and "quadrangular (quad)".

## INKING SYSTEMS

Q. What types of common inking systems are available?

A. Two roll system consisting of a rubber inking roller that rotates in the ink duct, while the anilox roller rotates against the inking roller and excess ink is squeezed off the anilox by applying pressure between the ink roller and anilox.

Reverse angle doctor blade system requires a doctor blade set at an obtuse angle in opposition to the rotation of the anilox. The blade removes excess ink from the anilox surface, whether the ink is directly applied, or from the inking roller in the duct.

Chamber doctor blade system consists of an anilox roller that rotates against two doctor blades placed in holders in a chamber assembly. When the blades are in contact with the anilox, an ink reservoir (or chamber) is formed between the doctor blades and the blade assembly. One blade acts as both a dam and metering device. The ink is pumped into the chamber to the correct level, coating the anilox and the doctor blade meters excess ink off the anilox.

## INK TRAY (DUCT)

Good ink circulation is essential

Q. Do inking rollers vary?

A. The hardness of the inking roller affects how much ink is supplied to the anilox. The hardness of the rubber is measured with a "Durometer" on a scale of 0 to 100, and figure of 50 indicates that the rubber is soft, and will carry up more ink. A reading of 80 means that the rubber is harder and will carry less ink to the anilox.

## PLATE CYLINDERS

Are well balanced accurate metal rollers manufactured to printers specifications by the press manufacturers.

Q. What is a print repeat?

A. A repeat corresponds to one revolution of the plate cylinder, and the repeat is determined by the overall circumference of the plate cylinder with the gears and mounted plates.

Q. What are the three types of plate cylinder?

A. Integral cylinders are manufactured in one piece  
Demonable cylinders are manufactured in two pieces, and they are mounted on a shaft (mandrel)  
Demonable sleeves that slide over the face of the plate cylinder by expanding with air or gas

## PRINTING PLATES

Q. What types of printing plates are available?

A. Rubber (natural and synthetic) in moulded or laser engraved form. Photo-polymer (liquid and solid)

Q. What are the main reasons for the increased use of the photo-polymer?

A. The need to make a zinc engraving and a matrix for a rubber plate is eliminated. Each photo-polymer plate is an original, being produced directly from a film negative, with no intermediate processing steps involved. Excellent dimensional stability simplifies handling and guarantees accurate print register. A variety of plate sizes, thicknesses, and hardness are available to meet most printing requirements.

Q. What is an integral plate roller?

A. This is a rubber covered roller or sleeve, where the non-printing area is removed by a laser beam, leaving the printing surface in relief.

Q. What are the methods of plate mounting?

A. The printing plate can be mounted on the plate cylinder by the optical or pin registration methods, using a suitable mounting tape. It is important with thin plates to select the right type of cushion backed mounting tape.

## INKS AND SOLVENTS

Q. What four components make up a flexographic ink?

A. Colourants (pigment) : Vehicle (resin) : Solvent (i.e. alcohol or water) Additives (i.e. waxes etc)

Q. What are the functions of these components?

A. Pigments are coloured particles that remain unchanged by the vehicle but they require "wetting" and "dispersing" in the vehicle

Resins in single or combination form give the characteristics of the ink film i.e.: adhesion, flexibility, gloss etc

Solvent is the liquid that dissolves the resin, and controls the drying rate and viscosity of the ink

Additives are used to enhance an ink's overall performance and become part of the dry ink film. They are used to control or adjust :- heat resistance, scuff resistance, slip resistance, foaming etc.

## INK VISCOSITY

is defined as resistance to the flow of a liquid and can be measured by flow cup or automatic means.

Q. What are the simple steps to follow with a viscosity flow cup?

A. Ensure that the cup is clean and the orifice is not blocked. Submerge cup in the ink, filling to the top. Raise cup out of ink and as it breaks the surface, start the stopwatch. Stop the watch when the continuous flow of ink breaks (If ink does not flow from the cup in a continuous stream, drain the ink and check there are no particles blocking the orifice. If the ink is too thick, change to a cup with a large orifice i.e.: Zahn No.2 to Zahn No.3)

## WATERBASED INKS

Do require a controlled pH for good printing characteristics

Q. What is pH?

A. pH is the measure of acidity or alkalinity of a liquid. A common alkaline pH range 8.0 to 9.5 allows the pigment to remain suspended in the ink vehicle.

## INK QUALITY

The overall appearance should be smooth and homogeneous

Q. What are the signs of a poor quality ink?

A. Foaming (surface bubbles) normally overcome by adding de-foamer in controlled quantities

Separating (like sour milk) caused by solvent in-balance or a mixture of inks that are not compatible. Add correct solvent

blend to correct in-balance i.e.: Normal reducer 50/50 alcohol, ester. Run reducer 40/60 (increase amounts of faster evaporating solvent)