

Printing Technology and Production

Printing

Printing is a process that reproduces text and images. Typically, this is done with ink on paper using a printing press. Printing is often a large-scale industrial process. It is an essential part of publishing and transaction printing.

Types of Printing

There are many types of printing, which results into confusion for the consumer to know, which printing method is best for their project. Different techniques are followed in different types of printing machines. Letter press printing is considered to be one of the oldest form of printing technique. Offset printing is the most popular printing technique used by the printers worldwide to manufacture high quality printed products in short span of time.

Letterpress Printing

It is one of the oldest printing techniques in use since, the 13th Century. Johann Guttenberg is known to have introduced printing from individually cast, movable type reusable letters set together in a frame in the 14th Century. Also known as *Typographic Printing Technique*, this commercial printing technique, includes production of many copies of an image by repeated direct impression of an inked, raised surface against sheets or a continuous roll of paper. The letterpress printing process involves printing images by the 'relief' type printing plates where the image or printing areas are raised above the non-printing areas. Ink is applied on the rollers, which further pass it onto a separate inkbed where a fresh film is picked for the following sheet of paper.

Offset Printing

It is one of the most common type of printing technique used by a number of industries. Although, these printing machines, equipments are expensive with high set-up costs, the printing process expense is nominal. The offset printing technique is famous because of the higher printing quality and large volume printing.

Flexography

It is a major printing technique, widely used to print packaging materials. This flexography printing technique is used to print on a number of materials and products including corrugated boxes, folding cartons, multi-wall sacks, paper sacks, plastic bags etc.

Gravure Printing

It is used for long-run printing with sharper, fine and clear images. It is generally used for high volume printing of packaging, wallpaper and gift wraps using fast drying inks. Although not widely used gravure printing also finds application in printing magazines, greeting cards and high-volume advertising print campaigns.

Screen Printing

It is a special technique that creates a sharp edged image using a porous fabric and a stencil. The screen printing technique can be traced back to the beginning of the 19th Century and gained popularity during, the I World War for making banners and printing flags. A screen made of a piece of porous, finely woven fabric including silk, polyester or nylon is stretched over a wooden or aluminum frame. Areas of the screen are blocked off with a non-permeable material (a stencil) which in turn is a negative of the image to be printed.

Electrostatic Printing

It technique is a type of printing done without any plate, ink or type form. The paper is coated with a thin layer of zinc oxide, making it an insulator in the dark and simultaneously a conductor of electricity when exposed to light. These machines are used for printing of geographic maps. With the advancement in technology and higher speed, the machines are also being used to print small books. Electrostatic printers are used for short-run printing as they are faster and also do not cost much.

Embossing

Embossing printing is also called blind printing or relief printing. Embossing printing technique allows transfer of text or images as a relief onto various substrates including paper, cardboard and metal foils. The front side of the print shows the image as a relief, whereas, the actual embossing is done on the back side. The embossing printing technique involves raising the area of the image or text on the paper; the image stands out giving a three dimensional effect. The technique enhances the look of the products and also increases the printing cost.

Major Printing Processes

Printing is a means of graphic communications, It is the reproduction of quantities of images, which can be seen or perceived visually. Regardless of the great number and variety of printed products they all have one thing in common each has the same visible image produced in quantity.

Each and every printing process is identified by the method of image transfer and by the general type of image carrier used. The printed image is transferred to the substrate either directly or indirectly, depending on the process. In indirect printing, the image is first transferred from the image carrier to the blanket cylinder and then to the substrate. In direct printing, the image transferred directly from the image carrier to the substrate.

Some of the important printing processes are as follows

Letterpress Printing

Letterpress printing is a term for the relief printing of text and image using a press with a 'type high bed' printing press and movable type, in which a reversed, raised surface is inked and then pressed into a sheet of paper to obtain a positive right reading image. It was the normal form of printing text in the west from its invention by **Johannes Gutenberg** in the mid 15th Century until the 19th century and remained in wide use for books and other uses until the second half of the 20th Century.

In addition to the direct impression of inked movable type onto paper or another receptive surface, the term Letterpress can also refer to the direct impression of inked printmaking blocks such as photo etched zinc 'cuts' (plates), linoleum blocks, wood engravings, etc using such a press. In the 21st Century, commercial letterpress has been revived by the use of 'water-wash' photopolymer plates which are adhered to a near type high base to produce a relief printing surface typically from digitally-rendered art and typography. The name letterpress brings to mind the images of raised letters pressing against a surface, on which ink is transferred. Letterpress printing is also meant for printing borders, rules, illustrations, etc. Letterpress is a relief printing process.

On the basis of printing surface or master and the surface on which paper is placed, *the letter press printing machines can be classified in three groups*

Rotary Letterpress Printing There are two types of rotary letterpresses, sheet-fed and web-fed. Web-fed rotary presses are the most popular type of letterpress printing. Sheetfed rotary presses are also declining in use; in fact these sheetfed rotary presses are no longer manufactured in the US Like all rotary presses, rotary letterpress requires curved image carrying plates. The most popular types of plates used are stereotype, electrotype and molded plastic or rubber. When printing on coated papers, rotary presses use heat-set inks and are equipped with dryers, usually the high-velocity hot air type. Web fed rotary letterpress presses are used primarily for printing newspapers. These presses are designed to print both sides of the web simultaneously. Typically, they can print up to four pages across the web; however, some of the new presses can print up to six pages across a 90 inch web. Rotary letterpress is also used for long run commercial, packaging, book and magazine printing.

Platen-type Letterpress Printing It is made up of two flat surfaces, called the **bed** and the **platen**. The platen provides a smooth backing for the paper or other substrate that is to be printed. The raised plate (image to be printed) is locked onto a flat surface. The plate is inked the substrate is then placed on another flat surface called the bed and passed against the inked plate.

Flat-Bed Cylinder Letterpress Printings use either vertical or horizontal beds. The plate is locked to a bed which passes over an inking roller and then against the substrate. The substrate passes around an impression cylinder on its way from the feed stack to the delivery stack. Another way of describing this is that a single revolution of the cylinder moves over the bed while, in a vertical position, so that both the bed holding the substrate and cylinder move up and down in a reciprocating motion. Ink is supplied to the plate cylinder by an inking roller and an ink fountain. The presses can print either one or two-colour impressions.

Relief Printing Process

The image, which is to be transferred to paper is raised above the surface of the printing plate in relief printing process. Ink is applied to the raised surface then rolled or stamped onto the substrate. This process is similar to using an inkpad and stamp. A relief print is an image created by a printmaking process, such as woodcut, where the areas of the matrix that are to show printed black are on the original surface, the parts of the matrix that are to be blank having been, cut away or otherwise removed. This contrasts with an intaglio print, such as an engraving or an etching (although there can also be relief etching), where the areas to print black are below the original surface of the matrix and the original surface of the matrix will print blank.

To print these, the whole matrix is inked and the ink then wiped away from the surface, so that it remains only in the lines that the artist has made below the surface of the matrix. Much greater pressure is then needed to force the paper into the channels containing the ink and a high pressure press will normally be required. The relief family of techniques includes woodcut, wood engraving, relief etching, linocut and some types of calligraphy. The printing form comprises a support layer on which there is deposited, in an imagewise pattern, a monolayer of uniformly sized granular developing particles within the range of about 25 to about 150 microns in diameter.

Screen Printing Process

A significant characteristic of screen printing is that a greater thickness of the ink can be applied to the substrate than is possible with other printing techniques. This allows for some very interesting effects that are not possible using other printing methods. Because of the simplicity of the application process, a wider range of inks and dyes are available for use in screen printing than for use in any other printing process. Utilisation of screen printing presses has begun to increase because production rates have improved. This has been a result of the development of the automated and rotary screenprinting press, improved dryers and UV curable ink. Screen printing uses a woven mesh to support an ink blocking stencil, which forms open areas of mesh that transfer ink as a sharp edged image on substrate. A roller is moved across the screen stencil, pumping ink past the threads of the woven mesh in open areas.

Screen printing is the most versatile of all printing procedures. It can be used to print on a wide variety of substrates, including paper, paper board, plastics, glass, metals, fabrics and many other materials.

Some common products from the screen printing industry include posters, labels, decals, signage and all types of textiles and electronic circuit boards. The advantage of screenprinting over other print processes is that the press can print on substrates of any shape, thickness and size.

Elements of Screen Printing

Three major elements of screen printing are the and screen which is the image carrier the squeegee and ink. The screen printing process uses a porous mesh stretched tightly over a frame made of wood or metal. The mesh is made of porous fabric or stainless steel. A stencil is produced on the screen either manually or photochemically. Screen printing ink is applied to the substrate by placing the screen over the material. Ink with a paint like consistency is placed onto the top of the screen. Ink is then forced through the fine mesh openings using a squeegee that is drawn across the screen, applying pressure thereby forcing the ink through the open areas of the screen. Ink will pass through only in areas where no stencil is applied, thus, forming an image on the printing substrate. Many factors determine the quality of the impression made by the squeegee, such as composition, size and form, angle, pressure and speed of the blade. The rate of screen printing production was once determined by the drying rate of the screen print inks.

Innovations which Made Screen Press Popular

- Development of automatic presses *versus* hand operated presses, which have comparatively slow production times.
- Improved drying systems which significantly improves production rate.
- Development and improvement of UV curable ink technologies
- Development of the rotary screen press which allows continuous operation of the press. This is one of the most recent technology developments.
- Other commercial printing processes

Planographic Printing

Planographic printing means printing from a flat surface, as opposed to a raised surface or incised surface. Lithography and offset lithography are planographic processes that utilise the property that water will not mix with oil.

Lithography It is a method for printing using a stone or a metal plate. Lithography originally used oil or fat. However, the image is now made of polymer applied to anodised aluminium plates. The smooth surface is divided into hydrophilic regions which accepts a film or water and while damp, these areas reject ink and hydrophobic regions, which accepts ink because the surface tension is higher on the greasier image area, which remains dry because water will part and run off the greasy image. The word 'lithography' also refers to photolithography, a microfabrication technique used to make integrated circuits and micro electromechanical systems, although those techniques have more in common with etching than with lithography.

Offset In offset printing the inked image is transferred from a plate to a rubber blanket and then to the printing surface. When used in combination with lithographic process, the offset technique employs a flat image carrier on which the image to be printed obtains ink from ink rollers, while the nonprinting area attracts a water-based film, keeping the non-printing areas ink free.

The majority of modern day printing is still done using the offset printing process. Even the newspaper industry uses offset printing.

Sheet-fed litho 'Sheet-fed' refers to individual sheets of paper or paperboard being fed into a press. A lithographic press uses principles of lithography to apply ink to a printing plate. Sheet-fed litho is commonly used for printing of short-run magazines, brochures letter headings and general commercial printing.