Registration No.	:	BSTech (TX)/3-16/M03020
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Title of Assignment	:	Printing Methods
Title of Course	:	Textile Printing
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Submission Date	:	10 Feb 2022

Printing Methods

A printed textile fabric can be produced by a wide variety of methods. Some of these require expensive equipment but others need only a very modest outlay. All methods represent the means of transferring the creative talent of the designer to the fabric. They differ basically in the speed with which reproduction of the original design may be effected.

Hand Block Printing

Hand block printing is a slow operation. The size of the block is limited by the weight that the printer can handle for long periods without undue fat gue^The pattern must invariably be fitted both across and along the cloth. Early mechamsation devices increased the block size to print a full fabric width and two or even three pattern repeats Both the perrotine printing machine and the flat press block printing machines were of this type.

Practically no working examples survive the reciprocating systeni having given way to a rotary one. This involved the replacement of the flat block by a cylindrical roL . Furnishrg tWs printing roller was an endless felt blanket to which print paste was applied and excess scraped off. These machines were frequently called ^rfacepnntmgmachines^nd were used with great success for printing high quality furnishing fabrics. They have only restricted use on textSes today, but are more widely employed for printing wallpaper The printing method involves relatively light pressures and machines based on these principles have been evolved for 'duplex printing', i.e. printing the fabric simultaneously on both sides. Another variation is one in which the

print paste uptake of the raised parts of the wooden printing roller has been greatly increased by using polyurethane foam. A machine modified in this way is used for printing carpets.

Printing from Engraved Metal Surfaces

Textile printing from flat engraved surfaces was relatively short lived although a very high level of craftsmanship was achieved. By engraving designs on a copper cylinder, rapid reproduction of the design becomes possible. Although each individual colour requires a separate roller, multicolour effects are possible but all the rollers must be used collectively. To prolong the life of copper printing rollers it is usual to chromium plate them after engraving.

Apart from accidental damage the rollers are subjected to a wearing action by the 'doctor blade'. This is an accurately set and sharpened steel or stainless steel blade, which presses on the printing roller and scrapes off all printing paste except that filling the engraving. The 'doctored' portion of the roller then comes in contact with the cloth at the 'nip' between the individual roller and the central printing cylinder. The colour paste is transferred to the cloth by the high pressure on the roller and the resiliency of the coverings on the central cyhnder.

The machinery necessary for roller printing is both complicated and expensive. It is seldom installed for purposes other than full scale commercial production, although some colleges have a laboratory roller printing machine for demonstration purposes. When the term machine printing is used in the textile industry it invariably refers to printing from engraved rollers.

Stencil and Screen Printing

A stencil is a flat sheet of paper or metal out of which a design has been cut. The stencil suffers from the defect that complete rings or circles fall out of the pattern and some form of 'tie' is necessary to link such shapes to the main stencil. Most authorities credit the Japanese with the ingenious adaptation that led to the development of screen printing. Stencils were cut from paper and hair was used to hold to the main design those areas that would otherwise fall out. These fine lines did not show on the final pattern because the dyestuff diffused sufficiently to cover the thin unprlnted line originally protected by the hair.

The next step was to stretch a silk gauze over a hght wooden frame and attach the stencil to it. The fine threads of gauze are not visible in the final print and few 1'"'*";'°"! of different techniques for putting various materials and ^ woe ^^^ discussed in detail in a later section, designs on them^exist,^n^^^^_^^^.^^ ^^^ followed two lines, as with In screen P" " ^.j^^jing Again, expensive machinery is required and block an "^"j.^j^^ ^j^^ ^^g ^f such devices to the industrial printer. Screen tln^today employs both flat and rotary techniques. Fully automatic and semi-automatic devices exist which utilise normal-type flat screens and mechanise the movements of screen, squeegee and cloth to varying extents. In addition, ingenious hollow circular screens have been produced which are fitted into a machine bearing a marked resemblance to a roller printing machine, but of Ughter construction. This is known as the Aljaba machine, the name being derived from the initial letters of the Portuguese inventor's name, Almerindo J. Barros. It has proved possible to develop the Aljaba machine into a duplex form, i.e. to print both sides of the fabric simultaneously. Because of the relatively light printing

pressures involved both rollers apply a single colour simultaneously from opposite sides of the cloth.

llers. Such equipment is in complete contrast to the large and complex machines needed to carry out duplex printing using engraved copper rollers. Among the makers of flat-bed automatic-screen printing machinery the Dutch firm of Stork pioneered the rotary-screen printing machine. A model was exhibited first in Hanover in 1963 and since that time large numbers of these Stork Rotary machines have been installed all over the world. Other firms active in this field include J. Zimmer (Austria), P. Zimmer (Austria), Buser (Switzerland) and Meccanotessile (Italy). From timeto-time other variations of printing techniques appear but these rarely introduce a radically different idea. One of the exceptions seen in recent years uses a photogravure technique to print a design on paper, where in a separate operation the design is transferred from the paper to the cloth, e.g. by heat. This method enables the art of photogravure — not normally capable of successful direct application to textiles — to be exploited. The total length of fabric printed in this manner is, however, small at present but is growing rapidly.

Block Printing

A separate block is required for each different colour in the finished design. The majority of blocks are made largely of wood, but metal may be used to reinforce parts of the design. Such blocks are used to apply thickened dyestuff pastes at normal room temperatures. A completely different type of block fashioned from copper strips soldered into a copper lattice is used to apply hot waxes in the traditional Javanese batik industry.

Distinct differences in block construction are distinguishable between those used in Europe (largely for factory production) and those evolved in the East, particularly in India. In Europe supplies of wood suitable for cutting into blocks are scarce and expensive. Although a block may be about 40 mm (1-5 in) thick the cutting necessary to raise the design in relief seldom penetrates deeper than 5 mm (0-2 in). By bonding together a layer of carefully selected, fairly hard, close-grained wood (e.g. sycamore, pear or lime) with cheaper woods, economies are possible. The layers in the bonded wood are arranged so that the grain runs in directions at right angles to each other. The size of block may vary slightly to allow for a design to be fitted in and have an irregular outline to encompass the pattern area. Because the block must be lifted and transferred to the cloth repeatedly during the printing operation, its weight, and therefore its average size, must be restricted. Dimensions greatly in excess of 500 mm x 500 mm x 40 mm (18 in x 18 in x 1 -5 in) are unusual but may be required for special designs.

Screen Printing

Screen printing is a relatively simple method of printing which can be carried out without the use of complicated and expensive equipment. Details of the manufacture and use of the necessary equipment are discussed under the headings Methods of Preparation of Screens, Screen Printing Tables, Squeegees, Methods of Fixing the Material to be Printed to the Table and the Printing Operation.

General Procedure. The silk gauze, stretched on the frame, is painted with a sensitising solution such as gelatine dichromate, and dried in the dark. The pattern to be produced is painted on transparent paper with a dense opaque ink, a separate painting and screen being necessary for each colour of the design. The coated screen may be

regarded as a piece of daylight photographic printing paper and the painted pattern as a negative or as it is more generally known, a positive. The positive is nov placed in contact with the sensitised screen and exposed to light. The length of exposure will vary according to the actual distance from the source of light and the type of Ught used (electric or daylight). The exposed screen is now well washed, first in cold water to harden'the insolubilised gelatine and then in warm water to remove the soluble gelatine. The screen is allowed to dry slowly. The layer of gelatine must be reinforced by the application of a lacquer which should be reasonably resistant to acids, alkalis and organic solvents.

The Screen Frame. Screen frames are usually made of either wood or metal. The wood must be smooth and well seasoned and only a soft wood with a low water absorbency, resistant to warping and to varying degrees of humidity and heat, is suitable. The types of wood that satisfy these requirements are coniferous, and the most important are the following: Western Red Cedar, Yellow Pine, Kenya or other Cedars. Hard woods such as Teak are not recommended for the making of screen frames.

Metal frames are made of rigid lightweight "hiaterials and will not warp or twist. They are expensive and are usually used in conjunction with > metal gauze. Screen frames vary in size and may be as large as 2 4 m X 1 -8 m (9 ft X 6 ft) and are used mainly for the printing of flags, bunting, etc. They are usually prepared froih wood of approximately 35-50 mm (1-5-2 in) in depth and 60 mm (2-5 in) in width. The frames must be made very rigid and the corner joints can be strengthened with angle brackets. The side pieces of the frames are bevelled at a slight angle so that when the screen is

laid flat on the table only the minimum area of the frame makes contact with the table. This helps to prevent marking-off on the following repeat. The outer edge of the wood is slightly rounded all round the frame to prevent the gauze from being cut when stretched over the frame.