Learning Objectives

The learning objectives of this unit are:

- Review the methods of printing textiles.

7.1 INTRODUCTION TO TEXTILE PRINTING

In the process of printing color designs are developed on fabrics by printing with dyes and pigments in paste form with specially designed machines.

Printing is used to apply colour only on localized areas.

Printed fabrics, usually have clear-cut edges in the printed portions on the face of the fabric.

Printing allows flexibility in creating great designs, and enables the creation of relatively inexpensive, patterned fabric.

7.2 The Difference Between Dyeing And Printing

In dyeing, only mono colour application can be done, whereas in printing, mono or multi-colour application is possible.

In dyeing, dyes are applied in liquid form, whereas in printing, dyes are applied with pastes.

Salt is needed for dyeing, but in printing it is not required.

In dyeing, temperature is used for better penetration, but in printing, temperature is not used.

Water plays an important role in dyeing, but in printing, thickening agent plays an important role.

In dyeing, percentage shade is calculated on the weight of the material, but in printing, percentage shade is calculated on the weight of the paste.

In dyeing, time is allowed for better penetration, whereas in printing, time is not required, since colour is applied only on the surface of the fabric.
Half bleached fabric is used in dyeing, but full-bleached fabric is used in printing.

In dyeing, the fabric is handled either in open width or in rope form, but in printing, the fabric is handled only in open width form.

During dyeing, the fabric may be wet or dry, but during printing, the fabric is to be kept in dry condition.

During printing, colour is applied uniformly on both faces of the fabric, but due to single printing, the printed face will be darker, and the other face will be paler.

In dyeing, simple machinery, such as tanks, winches, jiggers, soft flow and paddle mangle are required, but for printing, it is more complex, by way of design, screen preparation, printing machines and after process machineries.

The cost of dyeing per meter is lower, than the cost of printing.

The process of dyeing consumes more time than printing.

Dyeing consumes more water than printing.

### 7.3 Fabric Requirements for Printing

For proper printing the following are the general requirements of fabrics.

The fabric should be stitched with proper face on top and uniform width.

Shearing and cropping treatment is given to remove loose threads.

Desizing is necessary, for proper penetration of the print paste.

Singeing removes hairy fibers, to enable even adhesion of printing paste and sharpness.

Scouring gives better dye absorption.

Mercerization is given for cotton fabric and heat setting for synthetics.

Full bleaching is suitable for whiter background.

The fabric should be thoroughly dried.

It should be free from creases, and should be free from weft bowing.

### 7.4 Print Paste Ingredients
1. Dyestuff Or Pigments

2. Thickeners And Auxiliaries Used In Textile Printing

3. Wetting Agents

4. Dispersing Agents

5. Anti-Foaming Agents

6. Fixation Accelerators

7. Hydroscopic Agents

8. Oxidizing Agents

9. Reducing Agents

**1. DYE STUFF OR PIGMENT**

Used as a coloring matter depending on the nature of the fiber.

Lumps are broken by using a wetting agent and a smooth paste is obtained.

Selected on the basis of cost, fastness & shade requirement.

**2. THICKENER**

Prevents the spreading of the color on the cloth by capillary action.

Choice of a thickener depends upon the class of dye to be printed and the style of printing.

**Example:** CMC, Indalca, Tracaganth, British gum, Sodium Alginate, Emulsion thickener etc.

**3. WETTING AGENTS**

Used to obtain a smooth paste of the dyestuff without formation of any lumps.

Lumps if allowed to remain get deposited on the cloth during printing produce dark spots.

For insoluble dyestuffs like vats and Napthols, wetting agents are used to facilitate -wetting of the dyestuff.

For direct, acid, basic & reactive dyes, which are water soluble, a wetting agent is not normally required.

**4. DISPERSING AGENTS**
Used to prevent precipitation of dye particles as the concentration of the dyestuff in the printing paste is high.

**Example:** Di-ethylene glycol, Thio-di-glycol, Sodium benzyl sulphanilate.

5. **ANTI-FOAMING AGENT**

Used to reduce frothing in the printing paste. Dyestuffs have a tendency to froth during color preparation and printing because of:

The presence of wetting agents.
Continuous agitation by the printing roller and brush finisher.

**Due to frothing**

The paste overflows on the floor or into other color box.

The print also becomes specky and lighter in shade.

6. **FIXATION ACCELERATORS**

Are used to improve dyestuff fixation in printing as well as to shorten fixation time.( swelling compounds).

They are also effective in preventing fixation unevenness that may be caused by fluctuation of conditions for dyestuff fixation such as time, temp, humidity etc.

**Example:**

- P- phenyl phenol is applied for polyester,
- Thio urea is applied for polyamide,
- Resorcinol is applied for polyamide, cotton, acrylic fibers.

7. **HYGROSCOPIC AGENTS**

Are used to take up sufficient amounts of water during steaming to give mobility to the dye molecules to enable them to transfer in to the fiber. Example: Urea, Glycerine, Di-ethylene glycol.

8. **OXIDIZING AGENTS**

Required for printing certain classes of dyes & also in discharge & resist printing.
Most commonly used oxidizing agents: - Chlorates - Chromates and Dichromates - Nitrates and Nitrites of Sodium - Potassium Ferro Cyanide.

9. REDUCING AGENTS

They are required for discharge and resist printing as a discharge chemicals.

Example:
- Sodium Sulphoxilate Formaldehyde
- Zinc Sulphoxilate Formaldehyde
- Potassium Sulphite
- Ferrous Sulphate, Stannous Chloride, Thio urea etc.,

To meet all the requirements for printing more than two selected thickeners in combination are used.

For better workability, the following are considered while choosing the thickener.

Quick drying.

It should have desired viscosity, flow, ability to wet and good adhesion to substrate.

It should not affect the shade of the dyes used.

The storage stability of thickener should be good.

It should have low foaming properties.

It should be compatible and inert to dyes and other ingredients of the printing paste.

It should have good elasticity during squeeze action.

It should have good Film strength and non-crocking after drying.

It should have thermal stability at higher temperature.

It should be easily washed out, should be available at a reasonable prince and should be biodegradable and eco-friendly.

Synthetic thickeners:

Are derived from suitable vinyl compounds.

They provide finer designs with fine screen gauge and roller engravings.

Are cheaper and ecologically beneficial.
Enhance dye fixation and helps to achieve greater depth of colours.

Require no special storage requirements.

Synthetic thickeners when used without solvent produce very high quality of pigment prints.

They are free from hardening, browning during high temperature fixation.

7.5 Conclusion

To summarize in this unit you have reviewed the methods of printing textiles.