

What is Garments Dyeing?

Garments dyeing process is a new technology for us but it is actually using in the European countries for last 70 years. It is the process of dyeing fully fashioned garments subsequent to manufacturing, as opposed to the conventional method of [manufacturing garments](#) from pre-dyed fabrics. At first this technology applied on woollen and silk garments but now it is applied on polyester, nylon, acrylic and also extensively on cotton garments. Popularity of garment dyeing is increasing in France, Italy, Spain, Germany, Canada, Turkey, Israel, South Africa, Japan, USA and UK etc. countries.

In garment dyeing, fully fashioned garments such as pants, sweaters, shirts and skirts are dyed after manufacturing is completed. Most garments are made of cotton or a cotton-rich blends which may contain other fibres such as wool, nylon, silk, acrylic, or polyester as a minor component in the blend. Traditionally, garments are manufactured from pre-dyed fabrics before the cutting and sewing. Garment dyeing has been gaining importance and popularity due to cost savings and fashion trends in recent years, and will continue to grow in the future.



Garment dyeing, one of the finishing operations, allows the manufacturer to produce special colour effects that may not be feasible from continuous processed fabric. The demand from retailers for rapid response to fashion and colour changes has resulted in some speciality garment manufacturers producing products that can meet these requirements using fabric that has been previously prepared for dyeing when the garment is made. The made-up garments are then processed to their respective colours by specialised garment dyers. Thus, short runs of a specific product are therefore possible with the advantage of more economical garment production when only an uncoloured fabric is being used. This reduces wastage and lowers the cost of stock, when only a single fabric type is required.

The garments which are dyed in garments dyeing technique are as follows:

1. Active wear
2. Jeans item
3. Panty-hose
4. Shirt
5. Slacks
6. Terry items
7. Dresses
8. Leisure or [loungewear](#)
9. Pullover
10. Skirt
11. Socks
12. Sweater etc.

Popularity of garment dyeing is increasing day by day all over the world as well as in our country also. There are many advantages of garment dyeing which are the reasons of its popularity increase.

Advantages of Garments Dyeing:

There are many advantages in garments dyeing over fabric dyeing in case of solid colour garments production and export trade. The important advantages are summarized below:

1. Comparatively lower cost of production for any item of any colour and shade.
2. Comparatively less time is required to produce and supply garments.
3. No possibility of shade variation within the garments.
4. Small lots of different items could be produced at lower cost within less time.
5. Old garments could be redyed, hence becomes like new garments.
6. Desizing, scouring, bleaching, dyeing and finishing could be done in the same machine.
7. Comparatively lower capital investment cost to set-up a garment dyeing project.
8. In some cases, lower liquor ratio in garment dyeing requires lower water, steam and chemical consumption, hence lower garments dyeing cost.
9. During fabric cutting approximately 15% fabric is cut out as wastage, if this 15% fabric is cut out as grey fabric rather than coloured fabric, then the wastage cost will be saved.

Precautions to be taken before Garments

Dyeing:

Garments made from cotton grey fabric are dyed in garments form in the garments dyeing machine. Before garments dyeing some precautions are needed to avoid dyeing problems that may occur during garments dyeing. The precautions are discussed below:

1. Garments design should be made from engineering point of view.
2. If garment is made after desizing, scouring and bleaching of grey fabrics and then dyed in garments form, then the possibility of problems will be reduced.
3. If possible, garments should be made from the grey fabrics of the same lot and same source.
4. The seams should not be too tight or too loose especially in the areas containing elastic like waistband, cuff etc. which may create irregular dye penetration resulting irregular dyeing.
5. The garments which are produced from woven and knitted fabrics combinedly, the knit fabric should be pre-shrunk, otherwise seam pucker may develop after garments dyeing.
6. If the garment fabric is of mixed fibers, during garments dyeing, dye selection should be done carefully, having equal dye pick-up to avoid irregular dyeing.
7. Poor quality metals should not be used as accessories in the garments, which may be damaged during dyeing by the action of salt and alkali. If any metal component is used in the garments should be made from nickel or its alloy.
8. Sewing thread used for making the garment should be of same fibre like the garment fabric, otherwise colour difference may occur between garments fabric and sewing thread.
9. Buttons used in the garments should be selected carefully. Buttons made from casin, cellulose, nylon etc. may be damaged during garments dyeing but polyester button is safe in this respect.
10. If elastic is used in the garments and the elastic is made from natural rubber or polyurethane fibre like lycra may create problem during garments dyeing. To avoid such problem dye should be selected made of copper free. During bleaching, polyurethane fibres may be damaged by the chlorine. Polyester type elastomeric fibre is safe in peroxide bleaching.
11. Interlining is used in most garments. Only those interlinings should be used in the garments to be dyed only recommended for garments dyeing, otherwise the performance of interlining may be destroyed.
12. The garments made from compactly woven cotton fabric should be dyed with hot brand reactive dyes, otherwise problem of irregular dye penetration may occur.
13. For some specific colour, if specific dyes are used then the dyeing cost will be lower. For example, navy-blue and black colour could be produced in the garments by using Sulphur dyes at lower cost.
14. Presence of mineral impurities in the cotton fibres may vary which may impede the stability of peroxide liquor during bleaching with hydrogen peroxide. Even insoluble compounds may

form during hydrogen peroxide bleaching. Those insoluble compounds may redeposit on the garments fabric resulting spots on the fabric. Special chemicals are available to avoid such problem.

15. Crease marks may develop in the cotton garments during dyeing. To avoid such problem, special chemicals like "Imacol brand" may be used.

Selection of Interlining before Garments Dyeing:

Garments to be dyed after manufacturing, needs careful selection of interlining. As because, during garments dyeing, performance of interlining used in the garments may be destroyed due to effect of chemicals and temperature used in the dye bath. To avoid such problem, interlining for the garments to be dyed should have following properties:

1. Interlining used in the garments should take-up equal amount of dye and chemicals, as the garment fabric takes-up.
2. Due to garments dyeing, bond strength between interlining and garment fabric should be undisturbed or unaffected.
3. Handle properly of the interlining attached areas of the garment should be as per expectation.
4. During garments dyeing, resin present in the interlining may pick-up dye molecules, hence colour depth problem should not arise in the interlining areas of the garment with remaining areas of the garment.

. a) Base fabric:

1. If any resin used as binder for the non-woven fabric production, should not create any problem to dye penetration.
2. During garments dyeing, due to dyeing effect, nonwoven base fabric should not change its original dimension.
3. Due to garments dyeing, property of nonwoven base fabric should be unaffected.

b) Base fabric finishing:

If cotton fabric is used as base fabric for the manufacture of fusible interlining then, normally the base fabric is finished with resin. Dimethyl urea derivative base resin is normally used for cotton base fabric finishing, which creates problem during garments dyeing. Because it creates problem to dye penetration during garments dyeing. If the base fabric is mechanically shrunken and low formaldehyde resin is used for base fabric finishing, then the problem of dye penetration will be reduced. If cotton base fabric for the manufacture of fusible interlining is only mechanically shrunken finished, then the problem of dye penetration could be avoided. Moreover, there will be no problem of differential shrinkage of cotton base fabric and cotton garments fabric.

c) Fusible resin coating:

Various types of resin coating is used for the manufacture of fusible interlining. After attaching the fusible interlining into the garments, if the garments are dyed, sometime problem may arise into the fused areas of the garment. During garments dyeing, due to the effect of dyeing temperature, chemicals used in the dye bath and longer period of agitation onto the garments, splitting of the interlining fabric and garment fabric may occur by breaking bonding between those two fabrics.

Garments Dyeing Machine:

For more than last 60 years, continuous research and development is going on garments dyeing technique, process and machines. Various types of garments dyeing machines have been developed and all those garment dyeing machines can be classified into following two groups:

- Pedal dyeing machine
- Rotary dyeing machine

A brief discussion on both types of garments dyeing machines are done below:

A. Pedal garments dyeing machine:

Pedal type garments dyeing machine is the first and oldest type of garments dyeing machine still used in the European countries. Pedal type garments dyeing machines are two types that is overhead pedal type and side pedal type.

Pedal type garments dyeing machines are used for the woollen knit wear type garments dyeing. Dyeing cost is higher in pedal type garments dyeing machine due to manual operation, higher labour load, manual loading and unloading of garments, manual chemical feeding etc. reasons. This pedal type garments dyeing machine is not used in any garments dyeing industry of Bangladesh.

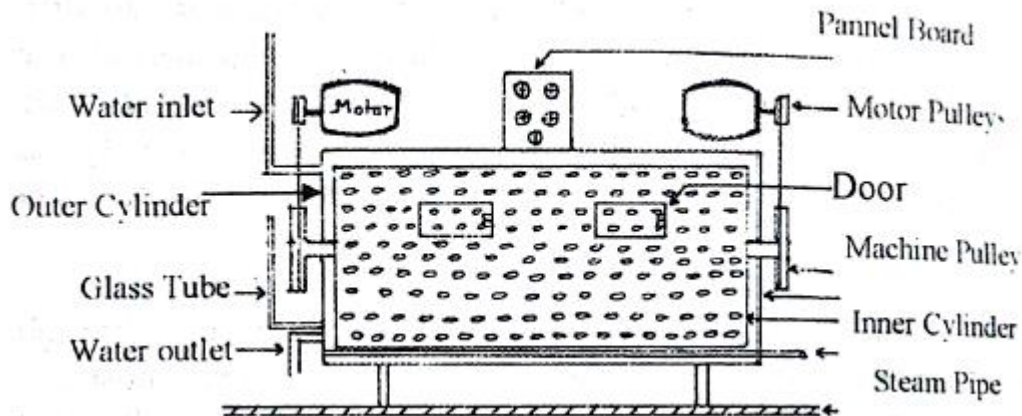
B. Rotary garments dyeing machine:

Rotary garment dyeing machine is the modified version of pedal type garment dyeing machine. Rotary garment dyeing machine are of two types: Normal atmospheric pressure type (less than 100°C) and high temperature type (More than 100°C dyeing temperature). The high temperature type garments dyeing machine is microprocessor-controlled machine, which is not still used in Bangladesh.

1. Atmospheric pressure rotary garments dyeing machine:

In our country, rotary type atmospheric pressure garment dyeing machine is widely used. This machine is made of stainless steel. In this machine, there are two big stainless-steel cylinders one inside the other. The outer stainless-steel cylinder is solid and have two sliding doors like microbus at the upper middle half position of the cylinder. The outer cylinder is fixed on the floor with heavy foundation to avoid any jerking during operation of the machine. There are also two chemical dosing doors on the sliding doors to facilitate chemical addition during machine running. The inner stainless-steel cylinder is perforated having two stainless steel side shafts. The side shafts are fixed

with the machine frame through ball bearing. Two machine pulley is fixed on the two side of the shafts. With the help of two big high-power motor and motor pulley, the machine pulley is rotated. As a result, the inner perforated cylinder can rotate freely inside the outer cylinder. The perforated inner cylinder has also two spring loaded doors. The doors of the inner cylinder and outer cylinder is aligned to the same position by the use of a inching motion switch, to load and unload the garments to be dyed. The inner cylinder can be rotated at 5 to 35 rpm through control panel of the machine. The rotation of the inner cylinder is automatically controlled for clock-wise direction and anti-clock wise direction by reversal driving unit which is simple electronic circuit. The dual directional movement of the inner cylinder is used to avoid roping effect of the garments during dyeing.



The inner

cylinder is about 4 feet diameter and 6 feet wide. The exact size of the inner cylinder depends on machine capacity. There are three to four inches gap between the inner and outer cylinder. A solid steam pipe is situated between the gaps. Steam is supplied from the boiler through the steam pipe of the gap. Hence, liquor is indirectly heated by the steam pipe to use desired dyeing temperature of the dye liquor. Dyeing temperature is controlled by a dial and indicator situated in the panel board of the machine. Pre-set temperature of the dial and indicator automatically controls the liquor temperature by controlling the steam supply on-off through the steam pipe.

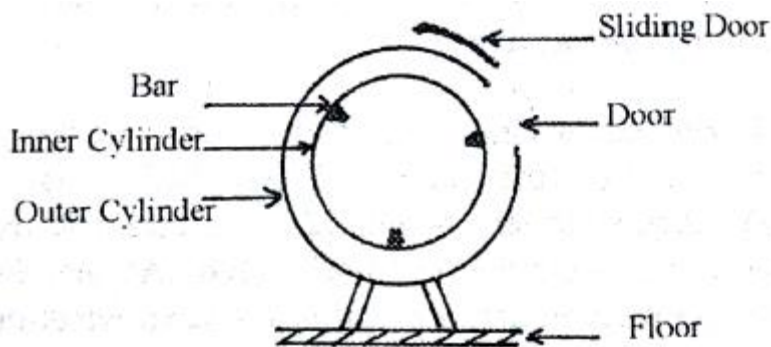


Fig: Side view of garment dyeing

machine

The inner cylinder has three triangular shape bars at equal distance that is 120° apart. The three triangular bars are about 6 inch high, which confirms the rotation of garments present inside the perforated cylinder during rotation of the perforated inner cylinder. Garments movement during garments dyeing is performed by those three bars which are also made of stainless steel.

2.High temperature rotary garments dyeing machine:

High temperature rotary garments dyeing machine is the modified and latest version of the atmospheric pressure type rotary garments dyeing machine. It is a microprocessor controlled high temperature garment dyeing machine which is not presently used in Bangladesh but it is used in the developed countries.

Garments dyeing could be carried out up to 140°C in this machine. Its main features are mentioned below:

1. Very big central door facilities material loading and unloading mechanically.
2. Light machine structure facilities high speed machine running with safe balance.
3. Simple a/c drive and a/c converter facilities 5 to 35 rpm of main cylinder.
4. Additional two chemicals tank facilities auto-dozing of dyes and chemicals during operation without any manual effort.
5. Separate chemical dosing tanks may be attached besides those two chemicals dosing tanks for auto dozing of more number of items to the dye solution during operation or processing in that machine.
6. Separate liquor circulating pump, heater and filter facilities additional liquor circulation, additional liquor heating and liquor filtration, hence better dyeing quality.
7. The machine is available only built-in form hence less risk of installation and running problem.

Basic Theory of Garment Dyeing:

Depending on wet fastness requirement of fabrics, garments made from cotton grey fabric are mainly dyed with direct dyes and reactive dyes. For low colour fastness direct dyes are used and for high colour fastness reactive dyes are used for cotton garments dyeing. If cotton garments are dyed with direct dyes then “hand wash separately” should be marked on the care label of the garments. If reactive dyes are used for cotton garments dyeing then the following advantages may be gained.

- a. Suitable for short and automatic dyeing process.
- b. Good level dyeing is achieved
- c. Dye migration and diffusion is better
- d. Colour fastness is acceptable
- e. Total colour range is available

If the cotton garments to be dyed with reactive dyes, then two types of reactive dyes are available in the market, namely

1. Hot brand reactive dyes
2. Cold brand reactive dyes

1. Basic principle of garments dyeing with hot brand reactive dyes:

Cotton garments may be dyed with hot brand reactive dyes as per following line diagram of basic dyeing principle.

At first load hot water in the dye bath add salt, lubricant, sequestering agent and maintain liquor pH at 7. Then load garments in the dye bath and start machine running. Raise liquor temperature of the dye bath to 80 degree Celsius within 30 minutes. After 5 minutes at 80°C, add dye solution in the dye bath within 15 minutes time. Continue dyeing for 30 minutes after dye addition in the liquor. Then add alkali to the dye liquor slowly within 15 minutes. After alkali addition, continue dyeing process for 30 to 60 minutes. At the end reduce liquor temperature to 70°C and then drop the liquor. After completion of dyeing, the garments are to be washed thoroughly at 40°C to 45°C for 5 minutes to remove the unfixed dyes from the garment's fabric surface. Then drop the liquor. Again [wash the garments](#) only with normal water for 5 minutes to clean the garments again. At the end of dyeing cycle, softener may be applied on the garments to improve the softness property of the garments.

2. Basic principle of garments dyeing with cold brand reactive dyes:

Use of cold brand reactive dyes for cotton garment dyeing is less than the hot brand reactive dyes. Simply, possibility of irregular dyeing that is irregular shade formation is higher in case of cold brand reactive dyes. Basic dyeing principle of cold brand [reactive dyes](#) are discussed below:

Load the garments with required quantity of water and the garments to be dyed. Start machine running and add salt in the dye bath. Continue processing for 10 to 15 minutes. Then add dye solution in the liquor through chemical dosing door slowly within 20 minutes. Continue dyeing without temperature for next 60 to 90 minutes. Then add sodium carbonate to the dye liquor and continue treatment for 30 to 45 minutes.

Comparison of garments dyeing with hot and cold brand reactive dyes:

Hot brand reactive dyes	Cold brand reactive dyes
Level dyeing may be achieved quickly.	Takes longer time to get level dyeing.
Exhaustion, reactivity, substantivity and fixation property of hot brand dyes are better, hence quick level dyeing is achieved.	Needs careful control of dyeing process to achieve level dyeing.
Dye migration property of dyes are better, hence higher possibility of level dyeing.	Dye migration property of cold brand reactive dyes are poor; hence possibility of irregular dyeing exists.

The risk of irregular dyeing in the seam areas like pocket, flap, collar, cuff, etc. of garments is lower due to the effect of temperature.	The said risk is higher due to lack of temperature effect.
Normally dyeing is carried out between 80°C to 95°C.	Dyeing is carried out upto below 50°C.
Entire dyeing process is easier and safer.	The process is little bit risky and needs always careful control.

Special Chemicals for Garments Dyeing;

Use of special chemicals and dyes become essential for garments dyeing. Because the use of special chemicals and dyes facilities additional advantages as well as saves accessories from risk of damage present in the garments. For example, zipper used in the garment may be protected from corrosion during garments dyeing by the use of special chemicals.

Basically, cotton garments are dyed in garments dyeing technique in our country. Cotton garments may be made from woven or knitted fabrics. Woven cotton garments dyeing process needs more precaution than the cotton knitted garments. Because, woven grey fabrics contains size materials and more impurities in the fabric than the cotton knitted fabrics. Use of metal components like zipper, button, stud, etc. is more in woven garments than the knitted garments. Possibility of crease marks formation during woven garments dyeing is more than the knitted garments.