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Islamabad

TEXTILE WET PROCESSING

LEARNER GUIDE

National Vocational Certificate Level 2

Version 1 - November, 2019

NAVTTC

Implemented by
giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

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Introduction

Welcome to your Learner's Guide for the Textile Wet Processing (Dyeing machine operator) Level-2. It will help you to complete the program and to go on to complete further study or go straight into employment.

Textile Wet Processing (Dyeing machine operator) Level-2 program is to engage young people with a program of development that will provide them with the knowledge, skills and understanding to start this career in Pakistan. The program has been developed to address specific issues, such as the national, regional and local trends, markets, the manpower availability within the country, and meeting and exceeding the needs and expectations of their employers / customers.

The main elements of your learner's guide are:

- **Introduction:**
  - This includes a brief description of your guide and guidelines for you to use it effectively
- **Modules:**
  - The modules form the sections in your learner's guide
- **Learning Units:**
  - Learning Units are the main sections within each module
- **Learning outcomes**:
  - Learning outcomes of each learning units are taken from the curriculum document
- **Learning Elements:**
  - This is the main content of your learner's guide with detail of the knowledge and skills (practical activities, projects, assignments, practices etc.) you will require to achieve learning outcomes stated in the curriculum
  - This section will include examples, photographs and illustrations relating to each learning outcome
- **Summary of modules**:
  - This contains the summary of the modules that make up your learner's guide
- **Frequently asked questions**:
  - These have been added to provide further explanation and clarity on some of the difficult concepts and areas. This further helps you in preparing for your assessment.
- **Multiple choice questions for self-test**:

  These are provided as an exercise at the end of your learner's guide to help you in preparing for your assessment.

TEXTILE WET PROCESSING

Module-5

LEARNER GUIDE

National Vocational Certificate Level 2

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Modules

Module 5: 0723001090 Perform Winch Dyeing

Objective of the module: This competency standard covers the skills and knowledge required to perform dyeing process by operating winch dyeing machine for production of dyed substrate according to required parameters.

Duration: 60 hours **Theory:** 12 hours **Practical:** 48 hours

Learning Unit	Learning Outcomes	Learning Elements	Materials Required
LU1: Prepare workstation for Winch dyeing	**The trainee will be able to:** Interpret program sheet for operating winch dyeing machine. Clean and clear winch dyeing machine as per check list. Arrange material for dyeing process as per program sheet. . Check and verify material and parameters according to program sheet.	Importance of program sheet before the start of dyeing process on machine at dyeing floor with understanding the all parameters given in the program sheet. Cleaning of machine according to standards for operating the winch dyeing machine. Advantages for proper machine cleaning. Arranging materials required for dyeing on winch dyeing machine such as water, dyes, chemicals and auxiliaries according to program sheet. Checking of material required for dyeing and verifying parameters of dyeing like dye weight, chemical pH, liquor ratio, temperature, weight and length of fabric etc.	Winch dyeing machine Over lock machine Textile trolleys Mug PPEs Mini Boiler Compressor Natural Gas Water Direct dyes Reactive dyes Fabric / Towel
LU2: **Operate Winch dyeing machine for fabric dyeing**	**The trainee will be able to:** Follow safety precautions as per job requirement. Load RFD (ready for dyeing / development) fabric on winch machine for dyeing as per program	Knowledge of safety precautions used for handling the chemicals and operating winch dyeing machine such as gloves, goggles, shoes, mask, apron, safety cap as per OH&S standards. Knowledge of process and techniques for fabric loading to the winch machine and related instruments for loading the fabric and maintain speed while loading and	Winch dyeing machine Plastic beaker Measuring cylinder Glass beaker Buckets

	sheet. Set machine parameters as per dyeing process requirement / program sheet. Run winch dyeing machine to start the dyeing process as per program sheet. Maintain quality parameters during process according to program sheet / protocol. Wash-off & Neutralize dyed fabric as per program sheet. Unload fabric for next process after completion the job. Clean workstation after closing the job.	unloading the fabric. Setting of winch dyeing machine parameters like setting of temperature, water level, liquor ratio according to recipe. Operational knowledge of winch dyeing machine for dyeing the product with required parameters like speed, capacity, working principle, temperature control, productivity, steam, air valve, water etc. Ensuring the quality parameters during dyeing process time to time like shade, temperature, pH etc. Importance and techniques used for wash-off and Neutralization of dyed fabric. Importance and advantages of cleaning the winch dyeing machine while loading & unloading the fabric and after closing the job for starting the new job. Removing regularly accumulated dust and dirt from the machine.	pH meter pH stripes Light Box Salt Wetting agents Leveling agents Sequestering agent Washing off agents Anti foam agents Fixing agents Sodium hydroxide
LU3: **Maintain Production Register for Winch dyeing machine.**	**The trainee will be able to:** Record lot-wise production on production register as per given format. Record running and stoppage time on production register as per given format. . Contact with supervisor for verification of production as per given format.	Importance of recording of machine and dyeing parameters like temperature variation, time consumption, fault detection, parts positions, chemicals and auxiliaries adding time during dyeing process etc on production register Advantages of recording the running and stoppage time of machine for calculating machine and operator's efficiency on production register. Communicating with supervisor for verification of parameters recorded in the production register and identifying the problems occurring (if any) during dyeing process.	Production Register Pen

Images of Winch Dyeing Machine

Cleaning in winch machine:

- Remove regularly accumulated dust and dirt from the machine.
- The inlet sensors and fabric guider are to be cleaned properly.
- While loading and unloading clean the machine's surrounding area.
- Transport the dyes and other chemicals safely in a proper way.
- Collect all the waste and store them in designated place

WINCH DYEING MACHINE

A dyeing machine consisting essentially of a dye vessel fitted with a driven winch (usually above the liquor level) which rotates and draws a length of fabric, normally joined end to end, through the liquor.

Winch dyeing machine is a rather old dyeing machine for fabrics in rope form with stationary liquor and moving material. The machine operates at a maximum temperature of 95-98°C. The liquor ratio is generally quite high (1:20-1:40). Winch dyeing machines are a low cost design that is simple to operate and maintain, yet versatile in application proving invaluable for preparation, washing or after treatments as well as the dyeing stage itself. In all winch dyeing machines a series of fabric ropes of equal length are immersed in the dye bath but part of each rope is taken over two reels or the winch itself. The rope of fabric is circulated through the dye bath being hauled up and over the winch throughout the course of the dyeing operation. Dyestuff and auxiliaries may be dosed manually or automatically in accordance with the recipe method.

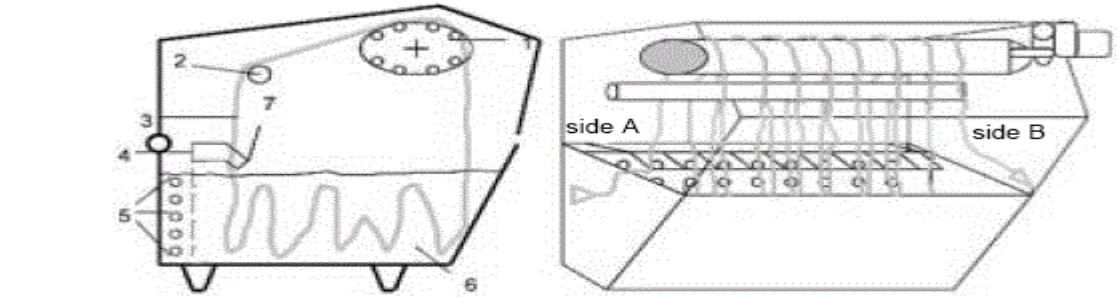


Fig: Schematic diagram of a winch dyeing machine

For more detail please visit: https://textilelearner.blogspot.com/2011/05/working-process-of-winch-dyeing_4222.html

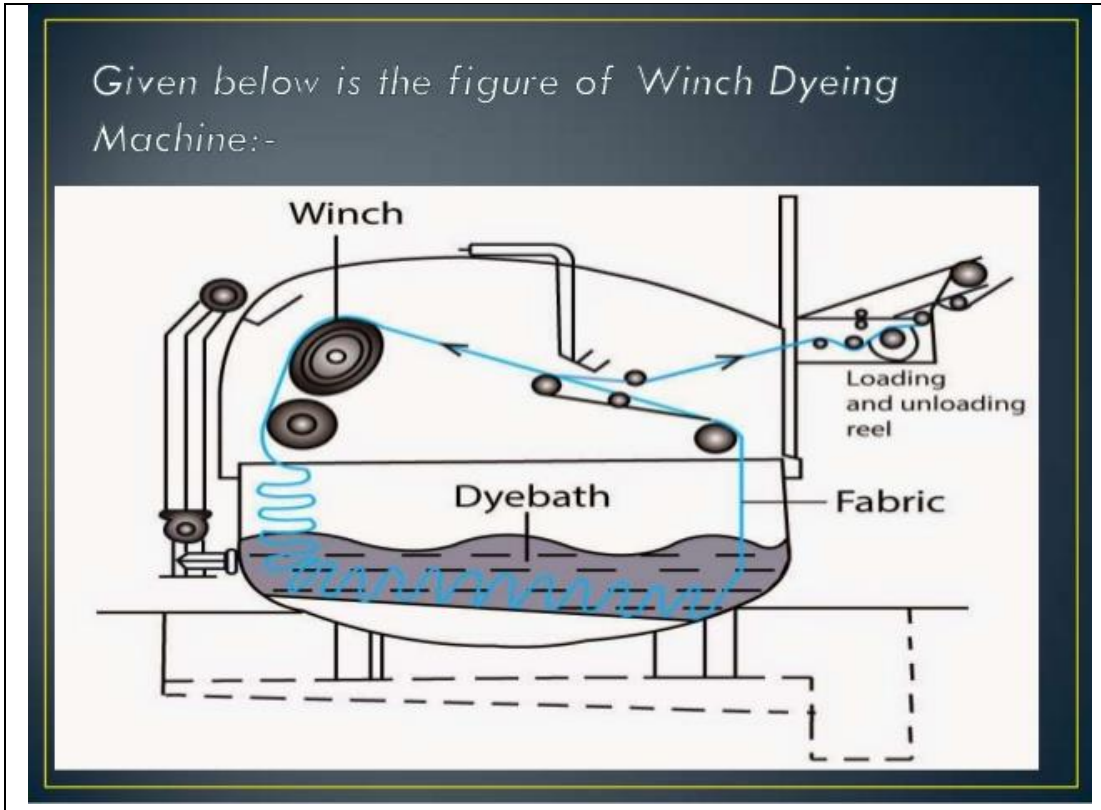
Features and Parameters of Winch Dyeing Machine:

I. The machine operates at a maximum temperature 95-98°C
II. The liquor ratio is generally quite high (1:20-1:40)
III. This is a dyeing machine for fabrics in rope form with stationary liquor and moving material.
IV. In winch machines, a number (1-40) of endless ropes or loops of fabrics of equal length (about 50-100m) are loaded with much of their length immersed in folded form inside the dye bath.
V. As for all forms of rope dyeing, the fabric must be fairly resistant to length ways creasing.
VI. A perforated separating compartment, positioned at a distance of 15-30 cm from its vertical side creates an inter space for heating and for adding reagents.
VII. Heating can be supplied by means of direct or indirect stem heating.
VIII. The rope passes from the dye bath over two elevated reels. The first roller is free-running (jockey or fly roller) and the second is winch reel.
IX. The winch reel not only controls the rate of movement of the fabric rope, but also the configuration of the rope in the dye bath.
X. The winch reel does not grip the fabric positively, but by the weight of the wet fabric and the friction between the reel and fabric.
XI. Now-a-days stainless reels with corrugated and broken surface for increase frictional forces are used.
XII. The maximum motion speed of the fabric must be approximately 40m/min.
XIII. The winch dyeing method is suitable for all fabrics, expects those which tend to originate permanent creases or which could easily distort under the winch stretching action.

Source: https://www.facebook.com/468645219825404/posts/assignment-on-winch-dyeing-machineintroductionthe-winch-or-beck-dyeing-machine-i/589147327775192/

Videos:

	Winch Dyeing https://www.youtube.com/watch?v=k35Y_YzyXEQ Duration: 00:01:41
	Winch Dyeing https://www.youtube.com/watch?v=Jd3_QHL_VhA Duration: 00:01:41



Working Principal of Winch Dyeing Machine

This is one kind old dyeing machine for fabrics in rope form with stationary liquor and moving material system. The machine is operated at a maximum temperature of 95^0 – 100^0 C for open bath winch but for closed winch, the machine operates at a maximum temperature of 130^0 – 160^0 C. The liquor ratio is generally quite high (1:20 – 1:40) for open bath winch and for closed or high temperature winch the liquor ratio is 1:8 to 1:10.

The system includes a vat with a front slant side acting as chute for the folded rope, while the rear side is entirely stay vertical. A perforated separating material, positioned at a distance of 15-30 cm from its vertical side, creates an inter space for heating and also for giving reagents. Heating is supplied by means of direct or indirect steam heating. The motion of fabric is driven by a circular elliptic winch coated with a special blanket to avoid the fabric slipping during the dyeing operation with subsequent possible fabric scratches.

The rope to be dyed then passes through a rack on the vertical perforated divider, which ensures the separation of the various folds of the rope and avoids possible entangling; the rope is then transferred onto the cylinder, which guided the fabric during the lifting from the vat carrying out a partial squeezing with subsequent liquor exchange. The rope (carried by the winch) folds while passing through the liquor. Surely when the fabric will be loaded into the machine it is necessary to sew the tail with the head of the rope (the fabric must be sewn according to the grain line or direction).

The maximum motion speed of the fabric must be approximately 35m/min to 40 m/min, as higher speeds could cause peeling; an excessive rope beating with subsequent entanglement. The fabric must not be folded and kept stationary inside the vat for more than two and half minutes to avoid possible defects or wrinkles; therefore the rope must be relatively short.

The winch dyeing method is preferable for all fabrics (especially for knit and light weight woven fabrics), except those which tend to originate permanent creases or which could easily distort under the winch stretching action (due to their fibre or structure composition).
Source: https://textileapex.blogspot.com/2014/09/winch-dyeing-machine.html

TEXTILE WET PROCESSING

Module-6

LEARNER GUIDE

National Vocational Certificate Level 2

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Module 6: 0723001091 Perform Jigger Dyeing

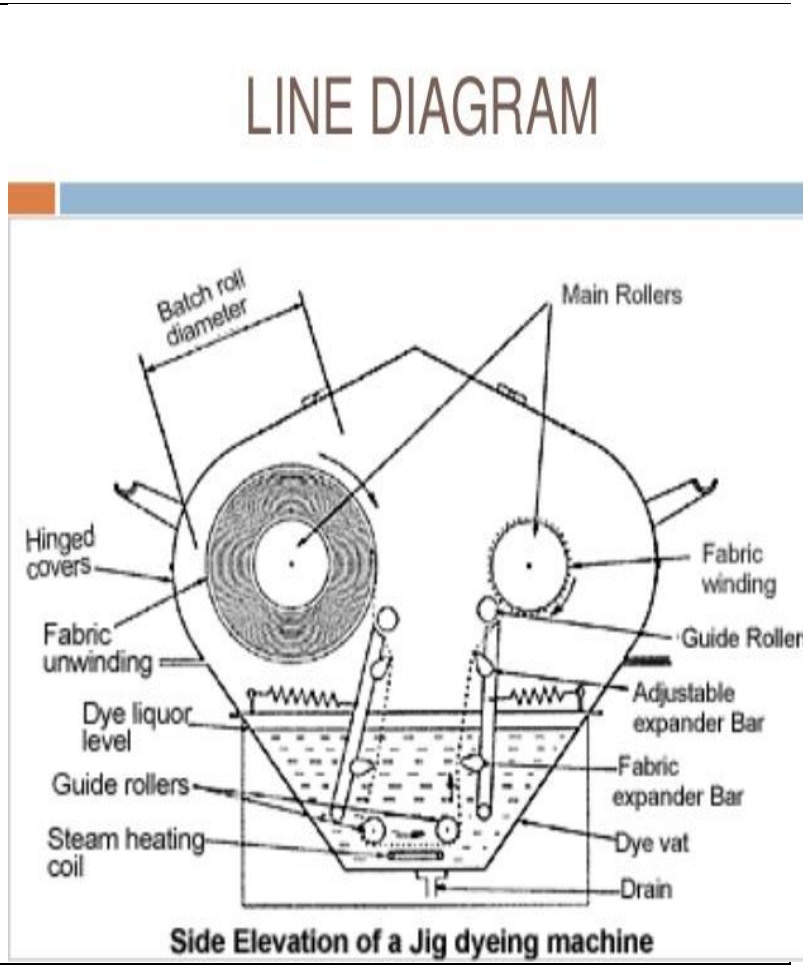
Objective of the module: This competency standard covers the skills and knowledge required to perform dyeing process by operating jigger dyeing machine for production of dyed substrate according to required parameters.

Duration: 60 hours **Theory:** 12 hours **Practical:** 48 hours

Learning Unit	Learning Outcomes	Learning Elements	Materials Required
LU1. **Prepare workstation for Jigger dyeing**	**The trainee will be able to:** Interpret program sheet for operating jigger dyeing machine. Clean and clear jigger dyeing machine as per check list. Arrange material for jigger dyeing process as per program sheet. . Check and verify material and parameters according to program sheet.	Importance of program sheet before the start of dyeing process on machine at dyeing floor with understanding the all parameters given in the program sheet. Cleaning of machine according to standards for operating the jigger dyeing machine. Advantages for proper machine cleaning. Arranging materials required for dyeing on jigger dyeing machine such as water, dyes, chemicals and auxiliaries according to program sheet. Checking of material required for dyeing and verifying parameters of dyeing like dye weight, chemical pH, liquor ratio, temperature, weight and length of fabric etc.	Jigger dyeing machine Over lock machine Textile trolleys Mug PPEs Mini Boiler Compressor Natural Gas Water Direct dyes Reactive dyes Fabric Textile Marker
LU2. **Operate Jigger dyeing machine for fabric dyeing**	**The trainee will be able to:** Follow safety precautions as per job requirement. Load RFD (ready for dyeing / development) fabric on jigger machine for dyeing as per program sheet. Set machine parameters as per dyeing process requirement / program sheet. Run jigger dyeing machine to start the dyeing process as per program sheet.	Knowledge of safety precautions used for handling the chemicals and operating jigger dyeing machine such as gloves, goggles, shoes, mask, apron, safety cap as per OH&S standards. Knowledge of process and techniques for fabric loading to the jigger machine and related instruments for loading the fabric and maintain speed while loading and unloading the fabric. Setting of jigger dyeing machine parameters like setting of temperature, water level, liquor ratio according to recipe.	Hydraulic device for fabric loading Winch dyeing machine Plastic beaker Measuring cylinder Glass beaker Buckets pH meter

	Maintain quality parameters during process according to program sheet / protocol. Wash-off & Neutralize dyed fabric as per program sheet. Unload fabric for next process after completion the job. Clean workstation after closing the job.	Operational knowledge of jigger dyeing machine for dyeing the product with required parameters like speed, capacity, working principle, temperature control, productivity, steam, air valve, water etc. Ensuring the quality parameters during dyeing process time to time like shade, temperature, pH etc. Importance and techniques used for wash-off and Neutralization of dyed fabric. Importance and advantages of cleaning the jigger dyeing machine while loading & unloading the fabric and after closing the job for starting the new job. Removing regularly accumulated dust and dirt from the machine.	pH stripes Light Box Salt Wetting agents Leveling agents Sequestering agent Washing off agents Anti foam agents Fixing agents Sodium hydroxide TDS Meter Formic Acid Soda Ash
LU3. **Maintain Production Register for Jigger dyeing machine.**	**The trainee will be able to:** Record lot-wise production on production register as per given format. Record running and stoppage time on production register as per given format. . Contact with supervisor for verification of production as per given format.	Importance of recording of machine and dyeing parameters like temperature variation, time consumption, fault detection, parts positions, chemicals and auxiliaries adding time during dyeing process etc on production register Advantages of recording the running and stoppage time of machine for calculating machine and operator's efficiency on production register. Communicating with supervisor for verification of parameters recorded in the production register and identifying the problems occurring (if any) during dyeing process.	Production Register Pen

Images of Jigger Dyeing Machine:



Jigger Dyeing Machine:

Jig or jigger dyeing machine is one of the oldest dyeing machines used for cloth dyeing operations. Jigger machine is suitable for dyeing of woven fabrics, up to boiling temperature without any creasing . Jigs exert considerable lengthwise tension on the fabric and are more suitable for the dyeing of woven than knitted fabrics. Since the fabric is handled in open-width, a jig is very suitable for fabrics which crease when dyed in rope form.

Some wovens are conveniently dyed on jigger are,

- Taffettas
- Plain wovens
- Satins
- Poplins
- Ducks
- Suiting and Shirting material.
- Sheeting etc.

But have limited application on fabrics which are tension sensitive such as crepes , flat crepes , knits , net fabrics and elastomeric warps etc.

Machine Description

The jigger machines have two main rollers which revolve on smooth bearings and are attached to with a suitable driving mechanism , which can be reversed when required. The fabric is wound on one of the main rollers and fed from the other. The fabric move from one roller to the other through the dye liquor trough located at the lower part of the machine. There is various arrangement of guide rollers at the bottom of liquor trough, and during each passage the cloth passes around these guide rollers .

The concentrated dye liquor is usually introduced directly into the dyebath in two equal portions, which are added just before commencing the first and second ends. The liquor is agitated by the movement of the fabric through the dyebath. Several horizontal spray pipes are fitted across the full width of the trough in order to expedite fabric rinsing.

Live steam injected into the bottom of the trough through a perforated pipe across the width of the jig heats the liquor. Some modern jigs also have heat exchangers for indirect heating.

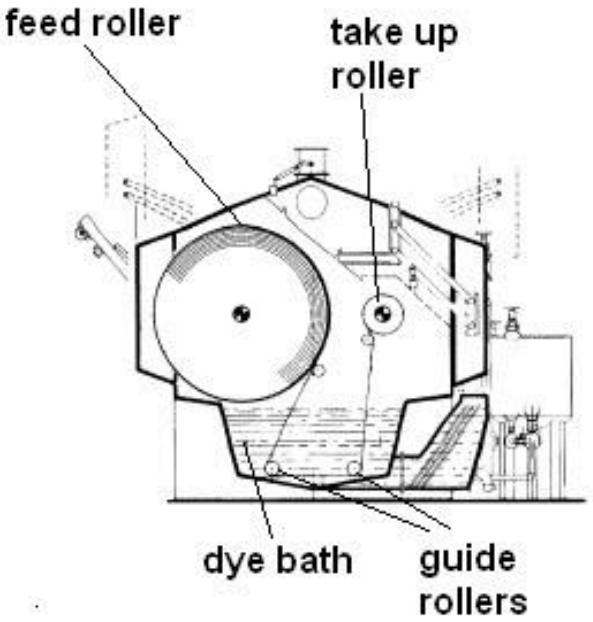
Covering the top of the jig minimizes the heat loss to the atmosphere, keeps the temperature uniform on all parts of the fabric and minimizes exposure of the liquor and the cloth to air. Minimizing exposure to air is important when using sulphur or vat dyes since these dyes can be oxidized by atmospheric oxygen.

A few meters of leading fabric, similar in construction to the cloth under process, is stitched to each end of the cloth batch, to allow the entire length of the

fabric to pass through the dye bath during the dyeing process. When jig processing is completed, the fabric is run onto an A-frame via a nip or suction device to remove extraneous water during unloading.

Modern machines such as automatic and jumbo jiggers have full automation in drive , tension regulation and control , fabric speed and metering, smooth and jerk less stop and start , counters for number of turns , gradual and noiseless reversal, automatic temperature regulation and control etc.

Dyeing Process by Jigger Dyeing Machine:



jigger dyeing machine

The dyeing process on jigger is regarded as a series of intermittent padding operation followed by dwelling periods on the main roller, during which the dyeing action and diffusion takes place. The factors controlling the rate of dye absorption are:

1. The amount of interstitial dye liquor retained in the interstices of the fabric weaves.
2. The exhaustion of the interstitial liquor in the dwell period between successive immersions.
3. The degree of interchange of liquor during one immersion (interchange factor).

In the **dyeing on jigger machines** the cloth revolves on two main rollers. The open-width fabric passes from one roller through the dyebath at the bottom of the machine and then onto a driven take-up roller on the other side. When all the fabric has passed through the bath, the direction is reversed. Each passage is called an end. Dyeing always involves an even number of ends. The dye bath has one or more guide rollers, around which the cloth travels, and during this immersion achieves the desired contact with the dye liquor. During this passage the fabric picks up adequate quantity of dye liquor, excess of which is drained out but still a good quantity is held in the fabric. During rotation of rollers this dye penetrates and diffuses into the fabric. The real dyeing takes place not in the dye liquor but when the cloth is on the rollers, since only a very small length of fabric is in the dyebath and major part is on the rollers therefore the speed of cloth during immersion in dye liquor has a very little effect on percentage of shade produced.

Some critical problems related to the conventional jigger dyeing machines (which are minimized in the modern day machines) the major problems are side-to-centre color variations, called listing, and lengthways color variations, called ending.

Other problems are

- Temperature control from side-to-side and end-to-end of the roll
- Tension control from end-to-end
- Constant speed control from end-to-end
- Prevention of creases
- Prevention of air

Limitations of Jigger Dyeing

1. Jigs exert considerable lengthwise tension on the fabric and are more suitable for the dyeing of woven than knitted fabrics.
2. In textile preparation due to the swelling and dissolution of size; which makes the fabric slippery and unstable in roll form;
3. The low liquor ratio makes washing-off difficult.
4. There is little mechanical action in a jig machine and it is less suitable where vigorous scouring is required before dyeing.
5. Moiré effects or water marks may arise on some acetate and nylon fabrics because of pressure flattening the structure of the rolled fabric.

Source: http://textilelearner.blogspot.com/2011/03/working-process-of-jigger-dyeing_5465.html

Importance of jigger machine:

- ✧ The jigger is a short liquor dyeing machine for textile fabrics in open-width form.
- ✧ The small lots can be easily processed in jigger machine.
- ✧ Most suitable for all kinds of shades.
- ✧ Excellent colour fastness properties are achieved in Jigger.
- ✧ Lower investment cost compared with continuous dyeing technique.

✧ Suitable for all kind of processes in open width, from pretreatment to finishing.

Modern Jumbo Jiggers:

Modern machines such as jumbo jiggers have full automation in drive , tension regulation and control , fabric speed and metering, smooth and jerk less stop and start , counters for number of turns, gradual and noiseless reversal, automatic temperature regulation and control etc.

Dyeing and washing:

The object of dyeing is uniform application of coloring matter on textile material. Dyeing in the jigger machine is called “Exhaust dyeing” technique. Careful control of the dyeing temperature, pH and auxiliary chemical concentrations is often necessary to obtain well-penetrated dyeing.
After dyeing, the material is rinsed to remove unfixed dyes and if needed additional washing Is also done in the Jigger dyeing machine.

Details of Jigger machine

Trough: Dyeing trough has a special high efficiency design allowing constant and controlled liquor ratio dyeing and high efficiency washing with minimum liquor content. The intended liquor ratio is minimum 1:4.
Stainless steel compartment: The machine consists of an enclosed stainless steel compartment with 6 mm thick sides. This compartment has inclined doors and heated door frames, which prevent dripping of condensate on the fabric.
Take up and Let off rollers: These are two stainless steel rollers, running in external bearings with mechanical seals to take up and let off the fabric rolls.
Pump for liquor circulation: Liquor circulation system consists of centrifugal pump at 2 bar pressure, internal sieve, stainless steel piping, and manual flow control valve and deflector system for even liquor distribution.
Quick liquor discharge: The Large diameter pneumatically controlled drain valve enables quick liquor discharge allowing short change over time.
Stainless steel guiding frame: There is one stainless steel guiding frame supported by 2 air cylinders for single unloading, including fixed stainless steel fabric spreading bar and mechanical safety lock.
Stainless steel side tank: Machine is also provided with a stainless steel side tank of 300 liters capacity with direct manual heating. The tank is equipped with sieve, manual drain valve, automatic mixer, level sensor, re-circulation connection and rinsing rim for automatic cleaning.

A typical recipe for various processes in jigger:

Dyeing and washing:
Reactive dyes (Colouring agent) - 2-4%

Wetting agent (Improve wetting tendency of fabric) - 0.5%
Sodium chloride (Exhausting agent) - 5%
Sodium carbonate (Fixing agent) - 1-2%
Soap (Removing unfixed dyes) - 0.5%

Various parts of Jigger dyeing machine:

Take up and Let off rollers
During machine running Unloading in Jigger
Spraying system Preparation tank & main panel

Operating Jigger machine:

Finding the exact dye powder measuring of dye powder
Mixing of required chemical Transportation of chemical
Filling of water in jigger machine Adjusting fabric tension
Operating panel unloading after dyeing

- Understand and follow the instruction from lot card and program book.
- Ensure main power is switched ON and open then compressed air, steam and water valve.
- Check the quality and lot number of the fabric before putting on the machine by checking the label.
- Transport the fabric to be run, to the inlet feeding unit of Jigger machine using hydraulic hand puller or electric truck.
- Initially load 10-15 meters of leader fabric and clean all the rollers properly.
- Ensure the process to be done, scouring & bleaching or dyeing or washing.
- Initially fill the water in the trough and clean the bottom of the trough thoroughly.
- Prepare the approved chemicals in front of the Supervisor.
- Start loading of the fabric in the Jigger machine.
- Do proper loading of fabric and ensure that no fabric crease occurs.
- Observe for any defect of the fabric while loading.
- Set the important parameters in the machine as shown below or as instructed by supervisor:

Machine speed – 10-100 m/min
Fixed speed of loading and unloading – 60 m/min
Max. batch diameter – 700 mm - 1100 mm
Max. Temperature – 98 ^{o}C
Fabric tension in practice – depends on fabric type
Set the No of ends according to the process type - 2 to 16 Nos

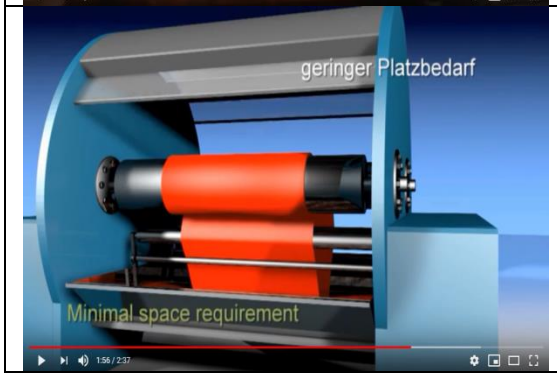
❖ Check for various process damages in the fabric like stains – dust, chemicals, rust, handling stains, crease, water dropping, oil, grease, etc.
❖ Check the fabric shade if dyeing process is carried out and whiteness index for bleaching process before unloading.
❖ Ensure proper batching in the outlet without any crease.

Cleaning in jigger machine:

❖ Remove regularly accumulated dust and dirt from the machine.
❖ The inlet sensors and fabric guider are to be cleaned properly.
❖ While loading and unloading clean the machine's surrounding area.
❖ Transport the dyes and other chemicals safely in a proper way.
❖ Collect all the waste and store them in designated place

Source: http://textilescommittee.nic.in/writereaddata/files/publication/Pro7.pdf

Videos:

	Jigger Dyeing Process https://www.youtube.com/watch?v=3q0d9vJdeXE Duration: 00:04:49
	Wichelhaus Jigger dyeing machine https://www.youtube.com/watch?v=BTkRqYbkh5w Duration: 00:02:37

TEXTILE WET PROCESSING

Module-7

LEARNER GUIDE

National Vocational Certificate Level 2

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Module 7: 0723001092 Perform Jet Dyeing

Objective of the module: This competency standard covers the skills and knowledge required to perform dyeing process by operating jet dyeing machine for production of dyed substrate according to required parameters.

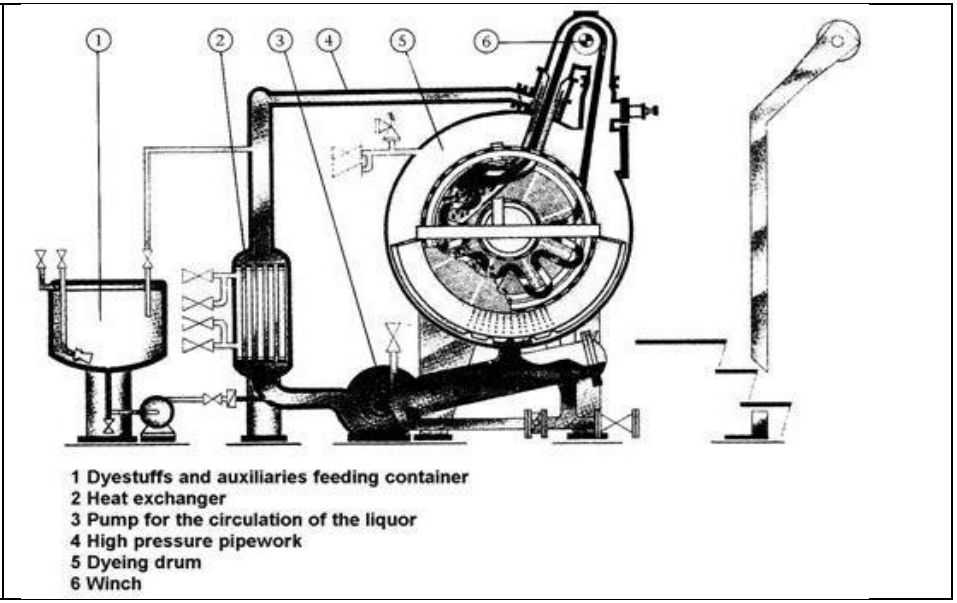
Duration: 70 hours **Theory:** 14 hours **Practical:** 56 hours

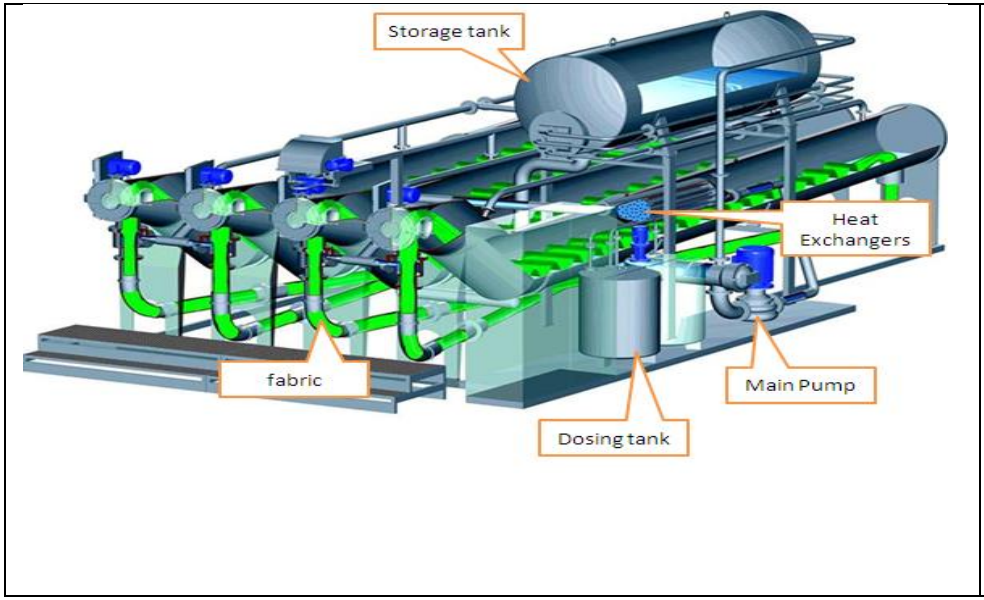
Learning Unit	Learning Outcomes	Learning Elements	Materials Required
LU1. **Prepare workstation for Jet dyeing**	**The trainee will be able to:** Interpret program sheet for operating jet dyeing machine. Clean and clear jet dyeing machine as per check list. Arrange material for dyeing process as per program sheet. . Check and verify material and parameters according to program sheet.	Importance of program sheet before the start of dyeing process on machine at dyeing floor with understanding the all parameters given in the program sheet. Cleaning of machine according to standards for operating the jet dyeing machine. Advantages for proper machine cleaning. Arranging materials required for dyeing on jet dyeing machine such as water, dyes, chemicals and auxiliaries according to program sheet. Checking of material required for dyeing and verifying parameters of dyeing like dye weight, chemical pH, liquor ratio, temperature, weight and length of fabric etc.	Jet dyeing machine Over lock machine Textile trolleys Scissor Air dryer Fabric drying oven Mug PPEs Mini Boiler Compressor Natural Gas Water Disperse dyes Reactive dyes Fabric (PC / Polyester) Textile Marker
LU2. **Operate Jet dyeing machine for fabric dyeing**	**The trainee will be able to:** Follow safety precautions as per job requirement. Load RFD (ready for dyeing / development) fabric on jet machine for dyeing as per program sheet. Set machine parameters as per dyeing process requirement / program sheet.	Knowledge of safety precautions used for handling the chemicals and operating jet dyeing machine such as gloves, goggles, shoes, mask, apron, safety cap as per OH&S standards. Knowledge of process and techniques for fabric loading to the jet machine and related instruments for loading the fabric and maintain speed while loading and unloading the fabric. Setting of jet dyeing machine parameters like setting of	Plastic beaker Measuring cylinder Glass beaker Buckets pH meter pH stripes Light Box Salt Wetting agents Leveling agents Sequestering agent

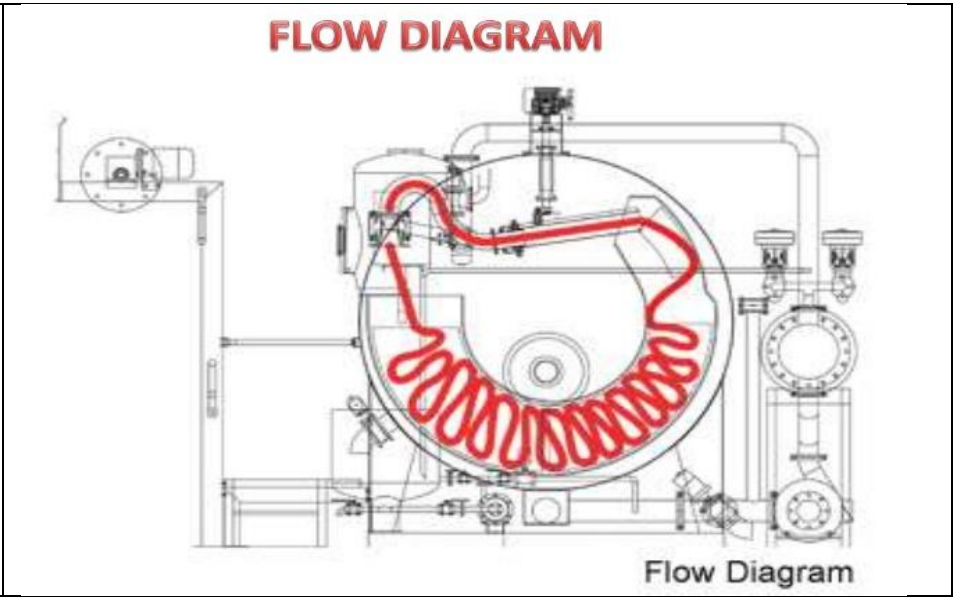
	Run jet dyeing machine to start the dyeing process as per program sheet. Maintain quality parameters during process according to program sheet / protocol. Wash-off & Neutralize dyed fabric as per program sheet. Unload fabric for next process after completion the job. Clean workstation after closing the job.	temperature, water level, liquor ratio according to recipe. Operational knowledge of jet dyeing machine for dyeing the product with required parameters like speed, capacity, working principle, temperature control, productivity, steam, air valve, water etc. Ensuring the quality parameters during dyeing process time to time like shade, temperature, pH etc. Importance and techniques used for wash-off and Neutralization of dyed fabric. Importance and advantages of cleaning the jet dyeing machine while loading & unloading the fabric and after closing the job for starting the new job. Removing regularly accumulated dust and dirt from the machine.	Washing off agents Anti foam agents Dispersing agents Sodium hydro sulphite Sodium hydroxide Anti creasing agent Formic Acid Soda Ash
LU3. **Maintain Production Register for Jet dyeing machine.**	**The trainee will be able to:** Record lot-wise production on production register as per given format. Record running and stoppage time on production register as per given format. . Contact with supervisor for verification of production as per given format.	Importance of recording of machine and dyeing parameters like temperature variation, time consumption, fault detection, parts positions, chemicals and auxiliaries adding time during dyeing process etc on production register Advantages of recording the running and stoppage time of machine for calculating machine and operator's efficiency on production register. Communicating with supervisor for verification of parameters recorded in the production register and identifying the problems occurring (if any) during dyeing process.	Production Register Pen

Images of Jet Dyeing Machine:

Source: https://www.slideshare.net/sheshir/jet-dyeing-machine



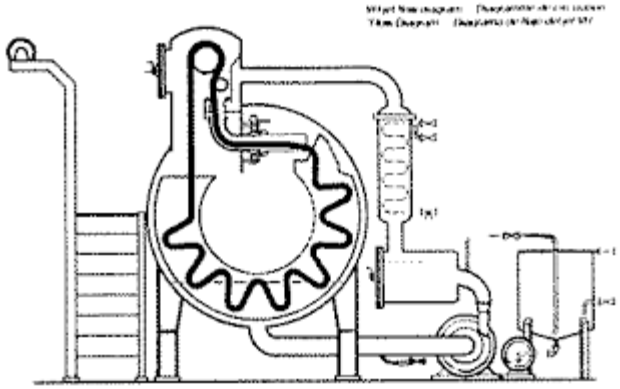




Jet Dyeing Machine

A machine used for dyeing of fabric in rope form. Jet dyeing machines came into existence with a purpose to minimize or eliminate the drawbacks of earlier machines like winch, jigger and beam dyeing units.

Principle of the Technology



Jet dyeing is a process that can be used for batch dyeing operations such as dyeing, bleaching, washing and rinsing. In this process, dyeing is accomplished in a closed tubular system, basically composed of an impeller pump and a shallow dye bath. The fabric to be dyed is loosely collapsed in a form of a rope, and tied into a loop. The impeller pump supplies a jet of dye solution, propelled by water and/or air, which transport the fabric within the dyeing system, surrounded by dye liquor, under optimum conditions. Turbulence created by the jet aids in dye penetration and prevents the fabric from touching the walls of the tube, thus minimizing mechanical impact on the fabric.

Special Features and Applications

1. Jet dyeing machines can be operated even at high temperatures and pressures. Jet dyeing systems are fitted with cooling systems with the potential for reuse of the warmed water on the next dyeing cycle.

2. Jet dyeing systems operate at a low liquor ratio or the ratio of the mass of the dye bath to the mass of the fabric in the dyeing machine. Compared to conventional dyeing, typically with a liquor ratio of 1:15 to 1:25, jet dyeing can be operated at a liquor ratio from as low as 1:3 up to 1:6. Consequently, the dyeing operation consumes less water and chemicals, and generates less effluent.
3. since the dyeing process depends on dye concentration, the lower liquor ratio increases the dyeing rate and dye fixation.
4. Increased dyeing rate results to quicker machine drains and fills and more rapid heating and cooling. The latter decreases energy requirements for heating the dye bath, which then leads to reduced steam and boiler use, reduced fuel consumption, and fewer emissions to the atmosphere from combustion.
5. the lengthwise tension is less, widthwise tension is absent and fabric achieves better fullness and handle.
6. The frequent movement of fabric round the jet through the machine reduces the tendency of crease formation.

Limitations of Jet Dyeing machines

1.High Initial investments and maintenance cost.
2. Limited accessibility during the dyeing process.
3. Foam forming substances are to be avoided.
4. Any roughness of the inside surface cause damage to cloth.
5. In case of cloth breakage, rethreading is complicated.

Types of Jet Dyeing Machines

After investigating the dyeing results under different conditions such as development of new fiber blends, different construction fabrics, interaction position of jet, quantity of the dye liquor to be present in around the fabric and the type of impact of the dye liquor on the fabric in the jet area, the following type of jet dyeing machines were developed

Source: http://dyeingworld1.blogspot.com/2010/01/jet-dyeing.html

A few other innovative additions to the machines are listed in the below:

- Automatic controlled variable jets e.g. vario Jet and Thies.
- Auto untangling device.
- Self-cleaning filters.
- Semi-automated salt dissolving and doing system.
- Spray system for efficient cleaning.

In all jet dyeing machines, the fabric rope passes through two main phases:

1. The active phase, in which the fabric moves at high speed, passing through the jet at vigorous pick up of fresh dye-liquor, about 2% of the total time, the material is in active phase.

2. The passive phase, in which the fabric moves slowly around the system until it is feed back to the jet.

Different Parts of Jet Dyeing Machine in Textile:

Major parts of jet dyeing machine have pointed out in the following:

- Winch roller or Reel
- Main Vessel or Chamber
- Chemical dosing tank
- Heat Exchanger
- Nozzle
- Fabric Plaiter
- Reserve Tank
- Controlling unit or Processor
- Different types of motors & Valves Main Pump
- Utility lines i.e. water line, drain line, steam inlet etc.

Source: https://www.fiber2apparel.com/2018/05/jet-dyeing-machine-textile-features.html

What does a Dyeing Machine Operator do?

A dyeing machine operator performs many tasks relating to coloring cloth, yarn, plastic, glass or paper. Their specific tasks may include cutting fabric, washing it, bleaching or distressing it, and dyeing it. Many dyeing machine operators are also responsible for preparing dye mixes according to established formulae, and are frequently called upon to develop new color formulations and to perfectly replicate colors by sight. Most commercial dye work uses the Pantone color system, which assigns a code to each of several thousand colors. The dyeing machine operator must be skilled at replicating the Pantone colors, even if he or she does not have access to the standard primary color dyes produced for this purpose by Pantone itself.

Because the weave and texture of fabric affects the way it holds color, a dying machine operator may also need to alter color formulas so that diverse fabrics will display precisely identical colors. Delicate fabrics require special handling; for the most fragile textiles, the dying machine operator may have to modify the washing, drying and dyeing procedure so it doesn't ruin the fabric.

Many pieces of equipment used by dying machine operators are large, complex and possibly dangerous to distracted workers. To keep this equipment functioning optimally, the dyeing machine operator may have to perform on-the-spot inspections and repairs so as not to remove that machine from the production cycle. Operators usually have to maintain logs and report any defects or problems with the machinery to their supervisors or the technical support staff, if there is one. They must be intimately familiar with workplace safety regulations and follow the safety guidelines meticulously; they must also report violations to their superiors.

Are you suited to be a dyeing machine operator?

Dyeing machine operators have distinct personalities. They tend to be realistic individuals, which mean they’re independent, stable, persistent, genuine, practical, and thrifty. They like tasks that are tactile, physical, athletic, or mechanical. Some of them are also conventional, meaning they’re conscientious and conservative.

What is the workplace of a Dyeing Machine Operator like?

Dyeing Machine Operators often work in large, noisy industrial environments where they are required to stand for hours at a time. Working with dyes, detergents and other potent chemicals may present a respiratory hazard; so many workers are made to wear masks, filters or ventilator equipment while on the job. Dye machines are extremely expensive and generally not used in small or home-grown textile companies. Individuals with dyeing machine experience, however, may find work with tiny companies that dye fabric by hand. A dye machine operator who has thorough knowledge of the pertinent chemicals is a valuable asset to any firm or startup venture that deals with colorants.

All dyeing machine operators must wear safety goggles, heavy gloves and clothing without loose, dangling parts; long hair must be pulled back, and necklaces, bracelets and large hoop earrings are forbidden because they can easily become entangled with quickly moving machine parts, resulting in injuries or death.

Dyeing machine operators often have to work strange hours, such as a shift from 10pm to 5am; this is most likely in retail companies with limited space. During the day, the bulk of the open spaces are dedicated to sales and service; furthermore, many dyeing machines are quite loud and would interfere with

customers' conversations. Despite the long shifts and exposure to harsh chemicals, many are attracted to this line of work because overtime is extremely rare, and machine operators are not expected to be "on call" at all times.
Source: https://www.careerexplorer.com/careers/dyeing-machine-operator/

Liquor ratio of dyeing machine

The liquor ratio of a dyeing machine is the amount of water needed to run a dyeing machine successfully divided by the mass of textiles to be dyed. For example: 1000 liter water divided by 200 kg textiles = liquor ratio 5.

Videos:

	Jet Dyeing Machine and Working Principle Jet dyeing machine: #Jet #Dyeing #Machine is the most modern machine used for the dyeing of polyester using disperse dyes. In this machine the cloth is dyed in rope form which is the main disadvantage of the machine. https://www.youtube.com/watch?v=NiC8mmjzBc0 Duration: 00:03:42
	JET DYEING MACHINE /FABRIC DYEING MACHINE https://www.youtube.com/watch?v=fyX-KrxTU8o Duration: 00:05:09
	Jet Dyeing Machine.avi https://www.youtube.com/watch?v=AwcNc82qJD4 Duration: 00:02:19

TEXTILE WET PROCESSING

Module-8

LEARNER GUIDE

National Vocational Certificate Level 2

Version 1 - November, 2019

Module 8: 0723001093 Perform Pad batch dyeing

Objective of the module: This competency standard covers the skills and knowledge required to perform dyeing process by operating Pad batch dyeing machine for production of dyed substrate according to required parameters.

Duration: 70 hours **Theory:** 14 hours **Practical:** 56 hours

Learning Unit	Learning Outcomes	Learning Elements	Materials Required
LU1. **Prepare workstation for Pad batch dyeing**	**The trainee will be able to:** Interpret program sheet for operating Pad-batch dyeing machine. Clean and clear Pad-batch dyeing machine as per check list. Arrange material for dyeing process as per program sheet. . Check and verify material and parameters according to program sheet.	Importance of program sheet before the start of dyeing process on machine at dyeing floor with understanding the all parameters given in the program sheet. Cleaning of machine according to standards for operating the pad batch dyeing machine. Advantages for proper machine cleaning. Arranging materials required for dyeing on pad batch dyeing machine such as water, dyes, chemicals and auxiliaries according to program sheet. Checking of material required for dyeing and verifying parameters of dyeing like dye weight, chemical pH, pick up, temperature, weight and length of fabric etc.	Pad Batch dyeing machine Over lock machine Scissor Iron Fabric drying oven Mug PPEs Batcher (A-frame) Compressor Jack Polyethylene cover Masking Brown tape Weighing balance Water Reactive dyes Fabric
LU2. Operate Pad batch dyeing machine for fabric dyeing	**The trainee will be able to:** Follow safety precautions as per job requirement. Apply Threading of feeding cloth as per requirement. Stitch RFD (ready for dyeing / development) fabric with feeding cloth on pad batch machine for dyeing as per program sheet.	Knowledge of safety precautions used for handling the chemicals and operating pad batch dyeing machine such as gloves, goggles, shoes, mask, apron, safety cap as per OH&S standards. Knowledge of process and techniques for fabric loading to the pad batch machine and related instruments for loading the fabric and maintain speed while loading and unloading the fabric. Setting of pad batch dyeing machine parameters like setting of temperature, water level, pick up settings	Plastic beaker Measuring cylinder Glass beaker Buckets Glass rod Light Box

	Set machine parameters as per dyeing process requirement / program sheet. Run Pad-batch dyeing machine to start the dyeing process as per program sheet. Maintain quality parameters during process according to program sheet / protocol. Wrap the batcher with polyethylene sheet to avoid fabric drying. . Rotate the dyed fabric for 8 to 12 hours for dyes fixation. Clean workstation after closing the job.	according to recipe. Operational knowledge of pad batch dyeing machine for dyeing the product with required parameters like speed, capacity, working principle, temperature control, productivity, water etc. Ensuring the quality parameters during dyeing process time to time like shade, temperature, pick up, pH etc. Importance and techniques used for wash-off and Neutralization of dyed fabric. Importance and advantages of cleaning the pad batch dyeing machine while loading & unloading the fabric and after closing the job for starting the new job. Removing regularly accumulated dust and dirt from the machine.	Salt Wetting agents Sodium silicate Anti foam agents Sodium hydroxide
LU3. Maintain Production Register for Pad batch dyeing machine.	**The trainee will be able to:** Record lot-wise production on production register as per given format. Record running and stoppage time on production register as per given format. . Contact with supervisor for verification of production as per given format.	Importance of recording of machine and dyeing parameters like temperature variation, time consumption, fault detection, parts positions, chemicals and auxiliaries adding time during dyeing process etc on production register Advantages of recording the running and stoppage time of machine for calculating machine and operator's efficiency on production register. Communicating with supervisor for verification of parameters recorded in the production register and identifying the problems occurring (if any) during dyeing process.	Production Register Pen

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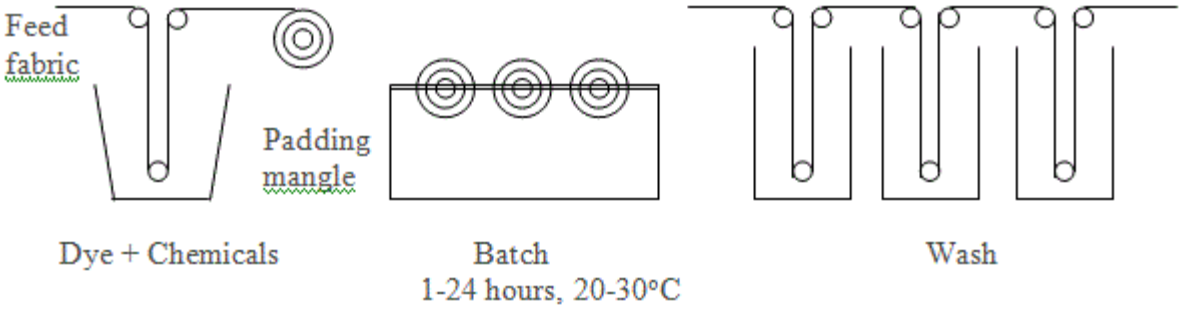
Definition of *pad dyeing*: a process of dyeing fabrics by passing the fabrics between rollers that apply the dyestuff

Images of Pad Batch dyeing machine:



Pad batch (hot) process:

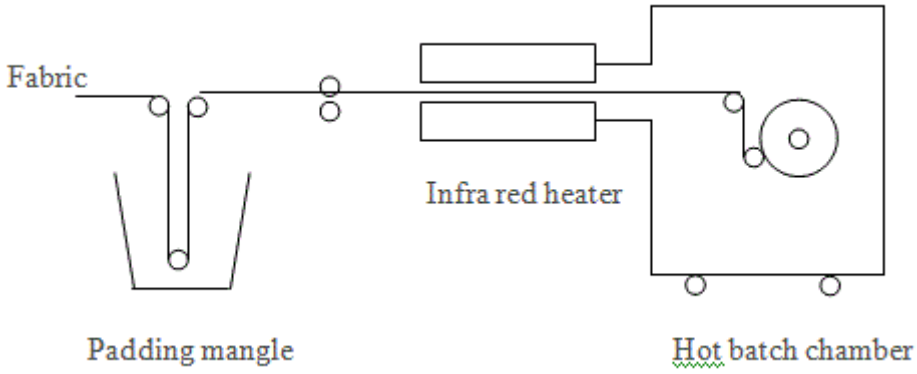


Figure: Pad batch (hot) process

Steps:

1. The fabric is first padded in a padding mangle with reactive dye in presence of an alkali.
2. The fabric is then passed in between infrared heater to preheat the padded fabric to 500C to 900C.
3. The fabric is then batched on a large diameter roller in a hot chamber. The batching is done under controlled conditions of temperature and humidity for a sufficient time to ensure diffusion and fixation of the dye in the fibre. During this period the batch is kept slowly rotating to avoid the seepage of dye liquor.
4. The cloth is then washed in a rope washing machine to remove the unfixed dyes.

Pad Batch Dyeing Machine

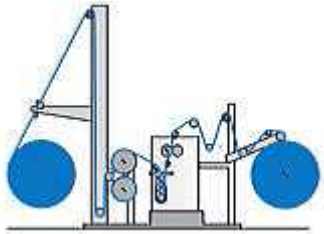
Pad batch dyeing machine is the easiest process of woven fabric dyeing. In cold pad batch dyeing machine both dye & chemicals are added in the same bath. The ratio of dye & chemical is 2:1. If 1000 liter liquor is to be prepared than 100% will be dye & 50% will be chemical. After mercerizing batcher is feed into the inlet of CPB machine. Where the fabric is passed over some free roller & guider. Here there is a compensator to control fabric open width entry & controlling fabric speed.

Application of Pad Machine

- Flexible dyeing of short slots.
- Even coloration.
- Maximum dyestuff yield.
- Fast slot &color change.

- Minimum rest liquor.
- Reproducibility of shade.

Sketch Diagram of Cold Pad Batch Dyeing Machine

 Sketch Diagram

Process Description with Pad Machine

Chemical Tank: Both chemical & color is prepared in different tank according to required. For example we need 1000 liter liquor then we will prepare 100% dye solution & 50% chemical. Then both of them are mixed & agitated in storage tank from which it is feed in to padding bath.
A typical recipe for 128×56/16×10 twill:

Nova Yellow NP – 10.5 gm/lt
Nova Blue CR – 5.00 gm/lt
Nova Red CD – 2.00 gm/lt

1. Soda Ash -15 gm/lt
2. Caustic -5 gm/lt
3. Albaflow pad (wetting)-2 gm/lt

Padding Unit: Here chemical comes from storage tank to maintain even range on padding tank. Here three bowl padding is occurred. Padding pressure is predetermined according to pick up required & fabric speed.


Pad Unit

Batching: After padding fabric is directly rolled in to batcher& packed with poly bag. Then it goes for rotation of 8 – 12 hours for color fixing.


Batching

Washing: Finally the fabric washing, soaping, neutralizing & drying is occurred.

Testing required during Cold pad batch operation

- Pick up testing,
- Shade matching.

Pick up testing: Before going to Pad steam pick up of the fabric should be calculated & based on this result liquor is prepared.

Shade matching: After each 1000 meter sample is cut then it is packed with poly bag.

Then it goes to carbolite for drying. After that wash & soaping is done. Finally drying then shade is checked in light box.

Solution of Dyeing Fault

Different types of fault can arise during dyeing which can be solved by the following process:

1. Tropping
2. Stripping

Tropping: In dyeing process firstly the color is matched in lab in it comes to production.
During production at first a sample is run. If it match then goes for production. But still few problems arise after few meters due to uneven picking shade is varied from original one. It becomes lighter or darker. Some times more reddish or greenish. This type of problem is solved by tropping.If the shade is lighter then addition is done & darker dilution can be done. But during tropping the ratio of dye & chemical is 1:4. A typical Recipe of tropping:

128×56/16×10 twill fabrics dyed in CPB. 15% light.

Nova yellow NP:0.5 gm/lt

Nova red CP: 0.5 gm/lt

Soda Ash -15 gm/lt

1. Caustic -5 gm/lt
2. Albaflow pad (wetting)-2 gm/lt

Stripping: If the shade is widely varied from the original one then the fabric goes through stripping. It is the process by which the color of dyed fabric is removed & makes it white for redyeing. The fabric strength become lower for that additional hard finish is required. Another problem is a stripe fabric can only dyed in dark shade, light shade is not possible.
Typical recipe of stripping: 128×56/16×10 twill reactive dyed

1. Caustic: 20 gm/lt
2. Hydrise:30 gm/lt

This recipe is not constant. It varies continuously based on color & quality of stripe required.

For more information please visit: https://autogarment.com/cold-pad-batch-dyeing-machine/

Videos:

	CPB(Cold pad batch)Dyeing the latest technology alternative of exhaust dyeing https://www.youtube.com/watch?v=hCR5mEIDOAI Duration: 00:01:19
	Batch Dyeing Procedure (Process of batch dyeing) https://www.youtube.com/watch?v=z1GBNyKGVqU Duration: 00:01:24
	Pad dyeing machine V2 https://www.youtube.com/watch?v=S-4Ii9piCNE Duration: 00:03:05

TEXTILE WET PROCESSING

Module-9

LEARNER GUIDE

National Vocational Certificate Level 2

Version 1 - November, 2019

Module 9: 0723001094 Perform Pad Thermosol Dyeing

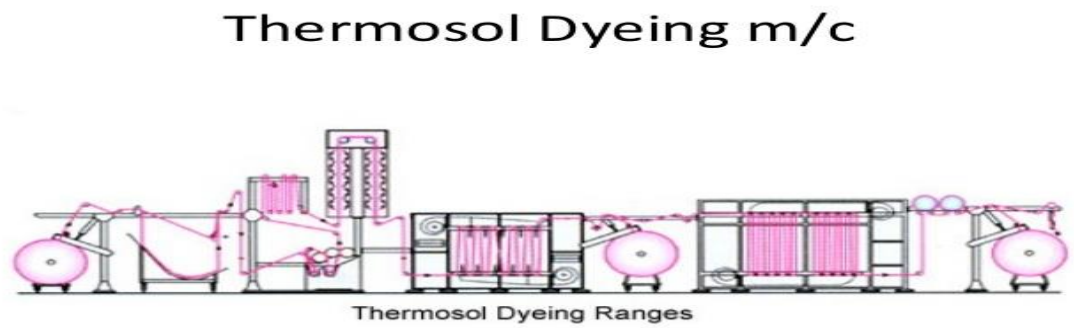
Objective of the module: This competency standard covers the skills and knowledge required to perform dyeing process by operating Thermosol dyeing machine for production of dyed substrate according to required parameters.

Duration: 100 hours **Theory:** 20 hours **Practical:**

Learning Unit	Learning Outcomes	Learning Elements	Materials Required
LU1. Prepare workstation for Pad Thermosol dyeing	**The trainee will be able to:** Interpret program sheet for operating pad thermosol dyeing machine. Clean and clear pad thermosol dyeing machine as per check list. Arrange material for dyeing process as per program sheet. . Check and verify material and parameters according to program sheet.	Importance of program sheet before the start of dyeing process on machine at dyeing floor with understanding the all parameters given in the program sheet. Cleaning of machine according to standards for operating the pad thermosol dyeing machine. Advantages for proper machine cleaning. Arranging materials required for dyeing on pad thermosol dyeing machine such as water, dyes, chemicals and auxiliaries according to program sheet. Checking of material required for dyeing and verifying parameters of dyeing like dye weight, chemical pH, pick up, temperature, weight and length of fabric etc.	Pad Thermosol dyeing machine Over lock machine Scissor Iron Fabric drying oven Mug PPEs Batcher (A-frame) Textile Trolleys Thermal boiler Compressor Jack Masking Brown tape Weighing balance Water Reactive dyes Fabric Woven (PC/100%polyester)
LU2. **Operate Pad Thermosol dyeing machine for fabric dyeing**	**The trainee will be able to:** Follow safety precautions as per job requirement. Apply Threading of feeding cloth as per requirement. Stitch RFD (ready for dyeing / development) fabric with feeding	Knowledge of safety precautions used for handling the chemicals and operating pad thermosol dyeing machine such as gloves, goggles, shoes, mask, apron, safety cap as per OH&S standards. Knowledge of process and techniques for fabric loading to the pad thermosol machine and related instruments for loading the fabric and maintain speed while loading and unloading the fabric.	Plastic beaker Pigments Vat dyes Disperse dyes Measuring cylinder Glass beaker Buckets Glass rod Urea

	cloth on pad thermosol machine for dyeing as per program sheet. Set machine parameters as per dyeing process requirement / program sheet. Run pad thermosol dyeing machine to start the dyeing process as per program sheet. Maintain quality parameters during process according to program sheet / protocol. Clean workstation after closing the job.	Setting of pad thermosol dyeing machine parameters like setting of temperature, water level, pick up settings according to recipe. Operational knowledge of pad thermosol dyeing machine for dyeing the product with required parameters like speed, capacity, working principle, temperature control, productivity, water etc. Ensuring the quality parameters during dyeing process time to time like shade, temperature, pick up, pH etc. Importance and techniques used for wash-off and Neutralization of dyed fabric. Importance and advantages of cleaning the pad thermosol dyeing machine while loading & unloading the fabric and after closing the job for starting the new job. Removing regularly accumulated dust and dirt from the machine.	Salt Wetting agents Leveling agents Sequestering agents Dispersing agents Anti foam agents Anti migrant agents Sodium Carbonate Sodium bicarbonate Acetic Acid
LU3. Maintain Production Register for Pad Thermosol dyeing machine.	**The trainee will be able to:** Record lot-wise production on production register as per given format. Record running and stoppage time on production register as per given format. . Contact with supervisor for verification of production as per given format.	Importance of recording of machine and dyeing parameters like temperature variation, time consumption, fault detection, parts positions, chemicals and auxiliaries adding time during dyeing process etc on production register Advantages of recording the running and stoppage time of machine for calculating machine and operator's efficiency on production register. Communicating with supervisor for verification of parameters recorded in the production register and identifying the problems occurring (if any) during dyeing process.	Production Register Pen

Images of Pad Thermosol dyeing:



Thermosol Dyeing Machine

Thermosol dyeing machine helps to improve production capacity. It does not required rotation after padding. It must feed on pad steam for fixation just after dyeing which gives finished product. It is a dyeing machine but it cannot produce the color as finally required or permanent. But in PDC process it can provide finished product. By this machine only color is migrated from liquor to fabric. Then it is dried on pre dryer & followed by hot air flow drying in thermosol unit. After this process color is developed in pad steam by chemical padding.

Flow chart of Thermosol Dyeing Machine

Fabric inlet
↓
J- Box
↓
Dye Padding
↓
VTGR (Airing Zone)
↓
IR Dryer-1 + 2
↓

Drying Unit

↓

Curing

↓

Cooling Cylinder

↓

J- Box

↓

Fabric Outlet

Sections of Thermosol Dyeing Machine

Thermosol Dyeing Machine – Fabric inlet section: After mercerizing batcher is feed into the inlet of thermosol machine. Where the fabric is passed over some free roller, parpet roller & platter. Here there is a compensator to control fabric open width entry & controlling fabric speed.


Fabric inlet section

Thermosol Dyeing Machine – Cooling roller: If the fabric comes in thermosol just after mercerizing, the fabric remains hot. When it will feed on thermosol machine it can increase temperature of chemical bath. So cooling roller is essential

 Cooling roller

Thermosol Dyeing Machine – Chemical Mixing tank: In thermosol machine only dye stuff & wetting agent & migrating agent is used. Dyes are dissolved separately from wetting & migrating agent then all are forced to chemical storage tank as required & agitated for proper mixing.

 Chemical Mixing tank

A typical recipes for thermosol process		
Recipe for Reactive Dye: Fabric construction:- 108 X 52 / 45 X 34/2 Nova yellow CRG = 0.76 gm/l Nova Red C- 2 BL= 0.72 gm/l Nova Blue CR = 0.53 gm/l Primasol-v = 10 gm/l Primasol-NF = 2 gm/l Urea = 50 gm/l Soda ash = 10 gm/l Fabric Speed – 5o m/min Temperature – 120 -130°C	**Recipe for Disperse Dye:** Fabric construction:- 133 x 60 / 20X 16 Nova yellow S3R = 4.80 g/l Nova red S3R = 5.90 gm/l Nova navy SG = 14.40 gm/l Soda ash = 15 gm/l Urea = 100 gm/l Primasol-v = 10 gm/l Primasol-NF = 2 gm/l	**A typical recipe of W/W dye:** Padder pressure = 3 bar Speed = 3m/min Steaming = 1.5 min Nova yellow NC = 5.84 gm/l Nova brown NC = 2.04 gm/l Nova blue CD = 2.9 gm/l R.salt = 3 gm/l Glubar salt = 10 gm/l Soda ash = 10 gm/l Wetting agent = 2 gm/l

Thermosol Dyeing Machine – Dye Padding Unit: Here chemical comes from storage tank to maintain even range on padding tank. Here three bowl padding is occurred. During padding the most common problem of dyeing “listing problem” can be solved by adjusting pressure on left, right & middle of padder. The layer of dyes keeps up to 50 liter & automatically dyes is come to dye bath.


Dye Padding Unit

Thermosol Dyeing Machine – VTGR (Airing zone): After dye padding before enter in to IR dryer unit, the fabric is passed through airing zone. Where fabric is conditioned by open air.

 VTGR (Airing zone)

IR dryer: After airing zone fabric pass over some free roller then enter in IR dryer. It is called pre dryer. Here temperature is around 650-750’C.it can differ based on fabric speed & type of fabric is processing. In thermosol there are two IR unit & each contain two heating zone (flamer). Here fabric is dried up to 40%.
M/C Name: Maxon

Inlet pressure: 80 bar

Heat input: 483 kw

Type of gas: Natural gas

Hot air flow drying unit: Fabric comes to this unit after pre-drying. Here there are three unit of heating. Each contains two heaters (gas type) & two blowers. Temperature is taken is around 80-150’C. If this flamer & blower are not work properly it will create listing problem. Here there are few additional options like humidity control unit & cleaning unit. When pad dry cure is performed in thermosol then humidity must be controlled. If it can control, no need to use urea. Fabric contains different types of dust so when hot water is blown it can make problem in heater & blower. So there is a screen unit so that dust cannot goes in blower or heater. Smaller particles can be taken out trough duct & release to environment. Here 30-35 meter fabric is remain.
Curing chamber: After drying the fabric is passed through curing chamber. Here the fabric is heated from 150-170’C in case of reactive & in case of disperse 200-210’C. In this chamber there are four layer of roller. And in this roller 80-85 meter fabric is remain for proper heating & fixing the color of fabric.
Cooling roller: After hot air flow drying fabric require a cooling. So fabric is passed over the cooling roller. It is a stainless steel roller through which cold water is passed. There are two cooling roller.

Thermosol Dyeing Machine – J-Box: It is a space for keeping fabric. When the batch is completed, it is needed to change & another empty batch roller is to be settled. Due to continuous dyeing process it is not possible to stop the m/c. So during changing batch roller the fabric is stored in J-BOX. And when new empty batch roller is settled, then the fabric is started to batching.


J-Box

Thermosol Dyeing Machine – Fabric outlet: Finally fabric is passed over batching roller & batched on batching roller. Then it becomes ready to feed in pad steam in chemical padding.


Fabric outlet

Thermosol Dyeing Machine – Control Panel: From control panel all types of instruction can be provide to the machinery. This machine has a full manual control panel. The operator controls every process by control switch.


Control Panel

Testing required during Thermosol operation:

1. Pick up testing
2. Shade listing identification.

Pick up testing: Before going to thermo soling pick up of the fabric should be calculated & based on this result liquor is prepared.

Thermosol Dyeing Machine – Shade listing identification: After each 1000 meter shade is tested in light box. Here listing problem is visualized & can be solved by increasing or decreasing left, centre or right Padder pressure. Suppose in left color is lighter then lower the pressure of left side.

Shade listing identification

Source: https://autogarment.com/thermosol-dyeing-machine/

Videos:

	Dhall Thermosol Dyeing Pad Dry Range at Saygindima Textile https://www.youtube.com/watch?v=QPifu2oQ_vM Duration: 00:00:57
	Dhall Continuous Dyeing & Thermosol Range at Mahavir Spinfab Kanpur https://www.youtube.com/watch?v=iFGn1P53kFE Duration: 00:06:06
	Thermosol Dyeing Machine | The Continuous Dyeing Process https://www.youtube.com/watch?v=kAsbX9cRnv8 Duration: 00:02:56

TEXTILE WET PROCESSING

Module-10

LEARNER GUIDE

National Vocational Certificate Level 2

Version 1 - November, 2019

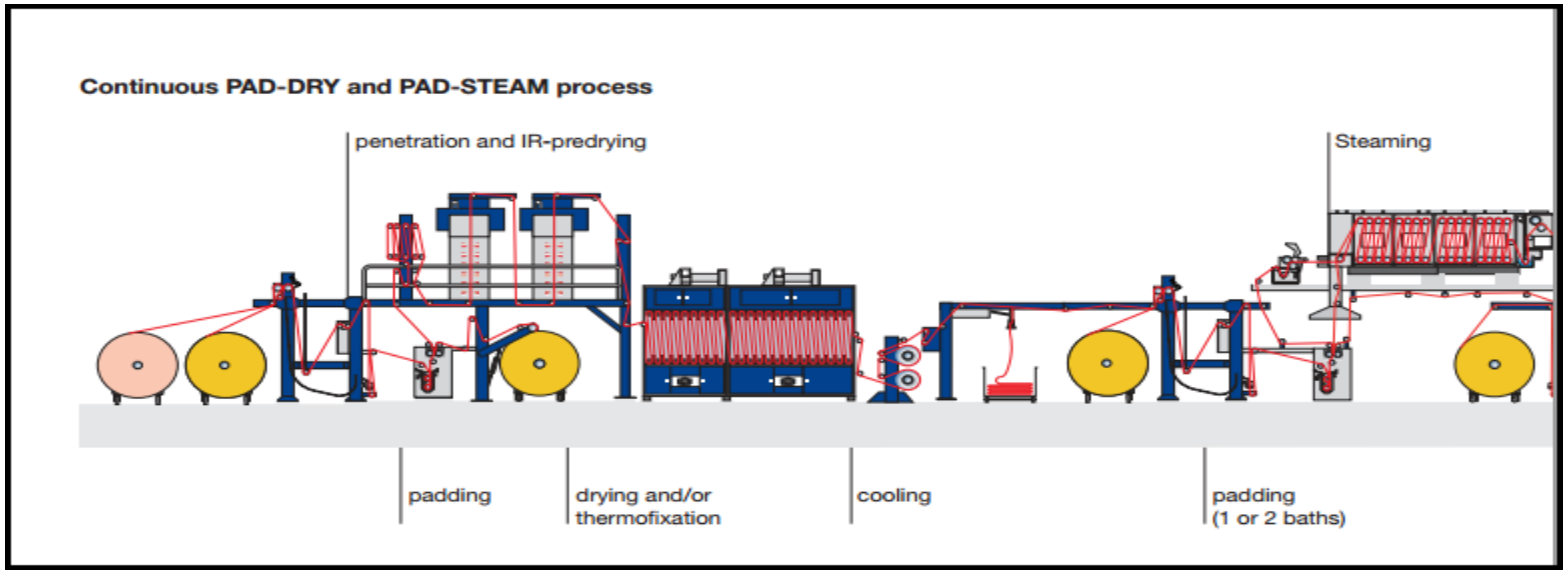
Module 10: 0723001095 Perform Pad steam dyeing

Objective of the module: This competency standard covers the skills and knowledge required to perform dyeing process by operating Pad steam dyeing machine for production of dyed substrate according to required parameters.

Duration: 50 hours **Theory:** 10 hours **Practical:** 40 hours

Learning Unit	Learning Outcomes	Learning Elements	Materials Required
LU1. **Prepare workstation for Pad steam dyeing**	**The trainee will be able to:** Interpret program sheet for operating Pad steam dyeing machine. Clean and clear Pad steam dyeing machine as per check list. Arrange material for dyeing process as per program sheet. . Check and verify material and parameters according to program sheet.	Importance of program sheet before the start of dyeing process on machine at dyeing floor with understanding the all parameters given in the program sheet. Cleaning of machine according to standards for operating the pad steam dyeing machine. Advantages for proper machine cleaning. Arranging materials required for dyeing on pad steam dyeing machine such as water, dyes, chemicals and auxiliaries according to program sheet. Checking of material required for dyeing and verifying parameters of dyeing like dye weight, chemical pH, pick up, temperature, weight and length of fabric etc.	Pad Steam dyeing machine Over lock machine Scissor Mug Mini Boiler PPEs Batcher (A-frame) Compressor Jack Natural Gas Weighing balance Water Textile Trolley Reactive dyes Sulphur dyes Vat dyes Fabric Cotton
LU2. Operate Pad steam dyeing machine for fabric dyeing	**The trainee will be able to:** Follow safety precautions as per job requirement. Apply Threading of feeding cloth as per requirement. Stitch RFD (ready for dyeing / development) fabric with feeding cloth on pad steam dyeing machine	Knowledge of safety precautions used for handling the chemicals and operating pad steam dyeing machine such as gloves, goggles, shoes, mask, apron, safety cap as per OH&S standards. Knowledge of process and techniques for fabric loading to the pad steam machine and related instruments for loading the fabric and maintain speed while loading and unloading the fabric. Setting of pad steam dyeing machine parameters like	Plastic beaker Measuring cylinder Glass beaker Buckets Glass rod

	for dyeing as per program sheet. Set machine parameters as per dyeing process requirement / program sheet. Run pad steam dyeing machine to start the dyeing process as per program sheet. Maintain quality parameters during process according to program sheet / protocol. Wash-off & Neutralize dyed fabric as per program sheet. Clean workstation after closing the job.	setting of temperature, steam, water level, pick up settings according to recipe. Operational knowledge of pad steam dyeing machine for dyeing the product with required parameters like speed, capacity, working principle, temperature control, productivity, water etc. Ensuring the quality parameters during dyeing process time to time like shade, temperature, pick up, pH etc. Importance and techniques used for wash-off and Neutralization of dyed fabric. Importance and advantages of cleaning the pad steam dyeing machine while loading & unloading the fabric and after closing the job for starting the new job. Removing regularly accumulated dust and dirt from the machine.	Salt Wetting agents Leveling agents Sequestering agents Washing off agents Anti foam agents Sodium hydroxide Acetic acid Sodium carbonate Sodium hydro sulphite Hydrogen peroxide
LU3. Maintain Production Register for Pad Steam dyeing machine.	**The trainee will be able to:** Record lot-wise production on production register as per given format. Record running and stoppage time on production register as per given format. . Contact with supervisor for verification of production as per given format.	Importance of recording of machine and dyeing parameters like temperature variation, time consumption, fault detection, parts positions, chemicals and auxiliaries adding time during dyeing process etc on production register Advantages of recording the running and stoppage time of machine for calculating machine and operator's efficiency on production register. Communicating with supervisor for verification of parameters recorded in the production register and identifying the problems occurring (if any) during dyeing process.	Production Register Pen



Pad steam method:

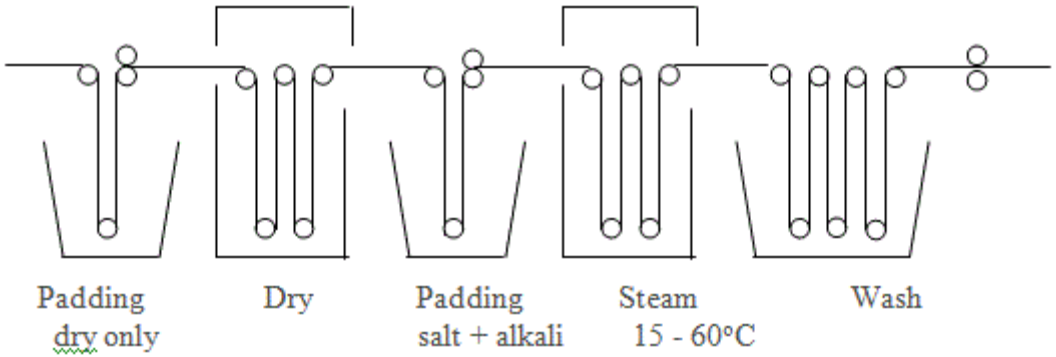


Figure: Pad steam method

Steps:

1. Fabric is first padded in a padder with the dye.
2. It is then passed through between two squeezing roller in a dryer. Drying should be done slowly; otherwise precipitation of dye due to quick removal of water may take place leading to lower color value.
3. After coming out from dryer fabric is padded in a padder containing salt and alkali. Due to salt exhaustion of dye takes place and due to alkali fixation occurs.

4. Fabric then passed through a steamer where it is kept for 15-19 second. Due to high temperature here fixation rate increases.
5. In this step fabric is washed in a washing machine to remove the unfixed dye.

Source: https://textilelearner.blogspot.com/2012/01/different-methods-of-reactive-dye.html

Pad-Steam dyeing is a process of continuous dyeing in which the fabric in open width is padded with dyestuff and is then steamed. Pad steam is an ideal machine for reactive dyeing of cotton and its blended fabrics. Light, pale and medium shades can be dyed in this machine. Continuous roller steamer is used for diffusion of reactive, vat, sulphur and direct dyes into cellulosic fibers in an atmosphere of heat and moisture that is created by saturated steam injected into the steamer.

Purposes of the machine

- It can be used as a pad batch for reactive dyeing in which batch is left for 12-18 hours for the completion of the reaction. For time saving the fabric passes through the steamer for 1 minute and the reaction is completed.
- It can also be used for reduction clearance (RC) in which we treat PC fabric with caustic and sodium hydrosulphide to remove the disperse dye from cotton.
- Stripping of the fabric can also be done on this machine that is, color can be removed completely by adding higher amount of caustic and sodium hydrosulphide.
- It can be used for the development of Vat dyes.
- The dyed fabric can be washed in this machine.

Process that can be done on his machine

- Reactive dyeing
- Pad-batch dyeing
- Reduction Dyeing
- Stripping
- Vat Development/ Vat Dyeing
- Hot and Cold Washing
- Pad Steam
- Wet Chemical Pad

Main Sections of the Machine

Inlet Section

Inlet section consist of Following Parts

- Plaiter/batcher
- Tensioner rollers
- Free guide roller
- Stationary rollers

Padding Section

- Padders use for padding.
- The pressure of the padders is 1.5 - 2 bar.
- Two types of pressure used in Kuster padders, hydraulic and pneumatic.
- The central pressure is hydraulic and side pressure is pneumatic.
- We can adjust the pressure of the padders, to prevent the listing problem.
- Liquor is picked in the fabric; afterwards the excessive liquor is squeezed out by means of padders at predetermined pick-up% set by applying pressure on the padders.

Kuster padder

Uniform squeezing pressure over the entire working width independent of fabric width (no selvedge pressure) No side-to-center shading, due to smooth treatment of the selvedges.

Advantages:

- Uniform liquor application over the whole fabric width.
- Different liquor application in the range of side-center-side zone is possible.
- Attractive price.
- Easily operation
- Reliable and economical padder

Steamer

Here in steamer temperature required for the fixation is given to the fabric. This temperature is achieved by saturated steam. The purpose of using saturated steam is that the chemicals used for developing should not dry on the surface of fabric preventing fabric from stains. Here roof temperature is given to avoid water dropping that causes spotty dyeing. Here water is not given at the entry of steamer because to prevent developing chemicals that just applied before going into steamer so water lock is given at the end of steamer.

Washer

Washing is carried out in order to remove unfixed dyes. After steamer fabric flows from 7 to 8 washers. Most commonly first to four washers are used for washing of salt or chemicals which are being applied in trough of pad steamer. In 5th, 6th washer, oxidation is done if required. If oxidation is not required then soaping is done in 5th, 6th washers. Neutralization is done in 7th washer by using acetic acid. There are 8 chambers counter flow system is used. The chambers are used for number of process a/c to the requirement of dyes by showering of different type of chemicals

Dryers

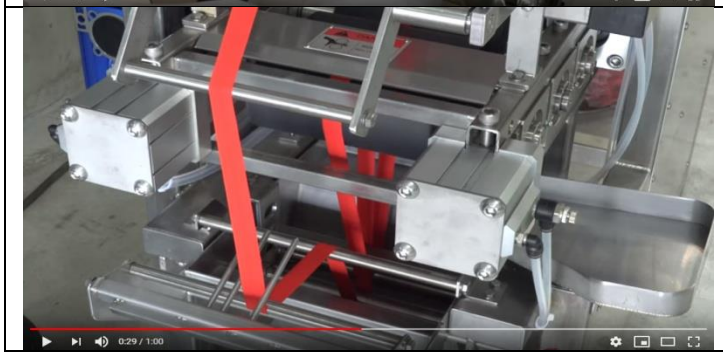
In the last of the pad steam machine, there are three groups of drying cylinder for dry the fabric. Each group has 12 hot cylinders, but last one has 10 hot and 2 cool cylinders. All the cylinders are Teflon coated. Their purpose is to remove water molecules from fabric.

Batcher

The fabric from drying cylinders passes through some tension rolls and also from anti-static rods which absorbs the charge from the fabric. This rod has 5 KV voltages and 1800-18000A of current after passing through this fabric is winded on the batcher.

Source: http://textileinsight.blogspot.com/2014/08/pad-steam-dyeing-machineprocess.html

Videos:

	Lab Pad Steam Range, Pad-Steam Range For Laboratory https://www.youtube.com/watch?v=gGgi9K8tKA4 Duration: 00:19:38
	2019 05 03 Pad Steam Dyeing Machine EL永光染色試驗機 https://www.youtube.com/watch?v=bdB0jZN5lko Duration: 00:01:00

TEXTILE WET PROCESSING

Module-11

LEARNER GUIDE

National Vocational Certificate Level 2

Version 1 - November, 2019

Module 11: 0723001096 Perform Cone Dyeing

Objective of the module: This competency standard covers the skills and knowledge required to perform dyeing process by operating Cone dyeing machine for production of dyed cones / package / yarn according to required parameters.

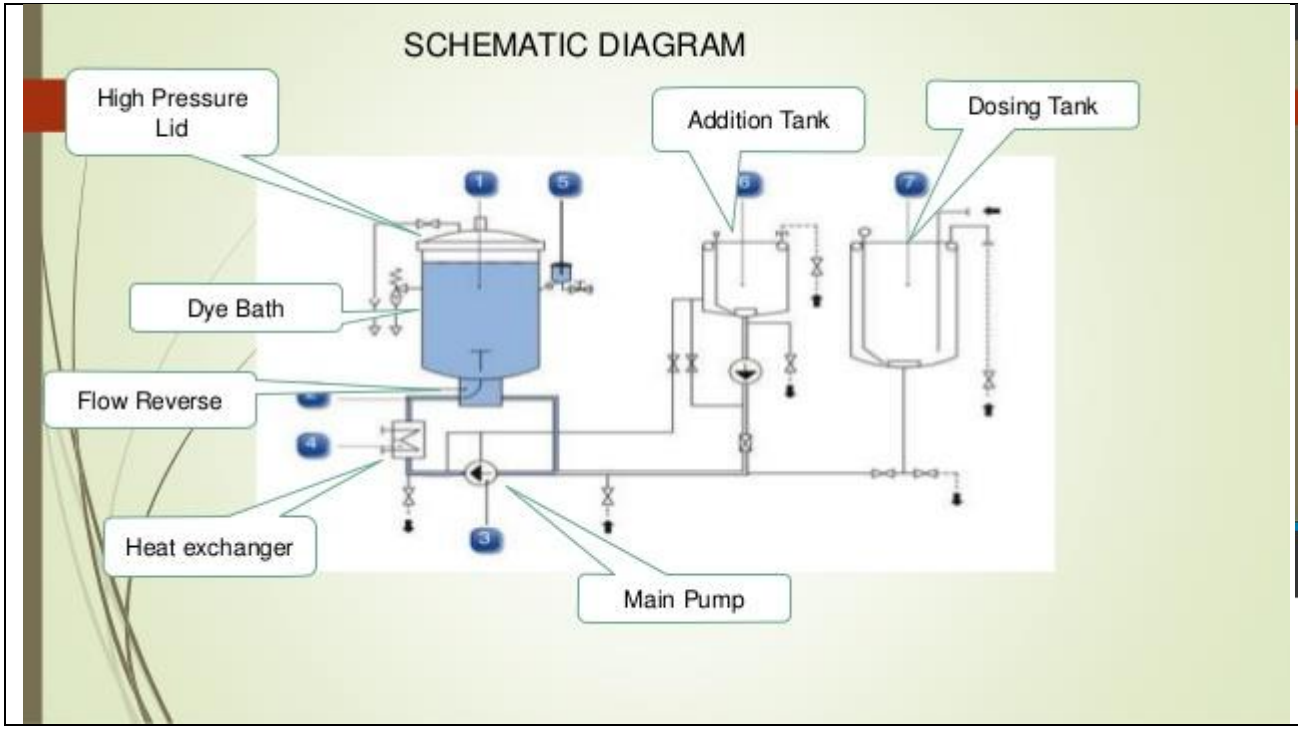
Duration: 80 hours **Theory:** 16 hours **Practical:** 64 hours

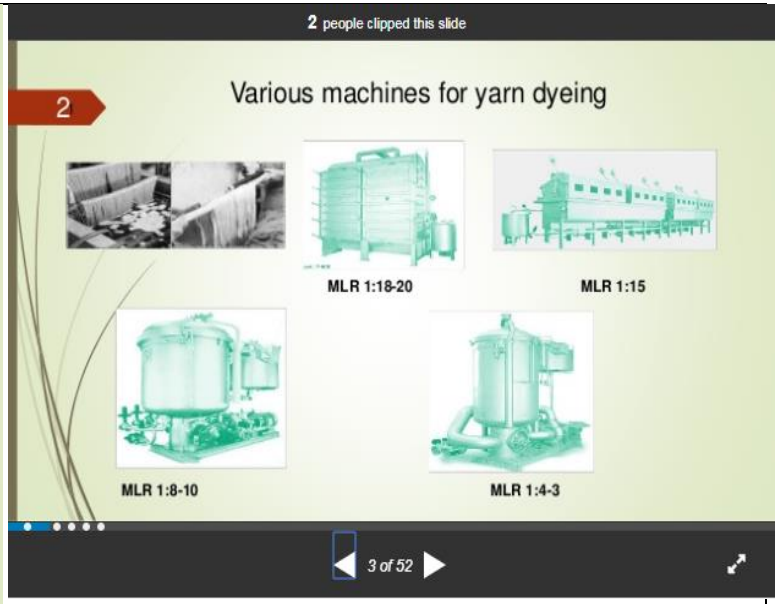
Learning Unit	Learning Outcomes	Learning Elements	Materials Required
LU1. **Prepare workstation for Cone dyeing**	**The trainee will be able to:** Interpret program sheet for operating Cone dyeing machine. Clean and clear Cone dyeing machine as per check list. Arrange material for dyeing process as per program sheet. . Check and verify material and parameters according to program sheet.	Importance of program sheet before the start of dyeing process on machine at dyeing floor with understanding the all parameters given in the program sheet. Cleaning of machine according to standards for operating the cone dyeing machine. Advantages for proper machine cleaning. Arranging materials required for dyeing on cone dyeing machine such as water, dyes, chemicals and auxiliaries according to program sheet. Checking of material required for dyeing and verifying parameters of dyeing like dye weight, chemical pH, liquor ratio, temperature, weight and length of yarn etc.	Cone dyeing machine Scissor Air dryer Mug Mini Boiler PPEs Compressor Natural Gas Weighing balance Water Cone Carrier Direct Dyes Reactive dyes Disperse dyes Vat dyes Cotton Cones
LU2. Operate Cone dyeing machine for yarn dyeing	**The trainee will be able to:** Follow safety precautions as per job requirement. Load RFD (ready for dyeing / development) cones / package on Cone dyeing machine for dyeing as per program sheet. Set machine parameters as per dyeing process requirement / program sheet.	Knowledge of safety precautions used for handling the chemicals and operating jet dyeing machine such as gloves, goggles, shoes, mask, apron, safety cap as per OH&S standards. Knowledge of process and techniques for fabric loading to the cone machine and related instruments for loading the cones and maintain speed while loading and unloading the fabric. Settings of cone dyeing machine parameters like setting of temperature, water level, liquor ratio according to	Plastic beaker Measuring cylinder Glass beaker Buckets Glass rod Salt Wetting agents

	Run Cone dyeing machine to start the dyeing process as per program sheet. Maintain quality parameters during process according to program sheet / protocol. Wash-off & Neutralize dyed fabric as per program sheet. Unload Cones for next process after completion the job. Clean workstation after closing the job.	recipe. Operational knowledge of cone dyeing machine for dyeing the product with required parameters like speed, capacity, working principle, temperature control, productivity, water etc. Ensuring the quality parameters during dyeing process time to time like shade, temperature, pick up, pH etc. Importance and techniques used for wash-off and Neutralization of dyed fabric. Importance and advantages of cleaning the cone dyeing machine while loading & unloading the yarn and after closing the job for starting the new job. Removing regularly accumulated dust and dirt from the machine.	Leveling agents Sequestering agents Washing off agents Anti foam agents Sodium hydroxide Acetic acid Sodium carbonate Fixing agents
LU3. Maintain Production Register for Cone dyeing machine.	**The trainee will be able to:** Record lot-wise production on production register as per given format. Record running and stoppage time on production register as per given format. . Contact with supervisor for verification of production as per given format.	Importance of recording of machine and dyeing parameters like temperature variation, time consumption, fault detection, parts positions, chemicals and auxiliaries adding time during dyeing process etc on production register Advantages of recording the running and stoppage time of machine for calculating machine and operator's efficiency on production register. Communicating with supervisor for verification of parameters recorded in the production register and identifying the problems occurring (if any) during dyeing process.	Production Register Pen

Images of Cone dyeing machine:

Liquor ratio is most important feature of package dyeing typically machines with MLR from 1:4 to 1:10 are commonly used however it is always preferred a machine with lowest possible liquor ratio, without affecting the quality of dyeing.





Presentation on yarn dyeing at: https://www.slideshare.net/OmkarSParmaj/omkar-parmaj-yarn-dyeing-presentation-final

Package dyeing machines are the most widely used now a days for dyeing of almost all type of yarns, due to economical, automatic and accurate dyeing results. The term package dyeing usually denotes for dyeing of any type yarn wound on the compressible dye springs/perforated solid dyeing tubes or cones. Yarn dyeing in package form is done at high temperature and under high pressure, with the packages mounted on hollow spindles .These spindles are fixed on the dyeing carriers, which is inserted into the dyeing vessel after closing the lid of the machine, the dyeing liquor is forced through the packages in two way pattern (inside to out and outside to in) and goes on circulating throughout the vessel and yarn. Heat is applied to the dye liquor to achieve the dyeing temperature, time –temperature and flow reversal are controlled through a programmer.

A series of technical developments in the recent years has resulted into package dyeing being developed into a highly sophisticated as well as an economic process. Latest design Package Dyeing machines are amenable to accurate control and automation. These features would likely to lead to increases in the application of package dyeing.

The term package dyeing usually denotes for dyeing of yarn that has been wound on perforated cones. This helps in forcing the dye liquor through the package. With the start of dyeing cycle, the dye liquor goes on circulating throughout the vessel and tank. This happens till all the dye is used up or fully

exhausted. The dye flows through to the yarn package with the help of the deliberate perforations in the tube package. Once full exhaustion is brought about, the carrier of coloured yarn is consequently removed from the vessel. A large centrifuge removes excess water from the packages. Finally the yarn is dried using an infra red drying oven. The image shows the process working of a Package dyeing machine.

Working Process of Package Dyeing Machine

The material to be dyed is wound on the dye springs, perforated plastic cheeses or steel cones and loaded in the carrier spindles, which are compressed and bolted at the top to make a uniform and homogeneous dyeing column. The liquor containing dyes chemical and auxiliaries is forced through with the help of pump, and circulated through the material from inside –out and is reversed periodically so that each and every part of the material get the same and uniform treatment. The dyeing cycle is controlled through a micro computer and different chemicals may be added through the injector pump or color kitchen at any stage of dyeing.

In case of fully flooded machines, the liquor expands with the rise in temperature (approximately 5% volume increases from 30-130 degree centigrade temperature) is taken back in the expansion tank through a back cooler. This extra water is then again injected to the dyeing vessel through an injector pump. Expanded volume of the dye liquor is thus remains in continuous circulation in the system.

Any type of addition can be done to the machine through the injector pump, the quantity and time of injection can be controlled through the programmer.

In case of air pad machines ,the air above the liquor acts as a cushion ,which is compressed with the increase in liquor volume, the pressure is controlled by pre set pressure control valve .In air pad machines have an advantage ,that entire dye liquor participate in dyeing and dye exhaustion is perfect. In case some addition has to be done in air pad machines, if the machine temperature is less than 80 degrees, the liquor is taken back by back transfer valve to addition tank, and injected back to machine vessel. If the machine temperature is above 80 Degree then cooling has to be done to bring down the machine temperature.

Air pad technology is possible in all types of machines such as vertical kier, horizontal kier and tubular dyeing machines. The material after dyeing is washed and finished properly in the same machine and taken out hydro extracted or pressure extracted in the same machine and dried subsequently.

Advantages of Package dyeing machine

Package dyeing methodologies have been subjected to intensive research and development. As a result package dyeing machine has evolved into a very sophisticated apparatus. It offers a number of advantages.

- Considerable reduction in yarn handling.
- Compatible to automatic control, in the process leading to reproducible dyeing.
- Open to large batches.
- High temperature dyeing a possibility.
- Low liquor ratios, giving savings in water, effluent and energy.

- Uniform and High rates of liquor circulation, that leads to level application of dyes. Machinery totally enclosed resulting in good working conditions at the dye-house.

Source: https://textilelearner.blogspot.com/2012/01/package-dyeing-machine-working-process.html

Videos:

	yarn dyeing machine working https://www.youtube.com/watch?v=ZZGsuhM2Gsc Duration: 00:51:28
	Fully Automatic Dyeing Process for Yarn Dyeing (Processing Advancements) https://www.youtube.com/watch?v=-tpzEywfhHc&t=36s Duration: 00:03:55
	染紗出入缸 (Cone dye process) https://www.youtube.com/watch?v=5KAdIXqEE6I Duration: 00:02:27

TEXTILE WET PROCESSING

Module-12
LEARNER GUIDE
National Vocational Certificate Level 2

Version 1 - November, 2019

Module 12: 0723001097 Perform Rope Dyeing (Denim)

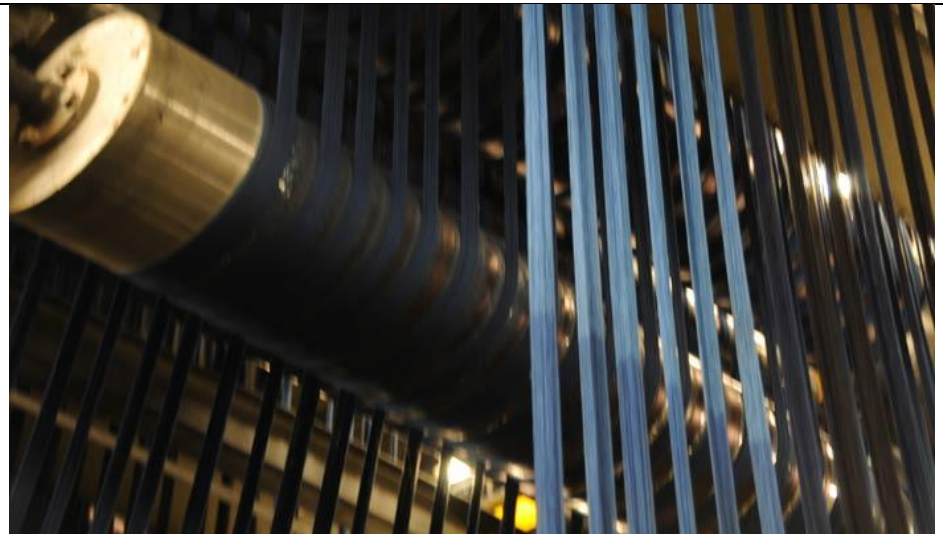
Objective of the module: This competency standard covers the skills and knowledge required to perform dyeing process by operating rope dyeing machine for production of dyed rope according to required parameters.

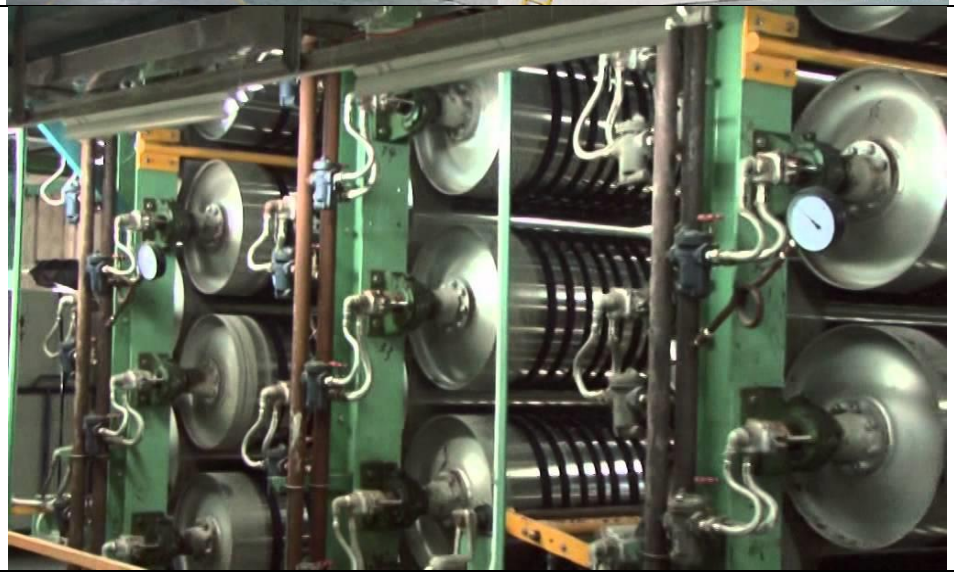
Duration: 80 hours **Theory:** 16 hours **Practical:** 64 hours

Learning Unit	Learning Outcomes	Learning Elements	Materials Required
LU1. **Prepare workstation for Rope dyeing**	**The trainee will be able to:** Interpret program sheet for operating rope dyeing machine. (sheet dyeing) Clean and clear rope dyeing machine as per check list. Arrange material for dyeing process as per program sheet. . Check and verify material and parameters according to program sheet.	Importance of program sheet before the start of dyeing process on machine at dyeing floor with understanding the all parameters given in the program sheet. Cleaning of machine according to standards for operating the rope dyeing machine. Advantages for proper machine cleaning. Arranging materials required for dyeing on rope dyeing machine such as water, dyes, chemicals and auxiliaries according to program sheet. Checking of material required for dyeing and verifying parameters of dyeing like dye weight, chemical pH, liquor ratio, temperature, weight and length of rope etc.	Rope dyeing machine Scissor Air dryer Mug Mini Boiler PPEs Compressor Natural Gas Weighing balance Water Textile trolleys Indigo dyes Sulphur dyes Cotton yarn
LU2. Operate Rope dyeing machine for rope dyeing	**The trainee will be able to:** Follow safety precautions as per job requirement. Apply Threading of feeding cloth as per requirement. Stitch RFD (ready for dyeing / development) ropes with feeding cloth on rope dyeing machine for dyeing as per program sheet. Set machine parameters as per dyeing process requirement /	Knowledge of safety precautions used for handling the chemicals and operating rope dyeing machine such as gloves, goggles, shoes, mask, apron, safety cap as per OH&S standards. Knowledge of process and techniques for rope loading to the rope machine and related instruments for loading the fabric and maintain speed while loading and unloading the ropes. Setting of rope dyeing machine parameters like setting of temperature, water level, liquor ratio according to recipe. Operational knowledge of rope dyeing machine for	Plastic beaker Measuring cylinder Glass beaker Buckets Glass rod Sodium hydro sulphite Hydrogen peroxide Salt

	program sheet. Run rope dyeing machine to start the dyeing process as per program sheet. Maintain quality parameters during process according to program sheet / protocol. Wash-off & Neutralize dyed fabric as per program sheet. Clean workstation after closing the job.	dyeing the product with required parameters like speed, capacity, working principle, temperature control, productivity, water etc. Ensuring the quality parameters during dyeing process time to time like shade, temperature, liquor ratio, pH etc. Importance and techniques used for wash-off and Neutralization of dyed fabric. Importance and advantages of cleaning the rope dyeing machine while loading & unloading the rope and after closing the job for starting the new job. Removing regularly accumulated dust and dirt from the machine.	Sodium sulphite Wetting agents Leveling agents Sequestering agents Washing off agents Anti foam agents Sodium hydroxide Acetic acid
LU3. Maintain Production Register for Rope dyeing machine.	**The trainee will be able to:** Record lot-wise production on production register as per given format. Record running and stoppage time on production register as per given format. . Contact with supervisor for verification of production as per given format.	Importance of recording of machine and dyeing parameters like temperature variation, time consumption, fault detection, parts positions, chemicals and auxiliaries adding time during dyeing process etc on production register Advantages of recording the running and stoppage time of machine for calculating machine and operator's efficiency on production register. Communicating with supervisor for verification of parameters recorded in the production register and identifying the problems occurring (if any) during dyeing process.	Production Register Pen

Images of rope dyeing:





Rope Dyeing

What does *Rope Dyeing* mean?

Believed to be the best possible indigo dyeing method for yarn, the threads of denim yarn are initially twisted into a rope, then undergo a repetitive sequence of dipping and oxidization. The more frequent the dipping and oxidizing, the stronger the indigo shade.

Heddels explains *Rope Dyeing*

Rope dyeing consists of twisting the yarns into a rope that is then quickly dipped into indigo baths. It is considered the best method for dyeing denim as the short dyeing time does not allow the indigo to fully penetrate the fibers, thus creating ring-dyed yarn that fades better and faster than fully dyed yarn.

Rope Dyeing Machine

Rope Dyeing Machine forms an essential process in the denim plant. It works on the principle of the form of rope (from the ball warping m/c). In MIL, generally 32ropes are simultaneously fed to the rope dyeing machine through various guides and tensioning arrangement at the creel zone to introduce firstly into the scouring box. The level of this bath is controlled by a leveler which on lowering up to a certain level (manually present) along with liquid level opens a value for addition of the caustic liquor from the main tank. Then come the two wash boxes, hot wash box followed by the cold one.

The ropes now ready to dye enters the first dye bath. There are eight dye baths and number of them employed depends according to the type of dye to be done .The addition of dye liquor and other aux are carried out through different metering pumps like DYSTAR .The liquors circulated between the employed dyes baths to another circulated pumps, as they are inter connected .Formula use for estimating the feeding rate:

Feeding (lt/min)=(total no.of ends *machine speed*shade%)

(Count *length of yarn)

After coming out of the each dye box yarns are padded, the pressure being highest at the first and last dye box, which is 55psi and the intermediate 40-50psi.The ropes pass after padding around a no. of sky roller to provide adequate time of oxidation. After this the ropes passes through the five wash box, where hot wash, cold wash and neutralization is carried out.

Sometime softener treatment is also given in one of the wash box .The temperature of the entire wash box is controlled through the control panel by means of thermostat.

Colours Processed In Plant

1. Pure 100% indigo dyed
2. Midnight indigo
3. Deep blue
4. Light blue

5. Sulphur black

Faults Of Lcb

1. Missing end
2. End piecing
3. Weak places
4. Reed cut
5. Weak piecing
6. Knotting
7. Fluff cut for Rope Dyeing Machine

For more information please visit: https://autogarment.com/rope-dyeing-machine/

INDIGO DYEING

1. Indigo is not a perfect vat color. It may be called a trash vat color. The constant of substantively for other colors is 30, for indigo it is only 2.7. So there is a need of 5 to 6 dye baths and make the use of multi-dip and multi-nip facility to increase the penetration.
2. The dyeing is done at room temperature as indigo belongs to Ik class of vat dyes, where dyeing is done at room temperature and oxidation is done by air only and not by chemicals. If oxidizing agents are used, they will cause stripping of colors.
3. Indigo is not soluble in water. So it is reduced with Sodium Hydrosulphide. Then caustic soda is added to make sodium salt of vat colors to make it soluble. To reduce 1 kg of Indigo, 700 gms of sodium hydrosulphide is required. However some extra SHS needs to be taken to avoid some decomposition of SHS.

Practically it is prepared in the following sequence

-Take indigo
-Add caustic
-Then reducing agent

4. When caustic is added to indigo, it is an exothermic reaction. It is allowed to cool down, then before sending it to feeder, sodium hydro-sulphide is added. Reducing agent is not added first as it will be decomposed first, so consumption of it will increase. It is also not advisable to take solubalised vat, as offered by some companies due to the following reasons:

a. If it is used after 6 months, there will be a decomposition of sod. Hydrosulphide. It will become partially soluble. Then to make it soluble again, more SHS has to be added.
b. Transportation is difficult
c. Cost is more

5. Feeding System

Rat of flow of yarn is given by

((No of ropes x no of ends x speed of machine)/ count x 1.693 x 1000)

in kg of yarn / minute
So we can determine the rate of feed of indigo. It is very important that replenishment of indigo is there as any variation will result in the change of shade and also if level is more, there is a problem of over-flow.
6. If total capacity of dye bath for example is 15000 litres, then circulation must be 3 times the volume. If it is less then there are 100% chances of getting a lighter shade.

Difference Between Rope Dyeing and Sheet Dyeing

	Rope Dyeing	Sheet Dyeing
1	In rope dyeing there is an opportunity at rebeaming to repair broken ends	No Such Opportunity
2	More than one slasher sets can be dyed at one time	Only one slasher set may be dyed at one time
3	Possible to mix yarns of different colors- one can get denim stripes at rebeaming	not possible
4	No need to start and stop the machine at each set, so shade matches perfectly	Need to start/ stop the machine. Difficult to achieve the target shade until hundreds of meters of yarn have been run
		when the slasher dyeing machine slows down at the end of each yarn set, the wash down shade will be altered
5	Large number of yarns are difficult to open at rebeaming- not very suitable for lighter weight yarn	Advantageous for lighter weight fabrics >16s
6	No extra ends	Extra ends

For more information: https://www.denimsandjeans.com/denim-fabric-developments/indigo-rope-dyeing-some-important-technical-considerations/804

Videos:

	Ball Warping ,Rope Dyeing in Bangla Ft.Textile Maniaa (বল ওয়ার্পিং, রোপ ডাইং) https://www.youtube.com/watch?v=2vlh8v04I0E Duration: 00:02:53
	Denim Yarn processes- Dyeing https://www.youtube.com/watch?v=qp2Z_pYsRGM Duration: 00:14:35
	Rope Indigo Dyeing Machine (Prism Textile Machinery Pvt. Ltd.) https://www.youtube.com/watch?v=81GPvwzmyEs Duration: 00:02:58

TEXTILE WET PROCESSING

Module-13

LEARNER GUIDE

National Vocational Certificate Level 2

Version 1 - November, 2019

Module 13: 0723001098 Perform Soft flow dyeing

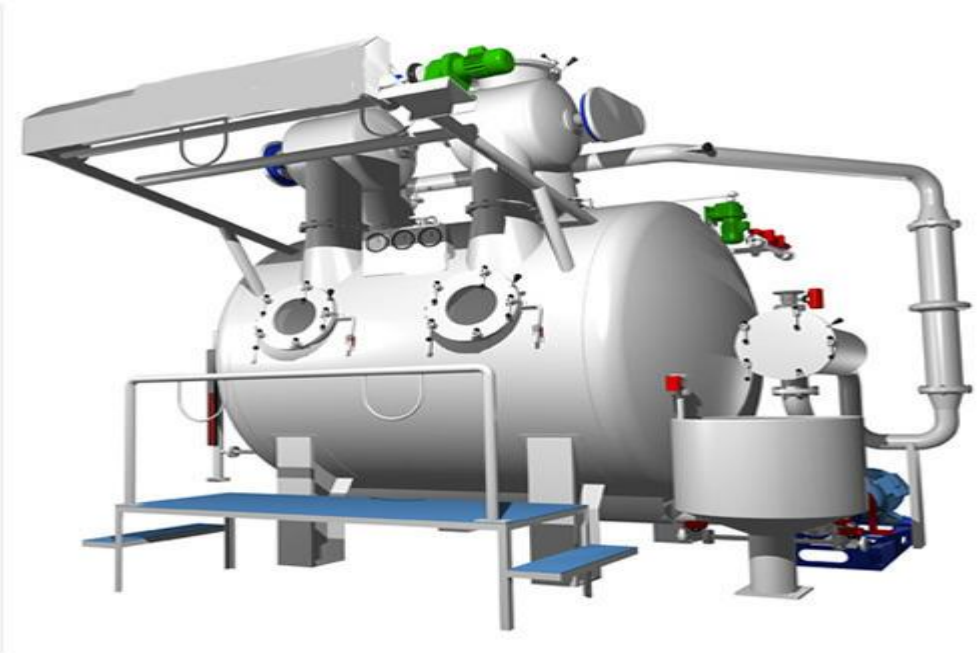
Objective of the module: This competency standard covers the skills and knowledge required to perform dyeing process by operating Soft flow dyeing machine for production of dyed substrate according to required parameters.

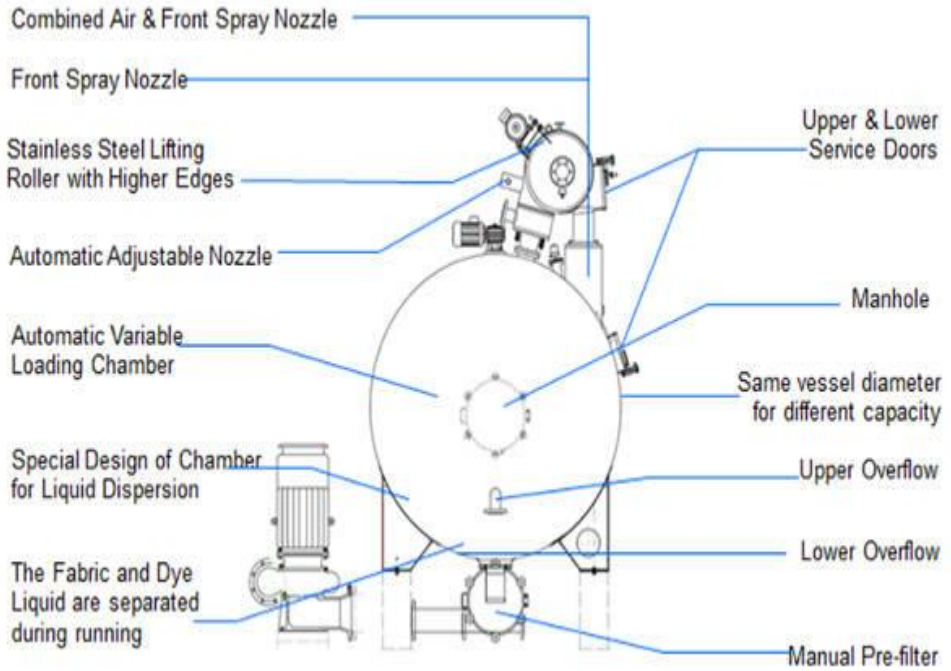
Duration: 60 hours **Theory:** 12 hours **Practical:** 48 hours

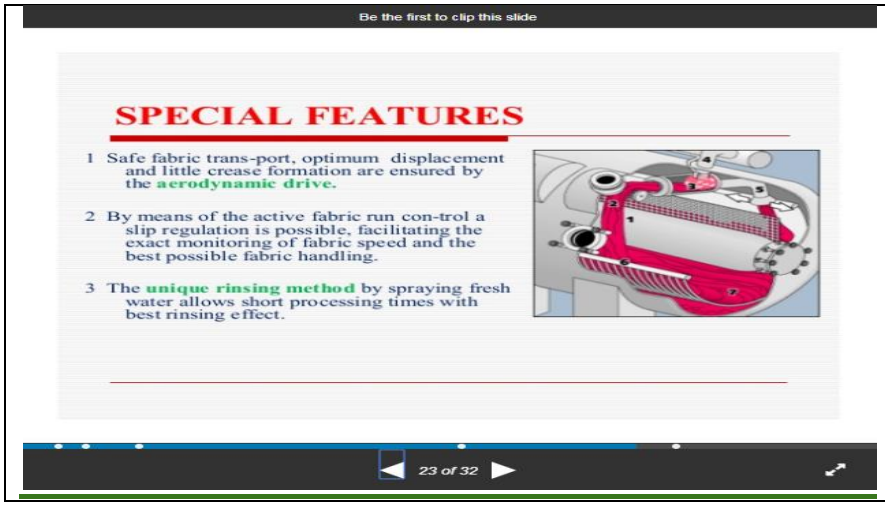
Learning Unit	Learning Outcomes	Learning Elements	Materials Required
LU1. **Prepare workstation for Soft flow dyeing**	**The trainee will be able to:** Interpret program sheet for operating soft flow dyeing machine. Clean and clear soft flow dyeing machine as per check list. Arrange material for dyeing process as per program sheet. . Check and verify material and parameters according to program sheet.	Importance of program sheet before the start of dyeing process on machine at dyeing floor with understanding the all parameters given in the program sheet. Cleaning of machine according to standards for operating the soft flow dyeing machine. Advantages for proper machine cleaning. Arranging materials required for dyeing on soft flow dyeing machine such as water, dyes, chemicals and auxiliaries according to program sheet. Checking of material required for dyeing and verifying parameters of dyeing like dye weight, chemical pH, liquor ratio, temperature, weight and length of fabric etc.	Soft flow dyeing machine Over lock machine Scissor Air dryer Mug Fabric drying oven Mini Boiler PPEs Compressor Natural Gas Weighing balance Water Textile trolleys Direct dyes Indigo dyes Reactive dyes Disperse dyes Vat dyes Fabric (Cotton / Towel / Denim) woven / Knitted
LU2. Operate Soft flow dyeing machine for fabric dyeing	**The trainee will be able to:** Follow safety precautions as per job requirement. Load RFD (ready for dyeing / development) fabric on soft flow machine for dyeing as per program sheet.	Knowledge of safety precautions used for handling the chemicals and operating jet dyeing machine such as gloves, goggles, shoes, mask, apron, safety cap as per OH&S standards. Knowledge of process and techniques for fabric loading to the soft flow machine and related instruments for loading the fabric and maintain speed	Plastic beaker Measuring cylinder Glass beaker Buckets

	Set machine parameters as per dyeing process requirement / program sheet. Run soft flow dyeing machine to start the dyeing process as per program sheet. Maintain quality parameters during process according to program sheet / protocol. Wash-off & Neutralize dyed fabric as per program sheet. Unload fabric for next process after completion the job. Clean workstation after closing the job.	while loading and unloading the fabric. Setting of soft flow dyeing machine parameters like setting of temperature, water level, pick-up settings according to recipe. Operational knowledge of soft flow dyeing machine for dyeing the product with required parameters like speed, capacity, working principle, temperature control, productivity, water etc. Ensuring the quality parameters during dyeing process time to time like shade, temperature, liquor ratio, pH etc. Importance and techniques used for wash-off and Neutralization of dyed fabric. Importance and advantages of cleaning the soft flow dyeing machine while loading & unloading the fabric and after closing the job for starting the new job. Removing regularly accumulated dust and dirt from the machine.	Glass rod Textile Marker Sulphuric acid Sodium carbonate Salt Wetting agents Leveling agents Sequestering agents Washing off agents Anti foam agents Dispersing agents Sodium hydroxide Acetic acid
LU3. Maintain Production Register for Soft flow dyeing machine.	**The trainee will be able to:** Record lot-wise production on production register as per given format. Record running and stoppage time on production register as per given format. . Contact with supervisor for verification of production as per given format.	Importance of recording of machine and dyeing parameters like temperature variation, time consumption, fault detection, parts positions, chemicals and auxiliaries adding time during dyeing process etc on production register Advantages of recording the running and stoppage time of machine for calculating machine and operator's efficiency on production register. Communicating with supervisor for verification of parameters recorded in the production register and identifying the problems occurring (if any) during dyeing process.	Production Register Pen

Images of soft flow dyeing machine







Presentation on:

Soft flow dyeing machine.

https://www.slideshare.net/gurub1/soft-flow-dyeing-machine-17711160

Soft Flow Dyeing Machine:

In the soft flow dyeing machine water is used for keeping the fabric in circulation. The conceptional difference of this equipment from a conventional jets that operates with a hydraulic system is that the fabric rope is kept circulating during the whole processing cycle (right from loading to unloading). There is no stopping of liquor or fabric circulation for usual drain and fill steps. The principle working behind the technique is very unique. There is a system for fresh water to enter the vessel via a heat exchanger to a special interchange zone. At the same time the contaminated liquor is allowed channel out through a drain without any sort of contact with the fabric or for that matter the new bath in the machine.

Key Features of Soft flow Dyeing Machine:

- Significant savings in processing time.
- Savings in water that is around 50%.
- Excellent separation of different streams results in optimum heat recovery and a distinct possibility of further use or a dedicated treatment.

Principle of Soft Flow Dyeing Machine:

Textile material can be dyed using batch, continuous or semi continuous process.

Batch processes are the most common method used to dye textile materials. There are three general types of batch dyeing machines:

1. In which fabric is circulated
2. In which dye bath is circulated
3. In which both the bath and material is circulated.

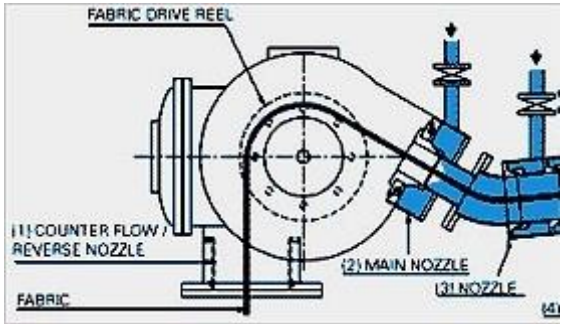
Types of Soft Flow Dyeing Machine:

A few of the commercially popular brands along with their particular technical specifications are discussed here. The categories are not exhaustive as such.

Multi Nozzle Soft Flow Dyeing Machine:

Technical Features:

1. Very low Liquor ratio - around 1:1 (Wet Fabric)
2. Can reach high temp. up to 140°C
3. Easily dye 30 to 450 g/mt.sq. of fabrics (woven & knitted fabrics)
4. Number of very soft-flow nozzles
5. No pilling effect
6. Wide capacity



Multi Nozzle Soft flow Dyeing Machine

High Temperature High Pressure Soft Flow Dyeing Machine :

Technical Features:

1. Compact body made of stainless steel.
2. High efficiency heat exchanger for quick heating/cooling.
3. Compact body made of stainless steel.
4. Heating rate - around 4°C/Min upto 900°C - around 3°C/Min upto 135°C At steam pressure of 6 Bar.
5. Cooling Rate- around 4°C/ Min At water pressure of 4 Bar and 15°C.
6. Maximum working temp is 135°C.
7. Maximum working pressure of 3.2 Bar.
8. Control manual as well as automatic.
9. Heavy duty stainless steel pump.

Soft Flow Dyeing Machine

10. The vigorous agitation of fabric and dye formulation in the cloth increases the dyeing rate and uniformity. It minimizes creasing as the fabric is not held in any one configuration for very long. The lower liquor ration allows shorter dye cycles and saves chemicals and energy.

11. In soft flow dyeing machines the fabric is transported by a stream of dye liquor. However, the transport is assisted by a driven lifter reel.

12. These machines use a jet having lower velocity that that used on conventional jet dyeing machines.

13. The soft flow machines are gentler on the fabric than conventional jet machines.
Source: https://textilelearner.blogspot.com/2013/01/soft-flow-dyeing-machine-and-principle.html

Videos:

	SOFTFLOW DYEING MACHINE https://www.youtube.com/watch?v=ubS7gmUXCNk Duration: 00:06:31
	Soft Flow Dyeing Machine and Its Working Principle https://www.youtube.com/watch?v=133f3-23CEg Duration: 00:01:35
	MCS Group – Dyeing machine - SOFTFLOW-100 HT https://www.youtube.com/watch?v=WMFcpl08p1A Duration: 00:03:15

Module 13: 0723001099 Perform Garment dyeing

Objective of the module: This competency standard covers the skills and knowledge required to perform dyeing process by operating garment dyeing machine for production of dyed substrate according to required parameters.

Duration: 70 hours **Theory:** 14 hours **Practical:** 56 hours

Learning Unit	Learning Outcomes	Learning Elements	Materials Required
LU1. **Prepare workstation for Garment dyeing**	**The trainee will be able to:** Interpret program sheet for operating garment dyeing machine. Clean and clear garment dyeing machine as per check list. Arrange material for dyeing process as per program sheet. . Check and verify material and parameters according with program sheet.	Importance of program sheet before the start of dyeing process on machine at dyeing floor with understanding the all parameters given in the program sheet. Cleaning of machine according to standards for operating the garment dyeing machine. Advantages for proper machine cleaning. Arranging materials required for dyeing on garment dyeing machine such as water, dyes, chemicals and auxiliaries according to program sheet. Checking of material required for dyeing and verifying parameters of dyeing like dye weight, chemical pH, liquor ratio, temperature, weight and length of garment etc.	Garment dyeing machine Scissor Air dryer Mug Fabric drying oven Mini Boiler PPEs Compressor Natural Gas pH meter pH stripes TDS meter Light Box Hydro exacter Tumble dryer Water Textile trolleys Direct dyes Reactive dyes Sulphur dyes Pigments Cotton garment
LU2. Operate Garment dyeing machine for garment dyeing	**The trainee will be able to:** Follow safety precautions as per job requirement. Load ready for dyeing (RFD) garments on garment dyeing	Knowledge of safety precautions used for handling the chemicals and operating jet dyeing machine such as gloves, goggles, shoes, mask, apron, safety cap as per OH&S standards. Knowledge of process and techniques for garment	Plastic beaker Measuring cylinder Glass beaker

	machine for dyeing as per program sheet. Set machine parameters according to garment dyeing process requirement / program sheet. Run garment dyeing machine to start the dyeing process as per program sheet. Maintain quality during process according to program sheet. Wash-off & Neutralize dyed garment as per program sheet. Unload garment for next process as per program sheet. Apply mechanical drying through hydro extractor as per process requirement. Dry processed garment through Tumble dryer as per process requirement. Clean workstation after closing the job.	loading to the garment machine and related instruments for loading the garment and maintain speed while loading and unloading the garment. Setting of garment dyeing machine parameters like setting of temperature, water level, liquor ratio settings according to recipe. Operational knowledge of garment dyeing machine for dyeing the product with required parameters like speed, capacity, working principle, temperature control, productivity, water etc. Ensuring the quality parameters during dyeing process time to time like shade, temperature, liquor ratio, pH etc. Importance and techniques used for wash-off and Neutralization of dyed garment. Importance and advantages of cleaning the garment dyeing machine while loading & unloading the garment and after closing the job for starting the new job. Methods of mechanical drying with their working principles. Importance dry process through tumble dryer for garment. Removing regularly accumulated dust and dirt from the machine.	Buckets Glass rod Textile Marker Sodium carbonate Salt Sodium hydro sulphite Wetting agents Leveling agents Sequestering agents Washing off agents Anti foam agents Sodium hydroxide Hydrogen peroxide Binder Acetic acid Fixing agents
LU3. Maintain Production Register for Garment dyeing machine.	**The trainee will be able to:** Record lot-wise production on production register as per given format. Record running and stoppage time	Importance of recording of machine and dyeing parameters like temperature variation, time consumption, fault detection, parts positions, chemicals and auxiliaries adding time during dyeing process etc on production register Advantages of recording the running and stoppage time of machine for calculating machine and operator's	Production Register Pen

	on production register as per given format. . Contact with supervisor for verification of production as per given format.	efficiency on production register. Communicating with supervisor for verification of parameters recorded in the production register and identifying the problems occurring (if any) during dyeing process.	

Images of Garment dyeing:

Garment Dyeing

Garment dyeing is the process of dyeing fully fashioned garments (such as pants, pullovers, t-shirts, jeans, sweaters, dresses, bathrobes, casual jackets, shirts, skirts, hosieries) subsequent to manufacturing, as opposed to the conventional method of manufacturing garments from pre-dyed fabrics. Most garments are made of cotton knit goods and/or cotton woven fabrics.

Although several other fabrics can be found in the whole or in part such as wool, nylon, silk, acrylic, polyester and others. Due to cost savings and fashion trends, garment dyeing has been gaining importance and popularity in the past years and will continue to do so in the future.

Why Garment Dyeing?

Traditionally, garments are constructed from fabrics that are pre-dyed (piece dyed) before the actual cutting and sewing. The advantage of this process is the cost effectiveness of mass producing identical garments of particular colors. A major drawback with this approach is the risk associated with carrying a large inventory of a particular style or color in today's dynamic market.

Garment Dyeing Machines

Paddle machines and rotary drums are the two types of equipment regularly used for garment dyeing. Rotary drum machines are sometimes preferred for garments, which require gentler handling, such as sweaters. A high liquor ratio is required for paddle machines, which is less economical and may limit shade reproducibility. Many machinery companies have developed sophisticated rotary dyeing machines, which incorporate state-of-the-art technology. Following machines are generally used for garment dyeing.

Fig: Garment dyeing machine

1. Paddle Dyeing Machines

A process of dyeing textiles in a machine that gently move the goods using paddles similar to a paddle wheel on a boat. This is a slow process, but there is

extremely little abrasion on the goods. Horizontal Paddle Machines (over head paddle machine) consist of a curved beck like lower suction to contain the materials and the dye liquor. The goods are moved by a rotating paddle, which extends across the width of the machine. Half immersed paddles cause the material to move upwards and downwards throughout the liquor. The temperature can be raised to 98o C in such system.

In lateral / oval paddle machines consist of oval tank to enhance the fluid flow and the processing the goods. In the middle of this tank is a closed oval island. The paddle moves in a lateral direction and is not half submerged in the liquor and the temperature can be increased up to 98o C.

HT Paddle Machines work according to the principle of horizontal paddle machine; however, the temperature can be raised up to 140o C. PES articles are preferably dyed on HT paddles. In paddle machines, the dyeing can be carried out with 30:1 to 40:1, lower ratios reduces optimum movement of the goods, lead to unlevel dyeing, crease formation. For gentleness, the blades of the paddle are either curved or have rounded edges and the rotating speed of the paddle can be regulated from 1.5 to 40 rpm. Circulation of the liquor should be strong enough to prevent goods from sinking to the bottom. Paddle machines are suitable for dyeing articles of all substrates in all forms of make ups. The goods are normally dyed using PP/PET bags.

2. Rotary Drum Dyeing Machines

These machines work on the principle of “movement of textile material and a stationary liquor”. The rotary drum dyeing machine consists of rotating perforated cylindrical drum, which rotates slowly inside a vessel of slightly bigger in size. The internal drum is divided into compartments to ensure rotation of goods with the drum rotation, and the outer vessel holds the required quantity of dye liquor. High temperature drum machines are capable of processing the garments up to 140o C.

Features of modern rotary-dyeing equipment include the following:

- Lower liquor ratio
- Gentle movement of goods and liquor (minimizes surface abrasion)
- Rapid heating and cooling
- Centrifugal extraction
- Variable drum speed with reversal capability (adaptable to a wide variety of goods)
- Continuous circulation of goods (improves migration control)
- Easy of sampling
- Variable water levels with overflow rinsing capabilities
- Large diameter feed and discharge lines (minimizes filling and draining time)
- Microprocessor controls
- Lint filters
- Pressure dyeing
- Auto-balancing drums

One feature that can be used to reduce abrasion on delicate garments or to minimize tangling is a compartmental chamber, sometimes referred to as a "Y" pocke .The rotary drum machines are very simple to operate and are quite compact in size. The cost of unit is also not high .

Drum dyeing-centrifuging machines are also called “multipurpose drum machines” or “multi-rapid dyeing centrifuging machines” since these machines can perform scouring, dyeing, centrifuging and conditioning successively with automated controls. The goods are treated in a perforated inner drum housed within an outer drum (dyeing tank). Inner drums without dividing walls are provided with ribs that carry the goods along for a certain time, partially lifting them up out of the liquor. These machines can operate at very low liquor ratios and can dye the goods up to 98 -140o C. This is suitable for knits as well as other garments. Liquor circulation can be intensified using additional jets. Drums can be rotated in both the directions.

3. Tumbler Dyeing Machines

These machines are being used for small garments either in loose form or in open mesh bags. Design wise the tumbler dyeing machines are similar to the commercial laundering machines.

The principle of operation is to load the material into perforated inner SS tanks, which rotates round a horizontal shaft fixed at the back of the drum. The drum is divided into compartments for moving the goods with rotation of drum. A variety of tumbling machines have higher rotation speeds and can spin dry at the end of the cycle. These are similar to dry-cleaning machines.

Rotating drum machines are more efficient and cleaner to operate than paddle machines. The more vigorous mechanical action often promotes more shrinkage and bulking, which may be desirable for some articles. In order to handle higher quantities and large production of similar pieces the latest machines are provided with several automatic features and sophistication.

4. Toroid Dyeing Machines

In these machines the garments circulate in the liquor in a toroidal path with the aid of an impeller situated below the perforated false bottom of the vessel. Movement of the goods depends completely on the pumped action of the liquor. High-temperature versions of this machine operating at 120 to 130°C were developed in the 1970s for dyeing fully-fashioned polyester or triacetate garments. The liquor ratio of such machines is about 30:1.

5. The Gyrobox

The machine has support in the form of a large wheel, which is divided into 12 independent non radial compartments. The goods are placed in these compartments .The wheel runs at a moderate speed of 2-6 rpm. The main advantage of this machine is,

- Reduced M:L
- Different types of garments can be dyed simultaneously.
- Flexible loading
- Fully automatic operation.
- The MCS Readymade garment dyeing machine

The rotary dye machines are suitable for dyeing pure cotton, wool, polyester, cotton blends in the form of T shirts, sweaters, bath rugs and accessories , socks and stockings.

6. Modified Pegg Toroid Whiteley Garment Dyeing Machine

This is an improved version of Toroid machines, the additional features are

- The machine is suitable for both atmospheric and pressure dyeing.
- Full automation up to hydro extraction.
- The design features, speed and performance are simplified to make the machine more versatile and free from operating problems.

Advantages of Garment Dyeing

1. Handling of smaller lots economically
2. Enables various special effects to achieved
3. Distressed look can be effectively imparted
4. Unsold light shades can be converted into medium and deep shades

By the time the garment has been in a boiling dyebath and then tumble-dried, it will have adopted its lowest energy state and will not suffer further shrinkage under consumer washing conditions

Latest fashion trends can be effectively incorporated through garment wet processing by immediate feedback from the customer

Disadvantages of Garment Dyeing

1. High cost of processing
2. A little complicated dyeing
3. Garment accessories like zips, buttons, etc impose restrictions.
4. The garments produced from woven fabrics create many problems and it has been found that the existing textile treatment styles as developed for piece dyed fabric cannot be just assembled for garment wet processing operation such as garment dyeing, unless they have been engineered from the original design stage for garment dyeing.

The factors governing processing of ready-made garments are

- Sewing Thread
- Metal Components. Shrink behavior
- Accessories
- Foreign substances
- Interlining
- Care labeling.

Source: https://textilelearner.blogspot.com/2011/03/description-of-garment-dyeing_6882.html

Production Flow Chart of Garments Dyeing

Batching
↓
Pre-treatment
↓
Dyeing
↓
Sample check
↓
Hydro Extraction
↓
Drying
↓
Quality Control
↓
Storage

Problems in Garment Dyeing

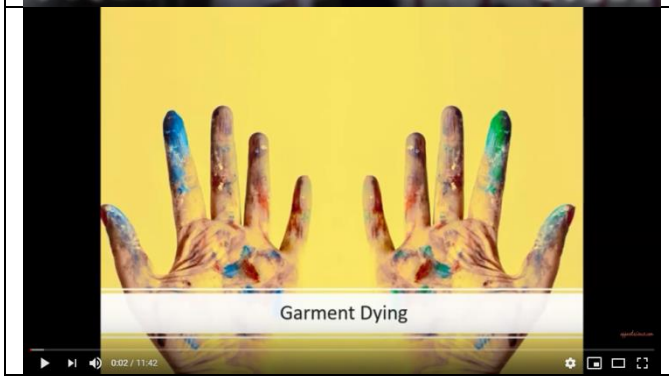
With today's exploding clothing markets of leisure , casual wear and sports wear , garment wet processing has emerged as one of the best production routes towards meeting the quick changing fashion markets.

Unlike fabric or yarn as a substrate , a garment is not a uniform in texture ,it is full of thick places like seams , multilayered sites like pockets , cuffs and shoulders. At times certain unevenness like puckered seams lend a distinct style often highly valued but it could result into rejection of goods at other times .

Here we will try to figure out certain key problems associated with garment dyeing and their possible causes, so that a garment can analyze and overcome these problems.

For more information please visit: http://dyeingworld1.blogspot.com/2012/01/problems-in-garment-dyeing.html

Videos:

	C.P. Company Garment Dyeing https://www.youtube.com/watch?v=EcPzVSusp34 Duration: 00:02:16
	Smartex Miracle Highspeed Garment Dyeing Machine https://www.youtube.com/watch?v=N0Mh9kCEDQ8&t=167s Duration: 00:04:18
	Garment Dyeing (Reactive) https://www.youtube.com/watch?v=MNzouhgDIc8 Duration: 00:11:42

TEXTILE WET PROCESSING

Module-15

LEARNER GUIDE

National Vocational Certificate Level 2

Version 1 - November, 2019

Module 15: 0723001100 Perform Stenter dyeing

Objective of the module: This competency standard covers the skills and knowledge required to perform dyeing process by operating Stenter dyeing machine for production of dyed substrate according to required parameters.

Duration: 40 hours **Theory:** 08 hours **Practical:** 32 hours

Learning Unit	Learning Outcomes	Learning Elements	Materials Required
LU1. **Prepare workstation for Stenter dyeing**	**The trainee will be able to:** Interpret program sheet for operating Stenter dyeing machine. Clean and clear Stenter dyeing machine as per check list. Arrange material for dyeing process as per program sheet. . Check and verify material and parameters according to program sheet.	Importance of program sheet before the start of dyeing process on machine at dyeing floor with understanding the all parameters given in the program sheet. Cleaning of machine according to standards for operating the stenter dyeing machine. Advantages for proper machine cleaning. Arranging materials required for dyeing on stenter dyeing machine such as water, dyes, chemicals and auxiliaries according to program sheet. Checking of material required for dyeing and verifying parameters of dyeing like dye weight, chemical pH, pick up, temperature, weight and length of fabric etc.	Stenter dyeing machine Over lock machine Scissor Air dryer Mug Fabric drying oven Thermal Boiler PPEs Compressor Weighing balance Water Textile trolleys Batcher Jack Pigments Direct dyes Indigo dyes Reactive dyes Disperse dyes Vat dyes Fabric (PC Woven) Fabric Denim woven / Knitted
LU2. Operate Stenter dyeing machine for fabric dyeing	**The trainee will be able to:** Follow safety precautions as per job requirement. Apply Threading of feeding cloth as per requirement.	Knowledge of safety precautions used for handling the chemicals and operating stenter dyeing machine such as gloves, goggles, shoes, mask, apron, safety cap as per OH&S standards. Knowledge of process and techniques for fabric	Plastic beaker Measuring cylinder

	Stitch RFD (ready for dyeing / development) fabric with feeding cloth on stenter dyeing machine for dyeing as per program sheet. Set machine parameters as per dyeing process requirement / program sheet. Run stenter dyeing machine to start the dyeing process as per program sheet. Maintain quality parameters during process according to program sheet / protocol. Clean workstation after closing the job.	loading to the stenter machine and related instruments for loading the fabric and maintain speed while loading and unloading the fabric. Setting of stenter dyeing machine parameters like setting of temperature, water level, pick up settings according to recipe. Operational knowledge of stenter dyeing machine for dyeing the product with required parameters like speed, capacity, working principle, temperature control, productivity, water etc. Ensuring the quality parameters during dyeing process time to time like shade, temperature, pick up, pH etc. Importance and techniques used for wash-off and Neutralization of dyed fabric. Importance and advantages of cleaning the stenter dyeing machine while loading & unloading the fabric and after closing the job for starting the new job. Removing regularly accumulated dust and dirt from the machine.	Glass beaker Buckets Glass rod Sulphuric acid Sodium carbonate Salt Wetting agents Anti foam agents Fixing agents Anti migrant agents Softener
LU3. Maintain Production Register for Stenter dyeing machine.	**The trainee will be able to:** Record lot-wise production on production register as per given format. Record running and stoppage time on production register as per given format. . Contact with supervisor for verification of production as per given format.	Importance of recording of machine and dyeing parameters like temperature variation, time consumption, fault detection, parts positions, chemicals and auxiliaries adding time during dyeing process etc on production register Advantages of recording the running and stoppage time of machine for calculating machine and operator's efficiency on production register. Communicating with supervisor for verification of parameters recorded in the production register and identifying the problems occurring (if any) during dyeing process.	Production Register Pen

Images of Stenter dyeing machine:

APPLICATION:

- The IR dyeing machine is a state of the art dyeing instrument. This unit produces more accurate lab sample dyeing with level and re-producible results and accommodates up to 24 pots with a low liquor ratio for diverse fibers.
- This unit moves the beakers in a circular rotation with latest IR heating technology, instead of traditional two-positioned IR heating system, to avoid uneven heating for beakers. Dye-bath temperature is measured directly by a PT-100 probe inside the beaker.
- This unit is suitable for most of substrates. It is designed for fast, convenient use for lab with accurate temperature control and low energy consumption.

FEATURES:

- Patented IR heating technology at an affordable price; use latest IR heating ring technology, instead of traditional two-positioned IR heating system, to avoid uneven heating for beakers
- Glycol free infra red heating system;
- Accurate temperature control with PT-100 sensor;
- Seamless stainless steel beakers, no need for cumbersome beaker cleaning;
- Easy to operate multi-step controller according to specified diagram (see figure above).
- Clean and fast handling of beakers as well as samples
- Air cooling system, no need for water source and reduce operation cost

KEY SPECIFICATION:

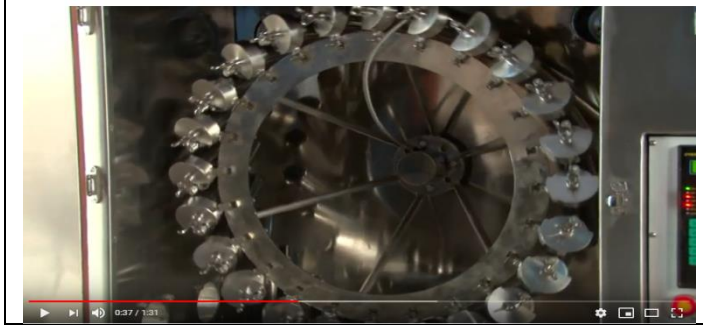
- Temperature range 20-140^{0}C
- Temperature gradient 0.5-4.5^{0}C/min
- Temperature return speed 5^{0}C/min
- Liquor ratio 1:5
- Rotation speed 5-70RPM(forth and reverse, two directions)
- Heating system Infra-red
- Temperature control PLC unit
- Cooling system Forced air
- Max dyeing positions 24
- Power supply Ac380V, 50Hz, 3.5KW
- Instrument size 750×775×855mm
- Instrument weight 165kg

STANDARD CONFIGURATION:

No.	Item	Quantity
1	Main machine	1 set
2	Beaker(Dyeing pot) 300ml	24 sets
3	Beaker rack	1 set
4	Wrench	1 pcs

Source: http://www.km-textilemachines.com/ir-dyeing-machine.html

Videos:

	WORKING OF STENTER MACHINE https://www.youtube.com/watch?v=AWnbehZfUio Duration: 00:21:31
	INFRA COLOUR DYEING MACHINE https://www.youtube.com/watch?v=eq0tFMUsXxU Duration: 00:01:31

Module Summary:

Module Title and Aim	Learning Units	Timeframe of modules
Module 1: Comply with Perform Personal Health and Safety Guidelines **Aim:** The Aim of this module is to protect/apply occupational Safety, health and Environment at workplace according to the industry's approved guidelines, procedures and interpret environmental rules/regulations. Trainee will be expected to identify and use Personal Protective Equipment (PPE) according to the work place requirements. The underpinning knowledge regarding Observe Occupational Safety and Health (OSH) will be sufficient to provide the basis for the job at workplace.	LU1: Identify Personal Hazards at Workplace LU2: Apply Personal Protective and Safety Equipment (PPE) LU3: Comply Occupational Safety and Health (OSH) LU4: Dispose of hazardous Waste/materials from the designated area.	30
Module 2: Communicate the Workplace Policy and Procedure **Aim:** The aim of this module is to describe the performance outcomes, skills and knowledge required to develop communication skills in the workplace. It covers gathering, conveying and receiving information, along with completing assigned written information under direct supervision.	LU1: Identify workplace communication procedures LU2: Communicate at workplace LU3: Draft Written Information LU4: Review Documents	20
Module 3: Perform Basic Communication **Aim:** This aim of this module is to assist in the development of communication competence by providing information regarding different forms of communication and their appropriate use.	LU1: Communicate in a team to achieve intended outcomes LU2: Follow Supervisor's instructions as per organizational SOPs LU3: Develop Generic communication skills at workplace	30
Module 4: Perform Basic Computer Application **Aim:** The aim of this module is to use spreadsheet to prepare a page of document, develops familiarity with Word, Excel, Access, PowerPoint, email, and computer graphics basics.	LU1: Create Word Documents LU2: Use internet for Browsing	40

Module Title and Aim	Learning Units	Timeframe of modules
Module 5: Perform Winch Dyeing **Aim:** The aim of this module is to perform dyeing process by operating winch dyeing machine for production of dyed substrate according to required parameters.	LU1: Prepare workstation for Winch dyeing LU2: Operate Winch dyeing machine for fabric dyeing LU3: Maintain Production Register for Winch dyeing machine.	60
Module 6: Perform Jigger Dyeing **Aim:** The aim of this module is to perform dyeing process by operating jigger dyeing machine for production of dyed substrate according to required parameters.	LU1: Prepare workstation for Jigger dyeing LU2: Operate Jigger dyeing machine for fabric dyeing LU3: Maintain Production Register for Jigger dyeing machine.	60
Module 7: Perform Jet Dyeing **Aim:** The aim of this module is to perform dyeing process by operating jet dyeing machine for production of dyed substrate according to required parameters.	LU1: Prepare workstation for Jet dyeing LU2: Operate Jet dyeing machine for fabric dyeing LU3: Maintain Production Register for Jet dyeing machine.	70
Module 8: Perform Pad batch dyeing **Aim:** The aim of this module is to perform dyeing process by operating Pad batch dyeing machine for production of dyed substrate according to required parameters.	LU1: Prepare workstation for Pad batch dyeing LU2: Operate Pad batch dyeing machine for fabric dyeing LU3: Maintain Production Register for Pad batch dyeing machine.	70
Module 9: Perform Pad Thermosol Dyeing **Aim:** The aim of this module is to perform dyeing process by operating Pad Thermosol dyeing machine for production of dyed substrate according to required parameters.	LU1: Prepare workstation for Pad Thermosol dyeing LU2: Operate Pad Thermosol dyeing machine for fabric dyeing LU3: Maintain Production Register for Pad Thermosol dyeing machine.	50
Module 10: Perform Pad steam dyeing **Aim:** The aim of this module is to perform dyeing process by operating Pad steam dyeing machine for production of dyed substrate according to required parameters.	LU1: Prepare workstation for Pad steam dyeing LU2: Operate Pad steam dyeing machine for fabric dyeing LU3: Maintain Production Register for Pad steam dyeing machine.	50

Module Title and Aim	Learning Units	Timeframe of modules
Module 11: Perform Cone Dyeing **Aim:** The aim of this module is perform dyeing process by operating Cone dyeing machine for production of dyed cones / package / yarn according to required parameters.	LU1: Prepare workstation for cone dyeing LU2: Operate cone dyeing machine for yarn dyeing LU3: Maintain Production Register for cone dyeing machine.	80
Module 12: Perform Rope Dyeing (Denim) **Aim:** The aim of this module is to perform dyeing process by operating rope dyeing machine for production of dyed rope according to required parameters.	LU1: Prepare workstation for rope dyeing LU2: Operate rope dyeing machine for rope dyeing LU3: Maintain Production Register for rope dyeing machine.	80
Module 13: Perform Soft flow Dyeing **Aim:** The aim of this module is to perform dyeing process by operating Soft flow dyeing machine for production of dyed substrate according to required parameters.	LU1: Prepare workstation for Soft flow dyeing LU2: Operate Soft flow dyeing machine for fabric dyeing LU3: Maintain Production Register for Soft flow dyeing machine.	60
Module 14: Perform Garment Dyeing **Aim:** The aim of this module is to perform dyeing process by operating garment dyeing machine for production of dyed substrate according to required parameters.	LU1: Prepare workstation for garment dyeing LU2: Operate garment dyeing machine for fabric dyeing LU3: Maintain Production Register for garment dyeing machine.	60
Module 15: Perform Stenter Dyeing **Aim:** The aim of this module is to perform dyeing process by operating stenter dyeing machine for production of dyed substrate according to required parameters.	LU1: Prepare workstation for stenter dyeing LU2: Operate stenter dyeing machine for fabric dyeing LU3: Maintain Production Register for stenter dyeing machine.	40

Test Yourself (Multiple Choice Questions)

Question	Candidate's answer
1. Winch dyeing machine can be used for dyeing of _____fabric?	• Polyester fabric • Cotton Fabric • Acrylic fabric • Nylon fabric
2. Which types of fabric (by construction) can be dyeing on winch dyeing machine?	• Knitted fabric • Woven Fabric • Non woven fabric • none of above
3. Liquor ratio required for winch dyeing process is _____ or less.	• 2:20 • 3;10 • 4:10 • 1:20
4. Enlist any THREE dyeing faults during winch dyeing operations?	• Crease mark • Roll to roll variation • Shade variation • uneven dyeing • Spotty dyeing
5. No of dyeing cycles are increased for increasing the depth of shade on winch machine (True/ False)	True

Question	Candidate's answer
6. The fabric is dyed in _____form on winch machine?	• Rope form • Open width • continuous • none of above
7. What is the role of salt in reactive dyeing on winch dyeing machine?	For exhaustion / migration / adsorption
8. Alkali is used for _____at winch dyeing machine?	• neutralization • exhaustion • migration • fixation
9. Maximum temperature that can be achieved on winch dyeing machine?	• 110 ^{o}C • 98^{o}C • 85^{o}C • 70^{o}C
10. Which chemical is used for neutralization after cotton fabric dyeing?	• Sulphuric Acid • Caustic Soda • Acetic Acid • Sodium Chloride
Question	Candidate's answer

Question	Candidate's answer
11. Jigger dyeing machine can be used for dyeing of _____fabric?	• Polyester fabric • Cotton Fabric • Acrylic fabric • Nylon fabric
12. Which types of fabric (by construction) can be dyeing on jigger dyeing machine?	• Knitted fabric • Woven Fabric • Non woven fabric • none of above
13. Liquor ratio required for Jigger dyeing process is _____.	• 1:4 • 1;8 • 1:12 • 1:20
14. Enlist any THREE dyeing faults during jigger dyeing operations?	• Crease mark • Roll to roll variation • Shade variation • uneven dyeing • Spotty dyeing
15. Temperature can be raised for jigger dyeing machine is up to:	• 80 ^{o}C • 98^{o}C • 120^{o}C • 140^{o}C
16. The fabric is dyed in _____form on jigger machine?	• Rope form • Open width • continuous • none of above

Question	Candidate's answer
17. What is the role of salt in reactive dyeing on jigger dyeing machine?	For exhaustion / migration / adsorption
18. In reactive dyeing on jigger dyeing machine alkali is used for?	• neutralization • exhaustion • migration • fixation
19. Write any THREE parts of jigger dyeing machine?	• Feed roller • Take up roller • Dye bath • Guide rollers • tank
20. Which chemical is used for neutralization after cotton fabric dyeing?	• Sulphuric Acid • Caustic Soda • Acetic Acid • Sodium Chloride
Question	Candidate's answer
21. Enlist any TREE parts of Jet dyeing machine?	• Winch roller or Reel • Main Vessel or Chamber • Chemical dosing tank • Heat Exchanger • Nozzle • Fabric Plaiter • Reserve Tank • Controlling unit or Processor

Question	Candidate's answer
22. Vario and Thies are the types of?	• Jet dyeing dyestuff • Jet dyeing process • Jet dyeing machine • Jet dyeing chemicals
23. Jet dyeing machine can be operated at a liquor ratio from?	• 1:1 to 1:2 • 1:3 t0 1:6 • 1:10 t0 1:12 • 1: 15 to 1:20
24. Enlist any THREE dyeing faults during Jet dyeing operations?	• Crease mark • Roll to roll variation • Shade variation • uneven dyeing • Spotty dyeing
25. Jet dyeing machine can be used for dyeing of _____fabric?	• Polyester fabric • Cotton Fabric • Acrylic fabric • Nylon fabric
26. For polyester fabric dyeing, _____ dyes are used.	• Reactive dyes • Disperse dyes • Direct dyes • Acid dyes
27. What is the role of salt in reactive dyeing on jet dyeing machine?	For exhaustion / migration / adsorption

Question	Candidate's answer
28. Fabric is dyed on jet dyeing machine in _____ form.	• Width-wise • zigzag • Semi-continuous • rope
29. What is the Liquor ratio of dyeing machine?	The liquor ratio of a dyeing machine is the amount of water needed to run a dyeing machine successfully divided by the mass of textiles to be dyed. For example: 1000 liter water divided by 200 kg textiles = liquor ratio 5.
30. Why do jet dyeing machine have a filter?	The filter eliminates the loose fibres in the dye bath, consequently it reduces the loose fibre loads on the fabric.
Question	Candidate's answer
31. Pad batch dyeing machine can be used for dyeing of _____fabric?	• Cotton Fabric • Polyester fabric • Acrylic fabric • Wool fabric
32. Which types of fabric (by construction) can be dyeing on Pad Batch dyeing machine?	• Knitted fabric • Non woven fabric • Woven Fabric • none of above

Question	Candidate's answer
33. The Cotton is dyed by reactive dye at _____ pH on pad batch dyeing machine	• Alkaline • Acidic • Neutral
34. Enlist any THREE dyeing faults during pad batch dyeing operations?	• Crease mark • Listing • Tailing • uneven fixation
35. Why batching is done on pad batching dyeing machine?	a) Fixation b) Adsorption c) Neutralization d) Exhaustion
36. The batcher is covered with polyethylene to?	Avoid drying
37. Padder pressure is directly proportional to Padder Pickup. (True / False)	False
38. Batching time directly affects the depth of shade. (True / False)	True

Question	Candidate's answer
39. Absorption of dye in Pad batch dyeing machine is done by?	• Salt • Alkali • Padder pressure • batching
40. Write down the definition of pad batch dyeing?	A process of dyeing fabrics by passing the fabrics between rollers that apply the dyestuff
Question	Candidate's answer
41. Enlist any THREE chemicals used during pad thermosol dyeing operations?	• Wetting agent • Migrating agent • Soda Ash • Gulbar salt • R salt • Urea
42. When pad dry cure is performed in thermosol then _____ must be controlled?	• Color • Fixation • Humidity • Softener
43. Light Box is used for?	• Shade matching • Proper lighting for dyeing • padding • Neutralization

Question	Candidate's answer
44. Enlist any THREE dyeing faults during pad batch dyeing operations?	• Crease mark • Listing • Tailing • uneven fixation • bad drying
45. What is the purpose of J-Box section in pad thermosol dyeing machine?	It is a space for keeping fabric. When the batch is completed
46. The temperature of curing chamber for reactive dyeing at Pad thermosol dyeing is:	• 90-110^{o}C • 120-1400^{o}C • 150-170^{o}C • 190-210^{o}C
47. The temperature of curing chamber for disperse dyeing at Pad thermosol dyeing is:	• 100- 120^{o}C • 140-170^{o}C • 200-210^{o}C • 240-260^{o}C
48. Testing required during pad thermosol operation are:	Pick up testing and Shade listing identification.
49. Enlist ant THREE sections of pad thermosol dyeing machine?	• Fabric inlet section • Cooling roller • Chemical Mixing Tank • Dyeing padding Unit • Airing Zone

Question	Candidate's answer
	• IR dryer • Hot air flow drying unit • Curing chamber • J-Box • Fabric outlet • Control Panel
50. In pad thermosol dyeing the fabric feeding at pad steam after padding for?	• Fixation • Drying • Washing • Anti creasing
Question	Candidate's answer
51. After steamer at pad steam dyeing machine the flows from _____ washers?	• 1-2 washers • 3-4 washers • 5-6 washers • 7-8 washers
52. When pad dry cure is performed in steaml then _____ must be controlled?	• Color • Fixation • Humidity • Softener
53. Write down the purpose of Pad steam dyeing machine?	Pad-Steam dyeing is a process of continuous dyeing in which the fabric in open width is padded with dyestuff and is then steamed. Pad steam is an ideal machine for reactive dyeing of cotton and its blended fabrics. Light, pale and medium shades can be dyed in this machine.

Question	Candidate's answer
54. Enlist any THREE dyeing faults during pad steam dyeing operations?	• Crease mark • Listing • Tailing • uneven fixation • bad drying
55. Enlist THREE processes that can be done on pd steam dyeing machine?	• Reactive dyeing • Pad-batch dyeing • Reduction Dyeing • Stripping • Vat Development/ Vat Dyeing • Hot and Cold Washing • Pad Steam • Wet Chemical Pad
56. The temperature of steam after padding at Pad Steam dyeing is:	• 30^oC • 40^oC • 60^oC • 80^oC
57. Fabric is washed in a washing machine to remove the _____.	• Dust • salt • unfixed dye • color
58. Testing required during pad steam operation are:	Pick up testing and Shade listing identification.

Question	Candidate's answer
59. Enlist ant TWO sections of pad thermosol dyeing machine?	• Padding • Drying • Thermo fixation • Cooling • Penetration • IR pre-drying
60. In pad steam dyeing machine the fabric is first padded in a padder with the _____.	• Dye • water • salt solution • foam
Question	Candidate's answer
61. Liquor ration for cone dyeing machine may be:	• 1:2-1:4 • 1:4-1:6 • 1:4-1:0 • 1:10-1:20
62. Any type of addition can be done to the cone dyeing machine during dyeing through the _____?	• Hand • dye bath • Injector pump
63. The dyeing cycle is controlled through a _____ at cone dyeing machine?	a) Physically b) Mini-computer c) Spectrophotometer d) X-ray

Question	Candidate's answer
64. Enlist any THREE dyeing faults during cone dyeing operations?	• Listing • Tailing • uneven fixation • bad drying • Uneven dyeing • Breakage of yarn
65. After drying at cone dyeing machine the yarn id dried using an _____?	• Infra red drying oven • Eco-dry machine • Universal hydro extractor • Air
66. Yarn dyeing in package form is done at_____ temperature and under _____ pressure:	• Low • medium • high
67. The term package dyeing usually denotes for dyeing of_____ that has been wound on perforated cones	• Fibre • fabric • yarn • garment
68. Enlist any THREE chemicals use for dyeing the cone at cone dyeing machine?	• Anti foam agents • Sodium hydroxide • Fixing agents • Acetic acid • Sodium carbonate • Leveling agents • Sequestering agents • Washing off agents

Question	Candidate's answer
69. Enlist ant THREE sections / parts of cone dyeing machine?	• High Pressure Lid • Dye Bath • Flow Reverse • Heat exchanger • Main Pump • Addition Tank • Dosing Tank
70. Write any THREE advantages of package / cone dyeing machine?	▪ Considerable reduction in yarn handling. ▪ Compatible to automatic control, in the process leading to reproducible dyeing. ▪ Open to large batches. ▪ High temperature dyeing a possibility. ▪ Low liquor ratios, giving savings in water, effluent and energy. ▪ Uniform and High rates of liquor circulation, that leads to level application of dyes.
Question	Candidate's answer
71. What does Rope Dyeing mean?	Believed to be the best possible indigo dyeing method for yarn, the threads of denim yarn are initially twisted into a rope, then undergo a repetitive sequence of dipping and oxidization. The more frequent the dipping and oxidizing, the stronger the indigo shade.
72. Why scoring is done on rope before dyeing on rope dyeing machine?	To remove impurities from yarn
73. Which dyes are used in rope dyeing machine?	• Sulphur dyes • Indigo dyes • Vat dyes • all of above

Question	Candidate's answer
74. Enlist any THREE colors processed in the plant of rope dyeing.	1. Pure 100% indigo dyed 2. Midnight indigo 3. Deep blue 4. Light blue 5. Sulphur black
75. _____type of softener is used in rope dyeing?	• Anionic • Nonionic • Cationic • Amphoteric
76. Sulphur dye is reduced by using _____.	• Sodium dithionite • Sulphuric Acid • Sodium Sulphide • Sodium Chloride
77. Vat dyes are re-oxidized by_____.	a) Airing b) Caustic Soda c) Sodium dithionite d) Sodium Sulphide
78. What is ring dying?	When dye is present only on the surface of the yarn and colorless at the core dying
79. What is Solid/core dying?	When dye is present on the surface and as well as in the core of the yarn is called solid dying

Question	Candidate's answer
80. Scouring temperature of rope in rope dyeing machine is_____?	• 90^oC • 110^oC • 70^oC • 60^oC
Question	Candidate's answer
81. Soft Flow dyeing machine can be used for dyeing of _____fabric?	• Polyester fabric • Cotton Fabric • Acrylic fabric • all of above
82. Write down any THREE parts of soft flow dyeing machine?	• Combined air & front spray nozzle • Stainless steel lifting roller • Automatic adjustable nozzle • Loading chamber • Main hole • Manual pre-fitter
83. In Soft Flow dyeing machine liquor ratio is	• High • Medium • Very low • very high
84. Enlist any THREE dyeing faults during soft flow dyeing operations?	• Crease mark • Roll to roll variation • Shade variation • uneven dyeing • Spotty dyeing

Question	Candidate's answer
85. What is the Maximum working pressure on Soft Flow dyeing machine?	a) 3.2 Bar b) 3.4 Bar c) 3.6 Bar d) 3.8 Bar
86. The fabric is dyed in _____form on Soft Flow dyeing machine.	• Rope form • Open width • continuous • none of above
87. In soft Flow dying machine, dye liquor is _____.	a) Stationary b) Circulating/moving c) sufficient d) Insufficient
88. In soft Flow dying machine, fabric is circulated. (True / False)	True
89. Soft Flow dyeing machine can reach up to _____ temperature?	• $180^{o}C$ • $70^{o}C$ • $140^{o}C$ • $100^{o}C$
90. Soft Flow dyeing machine has better dye uniformity and dyeing rate, why?	Due to vigorous agitation of fabric

Question	Candidate's answer
Question	Candidate's answer
91. What is Garment dyeing?	Garment dyeing is the process of dyeing fully fashioned garments (such as pants, pullovers, t-shirts, jeans, sweaters, dresses, bathrobes, casual jackets, shirts, skirts, hosieries) subsequent to manufacturing, as opposed to the conventional method of manufacturing garments from pre-dyed fabrics.
92. Normally the liquor ratio setting for garment dyeing machine is?	• 5:1 • 15:1 • 30:1 • 50:1
93. Choose right sequence (flow chart) of Garment dyeing?	• Batching / Pre-treatment / Dyeing / Sample check / Storage / Hydro extraction / Drying / QC • Batching / Pre-treatment / Dyeing / Sample check / Hydro extraction / Drying / QC / Storage • Batching / Pre-treatment / Dyeing / Hydro extraction / Sample check / Drying / QC / Storage • Batching / Dyeing / Sample check / Hydro extraction / Pre-treatment /Drying / QC / Storage
94. Enlist any THREE dyeing faults during garment dyeing operations?	• Crease mark • Patchy dyeing • spotting • harshness • back staining • unlevel dyeing • shade variation

Question	Candidate's answer
95. Write any TWO types of equipments used for garment dyeing machine?	1. Paddle machines 2. Rotary drums 3. Tumbler 4. Toroid 5. Gyrobox
96. Write down ant TWO disadvantages of Garment dyeing machines?	5. High cost of processing 6. A little complicated dyeing 7. Garment accessories like zips, buttons, etc impose restrictions.
97. Write down ant TWO advantages of Garment dyeing machines?	5. Handling of smaller lots economically 6. Enables various special effects to achieved 7. Distressed look can be effectively imparted 8. Unsold light shades can be converted into medium and deep shades
98. The temperature can be increased up to _____ in garment dyeing machine (paddle).	• 78^oC • 88^oC • 98^oC • 108^oC
99. High temperature garment dyeing machine (drum machine) is capable of processing the garment dyeing up to _____.	• 100^oC • 120^oC • 140^oC • 160^oC
100. Tumbler machine is used for?	1. Washing 2. Storage 3. Dye preparation 4. drying

Question	Candidate's answer
Question	Candidate's answer
101. Stenter dyeing machine can be used for dyeing of _____fabric?	• Polyester fabric • Cotton Fabric • Acrylic fabric • Nylon fabric
102. Which types of fabric (by construction) can be dyeing on stenter dyeing machine?	• Knitted fabric • Woven Fabric • Non woven fabric • none of above
103. Liquor ratio required for Stenter dyeing process is _____.	• 1:5 • 1;10 • 1:15 • 1:20
104. Enlist any THREE dyeing faults during jigger dyeing operations?	• Crease mark • Roll to roll variation • Shade variation • uneven dyeing • Spotty dyeing
105. Temperature can be raised for stenter dyeing machine is up to:	• 120 ^{o}C • 140^{o}C • 160^{o}C • 180^{o}C

Question	Candidate's answer
106. The fabric is dyed in _____form on Stenter machine?	• Rope form • Open width • continuous • none of above
107. What is the role of salt in reactive dyeing on Stenter dyeing machine?	For exhaustion / migration / adsorption
108. In reactive dyeing on stenter dyeing machine alkali is used for?	• neutralization • exhaustion • migration • fixation
109. Heating system for stenter machine is?	• Natural Gas • Boiler • Infra-Red • Chemical treatment
110. Which chemical is used for neutralization after cotton fabric dyeing?	• Sulphuric Acid • Caustic Soda • Acetic Acid • Sodium Chloride

Frequently Asked Questions

1. What is Competency Based Training (CBT) and how is it different from currently offered trainings in institutes?	Competency-based training (CBT) is an approach to vocational education and training that places emphasis on what a person can do in the workplace as a result of completing a program of training. Compared to conventional programs, the competency based training is not primarily content based; it rather focuses on the competence requirement of the envisaged job role. The whole qualification refers to certain industry standard criterion and is modularized in nature rather than being course oriented.
2. What is the passing criterion for CBT certificate?	You shall be required to be declared “Competent” in the summative assessment to attain the certificate.
3. What are the entry requirements for this course?	The entry requirement for this course is 8th Grade or equivalent.
4. How can I progress in my educational career after attaining this certificate?	You shall be eligible to take admission in the National Vocational Certificate Level-2 in Textile Wet Processing (Dyeing Machine Operator). You shall be able to progress further to National Vocational Certificate Level-3 & Level-4; and take admission in a level-5, DAE or equivalent course. In certain case, you may be required to attain an equivalence certificate from The Inter Board Committee of Chairmen (IBCC).
5. If I have the experience and skills mentioned in the competency standards, do I still need to attend the course to attain this certificate?	You can opt to take part in the Recognition of Prior Learning (RPL) program by contacting the relevant training institute and getting assessed by providing the required evidences.
6. What is the entry requirement for Recognition of Prior Learning program (RPL)?	There is no general entry requirement. The institute shall assess you, identify your competence gaps and offer you courses to cover the gaps; after which you can take up the final assessment.
7. Is there any age restriction for entry in this course or Recognition of Prior Learning program (RPL)?	There are no age restrictions to enter this course or take up the Recognition of Prior Learning program
8. What is the duration of this course?	The duration of the course work is 950 hrs. (06 to 08 months)

9. What are the class timings?	The classes are normally offered 25 days a month from 08:00am to 01:30pm. These may vary according to the practices of certain institutes.
10. What is equivalence of this certificate with other qualifications?	As per the national vocational qualifications framework, the level-4 certificate is equivalent to Matriculation. The equivalence certificate can be obtained from The Inter Board Committee of Chairmen (IBCC).
11. What is the importance of this certificate in National and International job market?	This certificate is based on the nationally standardized and notified competency standards by National Vocational and Technical Training Commission (NAVTTC). These standards are also recognized worldwide as all the standards are coded using international methodology and are accessible to the employers worldwide through NAVTTC website.
12. Which jobs can I get after attaining this certificate? Are there job for this certificate in public sector as well?	You shall be able to take up jobs in the Textile dyeing industries in the functions of operating different types of dyeing machine for dyeing operations. This is mainly private sector industry and many benefits offered by reputed textile dyeing industry nationally and internationally.
13. What are possible career progressions in industry after attaining this certificate?	You shall be able to progress up to the level of supervisor after attaining sufficient experience, knowledge and skills during the job. Attaining additional relevant qualifications may aid your career advancement to even higher levels.
14. Is this certificate recognized by any competent authority in Pakistan?	This certificate is based on the nationally standardized and notified competency standards by National Vocational and Technical Training Commission (NAVTTC). The official certificates shall be awarded by the relevant certificate awarding body.
15. Is on-the-job training mandatory for this certificate? If yes, what is the duration of on-the-job training?	On-the-job training is not a requirement for final / summative assessment of this certificate. However, taking up on-the-job training after or during the course work may add your chances to get a job afterwards.
16. How much salary can I get on job after attaining this certificate?	The minimum wages announced by the Government of Pakistan in 2019 are PKR 17,500. This may vary in subsequent years and different regions of the country. Progressive employers may pay more than the mentioned amount.
17. Are there any alternative certificates which I can take up?	There are some short courses offered by some training institutes on this subject. Some institutes may still be offering conventional certificate courses in the field.
18. What is the teaching language of this course?	The leaching language of this course is Urdu and English.

19. Is it possible to switch to other certificate programs during the course?	There are some short courses offered by some training institutes on this subject. Some institutes may still be offering conventional certificate courses in the field.
20. What is the examination / assessment system in this program?	Competency based assessments are organized by training institutes during the course which serve the purpose of assessing the progress and preparedness of each student. Final / summative assessments are organized by the relevant qualification awarding bodies at the end of the certificate program. You shall be required to be declared “Competent” in the summative assessment to attain the certificate.
21. Does this certificate enable me to work as freelancer?	You can start your small business of stitching leather garments, gloves of other products. You may need additional skills on entrepreneurship to support your initiative.

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