Textile chemical processing

NTQF Level – II

Learning Guide# 17

Unit of Competence: Load and operate dyeing equipment

Module Title: Loading and operating dyeing equipment

LG Code: IND CHP02 M06 0919LO1-LG17

TTLM Code: IND CHP02 TTLM6, 0919v1

LO1. Set up and load machine

Instruction Sheet	Learning Guide #17

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:

1.1 Mixing dyes
1.2 Checking dye worksheet
1.3 Applying dyeing OHS practice
  1.3.1 Hazard identification and control,
  1.3.2 Risk assessment
  1.3.3 Risk reduction measures implementation
    1.3.3.1 Manual handling techniques
    1.3.3.2 Standard operating procedures
    1.3.3.3 Personal protective equipment
    1.3.3.4 Safe materials handling
    1.3.3.5 Taking rest breaks
    1.3.3.6 Ergonomic workplaces arrangement
    1.3.3.7 Following marked walkways
    1.3.3.8 Safe equipment storage
    1.3.3.9 Housekeeping
    1.3.3.10 Reporting accidents and incidents
    1.3.3.11 Environmental practices
1.4 Loading dye and dyeing chemicals
1.5 Weighing and loading Yarn or fabric
1.6 Reporting Non-conforming dyeing materials
1.7 Keeping working area and machine clean

This guide will also assist you to attain the learning outcome stated in the cover page. Specifically, upon completion of this Learning Guide, you will be able to:

- Mix dye according to dye worksheet using correct measuring devices and personal protective equipment.
- Check dye worksheet and if required entered into the dyeing machine.

- Load dye and dyeing chemicals into the tank or machine according to OHS practices.
- Weigh and load yarn or fabric for dyeing according to specifications.
- Report non-conforming materials.
- Keep area around dye tank or machine clean during setting and loading.

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described in number **3 to 5.**
3. Read the information written in the information “Sheet 1, Sheet 2, Sheet 3, Sheet 4, Sheet 5, Sheet 6 and Sheet 7” respectively.
4. Accomplish the “Self-check 1, Self-check 2, Self-check 3, Self-check 4, Self-check 5, Self-check 6 and Self-check 7” in page -7, 13, 26, 29, 32, 35 and 38 respectively.
5. If you earned a satisfactory evaluation proceed to “Learning Guide # 18”. However, if your rating is unsatisfactory, see your teacher for further instructions or go back to Learning Guide #17.

Information Sheet-1	Mixing dyes

Different textile dyes have their own dye mixing procedures. To prepare the dye solution the dye is mixed with a small quantity of cold water until homogenous paste is obtained. Then enough hot water (about 80^0C) is added to the paste to dissolve the dye completely. Finally, leveling agent is dissolved in the dye solution (for dyes difficult to level).

Dye compatibility must be checked and controlled since it affects dyeing process. Compatible dyeing behavior is a function of all the process variables and requires careful control of the dyeing temperature, salt and alkali concentrations, the dyeing time and the liquor ratio. Once the dye has reacted with the cellulose, it is completely immobilized and cannot migrate. Control of the process variables determines whether a given shade will be reproducible from batch to batch.

Before mixing different dyes with its auxiliaries, different methods are used to prepare their concentration. These methods are listed as follow.

- **a.** Simple Dilution (Dilution Factor Method based on ratios)
- **b.** Serial Dilution
- **c.** Making fixed volumes of specific concentrations from liquid reagents:
- **d.** Moles and Molar solutions (unit = M = moles/L)
- **e.** Percent Solutions (% = parts per hundred or grams/100 ml)
- **f.** Normality (N): Conversion to Molarity and etc.

Specifically let as discuss about percent solution (% = parts per hundred or gm/100 ml). Many reagents are mixed as percent concentrations as weight per volume for dry reagent. When working with a dry reagent it is mixed as dry mass (gm) per volume and can be simply calculated as the % concentration (expressed as a proportion or ratio) x volume needed = mass of reagent to use.

Example 1:

If you want to make 200 ml of 3 % NaCl you would dissolve 0.03 g/ml x 200 ml = 6.0gm NaCl in 200 ml water. This is the weight ratio between the total dry material and the total liquor.

Example: See the following given data and their calculation.

	MLR: 1:5 Temperature= 60 ^{0}C Time= 2hr
Chemicals used	**Concentration**
Reactive dye (% o.w.f.)	1
Sodium chloride	20g/l
Sodium carbonate	10g/l

Procedure:

1) Take 10gm sample of bleached fabric

   a. **Prepare the dyeing liquor.**

   - Water, 1gm = 5ml

     10gm =?

   10gm*5ml = **50ml** of water
   1g

   b. **Prepare NaCl.**

   - NaCl, 20g = 1000ml

     ? = 50ml

   20g*50ml = **1gm** of NaCl
   1000ml

   c. **Prepare Na_2CO_3.**

   - Na_2CO_3, 10g = 1000ml

     ? = 50ml

   10gM*50ml = **1gm** of Na_2CO3
   1000ml

d. Prepare Dye.

Dye concentration (gm) =1 * (20gm) = **0.2gm,** from the above given data in the table.
100

Self-Check- 1	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. List down solution preparation methods. (6 points)
2. Assume you are given the following dyeing information for certain textile company, and then try to prepare each chemical concentration. Given fabric sample weight is 15gm. (5points)

	MLR: 1:10 Temperature= 60 ^{0}C Time= 2hr
Chemicals used	**Concentration**
Dye (% o.w.f.)	5
X_1	2g/l
X_2	4g/l
X_3	10g/l

Note: **Satisfactory rating – 6.5 and above points Unsatisfactory - below 6.5 points**

You can ask you trainer for the copy of the correct answers.

Answer Sheet

Score = _____
Rating: _____

Name: _____ Date: _____

Short Answer Questions

1.

a. _____
b. _____
c. _____
d. _____
e. _____
f. _____

2. _____
_____

Information Sheet-2	Checking dye worksheet

Introduction

Concepts of worksheet

Worksheet is a kind of learning aid. Generally the worksheet is a learning tool as a match or perhaps a means of promoting the implementation of the education plan.

Along the way of education, worksheet purpose to get ideas and application of concepts.

Components of dye worksheet:

Components of worksheet are depending on the activity to be performed. Example for dyeing activity, the dye worksheet composes the following elements.

a. Purpose of specific dyeing activity
b. Theoretical Background of specific dyeing process
c. Materials used for specific dyeing process
d. Materials/Chemicals/Equipment's/Apparatus:
e. Dyeing recipes and after treatment Recipe
f. Procedures for specific dyeing process and etc.
g. May be certain questions to be answered.

Generally before dyeing is conducted, its dye worksheet must be checked and analyzed before start specific dyeing process.

Examples try to see the following dye worksheet for direct dyeing of cotton fabrics.

1.1 Experimental Objectives

- To carry out dyeing of cotton fabrics with direct dyes
- To understand the action of electrolytes on the exhaustion of direct dyes on cotton
- To carry out after treatment of dyed cotton fabrics using copper salts ($CuSO_4$)
- Compare wet – fastness properties before and after subsequent treatments

1.2 Theoretical Background

Direct dyes are so called because they dye cellulosic such as cotton without the need for a mordant. Direct dyes are anionic in nature. These dyes are water soluble, even though some of them require the presence of sodium carbonate to dissolve; their solubility increases with an increase in the number of solubilizing groups and with temperature, and decreases in relation to molecular weight.

Direct dyeing of cotton fabrics is influenced by different factors. Among the factors are action of temperature, action of electrolytes (neural and alkaline), liquor ratio and agitation. The major problem of using direct dyes for dyeing cotton fabrics is poor wet fastness characteristics.

1.3 Materials/Chemicals/Equipment's/Apparatus:

Materials/chemicals: Bleached cotton fabric, direct dyes, sodium chloride, Glaubers' salt (sodium sulphate), leveling agent, copper-sulphate, acetic acid (80%), and formic acid (85%).

Equipment's/Apparatus: Weighing balance, scissors, ruler, stirrers, stoves, measuring cylinders, beakers, and other accessories.

1.4 Dyeing and after treatment Recipe

Table 1.1: Dyeing Recipe

	MLR: 1:30 PH : Neutral Dyeing temperature = 90 – 100 ^{0}C Dyeing time = 30 – 45 min			
Chemicals used	**Concentration**			
	Test 1	**Test 2**	**Test 3**	**Test 4**
Direct dye (% o.w.f.)	0.5 -1	0.5 - 1	0.5 -1	0.5 -1
Sodium chloride or sodium sulphate (gpl)	15	10	5	0
Leveling agent (gpl)	0.1-0.5	0.1-0.5	0.1-0.5	0.1-0.5

Table 1.2: After treatment recipe

	MLR: 1:30 PH : Acidic Treatment temperature = 50- 70 ^{0}C Treatment time = 30 min

Chemicals used	**Concentration**
Copper sulphate (o.w.f)	1 - 4
Acetic acid (80 %) (o.w.f)	0.5 - 1.5
Formic acid (85 %) (o.w.f)	0.5 – 1 (optional)

1.5 Procedure

1. Prepare the direct dye solution: To prepare the dye solution the dye is mixed with a small quantity of cold water until homogenous paste is obtained. Then enough hot water (about 80^{0}C) is added to the paste to dissolve the dye completely. Finally, leveling agent is dissolved in the dye solution (for dyes difficult to level).

2. Dyeing: Carry out the dyeing process according to the following dyeing cycle.

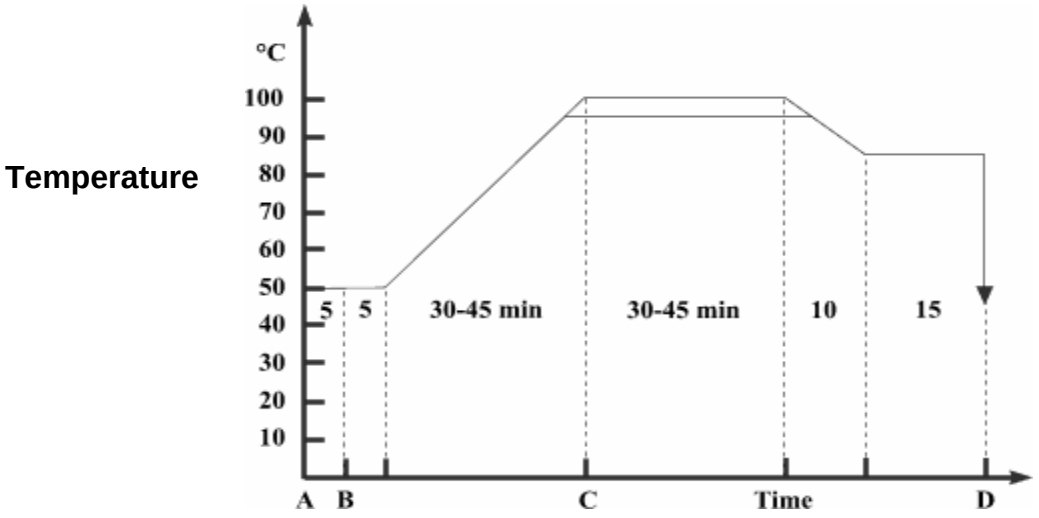


Figure 1.1 Dyeing cycle: Direct dyeing of cotton fabrics

- At 'A' start with the prepared dye solution in a beaker with the fabric sample immersed in it.

- At ‘B’ add 1/5th of the total amount of the neutral electrolyte (sodium chloride or sodium sulphate) required.
- At ‘C’ add 4/5th of the total amount of the neutral electrolyte (sodium chloride or sodium sulphate) required.
- At ‘D’ rinse the sample twice with cold water.
- Dry the dyed fabric.
- Keep half of the dyed sample for wet- fastness treatment.

3. After treatment for fastness improvement:

Prepare after treatment solution: To prepare the after treatment solution acetic acid is dissolved in water and to this the copper sulphate is added and dissolved completely. To acidify the solution formic acid can be added.

Carry out after treatment To carry out after treatment half of the dyed cotton fabric sample is introduced into the prepared solution at 50 – 70 ^{0}C and is kept there for half an hour. It is then washed well and if necessary 10mins soaping at 40 – 50 ^{0}C can be carried out.

Self-Check-2	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. Define what is dye worksheet? (1 point)
2. List down different components of dye worksheets! (5 points)

Note: **Satisfactory rating – 4 and above points Unsatisfactory - below 4 points**

You can ask you trainer for the copy of the correct answers.

Answer Sheet

Score = _____
Rating: _____

Name: _____ **Date: _____**

Short Answer Questions

1. _____

   _____

2. _____

   a. _____

   b) _____

   c) _____

   d) _____

   e) _____

Information Sheet-3	Applying dyeing OHS practice

Introduction

OHS Practice includes three main activities at work place. This includes: Hazard identification and control, Risk assessment and Risk reduction measures implementation.

3.1 Hazard identification and control:

Introduction:

Concepts of hazards:

Hazard: Anything (e.g. condition, situation, practice, behavior) that has the potential to cause harm.

Hazard Identification:

This is the process of examining each work area and work task for the purpose of identifying all the hazards which are “inherent in the job”.

Types of Hazards in a Workplace:

Commonly they are of five types. These are ergonomic hazards, physical hazards, biological hazards, chemical hazards and psycho- social hazards.

Ergonomic hazards:

Ergonomic hazards are problems that can occur when a worker’s physical workplace do not match up with his physical size or work positions. These types of hazards may occur in both office and industrial settings. Example: poor seating in computer class and weaving class.

Physical hazards:

These are workplace hazards that can affect the body. They may include radiation and excessive noise levels, falls.

Chemical hazards:

This may result if an employee inhales or absorbs harmful chemicals through his mouth, nose or via skin contact. Chemical hazards can come in several forms, such as liquids, vapors, gases or solids.

Biological work hazards:

It may occur if workers are exposed to living organisms, such as parasites, viruses, fungi and bacteria. These types of work hazards may also come from toxins.

Psycho-social hazards:

This can arise out of the many different ways that people interact with each other. This type of hazard may show up as negative work place conditions like bullying, violence or sexual harassment. This is due to stress outside or inside the work place, the type of work being done or the attitudes and behaviors that different people bring to their jobs.

Contributing factors for work place hazards:

These are categorized into four (4) types. People, materials, equipment and environment.

***Materials*:** Thinking about whether a material is proper for the job or not.

Environment: It refers to how conditions around workers and supervisors further impact hazard and work place safety. Example- are wor areas too cold or too hot?

Equipment's: this is determining whether equipment, tools and even protective equipment are proper for the job.

People: this is considering how the action or no-action of people influences work place hazards and situations.

3.2 Risk assessment :

Risk Assessment Is defined as the process of assessing the risks associated with each of the hazards identified so the nature of the risk can be understood. This includes the nature of the harm that may result from the hazard, the severity of that harm and the likelihood of this occurring.

Risk Assessment Procedure

The risk assessment procedure can best be illustrated in the following way.

Step-1: identify hazards

Step-2: Assess Risks

Step-3: Control Risks

Step-4: Review created measures

Step 1: Identify Hazards

In order to identify hazards the following are recommended:

a. Past incidents/accidents are examined to see what happened and whether it could occur again.

f) Employees be consulted to find out what they consider are safety issues.

g) Work areas are inspected to find out what is happening now. Identified hazards should be documented to allow further action.

h) Information about equipment (e.g. plant, operating instructions) and Material Safety Data Sheets are reviewed to determine relevant safety precautions.

i) Welcome creative thinking about what could go wrong takes place, i.e. what hazardous event could take place here?

Step 2: Assess Risks

It involves considering the possible results of someone being exposed to a hazard and the likelihood of this occurring. It determines how severe a risk is and existing control measures are effective.

A risk assessment should include:

i. Identify factors contributing to the risk.

ii. Review health and safety information from source and its particular hazard.

iii. Evaluation of how severe the harm could be. This is types of injuries.

iv. Determining the likelihood of harm occurring. The level of risk will increase as the likelihood of harm and its severity increases.

v. Identify the actions necessary to eliminate or control the risk.

vi. Identify records that it is necessary to keep to ensure that the risks are eliminated or controlled.

Step 3: Controlling Risks

Once a risk rating is determined, each hazard has its risk control measures evaluated using the Evaluation of Control Effectiveness Table. This allows for determination of any additional requirement necessary.

Evaluation of Control Effectiveness Table

Well Designed Control ?		Effectively Implemented ?	
3	Needs improvement	3	Deficient *(b)*
2	Adequate	2	Marginal
1	Strong	1	Effective

Step 4: Implement additional risk controls

The Hierarchy of Controls (see diagram below) ranks control options from highest level of protection and reliability to lowest. This should be used to determine the most effective control/s.

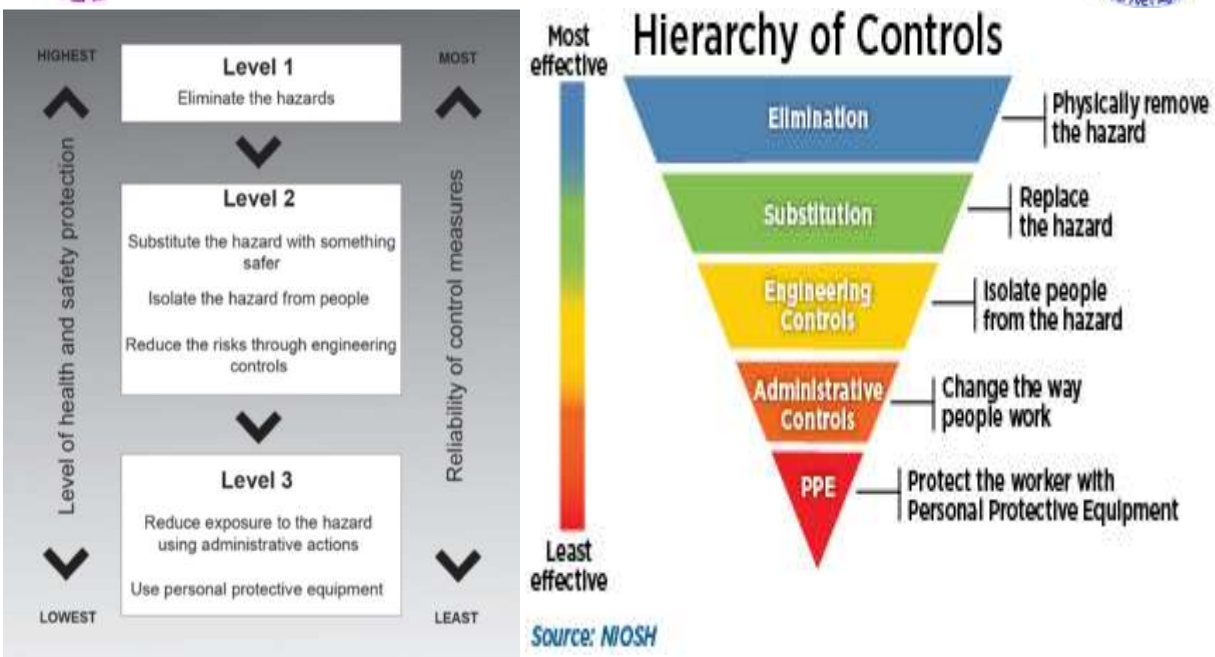


Figure: Hierarchy of Controls:

Level 1 Control Measures:

It is eliminating the hazard and associated risks. It is the most effective control measures. This can be achieved through removing the hazard or selecting alternate products or equipment to eliminate the risk. If a hazard cannot be eliminated then risks can be minimized by lower control measures

Level 2 Control Measures:

This is used to minimize the risks by involving following as separate or as a combination.

a. *Substitute the hazard:* substitute method or material to reduce the risk or hazard.

- *Isolate the hazard:* separate the hazard from the workplace or people. Example- Chemical store room kept locked except to an authorized person.

b. *Use engineering controls:* Modify existing machinery or plant or purchase different machinery to provide a physical solution. Example: Guard rails.

Level 3 Control Measures:

These are control options that are considered last as they do not control the source of the hazard but rely on human behavior or supervision and are therefore less effective. They include;

i. ***Administrative Procedures*:** Develop work methods or procedures to reduce the conditions of risk.

a. Written Safe Operating Procedures

b. Job rotation to restrict hours worked on difficult jobs.

c. Staff trained in the correct operating procedures.

ii. ***Use Personal Protective Equipment:*** this offer the lowest level of protection and the last resort to deal with the hazard, where the hazard cannot be removed.

Example:

a. Handling of chemicals – gloves, safety glasses, aprons.

b. Protecting eyes from flying particles.

c. Protecting feet – safety boots.

Step 5: Monitor and Review

Hazard identification, risk assessment and control are an on-going process. Therefore, regularly review the effectiveness of your hazard assessment and control measures. Make sure that you undertake a hazard and risk assessment when there is a change to the workplace including when work systems, tools, machinery or equipment change.

The effectiveness of control measures can be checked through regular reviews as well as consultation with workers.

3.3 Risk reduction measures implementation:

Specifically to this competence Risk reduction measures implementation may include. Manual handling techniques, Standard operating procedures, Personal protective equipment , Safe materials handling, Taking rest breaks, Ergonomic workplaces arrangement , Following marked walkways, Safe equipment storage, Housekeeping,

Reporting accidents and incidents and Environmental practices. These are explained as follow.

3.3.1 Manual Handling Techniques

Manual handling refers to any activity that requires the use of force to lift, lower, push, pull, carry or move a person, animal or object. By observing simple, safe manual handling methods, you can avoid manual handling injuries. Have a look at Darren's story, below. Incorrect manual handling can cause different types of injuries. Long-term injuries can include damage to the spine and joints. Short-term injuries include sprained ligaments or torn/strained muscles.

Preparing for a manual handling job:

There are a few easy steps you can follow to make sure that you're ready for a manual handling task.

j) Warm up:

Just as you'd warm up before taking part in sports or exercise, you need to warm up before you handle a heavy load.

k) Check the load:

Have a good look at the load. Check for:

- Areas where you can get a firm grip on the load
- The overall size and shape of the load
- The weight of the load, loads that are less than 20kg handle manually and beyond that, you should use equipment such as a fork lift to move these loads.

l) Move yourself into position:

Get close to the load and put yourself in the best position to handle the load.

Safe lifting methods:

Lifting a heavy object can strain your back and knees. There are 10 safe steps to follow when you have to lift a heavy object.

Assess the load → Get close to the load → Set your feet apart for balance



Lower your head ← lower body and bend your knees ← Relax your knees



Get a firm grip → Raise your head and look ahead → Straighten your legs



Lift; turn your leg before walk

3.3.2 Standard operating procedures:

A standard operating procedure is a set of step-by-step instructions compiled by an organization to help workers carry out complex routine operations.

It is aimed to achieve efficiency, quality output and uniformity of performance, while reducing miscommunication and failure to comply with industry regulations. Different templates may be used to develop SOP.

3.3.3 Personal protective equipment:

Personal protective equipment (PPE) refers to protective clothing, helmets, goggles or other garments or equipment designed to protect the wearer's body from injury or infection.

3.3.4 Safe materials handling:

Material handling involves short-distance movement within the confines of a building or between a building and a transportation vehicle. It utilizes a wide range of manual, semi-automated and automated equipment and includes consideration of the protection, storage, and control of materials throughout their manufacturing, warehousing, distribution, consumption, and disposal. Example-using Overhead systems, Conveyer systems, Underground systems and etc.

3.3.5 Taking rest breaks:

An employer should give an employee enough breaks to make sure their health and safety isn't at risk. It is of 3 types:

a. Rest breaks at work,
b. Daily rest and
c. Weekly rest.

a. Rest breaks at work:

Workers have the right to one uninterrupted 20 minute rest break during their working day, if they work more than 6 hours a day. This could be a tea or lunch break.

The break doesn't have to be paid - it depends on their employment contract.

b. Daily rest:

Workers have the right to 11 hours rest between working days, eg if they finish work at 8pm, they shouldn't start work again until 7am the next day.

c. Weekly rest:

Workers have the right to an uninterrupted 24 hours without any work each week

3.3.6 Ergonomic workplaces arrangement:

Workplace ergonomics is the practice of designing workspace in a way intended to minimize employee health risks and increase employee productivity, thus reducing employer costs. Try to observe the following two figures!

Benefits of superior ergonomics:

- ❖ Happier employees
- ❖ Higher production
- ❖ A greater safety commitment and etc.

3.3.7 Following marked walkways:

The uses of marked walkways are:

- ❖ Separate workers from machines and moving equipment:
- ❖ Warn of hazardous areas

- Provide instruction and etc.

Industrial environments can be hazardous, particularly if one is not familiar with the activities. A simple way to stay out of harm's way is to:

- Keep your eyes open
- Observe all signage
- Stay behind barricades
- And use marked walkways at all times

3.3.8 Safe equipment storage:

Create a plan for storing all equipment and materials at your site. Assign a specific location to each item or type of item and label the space accordingly. Make certain that work areas and walkways are kept clear of all stored items. Use tape or paint to identify such areas on the floor of a large area, such as a manufacturing facility. In an office, laboratory or similar smaller setting, use cabinets with doors that close securely. Always leave at least 1.5 feet between the top of stored items and fire sprinklers, if present. Make sure that all stacks are solid and secure them whenever possible.

3.3.9 Housekeeping:

Housekeeping refers to the management of duties and responsibilities involved in the running of a household, such as cleaning, cooking, home maintenance, shopping, laundry and any activities performed in house. These tasks may be performed by any of the household members or by other persons hired to perform these tasks. The term is also used to refer to the money allocated for such use.

3.3.10 Reporting accidents and incidents:

Accidents and unexpected incidents at work are something you try to avoid. But they can happen. This all starts, with reporting. Employees should report all accidents and incidents to their employer by filling to the accident book. Employers should investigate all reports and notify their insurance company.

Accident reports can be used to:

- Gather information
- Identify problems

- Prevent it from happening again
- Provide training
- Improve management skills
- Comply with legal requirements and etc.

In any case, it's best to report and investigate accidents quickly. You can get more information while the incident is fresh in everyone's minds. And, the quicker you act to fix any problems found, the less risk of it happening again.

3.3.11 Environmental practices

The term best environmental practice means the application of the most appropriate combination of environmental control measures and strategies. These may include: recycling and re-use; saving resources, avoiding the use of hazardous substances and etc.

Self-Check -3	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. Try to define the word hazard. (1point)
2. List and discuss different type's work place hazards. (5points)
3. List and discuss hazards contributing factors. (4points)
4. List risk assessment procedures. (4points)
5. Draw and analyze hierarchy of controls. (5points)
6. List at all risk reduction measures implementation. (11points)

Note: **Satisfactory rating – 16 and above points Unsatisfactory - below 16 points**

You can ask you trainer for the copy of the correct answers.

Answer Sheet

Score = _____
Rating: _____

Name: _____ **Date:** _____

Short Answer Questions

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____

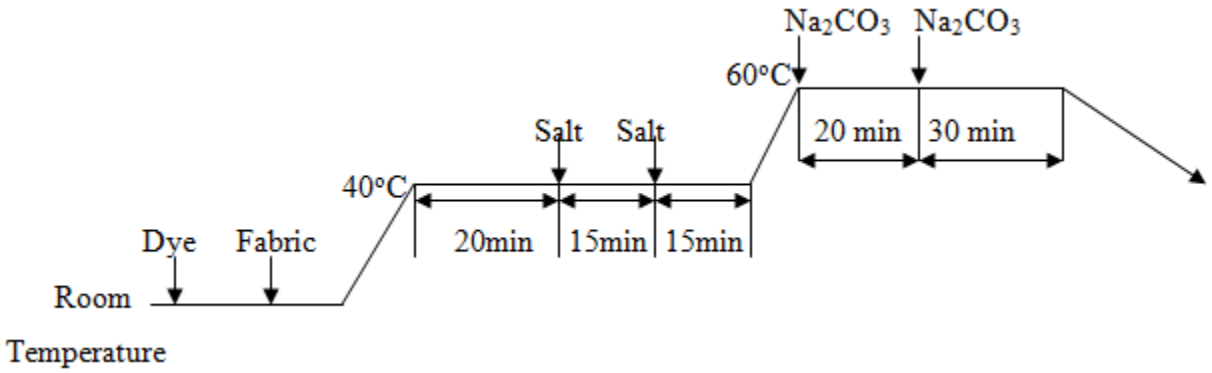
Information Sheet-4	Loading dye and dyeing chemicals

Introduction

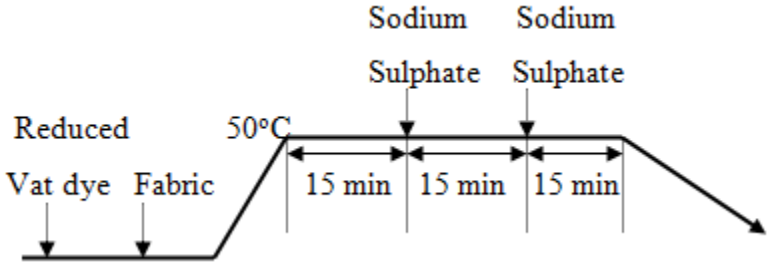
Loading is the process of putting dyes or auxiliaries on the digital weighing balance to determine its required weight for dyeing purpose.

After specific dyes and its auxiliaries are weighed to their standard given, they are loaded to the dyeing machines according their procedures for each dye type.

How to load reactive dye and its dyeing chemicals:



How to load vat dye and its dyeing chemicals:

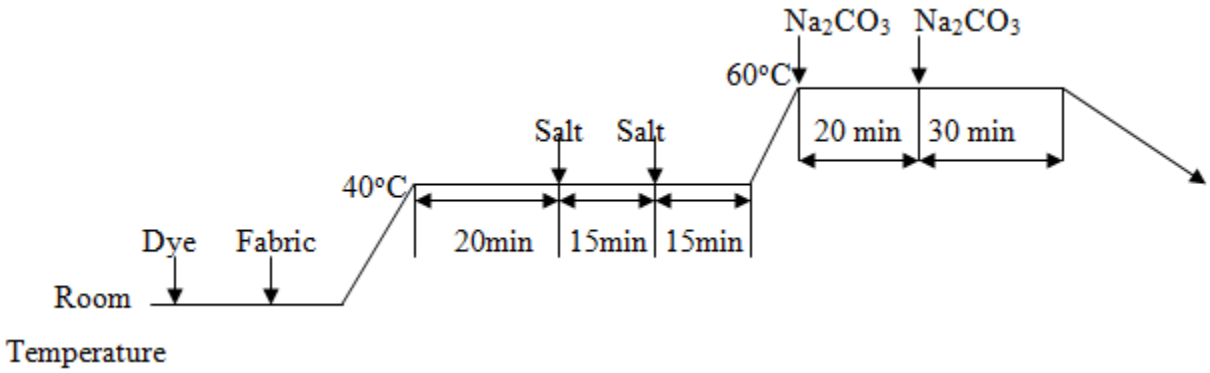


Generally all dyes have their own procedures to load dyes and their chemicals separately.

Self-Check-4	Written Test

Instructions: Perform the following tasks. Write your answers in the answer sheet provided:

1. Try to interpret the following dye and chemical loading process. (14 points)



Note: **Satisfactory rating – 15 and above points Unsatisfactory - below 15 points**

You can ask your trainer for the copy of the correct answers.

Answer Sheet

Score = _____
Rating: _____

Name: _____ Date: _____

1. _____
   _____

2. _____
   _____

Information Sheet-5	Weighing and loading Yarn or fabric

Weighing (using a weighing scale) is an entirely acceptable way of measuring mass of the textile samples to be dyed i.e. yarn or fabric for this lesson.

A device used to measure weight or mass is known as beam balance. These are also known as mass scales, weight scales. The system is made up of a weigh scale indicator. Before the textile samples (yarn or fabric) are weighed, the weighing device must be calibrated first.

Calibration is the process of testing the scale, to ensure the level of accuracy you require. In a laboratory setting, results are dependent upon exact scale calibration.

An inaccurate scale could significantly hurt your results. Incorrect measurements could result in product quality issues or scrapped batches. The most common practice is the following: start with zeroing the instrument without any load.

Procedures of weighing yarn or fabric for dyeing:

Option-1

- **a.** With nothing on the pan, set to zero by pressing the "on" button.
- **b.** Place weighing bottle or vial on balance and set to zero again.
- **c.** Transfer sample into container slowly, until you reach the desired mass and then write down the result.

Option-2

- **a.** With nothing on the pan, set to zero by pressing the "on" button.
- **b.** Place the sample on to weighing balance slowly, until you reach the desired mass and then write down the result.

Finally after the desired yarn or fabric weight is achieved, it is loaded on to dyeing machines.

Self-Check-5	Written Test

Instructions: Perform the following tasks. Write your answers in the answer sheet provided:

1. What is calibration? (1point)
2. Write down the two options of yarn or fabric weighing procedure. (2points)

Note: **Satisfactory rating – 2.5 and above points Unsatisfactory - below 2.5 points**

You can ask your trainer for the copy of the correct answers.

Answer Sheet

Score = _____
Rating: _____

Name: _____ **Date:** _____

1. _____

   _____

2. _____

   _____

Information Sheet-6	Reporting non-conforming dyeing materials

Introduction:

Concepts of non-conforming dyeing materials:

These are the dyeing materials which are unknowingly used during dyeing yarns or fabrics. Once they are observed in dyeing process, they must be reported to concerned personnel to fix their solutions unless they lead to faulty dyeing.

These may include:

- Improper mixing of the Softener.
- Batch to batch weight variation of dyes and chemicals.
- Dyes lot variation.
- Entanglement of fabric.
- Faulty injection of alkali.
- Hardness of water.
- Improper salt addition.
- Improper dyes solubility.
- Uneven pretreatment (uneven scouring & bleaching).
- Lack of control on dyeing m/c

Self-Check – 6	Written Test

Instructions: Perform the following tasks. Write your answers in the answer sheet provided:

1. List at least 10 non-conforming dyeing materials. (10 points)

Note: **Satisfactory rating – 6 and above points Unsatisfactory - below 6points**

You can ask your trainer for the copy of the correct answers.

Answer Sheet

Score = _____
Rating: _____

Name: _____ **Date:** _____

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____

Information Sheet-7	Keeping working area and machine clean

Introduction:

Cleaning is the process of removing unwanted substances, such as dirt, infectious agents and other impurities from an object or environment.

Different workplaces and machines require different methods of cleaning.

Methods of work place cleaning:

Cleaning is broadly achieved through mechanical action or solvent action; many methods rely on both processes.

Example:

- **Washing:** usually done with water and often some kind of soap or detergent
- **Acoustic cleaning:** the use of sound waves to shake particulates loose from surfaces. Example-Ultrasonic cleaning, using ultrasound, usually from 20–400 kHz
- **Dry cleaning of clothing and textiles:** using a chemical solvent other than water
- **Flame cleaning** of structural steel with an oxyacetylene flame

In general by whatever cleaning methods, work place must be cleaned and neat.

Ways of working area cleaning:

1. Use proper storage for every thing
2. Get rid of what you don't use
3. Move to a paperless office (using different programs)
4. Organize your cables and etc. Because Cables can cause excess dust.

Immediately clean dyeing machine to avoid dye staining. The scope of dyeing machines cleaning is up to, its outer surface and its interior parts as well. The interior parts and some outer parts are washed with hot water and detergent. The other outer parts are polished to remove dusts and dirty. Because these dusts or dirty will deteriorate the machine surface and reduces its life span too.

Generally working area and dyeing machine must be kept clean at any time.

Self-Check – 7	Written Test

Instructions: Perform the following tasks. Write your answers in the answer sheet provided:

1. List the two actions used to achieve cleaning. (2points)
2. List the scopes of dyeing machine cleaning. (2points)

Answer Sheet

Score = _____
Rating: _____

Name: _____ Date: _____

1. _____
   a) _____
   b) _____
2. _____
   a) _____
   b) _____

Lists of Reference Materials

1. https://db-excel.com/chemistry-of-tie-dye-worksheet/
2. https://www.osha.gov/shpguidelines/hazard-prevention.html
3. http://www.worksafeforlife.ca/Portals/worksafeforlife/CareerColleges/WCBNS_
4. https://www._Hazard_Identification,_Risk_Assessment_and_control_Procedure.pdf
5. https://occupational_health/manual_handling.html
6. https://www.gov.uk/rest-breaks-work
7. https://www.bing.com/search?q=ergonomic+workplaces&form
8. https://www.bing.com/search?q=concepts+of+housekeeping&form
9. https://www.haspod.com/blog/management/reporting-accidents-incidents-at-work
10. https://www.haspod.com/blog/management/reporting-accidents-incidents-at-work
11. https://blog.beamex.com/weighing-scale-calibration-how-to-calibrate-weighing-instruments
12. http://blog.fabricuk.com/understanding-fabric-weight/
13. https://en.wikipedia.org/wiki/Cleaning
14. https://www.bing.com/search?q=personal+protective+equipment&form
15. Textile Coloration Lab. Manual, Bahir Dar University, Institute of Technology for Textile, Garment and Fashion Design (iOTEX)

Textile chemical processing

NTQF Level – II

Learning Guide# 18

Unit of Competence: Load and operate dyeing equipment

Module Title: Loading and operating dyeing equipment

LG Code: IND CHP02 M06 0919LO2-LG18

TTLM Code: IND CHP02 TTLM6, 0919v1

LO2. Operate and monitor dyeing machine

Instruction Sheet	Learning Guide #18

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:

2.1 Starting and stopping dyeing machine

2.2 Monitoring dyeing operation

- 2.2.1 Dyeing
- 2.2.2 Drying
- 2.2.3 Washing
- 2.2.4 Treatments
- 2.2.5 Atmospheric dyeing
- 2.2.6 Pressure dyeing
- 2.2.7 Dyeing regime
- 2.2.8 Dye uptake
- 2.2.9 Levelness
- 2.2.10 Binding or fixation
- 2.2.11 Discharging effluent

2.3 Sorting waste

2.4 Cleaning tank or machine

2.5 Identifying and correcting minor faults

2.6 Reporting major machine faults

This guide will also assist you to attain the learning outcome stated in the cover page. Specifically, upon completion of this Learning Guide, you will be able to:

- Start and stop dyeing machine according to manufacturer requirements.
- Start and stop dyeing machine to ensure conformance with dye worksheet.
- Waste is sorted.
- Clean tank or machine when required.
- Identify and correct minor faults where necessary to meet specified requirements and are reported.
- Report major machine faults or incorrect dyeing.

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described in number **3 to 7.**
3. Read the information written in the information “Sheet 1, Sheet 2, Sheet 3, Sheet 4, Sheet 5 and Sheet 6” respectively.
4. Accomplish the “Self-check 1, Self-check 2, Self-check 3, Self-check 4, Self-check 5 and Self-check 6” in page - 44, 52, 56, 59, 64 and 67 respectively.
5. If you earned a satisfactory evaluation from the “Self-check” proceed to “Operation Sheet 1 and Operation Sheet 2” in page -46 and 47 respectively.
6. Do the “LAP test” in page – 48 (if you are ready).
7. If you earned a satisfactory evaluation proceed to “Learning Guide # 19”. However, if your rating is unsatisfactory, see your teacher for further instructions or go back to Learning Guide #18.

Information Sheet-1	Starting and stopping dyeing machine

Introduction:

There are different types dyeing machines. Example: Winch dyeing machine, Jig dyeing machines, Beam dyeing machines, Jet dyeing machines, Garment dyeing machines and etc. Any dyeing machines is started and stopped according to its dye worksheet. Specifically the following description tells us about jigger and winch dyeing machines in detail.

Jigger dyeing machine:

It is particularly useful for fabrics woven fabrics. The open-width fabric passes from one roller through the dye bath 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. As in winch dyeing, the fabric moves through a stationary bath, which is stirred only by the movement of the fabric through it. The rate of dyeing depends on the amount of liquor retained by the fabric, the degree of exhaustion in the dwell period and the extent of liquor exchange during the next dip.

Winch dyeing machine:

It serves for scouring, bleaching, dyeing, washing-off and softening processes. This type of winch is preferred when fabric is stretching, specifically knitted fabric. The two edges of the fabric are sewn together to form a continuous rope. The winch rotates to load and unload the fabrics within the dye bath. The fabric rope is held on the winch by friction and its own weight.

Generally all dyeing machines have their own working manuals. These manuals contain the working procedures which intend us how to start and stop any dyeing machine separately. So any operator need to use the working manual in order free from any danger and to have quality results too.

Self-Check 1	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. List at least 3 types of dyeing machines. (3 points)
2. Of winch and jigger dyeing machine which one is used for woven fabrics? (1 points)

Note: **Satisfactory rating – 3 and above points** **Unsatisfactory - below 3 points**

You can ask you trainer for the copy of the correct answers.

Answer Sheet

Score = _____
Rating: _____

Name: _____ **Date:** _____

Short Answer Questions

1. _____
   a. _____
   b. _____
2. _____

Operation Sheet #1	Operation of jigger dyeing machine

Purpose:

- To operate and monitor jigger dyeing machine

Equipment, Tools & materials:

- Jigger dyeing machine, reactive dyes, woven fabrics, beaker, measuring cup, sodium chloride, sodium carbonate, soap powder, different safety tools and equipment.

Conditions or situations for the operations:

The operation is take place in Standard temperature & closed machine lid.

Quality criteria:

- Uniform shade
- Good color fastness ant etc.

Operation procedures:

A. Fabric is wetted with water and wound around the two cylinders of jigger carefully without folds.

B. Add dyeing solution in the trough of jigger and heat the solution and start dyeing.

C. After dyeing has been carried out at 40oC for 20 min, half of sodium chloride dissolved with 100ml water is added in the trough, the remaining sodium chloride is added after 35 min of dyeing time. (Given parameters are: MLR: 1:5, Reactive dye (%o.w.f.)=1, NaCl=20gm, Na2CO3=15gm, water=1L)

D. After 15 min, the temperature of the dye bath is elevated up to 60oC, and then half of sodium carbonate dissolved with 100 ml water is added in the trough. After 20 min the remaining sodium carbonate is added.

E. After 30 min, remove dyeing solution from the trough and add cold water in the trough, to wash the dyed fabric for 5 min. Then, wash the fabric with hot water (70-80^{o}C) for 5min.

F. Dyed fabric is soaped at 95^{o}C for 10 min.

G. The fabric is washed with hot water for 5min and washed with cold water for 5 min and then dried.

Operation Sheet #2	Operation of Winch dyeing machine

Purpose:

- To operate and monitor winch dyeing machine

Equipment, Tools & materials:

- winch dyeing machine, dyes and its auxiliaries, knitted fabrics, beaker, measuring cup, soap powder, different safety tools and equipment.

Conditions or situations for the operations:

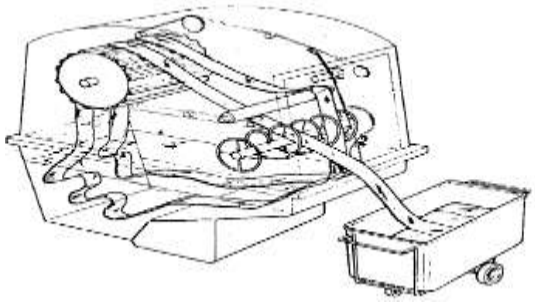
The operation is take place in Standard temperature & closed machine lid.

Quality criteria:

- Uniform shade
- Good color fastness ant etc.

Operation procedures:

a. Load the dye mixture into dye bath
b. Pass one edge of the fabric over the winch and the other edge below winch.
c. Then, sew them together to form a continuous rope. This rope passes from the dye bath over two elevated reels and then falls back into the bath see Figure below.



d. Set dyeing parameter (temp, time and rate) from control panel by pressing Mode.
e. Then execute the set data.
f. Close the machine to avoid steam and heat losses when dyeing.

2. Finally start running.

LAP TEST	Practical demonstration

Name_____ Date_____

Time started_____ Time finished_____

Instructions:

Task-1. Operate and monitor jigger dyeing machine. (5points)

Task-2. Operate and monitor winch dyeing machine (5points)

Task-3. Request your instructor for evaluation & feed buck.

Information Sheet-2	Monitoring dyeing operation

Introduction

2.1 Dyeing

It is a method for coloring a textile material in which a dye is applied to the substrate in a uniform manner to obtain an even shade with a performance and fastness appropriate to its final use. So during dyeing all the dyeing parameters (time, temp. pressure and MLR) must be controlled by the operator to achieve quality dyeing.

2.2 Drying

Drying is necessary to eliminate or reduce the water content of the fibers, yarns and fabrics following wet processes. Water evaporation leads to increase in dye concentration. Drying in particular by water evaporation, is a high-energy consuming step. Drying techniques may be classified as mechanical or thermal. Mechanical processes are used in general to remove the water which is mechanically bound to the fiber. Thermal processes consist in heating the water and converting it into steam. Heat can be transferred by means of:

- Convection
- Infrared radiation
- Direct contact and etc.

2.3 Washing

Washing is the activity intended to remove residual or excess chemicals remained on the dyed samples. This washing is carefully performed to the samples either open width or rope form. After washing the sample will be rinsed.

2.4 Treatments

The objective of this process is either for removing the unfixed dye by washing with surfactants (dispersing effect) or reducing the solubility of the dye by blocking the hydrophilic groups (enlargements of the molecule). So this must be monitored depending on its objective.

2.5 Atmospheric dyeing

It is a type of dyeing machine. It is suitable for all cotton fabrics.

2.6 Pressure dyeing

In the absence of pressure in this dyeing process, dye molecules will not penetrate inside the material. They will stay on surface only. In this method, temperature is kept in between 105-140°C and pressure is kept from 0 to 170 kPa. Polyester dyeing uses such method.

2.7 Dyeing regime

Dyeing regime is defined as dyeing rules and regulation that is followed by the operator. May be it contains a set of instructions.

2.8 Dye uptake

Dye up take is the property or ability of textile fiber to capture the given amount of dye. This property varies fiber to fiber and depends on dye sites, orientation in a fiber.

2.9 Levelness

It is uniformity in shade over the surface of a piece of dyed fabric or along the length of dyed yarn. In general level dyeing is promoted by good agitation, careful control of the rate of rise of the temperature of the dye bath, control of PH, and sometimes by use of special leveling agents or retarders. It is often the case that the dyes that level most easily are the least wash fast.

2.10 Binding or fixation

Fixation is a formation of the “final “bond between the dye and the fiber with the mechanisms such as ionic bonding and hydrophobic forces.

Fixation can be of two types. I.e. fully continuous or simple batch operations. Fully continuous fixation usually involves heating the material in saturated steam, in hot air, or by contact with heated metal cylinders. Sometimes, when using two different types of dyes, a second fixation step is preceded by application of additional chemicals in a second pad unit.

In semi-continuous dyeing processes, fixation is usually a batch process. This can be as simple as storing a covered roll of impregnated fabric overnight or fixation with an appropriate solution of chemicals in a conventional batch dyeing machine.

Generally In both types of fixation process, the operators need to monitor all its parameters to ensure it better fixation.

2.11 Discharging effluent

Specifically to this unit of competence, discharging effluent is the process of removing dyeing wastes from workplace area. Effluent is any type of generated at work place.

Self-Check- 2	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. List down different operations to be monitored before, during and after in dyeing process. (5 point)

Note: **Satisfactory rating – 3.5 and above points** **Unsatisfactory - below 3.5 points**

You can ask you trainer for the copy of the correct answers.

Score = _____
Rating: _____

Answer Sheet

Name: _____ **Date:** _____

Short Answer Questions

1. _____
   a. _____
   b. _____
   c. _____
   d. _____
   e. _____

Information Sheet-3	Sorting waste

Introduction

Concepts of waste sorting:

Waste sorting is the process by which waste is separated into different elements. Waste sorting can occur manually or automatically. Hand sorting was the first method used in the history of waste sorting.

A separation of waste at the beginning of the process supports the treatment of the waste and helps to raise the efficiency of the facilities which deals with the waste. Wastes may become resources if they are properly segregated and utilized. Different wastes have different properties. Waste treatment procedures follow those properties to manage that waste.

Waste Classification:

We have classified all our wastes according to different points of view.

Depending on the states of the wastes, wastes are classified as-

A. Solid Waste (solid in nature).
B. Liquid Waste (such as wastewater that is mixed with different dyes & chemicals),
C. Gaseous Waste (Smoke or gas emitted from combustion channels like generators, boilers, dryers etc.).

According to the potential degree of hazard, wastes have been classified as-

A. Hazardous Waste (H)
B. Low – hazardous Waste (L H)
C. Non – hazardous Waste (N H)

According to production point of view, wastes has also been classified as-

A. Production Waste (Generated directly from production process).
B. Non Production Waste (Not directly associated with production).

Generally Work place generated waste is not a waste until it is properly disposed of. It can be either a resource or a hazard. That is why it has to be segregated as resource

material or hazard substance as early as possible. Hazardous wastes should be separated from other wastes since hazardous waste may contaminate the potential of non-hazardous wastes.

Self-Check -3	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. Define the word waste sorting. (1point).
2. List down the two methods of waste sorting. (2points).
3. Try to classify the waste according to different viewpoints. (3points).

Note: **Satisfactory rating – 4 and above points** **Unsatisfactory - below 4 points**

You can ask you trainer for the copy of the correct answers.

Answer Sheet

Score = _____
Rating: _____

Name: _____ **Date:** _____

Short Answer Questions

1. _____
2. _____
   a. _____
   b. _____
3. _____
   a. _____
      _____
      _____
      _____
   b. _____
      _____
      _____
      _____
   c. _____
      _____
      _____
      _____

Information Sheet-4	Cleaning tank or machine

Introduction

Dyeing machine tank or machine cleaned either manually or by automatic tank cleaning machine. An automated tank cleaning machine is a machine used to clean cargo, process, underground storage tanks and similar equipment such as those found in tank dye tank, oil tankers, food and beverage manufacturing facilities, chemical processing plants, ethanol plants, and brewing facilities.

Generally dye tank cleaning is used to avoid staining of dyes to different bodies of dyeing machine. In addition to this, cleaning can avoid dye contamination also.

Self-Check-4	Written Test

Instructions: Perform the following tasks. Write your answers in the answer sheet provided:

1. What is the purpose of dye tank cleaning? (1 points)
2. List down methods of dye tank cleaning methods. (2 points)

Note: **Satisfactory rating – 2.5 and above points Unsatisfactory - below 2.5 points**

You can ask your trainer for the copy of the correct answers.

Answer Sheet

Score = _____
Rating: _____

Name: _____ **Date:** _____

1. _____
   _____

2. _____
   _____

Information Sheet-5	Identifying and correcting minor faults

During dyeing any textile materials, we encounter different dyeing faults. These may include: uneven dyeing, Batch to Batch Shade variation, Patchy dyeing effect, Crease/ Wrinkle mark, Dye spot, Softener Mark and etc. so their causes and remedies are discussed below.

Uneven Dyeing:

Causes:

- Uneven pretreatment (uneven scouring & bleaching).
- Improper color dosing.
- Uneven heat-setting in case of synthetic fibers.
- Lack of control on dyeing m/c

Remedies:

- By ensuring even pretreatment.
- By ensuring even heat-setting in case of synthetic fibers.
- Proper dosing of dyes and chemicals.
- Proper controlling of dyeing m/c

Batch to Batch Shade Variation:

Causes:

- Fluctuation of Temperature.
- Improper dosing time of dyes & chemicals.
- Batch to batch weight variation of dyes and chemicals.
- Dyes lot variation.
- Improper reel speed, pump speed, liquor ratio.
- Improper pretreatment.

Remedies:

- Use standard dyes and chemicals.
- Maintain the same liquor ratio.
- Follow the standard pretreatment procedure.
- Maintain the same dyeing cycle.
- Identical dyeing procedure should be followed for the same depth of the Shade.
- Make sure that the operators add the right bulk chemicals at the same time and temperature in the process.
- The pH, hardness of supply water should check daily.

Patchy Dyeing Effect:

Causes:

- Entanglement of fabric.
- Faulty injection of alkali.
- Improper addition of color.
- Due to hardness of water.
- Due to improper salt addition.
- Dye migration during intermediate dyeing.
- Uneven heat in the machine, etc.

Remedies:

- By ensuring proper pretreatment.
- Proper dosing of dyes and chemicals.
- Heat should be same throughout the dye liquor.
- Proper salt addition.

Roll to Roll Variation or Meter to Meter Variation:

Causes:

- Poor migration property of dyes.
- Improper dyes solubility.
- Hardness of water.
- Faulty m/c speed, etc

Remedies:

- Use standard dyes and chemicals.
- Proper m/c speed.
- Use of soft water.

Crease Mark:

Causes:

- Poor opening of the fabric rope
- If pump pressure & reel speed is not equal

Remedies:

- Proper opening of fabric rope.
- Maintaining proper reel sped & pump speed.
- Higher liquor ratio

Dye Spot:

Causes:

- Improper Dissolving of dye particle in bath.
- Improper Dissolving of caustic soda particle in bath.

Remedies:

- By proper dissolving of dyes & chemicals
- By passing the dissolved dyestuff through a fine stainless steel mesh strainer, so that the large un-dissolved particles are removed.

Softener Mark:

Causes:

- Improper mixing of the Softener.
- Improper running time of the fabric during application of softener.
- Entanglement of the fabric during application of softener

Remedies:

- Maintaining proper reel sped & pump speed.
- Proper Mixing of the softener before addition.
- Prevent the entanglement of the fabric during application of softener

Self-Check-5	Written Test

Instructions: Perform the following tasks. Write your answers in the answer sheet provided:

1. List down at least 4 dyeing faults and their remedies. (4 points)

Note: **Satisfactory rating – 3 and above points Unsatisfactory - below 3 points**

You can ask your trainer for the copy of the correct answers.

Answer Sheet

Score = _____
Rating: _____

Name: _____ **Date:** _____

#1. Defect type-1: _____

a. Cause:

_____

_____

_____

d. Remedies:

_____

_____

_____

Defect type-2: _____

a. Cause:

_____

_____

_____

b. Remedies:

_____

_____

_____

Defect type-3: _____

a. Cause:

_____

_____

_____

b. Remedies:

_____

_____

_____

Defect type-4: _____

a. Cause:

_____

_____

_____

b. Remedies:

_____

_____

_____

Information Sheet-6	Reporting major machine faults

Major dyeing machine faults are type of faults that are resulted from the any textile machines during processing textile materials than other factors. Once these faults are observed it is the responsibility of the operator report it to the concerned personnel immediately. Some of the major machine faults may include the following:

Snagging:

Snagging appears on the knitted fabric surface, as a pulled up yarn float, showing up in a form of a large loop. It is caused by the pulling or the plucking of yarn from the surface, by the sharp objects. This fault can be seen in Soft flow dyeing, Tumble dryer & Centrifuge etc.

Bowing:

It appears as rows of courses or yarn dyed stripes along the fabric width.

It is caused by uneven distribution of tensions across the fabric width while dyeing or finishing the fabric. It is corrected, by reprocessing of the fabric by feeding it from the opposite end.

***Curling the edge of fabric*:**

When laying the single jersey fabrics on the table the both side salvage may be curling**.**

Folding marks:

Folding marks appear as distinct pressure marks, along the length of the fabric due to high pressure.

GSM Variation:-

The fabric will appear to have a visible variation in density, from roll to roll or within the same roll of the same dye lot. This is due to roll to roll variation in the process parameters (over feed &width wise stretching of the dyed fabric), on the stenter, compactor or calendar machines and due to roll to roll variation in the fabric stitch length.

Stains:

Stains appear as a spots or patches, of grease, oil or dyes of different color in a neat & clean finished fabric's surface. It is a common defect.

Self-Check – 6	Written Test

Instructions: Perform the following tasks. Write your answers in the answer sheet provided:

1. List and discuss at least two different types of major machine faults. (4 points)

Note: **Satisfactory rating – 3 and above points** **Unsatisfactory - below 3 points**

You can ask your trainer for the copy of the correct answers.

Answer Sheet

Score = _____
Rating: _____

Name: _____ **Date:** _____

1. _____
   _____
2. _____
   _____

List of Reference Materials

1. Basic principles of textile coloration
2. T Vickerstaff, *The Physical Chemistry of Dyeing*, 2nd Edn (London: Oliver & Boyd, 1968).
3. J Park, *A Practical Introduction to The Continuous Dyeing of Woven Fabrics* (Leek: Roaches International, 1990).
4. D G Duff and R S Sinclair, *Giles's Laboratory Course in Dyeing* (Bradford: SDC, 1989).
5. W Ingamells, *Colour for Textiles – A User's Handbook* (Bradford: SDC, 1993)
6. https://Textile learner.blogspot.com
7. https://autogarment.com/objective-waste-management-system/
8. https://en.wikipedia.org/wiki/Automated_tank_cleaning_machine
9. https://tarikulislamjony.blogspot.com/2015/12/which-are-major-dyeing-faults-and-what.html
10. https://major-dyeing-faults-and-what.html

Textile chemical processing

NTQF Level – II

Learning Guide# 19

Unit of Competence: Load and operate dyeing equipment

Module Title: Loading and operating dyeing equipment

LG Code: IND CHP02 M06 0919LO2-LG19

TTLM Code: IND CHP02 TTLM6, 0919v1

LO3. Complete dyeing operations

Instruction Sheet	Learning Guide #19

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:

3.1 Unloading yarn or fabric

3.2 Dispatching product

3.3 Completing area cleaning

3.4 Completing production records and other documentation

This guide will also assist you to attain the learning outcome stated in the cover page. Specifically, upon completion of this Learning Guide, you will be able to:

- Unload yarn or fabric.
- Dispatch product to next process.
- Complete cleaning of area to ensure work environment is maintained in a safe and productive manner.
- Complete production records and other documentation accurately.

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described in number **3 to 5.**
3. Read the information written in the information “Sheet 1, Sheet 2, Sheet 3 and Sheet 4, respectively.
4. Accomplish the “Self-check 1, Self-check 2, Self-check 3 and Self-check 4” in page - 73, 77, 79 and 82 respectively.
5. If you earned a satisfactory evaluation proceed to “Learning Guide # 20”. However, if your rating is unsatisfactory, see your teacher for further instructions or go back to Learning Guide #19.

Information Sheet-1	Unloading yarn or fabric

Introduction:

Unloading is the activity performed after dyeing is completed. During this activity, the dyed samples get-rid off or removed from the specific dyeing machine. The dyed packages can be unloaded from dyeing machines in different forms. For example either in fiber forms, Yarn forms or fabric form.

Figure: Fabric forms package

Figure: Yarn forms package

Generally during unloading any dyed textile samples, care must be taken.

Self-Check -1	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. List down the three different package forms dyed materials to be unloaded. (3 points).
2. Describe what is unloading of dyed yarns or fabrics? (1 points)

Note: **Satisfactory rating – 3 and above points** **Unsatisfactory - below 3 points**

You can ask you trainer for the copy of the correct answers.

Answer Sheet

Score = _____
Rating: _____

Name: _____ **Date:** _____

Short Answer Questions

1. _____
   _____
2. _____
   _____

Information Sheet-2	Dispatching product

Introduction

Dispatching is the physical handing of a manufacturing order to the operating facility (a worker) through the release of orders and instructions in accordance with a previously developed plan of activity (time and sequence) established by the scheduling section of the production planning and control department.

Dispatch function in production management executes planning function. Dispatching ensures that the plans are properly implemented. Dispatch function determines, by whom the job shall be done and it co-ordinates production. It is the key point of a production communications system. It creates a direct link between production and sales.

Dispatcher transmits orders to the various shops. A dispatcher is familiar with the productive capacity of each equipment. He always keeps an eye over the progress of orders which move at different speeds on different routes.

Dispatching aspects which have to be taken care of:

A. All production information should be available beforehand.
B. Various order cards and specification drawings should be ready.
C. Equipment's should be ready for use.
D. Progress of various orders should be properly recorded on the Gantt charts or display boards.
E. All production records should be properly maintained.

Dispatch function may be centralized or decentralized.

In a Centralized dispatch system:

A central dispatching department, orders directly to the work station. It maintains a full record of the characteristics and capacity of each equipment and work load against each machine. The orders are given to the shop supervisor, who runs his machines

accordingly. In most of the cases, the supervisor can also give suggestions as regards loading of men and machines under him.

A centralized dispatching system has the following advantages:

- A greater degree of overall control can be achieved.
- Effective co-ordination between different facilities is possible.
- It has greater flexibility
- Because of urgency of orders, changes in schedules can be affected rapidly without upsetting the whole system.
- Progress of orders can be readily assessed at any time because all the information is available at a central place.
- There is effective and better utilization of manpower and machinery.

In a Decentralized dispatching system:

The shop supervisor performs the dispatch factions. He decides the sequence of handling different orders. He dispatches the orders and materials to each equipment and worker and is required to complete the work within the prescribed duration.

In case he suspects delay, with due reasons, he informs the production control department.

A decentralized dispatching system has the following advantages.

a) Shop supervisor knows best about his shop; therefore, the work can be accomplished by the most appropriate worker and the machine.
b) Elaborate reports and duplication of postings can be avoided
c) Communication gap is reduced
d) It is easy to solve day-to-day problems
e) It keeps the natural urge of a section to be self-sufficient.

The advantages of a centralized system, more or less give an idea about the disadvantages of the decentralized system and vice versa.

Self-Check-2	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. Define what is dispatching? (1point)
2. What is the function of dispatching in production management? (1point)
3. List down the aspects of dispatching which have to be taken care of it! (5points)
4. List down the advantages of centralized dispatch system! (6points)
5. List down the advantages of decentralized dispatch system! (5points)

Note: **Satisfactory rating – 9.5 and above points Unsatisfactory - below 9.5 points**

You can ask you trainer for the copy of the correct answers.

Answer Sheet

Score = _____
Rating: _____

Name: _____ **Date:** _____

Short Answer Questions

1. _____

   _____

2. _____

   _____

3. _____
   a. _____
   b. _____
   c. _____
   d. _____
   e. _____
4. _____
   a. _____
   b. _____
   c. _____
   d. _____
   e. _____
   f. _____
5. _____
   a. _____
   b. _____
   c. _____
   d. _____
   e. _____

Information Sheet-3	Completing area cleaning

Introduction

After any work is performed, work area must be cleaned to its standards and get ready for the next activity. Poor floor conditions are a leading cause of incidents so cleaning up spilled oil and other liquids at once is important. Allowing dust to accumulate can also cause incidents. So regularly cleaning the floor can prevent their accumulation.

Areas that cannot be cleaned continuously, such as entrance ways, should have anti-slip flooring. Keeping floors in good order also means replacing any worn or damaged flooring that poses hazard.

Generally area cleaning can use the following equipment and tools. Brooms, detergents, glove, breathing musk, safety clothes and etc.

Self-Check -3	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. List down the consequence of absence of area cleaning. (4 point)
2. List at least 4 types of equipment and tools used in cleaning work area. (4 point)

Note: **Satisfactory rating – 5 and above points Unsatisfactory - below 5 points**

You can ask you trainer for the copy of the correct answers.

Answer Sheet

Score = _____
Rating: _____

Name: _____ **Date:** _____

Short Answer Questions

1. _____
2. _____
   a) _____
   b) _____
   c) _____
   d) _____

Information Sheet-4	Completing production records and other documentation

Introduction

After all dyeing activities are carried out; the operators need to record/write down all dyeing output including amount of dyed yarn or amount of dyed fabric and any problems encountered in work place area. And the recorded data are kept for file in the future.

Documentation is a set of documents provided on paper or online, or on digital or analog media, such as audio tape or CDs.

Procedure and techniques of documentation:

It is vary from sector to sector. In general these may involve documenting drafting, formatting, submitting, reviewing, approving, distributing, reposting and tracking, etc. it could also involve creating content from scratch. Documentation should be easy to read and understand.

Self-Check-4	Written Test

Instructions: Perform the following tasks. Write your answers in the answer sheet provided:

1. What components are recorded and documented in dyeing section? (2 points)
2. What is the purpose of recording and documenting in work area? (1 points)

Note: **Satisfactory rating – 2.5 and above points Unsatisfactory - below 2.5 points**

You can ask your trainer for the copy of the correct answers.

Answer Sheet

Score = _____
Rating: _____

Name: _____ **Date:** _____

1. _____
   _____

2. _____
   _____

Lists of Reference Materials

1. https://www.mbaknol.com/operations-management/dispatch-function-in-production-management/
2. https://www.ccohs.ca/oshanswers/hsprograms/house.html
3. https://www.wikihow.com/Document-a-Process

Textile chemical processing

NTQF Level – II

Learning Guide# 20

Unit of Competence: Load and operate dyeing equipment

Module Title: Loading and operating dyeing equipment

LG Code: IND CHP02 M06 0919LO2-LG20

TTLM Code: IND CHP02 TTLM6, 0919v1

LO4. Check dye outcomes

Instruction Sheet	Learning Guide #20

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:

4.1 Checking Yarn or fabric

4.1.1 Color

4.1.2 Treatment

4.2 Assessing Yarn or fabric faults

4.2.1 Inconsistent coloring

4.2.2 Marks

4.2.3 Contamination

4.3 Rectifying and reporting yarn or fabric dyeing faults

This guide will also assist you to attain the learning outcome stated in the cover page. Specifically, upon completion of this Learning Guide, you will be able to:

- Check yarn or fabric against quality standards for dye coloring.
- Assess yarn or fabric for faults and non-conformances.
- Rectify or report yarn or fabric dyeing faults.

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described in number **3 to 5.**
3. Read the information written in the information “Sheet 1, Sheet 2 and Sheet 3” respectively.
4. Accomplish the “Self-check 1, Self-check 2 and Self-check 3” in page -90, 93 and 95 respectively.
5. If you earned a satisfactory evaluation proceed to “Learning Guide # 21”. However, if your rating is unsatisfactory, see your teacher for further instructions or go back to Learning Guide #20.

Information Sheet-1	Checking Yarn or fabric

The main objective of checking dyed materials (yarn or fabric) is, to confirm their quality with pre-set quality standard. Example: color fastness, dye absorbed to yarn or fabric and etc. dyeing result will be deviate from standard due may be due to dyeing parameters change (Temp, Time, MLR, Pressure and etc.).

The outstandingly important property of a dyed material is the fastness of the shade. Fastness may include light fastness, wash fastness, rubbing fastness and etc. the fastness of a dye is related to the depth of the shade. Assessment of fastness involves a visual determination of either change in shade or staining of an adjacent material.

Most of the difficulties are overcome by the use of grey scales against which it has been found possible to compare loss of color or staining of any hue irrespective of depth. It is necessary to use two scales, one for assessing change in color and the other for staining.

Faster the dye, minor changes in color. In this respect the geometric scale reads bigger number and it is more satisfactory.

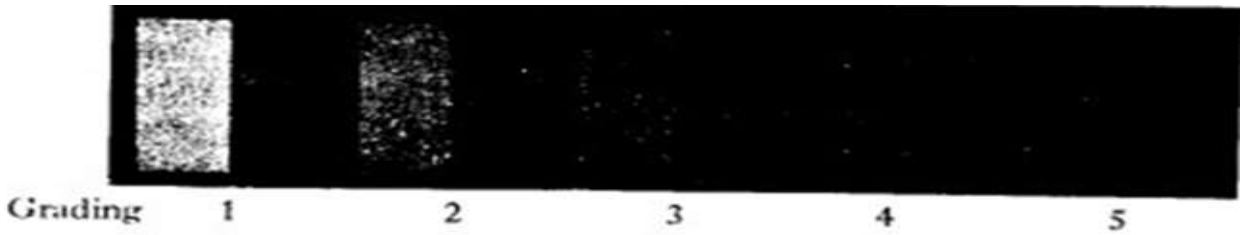


Fig. grey scale for alteration of color

Color difference	Fastness rating
0	5
4	4
8	3
16	2
32	1

1.1 Color:

Concepts of color:

Color is defined as “the sensation experienced or caused by light reflected from or transmitted through objects”.

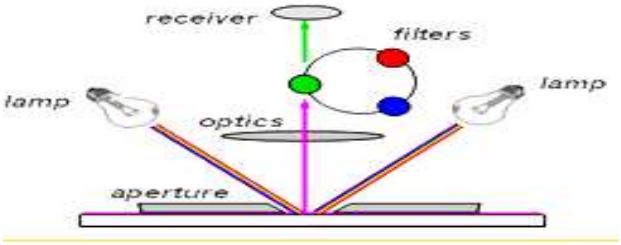
Measurements of color:

There are a variety of instruments available for the measurement of color within the textile samples. This may include: colorimeter, spectrophotometer and others.

Colorimeters:

It was the pioneers of color measuring instruments. Colorimeters view a sample through at least three filters measuring the quantity of light reflected from the sample and passed through each of the filters.

The filters were originally designed to mimic the response of the red, blue and green cones of the eye as closely as possible. Deficiency of colorimeters is unable to detect if an object’s color will appear differently under different light sources. Therefore, colorimeters have limited capability when compared with current technology.



The reflectance of a sample is expressed between 0 and 1 (as a fraction) or between 0 and 100 (as a %). It is important to realize that the reflectance values obtained are relative values.

Reflectance spectrophotometers:

The operation of a spectrophotometer is basically to illuminate the sample with white light and to calculate the amount of light that is reflected by the sample at each wavelength interval.

This is done by passing the reflected light though a monochromating device that splits the light up into separate wavelength intervals.

Components of Reflectance Spectrophotometer:

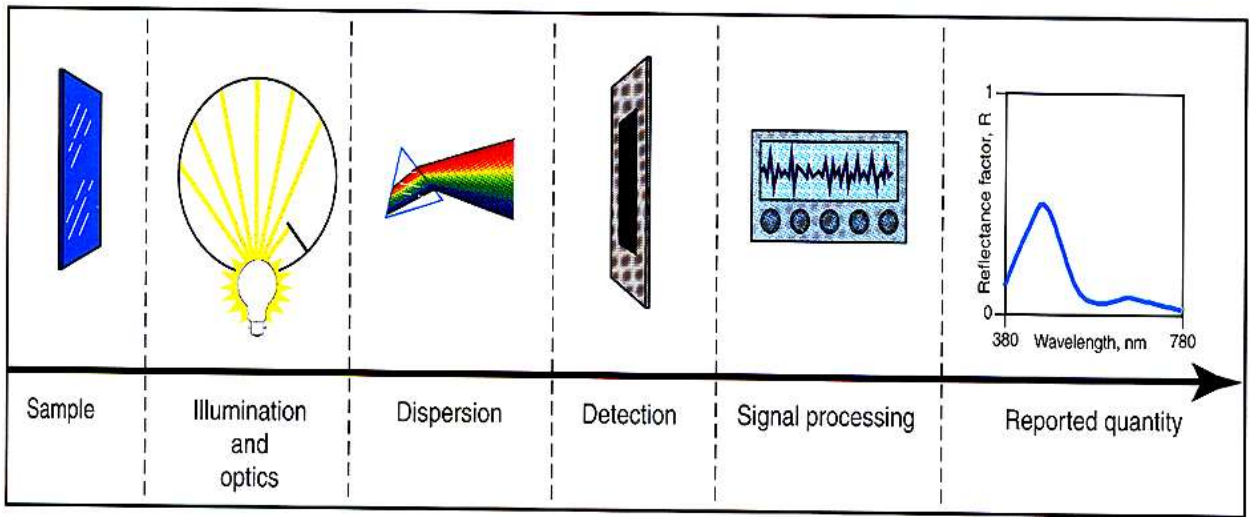


Figure: Block diagram of spectrophotometer components

The spectrophotometer is complete color laboratory equipment with variety functions which includes all color parameters, color difference measurements, recipe prediction parameters for colored samples and shade library's.

In color processing industries it is very important to reproduce the same color consistently without shade or hue variation and it is equally important to formulate color for a given colored sample as received from a costumer for reproduction.

1.2 Treatment:

The main objective of treatment for dyed yarn or fabric is either:

- To remove the residual dye from the surface of dyed sample or from their interior.
- To improve fastness property by using different chemicals.

Self-Check- 1	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. Describe the word color. (1 points)
2. List and describe types of color measuring instruments. (4 points)
3. List at least 5 main components of reflectance spectrophotometer? (2 points)
4. List the three filters used in colorimeters. (3 points)

Note: **Satisfactory rating – 6 and above points** **Unsatisfactory - below 6 points**

You can ask you trainer for the copy of the correct answers.

Answer Sheet

Score = _____
Rating: _____

Name: _____ **Date: _____**

Short Answer Questions

1. _____

   _____

2. _____
   a. _____
   b. _____
   c. _____
   d. _____
3. _____
   a. _____
   b. _____
   c. _____
   d. _____
   e. _____
4. _____
   a. _____
   b. _____
   c. _____

Information Sheet-2	Assessing Yarn or fabric faults

Introduction

When dyed yarn or fabric is assessed for its quality, different yarn or fabric dyeing faults may be observed after assessment. Regardless of this range of variables, it is limited to the following faults only, this includes: Inconsistent coloring, Marks and Contamination only. Their description is as follow.

2.1 Inconsistent coloring

It the color shades difference across the textile materials to be dyed. Small percentage of shade difference can move a material to rejection. So, it needs high care full during dyeing.

2.2 Marks

Mark is the types of dyeing faults which can be seen on the surface of any dyed textile materials. This mars are of different types. Example: Softener Mark, Crease Mark, Folding marks and etc.

2.3 Contamination

It is the presence of a constituent, impurity or some undesirable elements that affect dyeing process.

Self-Check - 2	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. List down the probable faults assessment results of yarn or fabric dyeing (3 point)

Note: **Satisfactory rating – 2.5 and above points Unsatisfactory – below2. 5 points**

You can ask you trainer for the copy of the correct answers.

Information Sheet-3	Rectifying and reporting yarn or fabric dyeing faults

Introduction

Any observable yarn or fabric dyeing faults must be corrected or rectified and reported to concerned personnel. These yarns or fabric dyeing faults solutions or corrections that need be to fixed and reported may include:

- Follow the standard pretreatment procedure.
- Ensuring even heat-setting in case of synthetic fibers.
- Proper dosing of dyes and chemicals.
- Proper controlling of dyeing m/c
- Use standard dyes and chemicals.
- Maintain the same liquor ratio.
- Maintain the same dyeing cycle.
- The pH, hardness of supply water should check daily.
- Use of soft water.
- Proper opening of fabric rope.
- Maintaining proper reel sped & pump speed.
- By proper dissolving of dyes & chemicals
- By passing the dissolved dyestuff through a fine stainless steel mesh strainer, so that the large un-dissolved particles are removed.
- Proper Mixing of the softener before addition.
- Prevent the entanglement of the fabric during application of softener

Self-Check -3	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. List down at least 5 solutions or rectifications methods for yarn or fabric dyeing faults that are to be reported (5 point)

Note: **Satisfactory rating – 3.5 and above points Unsatisfactory - below 3.5 points**

You can ask you trainer for the copy of the correct answers.

Answer Sheet

Score = _____
Rating: _____

Name: _____ **Date:** _____

Short Answer Questions

1. _____
   a. _____
   b. _____
   c. _____
   d. _____
   e. _____

Lists of Reference Materials

1. Color measurement and communication lab manual 2004, Bahir Dar University, Institute of Technology for Textile, Garment and Fashion Design (iOTEX)
2. Textile coloration practical lab manual 2000 Edited by Adane Haile , Bahir Dar University, Institute of Technology for Textile, Garment and Fashion Design (iOTEX)
3. https://tarikulislamjony.blogspot.com/2015/12/which-are-major-dyeing-faults-and-what.html