Quality Control
in
Wet Processing

Properties of raw materials for dyeing

Raw materials	Desired Properties
Grey Fabric	1. Free from stains 2. Free from foreign matters and contamination 3. Free from manufacturing defects
Cloth for dyeing	1. Good absorbing capacity 2. Free from impurities 3. Even whiteness 4. Smooth surface
Dyestuff	1. Sufficient strength of required quality 2. Good fastness properties 3. Availability of data and shade card

Properties of raw materials for dyeing

Raw materials	Desired Properties
Chemicals and auxiliaries	1. Required purity 2. Required strength and concentration 3. Good efficiency 4. Compatibility
Water	1. Softness, free from iron and metal salts 2. Neutral *pH* 3. Required ppm of water ingredients (TDS<300)

Qualities of dye house water

Standard	Permissible Concentration
Color	Colorless
Smell	Odorless
pH Value	Neutral (*pH=7)*
Water hardness	< 5 degree dH
Dissolve solid	< 1 mg/L
Solid deposit	< 50 mg/L

Qualities of dye house water

Standard	Permissible Concentration
Organic Substance	< 20 mg/L
Organic Salts	< 500 mg/L
Iron	< 0.1 mg/L
Copper	< 0.005 mg/L
Nitrate	< 50 mg/L
Nitrite	< 5 mg/L

Estimation of Pre-Treatments: Scouring Effect

- Estimation of Scouring:

1. Determination of **weight loss%**
2. **Absorbency Test**
    - Immersion Test
    - Drop Test/Spot Test
    - Wicking Test

Estimation of Scouring Effect

1) **Determination of weight loss%:** The weight of un-scoured and scoured sample is taken at same MR% and from these figures weight loss% can be calculated from the following formula:

$$\text{Weight loss\%} = \frac{\text{Weight before scouring} - \text{Weight after scouring}}{\text{Weight before scouring}} \times 100$$

The standard weight loss is (4-8)%

If it is 8% then we may say that the sample is well scoured, but if it is more than 8% then it is not acceptable as it indicates that the fibre damage has been taken place.

If it is less than 4%, it shows that the sample is not well scoured and there are some impurities still present in the sample.

Estimation of Scouring Effect

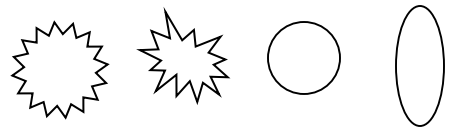
2) **Absorbency test:** 3 types-

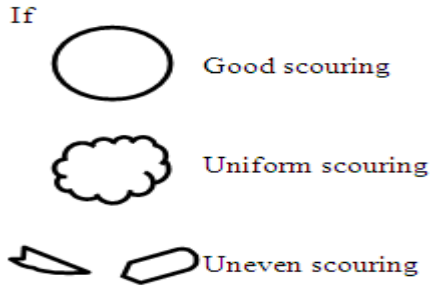
a. Immersion test
b. Drop test/ Spot test
c. Wicking test

a. **Immersion test:** A sample is more absorbent when it is scoured. 1 cm×1 cm sample is placed on a water surface and time taken by it to be immersed is noted. The standard time is 5 second. It is up to 10 second. If it is greater than 10 second then it indicates that the scouring has not taken place properly.

Estimation of Scouring Effect

b. **Drop/Spot test:** Colored solution of 0.1% direct dye (Red) is used. The solution is dropped on to the sample by pippet from 1-2 inch above and its absorbency is examined visually. The drop may have the following shapes:





Two things can be measured:

* The time taken in second to absorb one drop of solution is measured. Standard time is (0.5-0.8) sec; upto 1 sec is allowed.
* If the drop is circularly absorbed then we may say that the sample is uniformly scoured. If the drop is circular but has small area then the sample is uniformly scoured but not well scoured. If it is almost circular then it is uniformly scoured too. If not circular then it is not uniformly scoured.

Estimation of Scouring Effect

C. **Wicking test:** A sample of 5 cm x 18 cm is taken and a mark is made at 1 cm from bottom. Then 1cm portion is immersed into 1% direct dye solution for 5 minutes and then the distance traveled by the colored solution above 1cm mark is noted. The acceptable range is (30-50) mm.

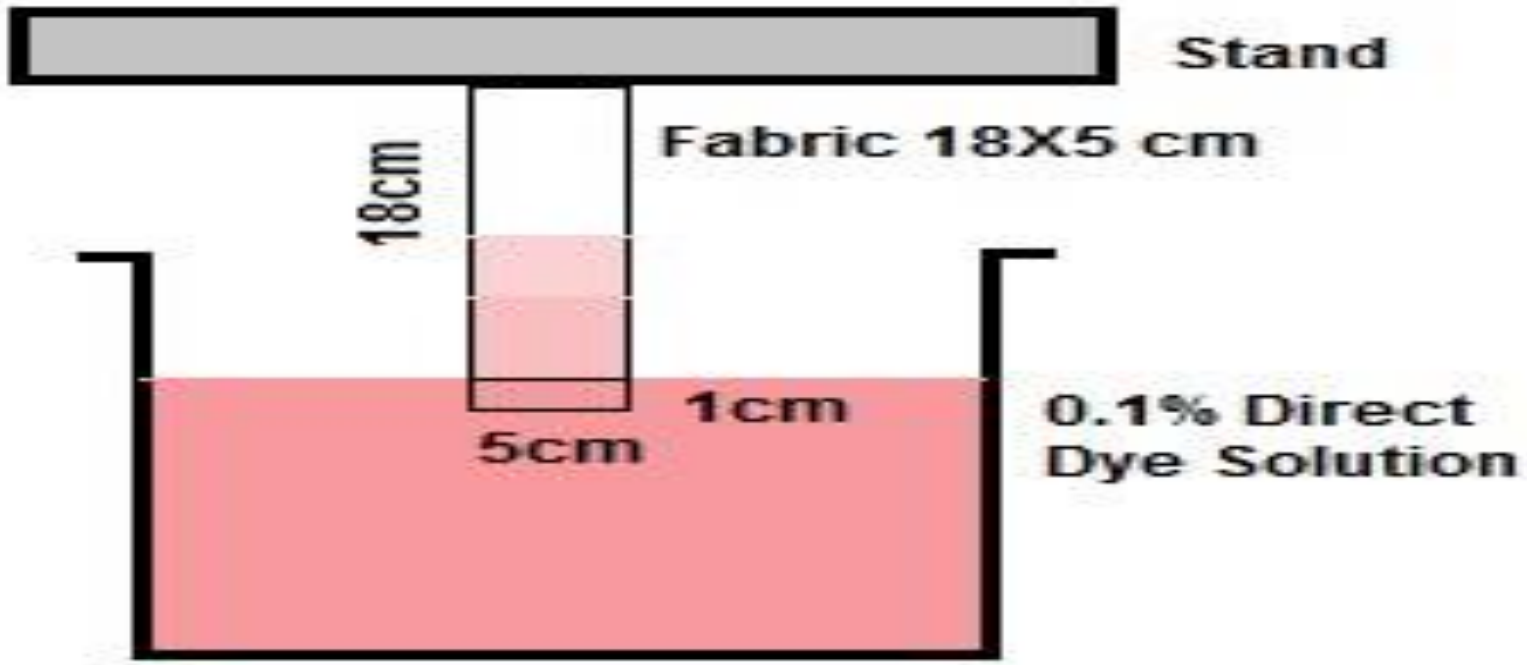


Fig: Wicking test

Estimation of Bleaching Effect

- **Measurement of reflectance by Leucometer:**

The light reflectance capacity of a bleached fabric is higher than of unbleached fabric. Standard bleached fabric has a reflectance of (84-86)%. The reflectance can be sometimes increased to (90-95)%. But it is very risky and such high bleaching can be done in kier boiling and in a very high temperature of about (110-120) °C. Such high percentage of reflectance may be accompanied by strength loss.

It may be done by Computer Colour Matching System (CCMS), Reflectance (R%) from a mixture of Dyes or Pigments.

Whiteness/Leucometer Meter

Data color

Estimation of Mercerizing Effect

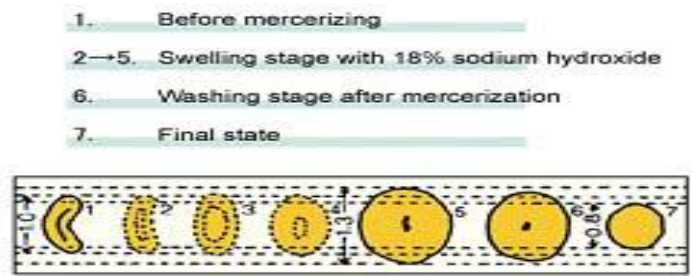
- **Determination of Barium Activity Number (BAN):**

This is the most effective test. Barium Activity Number is defined as the ration of the amount of Ba(OH)2 absorbed by mercerized sample to the amount of Ba(OH)2 absorbed by same amount of un-mercerized sample expressed as a percentage.

BAN=(Ba(OH)2 absorbed by mercerized sample/Ba(OH)2 absorbed by same amount of un-mercerized sample) x 100

If the mercerization happens the result will be greater than 100 (usually 115-135 is acceptable).

Below 115 indicates poor mercerization has been taken place and it will result uneven dyeing. 127 indicates very high rate of mercerization. If the result is 100 then it indicates that no mercerization has happened.



Fabric Inspection

Before the production of garments the quality of fabric should be inspected. When fabric received in store, at least it is needed to inspect 10% fabric. This inspection is done by point systems.

Some point system for fabric inspection are:

- 4-point system
- 6.5-point system
- 10-point system
- Dallas point system

Fabric Inspection

4-point system

The 4-point system, also called the American Apparel Manufacturers Association (AAMA) point-grading system for determining fabric quality, is widely used by producers of apparel fabrics and by the department of defense in United States and is endorsed by the AAMA as well as ASQC (*American Society for Quality Control)*.

The system in which the penalty point of a defect is maximum 4 is called 4-point system of quality control.

Fabric Inspection

- **Basic Principle:** Defect point values should be counted in 100 square yards of fabric. If defect point values are 40 or less then it indicates first quality fabric. The grading range is given below:

Point	Grade
≤ 40	A
Above 40-60	B
Above 61-80	C
Above 80	Rejected

Fabric Inspection

- **Procedure:**
  - Should select 10% fabric randomly from the fabric received quantity.
  - The defects are located, marked and recorded on a frame.
  - Fabric defect point values are taken based on the following:

Length of Defect	Point Allocated
Up to 3 inch	1
Over 3 inch-Up to 6 inch	2
Over 6 inch-Up to 9 inch	3
Over 9 inch	4
≤1 inch (Holes)	2
Over 1 inch	4

- **Calculation:**

Points per 100 square yards= {(Total point scored in a roll x 3600)/ (Total yds inspected x Fabric width in inch)}

Exercise-1. Exercise:

A 132 yards long, 43 inches wide fabric roll is inspected, and the following defects were found::

Size of Defects
Defects up to 3 inches
Defects > 3 inches ≤ 6 inches
Defects > 6 inches ≤ 9 inches
Defects > 9 inches

Find out the grade of fabric based on 4-point system.

Size of Defects	No. of Defects	Penalty Points
Defects up to 3 inches	6	6 defects x 1 points = 6 points
Defects > 3 inches ≤ 6 inches	4	4 defects x 2 points = 8 points
Defects > 6 inches ≤ 9 inches	4	2 defects x 3 points = 6 points
Defects > 9 inches	2	2 defects x 4 points = 8 points
	Total Penalty Points:	28

Answer: (28 x 3600) / (132 x 43) = 17.8 defect points per 100 square yards. The defect is acceptable.

Consequences of fabric defects

- The customer (garments manufacturer) may totally reject the defective fabric.
- If the rate of defect is not very high in that case fabric is accepted with **certain penalization in terms of either reduction of cost of the fabric or additional fabric is demanded by the buyer**. This means that fabric defect may ultimately reduce the profitability of the concern entrepreneur.
- The garment manufacturer will be **in trouble in handling a defective fabric in the cutting table.**
- In spite of all preventive measures, garments are produced with **fabric defects that result in ultimate rejection of the particular garment or even rejection of the whole lot.**