TECHNOLOGY OF BLEACHING -1

Impurities of cotton

OBJECTIVE:- A diploma holder in textile processing must know about principal of desizing, scouring and bleaching, operation, materials machinery and processes in order to effectively supervise the bleaching section. Hence this subject.

1.. Natural and added impurities in cotton

1 Natural impurities:- there impurities come from nature, dirt, dust, protein, natural colouring matter come in this category.

2 Added impurities:- these are added during spinning weaving and sizing. They mainly contain oil, grease, starch etc.

a. Oil, grease, starch are to be removed to get uniform absorbency in bleaching, dyeing, printing.

b. Natural colouring matter is removed to get whiteness.

2. Singeing, objectives and working of singeing machines

Singeing :- Singeing is the process of removal of small hairy protruding fibres by passing the fabric through hot surface to improve the appearance fabric.

Plate singeing M\C:- two copper plates are heated and fabric in open width form is passed over these plates the protruding fibre are burnt.

Advantage:- Lusture of fabric is improved.

Disadvantage:-

1. fibre in the interstices are not removed.
2. Uneven singeing takes place as temperature is not uniform .

Roller singeing machine:- A rotating cylinder is heated and fabric is passed over it.

Advantage:- uniform singeing taken place.

Disadvantage:- Fibre ends is the interstices of warp and weft are not removal.

Gas singeing machine:- this machine consist of one or more burners giving continuous flow. Fabrics is drown over the flame at very high speed and short fibres are burnt.

Advantage:-

1. Uniform singeing takes place
2. Fibre ends is the interstices are burnt

Shearing or cropping :- cropping machine have blades to cut long protruded fibre. Fabric is passed at very high speed .

3 . Desizing – purpose, desizing agents and desizing methods

Object:- to remove the starch applied during singeing to improve water absorbency of fabric.

Methods:-

1. Rot step method:- passed fabric through a padding mangle having warm water 40°c temperature and stand fabric for 24 hrs.

Micro organism naturally present in water and most of starch is remove .

Disadvantage:- this method is a slow process .

2. Acid step method:-

- Treat fabric with dulite sulphuric acid in a padding mangle.
- Stand for (8-12) hrs.
- Starch is liquefied and removed in washing.

Disadvantage:- loss in weight is more.

3. Enzymatic desizing:-

- Treat fabric with malt extract solution at (60-70)°C .
- Starch is liquefied removed by washing
- Malt extract is most effective at (60-70)°C so proper temperature should be maintained .
- 4. Bromate Desizing:- pad fabric with-

- 0.3% - sodium bromate (as a wetting agent)
- 0.1% - sodium carbonate
- Room temperature – temperature
- Time - (6-20) min.
- PH – 10
- Washed and treated with hot caustic soda solution to remove starch completly

4.. Principles and process of scouring of cotton and coloured woolen goods

After desizing fabric still contain wax and fats due to which absorbency of fabric is adversely of affected which causes improper dyeing, printing , bleaching and finishing,

Hot alkali solution containing :-

Caustic soda – NaOH

Sodium carbonate - Na_2CO_3

Detergent use like - lissopeded is circulated under pressure through desized fabric.

Machine used is “KIER” so process is also called KIERING

Main process which is accour during “scouring”

1. “Saponification of impurities” due to sodium hydroxide.
2. “Emulsification” due to “Detergent”.
3. Dissolution of mineral water.
4. Removal of dust particles.

5. Description and working of high pressure kiers, J. Box and vapour lock machines

J – BOX Machine:-

This machine is like English letter J

Fabric in this machine is treated in rope form . The process of Bleaching, Desizing and scouring are carried out successfully.

This machine is consist of three part.

Saturator:- for treating fabric with chemicals.

J – BOX:- treated fabric is kept for desired time to complete the reaction.

Washing unit:- unit where fabric is washed with water.

1. In saturator fabric is treated with scouring liquor containing caustic soda and soap solution concentration of caustic soda is up to 4% .
2. In J-Box fabric is kept is slock condition so that reaction between chemical and fabric take place.
3. Last unit of machine is a washing chamber where fabric is washed.

Vapour loc Machine:-

This machine is used for continuous Desizing, Scouring, Bleaching in J-Box fabric is steamed at atmospheric pressure. In Vapour loc machine fabric is steamed under pressure.

This machine consist of 3 to 5 units

1. Saturator:- there may be one or two saturator in first saturator fabric is wetted and in other saturator fabric is treated with chemicals like NaOH, Soda Ash, Hydrogen Peroxide for suitable and then squeeze.
2. Reaction chamber:- It is a stainless steal chamber having top and bottom guide rollers. The fabric treated with chemicals is kept in this chamber for desired time , so that reaction may be completed.
3. Washing unit:- In vapour loc machine there are two or three washing unit where fabric is washed with both hot and cold water.

   High Pressure Kier:-

   This machine is mainly used for scouring where wax and oil are removed from cotton by treating with a solution containing NaOH and soap solution at boiling temperature.

   Machine consist following parts..

1. Cylindrical Iron Vessel kept vertically.

2. Perforated false bottom on which fabric rests.
3. Two Man Holes through which fabric is loaded and unloaded.
4. A circulation pump which circulate the scouring solution in the machine.
5. A multitubulor Heater for heating the scouring solution.
6. A Puffer pipe through which scouring solution is throw upwards.
7. A separator plate which scatter scouring solution in all direction.
8. Inlet and outlet for scouring solution.

1. **Washing and souring – purpose, counter current washing, tight and slack rope washing machines.**

Washing Machine:-

Washing is necessary at different stages to remove the residual chemical such as acid, alkali, Bleaching agents etc. to avoid any damage.

Three type of washing machine are generally used .

1. Tight Rope Washing Machine:- This machine remove starch, impurities, alkali etc.

A. Machine consist of two wooden roller (A and B) and a manual pressure device C.

B. There are a pit (F) having two guide rollers.

C. Fabric enters from one side and emerges from other side after washing and squeezing .

D. Machine is suitable for desizing, scouring and washing.

Slock Rope Washing Maching:-

- A+B are squeezing roller
- D guide Roller which guide the movement of fabric .
- E Task containing water used for washing

After final washing fabric passes through squeezing mangle having two squeezing roller

Fabric is washed and squeezed continuous in tensionless form .

This machine is used for washing, desizing and scouring.

Winch Washing Machine:-

This machine is used for scouring and washing of delicate fabric like rayon.

A. An elliptical winch used to plaiting action.
B. Perforated partition in tank through which additional liquid is supplied and also steam can be supplied.
C. guide roller to guide the movement of fabric.
D. Tank containing water and other chemicals.

Several layer of fabric can be processed simultaneously in this machine.

Bleaching:-

Bleaching remove natural colouring matter and give extra whiteness.

Permanent bleaching is obtained by “OXIDIZING BLEACHING AGENT”.

HYPROCHLORITE Bleaching:-

- it is salt of “Hypochlorous Acid”.
- It is available as a clear solution containing 14-15% of available chlorine.

Method of preparation of sodium hypochlorite:-

- By passing gaseous chlorine through sodium hydroxide.
- By electrolysis of sodium chloride solution.

Method of Bleaching:- material is treated with a solution containing sodium hypochlorite and soda ash at room temperature.

Disadvantage :- Fabric is semi bleached.

2. Bleaching – Process of bleaching of cotton with bleaching powder, sodium hypo chlorite, hydrogen peroxides and sodium chlorite. Effect of pH on bleaching. Advantages of one method over other

Bleaching:-

1. Scouring remove all impurities except natural colouring matter and this natural colouring matter is removed in bleaching.
2. Bleaching also give extra whiteness.
3. Permanent bleaching is obtain by using oxidising bleaching agent.

Various Bleaching Agents

1. Bleaching powder:- It is a traditional oxidising agent it is prefared by spreading shaked lime on the floor of a chamber and then gases chlorine is passed through this chamber.

Properties of Bleaching powder:-

A. It is a white powder having smell of chlorine.
B. In contact with air it is damaged.
C. When mixed with water, it tend to form cake.
D. Bleaching powder solution is alkaline I nature.

Method of Bleaching:- After scouring cotton material is kept in some vessel having perforated false bottom and circulation pump. Bleaching powder solution is pumped up in vessel and spread over the material and process is repeated till whiteness is achieved.

Disadvantages of Bleaching powder:-

1. Bleaching powder's sludge is a problems
2. Feel the fabric is harsh
3. Bleaching time is more. Due to poor diffecult.

Hypochlorite Bleaching:-

It is an oxidising bleaching agent. It is available in aqueous solution form. The stability of hypochlorite solution depend on …

1. Temperature – Room temperature
2. PH - 10-11
3. Concentration
4. Presence of impurities
5. Storage conditions

Method of Bleaching:- same as Bleaching powder

Advantage of Hypochlorite:-

1. Bleaching powder sludge is a problem but in case of sodium hypochlorite. There is no such problem
2. Feel of fabric is not harsh.
3. Bleaching time is less.

Disadvantage:- fabric is semi bleached.

Hydrogen Peroxide Bleaching:-

Advantages:-

1. Hydrogen peroxide is an universal Bleaching agent.
2. Less labour and water is required.
3. Loss in weight of material is less.
4. Requirement of water is less.
5. No souring treatment is required.
6. It is give full Bleaching.

Properties of Hydrogen Peroxide:-

1. It is a clean syrupy liquid.
2. It is a colourless liquid when smell in amount but it bulk quantity it is bluish in colour.

3. It is neutral in dilute solution.
4. It is fairly stable for several week if it is kept away from sun light.

Various factors which affected Hydrogen peroxide bleaching:-

1. In temperature range of (80-85)°C Bleaching action is proper or adequate.
2. PH of Bleaching solution should be in the range of 10.8 - 10.9 . For this we add mixture of Sodium Hydroxide(NaOH) and Sodium carbonate to bleaching liquor.
3. PH of Bleaching solution should be in the range of 10.8 - 10.9 through out the process so sodium silicate should be added to Bleaching liquor which act as PH stabilizer
4. Hard water give good results.

Method of Bleaching:-

Material is treated in a kier machine with a solution containing.

Hydrogen peroxide – (3-5)%

Caustic soda – (0.3 – 0.8)%

Soda Ash – (0.6 – 1.0)%

Sodium Silicate – (2 – 3)%

Wetting agent – (0.5 – 1.0)%

Temperature – (80 – 85)°C

Time - (2 – 3)hrs.

Continuous Bleaching

Sequence for continuous bleaching.

1. Treating material with 4% NaOH solution.
2. Material is heated and stored in J- Box machine.
3. Washing of sodium hydroxide with cold water.
4. Saturation of material with Hydrogen Peroxide solution.

5. Storing of material in J-Box so that bleaching action take place.
6. Washing of material with hot and cold water.

Sodium chlorite as Bleaching agent

1. It is universal bleaching agent used for all type of synthetic fibres.
2. It is a safe bleaching agent as it can be used over a wide range of conditions of Time, temperature, acidity and alkalinity.
3. It is not used in case of cotton as it is costly and secondly it evolve chlorine which is harmful to worker and machine.

Souring:-

After bleaching fabric contains metallic salt such as calcium carbonate, magnesium carbonate etc. due to which fabric gives harsh feel.

These metallic salt are removed by treating the fabric with HCl or sulphuric acid and process is called “souring”. Souring is carried out in ordinary washing machine thoroughly after souring to remove the remaining acid.

7. Drying machines – Cylinder drying, stenter drying, and chamber drying

Drying machine

Cylinder Drying Machine:-

1. It is also called Drum Drying Machine.
2. A series of Hollow Cylinder is arrange either horizontally or vertically.
3. Steam under pressure is supplied to each hallow to heat up the cylinder which drier the fabric.
4. Cylinder are placed step wise so that fabric is its movement is it contact with hot surface.

Hot Air Drying Machine (Hot flue Dryer):-

It is also called festoon dryer or Hanging Dryer machine consist of a metal casing suitable insulate.

There are poles on which fabric is hanged over hot air is circulated through casing to dry the fabric.

Stenter Drying machine:-

1. In stenter drying machine width of fabric can be controlled.
2. Stenter consist of pair of travelling chain to hold the selvedge of fabric and to control the width.
3. Hot air or Hot gases are used to dry the fabric.

Comparison or Advantage of Stenter

1. In stenter higher temperature can be achieved and twine and energy can e saved.
2. In stenter width of fabric can be controlled.
3. In stenter drying, Finishing, and Heat setting can be done simultaneously.

8. Mecerisation – Purpose, fundamentals, physical and chemical changes, mercerization of yarn and fabric. Mercerizing machines – pad chain, pad chainless machines.

MERCERISATION:-

During filtering NaOH filtrate obtained was of low concentration due to absorption of sodium Hydroxide by fabric and following changes were absorbed

1. Shrinkage in area.
2. Increased dye uptake.
3. Change in structure.
4. Increase in tensile strength.

It was suggested that some chemicals can swell. Cotton and cause structural changes.

The only draw back was shrinkage which could be avoided if material is kept under tension when immersed in caustic soda.

Additional properties

1. Increase lusture.
2. Great response to mechanical finishing .
3. Soft handle.

“it mercerization process cotton is treated with (52-54)°Tw and washed to improve strength lusture and Dye absorption”.

Yarn Mercerising machine:-

B and C are Rubber covered roller in which yarn is wound in hank form.

A. Spurt pipe through which caustic soda solution is sprayed on the yarn.
Y. Yarn wound on roller in hank form.
D. Squeezing roller to squeeze the excess of alkali.

The whole process is carried out automatically.

Fabric Mercerizing machine

A. Pad chain Type:-

1. It is high speed machine.
2. It has two powerful 3- Bowl padding mangle for treatment with caustic soda solution.
3. A clip stenter where washing and recovery of caustic soda is done.
4. Two washing units with squeezing roller and platter.

B. Pad chainless Fabric Mercerizing machine

1. Two padding mangle where fabric is treated with caustic soda solution.
2. Series of drum between two mangle for movement of fabric.
3. Washing and stretching unit where fabric is washed and stretched after treating with caustic soda solutions.
4. no stuttering is required.

Pad Chainless Fabric Mercerizing Machine:-

3. This machine neither contains any mangle nor stenter.
4. There are two caustic impregnating tank in each tank there are two rows of rollers positioned in such way that fabric is under tension during its passage.
5. After treating with caustic soda solution fabric is squeezed and then washed with hot water.
6. Fabric is again squeeze then it enters in recuperator and then finely it naturalised and washing unit.
7. Recuperator is a device to remove remaining NaOH from treated fabric.

Objective Question

1. **Give examples of added impurities.**
2. **What is universal bleaching agent.**
3. **Give chemical formula of per hydroxylion.**
4. **What are improcess impurities.**
5. **What is drop test in scouring.**
6. **Define detergency.**
7. **What ois temperature range in full bleach & half bleach.**
8. **What is purpose of mercerization.**
9. **Which impurities are removed in bleaching.**
10. **Give examples of drying machines.**
11. **Define shearing.**
12. **At what stage mercerization is done.**
13. **What is purpose of washing.**
14. **Define kiering.**
15. **What is OBA.**
16. **What is the formula of sodium chlorite.**
17. **What is local cooling.**
18. **Write down objects of scouring process.**

1. **object of desiging**
2. **object of scouring**
3. **object of singeing**
4. **what is bleaching**
5. **what are natural impurities**

6. **name any two added impurities**
7. **name any two desizing methods**
8. **name any two drying machines used in textile industry**
9. **at what stage scouring ins is done**
10. **write two advantages of gas singeing**
11. **at what pH hypochlorite bleaching is done**
12. **what is shearing**
13. **name any two parts of vapour 10c machine**
14. **at what temperature hydrogen per oxide bleaching is done**
15. **what is the function of sodium silicate in hydrogen per oxide**
16. **name any two washing machines**
17. **which process can be carried out on a 'kier'**
18. **two advantages of hydrogen per oxide**

short answer type question

19. **Discuss the iodine test.**
20. **Write down the recipe for full bleach.**
21. **Give the examples of stabilizer & its advantages in H_2O_2 bleaching.**
22. **Write a short note on plate singeing.**
23. **What are the demerits of sodium chlorite bleaching.**
24. **Write a short note on vapour lock machine.**
25. **Write down working of chamber drying.**
26. **What are the merits & demerits of acid desizing.**
27. **List out properties of bleaching powder.**
28. **Write a short note on scouring.**
29. **Write down some physical & chemical changes observed in cotton after mercerization.**
30. **Write down advantages of hydrogen peroxide bleaching over other methods.**
31. **Write down saponifications step.**
32. **Write doen effects of ph & temperature on bleaching.**
33. **Discuss counter current washing.**

19. **discuss briefly about added impurities**
20. **list out main process which occur in kier boiling**
21. **what is Emusification discuss in details**
22. **write short note on "Bromite Desizing"**
23. **list out the properties of bleaching powder**
24. **compare bleaching powder with sodium hypochlorite as bleaching agent**
25. **write short note on "added impurities" in cotton**

26. **write the working of J-Box machine**
27. **explain the role of stabilizer in hydrogen per oxide bleaching**
28. **discuss is brief about sodium chlorite as bleaching agent**
29. **list out advantages of hydrogen per oxide**
30. **write about the various change in mercerization**
31. **what is scouring briefly discuss**
32. **write short note on scouring of coloured woven goods**

Long answer type question

34. **With all technical specification discuss the desizing of cotton by different hydrolytic methods.**
35. **Explain the bleaching of cotton with hydrogen peroxide, bleaching powder & sodium chlorite methods.**
36. **Write a short note on**
    -tight & slack rope washing machines
    -stentor drying
37. **Explain the working & constructions of high pressure kiers & J box.**
38. **Explain working of pad chainless mercerization machine.**

1. **what are various impurities present in grey cotton fabric**
2. **discuss in detail the various washing machines used in textile industry**
3. **write short note on following a) saporification b) detergency**
4. **discuss in details the construction and working of pad chain less mercerizing machine**
5. **write short note on following**

a) **cylinder drying machine b) hot air drying machine**