

## TECHNOLOGY OF FINISHING – II

**Objective:-** knowledge and skill is required regarding principles and procedures use for finishing by a diploma holder in textile processing. Also he should have knowledge about different type of processing machine used for finishing.

**1. Special Finishes: Description, regarding Principle, Process, Chemicals. Methods of application of the following.**

- 1.1 Special calendaring finishes
- 1.2 Water proof & water repellent finishes
- 1.3 Flame retarding & flame proof finishes
- 1.4 Soil release finishes and soil repellent finish
- 1.5 Anti bacterial & moth proof finishes.
- 1.6 Crease resistant/wrinkle resist finishes.

### CALENDERING MACHINE:-

An ordinary calender consists of a series of hard and soft bowls placed in a definite order.

The soft roller may be of compressed cotton or paper. Calender may consist 3,5,6,7 or 10 cylinders. The sequence of roller is that no two hard rollers are in contact with each other. Pressure and heat applied in calendaring depends

on the finish required.

Calendering effect depends on moisture content of fabric, no of bowls used, bowl arrangement, temp, pressure and speed.

### TYPES OF CALENDERING MACHINE:-

There are five types of calendaring machine, which are following-

1. Snizzing Calender or Ordinary Calender
2. Friction Calender
3. Chasing Calender
4. Schreineing Calender
5. Embossing Calender

### SWIZZING CALENDER:-

Simple running of cloth through all the nips is called snizzing. This operation closes interstices of the cloth and gives it a smooth appearance. Before calendering softening and filling agents are applied to produce lusture. All bowls rotate at same speed.

Iron bowls are heated by passing steam inside the bowl. Hot calender produces smoothness and lusturous surface

#### FRICION CALENDER:-

In this top four bowls of a 7 bowl universal calender may be lifted up disconnecting the contact between third and fourth bowl. This operation produces high degree of lusture on one side of fabric i.e. the side which touches the iron bowl and heavy closing of threads take place. Top iron bowl is rotated at double speed of the fabric and of lower two bowls.

#### CHASING CALENDER:-

- Cotton fabric passes through the all nips of calender over the chasing roller and into the cotton nip of calender again so that fabric passes through the machine. Several times each layer of cloth lying over another chasing gives to the cloth a linen type appearance and a special soft handle or feel.

#### SCHREINERING CALENDER:-

This gives a silk like brilliance to cotton fabric. This is done mainly on cotton linings, printed fabric. In case of mercerized cotton it gives almost silk like appearance.

Schreiner calender has strong frames carrying two bowls top one being of special fine steel which is engraved with required no of lines and is heated by gas. The upper roller is in contact with the lower cotton bowl when machine is running and is seperated while not in use. Top bowl is in fixed position and lower one is moved up and down. When fabric passes through the nip very high pressure is exerted.

#### EMBOSSING CALENDER:-

It is similar to schreiner calender but bowls are much bigger. The top chilled iron roll has a design engraved on it and is heated. In this damask effect can be produced on cotton fabric but the effect is temporary. It last longer on mercerised cotton. Also high degree of lusture is produced on the surface of ordinary sniz calendered fabric. The lusture is due to polishing effect of the roll engravement under the influence of heat and pressure. The degree of lusture can be increased by passing the fabric once or twice through friction calender before passing through embossing calender.

#### Waterproofing:

“Waterproofing is nothing but preventing the passage of both air and water through a fabric.”

**Purpose of Water Proofing:**

For certain uses such as Tarpaulin, Umbrella cloth, Rain coat fabrics etc., it is required to give this type of finish as these type of fabrics are generally used against the air and water in the normal life. So they should have some property to prevent both air and water passing through them.

This finish makes the wearer feel uneasy and uncomfortable as the air circulation is not there.



Water proof fabric

**Principle of Water Proofing:**

A film on the surface of the fabric should be formed for the prevention of air and water.

When a uniform coating of suitable substances such as rubber is produced on the surface of a fabric, the interstices between the warp and weft yarns are blocked by the continuous film or substance and both water and air not pass through the treated fabrics.

It is a chemical and property giving finish.

**Requirements:**

The fabric should not become unnecessarily stiff and the fabric should have soil release or soil repellent property.

The finish should not alter the **fastness properties** or dyed material, feel, strength etc., of the fabric.

**Method:**

By two methods it can be carried out:

1. Methods by which hydrophobic substances are deposited on the cloth.
2. Methods by which the fabric itself becomes hydrophobic.

**Chemicals Used:**

1. Vulcanized natural rubber.
2. Oxidised oils of varnishes.
3. Polyvinyl chloro acetate.
4. Polyvinylidene chloride.

- 5. Cellulose acetate.
- 6. Cupprammonium hydroxide solution.

**Process:**

A. The simplest method of water proofing is the coating of fabric with rubber as a thin film.

**Disadvantage:**

- Unwanted stiffness and harshness.
- Fabric becomes harsh and brittle.

B. The application of natural oil will also produce this finish.

**Advantage:**

- No cracks or brittleness.

**Disadvantage:**

- It is not permanent.

C. Coating of water impermeable substances like pitch, asphalt and molten waxes produce water proofing.

**Advantage:**

- It will give excellent proofing.

**Disadvantage:**

- Many desirable properties of the fabric will be destroyed.

D. Using synthetic resins we can produce this finish.

Example: Polyvinyl chloro acetate, Cellulose acetate, Polyvinylidene chloride.

E. Water proofing with wax emulsion.

- It can be applied on cotton, linen, wool, silk fabrics.
- Aluminium acetate is used along with the wax emulsion.

There are two steps involved in producing this finish.

**1ststep:**

Waxemulsion:		1-3kg
Water	:	50litres
Padthematerialwithwaxemulsion		solution.

**2ndstep:**

Inwetcondition,		
Aluminiumacetate:	1-	3kg
Water	:	(12°Tw) 50litres

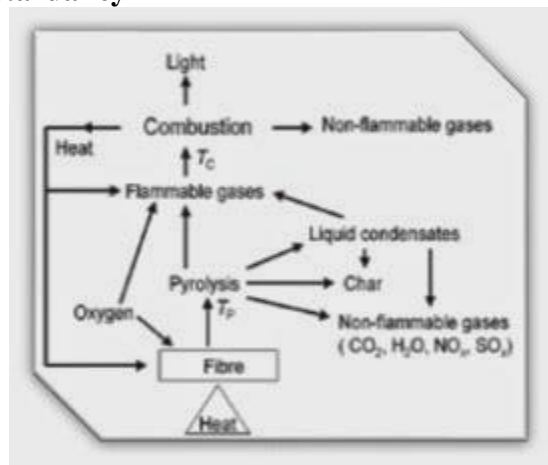
Impregnate the fabric and squeeze thoroughly. Then dry the fabric in a stenter or on a drying range at 110° to 120°C.

## Flame Retardants Finishes

Flame-retardant **finishes** provide textiles with an important performance characteristic.

- Protection of consumers from unsafe apparel
- Firefighters and emergency personnel require protection
- Floor coverings, upholstery and drapery protection
- The military
- The airline industry

## Mechanisms of Flame Retardancy



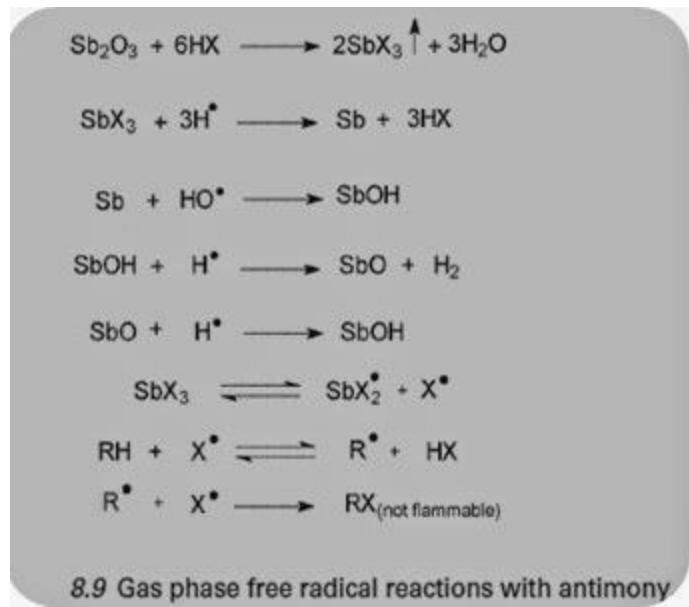
**Combustion:** is an exothermic process that requires three components,

- Heat
- Oxygen
- Suitable fuel.

## Flame-retardant

## Chemistry

The synergistic effect of antimony comes from the volatility of antimony trihalides and the effectiveness of antimony compounds in scavenging free radicals over a broad temperature range (for example 245–565 °C).

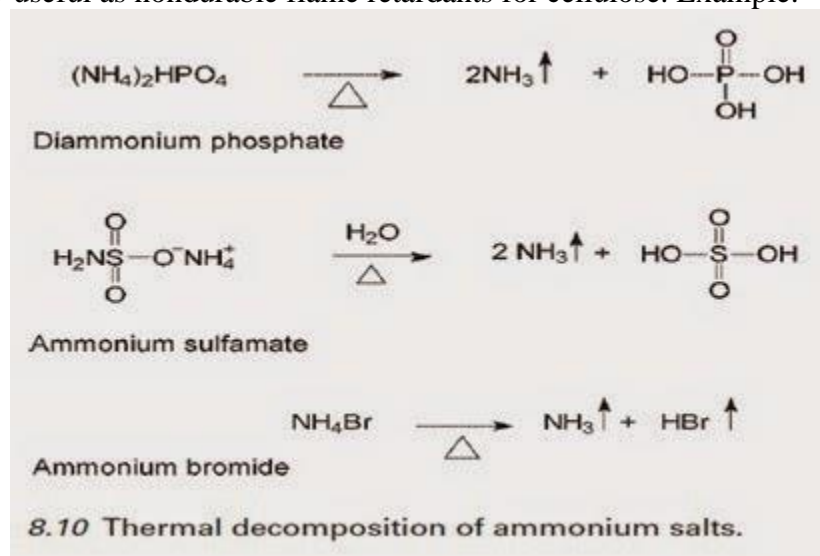


**Flame  
Non**

**Retardants for**

**Cellulose  
durable:**

1. Inorganic salts have long been known to provide flame retardancy on cellulosic material that will not be exposed to water, rain or perspiration.
2. The French chemist Gay-Lussac proposed a borax and ammonium sulfate treatment as a flame retardant for cotton in 1820.
3. Today, a mixture of boric acid and borax is still an effective flame retardant for cotton at ~ 10 % solids add-on.
4. Ammonium salts of strong acids, especially phosphoric acid (P/N synergism) are particularly useful as nondurable flame retardants for cellulose. Example:

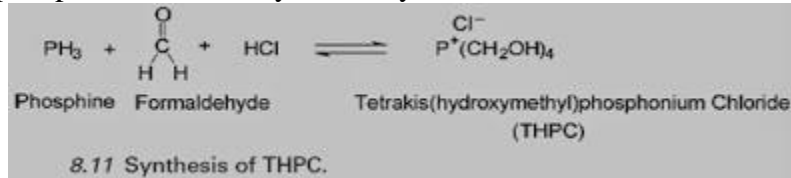


**Durable:**

1. The most successful durable flame retardants for cellulose are based on
  - Phosphorous- and nitrogen-containing chemical systems .
  - That can react with the fibre or form crosslinked structures on the fibre.

2. The key ingredient of one of these finishes is

- Tetrakis(hydroxymethyl)phosphonium chloride (THPC),
- Made from phosphine, formaldehyde and hydrochloric acid



Soil release finish :-

Accumulation of soil and dust particles is known as soiling.

Fabric can not be made totally soil repellent or soil resistant but a type of finish is given so that during washing the accumulated soil can easily removed .

This type of finish is mainly given to synthetic fibers. The deposition of soil will reduce the appearance so it is essential to carry out soil release finish.

Finish should not affect the physical properties such as strength ,feel , drape etc. also it should be fast to light , washing etc.

Factors affecting soiling:-

Increase in temp ,twist , static charges increase the soiling. Increase in moisture regain , smoothness decreases the soiling.

Moth proofing :-

Moth proofing is given to prevent the growth of “Moth”. It is mainly carried out on wool fabrics material is padded with 20% solution of any of mentioned chemicals, dried and cured Moth is a small insect that feeds on substance like keratin and fibroin. So animal fibers are more susceptible to attack of moth.

Various methods of moth proofing:-

- 1) By exposing the material to sun light
- 2) By using Naphthol balls and para Dichlorobenzene.
- 3) Using substance containing fluorine such as sodium fluoride , aluminum fluoride etc.
- 4) Using soluble solvents such as Dichlorobenzene.

Another concept is that keratin structure may be altered by chemical means. The disulphide linkages in wool substance are changed by reduction followed by alkylation.

## **2 Stabilization finishes: Purpose, agents and applications of the following**

### **2.1 Mercerizing**

### **2.2 Ammoniating**

### **2.3 Shrinking**

### **2.4 Chemical treatments/chlorination**

### **2.5 Resin treatments**

### **2.6 Stentering/Tentering – for dimensional stability**

### **2.7 Fulling**

### **2.8 Crabbing, potting**

### **2.9 Decatising**

### **2.10 Heat setting –Mechanism & Machines used.**

Mercerizing :-

It is an important preparatory process for cotton. The fabric is usually singed before mercerizing. Mercerizing causes flat twisted ribbon like cotton fiber to swell in to round shape and to contract in length the fiber becomes much more lustrous and its strength is increased by 20%. Its affinity for direct vat and reactive dye is much greater

the fabric is passed through a cold solution of 15-20% caustic soda. it is then stretched out on a stenter frame where hot water sprays remove most of caustic

a variation of process is known as hot mercerization. The hot mercerization process can double the strength of cotton fabric and contribute resistance to shrinkage in washing. The process involves saturation in caustic soda solution at elevated temperature controlled hot stretching and cooling tension controlled washing and traditional washing

Ammoniating :-

This process has many advantages over mercerizing. The process is less expensive and has no polluting consequences produces greater strength of 40-50% over untreated cotton as compared to 20% increase by mercerizing and increase yarn smoothness there by improving



abrasion resistance like mercerizing ammoniating increases luster dimensional stability and affinity for dyes

the process consists of passing the yarn or fabric through a weak solution of ammonium at 27° F at which point swelling and shrinkage occurs and then rapidly passing it through hot water as it is stretched about 5% more than its original length. It is then dried in hot air

cotton fabric that are ammoniated and subsequently cross linked present a greater challenge to man made fiber fabrics they retain their smooth appearance are more absorptive and comfortable they have better heat resistance and will not be quickly degraded by hot iron.

3) Shrinking:- Fiber spun in to yarn are under constant tension during weaving process. Their physical condition is not changed, fibers tend to revert to their natural state causing shrinkage. The yarns are made to assume a final condition by shrinking the fabric in finishing process that minimize subsequent shrinkage, such as immersion in cold water , steaming or

a chemical treatment but even when textile fabrics are pre shrunk, they are liable to further shrinkage when washed. To realize maximum pre shrinkage the fabric must be given a pre shrinking operation in which no tension is exerted while damping the fabric. In general the factors that control shrinkage are the stability of fiber and construction of fabric.

4) Chlorination:- This is a chemical method of treating wool so that fabric will be shrink proof. The wool fabric is treated with a dilute solution of calcium or sodium hypochlorite . some of scales of fibers are removed , as a result shrinkage decreases when this protective scaly covering is removed, felting quality is lessened and durability of fabric is affected, but lusture and affinity for dyes is increased. Chlorination is done in woolen underwear , socks and sweaters.

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5) Fulling :- it is an important operation in finishing of wool fabric. The fibers are cleaned ,scoured and condensed by a combination of moisture ,heat ,soap and pressure. the condensing is a natural result of felting property of wool fiber. Shrinkage takes place because the fibers are drawn together. As a results fiber has a fuller compact body.

6) Crabbing:- In finishing wool fabrics a stretching process called crabbing passes the cloth over rollers in to hot water or steam. The fabric is then put in to cold water after which it is pressed. This process is similar to stentering as the fabric is stretched where necessary and finally set at width at which warp and filling yarns are in proper relature to each other. Crabbing prevents creasing and uneven shrinkage.

Weighting of silk:- the process of increasing the weight of silk material is known as weighting of silk. After the processing of silk material, it loses about 25% of its weight particularly after degumming. This loss in weight leads to great loss of money. To compensate the loss, some weight is artificially added to the material by chemicals means.

Other objects of weighting:-

- 1) To impart a bulky effect
- 2) To give body to fabric
- 3) To give greater filling capacity

Methods :-

- 1) The silk is soaked with stannic chloride solution followed by fixation with sodium carbonate followed by soaping. Marginal weight increase is observed but the strength is adversely affected.
- 2) The silk is snaked in stannic chloride and fixed with sodium phosphate. It is then washed and taken out even through increase in weight is considerable but strength loss is still high in this method.
- 3) 3)In this method fixation is done with sodium silicate. This brings out the required increase in weight without the loss of strength much in normal practice soaked in

stannic chloride solution called picking later it is treated with sodium phosphate called phosphating the picking end phosphating is carried of alternatively till sufficient weight in achieved.

- 4) Trubenising:- this is a process of binding several layer of cloth by placing layers of acetate rayon. on subjecting to hit and pressure cellulose acetate melts and on Colling binds the layer of cloth. The plasticizers which are combined with the cellulose acetate is also responsible for the binding purpose. This method is used for making colors and cuffs .

### 3. Weightening of silk & Trubenising

#### Weighting of Silk:

The process of increasing the weight of the silk material is known as weighting of silk.

#### Object.of.Silk.Weightening:

1. After the processing of silk material, it loses about 25% of its weight particularly after degumming.
2. This loss in weight leads to a great loss of money since they are very expensive.
3. To compensate the loss, some weight is artificially added to the material by chemical means.
4. During **degumming of silk**, a weight loss of 25% is normally observed in case of **silk fabrics**.
5. Owing to the expensive nature of silk, it is necessary to compensate the weight loss.



Silk Weightening

#### Other Objects:

1. Weighting is also done to reduce limpness.
2. To impart a bulky effect.
3. To control the scroopy effect.

4. To give body to the fabric.
5. To give a greater filling capacity.

**Silk Weighting Process:**

Tin salts are widely used for silk weighting.

**There are three methods which are followed:**

**1<sup>st</sup>.method:**

The silk is soaked with stannic chloride solution followed by fixation with sodium carbonate followed by soaping.

Marginal weight increase is observed but the strength is also adversely affected in this method.

**2<sup>nd</sup>.method:**

- The silk is soaked in stannic chloride and the fixed with sodium phosphate.
- It is then washed and treated with little amount of sulphuric acid.
- It is then soured, washed and taken out.

Even though increase in weight is considerable, the strength loss is still high in this method.

**3<sup>rd</sup>.method:**

- In this method the fixation is done with sodium silicate.
- This brings out the required increase in weight without affecting the strength much.

**Normal Method:**

- In the normal practice silk is soaked in stannic chloride solution called Picking.
- Later it is treated with sodium phosphate called Phosphating.
- The picking and Phosphating is carried out alternatively till the sufficient weight is achieved and the sequence is:
- Picking washing - Phosphating - acidifying
- Finally after sufficient loading it is treated with Sodium Silicate.

**4.**

**4. Delustering of Rayons**

Delustering of rayon's:-

Rayon possess a bright metallic luster which is not acceptable by consumer so it necessary to reduce the luster and process is know as delustering.

Delustering is done by

1- internal delustering or spume delustering

2- external delustering or after treatment

internal delustring :-various substances are added to spinning solution from which filament is extruded .

1-white inorganic pigment

2-gasforming compounds

3-organic compounds such as oils ,waxes etc.

Titanium oxide is generally used as its consumption is less .also TiO<sub>2</sub> is produced in small average size which dose not block the spinning rate . Due to less consumption does not reduce the tenacity much .

External delustring:-one batch method –material is impregnate with a cold aqueous solution of sodium stannate. In soluble stannic acid is formed on draying.

1-material is impregnated with a solution of substance which may be decomposed to leave an in soluble deposit on the fiber mainly aluminum oxide, zinc oxide ,titanium oxide and barium sulphate

2-material is treated with urea and formaldehyde solution then water is squeeze material is immersed in HCL.HCL act as precipitant.

3-methylene urea :-this is condensation product of urea and formal dehyde.it is deposited at room temperature form slightly acidified solution of urea and formaldehyde.

Milling –milling is an essential process for woolen material.it is also known as felting.the object of milling is to make the fabric fuller and denser as a result of which the woven patterned because more or less obscure both died and undied fabrics are milled.

Milling is classified in to two types

1- acid milling

2-alkaline milling

Alkaline milling-this may be carried out with soap and soda ash or with alkali alone for based results the following condition may be used

Sodium carbonate- 6-7tw

Ph-9-11

Temp- 88 c

This is suitable for unscored wool of low quality

Advantage-both scouring and milling is carried out in one operation .

Soap milling –it is very widely used method for the process .the following condition may be used.

soap solution- 8-10%

Temp-40 c

After milling the material is given a short and warm wash to remove all traces of soap.

Advantage-softer clothes are milled with less risk of damage.

Disadvantage-it is slightly costlier process

Acid milling :-

Sulphuric is best milling agent

Sulphuric acid – 0.2-0.5%

ph. – 2

Temperature : - 45 c

After treating with sulphuric acid fabric is washed thoroughly

Advantage :-

this method is used for even very stronger fabric

This method is useful to mill cross breed wool which is difficult to mill with is soap solution

Disadvantage :-

It is suitable only for animal fiber

It destroys cellulosic fiber

It produced unwanted harshness

## **5. Finishing of woolen fabrics:**

### **5.2 Acid & Alkaline milling of wool**

### **5.3 Felting/non felting of wool**

### **5.4 Permanent setting:-**

- Decatising
- London shrinking
- Cylinder method

Felting and non felting of wool :-

By felting of wool milling effect is produced which is necessary for all woolen material. But for knitted wool felting is of great disadvantage. Cloth which to be printed needs antifelting which increase affinity for dyeing non felting is done by modifying the scale structure in non felting of wool either removal of scale takes place or scale become blunt

Method for non felting of wool :-

Wool is treated with chlorine gas at a pH-7 or below and then subsequently treated with acid. The felting property to removed and luster is obtained with in creased affinity for dyeing. This treatment also acquires a antishrinking property

Wet chlorinating:-

Material in wet state is treated with 2.3% of active chlorine, sodium hypochlorite solution for half an hour, the bath is then acidified with 6% HCL and treatment is continued for further a provide for 30 min.

Finally an antichlor treatment is giver using sodium sulphite and sodium bisulphite

Dry chlorinating :-

Wool is first conditioned to standard moisture content and placed in auto clave air from auto clave is removed by a vacuum pump and chlorine gas is let in and circulated for 1 hours. Then antichlor treatment is given. This process gives more uniform results then vat chorinateing.

## Decatising

This is a finish similar to Felt Calendering mainly meant for woolen fabrics. Essentially this is a stage Relaxation process.

The function of setting is to relax the various stresses built up in the material during spinning and weaving and to stabilize the fabrics in new and desired construction

### Mechanism

The fabric is compressed between two layers of woolen felt and steam is blown simulataneously. The fabric acquired body, suppleness. This is due to swelling of fibre by steam.

The effectiveness of decatising depends on

1. Type of fabric
2. Time of contact
3. Amount of steam
4. Tension
5. Type of finish desired

### PROCESS

Felt is run backward and forward for 15-30min without fabric. Now feed the fabric along with woolen felt and shut the chamber door. Open the steam and maintain the process of 10-15P.S.I. Run the felt forward and backward for few minutes. Now shut off the steam and collect the fabric.

### Chemical Decatising

It will give a full soft feel. Normally Sodium Bi Sulphide is used at a concentration of 10-20gpl.

### Pad-Dry-Steam

Padding is done at an expression of 50% on a padding mangle. Steaming is done for 3-5min.

### Cylinder Method



This method is for shrinking wool. This method is used two perforated cylinder which steam the fabric as it is rolled of one cylinder and rewound on the other. The steamed fabric is then wound loosely around wood roller where it dries and cools slowly and naturally.

### Loudon Shrinkage

Loudon shrinking is a cold water process of per shrinking fabrics. Lengths of wool fabric are retained between wet blankets for about 20 hours while the moisture of blankets penetrates into fabrics of clothes. The cloth is then dried slowly and subsequently to a hydrolic pressure of about 3500 pounds. It is considered one of the best methods.

### **6. Description & working of rotary & paper press.**

#### Rotary Press

It is generally applied to woolen material especially for woolen blankets. It might double or single rotary press. It consist of a central chilled iron bowl having a rough surface at the top and bottom(if double rotary) there are highly polished brass half curved plates which are heated by steam the central iron bowl is also heated by steam.

The cloth first passes through series of brush rollers and then over a scrimp roller and then enters the rip between the central bowl and curved plate. As central bowl is rough it carries the cloth bodily while being pressed between plate and bowl. Emerging from bottom plate, cloth enters the top plate to get pressed on both the sides of the cloth.

The effect of rotary press is to import a smooth surface, but the fabric get flattened which is again raised in blowing machine.

#### Finishing of Synthetics

There is hardly any special finish needed for synthetic fibres except "Heat setting". Usually softening by cotton active softener such as Ceramine machine may be given to make the fabric surface soft. Machine is used for applying softness is "Stenter Machine". Also silicon may be given for "water proofing" through synthetic fabrics are already highly hydrophobic in character.

#### Permanent soft and antcrease finish on polyester/cotton & viscose fibre

This finish is mainly given to terry/cotton fabrics.

Fabric after scouring and heat setting is printed with disperse dyes which prints only the polyester. After fixing disperse dyes by thermofixation, fabric is washed and then treated with cold sulphuric acid and then thoroughly washed and dried on Palmer Dryer. All cotton portions are removed leaving 100% Terylene.

#### Advantages

1. Yarn count is changed to finer one producing finer fabric.
2. Anti crease property like 100% polyester.
3. Better water repelling property.
4. Increase in strength.

### **7. Finishing of synthetics: Heat setting, mechanism & process**

#### Heat Setting

The process of bringing dimensional stability to synthetic fabrics is now as heat setting.

#### Objects

1. Gives dimensional stability.
2. Give creases resistant property.
3. Improves resistance to pilling.
4. Improve dyeing properties.

#### Type of heat setting

1. Before wet processing
2. After bleaching and scouring.
3. After all wet processes

#### Condition for heat setting

Fabric is subjected to high temp(180-200c) under control for a definite time(30-40sec) and allowed to shrink. At setting temp molecular chains of polyester become mobile and over feeding of fabric is done at this stage and fabric is set at lower temp. This is a type of shrinkage.

### Stage of heat setting

It is better to heat set before dyeing of heat setting is carried out after during migration and sublimation problems will take place.

### Medium and machine

Hot air saturated steam or high pressure can be used as heating medium mainly in pin stenter.

### Anti Pilling Finish

Pilling is the formation of small raised balls of fibres on the surface of fabric which spoils the appearance of fabric. The main reason for formation of pills is high tenacity of fibres.

High tenacity fibres like PET, Nylon form pills.

The problem of pilling is mainly in polyester blends.

### Factor affecting Pilling

1. Yarn construction
2. Fabric construction
3. Staple length, Denier of fibre

### AntiPilling Treatment

1. Mechanical Treatment
2. Chemical Treatment

### Mechanical Treatment

Cropping, Shearing, Singeing include in this category. In cropping and shearing fabric is first sheared and then cropped. The process is repeated two or three times. It is then singed which is most important operation to reduce pilling during singeing the protruded fibres are burnt.

### Chemical Treatment

Fabric is treated with 2 gpl of caustic soda solution at 60c for 30 min washed, dried and heat set.

In another method fabric is treated with 3.5% Ammonia solution at 130°C for a few minutes followed by washing and drying.

But both these methods strength is reduced resulting in lower pilling.

### **8. Anti static finish – agents & their applications.**

#### Anti Static Finish

Wool and such man made fibre as Nylon, acrylic and polyester develop static electricity from the friction caused by wearing and general use. As a result the fabric attracts dirt particles etc and even sparks and causes very minor but discomforting shocks to the user. Some companies do apply antistatic treatments, sometimes in combination with other finishes which may have antistatic components in them.

Antistatic agents are chemicals that may either reduce the generation of electrical charges on the fibres or increase surface conductance.

Non-durable antistatic agents are usually hygroscopic surface active materials, similar in structure to softeners and wetting agents. The drawback of these non-durable agents is that they impart a sticky hand and increase the soil pick-up.

So permanent antistatic agents have been developed

1. Resin condensate made by reacting melamine with formaldehyde and polyethylene oxide is applied to polyamide, polyester cellulose acetate in the presence of ammonium nitrate
2. Products based on ammonium or sodium salt of a copolymer of maleic acid and styrene are recommended as antistatic agents for polyamide and polyester fibres. They are applied as aqueous liquor in the presence of polyglycol and ammonium chloride by the Pd-Dry-Cure process.
3. For acrylic fibres the use of polyethylene glycol acrylate is suggested. It is prepared by reacting polyethylene glycol with acrylic acid in benzene solution using sulphuric acid as a catalyst.

#### Use of Synthetic Resin

In textile finishing preparation and use of synthetic resin is most important. The formation of synthetic resin inside the fibre has great commercial utility in producing the following effects-

1. Anti shrink finish
2. Anti crease effect (crease resistance)

3. Water proof effect
4. 4. Anti static effect
5. 5. Dimensional Stability
6. 6. Fire proof effect
7. 7. Moth proof effect
8. 8. Soil release effect
9. 9. Durable Press
10. Formation of synthetic resin can take place either on the surface of the cloth or inside the fibre when resin formation take place on the surface only it is known as "External Resin" and when takes place inside the fibre it is known as "Internal Resin"
11. External Resin
12. It has the object for filling material and at the same time to produce full, soft and supple handle of the cloth. The finish thus obtained is almost semi permanent.

#### Internal Finish

For the formation of internal resin, cloth must be fully absorbant and these should be no other foreign matter as it would interfere the formation of resin.

### **9. Use of synthetic resins & rubber in finishing & their applications Thermoplastic resins Thermosetting resins.**

#### Thermo Plastic Resins

"There are made up of long molecular which are not linked to each other"

When these plastics are heated up, the molecules can move about in relation to one another so such plastics softenes in the application of heat with or without pressure but they require cooling to set them to shape so finished article from thermo plastic resins will soften on heating.

Important type of Thermoplastic Resins are-

1. Poly Vinyl Chloride- It is hard rubber like material resistant to light, chemicals and atmospheric oxygen, it is used for covering of cables, rain coat, umbrella and table clothes etc.

2. Poly Vinyl Acetate- It is colourless tough and transparent. It offers resistant to water chemicals etc. It is used as organic coating and adhesive for food stuff packing.
3. Poly styrene- It is colourless transparent material. It offers good resistant to moisture, acid, alkali etc.
4. Cellulose Plastic- These are tough, brittle, transparent resistant to chemicals. They are used for manufacturing of pen, radio, dials etc.
5. Cellulose Acetate- These are prepared by the action of acetic acid or cellulose in presence of sulphuric acid. They offer resistant to chemicals and arc light in weight and easy to mold.

#### Thermo setting Resins

These are long molecules which are cross linked chemical. They cant moved about when heated. S o these aare hard and rigid and does not soften when heated.

#### Important Type of Thermo setting Resins

1. Urea Formaldehyde- Prepared by heating urea and aqueous formaldehyde in presence of some catalyst. It is transparent and entirely free from colour. In textile it is used for giving crease resistant and wash and wear finish to fabric.
3. Poly styrene- It is colourless transparent material. It offers good resistant to moisture, acid, alkali etc.
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2. Phenol Formaldehyde- It is condensation product of phenol and aldehyde of phenolic resin. It is hard offers resistant to heat, acid, alkalis, to other chemicals. In textile is used to give dimensional stability, crease resistant and durable press finish.

3. Silicones- These are obtained by hydrolyzing and condensing mixture of by functional alkyl silicone polide. These are resistant to water, temp and oxidation. They are mainly used in textile for applying water proof finishes.

4. Alkyl Resins- Alkyl resins are condensation product and are deposition type of resins. Here no reaction will take place between fibre and resin they are mainly used to give crease resistant, wash n wear and durable press finish to fabric.

#### Sequence of Operation for Long Cloth

Long cloth of lower quality and loose construction is normally given "Back Filling" in order to cover the gap between warp and weft.

1. Fabric is padded with a thin paste of

(wheat)starch-100gpl

wetting agent-0.5gpl

china clay-500gpl

Borax-1gpl

#### Function

starch- for stiffening

wetting agent- for softening

china clay-for weighting material

Borax- antiseptic agent

2. After applying the above paste on back starching machine drying is done on the cylinder with the special guide roller in other to dry the side which has not been starched.

3. Before back starching cloth should be calendered in seven bowl to reduce the gap between warp and weft.

4. After back starching, drying, stentering, clamping is done.

Finishing of worsted :- process the sequence of open worsted goods

- 1) Crabbing in loom stags
- 2) Scouring
- 3) Bleaching
- 4) Dying
- 5) Hot air stuttering
- 6) rotary pressing
- 7) Decatisiup or potting of read

**10. Finishing routine – sequence of operations for long cloth, poplins, voiles, drills, organdie finish worsted woolens, woolen blankets, terry cot shirting/suiting, and terry wool.**

Finishing of worsted :- process the sequence of open worsted goods

- 1) Crabbing in loom stags
- 2) Scouring
- 3) Bleaching
- 4) Dying
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Evolution of antistatic agents-these agents are evolution by the preformation test. The agent is applied on the cloth. Which is the tested electric charge using electrical resistance.



Electro-static cleaning method-electrical resistance meter, resistance and radio active both are used. The electrical resistance meter is celebrated. The specimen are the for 24 hours at 24 degree temp. static charges on the surface of fabric are removed by passing a radio both over both sides of f/c. the electrical resistance is measured . The current is pass throw the specimen . 1 minute until a constant reading is obtain. Three reading in warp and three weft are

Formula-  $\text{resistivity in ohm/square} = \frac{\text{measured resist in ohm}}{X \text{ with of specimen}}$

X with of specimen

Distance b/w electrode

Evolution of anti-pilling agent-anti-pilling agent are allowed treated and untreated f/cs are tested for a pilling by any of following four methods-

- 1- appearance detension
- 2-brush & spone
- 3-random tumble
- 4-ICCI tumble pilling

Evolution of weting agent-these agent are evaluated by the preformation test. The agent is applied on the cloth. Which is the tested electric charge using electrical resistance electrical meter, resister and radio active both are used. The electrical resistance meter is celebrated. The specimen are the for 24 hours at 24c temp. static charges on the surface of fabric are removed by passing a radio both over both sides of s/c. the electrical resistance is measured . The current is pass throw the specimen. 1 minute until a constant reading is obtain. The overage of at least for determination of sinking time are obtained at this concertation. The lower the sinking time better is the efference of the wetting agent .

Evolution of detergency-it helping from difficult to device a laboratory test. Which reproduces satisfactory particle scouring perforations. The only method is measurement of oil and dust remove from the soiled material. The specimen is soiled by integration with a suspension of carbon black in a solution of an oil or wax. In an organic solvent with detergent under investigation . The amount of soil removed is measured by determination of soil content.

Chapter:-11

AZ riding phosphine oxide is the resin forming polymer imparts flame resistance to fabric. An emulsion containing APO and methyl hydrogen siloxane imparts durable water repellency crease resistance and soft handle. To provide a durable flame retardancy to wool 6.5% pyrset

cp and 2.5% phosphoric acid is sufficient as against 20-30% pyro sing cp and 15-25% phosphoric acid required for cotton.

- 1) Pad dry the fabric with chemicals
- 2) Dry it
- 3) Cure the fabric at 150c for 10 min.

Phosphors compound and halogen compounds are generally used

Pad-dry- thermofixation

Method of evolution of textile auxiliaries:-

Evaluation of textile auxiliaries is of great importance. Since a large no of axillaries are available for different purpose. The composition to determine the efficiency and sufficient of axillaries

Evolution of wetting agent:-

This test is used to determine is efficiency of ordinary commercial wetting agent. Solution of wetting agent in water are prep art at different concertation 1000 ml solution is placed in are graduate cylinder. 5 gm of weight of yarn is faded affinity time to form a loop at inches around. A hook with 40 gm weight is attached to it at one and of the failed yarn and other his cut. Yarn is done insouded in the cylinder containing the wetting agent solution. The time required by the yarn to sink to the bottom of cylinder is measured. A average of at list for determination of sinking time are obtained at this concertation. The lower the sinking time batter is the efficiency of the wetting agent

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It helping from difficult to devised a laboratory test. Which reproduced satisfactory particle scouring preformation. The only method is measurement of oil and dirt remove from the soiled material. The specimen is soiled by integration with a suspensions of carbon black in a solution of an oil or wax in a organic solvent. The solvent is evaporated. Sample is scoured with detergent under investigation. The amount of soil remove is measured by determination of soil content.

Determination of cross-linking agent:-

Determination of nitrogen content 5 gm of sample is wt. quarterly and transferred to a flask, 5 ml. of concentrated sulphuric acid and 5 gm. of sucrose are add. The flask is set for one hour, 0.1 gm. Siliunium 0.3 gm. Of copper in the added. The flask placed in inclined position and

close to prevent of sulphuric acid entering . Mixer is perventally to soiling plant till the solution become clear and then soil for 2 hours. The content of flask transferred 100 ml. volume flask made up to the mark.

Evaluation of flame retarding agent:-

The efficiency of flame retarding agent is determined by applying them to a various concentration and performing a burning test on heated sample.

method :-

AAPCC method:- This method is design for measure the flame retarding for textile. Flame is applied at 1 inch. In this method a condition fabric specimen 7 mm by 254 mm is mounted vertical in a holder in a cabinete. It is then subjected to a ltd. Flame for specified time under control conditions. The time of flaming and under is observed and length of chart is meachured. The lower time of flaming greater is flame. 10 ml of this solution , 50 ml of slandered sulphuric acid are placed in the biker and 3 drops of mixed indicator (methylene blue) are added. The distillation assembly is heated and an excess of sodium hydro oxide solution added raw the separately and mixture of contents to the flask above 1/3 of total volume is distilled. The lid excess of sulphuric acid in the biker is tight fitted with slandereda sodium hydroxide. A blank in some manner without sample.

Evolution of optical brightening agent :-

1) Visual examination under day light:- In this method OBA is applied on the cloth and whiteness is evaluated by visual examination. The drawback of this method is the ecuraces is nat.

2) Secondly the evolution is difficult. When whiteness of different in tone is compared against is other because different in tone confused the actuation of whiteness.

3) Day light various in spectral qualities from time to time, but because of its simplecity this method is widely used.

Evaluation of water:-

Rain test:- A test specimen 8 inch\*8 inch backed by a 6 inch \*6 inch blotting paper of known wt. position. Heroization water spray is directed against specimen for five min. The blotting paper is removed and weighted quickly water penetration is indicated by increase in weight of blotting paper.

Finishing of worsted goods:-

The sequence of operation for finishing of worsted goods is

- Crabbing in loom stage
- Scouring
- Bleaching
- Dyeing
- Hot air stentering
- Rotary pressuring
- Doctoring

#### **11. Methods of evaluation of various finishes on textile materials.**

Sequence for Poplin

It is coarse long cloth

1. Fabric is padded with a solution containing

Maize Starch

Farina

Dextrin

Tallow

2. After applying the above solution on padding mangle fabric is dried, Stentered damped and kept for some time and then either friction calendered or seven bowl calendar. By seven bowl calendar, the cloth get softer but not much glaze. By friction calender there is a glaze on the cloth.

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Padding of fabric with above solution



Drying



Stentering



Damping



Calendering on



seven bowl calendar



Curing at 150C.

Sequence for viols:- viols are generally given light finish fabric is padded with a solution containing

maize

farina

waxol pa

water

maize and farina are first mixed with same water and paste is formed . It is boiled for same time and then waxol pa is added .the solution is generally applied in a two bowl padding mangle . The fabric is then dried over a cylinder studded and then calendared either in friction or 7-bowl as per demand . Normally wools are not given friction colander but finished in former type felt colander

Organdie finish :- by this finish we obtain a transparent and stiff effect . this is a process of dispersion and is brought about by the action of  $H_2SO_4$  . Different strengths of  $H_2SO_4$  produce different effects

Soft wool like finish is obtained when  $H_2SO_4$  of 110 to is used for a short time at room temperature and fabric is washed quickly at 114 to much shrinkage takes place producing a stiff effect

The treatment as regards the time has to be done under perfect control . The time usually allowed is 4-6 second . Normally formaldehyde is also added to avoid the damaging of cloth

passing the fabric through solve  $H_2SO_4$

quick washing

drying

stentering

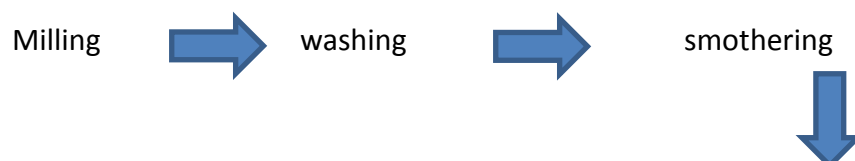
Finishing woolen blanket :- due to scales is structure of woolen blankets there will be shrinkage .due to shrinkage. Cloth become bulky .the procedure is as follows

fibers comes out

covering the yarn surface pressed

Fu tangle went takes pluses 24 the blanket surface

Process sequence :-



rotary pressing



wet raising



drying

## 12. Advancement in finishing

- Low wet pickup finishing
- Foam finishing Technology
- Kiss roll/luck roll Technology
- Spraying techniques
- Loop transfer technique

- 1) Low wet up finishing
- 2) Foam finishing technology
- 3) Kiss roll technology
- 4) Spraying technology
- 5) Loop transfer technology
- 6) Low wet up finishing:-
- 7) Wet processing of textile of energy is consumed for evaporating and heating
- 8) Water used during processing thus to reduce energy consumption low wet up
- 9) finishing technique are applied .
- 10) Expression methods:-
- 11) For this padding mangle is used . Fabric is thoroughly saturated with finishing liquor and surplus liquor is then remove by squeezing . The wet pick up can be reduced considerably during squeezing . This is the oldest technique and to have more efficient results we can only increase the hardness of squeezing rollers. But it has certain disadvantage

12) 1) It adversely affect the life of roller

13) 2) it may also deform in the structure of fabric

Another methods were opted and categorized in groups

A) Application of liquor at saturated level and than its removal

1) USE OF ROLLER OF TOP ROLLER:-

Here top roller is having small pores in it. in addition to squeezing ,it also carries out absorption of liquid but this method has a serious disadvantages that we have to stop the machine to clean these pores at a regular interval

2) Self padding technique :-

As shown in figure by special arrangement in a three bowl mangle we can squeeze the dry fabric along with final treated fabric. Fabric is take to a roller in the direction A and given a nip between top two bowls and is taken to path B over the fabric roller. Then given a dip along the path C and goes to D makes contact H botton bowl and then to E and finally to F by squeezing along with the dry fabric by this method we can bring down the fabric moisture by 40%.

B) Application of liquor at low level:-

1) A) kiss roll method :-

in this method a pad roll is partly immersed in the bath containing finishing liquor and this finishing liquor is carried along with pad roller and get transferred to moving fabric . This is called one bowl kiss roll arrangement

B) Two bowl kiss roller arrangement

Kiss roll system is same as one bowl method but pad roll nipped with top roller and penetration of solution inside the fabric take place.

2) Loop transfer technique :-

In this method a fabric loop moves continuously through pad path up to a nip where it is brought in contact with fabric to be treated. Loop transfer with 3 roll pad give less pick up than 2 roll pad. Net pick up is reduced from 40% to 20% in this method . It gives uniform and control application

3) Pad transfer technique :-



Fabric is first pre wet by a squeezing against a fully padded fabric, padded into a treating bath, squeezed, then squeezed against the incoming dry fabric. The treated fabric acts as its own loop. This treated is more uniform than other transfer system.

Foam finishing :-

This technology is used to apply finishing solution. Finishing solution is converted into its foam. A part of water from this solution is replaced by air. Volume of the foam gets increased considerably and can be easily applied all over the fabric uniformly. In this technique water content may be reduced as low as 5% and very high speed during drying can be achieved. Foam finishing unit may be divided into three parts.

- 1) Foam Generator
- 2) Foam Transporter
- 3) Foam Applicator

1) Foam Generator :-

Finishing solution and air are mixed together by a rotating device which rotates at very high speed. To enhance foaming a foaming agent is also added in finishing solution. Normally soap is used as foaming agent.

2) Foam Transporter:-

They are set of supply pipes through which controlled amount of foam is supplied normally there are three pipes one supply in the center of fabric and other two towards both selvedge. Therefore uniform foam may be supplied.

3) Foam Applicator:-

- A) Knife in Air:- Fabric is passed beneath a stationary knife and foam is continuously applied by the transporter on one side of fabric. Fabric moves ahead touching this knife when it leaves the knife the foam gets collapsed and solution is applied on all over the fabric.
- B) B) Knife on roller:- Better penetration of the solution inside the body fabric.

CALENDERING:-

Calendering is an operation carried out on a fabric to-

- Upgrade the fabric hand and to impart a smooth silky touch to the fabric
- Compress the fabric and reduce its thickness
- Reduce air permeability of the fabric by changing its porosity
- Impart different degree of lusture to the fabric

#### PRINCIPLE OF CALENDERING MACHINE:-

Closing of threads under the influence of heat and pressure to improve lusture and feel of fabric

Soil release finish :-

Accumulation of soil and dust particles is known as soiling.

Fabric can not be made totally soil repellent or soil resistant but a type of finish is given so that during washing the accumulated soil can easily removed .

This type of finish is mainly given to synthetic fibers. The deposition of soil will reduce the appearance so it is essential to carry out soil release finish.

Finish should not affect the physical properties such as strength ,feel , drape etc. also it should be fast to light , washing etc.

Factors affecting soiling:-

Increase in temp ,twist , static charges increase the soiling. Increase in moisture regain , smoothness decreases the soiling.

Mechanism of crese formation :-

Cotton cellulose chain contains –OH groups in both amorphous and crystalline region . There are hydrogen bonds b/w the –OH groups of molecular chain when a load is applied

On to cotton fabrics the cellulose chain in the fiber and the bending remains permanent since cellulosic chains are in elastic . This bending of cellulosic chain . Causes crese formation .

-

## Objective Question

1. Define functional finishing.
  2. What is raising process.
  3. What is tentering.
  4. What is crease resistance finish.
  5. What are the requirements of moth proofing finish.
  6. What type of finish is given to rain coats.
  7. Define beetling.
  8. What type of finish is given to tents, ropes used by army.
  9. What is stentering.
  10. Write purpose of wrinkle resistant finish.
  11. What are effluents.
  12. Why soil release finishing are used.
  13. What is embossing .
  14. What is fulling.
  15. Give example of water repellent finishes.
  16. Which chemical are used in the process of flame proofing.
  17. Which chemical are used in the moth proofing.
  18. Give the example of resins used in the finishing process.
- Write objectives of finishing.
  - Define temporary finish.
  - What is stenter?
  - Which type of finishing are required for medical textiles
  - What is friction calendaring ?
  - Define wrinkle
  - Give examples of dry cleaning agents .
  - What is resin ?
  - Define ETP.
  - What is the principle of crepe effect?
  - What factors effect soil release properties of a material ?
  - Define mercerization .
  - What common reasons for microbe growth in fabrics?
  - Define milling?
  - Write down chemical formula for DMU.
  - What is the objective of fulling.
  - What is decasting?
  - Write down antistatic agents used for textile materials.

▪ **Short answer type question**

1. Write a short note on flame proof finishes.
2. Differentiate between wet & dry decatizing.
3. Write a short note on anti bacterial finishes.
4. List down the objectives of mercerization
5. What are the reasons of cotton shrinkage & how will you mask the effect of shrinkage.
6. How can you improve the suitability & utility of the fabric.
7. Discuss various reagents used in finishing.
8. Differentiate water proof & water repellent finishes properties.
9. Discuss the process of ammoniating.
10. Explain the mechanism of chlorination.
11. Explain London shrinkage method.
12. Differentiate between friction calendaring & embossing.
13. What is mechanism of crease resistant finishing.
14. Differentiate between antibacterial & moth proofing.
15. Explain the principle involved in zero-zero finish.
16. Discuss reagents used for finishing.
17. Discuss principle of kiss roll process.
18. Discuss methods of evaluation of various finishes on textile materials.
19. What are the objectives of heat setting.
20. Write a short note on "Wet & dry decatizing".
21. What is London shrinkage.
22. What is flame retardant fabrics.
23. Discuss chlorination process.
24. Write down ammoniating process.
25. Discuss acid & alkali milling process.
26. Discuss delustering of rayons.
27. Write a short note on trubenising.
28. Discuss special calendaring finisher.
29. Write down use of synthetic resins in finishing.
30. What are the different types of stenter used in finishing.

**Long type questions**

1. Give a detailed account of water proof & crease resistant finish.
2. Explain recipe & function of various chemicals used in crease resistant finishes.
3. Give a detailed account of soil release & antibacterial finish.

4.. Write a short note on:

- a) Heat setting
- b) Crabbing of wool

5.. Explain the latest advancements in finishing.

- 6. Explain various objectives & advantages of textile finishing in detail.
- 7. Explain process of heat setting & stentering in detail.
- 8. Write a short note on
  - a) Crease resistant finishes
  - b) Low wet pickup finishing
- 9. Explain some advancement in finishing treatments.
- 10. explain process of calendaring & its applications with neat diagram.



