Textile Finishing Machineries

In textile manufacturing, finishing refers to the processes that convert the woven or knitted cloth into a usable material and more specifically to any process performed after dyeing the yarn or fabric to improve the look, performance, or "hand" (feel) of the finish textile or clothing.

Special finishes for natural fibers

Bio-polishing removes the protruding fibers of fabric with the action of an enzyme. Enzymes, such as cellulase for cotton, selectively remove protruding fibers. These enzymes may be deactivated by an increase in temperature and shifting pH.

Mercerisation makes the woven cotton fabric stronger, more lustrous, and less abrasive, and improves its dye affinity.

Peach Finish subjects the fabric (**either cotton or its synthetic blends**) to e**mery wheels**, making the **surface velvet-like**.

Fulling or waulking was a method of **thickening woolen material** to make it more **water-resistant**.

Decatising to bring **dimension stability to woollen** fabrics.

Calendering makes **one or both surfaces of the fabric smooth and shiny**. The fabric is **passed to through hot, fast-moving stainless-steel cylinders**.

Compacting it is the **advance version of the calendering machine** and suitable for **knitted fabric to achieve desired gsm and to set width**, **calendering and shrinkages control simultaneously**. The compactors machines come in both **tube and open width settings**.

Sanforizing prevents a fabric and the produced garment from **shrinking after production**. This is also a **mechanical finish**.

Crease-resist finish finishes are achieved by the **addition of a chemical resin finish** that makes the **fiber quality similar to that of synthetic fibers**.

Anti-microbial finish causes the **fabric to inhibit/ kill the growth of microbes**.

Antiviral finishes on textiles are a further exploitation of using antimicrobial surfaces that are applicable to both natural and synthetic textiles.

Self cleaning surface finish on cellulosic materials like cotton, treated materials **clean themselves of stains and remove odors when exposed to sunlight**. The fabric is coated with **N-TiO_2 film and lAgI particles**.

Special finishes for synthetic fibers

Heat-setting of synthetic fabrics **eliminates the internal tensions** within the fiber, generated during manufacturing, and the **new state can be fixed by rapid cooling**. This heat setting **fixes the fabrics in the relaxed state**, and thus avoids **subsequent shrinkage or creasing** of the fabric.

Stiffening and filling process: A stiffening effect is desirable in certain **polyamides and polyester materials** (**e.g. petticoats, collar inner linings**), which can be done by **reducing the mutual independence of structural elements of fabric** by thin film polymer coating.

Hydrophilic finishes compensate for **lower moisture and water absorption capacity** in synthetic fiber materials, which become uncomfortable in contact with skin. Certain products, based on **modified (oxy-ethylated) polyamides**, make the **fabric more pleasant** by **reducing the cohesion of water** so that it **spreads over a larger area** and thus **evaporates more readily**.

Anti-pilling finish reduces pilling. Knitting is prone to these effects due to the open weave and bulky yarn.

Anti-static finish prevents **dust from clinging to the fabric**. Anti-static effective chemicals are largely **chemically inert and require Thermasol or heat treatment**.

Non-slip finishes give the **filaments a rougher surface**. Synthetic warp and weft threads in **loosely woven fabrics** are particularly **prone to slip because** of their **surface smoothness**. **Silica gel dispersions or silicic acid colloidal solutions** are used in **combination with latex polymer or acrylates dispersions** to get a more permanent effect, along with simultaneous **improvement in resistance to pilling**.

Fire-resistant or flame-retardant finish reduces flammability.

Anti-microbial finish: with the increasing use of **synthetic fibers for carpets and other materials** in public places, anti-microbial finishes have gained importance. Products that are commonly applied are **brominated phenols,**

quaternary ammonium compounds, organo-silver, and tin compounds, which can be applied as solutions or dispersions.

List of Finishing Machines

Calendering of textiles is a finishing process used to s**mooth, coat, or thin a material**. Fabric is passed between **calender rollers** at **high temperatures and pressures**.

Decatising or decatizing, also known as **crabbing, blowing, and decating**, is the process of making **permanent a textile finish** on a cloth, so that it **does not shrink** during garment making. The word comes from the **French décatir**, which means to remove the **cati or finish of the wool**. Though used **mainly for wool**, the term is also applied to processes performed on fabrics of other fibers, such as **cotton, linen or polyester**. Crabbing and blowing are minor variations on the general process for wool, which is to **roll the cloth** onto a roller and **blow steam through it.**

Pressing or Ironing is the use of an iron, usually heated, to **remove wrinkles and unwanted creases** from fabric.The heating is commonly done to a temperature of **180–220 °C**, depending on the fabric. Ironing works by **loosening the bonds** in the fibres of the material. While the **molecules are hot**, the fibres are **straightened by the weight** of the iron, and they **hold their new shape** as they cool. Some fabrics, such as **cotton, require the addition of water to loosen the intermolecular bonds.**

Sanforization is a treatment for fabrics to **reduce shrinkage** from washing. The process was **patented by Sanford Lockwood Cluett** in 1930. It works by **stretching, shrinking, and fixing the woven cloth** in both length and width before **cutting and producing**. The original patent mentioned "**goods of cotton, linen, woolen, silk, rayon, and combinations thereof**"

What is the reason for fabric shrinkage?

Textile manufacturing is based on the **conversion of fiber into yarn**, **yarn into fabric, includes spinning, weaving, or knitting, etc**. The fabric passes through many **inevitable changes** and **mechanical forces** during this journey. When the products are **immersed in water**, the water acts as a **relaxing medium**, and all stresses and strains are relaxed and the **fabric tries to come back to its original state.**

The **more dimensionally stable** a fabric is, the **less it is subject to shrinkage**. Shrinkage is the **change of dimensions** in textile products when they **are washed or relaxed**. The major cause of shrinkage is the **release of stresses and strains introduced in manufacturing processes**.

Stenter machines

Stenter machines are used primarily in the textile industry for the finishing of fabrics. They function by stretching and aligning the fibers of the fabric to enhance its properties, such as width, smoothness, and overall appearance.

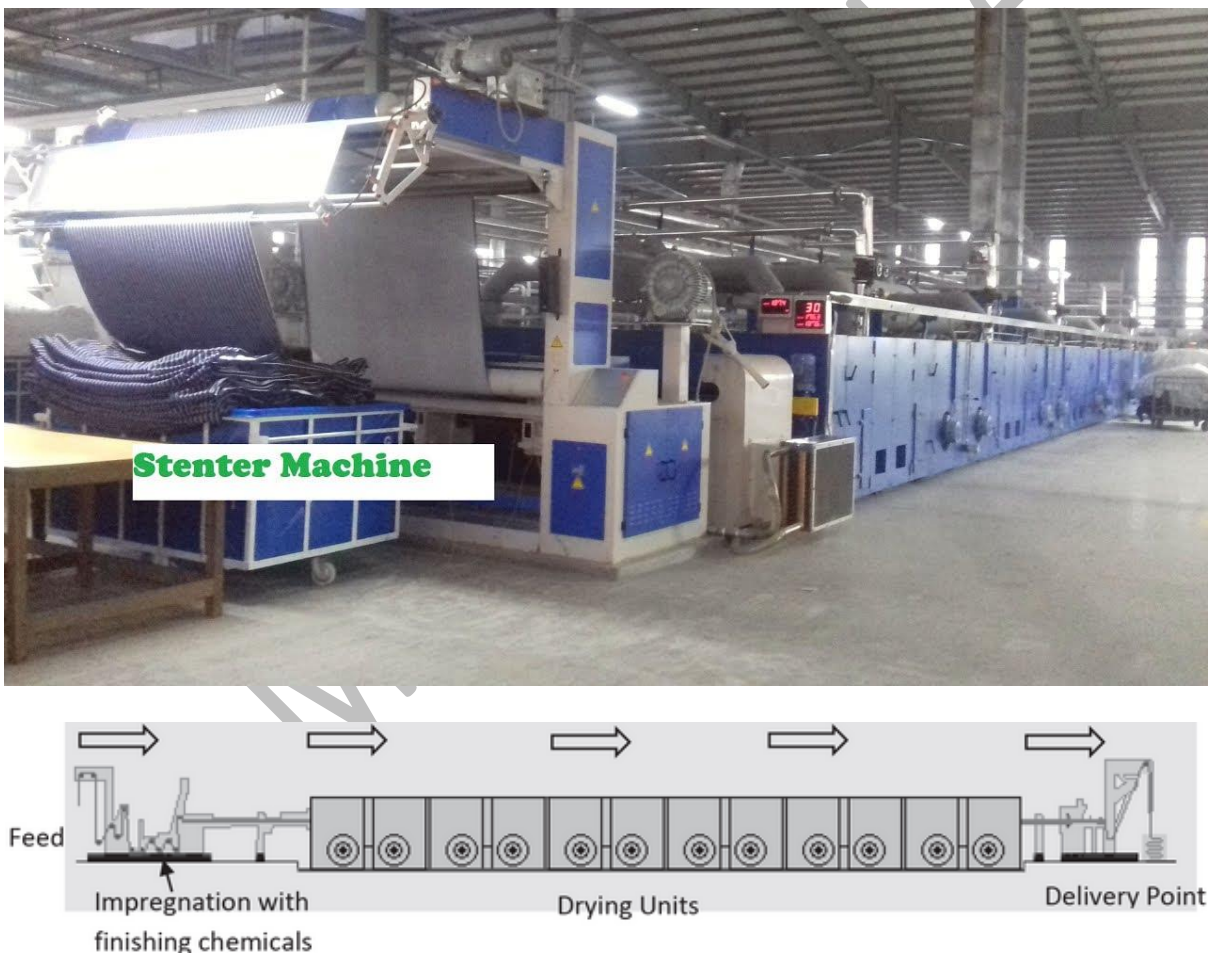

Fig: Schematic diagram of a stenter machine

Key Features of Stenter Machines:

1. **Heat and Tension**: Stenter machines **apply heat** while stretching the fabric, which helps to set the fibers in place. This process can **improve dimensional stability.**

2. **Adjustable Width**: The machine allows for **adjustment of the fabric width**, which is essential for achieving the **desired final dimensions**.
3. **Continuous Process**: The operation is **continuous**, enabling large volumes of fabric to be processed efficiently.
4. **Diverse Applications**: Beyond textiles, stenter machines can be used for **technical fabrics, nonwovens, and some types of coated materials**.
5. **Environmental Control**: Many modern stenter machines include systems for **managing humidity and air circulation**, which can enhance the quality of the finish.

Fabric Property controlling Processes by Stenter

Shrinkage control:

- Shrinkage is controlled by **proper over feeding**.
- To apply **less or more over feed speed** fabrics **reduce along to length** and **increase along to width**. **Maximum 70 – 75% shrinkage** is controlled by using it.

Fabric GSM Control:

- GSM is controlled by applying **proper over feeding speed**.
- If over feed is **more then GSM is also more**.
- If Over feed speed is **less then GSM is also is less**.
- If **Dia is more** then **GSM of the fabric will less**.
- If **Dia is less** then the **GSM of the fabric will more**.

N.B: <u>If GSM of the fabric is OK then shrinkage is also OK.</u>

Dia Control:

- Dia is controlled by **dia controlling meter scale**.
- If any fault, GSM of the fabric is **reduced then to increase the GSM** of the **fabric, dia will have to be reduced (2 – 3) inch**.
- If **Over feed speed is more then Dia of the fabric will be more**.
- If **Over feed speed is less then Dia of the fabric will be less**.
- If **length is more** then **width of the fabric is reduced**.
- If **length is less** then **width of the fabric is more**.

N.B: Fabric speed is controlled on the **fabric dia**. Here, **Dia less or More** fully depends on **yarn count and buyer order**. **Dia is done less or more** by using **expander rod**.