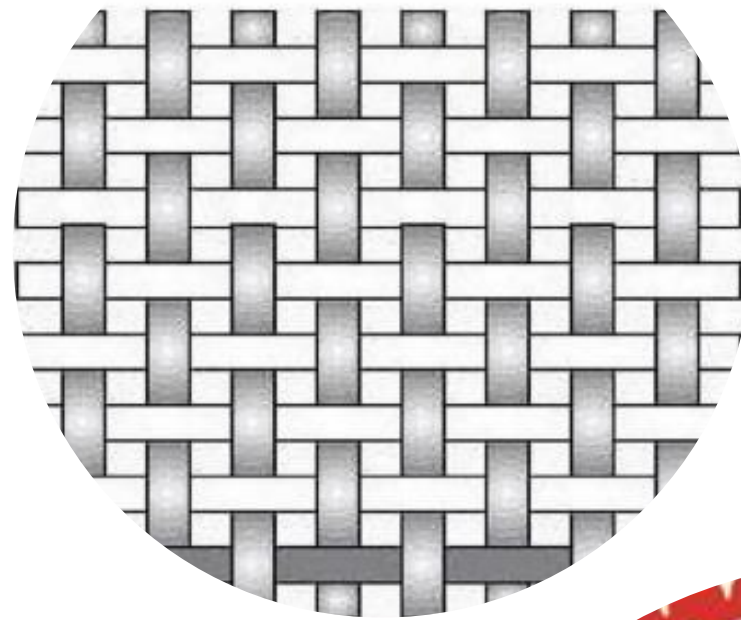


Fabric Manufacturing I (TXL231)

Dr. Sumit Sinha Ray

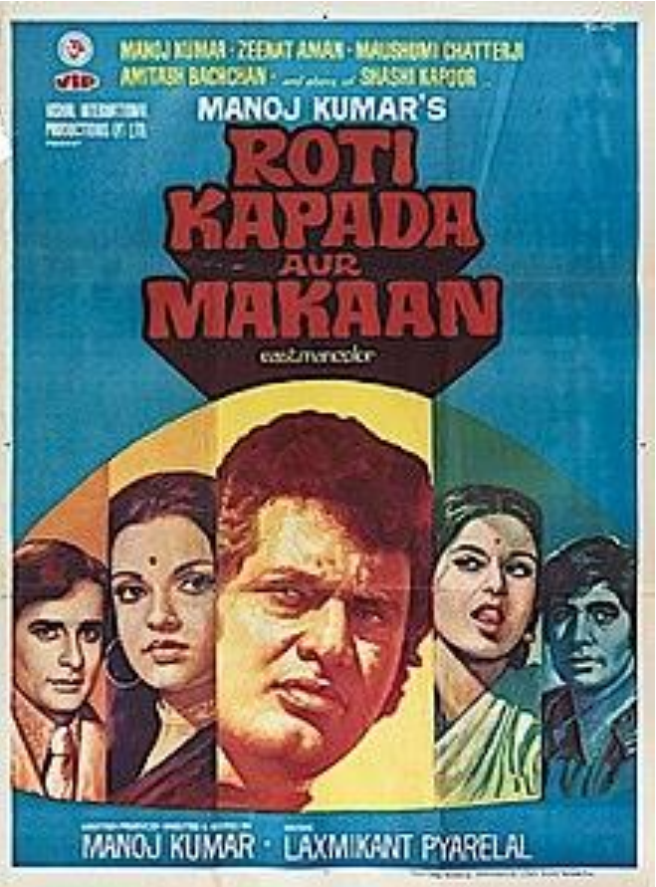
Asst. Professor

**Department of Textile and Fibre
Engineering**

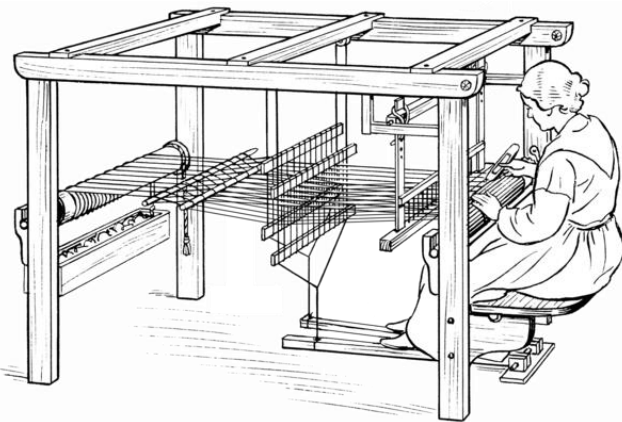


Introduction to Fabric Manufacturing

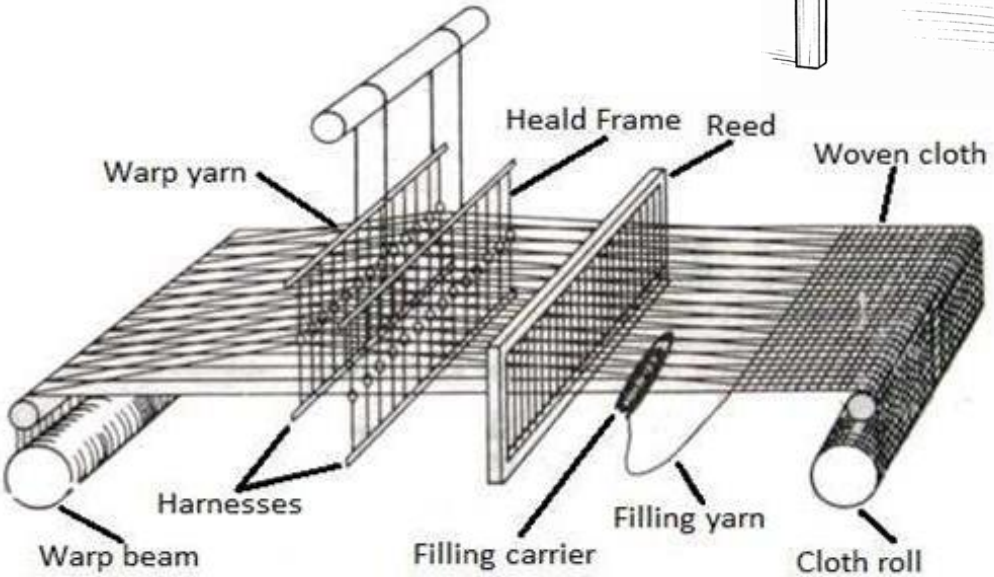
Clothing is our one of basic needs. Fabric formation is general and probably as old as human history, at least in terms of the real historical evidence that we have.



Egyptian flax linen remnants



Shuttleless weaving machine



Artist's imagination of Dhaka Muslin weaving



Gujarat weaver using power loom

History of Weaving

- ❖ The tradition of weaving traces back to Neolithic times – approximately 12,000 years ago. Even before the actual process of weaving was discovered, the basic principle of weaving was applied to interlace branches and twigs to create fences, shelters and baskets for protection
- ❖ The oldest known textiles found in the Americas are remnants of six finely woven textiles and cordage found in Guitarrero Cave, Peru. The weavings, made from plant fibres, are dated between 10,100 and 9080 BCE

John Kay (1733) invented the flying shuttle, used to pull thread horizontally (weft) across longitudinal threads (warp) on a weaving frame



The production increased, but the weavers needed more yarn. The traditional spinning wheel was an efficient machine but could only spin one thread at a time



James Hargreaves invented the spinning jenny (machine) in Lancashire in 1764 (patented in 1770) that could spin eight cotton threads at the same time.

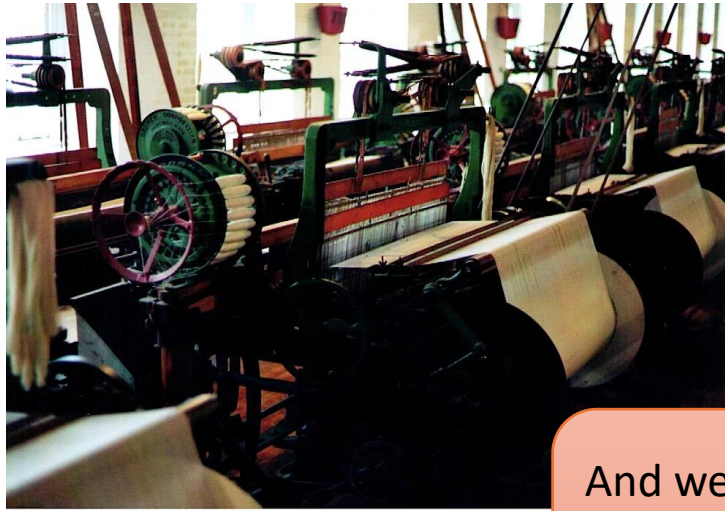
And undoubtedly, we entered our first Industrial Revolution (~1760-1820)



History of Weaving



- ❖ Then came Edmund Cartwright who invented Power Loom (1785)



And we all know the down spiral fate of Indian weavers by end of the 18th century (a part of colonization)

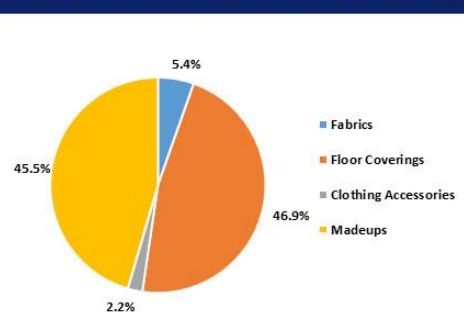
- ❖ Joseph Marie Jacquard, from Lyon, invented Jacquard loom (1801) to control each thread, as per design

- ❖ In mid 1900s, projectile weaving machines came as a part of shuttleless looms line up and the weaving industry didn't look back

Modern India and Weaving

- ❖ The handloom sector of India is one of the biggest unorganized economic activities
- ❖ It is the rural region's second-largest employment provider, employing more than 3 million people in direct and allied activities
- ❖ The sector employs 43.31 lakh weavers directly and indirectly throughout the country with 77% of them being women

Category-wise share of handlooms export revenue (2021-22)



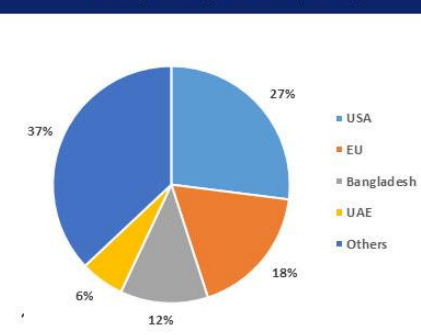
Source: The Handloom Export Promotion Council (HEPC)

India's handloom export trend (US\$ million)



Source: The Handloom Export Promotion Council (HEPC)
Note: *April 2021-Feb 2022 ** April 2022-July 2022

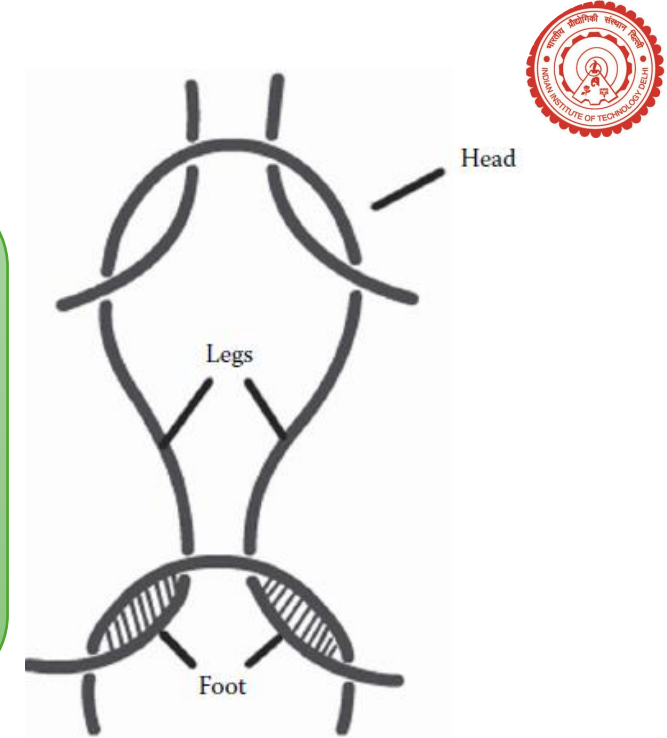
Country-wise exports share (2021-22)



Source: The Handloom Export Promotion Council (HEPC)

Knitting

- ❖ Knitting is a process of fabric formation by producing series of intermeshed loops
- ❖ The upper part of the loop is called 'head', whereas the two sides are called 'legs'. The intermeshing of two loops happens through the 'foot'
- ❖ The knitted fabrics are more stretchable than the woven fabrics. It also facilitates better moisture vapour transmission, making it suitable for sports garments and high-activity



Knitting is as old as >1000 years; the first set of knitted components was found to be socks from Egyptian socks



Madonna Knitting, by Bertram of Minden 1400-1410.

Source: Wikipedia

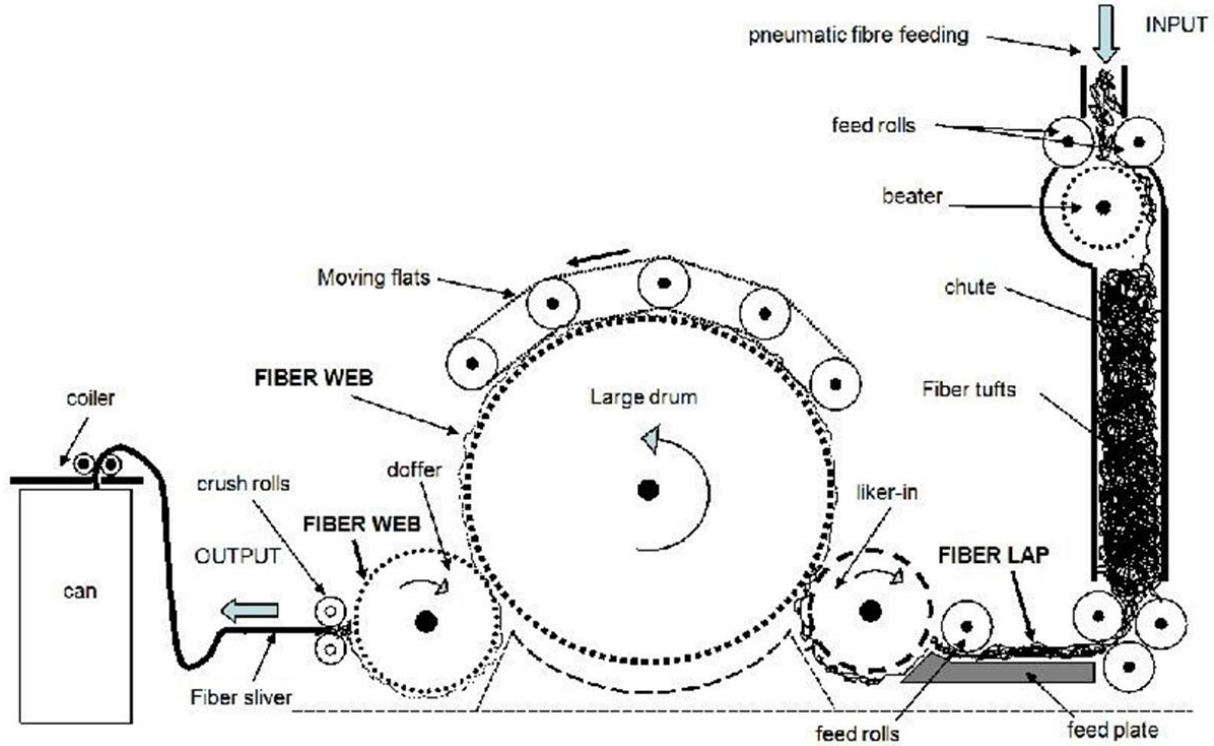


Braiding

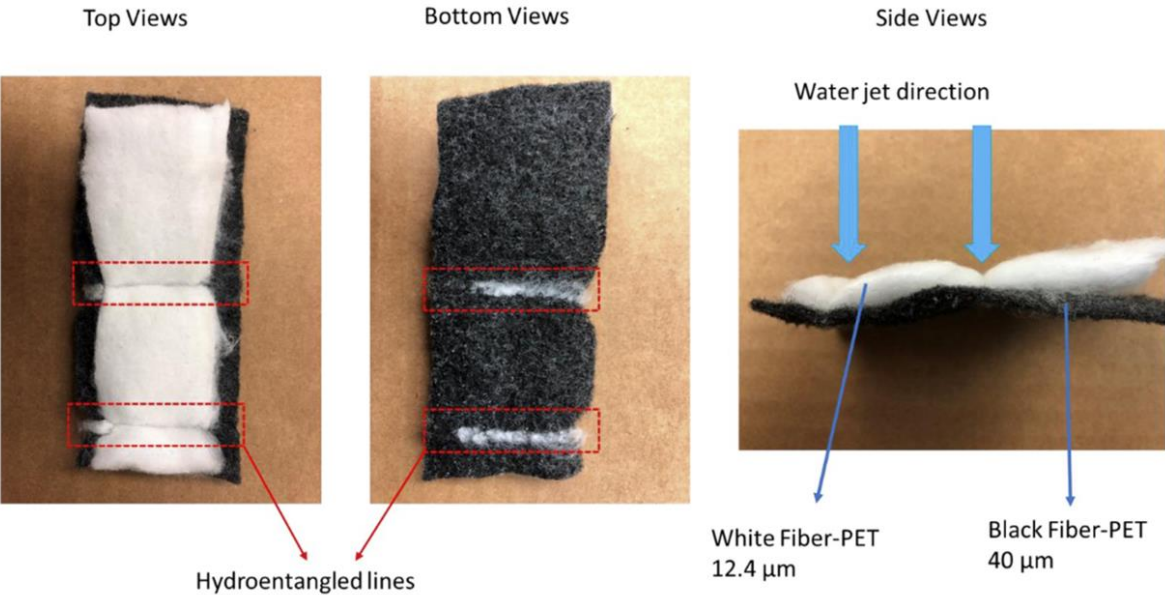
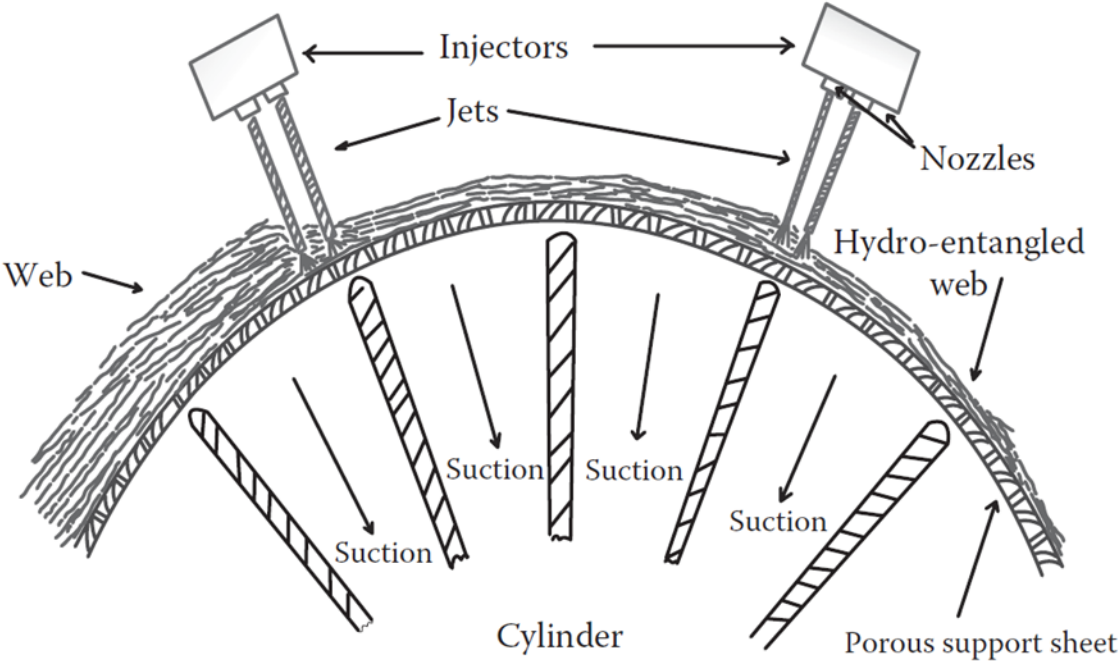
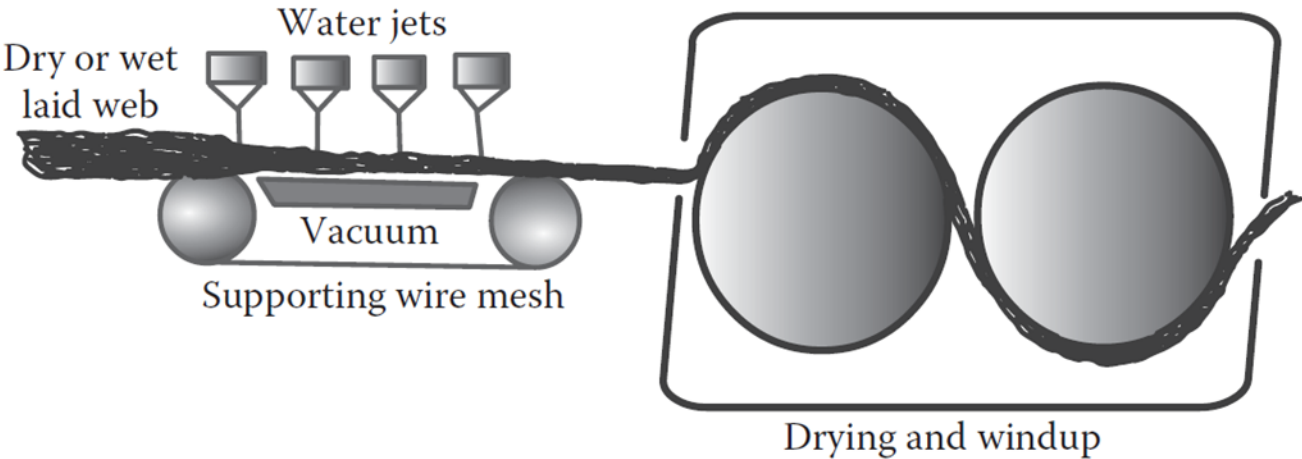
- Traditionally used as decorative trimmings and functional elastic components in apparel goods
- Demanding technical applications, like- in shielding wires from electromagnetic interference
- Absorbing very high impactful energy in the form of ropes, fishing lines, parachute cords
- Fairly modest and less demanding functions in household goods in the form of draw threads for curtains, wash lines
- And of course, shoelaces (the most ubiquitous one)



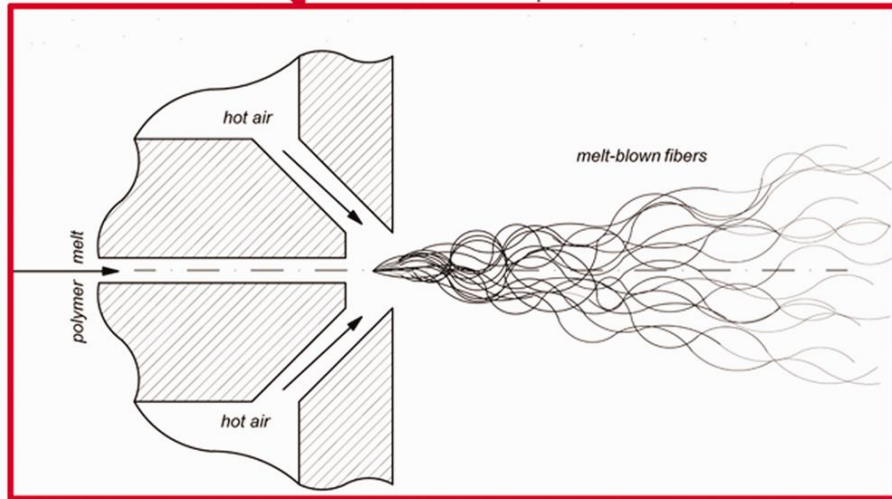
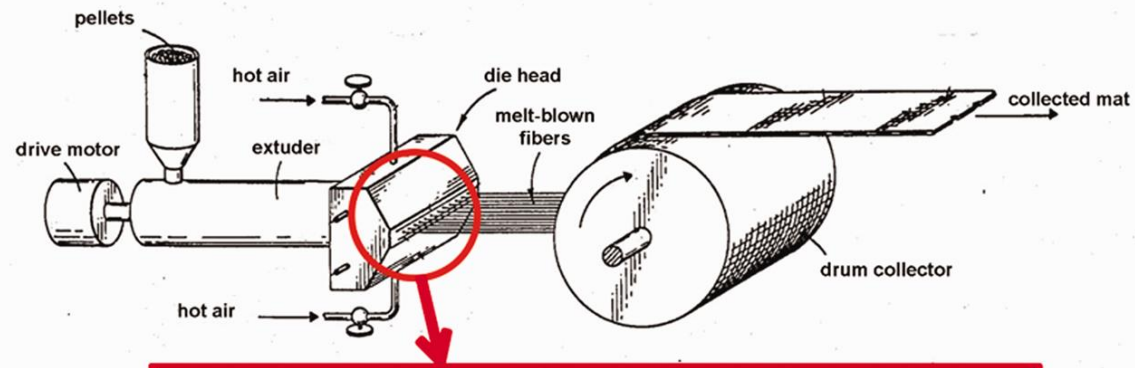
Nonwoven: Needle Punching



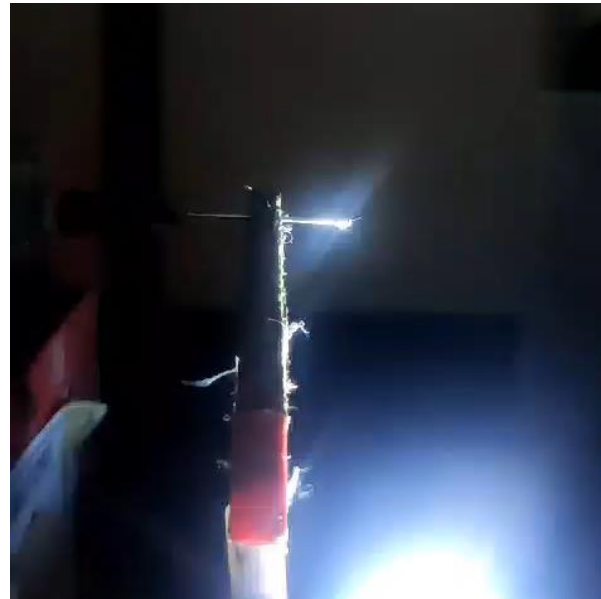
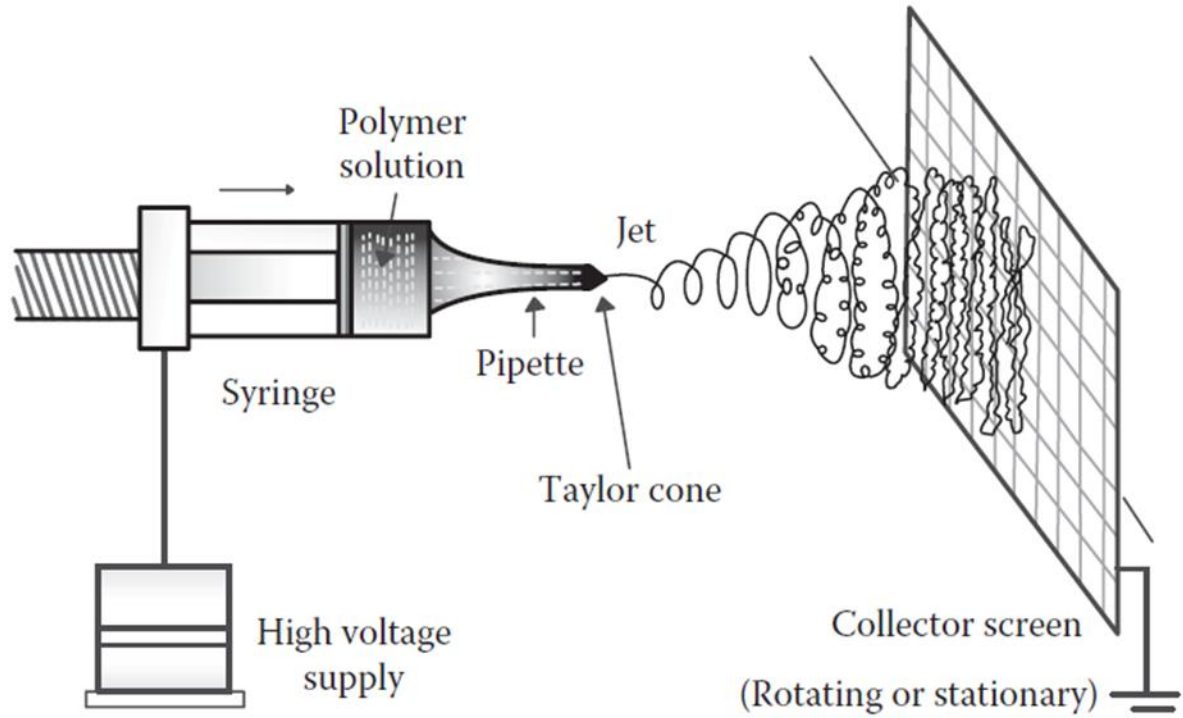
Nonwoven: Hydroentanglement



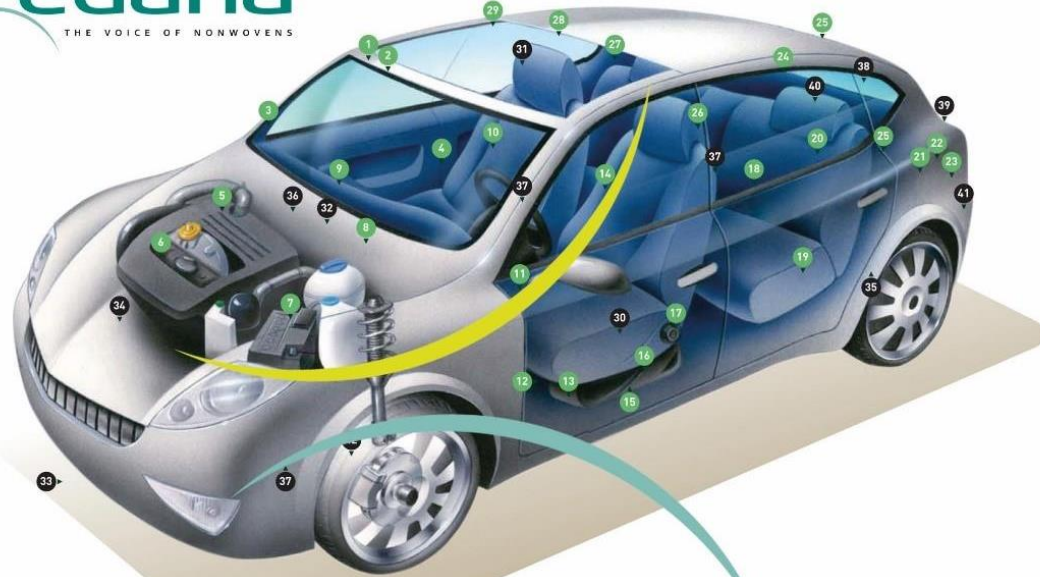
Nonwoven: Meltblowing



Nonwoven: Electrospinning

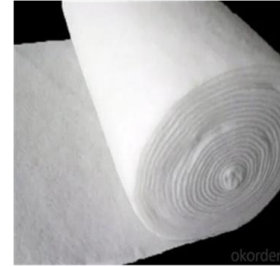


Vast World of Nonwoven

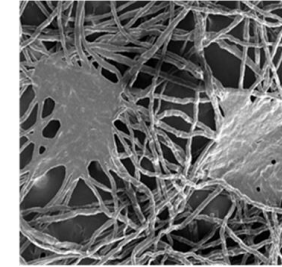


THE NONWOVENS CAR

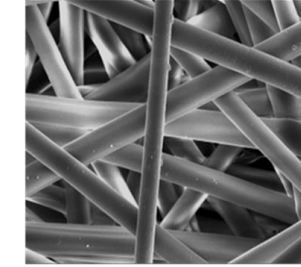
- | | | |
|------------------------------------|-------------------------------------|---------------------------------------|
| 1 Covering material for sun-visors | 16 Covering for seat belt anchorage | 30 Acoustic absorber applications |
| 2 Padding for sun-visors | 17 Covering for seat belt | 31 Doors |
| 3 A, B, C, column padding | 18 Decorative fabric | 31 Headliner |
| 4 Door trim pads | 19 Polyurethane coated backing | 32 Inner & outer dashboard insulation |
| 5 Fuel filters | 20 Seat slip agents | 33 Under engine shield |
| 6 Oil filters | 21 Boot (trunk) liners | 34 Moulded bonnet liner |
| 7 Battery separators | 22 Moulded fuel tanks | 35 Rear wheel arch liner |
| 8 Cabin air filters | 23 Bodywork parts | 36 Cowl |
| 9 Loudspeaker cover | 24 Window frames | 37 Pillar trim panels |
| 10 Covering for moulded seats | 25 Headliner facings | 38 Parcel shelf |
| 11 Transmission tunnel | 26 Upholstery backing | 39 Trunk trims |
| 12 Carpet & carpet reinforcement | 27 Loudspeaker housing | 40 Rear seat strainer |
| 13 Car mats | 28 Sunroof | 41 Air extractor |
| 14 Vinyl backing for seat covers | 29 Saloon roof | 42 Wheel arch liners |
| 15 Backing for tufted carpeting | | |



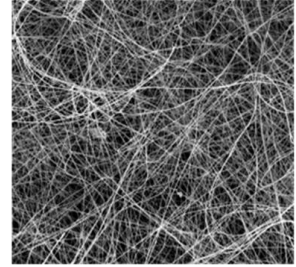
Needle punched



Spunbond



Meltblown



Electrospun

Where do you see the differences?

