TECHNICAL UNIVERSITY OF LIBEREC
Faculty of Textile Engineering

Clothing Technology
Lecture 1

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CLOTHING TECHNOLOGY

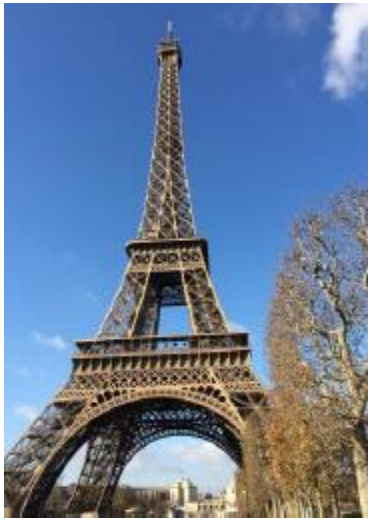
- Two Lessons
  - Lesson 1
  - – Flow Chart of Clothing production
  - – Spreading
  - – Textile cutters
  - Lesson 2

    -Sewing process

    -Garment Production System

Imagination

Places	People	Professions
Romantic	America	cooking

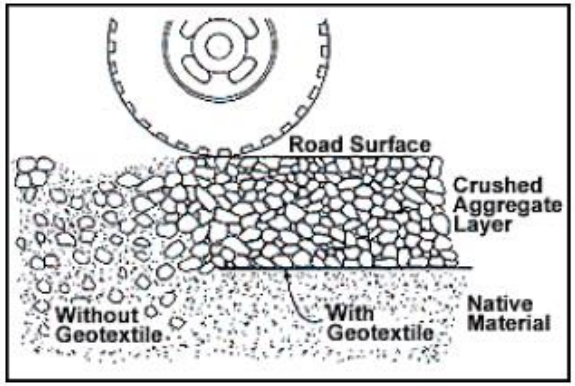


- Textile includes any industry with fibrous raw materials (excluding some fiber from food industry)
- It is NOT limited to spinning , weaving , knitting etc…
- Traditional textiles

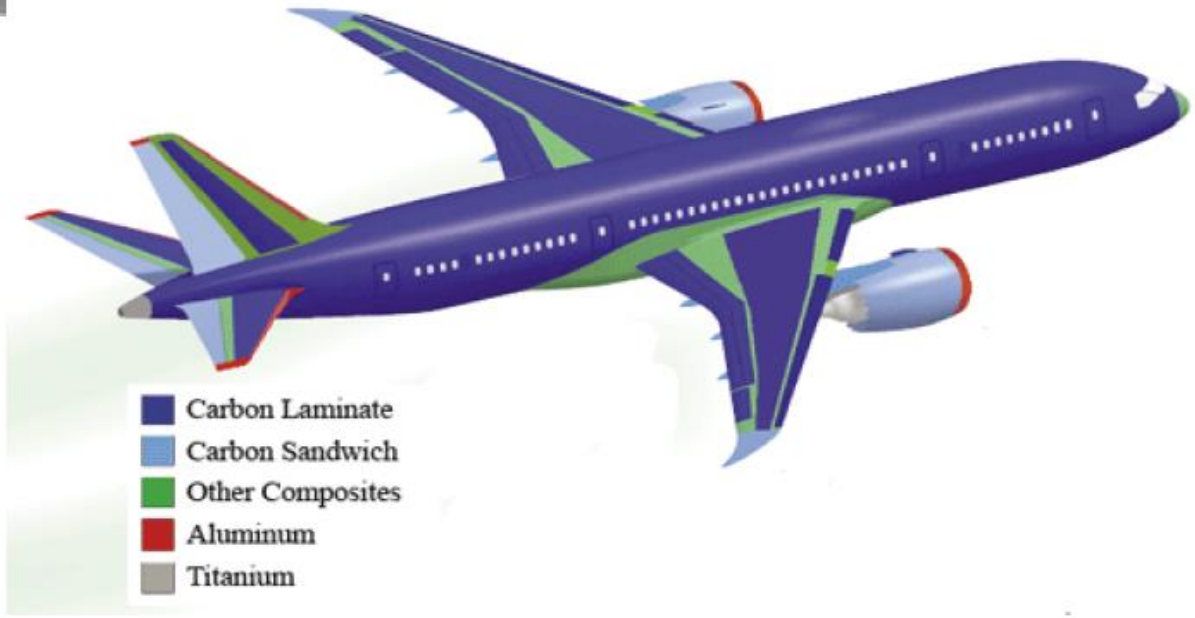
- Non traditional Textiles (Technical)

Technical Textiles

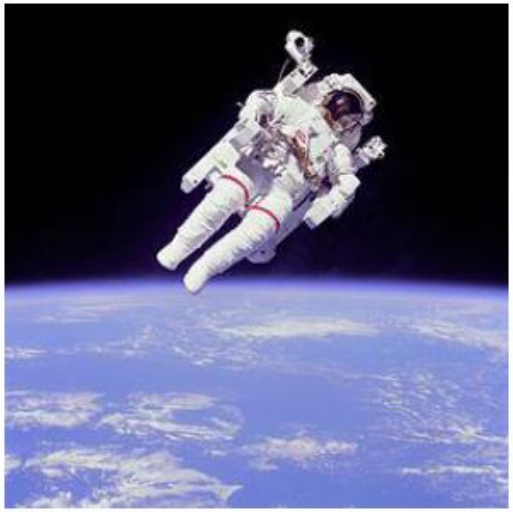
Geo Textiles

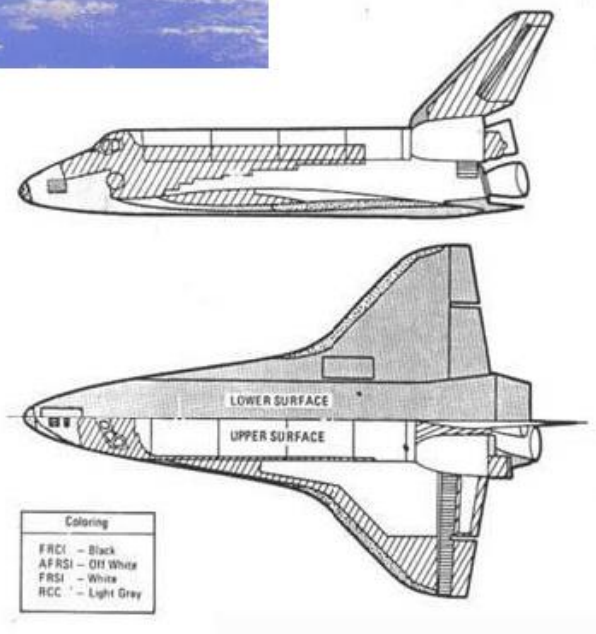


Aerospace and textiles



Space and Textiles



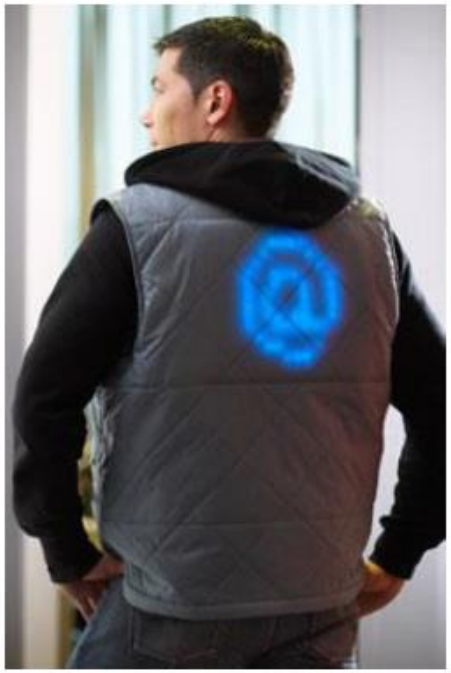


	Reinforced Carbon-Carbon (RCC)
	High-Temperature, Reusable Surface Insulation (HRSI) Fibrous Refractory Composite Insulation (FRCI)
	Low Temperature, Reusable Surface Insulation (LRSI) Advanced Flexible Reusable Surface Insulation (AFRSI)
	Coated Nomex Felt Reusable Surface Insulation (FRSI)
	Metal or Glass

Element*	Area, sq m (sq ft)	Weight Kg (lb)
FRSI	332.7 (3581)	532.1 (1173)
LRSI**	TBD	TBD
AFRSI**,***	TBD	TBD
HRSI**	TBD	TBD
FRCI**,*****	TBD	TBD
RCC	38.0 (405)	1697.3 (3742)
Miscellaneous		918.5 (2025)
Total	TBD	TBD

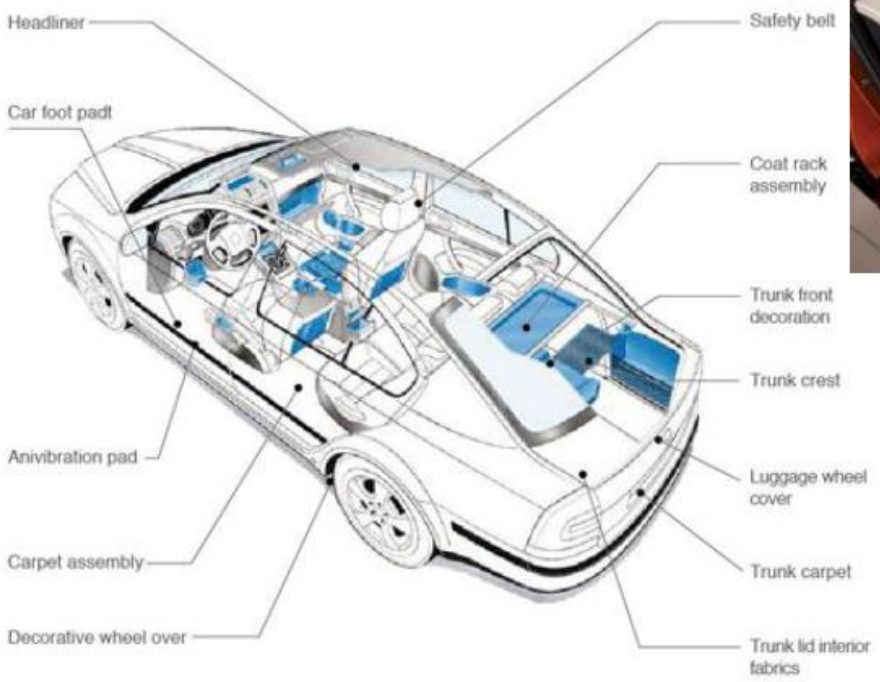
*Includes bulk insulation, thermal barriers, and closeouts
**Possibly some of Orbiter 099
***Orbiter 103 and subsequent
TBD – To Be Determined

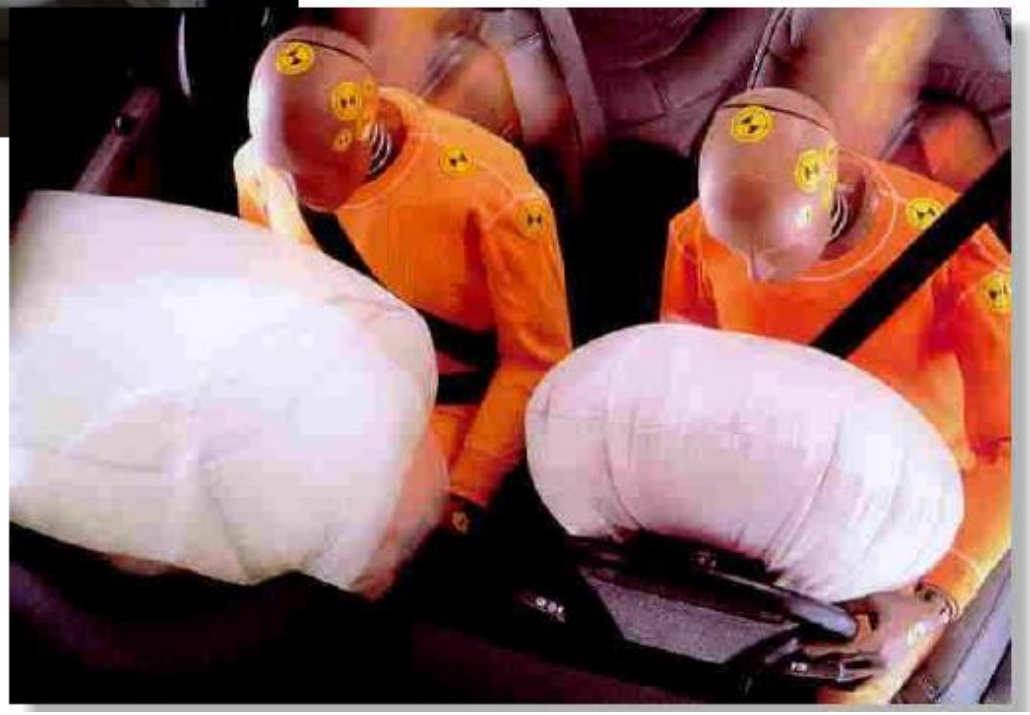
Wearable Electronics



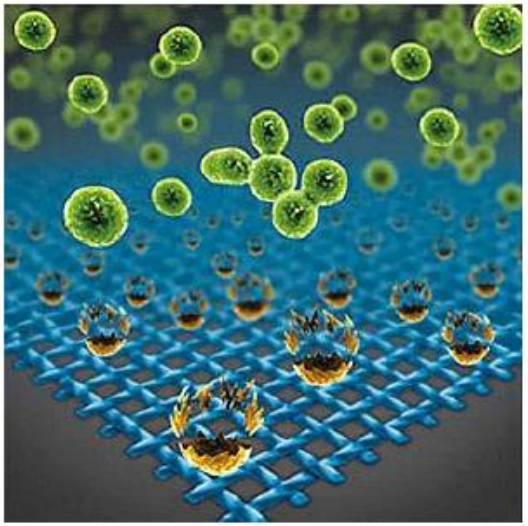
Sports and Textiles

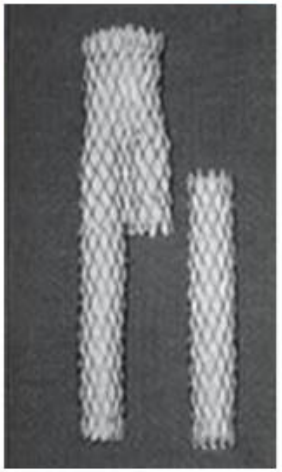
Automotive Textiles

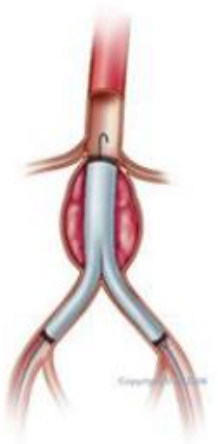




Medical textiles

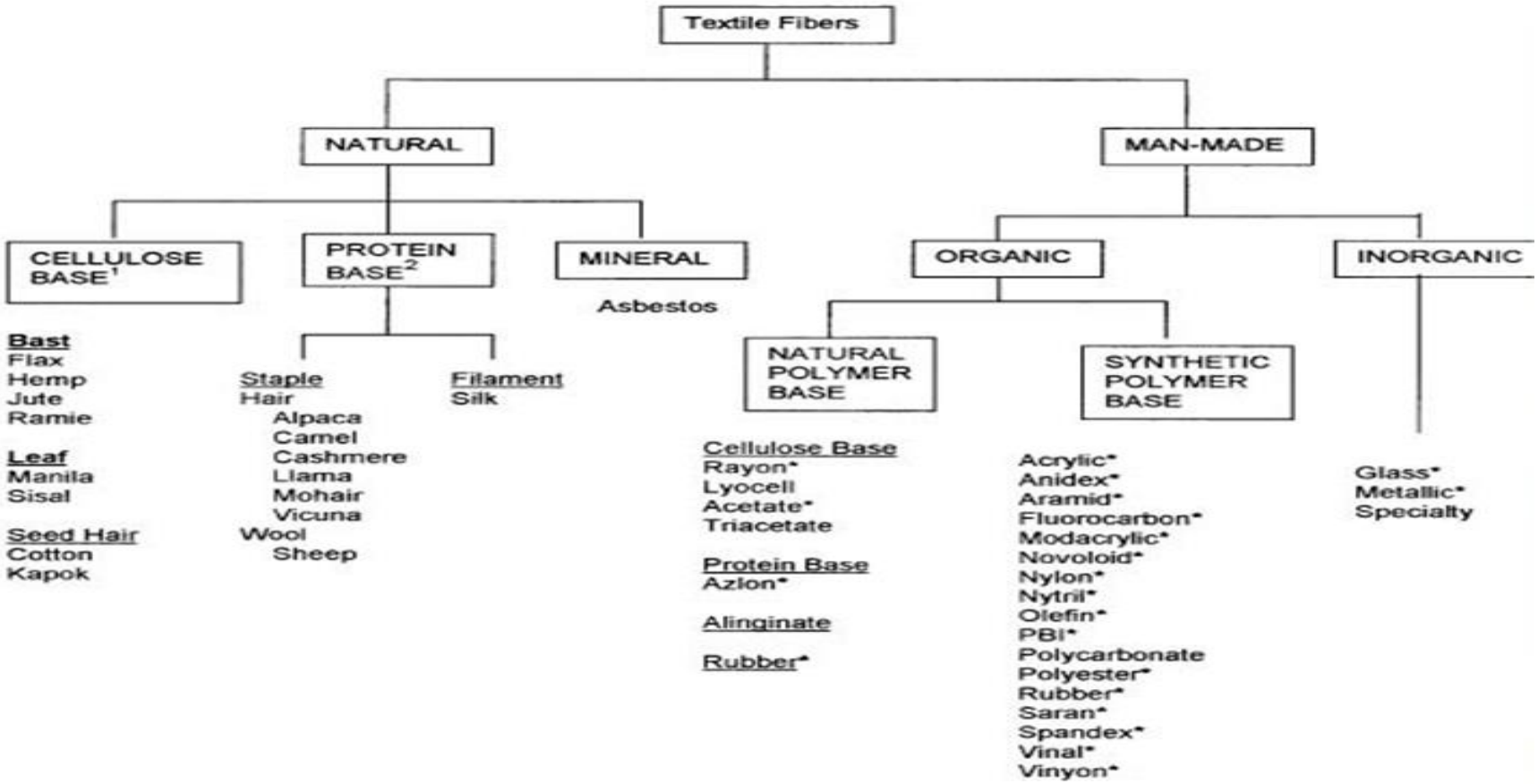






- A fibre is a material which is several hundred times as long as its thickness.

General Classification of Textile Fibers



Textile Production Flow

Spinning

1D

Weaving

Knitting

Nonwoven

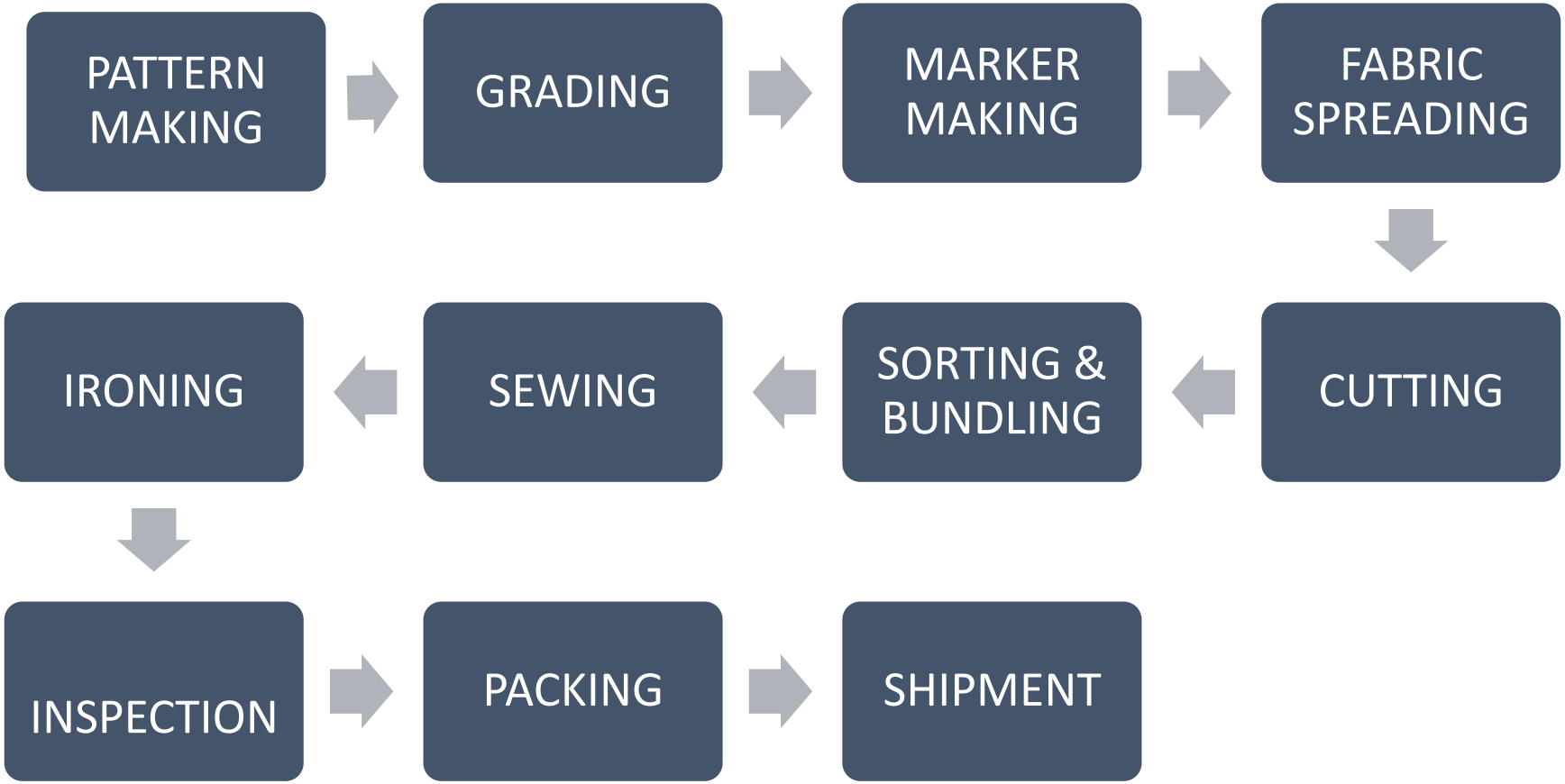
2D/
3D

Finishing

Garment

3D

Flow chart


PATTERN MAKING
GRADING
MARKER MAKING
FABRIC SPREADING
CUTTING
SORTING & BUNDLING
SEWING
IRONING
INSPECTION
PACKING
SHIPMENT

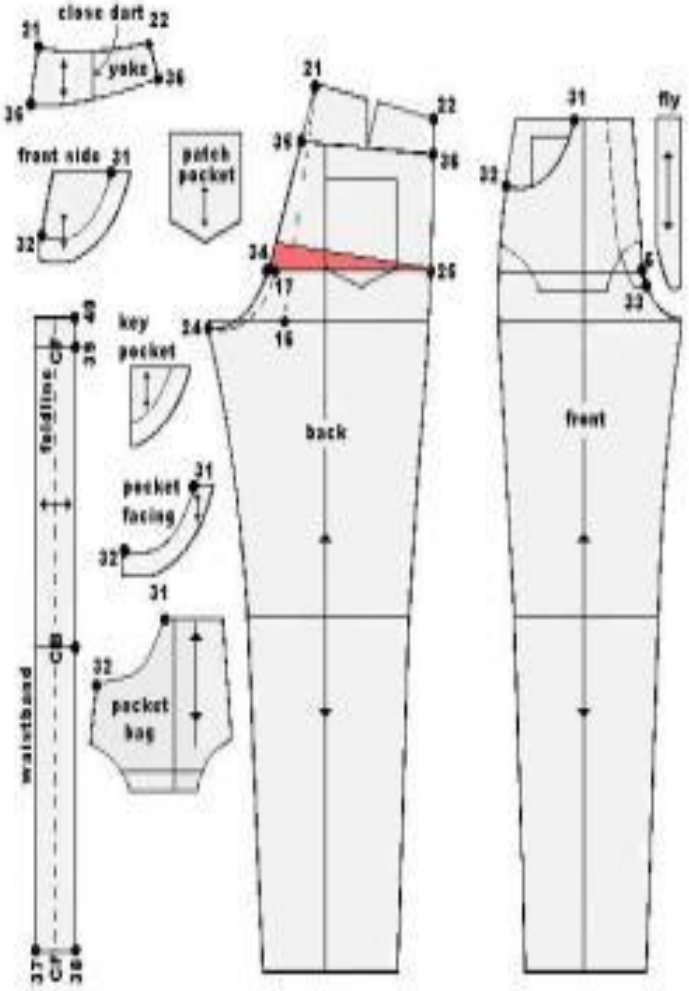
Pattern Making

Pattern Making

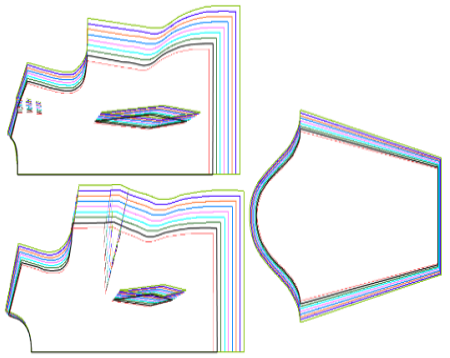
Patternmaking is the science of designing patterns.

Pattern

A template from which the parts of a garn traced onto fabric before cutting.



Pattern Grading & Marker making



Pattern Grading

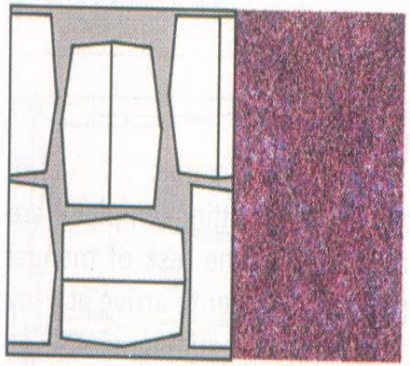
Increasing the pattern dimension according to garment Size like S,M,L,XL,XXL

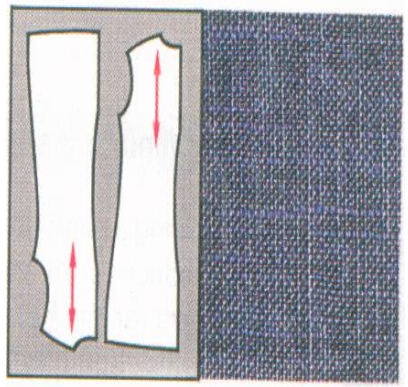
What is a Marker?

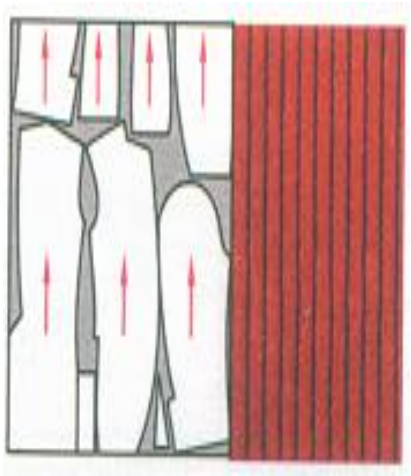
The Marker is a diagram of a precise arrangement of pattern pieces for the sizes of a specific style that are to be cut from a single spread.

There are three basic types of orientation:

i. **Nonwovens=** neither the orientation nor the direction
ii. **Cretonne=** orientation is important
iii. **Corduroy=** orientation and direction are both important(knitted)







- Fabric in roll form

Fabric Relaxation:

- **Relaxation Period:**
- Fabric relaxation is performed for a certain period. This time is varied from fabric to fabric. But the minimum time of relaxation is twelve (12) hours. This time also may vary according to the buyer's recommendation.

Fabric Spreading Process

- There are two methods applied in garment industry for fabric spreading process.
- Manual Method

Totally hand spreading method therefore this process is quite slow.

Mechanical Method

They are semi-automatic and full automatic

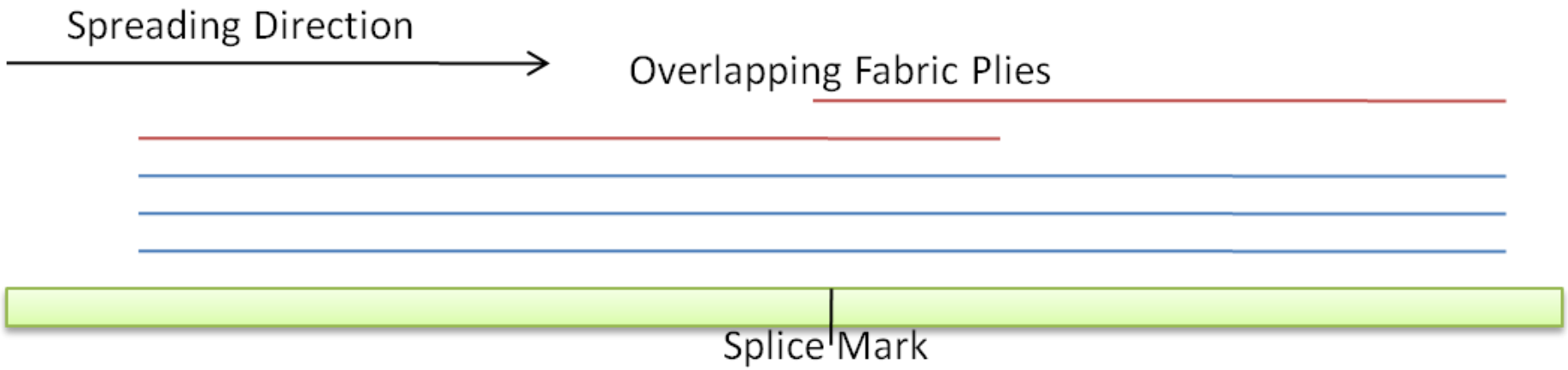
EXIT
03-Jul-12 3:57 pm

Fabric Spreading

Preparation before spreading

- **Fabric Length and Weight:**
- **Fabric Tension:**
- **Fabric Splicing:**
- **Static Electricity:**
- **Fabric Ply Direction:**
- **Ply Number**
- **Stripe and Check Matching:**
- **Fabric Faults removing**

Fabric Splicing



Fabric Splicing

- Splicing is the technique used in the cutting room during the process of spreading. It basically incorporates cutting the fabric across its width to overlap layers in between the ends of the lay. It can be used for different reasons
- 1. Firstly, to accommodate for fabric defects,
- 2. Splicing is also used when the fabric roll being spread ends in the middle of the marker, and the end bit length is sufficient to cut one complete garment piece.
- Lastly, it is used when there is a change in the size, i.e. the pattern pieces of each

Loss at Spreading section

- 1. Marking Loss
- 2. Spreading Loss

- 1. End of Ply Loss
- 2. End of Piece Losses
- 3. Edge Losses
- 4. Splicing Losses
- 5. length Losses

Avoid during spreading

- Fabric must be flat
- Elimination of fabric faults
- Correct ply direction and adequate lay stability
- Avoidance of fusion of plies:
- Mixing pieces

Types of Lay Plan

- **Half Garment Lay** includes only half of the garment pieces, for example, one side left or right. Generally used for tubular fabrics.
- **Whole Garment Lay** includes garment pieces, left and right sides. Generally used for Open width fabrics.
- **Single Size Lay** is used using all garment pieces of one single size. Disadvantageous as the consumption of fabric is higher.

Types of Spreading

- **Single Ply** is a single layer of fabric generally to make samples
- **A multiple Ply** is a number of fabric layers stacked on one top of other
- **Stepped Lay** is multiple lays in which groups of layers have different lengths generally used for getting best utilization and consumption of fabric.

Objectives:

i. To place the number of plies of fabric to the length of the marker plan correctly aligned as to length and width and without tension.

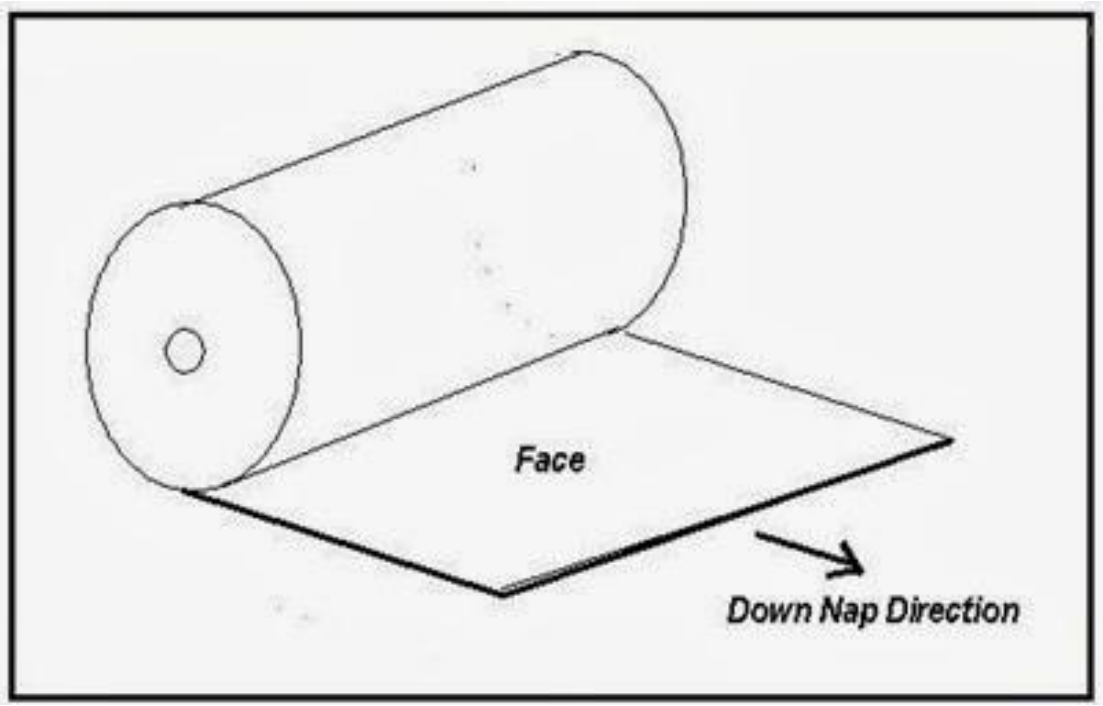
ii. To cut garments in bulk and saving in fabric through the use of multi garment marker plans and the saving in cutting time per garment that result from cutting many plies at a time.

iii. To make every ply plain and flat.

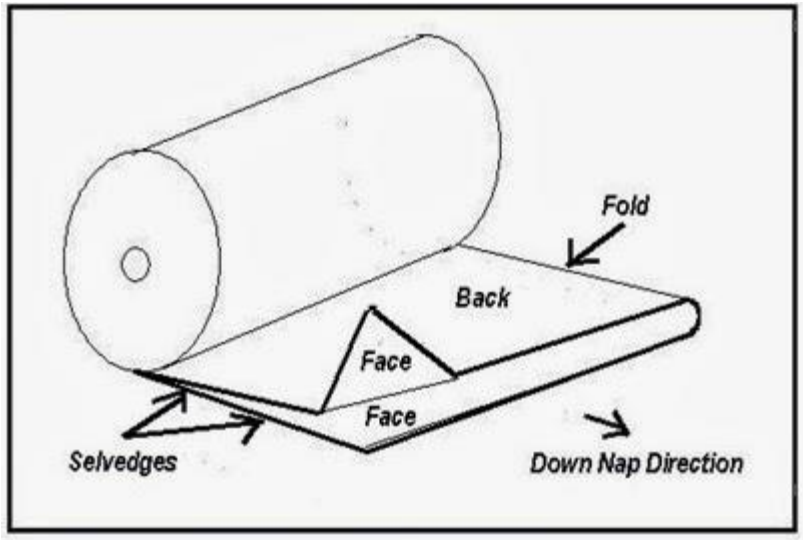
Forms of Spreading

- **One Way Cutting** is when the fabric is laid the same way up with grain or print pattern running in the same direction. The fabric has to be cut at the end of each ply.
- **The fact to Face Cutting** is when the plies are laid in pairs face to face. The grain or pattern runs in the same direction.
- **Two Way Cutting** is when plies are laid continuously from left to right and right to left without cutting at the end. Most Efficient method of spreading. Cannot be used with grain restrictions or one-directional printed fabric.

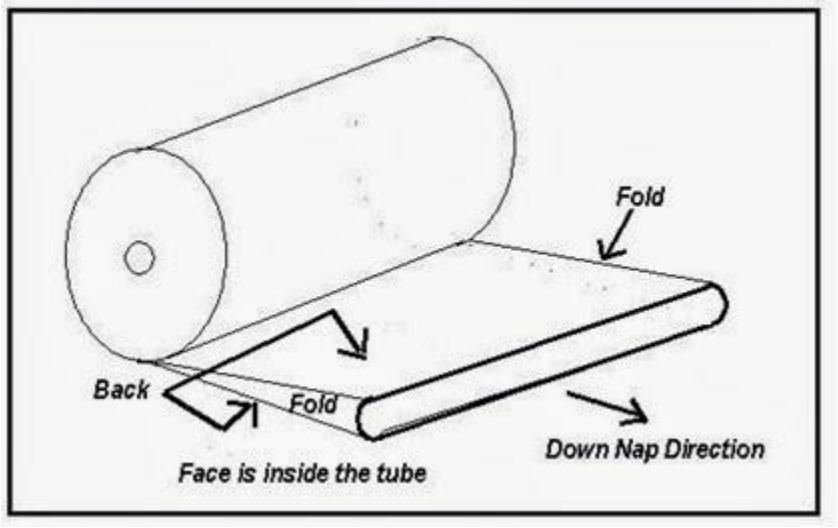
- **1. Fabric Put-up; Open and Rolled**



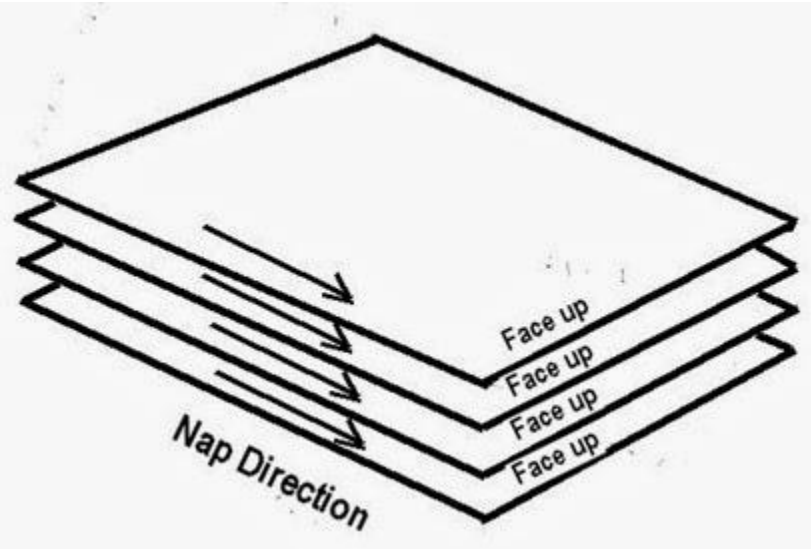
Fabric Put-up; Folded and Rolled



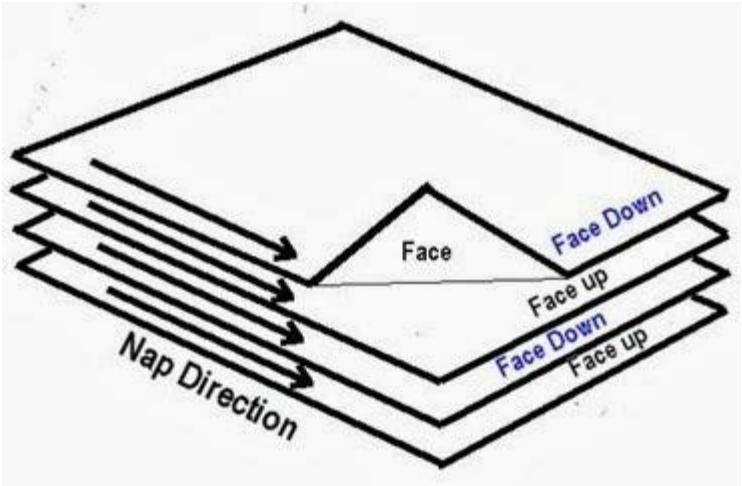
Fabric Put-up; Tubular Fabric Rolled



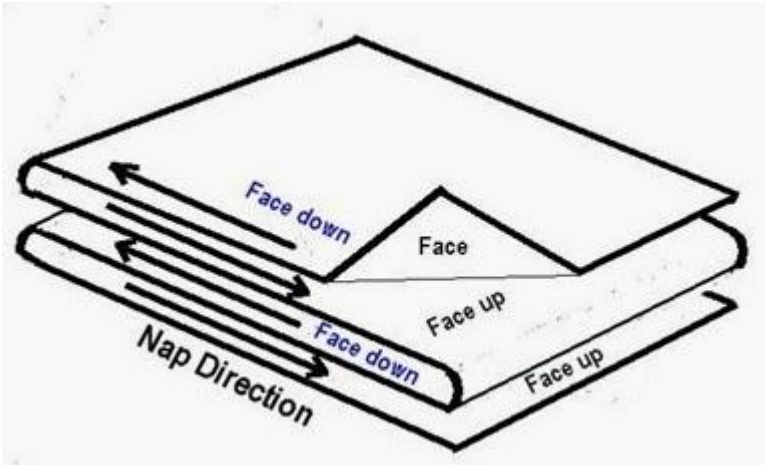
Spreading Mode; Open Fabric, Face One Way, Nap One Way (F/O/W, N/O/W)



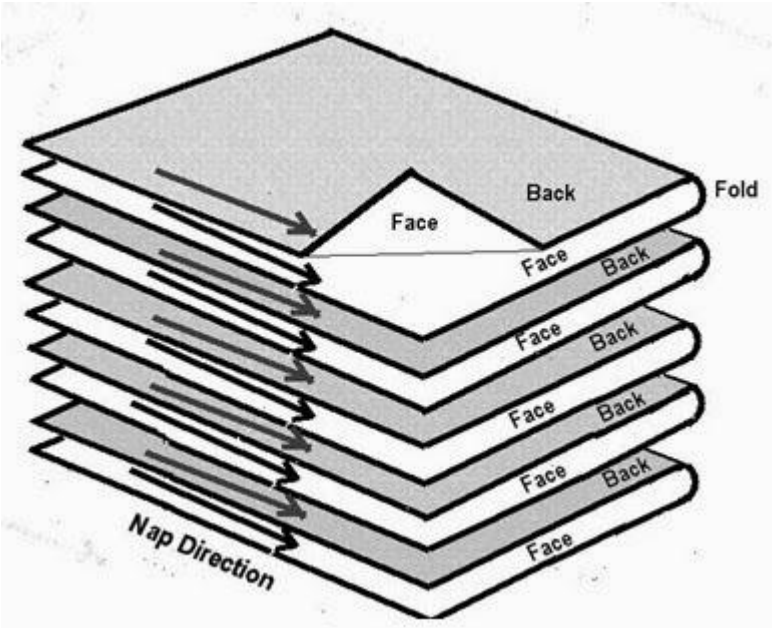
preading Mode; Open Fabric, Face to Face, Nap One Way (F/F, N/O/W)



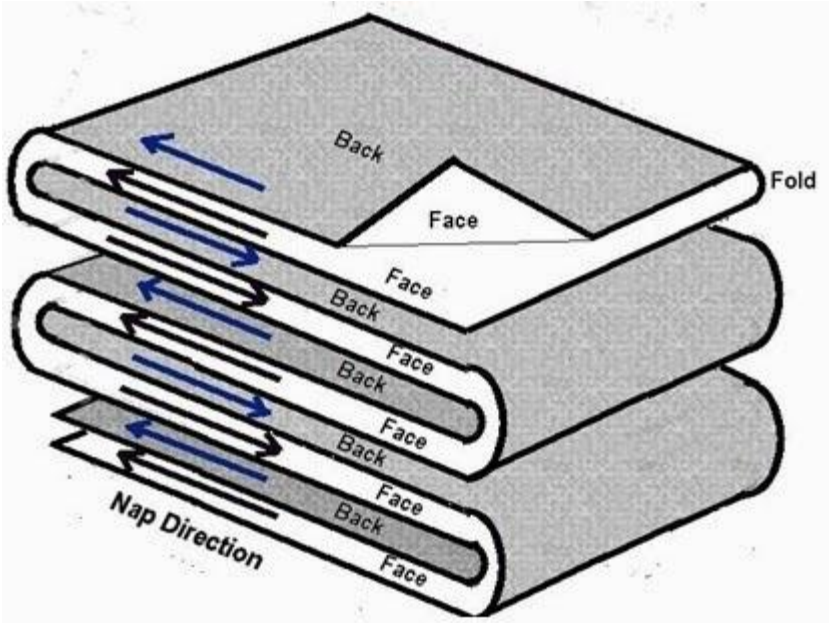
Spreading Mode; Open Fabric, Face to Face, Nap Up and Down (F/F, N/U/D)



Spreading Mode; Folded Fabric, Face to Face, Nap One Way (F/F, N/O/W)



Spreading Mode; Folded Fabric, Face to Face, Nap Up and Down (F/F, N/U/D)



Automatic Programmable Spreading Machines:

- All the requirements of spreading process can be fulfilled by fully automatic spreading machines. Their features include:Automatic loading/unloading and threading/rewinding device for fabric rolls.
- Automatic roll turning arrangement for face to back lay.
- Automatic leveling device for fabric edge alignment.
- Automatic cutting device (one way or two way cutoff) at the end of a run.
- Automatic **tensioning device** to control fabric tension.
- Automatic lay height sensing elevator.
- Programmable lay length, ply height and step-laying.
- Spreading seeds up to 140 m/min.

Cutting

Cutting

It is the second section of apparel manufacturing. The main purpose of this section is to cut the fabric according to the pattern of approved sample.

Methods of fabric cutting:-

There are mainly three methods of cutting are as follow

1. Fully manual:

- Hand operated scissor

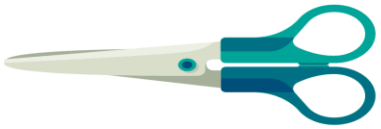
2. Manually operated power knife

- Straight knife
- Band knife
- Round knife
- Die cutting
- Notcher
- Drill

3. Computerized methods of fabri

- Computer controlled knife cutt
- Cutting by Laser beam
- Cutting by Water jet
- Cutting by Plasma torch

FULLY MANUAL CUTTERS

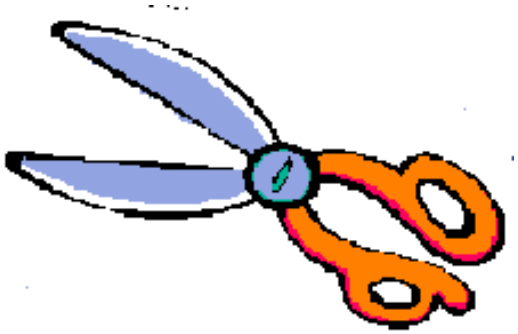


1. HAND OPERATED SCISSOR

- Scissor is the oldest cutting instrument in the world. It has two blades joined by a swivel pin that allows the cutting edges to be opened and closed. Hand operated scissors are quite useful. They can be used for many materials such as paper, thin plastic, hair etc.

Advantages of Hand Operated Scissor:

- The cheapest cutter.
- Most type of the fabrics can be cut by scissor.
- It is easy to operate.



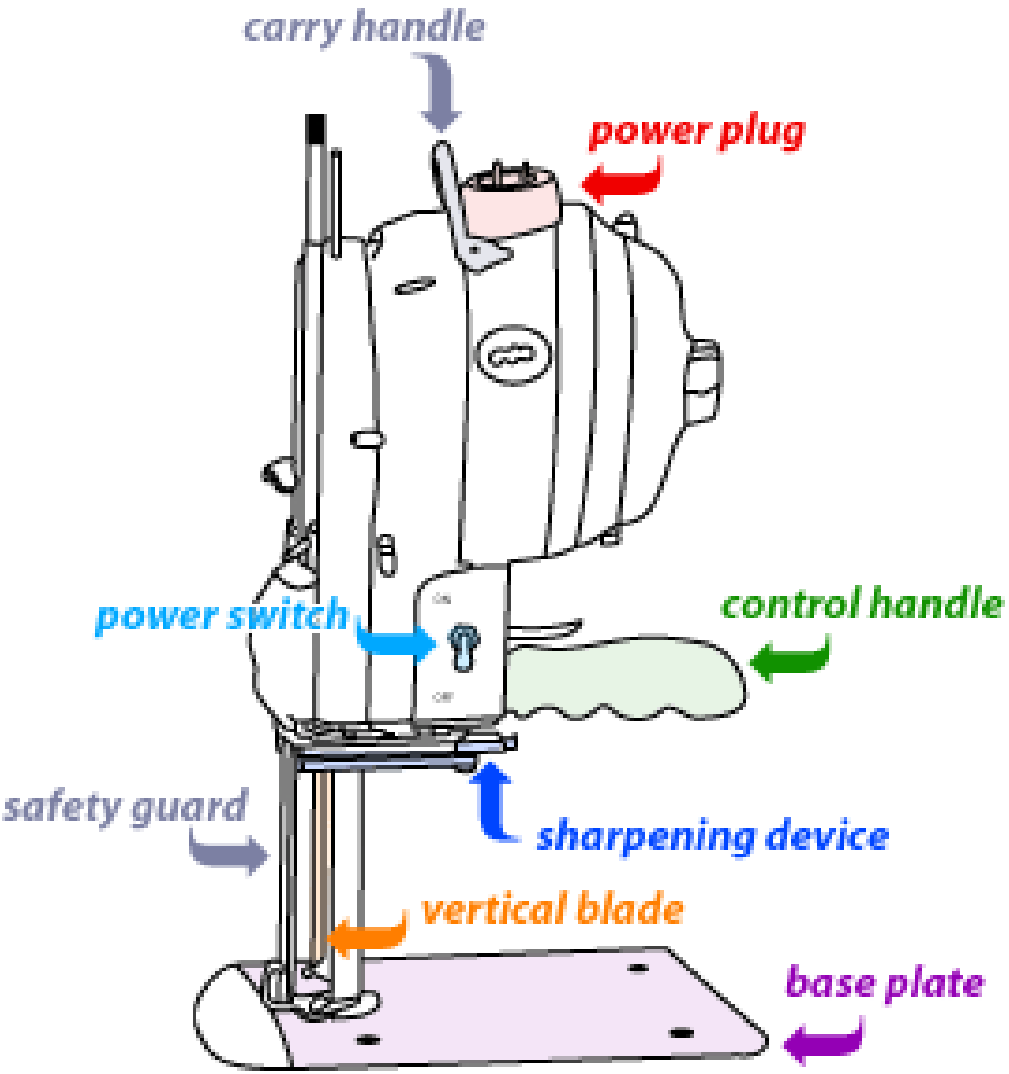
Disadvantages of Hand Operated Scissor.

- Fabric wastage is high.
- It takes more time to cut the fabric.
- Large production is not possible.

Manually Operated Power Knife

1.STRAIGHT KNIFE

- The straight knife is the most versatile machine in the garment industry. Two kinds of power are used for operating this machine. One of them is motor power which drives the reciprocating blade and the other one is operator power which drives the knife through the lay.


carry handle
power plug
power switch
control handle
safety guard
sharpening device
vertical blade
base plate

Advantages of Straight Knife:

- Faster than hand operated scissors.
- It can be used almost every type of fabrics.
- Easy to operate and high efficiency.
- Lay of higher height can be cut easily.
- Large production is suitable.

Disadvantages of Straight Knife:

- More risky than hand operated scissors, risk of accident is high.

2.BAND KNIFE

- Band knife cutting machine is one of the most important instruments of cutting fabrics. This machine basically consists of the following parts:

✓ Fixed body

✓ A table with large surface

✓ An endless knife

✓ Engine parts


HENG XIN

Advantages of Using Band Knife:

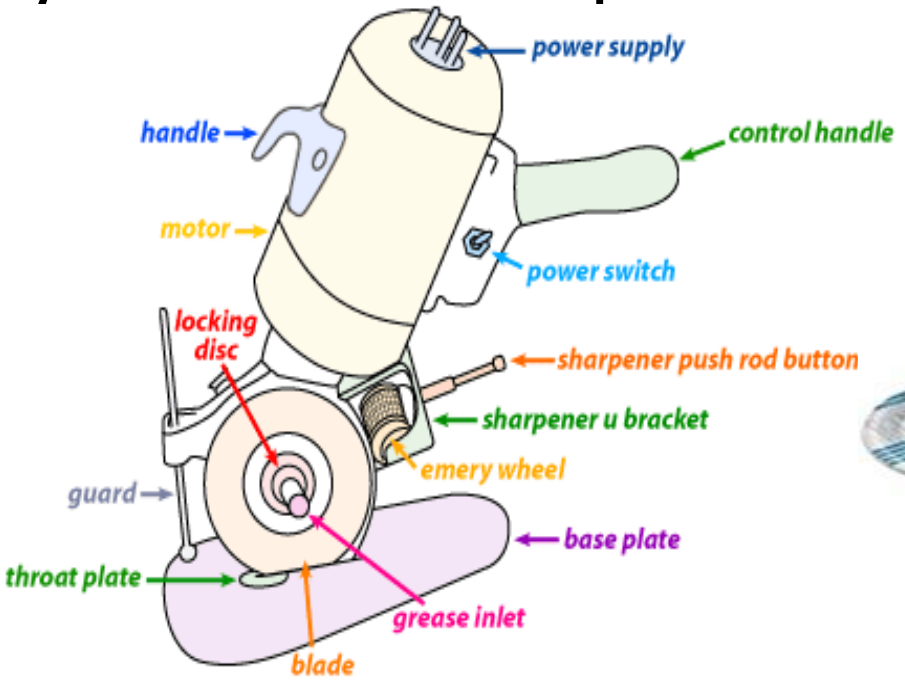
- Possible to cut 90° angle of the fabric lay.
- Air blower helps to reduce the fabric weight which increases smooth movement of fabric.
- Suitable for any types of fabric.

Disadvantages of Using Band Knife:

- Required more area.
- Using this machine without steel gloves is risky.
- Cutting large amount of fabric is not possible.

3.ROUND KNIFE

- This machine has a circular blade so, that is why, it is called round knife cutting machine. It is mostly used for small production.



- The main parts of this machine are circular blade, base plate, motor, handle and guard. Base plate supports the fabric during the cutting process. Knife diameter varies from 6-20 cm. For this reason, this machine is used for small production.

Advantages of Using Round Knife:

- It is useful for gentle curve line cutting.
- More effective than straight knife.
- Like cutting single ply, it is also suitable for cutting multilayer ply.

Disadvantages of Using Round Knife:

- Speed is low.
- It is not suitable for large production.
- Cutting little parts is difficult.

4.DIE CUTTING

- Die cutting methods are used for certain parts of clothes such as ?.
- There are several traditional varieties of die cutters, including rotary, press, and flat bed die cutting machines.

Advantages of Using Die Cutting Machine:

- Suitable for cutting certain parts of garments.
- There is no need to precision cutting.
- There is no need to skilled workers.
- Very smooth cutting is done.

Disadvantages of Using Die Cutting Machine:

- Fabric wastage is high.
- There can be some mistakes sometimes.
- Using die cutting machine costs high.

5.NOTCHER

- Notcher is a special type of cutting machine and it is used in special case. This machine is only used for making notch to the fabric, not used for cutting whole fabric.

Advantages of Using Notching Machine:

- It is most useful to make consistency in notching.
- Useful to cut small notch to the fabric.

Disadvantages of Using Notching Machine:

- The usage of this machine is limited.
- Thermoplastic fiber cannot cut by this machine.

6.DRILL

- Drill machine is used for making hole on the fabric for button attaching and to make reference mark for attaching small parts on the garments. This machine has a motor, a base plate with a hole to allow the drill to pass through, and a spirit level to ensure that the base is horizontal and hence the drill vertical.

Advantages of Using Drill Machine:

- It can make the hole permanently for a long.
- It has a special system to drill fabric.

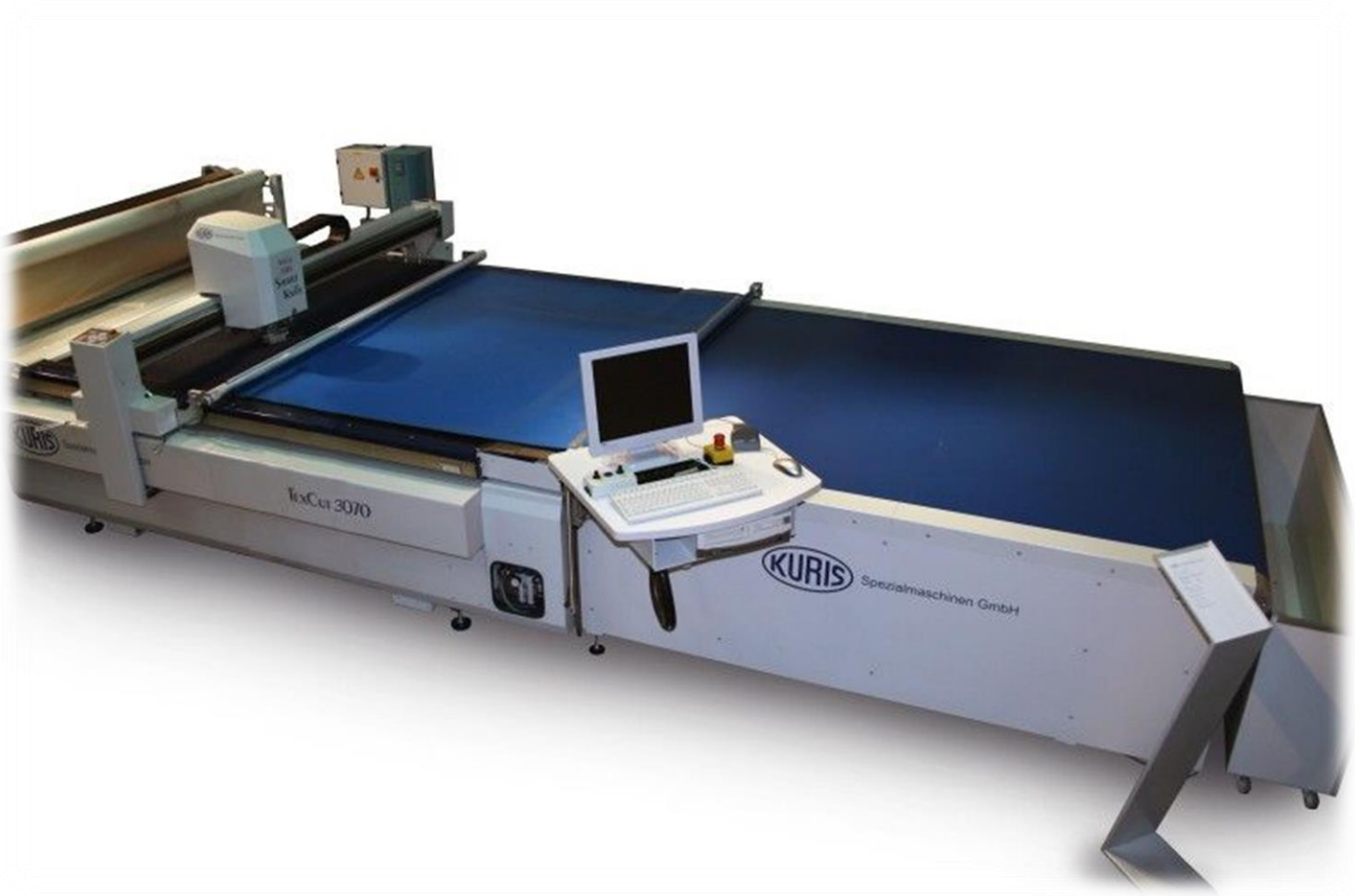
Disadvantages of Using Drill Machine:

- It cannot be used for cutting fabrics.
- The usage of this machine is limited.
- It is not suitable for every type of the fabric.

COMPUTERIZED METHODS OF FABRIC CUTTING

1.COMPUTER CONTROLLED KNIFE CUTTING

- Computer controlled cutting machine is known with its speed and advantages.


TexCut 3070
KURIS
Spezialmaschinen GmbH

Advantages of Using Computer Controlled Cutting Machine:

- Errorless cutting.
- Very high speed.
- Fabric wastage is less.
- Saving of time.
- Preparing to cutting process is less than the other techniques.

Disadvantages of Using Computer Controlled Cutting Machine:

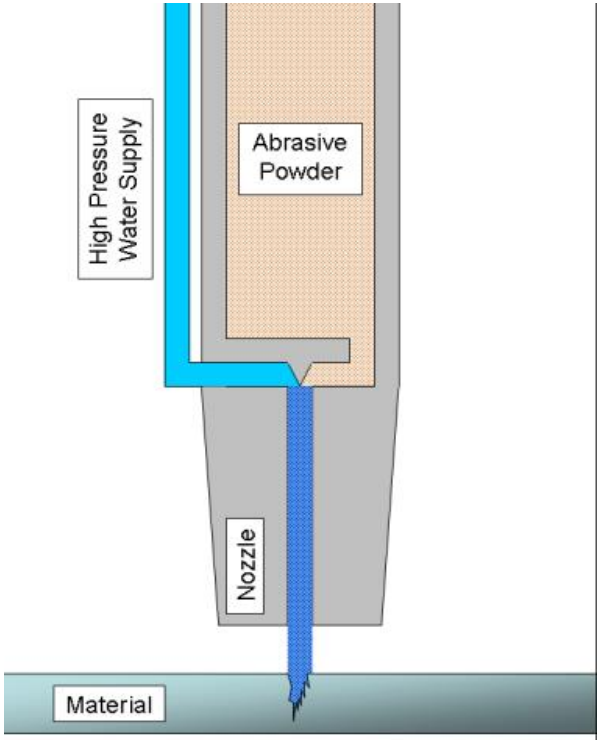
- Capital Cost $$.
- Need to high maintenance.

2.WATER JET CUTTING MACHINE

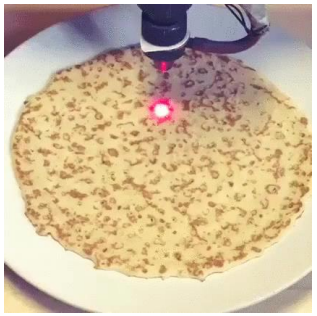
- In this machine, water is used to cut fabric and it is controlled by computer. In order to cut the fabric, it is used high pressure of water. High pressure of water acts like a sharp knife and due to it, the fabric can be cut easily. It has very high speed (60,000 lb/square inch). To improve the cutting speed, it is needed to adjust the pressure and radius of the jet.


HEAD2040RA
HEAD™ Waterjet
HEAD 2040 Waterjet

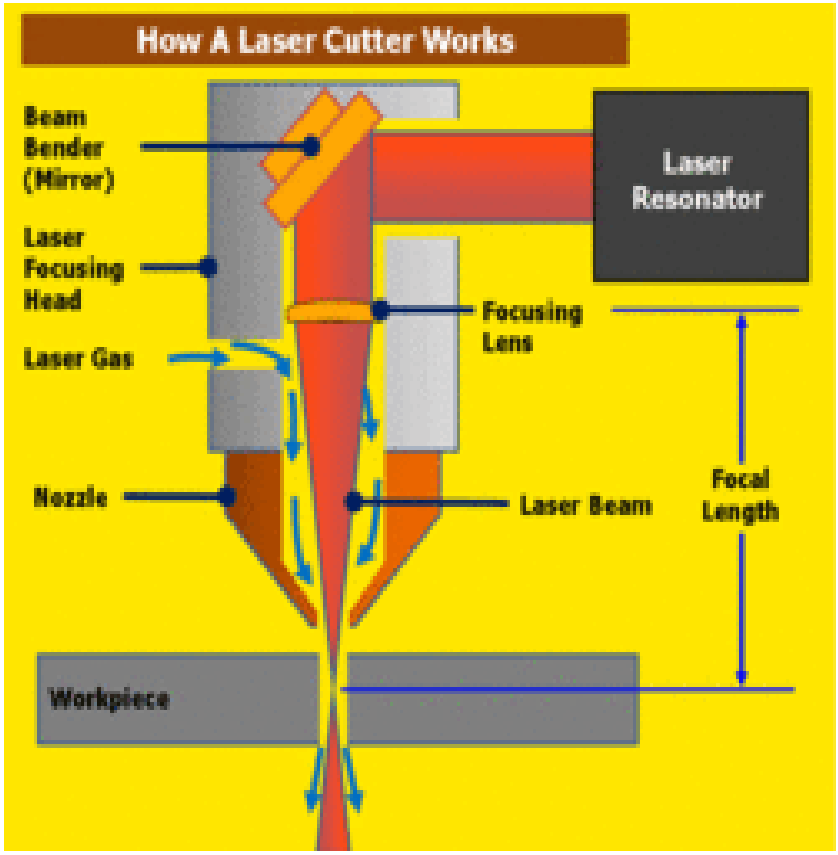
- The cutter is commonly connected to a high-pressure water pump (a local water main does not supply sufficient pressure) where the water is then ejected out of the nozzle, cutting through the material by bombarding it with the stream of high-speed water.



3.LASER CUTTING MACHINE



- Laser cutting is a technology that uses a laser to cut materials, and is typically used for industrial manufacturing. High-power laser is given to the fabric by computer. Then the material is cut but different type of materials give different type of reacts such as melting, vaporizing, burning etc. This machine works very fast. Maximum speed of this machine is 600 mm/s.


How A Laser Cutter Works
Beam Bender (Mirror)
Laser Resonator
Laser Focusing Head
Focusing Lens
Laser Gas
Nozzle
Laser Beam
Focal Length
Workpiece

Advantages of Using Laser Cutting Machine:

- Very high speed.
- Wastage of fabric is less.

Disadvantages of Using Laser Cutting Machine:

- It is not suitable for synthetic fibres.
- Only suitable for single ply cutting.

Thank you

References

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