Knitting Introduction

Introduction to Fabric Manufacturing

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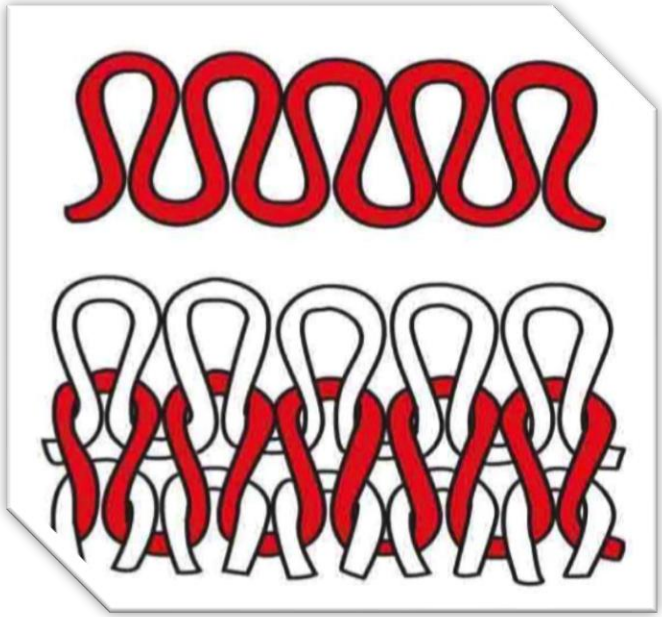
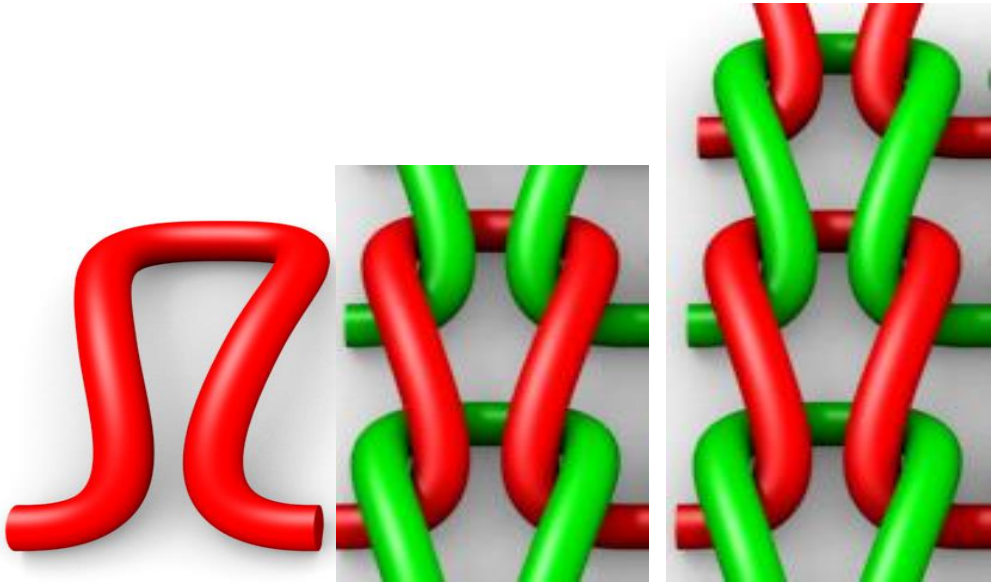
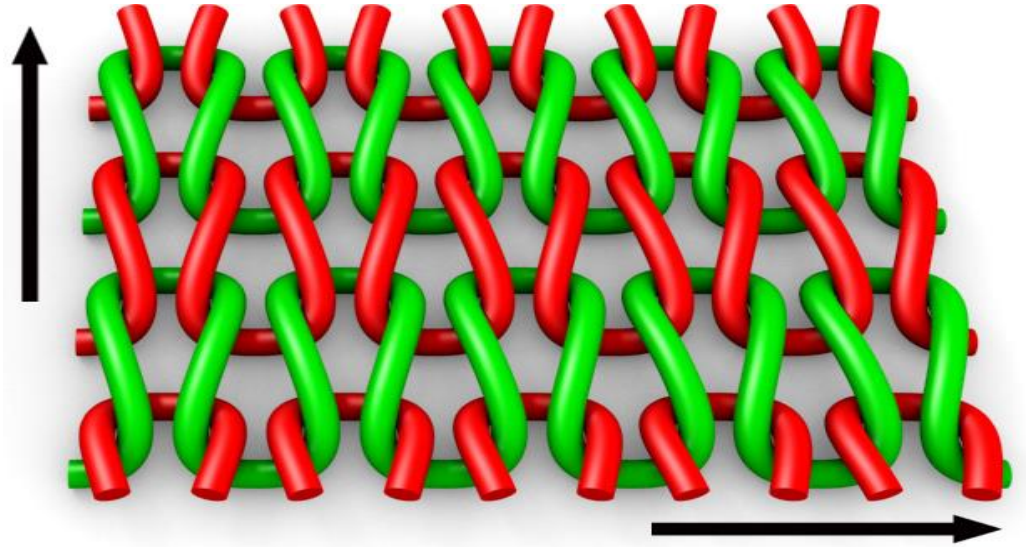
Knitting

- Second most popular technique of fabric formation
- Fabric formation by **inter-looping of yarns**
  - Straight continuous length of yarn is bent into loops and
  - those loops are interlooped for fabric formation
- Continuous length of yarn is converted vertically into intermeshed loop either by hand or machine



Interlooping





Knitting Status

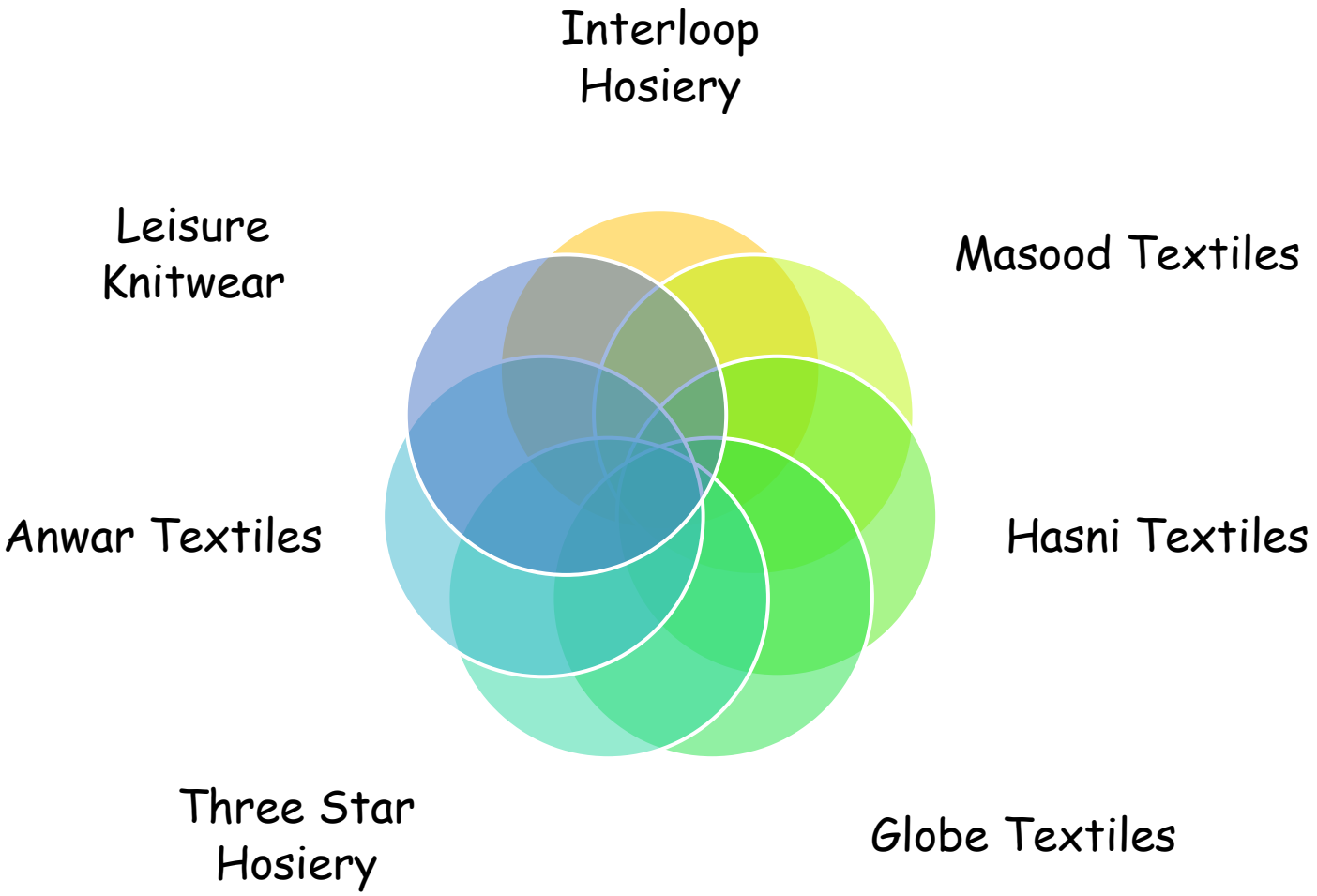
- **Knitted fabrics**
  - World Exports : US$ 33.6 billion
  - Pakistan exports: US$ 35.9 million
  - **Pakistan Share: 0.11 %**

- **Knitted apparel**
  - World exports: US$ 237.7 billion
  - Pakistan exports: US$ 2.4 billion
  - Bangladesh exports: US$ 14.35 billion
  - Vietnam exports: US$ 9.5 billion
  - **Pakistan Share: 1.01 %**
  - **China No. 1; Bangladesh No. 2; Vietnam No. 5; Pakistan No. 19**

Knitting Status of Pakistan

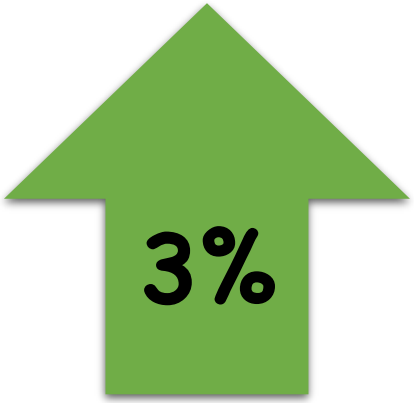
- 12,000 knitting machines
- The main export destinations are
  - European,
  - American and
  - UAE markets.

Major Knitting Industry

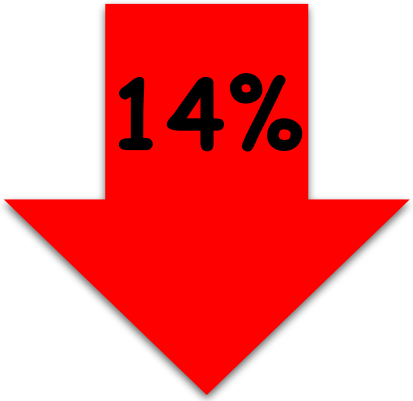


Knitting Status (Imports & Exports)

- 2010-2011 to 2011-2012



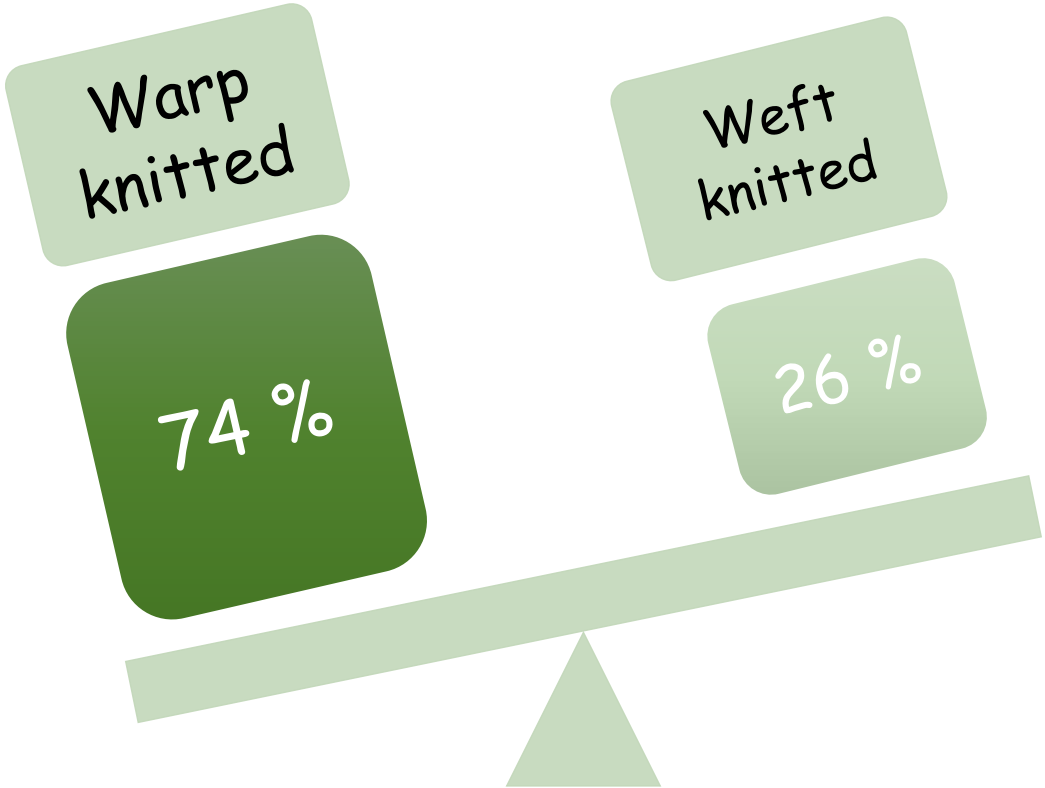
Import of knitwear and embroidery machines



Export of Knitwear (Hosiery)

Knitting Major Exports Apparel

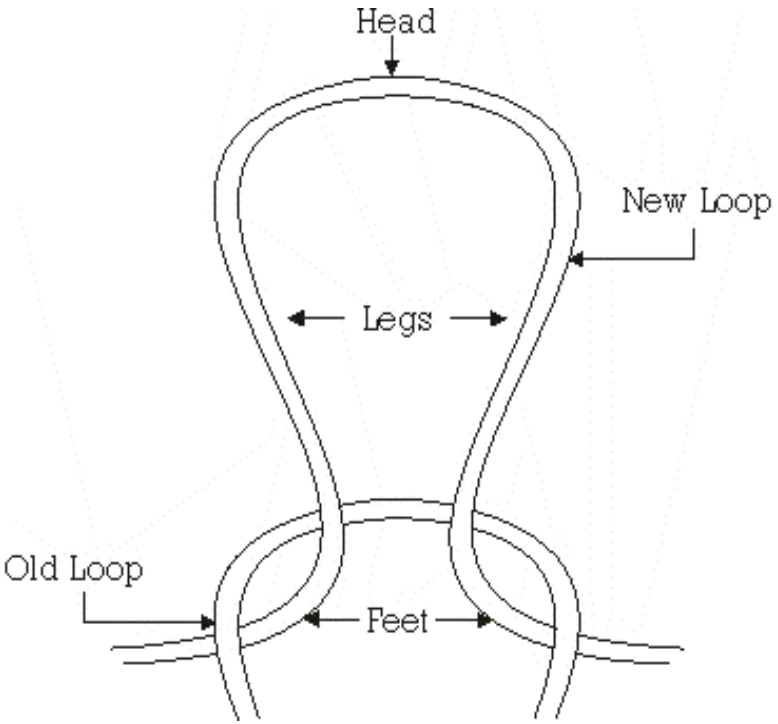
Technical Textile (Knitting)



Basic Terminologies

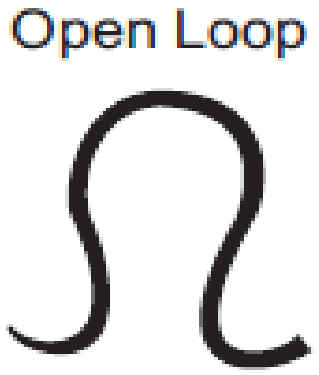
Loop

- Basic unit of knitted structure
- Three Parts
  - A head (H)
  - 2 side limbs or legs (L).
  - A foot (F), at the base of each leg
- Yarn passes through the head of the loop formed at the previous knitting cycle.

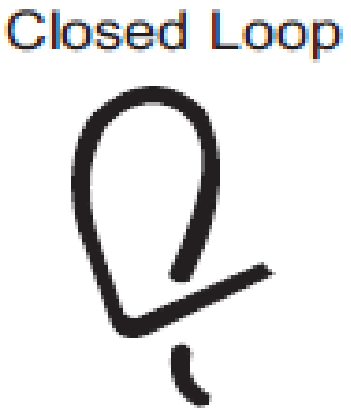


Loop Types

- **Open loop**
  - The open loop is one in which loop forming yarn does not cross at bottom of loop.



- **Closed loop**
  - In closed loop, legs of loop cross so loop closing takes place

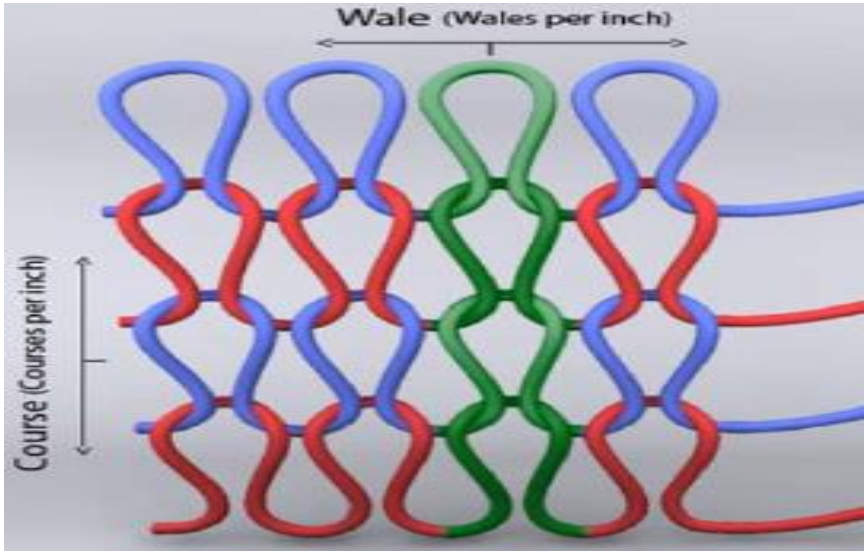


Courses

- A horizontal row of loops across the width of flat fabric
- Series of loops, connected horizontally (Feet to Feet)
- Courses per unit length is course density,
  - measured in cpi (course/inch) or cpcm(course/cm)

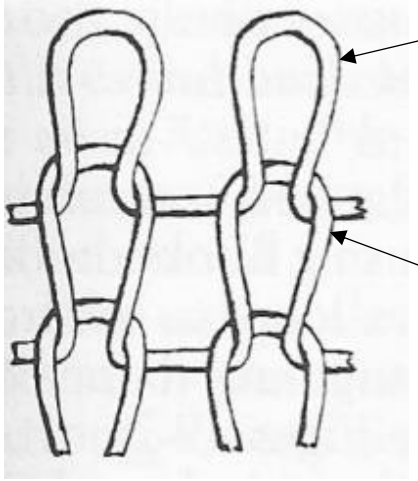
Wales

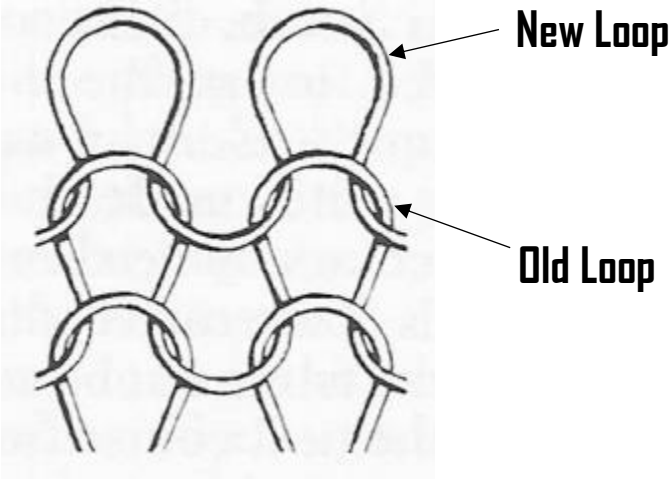
- A vertical column of loops along the length of fabric
- Series of loops intermeshing vertically (Head to Head)
- Wales per unit length is wale density,
  - *measured in wpi(wales/inch) or wpcm(wales/cm)*



Loop Types

- **Face loop**
  - In face loop legs of new loop pass over the head of old loop
  - (Legs are appeared)

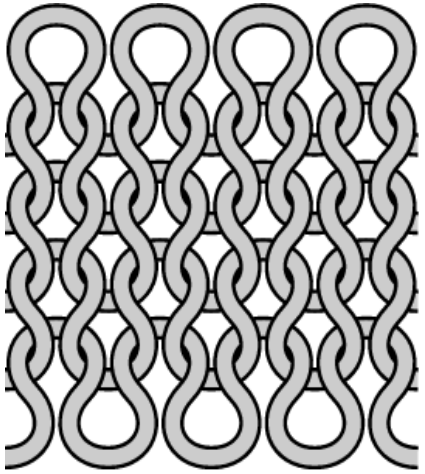


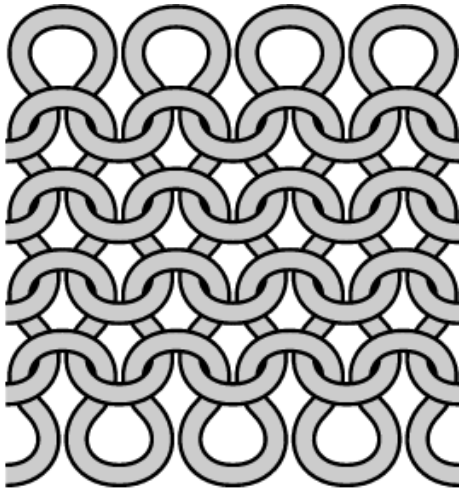


- **Back loop**
  - *In back loop head of old loop pass over the legs of new loop*
  - *(Head and Feet are appeared)*

Technical Face

- The side of the knitted fabric consist of **Face Knit Loops**





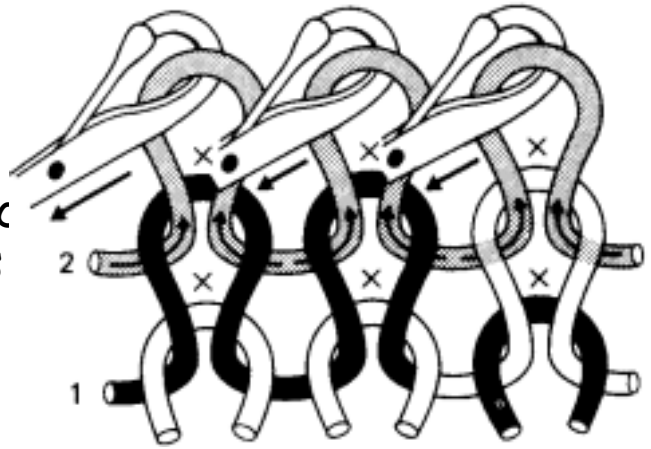
Technical Back

- The side of knitted fabric consist of **Back Knit Loops**

- **Technical Upright**
  - A knitted fabric is technically upright when its courses run horizontally and its wales run vertically,
  - with the heads of the needle loops facing towards the top of the fabric
  - and the course knitted first situated at the bottom of the fabric.

Welt

Secure edge of knitted fabric during/after knitting process



- **Stitch length**
  - length of the yarn in the knitted loop.
  - measured in millimetre
  - control properties of knitted fabrics
  - generally longer the stitch length, the more open and lighter the fabric.
- **Stitch density**
  - Total number of loops in a given area.
  - Is the product of Courses and Wales per unit length
  - measured in units of loops per square centimetre or loops per square inch.
  - CPC x WPC = Loops/Sq. cm
  - CPI x WPI = Loops/Sq. in

Knitting

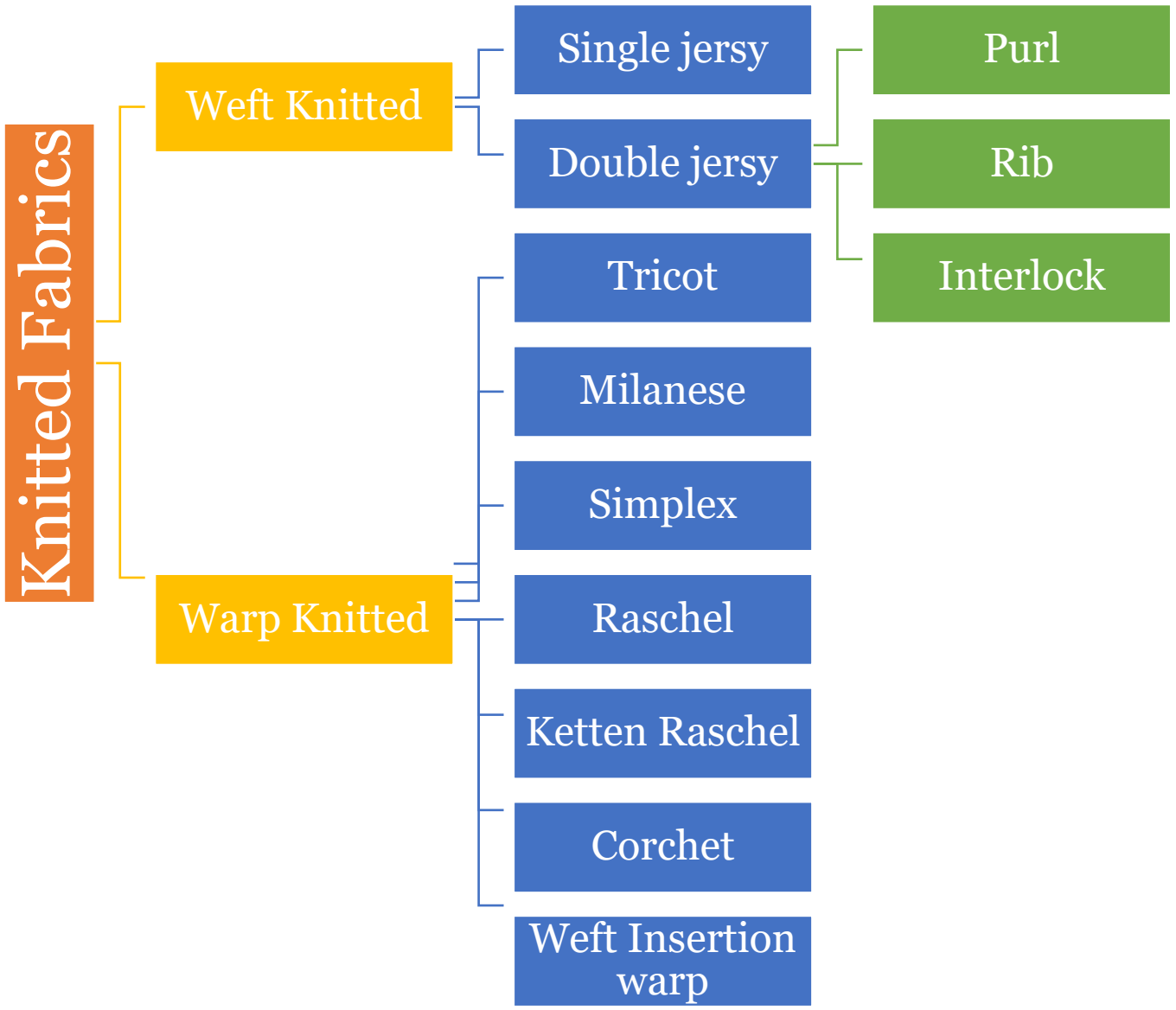
- First hand knitting machine was developed in 5th century.
- Actual Knitting machine was made in 1589 by Willian Lee.

Needle

- Instrument used for intermeshing of loops

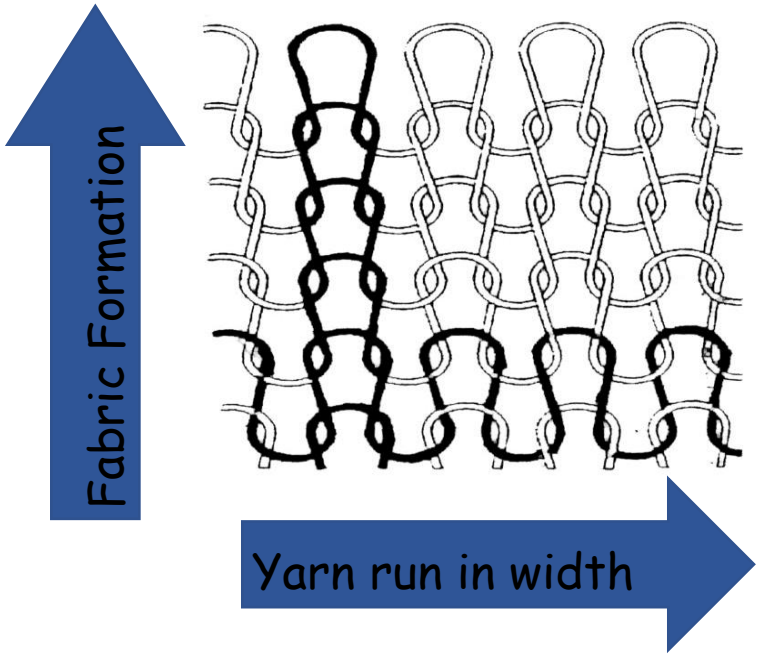
Gauge

- Number of needles per unit length of knitting machine is called gauge


Knitted Fabrics
Weft Knitted
Warp Knitted
Single jersy
Double jersy
Purl
Rib
Interlock
Tricot
Milanese
Simplex
Raschel
Ketten Raschel
Corchet
Weft Insertion warp

Weft Knitting

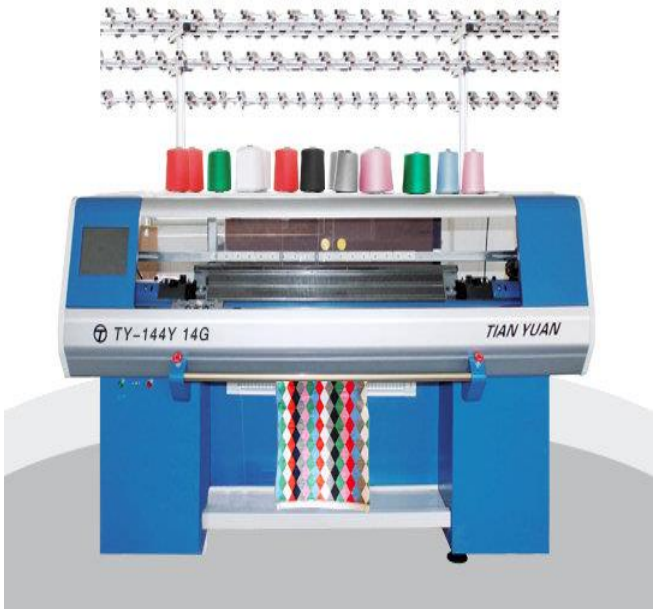
- Method of constructing the knitted fabric where loops made from each yarn run along the width or crosswise direction (courses) with reference to the direction of fabric formation during knitting, then the process of knitting is called weft knitting



Weft knitting machine

- Flat (gloves and fully fashioned machine)
- Circular (socks , single and double jersey machine)

Circular Knitting m/c



Flat Knitting m/c

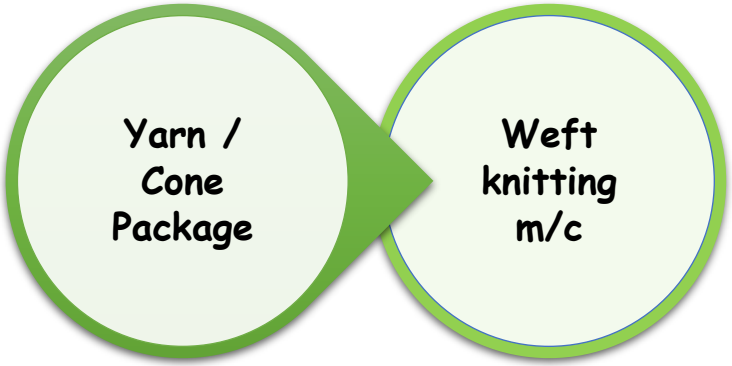
Weft knitting machine

Socks m/c

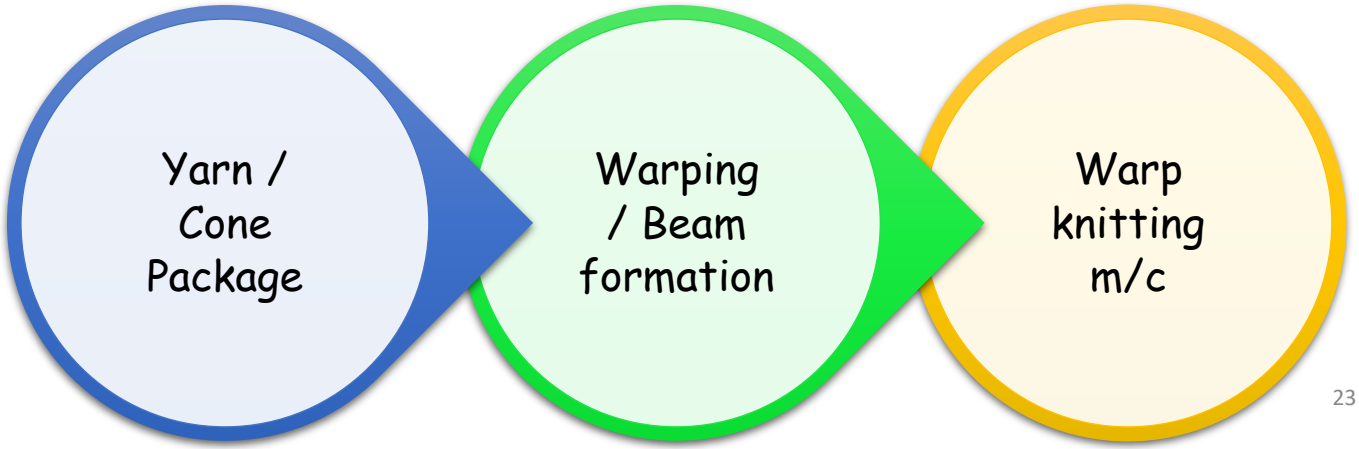
Gloves m/c

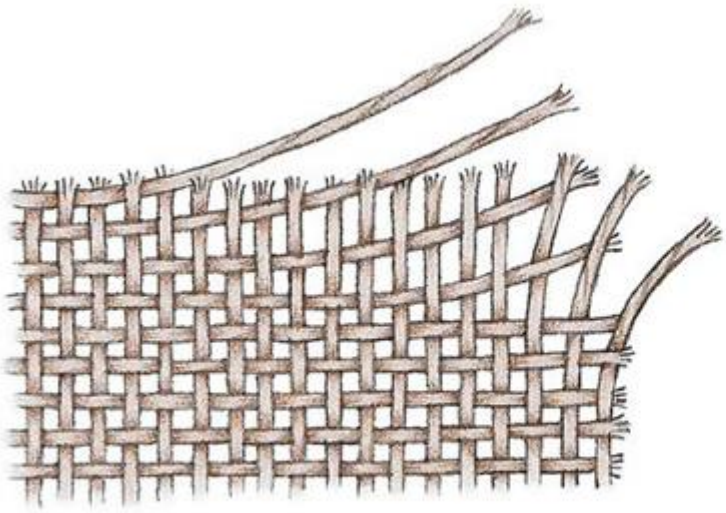
Flow process

- Weft knitting

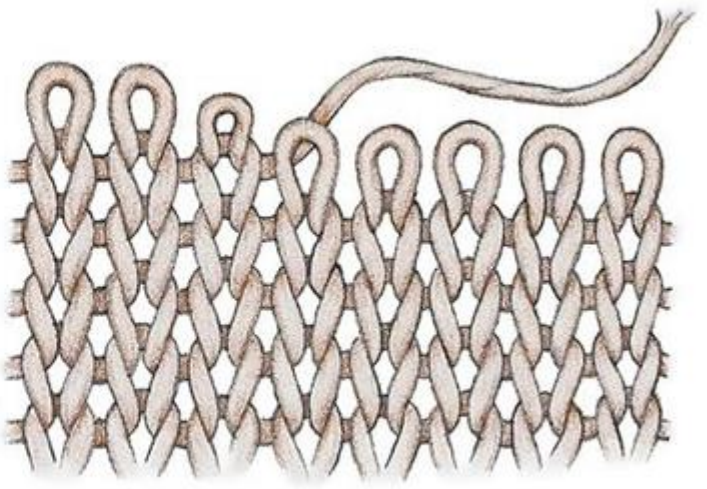


- Warp Knitting





woven material



knit material

Woven vs knitted

Weaving	Knitting
Produced by interlacement of yarn	Produce by interlooping of yarn
Minimum Two Sets of yarn is required for warp and weft	Minimum one yarn is required
Sizing is required	Don't require sizing
Production is lower	Production is higher
Production cost is higher	Production cost is less
Elasticity and stretch ability is poor	Good elasticity and stretch ability
Dimensional stability is higher	Dimensional stability is lower
Thick and wind resistant	Cool and breathable
Holds a crease well	Wrinkle resistant
More durability	Less durability
Harsher	Softer
less moisture absorption	More moisture absorption
Less air permeability	More air permeability
Lengthy processing route(singeing, desizing, scouring , bleaching) Less Shrinkage, Ironing is required	Short processing route(scouring, bleaching) More Shrinkage, Not necessary

Properties & Applications

Properties

- Knitted Fabric are popular for their
  - Shape fitting property,
  - Soft handle,
  - Bulkier nature and
  - High extension at low tension.

Clothing's

- Vests , Sweaters and pullover Cardigan (we)
- Gloves(we), Socks(we), Tights(wa,we)
- Seamless garments (wa, we)
- Undergarments (Wa,we)

Home and furnishing

- Curtain(wa)
- Uphostery (we)
- Blanket(we)
- Terry towel (wa,we)

Technical

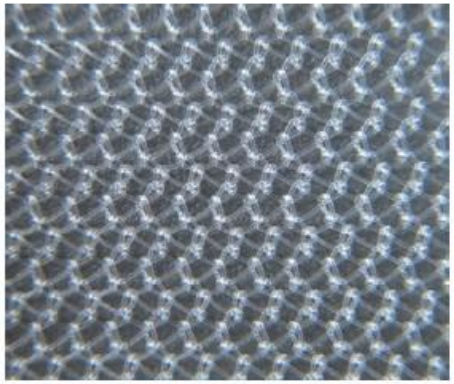
Medical(stocking, compression bandages) (wa,we)
Automotive(seat upholstery, roofing, filtration, composites)(wa,we)
Packaging and mosquito nets, filtration (wa,we)


No : 509053


Simply Maggie

Figure 9: Knitted implants. a) Artifitial blood vessel, b) surgical mesh, c) artificial heart valve

(a)



(b)

(c)