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## **BASICS OF KNITTING**

Knitting is the intermeshing or inter-looping of single yarn or single set of yarns to produce knitted fabric. Knitting is a process of manufacturing a fabric by intermeshing of loops of yarns.

There are mainly two basic knit structures viz. Weft knitting and Warp knitting as detailed in the below table.

| <b>Warp Knits</b> | <b>Weft Knits</b> |
|-------------------|-------------------|
| Tricot Knit       | Plain Jersey Knit |
| Raschel Knit      | Purl Knit         |
| Crochet Knit      | Rib Knit          |
| Milanese Knit     | Patterned Knits   |
|                   | Double Knits      |

There are mainly two types of weft knit machines viz. circular knitting and Flat bed knitting.

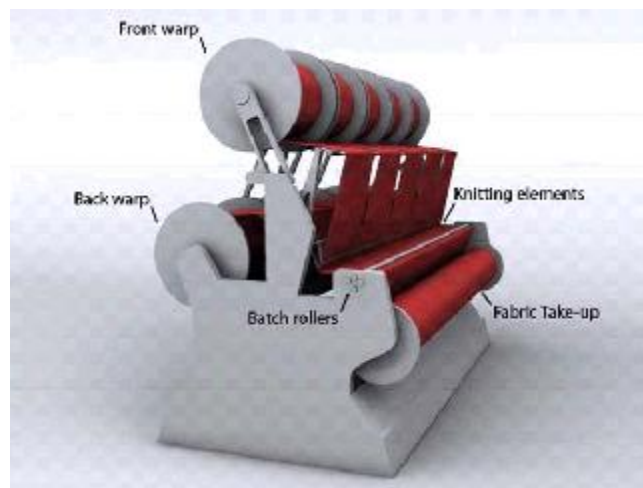
## ABOUT WARP KNITTING MACHINE OPERATIONS:

Warp knitting m/c is one kind of flat bed m/c. This m/c produces the knitted loops in wales direction. There are two major classes of warp knitting m/c. They are the 'Tricot' & the 'Raschel' warp knitting m/c. The 'Tricot' warp knitting m/c is also termed as automatic warp knitting of its function.



### M/C Description:

Compound needle is used in the m/c. With the help of the pattern drum and the chain link the patterning is done. The gears are merged in oil bath for smooth operation. There are two back beam for yarn supply. The yarns come through guide bar and through the needle the cloth is take down by cloth roller

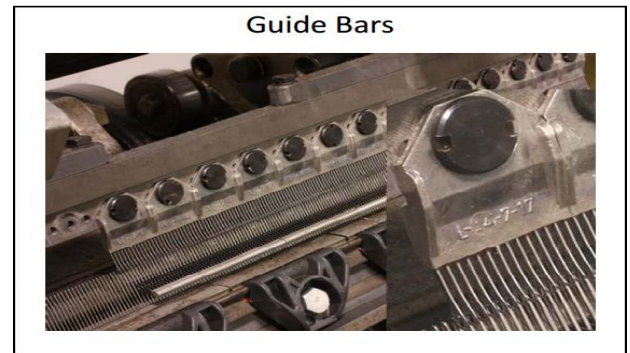


**Tricot warp knitting machine**

## Warp knitting machine parts

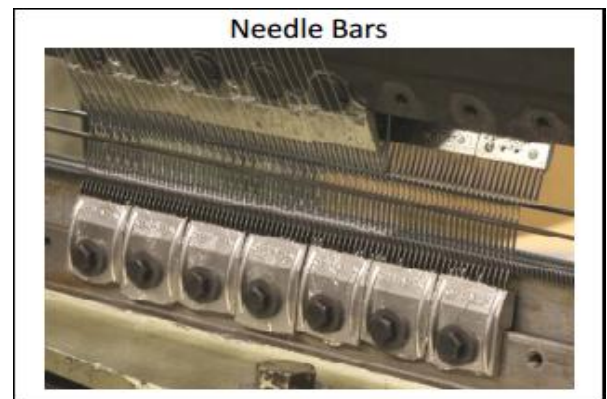
### Guide bars

Guide bars are supplied with yarn from each warp beam shaft. All the yarns from one row or shaft of beams is typically threaded through one individual guide bar.



### Needle bars

The needle bar is composed of leads containing needles. A sufficient number of leads will be attached to the needle bar to establish a certain fabric width. During machine operation, a needle bar will be rising to engage the yarns and then descends to form the yarn into knit loops.



### Latch needles

The latch of the needle depends, for its knitting operation, on the yarn. The loop within the hook opens the latch when the needle rises to the clearing position and closes it when the needle descends for knockover. A broken yarn causes a needle to be void of yarn, and hence, the latch stays closed, so that no loops can be formed. Such a needle has to be opened manually in order to allow loop formation to resume. Raschel machines are constructed in different gauges, ranging from 6 to 32 needles per inch.



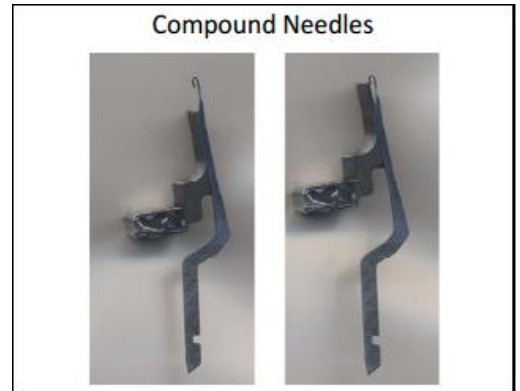
### Bearded needles

The bearded needle has a stem, around which the needle loop is formed. The needle head is where the stem is turned into a hook to draw the new loop through the old loop. The beard is the curved downward continuation of the hook that is used to separate the trapped new loop inside from the old loop as it slides off the needle beard. The eye or groove of the needle is cut in the stem to receive the pointed tip of the beard when it is pressed, thus enclosing the new loop.



### Compound needles

Compound needles consist of two separately controlled parts – the open hook and the sliding closing element. The two parts rise and fall as a single unit but, at the top of the rise, the hook moves faster to open the hook and at the start of the fall the hook descends faster to close the hook.



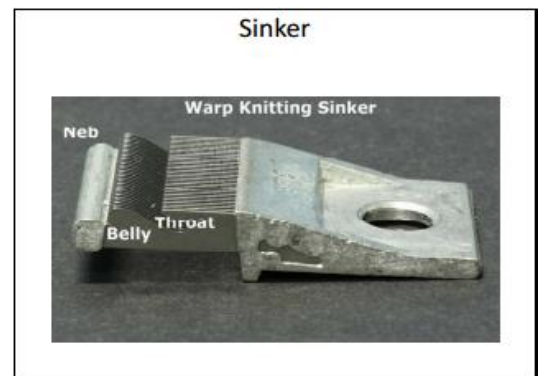
### Compound needles type 2

Some types of compound needles have the sliding element in a lead and they protrude through hollow stems in the needle hooks, which are also contained in leads.



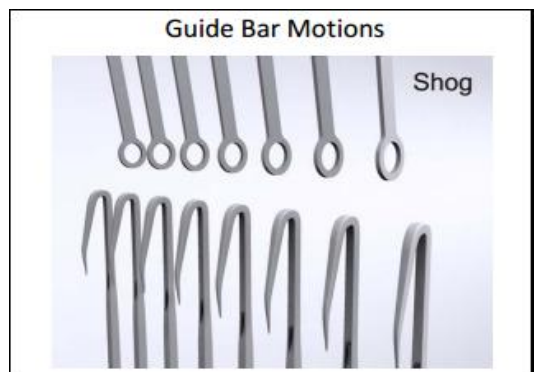
### Sinker

The sinker is a thin plate of metal which is placed between each needle. The belly of the sinker is used as a knocking-over platform.



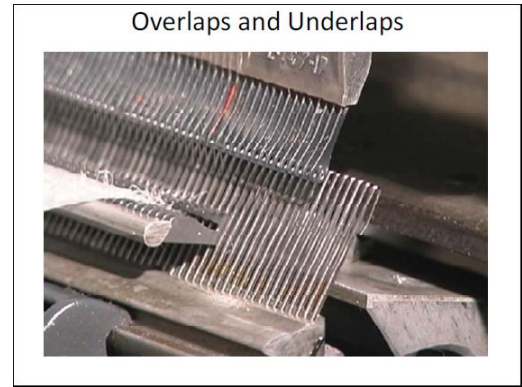
### Guide bar motions

The guides of the guide bar are required to execute a compound movement, composed of two separately derived motions. A swinging motion and a shogging movement act at right-angles to each other in order for their yarns to form overlap and underlap paths that combine as one yarn path around the needles.



### Overlaps and under laps

The guide bars swing between the needles, overlap yarns by shogging on the hook-side of the needles, swing back between the needles towards the machine front and then form the underlap by shogging on the back side of the needles which faces the machine front.



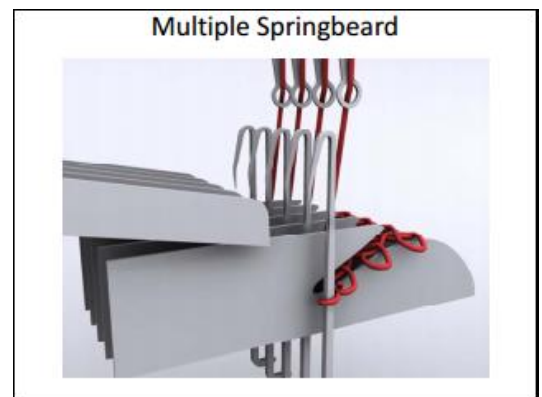
### Single springbeard needle

The needle rises to place the new loop of yarn within the beard. At this point, the needle starts to descend and the presser bar closes the beard. The descending needle then pulls the new loop of yarn through the previous loop, which was resting on the needle stem. The previous loop is then “knocked over” the top of the needle and is placed in the delivered fabric.



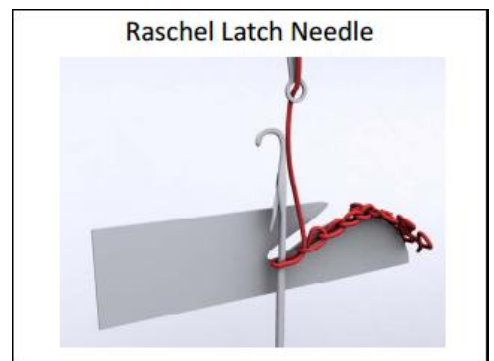
### Multiple springbeard

multiple bearded needles and multiple yarn guides swing in and shog to form the overlaps and then swinging out and shogging to form the underlaps. This helps to bind the wales together to form the fabric.



### Raschel latch needles

Latch needle in the yarn feeding position with the latch open. The sinker bar is in position to hold down the fabric. The needle then descends, allowing the old loop to close the latch as the new loop is pulled through it. The old loop is knocked over the needle hook and placed into the fabric.





## Operations involved in warp knitting machine

- Receive and correctly interpret work instructions
- Obtain the required resources and check that resources are sufficient and meet specification
- Protect resources from damage and contamination
- Ensure equipment is ready for use
- Take appropriate action when resources and equipment do not meet requirements
- Arrange resources and equipment to ensure efficient operations
- Certify correct sett loaded before warp drawn and to correctly draw ends in ensure that the creel, machine and any other equipment are clean and ready for use
- Ensure the correct yarn is selected
- Remove any existing yarn on the creel
- Plan the creel in sections according to the number of guide bars being used
- Thread the correct number of bobbins in the order specified for each guide bar
- Draw the warps in the correct order to the correct set of rollers and thread following the specified warp path
- Thread the guide bars in accordance with the pattern specified
- Ensure correct engage of section/tape is achieved
- Forward warp sheet safely to next location
- Ensure new beam is efficiently loaded onto loom
- Keep the work area clean and safe throughout operations
- Prepare the area to ensure efficiency during the next stage of work operations
- Carry out any other required preparation activities
- Identify problems address them within the limits of own responsibility
- Inform the relevant person of problems encountered
- Complete and store accurate records and documentation

## Mending broken thread



1 Thread break stops the machine



2 Broken thread is identified



3 Broken thread gripped by hook



4 Thread passed through guides



5 Thread passed through guides



6 Thread passed through guides



7 Thread passed through guides



8 Machine starts



## OPERATING THE WARP KNITTING MACHINE

- Use suitable creel.
- Ensure the creel is vibration free
- Ensure that the electronic stop motion working properly.
- Ensure the signal lamp indicate the yarn breakage (row wise).
- Ensure that yarn tension uniformly maintained & centrally adjustable between creel & warping machine by set up of load cell system.
- To ensure yarn tension can be set as the requirements of various yarn count & types.
- Fluff removed by air blowing nozzles on the disc on every tensioner with programmable cleaning cycle
- Preference for cone creel capacity
- Unwind the yarn from cone
- Ensure proper knotting to draw the yarn through the guide, guide rollers and pass it through the stopmotion ,guide bar in delivery zone
- Ensure proper functioning of knitting machine post knotting
- Collect the wastes collected during knotting and store the waste at respective waste box
- Segregate the reusable wastes and weigh and record them in a register
- Ensure standard knotting procedure is adopted and quality of knotting is as per standards
- Ensure minimum time is taken for knotting the yarn.
- Ensure safety while carrying out knotting activity
- Verify the quality of knotting done in the yarn
- Ensure yarn tension in the creeling section is appropriate
- Ensure proper functioning of the machine
- Collect the empty cones from creel and replace with full cone.
- Ensure whether the beam is ready for takeoff by viewing the details in display panel or by manual
- Keep the empty beam ready for replacement
- Keep the empty beam near the machine in manual take-off
- Ensure beam take off is carried out properly.
- Move the beam roll to warp knitting storage area
- Ensure the machine is properly restarted after take-off

### Changing broken needle

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## Changing needle

1 screw of broken needle loosened



2 Broken needle gripped and pulled out



3 new needles



4 new needle adjusted in slot



5 new needle adjusted in slot



6 Screw tightened



7 Screw tightened



8 machine starts



### Knitting defects causes and remedies

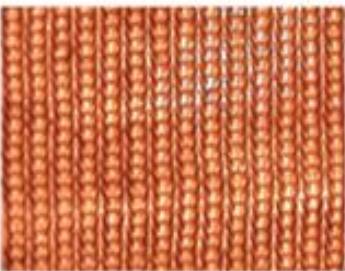
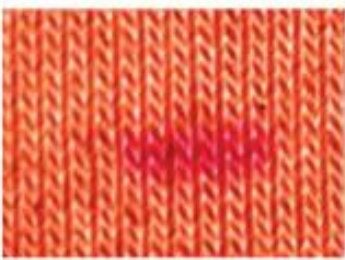


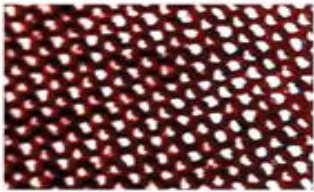




| Table 1: Fabric faults related to yarn   |  |   |
|--|--|---|
| Fault description  | Causes   | Solutions   |
|  <p>Unsettled fabric Local fault corresponding to a portion of yarn having a linear density quite lower or higher than the rest of the yarn.</p> | <p>Use of irregular yarns presenting an important level of long-period unevenness (thin, thick places and neps per km)</p> | <p>Yarn quality control: Application of an Uster test before knitting to measure the irregularity and imperfection level in used yarns</p>  |
|  <p><b>Cotton contamination</b><br/>Dark stains, undetectable on grey cotton fabric and appearing after light dyeing.</p>                       | <p>Contamination of raw cotton by insects laying in the cotton flowers</p>   | <ul style="list-style-type: none"> <li>◆ Impossible to remove</li> <li>◆ Laboratory dyeing tests on lab knitted samples before knitting production permit to detect this fault and remove contaminated bobbins</li> </ul> |









Table 2: Fabric faults related to knitting

| Fault description   | Causes  | Solutions   |
|---|---|---|
|  <p><b>Vertical stripes</b></p>  | <ul style="list-style-type: none"> <li>◆ Defective needles or sinkers</li> </ul>  | <ul style="list-style-type: none"> <li>◆ Needles and sinkers change after long time use</li> <li>◆ Checking needle detectors</li> <li>◆ Use of fabric fault detector</li> </ul>   |
|  <p><b>Horizontal stripes</b></p>  | <ul style="list-style-type: none"> <li>◆ Couliering or yarn consumption are not constant at all feeders</li> </ul>  | <ul style="list-style-type: none"> <li>◆ Yarn consumption and couliering readjustment</li> </ul>  |
|  <p><b>Fabric spirality</b><br/>Distortion of plain knitted fabric. Wales are not perpendicular to courses.</p>                        | <ul style="list-style-type: none"> <li>◆ Yarn twist too high</li> <li>◆ Number of feeder too high</li> <li>◆ Bad combination between yarn twist direction and machine rotation direction</li> </ul>   | <ul style="list-style-type: none"> <li>◆ Control of yarn twist (yarn twist should never be above 700 tr/m)</li> <li>◆ Reduction of feeders number</li> <li>◆ Use of Z-twist yarn with machines having needles watch rotation direction, and vice versa</li> <li>◆ Appropriate finishing reduces fabric spirality</li> </ul>   |
|  <p><b>Dropped stitches</b><br/>Local column of dropped stitches obtained when presented yarn is occasionally unhooked by needles.</p> | <ul style="list-style-type: none"> <li>◆ Yarn-guide not properly set</li> <li>◆ Defective needle latch</li> <li>◆ Yarn tension is not sufficient or too long stitches</li> <li>◆ Take-down too high</li> <li>◆ Cylinder-dial distance too high</li> <li>◆ Wrong yarn threading</li> </ul> | <ul style="list-style-type: none"> <li>◆ Precise yarn-guide resetting</li> <li>◆ Needle change</li> <li>◆ Yarn consumption and couliering readjustment</li> <li>◆ Take-down readjustment</li> <li>◆ Dial position readjustment</li> <li>◆ Yarn threading through the right bore</li> <li>◆ Use of fabric fault detector</li> <li>◆ This fault can be corrected by stitches reforming using a simple needle</li> </ul> |
|  <p><b>Holes</b><br/>Local holes obtained when yarn breaks during loop formation.</p>  | <ul style="list-style-type: none"> <li>◆ Presence of knots in yarn</li> <li>◆ Weak places in yarn</li> <li>◆ Yarn tension too high</li> <li>◆ Yarn too dry</li> <li>◆ Yarn-guide not properly set</li> <li>◆ Yarn guide blocked by yarn hair accumulation</li> </ul>                      | <ul style="list-style-type: none"> <li>◆ Use of flat knots</li> <li>◆ Yarn regularity control</li> <li>◆ Yarn consumption and couliering readjustment</li> <li>◆ Air humidification</li> <li>◆ Precise yarn-guide resetting</li> <li>◆ Use of yarn having lower hairiness, bobbins and yarn-guide blowing, use of protective filter creel</li> <li>◆ Use of fabric fault detector</li> </ul>                          |



|  |  |  |
|--|--|--|
|  <p><b>Yarn hair deposit</b><br/>Yarn hair and other yarn wastes deposit on needles fabric during knitting.</p> | <ul style="list-style-type: none"> <li>◆ Inappropriate air blowing</li> <li>◆ Use of yarn with high hairiness</li> <li>◆ Different machines working with different yarn types in the same place</li> </ul> | <ul style="list-style-type: none"> <li>◆ Readjustment of CKM blowing frequency and intensity</li> <li>◆ Use of yarn having lower hairiness, bobbins and yarn guide blowing, use of protective filter creel</li> <li>◆ Machines separation with partitions</li> </ul> |
|  <p><b>Knots</b><br/>Knot appearance on fabric.</p>   | <ul style="list-style-type: none"> <li>◆ Inappropriate yarn knotting</li> </ul>  | <ul style="list-style-type: none"> <li>◆ Use of flat knots</li> <li>◆ Use of fabric fault detector</li> </ul>  |

|  |  |   |
|--|--|---|
|  <p><b>Fabric fall-out</b><br/>Local dropped fabric obtained when big number of successive needles lose stitches.</p>   | <ul style="list-style-type: none"> <li>◆ Yarn rupture in yarn-guide due to weak places in yarn or yarn hair accumulation</li> <li>◆ Stitches rupture due to excessive take-down or weak places in yarn</li> <li>◆ Defective yarn feeder</li> <li>◆ Yarn tension too high</li> <li>◆ Yarn-guide not properly set</li> <li>◆ Defective needles or sinkers</li> </ul> | <ul style="list-style-type: none"> <li>◆ Yarn control before knitting. Use of yarn having lower hairiness, bobbins and yarn-guide blowing, use of protective filter creel</li> <li>◆ Take-down readjustment</li> <li>◆ CKM elements checking</li> <li>◆ Yarn consumption and couliering readjustment</li> <li>◆ Precise yarn-guide resetting</li> <li>◆ Needles and sinkers change after long time use</li> <li>◆ Regular machine cleaning</li> </ul> |
|  <p><b>Oil stains</b><br/>Local lubricating machine oil stains visible after fabric finishing.</p>  | <ul style="list-style-type: none"> <li>◆ Inadequate oil</li> <li>◆ Defective oiling circuit</li> <li>◆ Excessive oiling</li> </ul>   | <ul style="list-style-type: none"> <li>◆ Use of adequate oil, respect of oil washing recommendations (temperature, grey fabric storage duration)</li> <li>◆ Regular oiling circuit checking</li> <li>◆ Oiling quantity readjustment</li> </ul>  |
|  <p><b>Missing yarn</b><br/>Regular absence of yarn that</p>  | <ul style="list-style-type: none"> <li>◆ Wrong yarn threading</li> <li>◆ Defective yarn feeder</li> <li>◆ Yarn rupture in yarn-guide due to weak places in yarn or yarn hair accumulation</li> </ul>   | <ul style="list-style-type: none"> <li>◆ Yarn threading through the right bore</li> <li>◆ CKM elements checking</li> <li>◆ Yarn control before knitting. Use of yarn having lower hairiness, bobbins and yarn-guide blowing, use of protective filter creel</li> <li>◆ Regular machine cleaning</li> <li>◆ Use of fabric fault detector</li> </ul>  |
|  <p><b>Foreign yarn</b><br/>Regular coloured stripes that appear after dyeing when a foreign yarn different from normally used yarn is accidentally introduced.</p> | <ul style="list-style-type: none"> <li>◆ Workers carelessness</li> <li>◆ Presence of different yarn types having the same colour on the same creel</li> </ul>  | <ul style="list-style-type: none"> <li>◆ Workers training to recognise different yarn types</li> <li>◆ Rigorous yarn sorting and storage</li> </ul>   |
|  <p><b>Elastomeric misplating</b><br/>Regular absence of elastane yarn.</p>   | <ul style="list-style-type: none"> <li>◆ Defective elastane yarn feeder</li> <li>◆ Elastane roll-guide not properly set</li> </ul>   | <ul style="list-style-type: none"> <li>◆ CKM elements checking</li> <li>◆ Elastane roll-guide resetting</li> <li>◆ Use of fabric fault detector</li> </ul>  |

|  |  |   |
|--|--|---|
|  <p><b>Side crease</b><br/>Circular knitted fabrics containing elastane give rise to problems in as far as the side crease created when winding up a tube of circular knitted fabric is fixed within a short period and can no longer be removed. This fault appears after finishing.</p> | <ul style="list-style-type: none"> <li>◆ High pressure exerted by take-down rolls on tubular fabric inducing permanent deformation of elastane fibres at fabric sides</li> <li>◆ Too long tubular grey fabric storage</li> <li>◆ Use of ordinary take-down devices with elastane plated fabrics</li> </ul> | <ul style="list-style-type: none"> <li>◆ Use of take-down rolls with movable side rubber rings to avoid pressure on fabric sides</li> <li>◆ Short grey fabric storage</li> <li>◆ Use of open width take-down devices</li> </ul> |
|--|--|---|

**Table 3: Fabric faults related to finishing**

| Fault description   | Causes  | Solutions   |
|---|---|---|
|  <p>Fabric pilling</p>                                     | <ul style="list-style-type: none"> <li>◆ Use of yarn with high hairiness</li> <li>◆ Frictions undergone by fabric in dyeing machines</li> </ul> | <ul style="list-style-type: none"> <li>◆ Use of yarn having lower hairiness</li> <li>◆ Use of anti-pilling agents</li> <li>◆ Checking rolling organs outer surface of finishing machines</li> </ul> |
|  <p>requested    obtained</p> <p>Colour non-conformity</p> | <ul style="list-style-type: none"> <li>◆ Error in dyeing process</li> </ul>   | <ul style="list-style-type: none"> <li>◆ Lab dyeing before production</li> </ul>  |
|  <p>Colour non-uniformity</p>                             | <ul style="list-style-type: none"> <li>◆ Error in dyeing process</li> </ul>   | <ul style="list-style-type: none"> <li>◆ Respect of dyeing process</li> </ul>   |



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## **CLEANING AND WASTE DISPOSAL**

- Clean the wastes around the machine
- Segregate the wastes collected and deposit at the waste bins
- Remove the defect in cones / chesses.
- Use proper tools for cleaning as instructed by superiors
- Carryout cleaning activities in creeling zone, knitting zone, and fabric zone.
- Ensure the yarn paths, eyelets, knitting heads, machines, and working environment are clean and free of contamination in accordance with workplace procedures.
- Ensure safety while carrying out cleaning
- Ensure the wastes collected are deposited in the respective waste box
- Ensure knitting machine area is clean

## **SHIFT INTERCHANGE**

### **TAKING CHARGE OF SHIFT**

- Reach atleast 10 - 15 minutes early to the work place
- Bring the necessary operational tools to the department
- Discuss with the previous shift operator and collect the information regarding the count, process, issues faced in quality, current fabric production followed in the knitting department.
- Discuss about current order running for which company.
- Ensure the proper functioning of machine and problems if any should be reported to the supervisor and maintenance in- charge.
- Discuss about the current order quantity and balance quantity.
- Discuss about the new order fabric details and quantity.
- Discuss about the department cleanliness.



## **HANDING OVER AT SHIFT END**

- Clean the machine and department before handing over the shift.
- Hand over the necessary operational tools if any.
- Discuss with the next shift operator and give the information regarding the count, gsm, loop length, process, issues faced in quality, and current fabric production followed in the knitting department.
- Discuss about current order running for which company.
- Note the production details for the current shift
- Ensure the proper functioning of machine and problems if any should be reported to the supervisor and maintenance in- charge.
- Should discuss with next operator about the current order
- Quality, quantity and balance quantity.
- Discuss about the new order fabric details and quantity.
- Discuss about the department cleanliness.

## **HEALTH & SAFETY**

- Comply with health and safety related instructions applicable to the workplace
- Use and maintain personal protective equipment such as “ ear plug”, “ nose mask “ “ head cap” etc., as per protocol
- Maintain personal hygiene and dress code.
- Carry out own activities in line with approved guidelines and procedures
- Report any service malfunctions to supervisor
- Store materials and equipment in line with organisational requirements
- Safely handle and remove waste
- Minimize health and safety risks to self and others due to own actions
- Seek clarifications, from supervisors or other authorized personnel in case of perceived risks
- Monitor the workplace and work processes for potential risks and threat
- Carry out periodic walk-through to keep work area free from hazards and obstructions, if assigned
- Participate in mock drills / evacuation procedures organized at the workplace
- Take action based on instructions in the event of fire, emergencies or accidents and report to supervisor.
- Do not stack Yarns in front of Fire Extinguishers/ First Aid Box and passages.
- Do not keep the door of Machine room open while machine is in operation