TABLE OF CONTENTS

1. Basic Textile Terms of Spinning:

Fiber: The fundamental component used in making textile yarns and fabrics. Fibers are fine substances with a high ratio of length to thickness. They can be either natural (e.g. cotton, wool, silk etc.) or synthetic (e.g. polyester, nylon, acrylic etc.).

Blow room Lap: finished product of blow room in the form of a sheet of fibers.

Chute feed system: It is a system of feeding small tufts of fibers directly from blow room to a series of cards, arranged in a circuit through pneumatic pipe.

Sliver: The strand of loose, roughly parallel, untwisted fibers produced in Carding, Draw frame.

Roving: A product of speed frame in the form of a soft strand of fiber that has been twisted, attenuated, and free from foreign matter preparatory to spinning.

Yarn: A continuous strand of textile fibers that may be composed of endless filaments or shorter fibers twisted or otherwise held together.

Spinning: The process of making yarns from the textile fiber is called spinning. Spinning is the twisting together of drawn out strands of fibers to form yarn.

Yarn Count/Sliver Hank

Yarn count is the numerical expression of yarn, which defines its fineness or coarseness. (Linear density)

Yarn count system:

Indirect system: English count (Ne), Worsted Count etc.

i.e. Higher the yarn number, Finer the yarn.

Direct System: Tex, Denier.

i.e. Higher the yarn number , Coarser the yarn.

Similarly numerical expression of fineness or coarseness of sliver & roving are called Hank.

Note: English (Ne) count system is commonly followed in India.

English Count: No. of Hanks of length 840 yds weighing in 1 pound

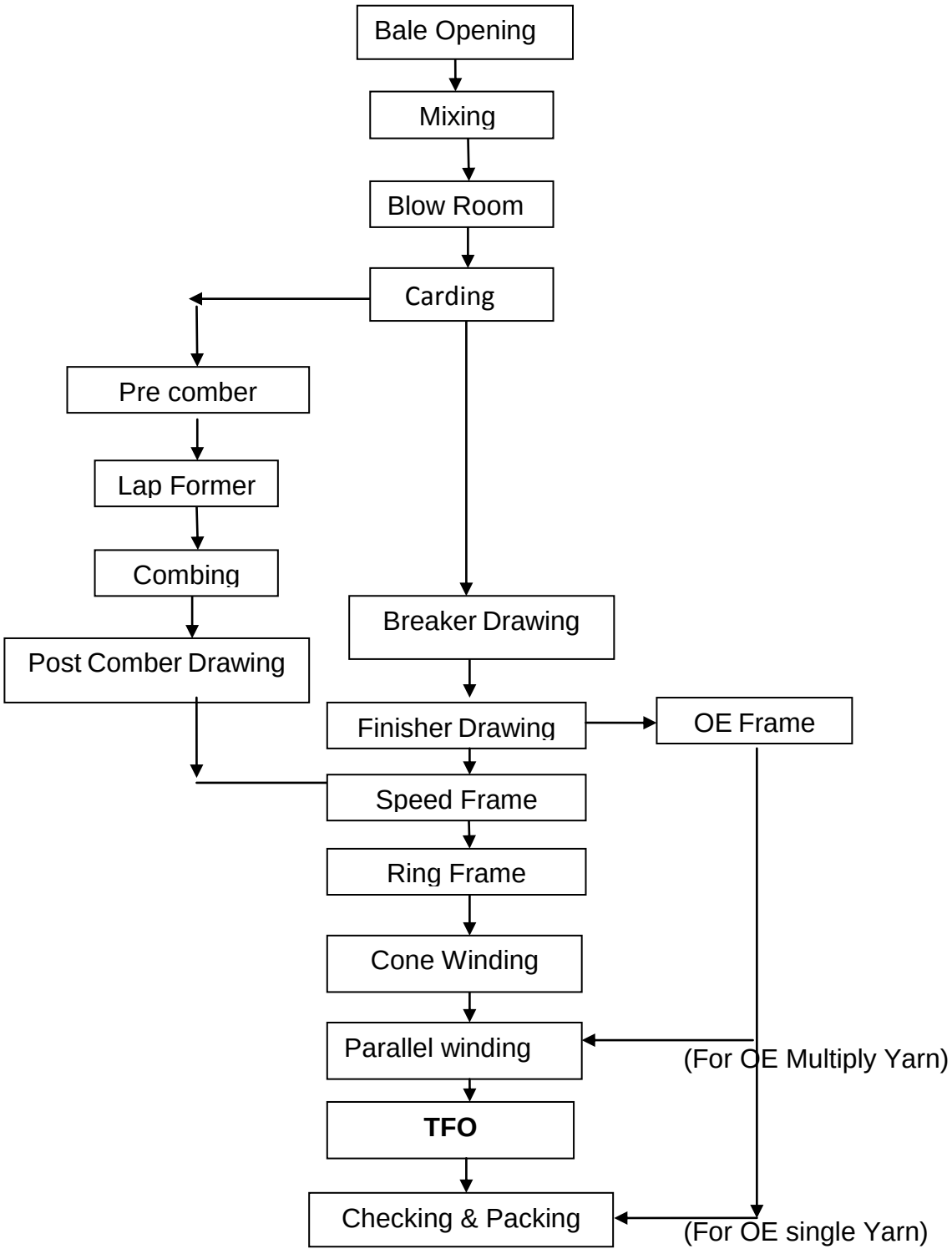
1yds: 0.9144 mtrs.

1lbs: 0.453 Kgs.

e.g. 40^{s} Ne = 40 hanks of 840 yds weighs 1 lbs.

20^{s} Ne = 20 hanks of 840 yds weighs 1 lbs.

2. Sequence of Spinning Process:



3. Material Flow in Spinning:

Carded Yarn Manufacturing:

TABLE-1

STAGE	MACHINE	INPUT MATERIAL	OUT PUT MATERIAL	PACKAGE FORM
Opening & cleaning	Blow Room machines	Raw cotton	Lap or chute feed	-
Carding	Card	Lap or chute feed	Card sliver	Slivers in Can
1st drawing	Breaker Draw frame	Card sliver	Drawn sliver	Sliver can
2nd drawing	Finisher Draw frame	Drawn sliver	Drawn sliver	Sliver can for Roving
Roving	Speed Frame	Drawn sliver	Roving	Roving bobbin
Spinning	Ring spinning frame	Roving	Ring-spun yarn	Spinning Cops
Post-Spinning processes	Winding	Yarn in spinning cops	Cone Yarn package	Cone, Cheese & Hank as required
Doubling/ Plying	Parallel Winding	Yarn in cones/cheese	Plied Yarn in cheese	Cheese
Twisting & Winding	**Two for one Twister**	**Plied Yarn in cheese**	**Plied and twisted yarn**	**Cone or Cheese**

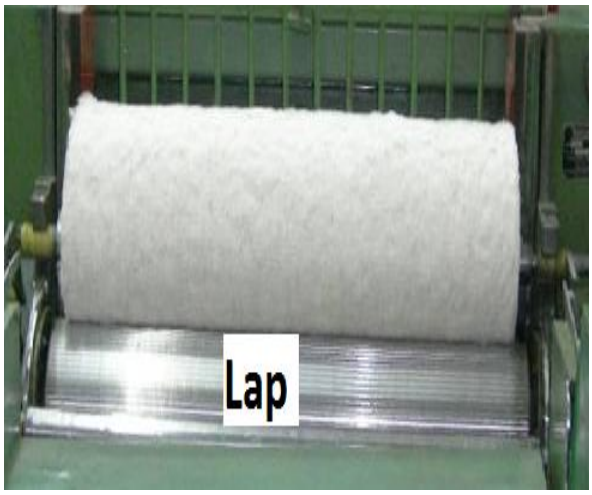
Combed Yarn Manufacturing

TABLE-2

STAGE	MACHINE	INPUT MATERIAL	OUT PUT MATERIAL	PACKAGE FORM
Opening & cleaning	Blow Room machines	Raw cotton	Lap or chute feed	-
Carding	Carding machine	Lap or chute feed	Card sliver	Carded Slivers in Cans
Pre comber Drawing	Breaker Draw Frame	Carded Sliver	Drawn Sliver	Drawn slivers in cans
Lap Formation	Super Lap or Lap Former	Drawn Slivers	Lap	Laps in spools
Combing	Comber	Lap	Combed Sliver	Combed sliver in Cans
Post comber Drawing	Finisher Draw Frame	Combed sliver	Drawn sliver	Post comber Draw frame slivers in cans
Roving	Speed Frame	Post comber Draw frame sliver	Roving	Roving bobbin
Spinning	Ring spinning frame	Roving	Ring-spun yarn	Spinning Cops

Post-Spinning processes	Winding	Yarn in spinning cops	Yarn	Cone, Cheese & Hank as required
Doubling/ Plying	Parallel Winding	Yarn in cones/cheese	Plied Yarn in cheese	Cheese
Twisting & winding	**Two for one Twister**	**Plied Yarn in cheese**	**Plied and twisted yarn**	**Cone or cheese**

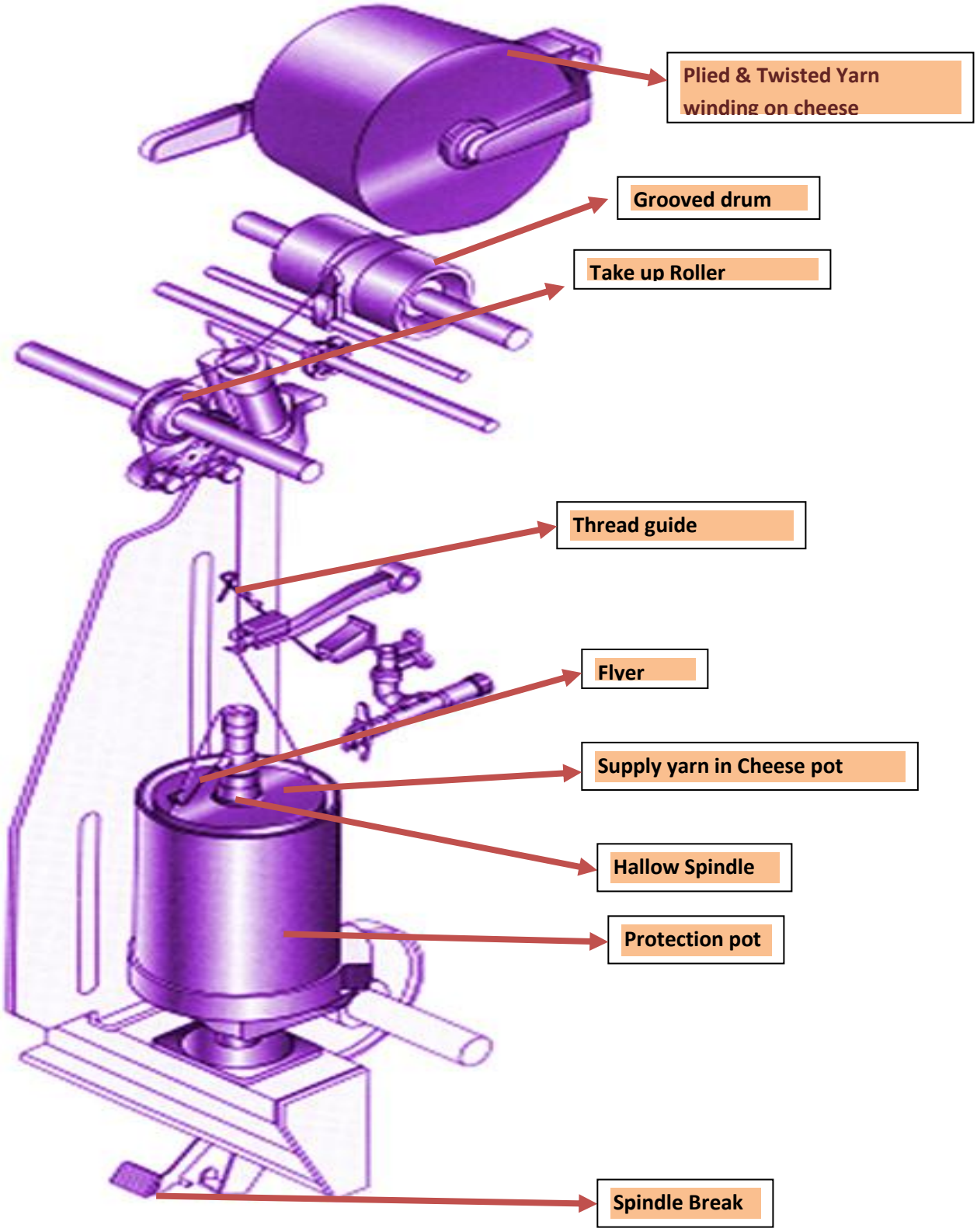
Various Package Form:



4. Functions of TFO Machine:

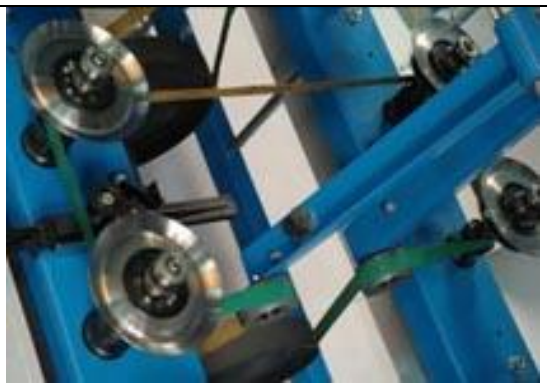
- To produce long length of knot free yarn of two or more ply, to facilitate better performance in the subsequent processes
- To insert sufficient amount of twist to the plied yarn to impart strength.
- To wind the yarn onto the Cone.
- To build the yarn package properly.

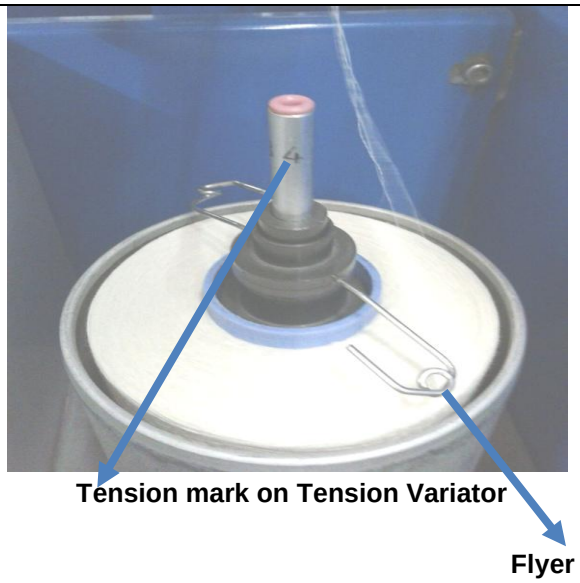
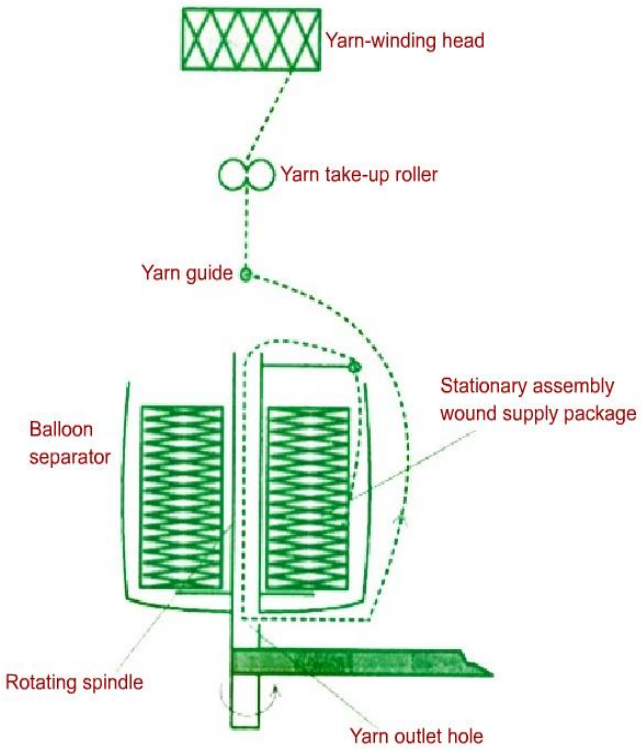
5. Details of TFO Machine:



Different Zones in TFO Machine:

Cheese Pot or Protection Pot The basic requirement of TFO twisters is to house a cylindrical stationary feed package and provide support at the time of unwinding of yarn from the package during working. For this purpose, yarn requires a protection pot called cheese pot around the package to protect the feed package from damage, abrasion, dust and fly etc.	 **Cheese pot**  **Cheese Pots in the machine**
Spindle: The paralleled Yarn in cheese are mounted on the Hallow spindle.	 **Spindle in the Cheese pot**

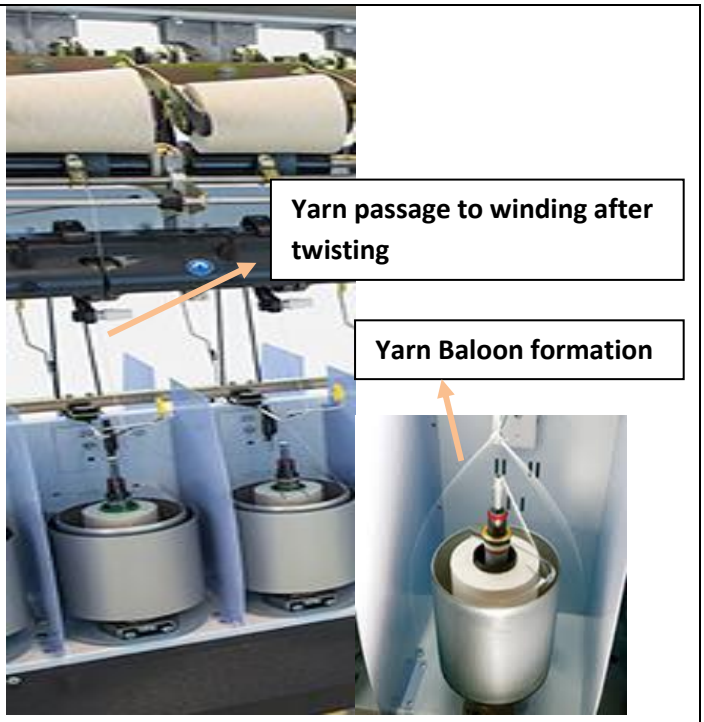
Four spindle assembly: In this case, every four spindle is driven by single long belt and tensioning arrangement is given individually**.**	 **Tape driven four spindle assembly in TFO**
Spindle break: Spindle break to stop the spindle during breakage for knotting	 **Spindle break**
Creeling in Cheese pot: Stationary supply package that is the paralleled cheese is fed to the TFO frame in the cheese pot. The hallow spindle in the cheese pot revolves to impart twist.	 **Creeled cheese**
Drop Wire: The function of the drop wire is to stop the winding automatically as soon as a thread breaks	 **Drop wire**

Tension Variator with flyer: The paralleled yarn passes through the flyer & tension variator which imparts requisite twist and tension needed to form yarn package. Tension variators have a marking number to use the suitable tension variators according to count of yarn wound.	
Twisting: The feed yarn undergoes a first twist between its entry into and exit from the spindle and a second twist between it's exit from spindle to the Yarn guide. This is possible because the paralleled yarn package does not move, instead it is the yarn that revolves around the package.	

Material Passage:

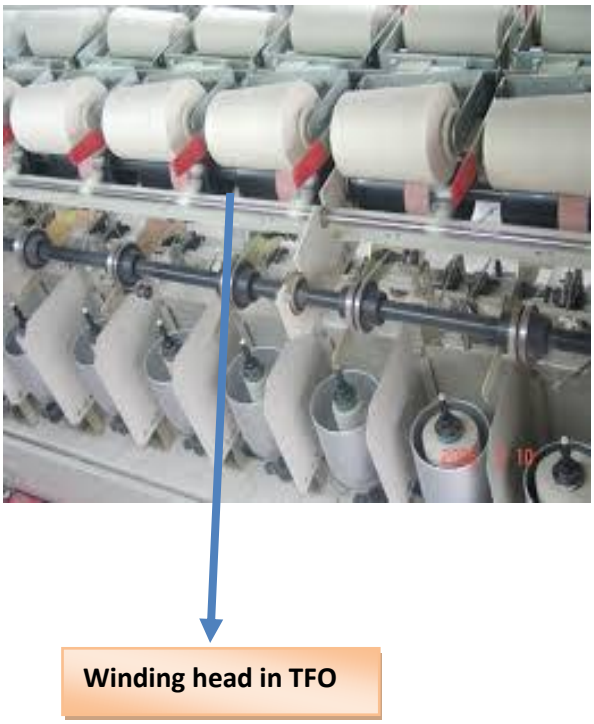
It illustrates the passage of paralleled yarn from cheese in the cheese pot up to final winding on cone.

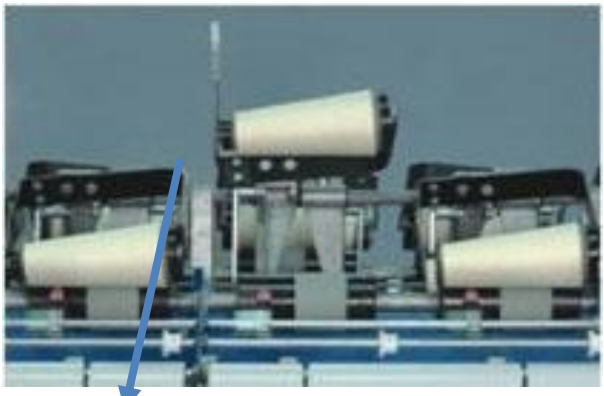
The supply yarn is threaded through a guide mounted on a freely rotating flyer and then passes through the hollow rotating spindle in the cheese pot. At the base of the spindle, the yarn comes out forming a balloon, and then goes onto the winding head via the yarn guide.



Winding:

The plied & twisted yarn is wound on cones above the winding drum, forming one package per spindle located in the upper part of the machine.



Cradle : This is the cone holder in the TFO to hold cones and enables smooth winding the plied & twisted yarn on cones	 **Cradle**
Doffing: To replace with empty cones when the plied & twisted yarn cones become full.	 **Taking out cone from machine for doffing**
Signal Lamps: Signal lamps are provided on the machine to indicate the reason for stoppage of machine. Understand each signal lamp and their purpose in the machine.	
Display Panel: It displays various operating machine parameters like speed, production, Count of yarn etc. Understand the details in the display panel and work accordingly	

6. OperatingTFO Machine:

- Creel the required number of yarn packages (Paralleled yarn on cheese) on the hallow spindle of the protection pot.
- Draw the thread from the package through the flyer and feed through the hallow spindle with the nylon wire.
- Take out the yarn from the bottom of the hallow spindle and pass the yarn through guide to the winding head.
- Operate the control switches for starting and stopping of TFO.
- Ensure that the "Tension Mark" and "Tension Weight" are uniform in all the spindles as instructed.
- Follow the different signal lamps.
- Ensure that the drop wire / stop motion wire are always in action.
- Piece the yarn during breakages.
- Ensure the yarn passes properly to winding head after attending to the breaks.
- View the display panel and identify the reasons for machine stoppages if any.
- Inform the supervisor and maintenance in charge in case of any break-downs.
- If the Spindle Tape is broken, report these spindle nos. to the superiors immediately and do not allow winding of untwisted ply yarn.
- Carryout cleaning activities in creeling, twisting, and in Winding head.
- Remove the waste while attending breakage/creeling and put them in appropriate waste collection bins.
- Support for carrying out maintenance activities.
- Always keep TFO machine area clean.

Importance of Colour coding:

The details related to colour coding and relevant information like Feeding Yarn package (Paralleled yarn cheese) colour, colour of empty cones, Count of yarn produced & Number of ply etc, are normally displayed in respective machine's display board. It is the responsibility of the machine operator to understand them & work accordingly.

Identifying Defects:

- Defects in feeding yarn package (Paralleled yarn cheese) like damaged cheese, stitches, Singles, 3Ply, 4ply,cuts in yarn etc, are to be identified and informed to supervisor for necessary action.
- Defects in TFO wound packages like soft packages, stained packages, tail end missing, back stitches, 3Ply,4Ply,Untwist,Low twist, High twist, flowering, unequal tapering, uneven and fluff accumulated TFO cones, slough off etc., are to be identified and informed to supervisor for necessary action.

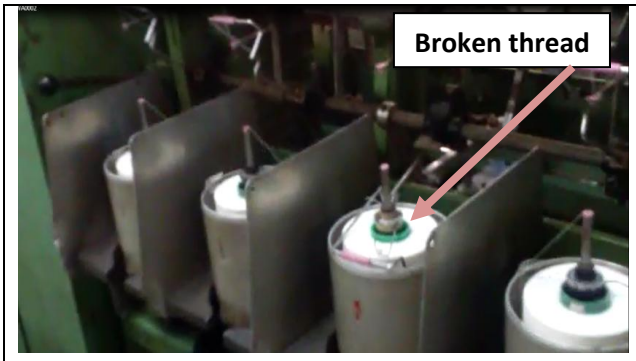
Creeling

- Bring the correct colour coded paralleled cheese package in the cheese trolley from storage area
- Identify cheese exhausts and remove the empty cheese
- Before taking empty cheese from inner pot lift the drop wire first.
- Take the flyer along with tension variator out and put them on pigtail guide rod and turn the pigtail otherwise the cut end cheese may be formed.
- Clean the inner pot using cloth.
- Lift the cheese spindle and properly mount the full cheese
- Now re fix the tension variator and flyer.
- Creel the cheese in the creel stands and ensure the cheese is properly fixed in the cheese pot.
- Take the yarn from cheese and pass through the flyer.
- Ensure minimum time is taken for creeling the cheese package during exhaust or cheese change

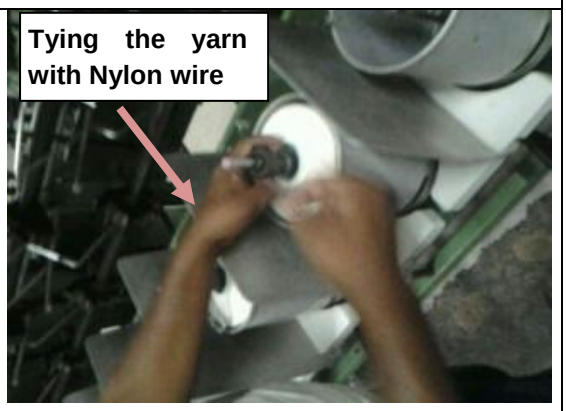
Attending yarn breakage in TFO

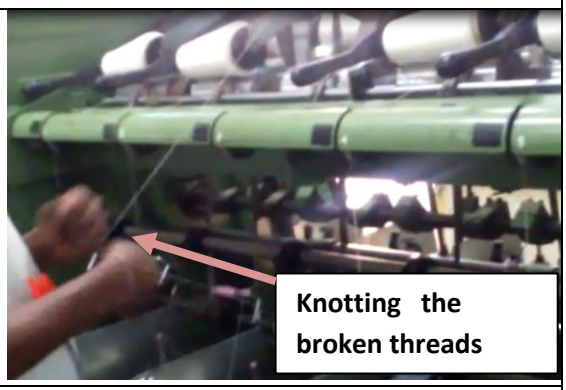
- Patrol around the machine to ensure proper production of ply yarn
- If there is any break, clean the cone and ensure proper twist
- Lift the drop wire
- Take the flyer and tension variator out and store in a suitable place.
- Take the cheese package and identify defects, if any

- Remove defects in the cheese package
- Put the cleaned and defect free cheese into the inner pot
- Fix the flyer and tension variator in correct positions
- Take the yarn from cheese and pass through the flyer
- Stop the spindle by applying brake.
- Insert the nylon wire through the tension variator
- Tie the yarn at the piecing wire properly
- Pullout the wire by holding the front end through the reserve disc
- Take the yarn through pig tail guide
- Release the brake
- Allow sufficient time for tying / knotting / splicing the yarns, in order to insert-required amount of twist to the untwisted portion of yarn.
- Engage the cradle
- Engage the drop wire
- Always Knot / Splice the ends using Knotter /splicer as instructed
- Ensure the size of knot / splice is minimal.
- Trim the knotted thread with scissor provided.
- Ensure correct yarn passage to avoid high / low twist and defective package.
- Always adopt proper procedure for knotting/splicing and trimming the yarn as instructed by supervisor/jobber
- while processing knotless yarn broken ends may be overlapped on the cone if instructed
- Properly handle the cheese and cone packages
- After Knotting/Splicing ensure proper yarn passage & tension variator position.
- Always ensure safety while carrying out creeling, knotting/splicing and trimming activities.
- Keep the work area clean



Taking out broken thread from cheese

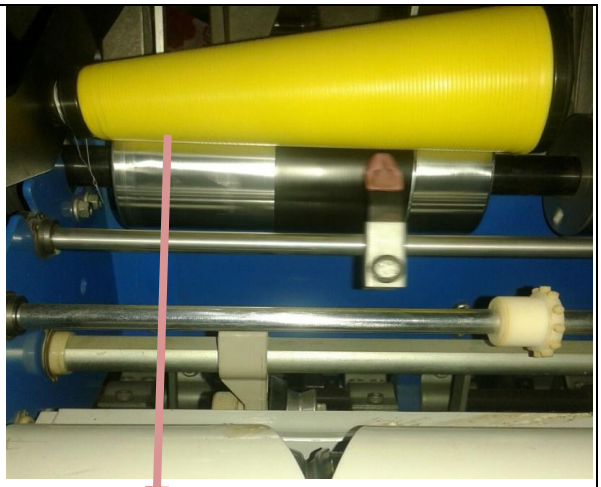




After Knotting fixing the cone on the drum for winding

Doffing the full cones and restarting winding

- Identify the machine ready for doffing.
- Follow the procedure as instructed by supervisor to doff the cone package from the machine.
- Before taking doffs take correct colour coded empty cone from empty cone peg stand.
- Remove full cone from cone holder, keep doffed cone on the peg trolley.
- Check whether the Cheese in the cheese pot is running out and is becoming empty for replacing with full cheese.
- Before taking the cheese from inner pot, take out the flyer and tension Variator and put it on pig tail guide rod & turn the pig tail guide, clean the inner pot using cloth then take the tension variator out.
- Take the empty cheese from inner pot, feed the full cheese, take the yarn from cheese in clockwise direction and pass the yarn through the flyer.
- Now in the winding head fix the empty cone tightly on centering disc nose and base side properly.
- Stop the spindle by applying brake.
- Insert the nylon wire through the tension variator
- Tie the yarn at the piecing wire properly
- Pullout the wire by holding the front end through the reserve disc
- Take the yarn through pig tail guide
- Release the brake
- Allow suitable time to insert-required amount of twist to the untwisted portion of yarn before tying the yarn on empty cone.
- Engage the cradle
- Engage the drop wire

 Doffing the cone	 Fixing empty cone after doffing

Storing the doffed cone packages

- Place the doffed cones in the peg trolley and store at designated storage place.
- Transport the full cones peg trolley to designated storage area
- Keep the empty cones in the reserve area for next doffing
- Carefully handle the cone packages and put them in the trolleys as instructed
- Always ensure safety while carrying out doffing

Cleaning of TFO & Waste disposal:

- Carry out cleaning of machine at periodic intervals as instructed & keep the machine free from fluff & dust accumulation.
- Clean the creeling area
- Clean the inner pot using cloth
- Properly clean different mechanisms in TFO machine
- Collect the yarn waste in the waste collection pocket provided and store them at designated place
- Clean around the TFO machine using proper cleaning equipments.
- Keep the TFO department clean.

7. Instructions for Shift Change:

Take Charge of the Shift

- Come at least 10 - 15 minutes earlier to the work spot.
- Meet the previous shift operator and discuss regarding the issues faced by them with respect to the quality or production or spare or safety or any other specific instruction etc.
- Understand the count produced, No of ply in the cheese (paralleled yarn) and colour coding followed in the TFO machine for his allocated number of Spindles/ machines.
- Check and understand the technical details mentioned in the display board.
- Check for the availability of the reserve empty cones and feeding cheeses.
- Check the condition of all the drums and ensure proper functioning of TFO machine parts.
- Check the cleanliness of the machines & other work areas.
- Check whether the waste collection boxes are empty while taking charge of shift.

Handing over the Shift:

- Properly hand over the shift to the incoming shift operator.
- Provide the details regarding count produced, colour coding followed for cheese (paralleled cheese) and the empty cones for the allocated spindles/machines.
- Provide all relevant information regarding the, idle drums, damaged machine parts etc.,
- Collect the wastes from waste collection bags weigh them and transport to storage place.
- Check the cleanliness of the work place.
- Get clearance from the incoming counterpart before leaving the work spot, in case if the next shift operators do not come, report it to shift supervisor.
- Report to the shift supervisor about the quality / production / safety issues/ or any other issue faced in the shift and leave the department only after getting concurrence for the same from supervisors.

8. Importance of Health & Safety

- Follow the work & safety instructions and adopt safe working practices like not opening the doors of the machine, not cleaning the interior parts & not taking any choked material when the machine is in running condition.
- Always use head cap, face mask and ear plug in the work spot.
- Do not carry any metallic parts during machine running as there are chances of fire and damage to machine parts.
- Take action based on instructions in the event of fire, emergencies or accidents, and participate in mock drills/ evacuation procedures organized at the workplace as per organization procedures.