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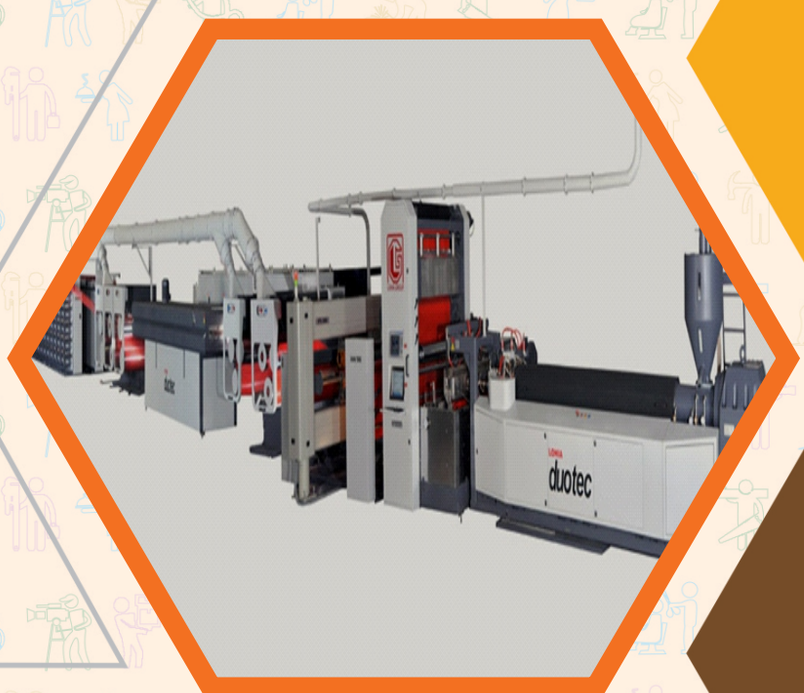
TEXTILE SECTOR SKILL COUNCIL
TSC
PERFECTING SKILLS

Participant Handbook



Sector
Textile Sector Skill Council

Sub-Sector
Technical Textiles

Occupation
Spinning - Technical Textiles

Reference ID: **TSC/Q8201, Version 4.0**
NSQF Level 3

Tape Plant Operator

This book is jointly developed by

Textile Sector Skill Council (TSC) &

Technical Training & Research Centre - Lohia Corp.

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"Skilling is building a better India. If we have to move India towards development then Skill Development should be our mission."

Shri Narendra Modi
Prime Minister of India

Acknowledgements

Textile Sector Skill Council (TSC) sincerely thanks Ministry of Skill Development & Entrepreneurship (MSDE), National Council for Vocational Education and Training (NCVET) & National Skill Development Corporation (NSDC) for creating a strong skill ecosystem in the country of which TSC is an integral part.

TSC is the Sector Skill Council approved by NSDC & recognized awarding body approved by NCVET under the ages of MSDE.

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Special Acknowledgement to **Mr. Rajeev Kumar Dwivedi** & **Mr. Jitendra Kumar Arya**

Dr. Swapna Mishra
CEO
(Textile Sector Skill Council)

About TSC

Textile Sector Skill Council (in short TSC) is a non-profit making organisation having license under Section 8 (1) of the Companies Act, 2013 registered under Companies Act 2013. Textile Sector Skill Council has been approved by National Skill Development Corporation, set up by Ministry of Finance, Govt. of India. TSC will develop a skilled work force for the textile industry through setting curriculum for training and accreditation of trade competency. TSC is to facilitate scalable "skill training" to the complete work force engaged in the manufacture of textile and hand-loom products. National Skill Development Corporation (NSDC approved Textile Sector Skill Council (TSC) for development of skill in spinning, weaving, processing and hand-loom sectors of the textile industry.Setting of Textile Sector Skill council has also been endorsed by Ministry of Textiles, Government of India vide approval letter dated 6th September 2013.The TSC is an organization represented by Industry, government and academia to develop innovative skill solutions and to investment in skills and job creation. The key objective of TSC is to define the skill requirement of the industry and to create a deployable talent pool of workforce for the textile industry. The TSC is incubated by textile industry associations and training providers including textile research associations and office of the Development Commissioner of Hand-looms. A governing council of this group will oversee the running of the TSC with its CEO and a team of professionals, who will collect, compile and manage Labour Market Information System (LMIS), build competency framework, evaluation methods and curriculum development in consultation with industry and academia.

About TTRC

TECHNICAL TRAINING & RESEARCH CENTRE (TTRC) was established by LOHIA CORP LTD at Kanpur, India in 2012 as an independent division of the group with objectives blended with CSR commitment to impart skills to unemployed youth for employment generation as well as to support the growing raffia industries by providing skilled & trained manpower. The objectives of TTRC have been drawn up in line with the vision of Mr Raj Kumar Lohia, Chairman, Lohia Group to create a Training Institution for the Raffia industry in the country.

Since its operation in 2012, TTRC has emerged as the global destination for training requirement in all disciplines of Raffia industry from Operator level program to Executive development programs with a systematic approach to create pool of trained & knowledge based manpower for Raffia Sector. Perhaps, TTRC is the first of its kind Technical training & research centre of international repute dedicated for Woven sack industry. TTRC campus at Kanpur, India is spread across 10 acre land with residential facilities within the campus & state of art infrastructure including Testing Laboratory & Workshop equipped with Tape plant, Looms, BCS, Valvomatic, MFY Extruder, etc.

LOHIA's TTRC has also been engaged by Woven sack manufacturing units from different countries of SAARC, Africa, Middle East, South East Asia, GCC as the Training partner. TTRC's Onsite training modules at factory premises are becoming popular which enable industries to improve productivity & quality in their operation. USP of TTRC programs is customization as per the requirement of Industries. TTRC's skill training program has been shortlisted by NSDA (apex body of Govt of India for skill development) as an innovative initiative in area of skill development. TTRC is registered as a Training Partner with Textile Sector Council Under NSDC to promote skill development.

Certificate

COMPLIANCE TO
QUALIFICATION PACK – NATIONAL OCCUPATIONAL STANDARDS

is hereby issued by the

TEXTILE SECTOR SKILL COUNCIL

&

TECHNICAL TRAINING & RESEARCH CENTRE - LOHIA CORP.

for

SKILLING CONTENT : PARTICIPANT HANDBOOK

Complying to National Occupational Standards of

Job Role/ Qualification Pack: '**Tape Plant Operator**' QP No. '**TSC/Q8201 ; NSQF Level 3**'

Dr. Swapna Mishra
CEO
(Textile Sector Skill Council)

Date of Issuance: **May 08th, 2025**
Valid up to*: **May 08th, 2028**
**Valid up to the next review date of the Qualification Pack or the 'Valid up to' date mentioned above (whichever is earlier)*

Mr. Rajeev Kumar Dwivedi
Director
(Technical Training & Research Centre - Lohia Corp.)

About this Book

This Participant Handbook is designed to enable training for the specific Qualification Pack (QP). Each National Occupational (NOS) is covered across Unit/s.

Plastics raffia or Woven sack sector is one of the key segments of plastics processing industries in India, contributing to the growth of consumption of commodity plastics like polyethylene (PE) & polypropylene (PP). The Plastics Woven sack industry can be classified into the following major product packaging categories depending upon the end use applications:

- **Polyolefin Woven Sacks / bags for packaging of Fertilizer, Cement, Food grain, Sugar, Petrochemical products, poultry / animal feed / agricultural produces, resins & chemicals etc.**
- **Flexible Intermediate Bulk Containers (FIBC)**
- **Tarpaulins of different types & applications**
- **Leno bags for fruit & vegetable packaging**
- **Wrapping fabrics**
- **Other tailor - made applications of woven fabrics in Postal, parcel, courier, good transportation/ shipping / logistic areas etc.**
- **Geotextiles / agro textiles**

The **Tape Plant Operator (TSC/Q8201)** is responsible for running the Tape Plant Line under supervision by maintaining health, safety, and security in the raffia industry.

This unit/task covers the following:

1. **Taking charge & handing over the shift to Tape Plant operator (TSC/N8201)**
2. **Running Tape plant line (TSC/N8202)**
3. **Contribute quality extrusion in Tape Plant line (TSC/N8203)**
4. **Maintain work area, tools and machines in raffia sector (TSC/N9011)**
5. **Working in a team in raffia sector (TSC/N9012)**
6. **Maintain health, safety and security at work place in raffia sector (TSC/N9013)**
7. **Comply with industry and organizational requirements in raffia sector (TSC/N9014)**



Symbols Used


Learning Outcomes


Objectives


Notes


Tips

Table of Contents

It is recommended that all trainings include the appropriate Employability Skills Module Content for the same is available here:

https://www.skillindiadigital.gov.in/content/list

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1. Taking Charge & Handing over the shift to Tape Plant Operator

TEXTILE SECTOR SKILL COUNCIL
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Unit 1.1 - Introduction

Unit 1.2 - Tape Plant Parts & Functions (main drive motor to Waste collection box)

Unit 1.3 - Formula's related to Tape Plant

TSC/N8201

Key Learning Outcomes

At the end of this module, you will be able to:

1. Explain the use of Tape Plant.
2. Operate the Tape Plant Line.
3. Contribute quality extrusion in Tape Plant line
4. Describe the role and responsibilities of a tape plant Operator.
5. State formulas related to the tape plant.
6. Do problem solving exercises related to tape plant.

UNIT 1.1: Introduction

Unit Objectives

At the end of this unit, you will be able to understand and know the:

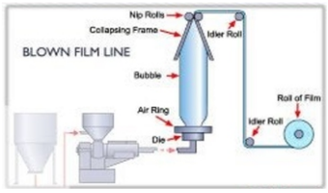
1. Describe the tape plant.

1.1.1: Tape Plant

▶ Tape plant is basically a machine used for manufacturing/producing monoaxially oriented tapes (from Semi crystalline Plastics like PP,HDPE) using the principle of Cast film Extrusion or Blown film extrusion. These tapes are then used for weaving and producing woven fabric/sacks.

- **Blown Film Extrusion**

  Polymer is melted in the extruder and pumped through a circular die, where it is extruded as a tube in the vertical direction and quenched through air.



- **Cast Film Extrusion**

  Polymer is extruded in the form of flat film through a slit Die and quenched in the Water bath Cast Film Extrusion Process is highly used for producing monoaxially oriented tapes.

- **Advantages Of Cast Film over Blown Film**
  - Higher Output rate
  - Better gloss & Clarity
  - Minimum thickness variation
  - Higher tenacity

▶ Used for producing high quality PP/HDPE tapes for a wide range of applications, such as – woven & knitted bags, jumbo bags - i.e., Flexible Intermediate Bulk Containers (FIBCs), carpet backings, tarpaulins, geo textiles, agro textiles, wrapping fabrics, ropes and twines.

Scan the QR code to see the related video

Technical Textiles: A Sunrise Segment in the Textile Ecosystem

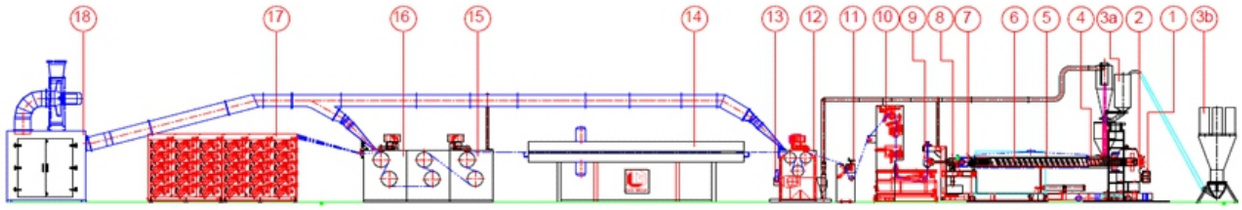
UNIT 1.2: Tape Plant Parts & Functions

Unit Objectives

At the end of this unit, you will be able to understand and know the:

1. Explain the Parts & Function of Tape Plant.

1.2.1: Parts & Functions



Tape plant Layout.

1. Main Motor
2. Gear Box
3a. Main Hopper.
3b. CDMU
4. Feeder Box (Sleeve)
5. Barrel
6. Screw
7. Screen and Breaker Plate
8. Melt Pump
9. T-Die
10. Quenching Tank
11. Slitting Unit (Six Station Cutter)
12. Holding Unit
13. Edge Trim Unit (Recycling)
14. Hot Air Oven
15. Stretching Unit
16. Annealing Unit
17. Winder Assembly
18. WCB (Wastage Collection Box)

1. Main Drive Motor

Main drive motor is an induction type AC Motor. The function of main drive motor is to provide the torque which turns the screw through Gear box.

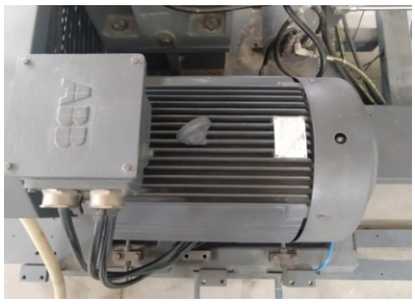
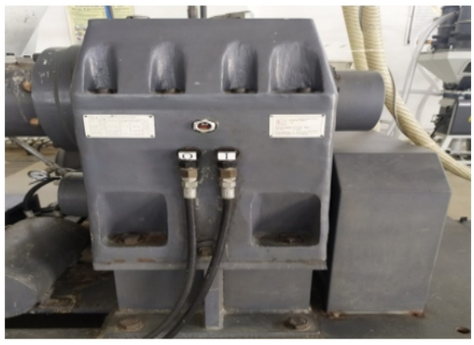


Fig.1.2.1.1: General textile process flow sequence

2. Gear Box

In general, the main motor runs at speed between 1485 rpm to 1500 rpm (A/C Induction motor) but we cannot run the extruder screw on same rpm as the extruder screw speed requirement in an extruder is between 10 to 240 rpm, hence, to reduce screw speed, the role of Gear reduction through gear box of ratio (5:1 to 20:1) is very important.



3a. Main Hopper

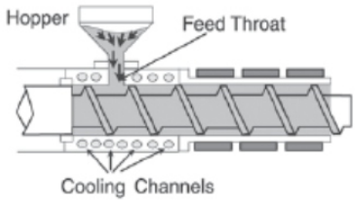
It is funnel like device and its purpose is to store and transfer plastics into the extruder barrel (feeder sleeve).

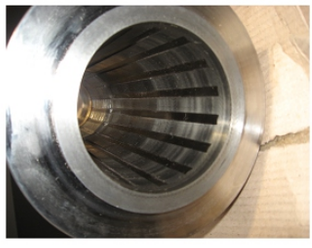
3b. CDMU

Gravimetric mixing unit with load cells is preferred over volumetric due to better accuracy of mixing. To guarantee uniform component distribution, each component is gravimetrically fed with different feeders. Due to space constraint above feed throat and to avoid vibrations of extruder, the gravimetric mixing unit is placed on ground.

4. Feeder Box(Sleeve)

Grooved feed- The grooves are in the axial direction but can also be helical around the feed section. The advantage of grooved feed throat is increase friction between material and the barrel wall, resulting in higher through puts.





Grooved Feed

Smooth Feed Grooved Feed

Important Note on Relative Merits/Demerits of Grooved Feed Vs Smooth feed or plain bush feed:

SMOOTH BARREL VS GROOVED FEED

The advantages of grooved feed throats:

- Reduction or elimination of the effect of high head pressure, resulting in higher output.
- Reduction in melt temperature at same output.
- Stabilized output.
- Not very sensitive to barrel temperatures.

The disadvantages of grooved-feed throats:

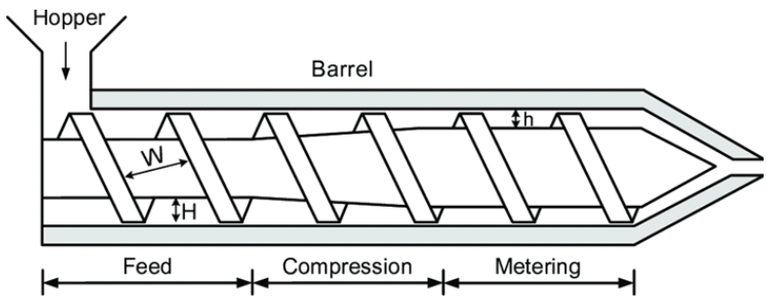
- Proportionally more drive power required.
- Performance very sensitive to particle characteristics.
- Generally, not suitable for most regrind due to plugging of the grooves. Does not work on "soft" polymers like many TPEs due to plugging of the grooves.
- Not as good for compounding additives without extensive mixing sections due to higher specific output.
- Not generally suitable for powdered polymers or additives.
- Can have accelerated screw/barrel wear without accurate balanced design due to higher pressures in feed section.
- Can be unstable with "hard" polymers such as polycarbonate. Requires higher volume of cold water for cooling.
- Requires a special screw design, unlike those used for smooth bore extruders.

A typical example – Comparison of Smooth Vs grooved feed

If the output of the grooved-feed-throat extruder of 90 mm is 260 kg/hr, with a melt temperature of 215°C at a screw speed of 95 rpm then the similar identical smooth-feed-throat extruder having a similarly designed screw, the output may reduce to 201 kg/hr at the same screw speed and a slightly lower head pressure and melt temperature may be high around 222°C

5. Barrel

The extruder barrel surrounds the screw and is made from heavy alloy steel tubing. They are designed to withstand the pressures which are generated internally due to the pumping action of the screw. Extruders have resistance type band heater which fit or wrap around the barrel. The barrel is divided into a series of zones known as heating zones, each of which is controlled by temperature control device, which senses and controls the temperature within the set value.



6. Extruder Screw

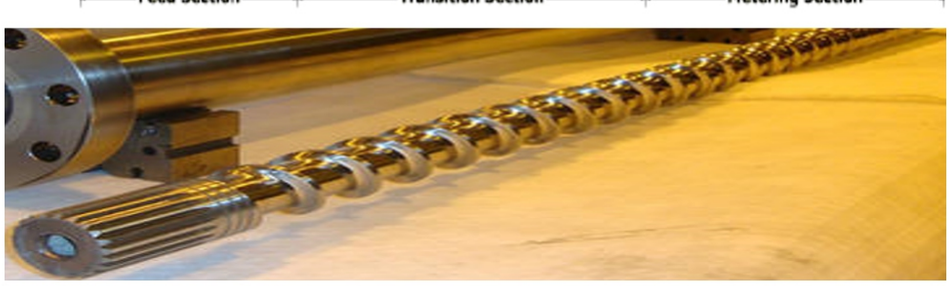
A cylindrical solid rod having a continuous helical thread all around the surface through the complete length. Screw can be considered as the heart of Extruder.

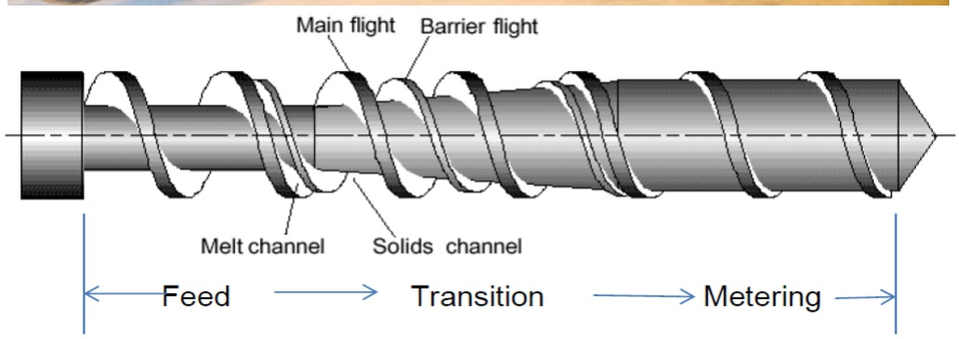
It performs following three functions:

a. Accept the plastics material from the hopper and convey it to the compression zone.

b. Compact the plastic granules or powder in compression zone and drive the air out. Soften the material due to compression and frictional heat produced by the screw rotation aided by the heat of the barrel wall.

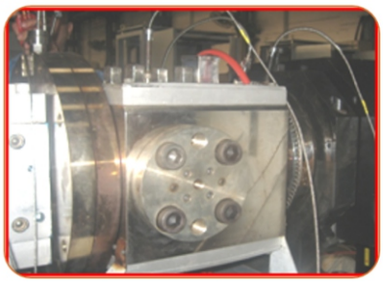
c. Deliver a constant output at the die end without any fluctuations or pulsations.



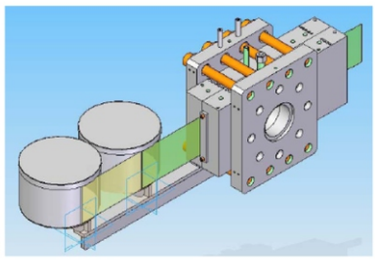


7. Screen pack and breaker plate

The function of screen pack is to filter out all possible contaminations from the polymer melt. The breaker plate along with screen is used for breaking up the turbulent flow of material into a more laminar flow.



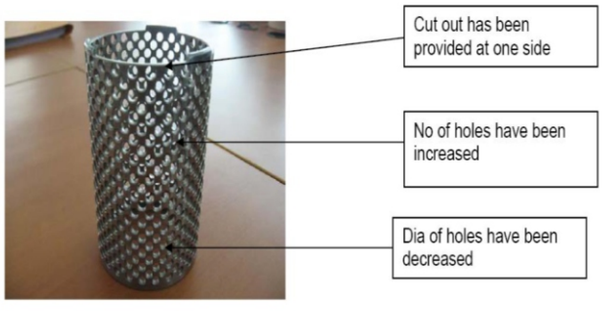
Screen Pack



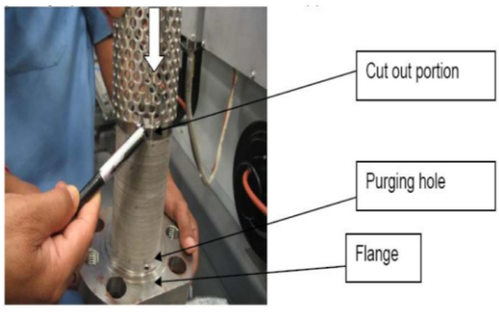
Auto Screen Changer

- Auto Screen Changer
  a) Pressure controlled/time controlled automatic movement of filter mesh.
- Continuous Screen Changer
  a) A parallel-operating, double-channel, continuous flow screen changer.
  b) Popular design in India.

COMPONENT OF EXTRUDER –BREAKER PLATE



Screen Support



Fitment Procedure

8. Melt Pump

A Melt pump is a device placed between the extruder and die, and helps positive pumping through the die. It is often called Gear pump. The Gear pumps are used in the extrusion process to provide a constant flow rate or equal pressure to the Die.

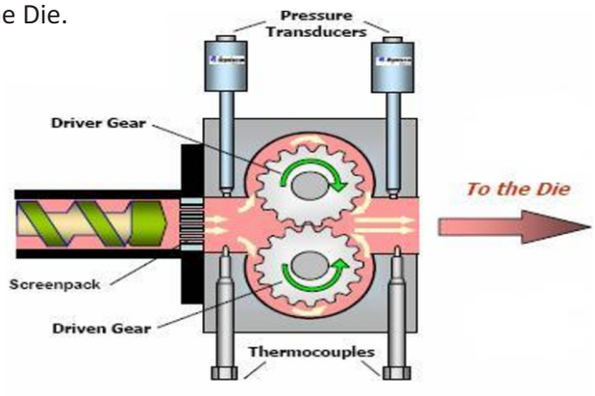


Figure The Gear Pump

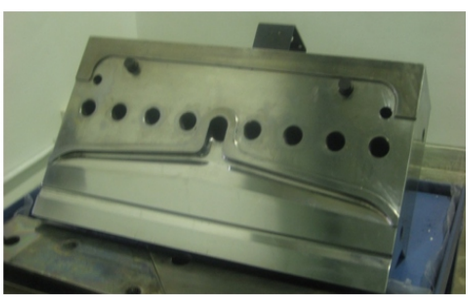
ADVANTAGES

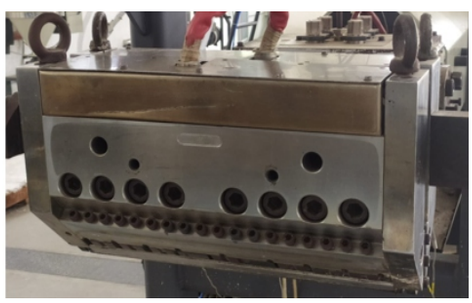
- Uniform conveying of molten material at low pressure.
- Elimination of extruder pulsation.
- Improved quality & dimensional stability of the end product.
- Longer life of screw and barrel.
- Increase production at low energy cost.

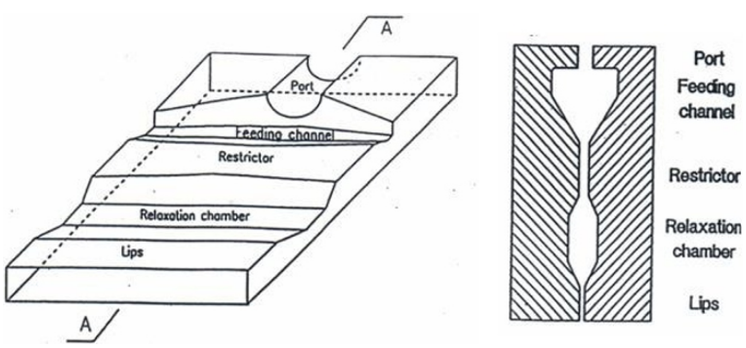
9. T-type/Coat Hanger Die

T-type/Coat hanger die is mostly used for producing films. In coat hanger type of die, the design is of triangular preland section, which gives balanced pressure leading to uniform flow of the material across the die width.

- Gives balance pressure
- Better gauge control
- Die width- 600 mm to 2000 mm
- Die gaps- 0.39 to 0.7 mm





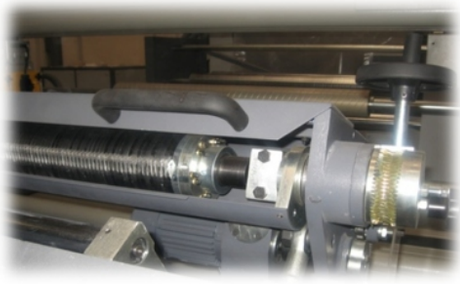


10. Quenching Tank

The cooling is done by quenching the film in a water tank. The film from the die is directly taken into the tank filled with water. Film quality and performance of the resulting tapes mainly depend on the quenching conditions. During quenching, the significant parameters which control the physicals of the tapes are die-water distance (air gap) and quench water temperature.

11. Slitting unit

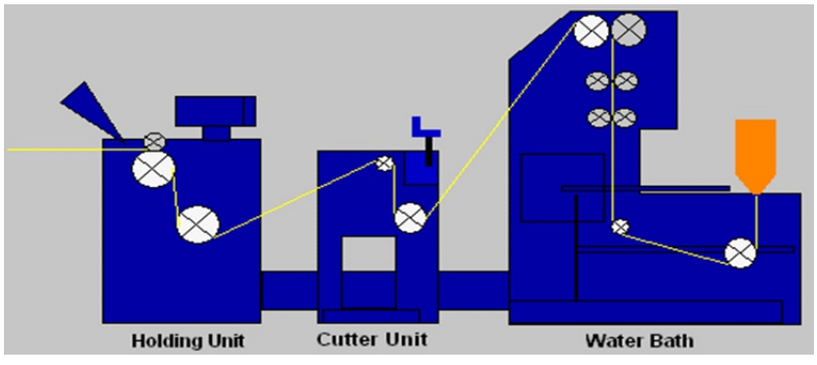
Flat films after quenching are slit into tapes of specific width according to end use requirement. Slitting tools are generally used are surgical are industrial blade between 0.1mm to 0.4mm.



12. Holding Unit:

Main Parts of Holding Unit

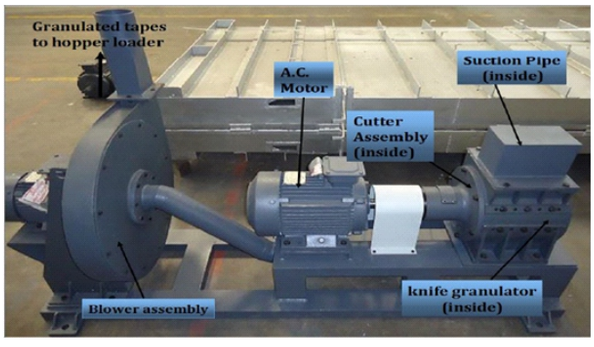
- 2 or 3 Godets Assembly
- Pulley and flat belt
- Broken Tape Suction Mouth-1st
- AC Motor with Drive
- Pressure Rubber Roller
- Gear Box
- Static Charge Eliminator



13. Edge Trim Unit

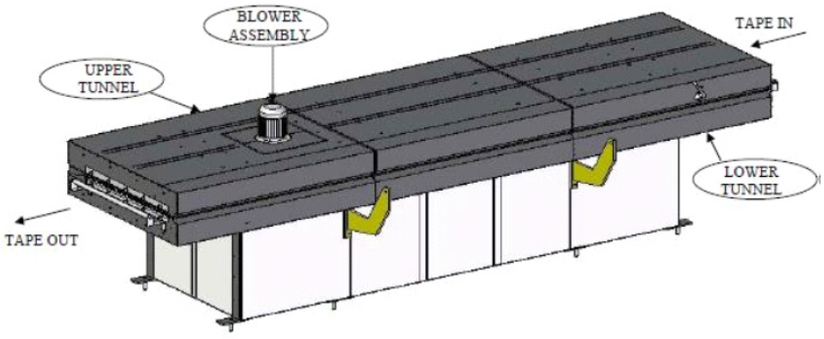
Main Parts of Edge Trimming Unit

- Shredding mill
- (Motor + Coupling + Rotating Cutters + Fixed cutter)
- Blower (motor + impeller)



14. Hot Air Oven

Tapes from the first set of godets (S1) are taken through an oven onto the second godet rollers (S2). Hot air is blown in the oven, counter current to the movement of tapes, and re-circulated through a blower-heater system at the rate of 10-20 m/s.



Main Parts of 6 m Hot Air Oven

- Tunnels with Heaters (U Shape heaters at exit side)
- Motor + Impeller

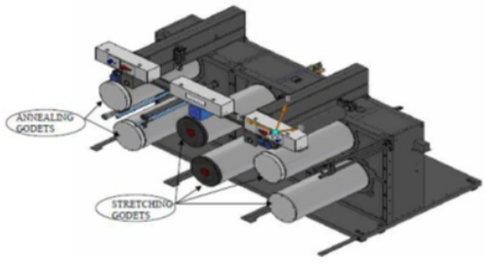
INTERMEDIATE STRETCHING UNIT

Main Parts of Intermediate Stretching Unit (For Duotec T/P)

- 3 Godets Assembly
- AC Motor with Drive
- Gear Box
- Pulley and flat belt
- Pressure Rubber Roller
- Broken Tape Suction Mouth-2nd

15. Stretching unit

Stretching of the tapes is done by passing them over two sets of rollers called holding godet rollers, placed on either side of the hot air oven/hot plate and operating at different speeds. *Ratio of speed of second set of rollers (S2), operating at high speed, to that of first set (S1) is termed as stretch ratio (SR).*



Stretching method on different Tape Line models

- Single stretching inside Hot Air Oven at Stretching temp. less than melting point of polymer.
- Dual stretching - First Stretch between Holding & ISU at temp. range (50-90 ^{0}C) and final stretch inside Hot Air Oven (145-160 ^{0}C).

16. Annealing unit

Drawn/oriented tapes are 'annealed' immediately after stretching operation, this helps to minimize tape shrinkage. Annealing is done by heating the stretched tapes while they pass over from second godet rollers (S2) to third godet rollers (S3). The annealing speeds maintained slightly lower (5% less) than the stretching speed and annealing temperature also slightly lower than the orientation temperature is around 70° c to 110° c.

Main Parts

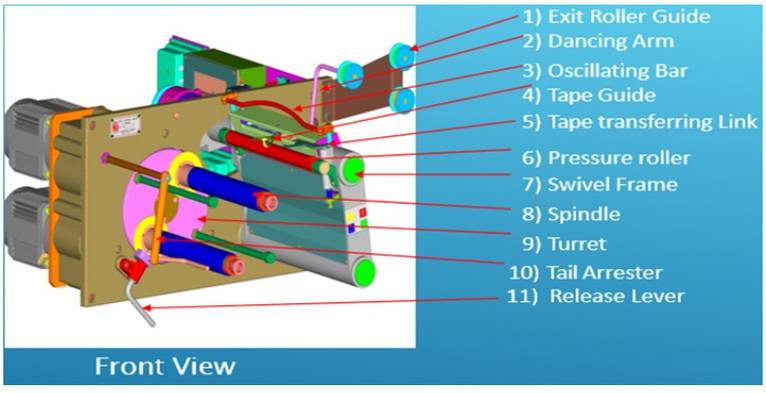
- Hot & Cool Godets
- Rotary Unions
- AC Motor, Drive, Gear box
- Pulley and flat belt
- Pressure Rubber Rollers
- Static Charge Eliminators
- Waste Tape Suction Mouth- 2nd

17. Winder Assembly

A winder essentially does three functions:

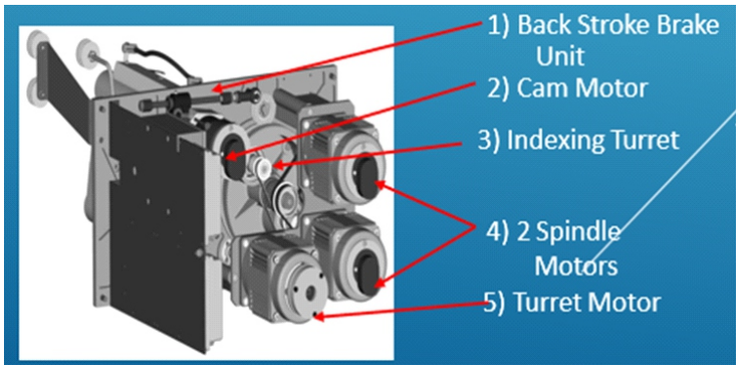
a. To lay the tape uniformly across the bobbin. This is achieved by the motion of the cam shaft-slider-thread guide assemble.

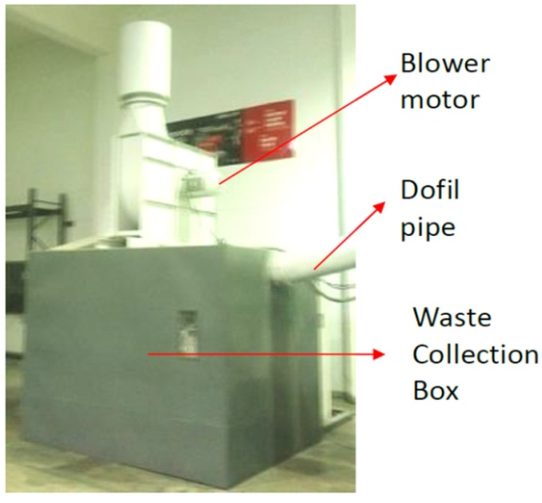
b. To control the winding tension throughout the bobbin diameter. This is achieved by the dancing arm mechanism in inverter winders and the magnetic coupling mechanism in the magnetic type winders.



18. Waste Collection Box

The purpose of Waste collection box is to suction of broken tapes at Holding/ ISU/ Annealing Units through Suction mouths and final collection in Waste Collection box.





FIBRILLATOR (Optional)

- Used to puncture the tapes
- The unit is placed between Hot air oven and Stretching unit.

Application

- Fibrillated tapes areusedin different applications like stitching of woven bags, weft tape for making FIBC, PP ropes, Carpet backing, Artificial turf, PP cable fillers and Concrete fibres etc.

UNIT 1.3: Formula's related to Tape Plant

Unit Objectives

At the end of this unit, you will be able to understand and know the:

1. Determine the formulas related to tape plant.

1.3.1: Formula's related to Tape Plant

1. Spacer Size (mm) = $\sqrt{Stretch\ Ratio}$ X Width of Tape (mm)

2. Stretch Ratio = $\left(\frac{\text{Spacer Size}}{\text{Width of Tape}}\right)^2$

OR

Stretch Ratio = $\frac{\text{Stretching Speed}}{\text{Holding Speed}}$

3. Production Kg/hr = $\frac{\text{Denier x Final Line speed x No. of Tapes x 60}}{9000\text{x}1000}$

OR"

Production Kg/hr = $\frac{\text{Denier x Final Line speed x No. of Tapes}}{150000}$

4. Elongation % = $\frac{\text{Tape Final length - Initial Length x 100}}{\text{Initial length}}$

5. Tape Thickness Stretched = $\frac{\text{Denier}}{9000\text{x Tape Width x Density}}$

6. Unstretched Tape Thickness = $\sqrt{Stretch\ Ratio}$ X Stretched Tape Thickness

7. Denier Setting Formula = $\frac{\text{Holding Speed x Actual Denier}}{\text{Required Denier}}$

8. Relaxation % = $\frac{\text{Stretching speed – Annealing Speed}}{\text{Stretching Speed}} \times 100$

9. GPD = $\frac{\text{Strength}}{\text{Denier}} \times 1000$

10. Gear Ratio Formula = $\frac{\text{Motor speeds x Motor Pulley Dia}}{\text{Screw rpm x Gear Box Pulley Dia}}$

11. Screw Speed Formula = $\frac{\text{Motor speeds x Motor Pulley Dia}}{\text{Gear Ratio x Gear Box Pulley Dia}}$

12. Useful Width (Flat Film) = Film Width- (Edge Trim on Extruder)

13. Denier = Stretched Tape Thickness x Tape width x density x 9000

"OR"

Denier = Final Tape Thickness x Final Tape width x 8.11

14. Denier setting formula through Screw RPM = $\frac{\text{Screw rpm x required denier}}{\text{Actual Denier}}$

15. Die setting formula = $\frac{\text{Film Width}}{\text{Die Bolt x Spacer Size}}$

Scan the QR code to see the related video

Tape Stretching Line
- PP/HDPE Tapes for Woven Sacks

Tape plant - 1600 Deo teck
- woven sack machine

Notes

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2. Running Tape Plant Line

Unit 2.1 - Tape Plant manufacturing stages

Unit 2.2 - Tape Plant process description

TSC/N8202

Key Learning Outcomes

At the end of this module, you will be able to :

1. Explain about Tape Plant Manufacturing stages & Sequence.
2. Explain about the Tape Plant process description

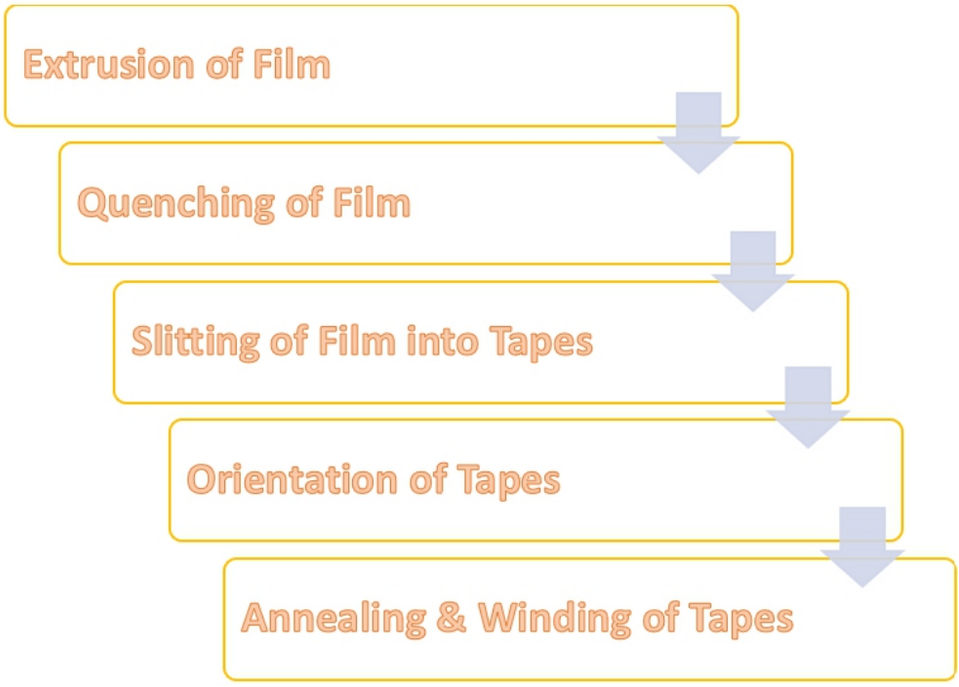
UNIT 2.1: Tape Plant Manufacturing Stages

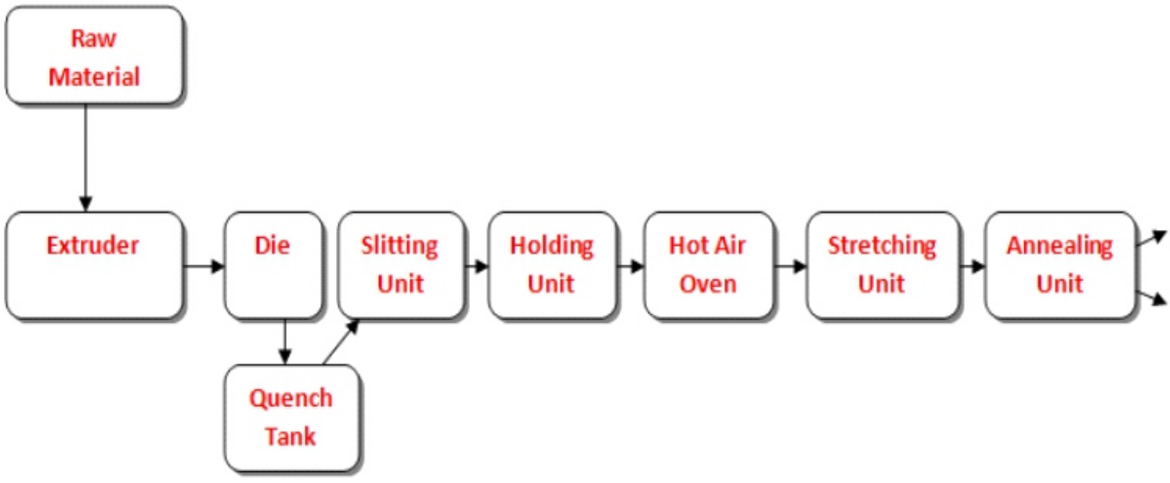
Unit Objectives

At the end of this unit, you will be able to:

1. Explain about Tape Plant Manufacturing stages & Sequence.

2.1.1: Tape Plant Manufacturing Stages





Manufacturing Sequence of Tape Plant

UNIT 2.2: Tape Plant Process Description

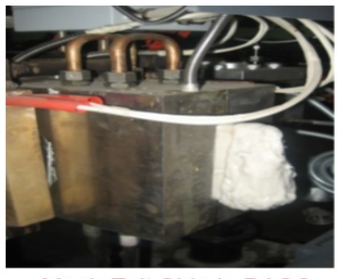
Unit Objectives

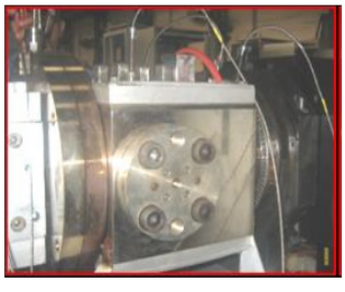
At the end of this unit, you will be able to:

1. Explain about Tape Plant parts & Process description.

2.2.1: Tape Plant Process Description

1. The material is fed to the hopper using gravimetric dosing and mixing unit (CDMU) after which flood feeding of mixed material to the feed throat.
2. Grooved feed throat with cooling channels. The cooling around the feed section removes generated frictional heat and prevents premature melting of pellets/breezing.
3. **Extrusion Process:**
   Screw – Heart of the Extruder
   a) External Heating
   b) Frictional Heating
   Screw melts the solid resin particles, homogenizes, melt & conveys molten polymer to the Die.
4. Bimetallic Barrel is designed to withstand high pressure as well as abrasion due to inorganic fillers. The barrel and heaters help heating and melting the polymer by effective controlling the temperature in the different zones, preventing material from overheating and degrading. Generally, we have 5 heat zones in barrel. Thermocouples in each heat zone control the heaters and barrel temperature. Air-cooling is also used in each zone to control the barrel temperature
5. Screen Changer and Breaker Plate arrests rotational flow, helps in Homogeneity, improves mixing & filters out contamination.

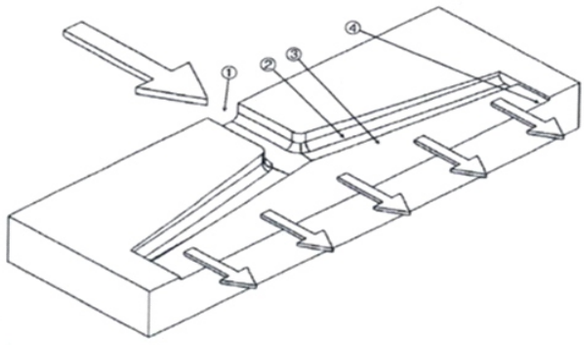

Mesh Exit Side in BASC



Inlet Side adjacent to Barrel


Exit side adjacent to die / melt pump

6. **Melt Pump:** The pockets in the gears transport the molten polymer, producing a positive volumetric displacement of the melt.
7. **T-Type/ Coat Hanger Die:** Melt is extruded through the coat hanger die



Coat hanger –type die concept

(1) Central Inlet Port: Connects to the extruder barrel.

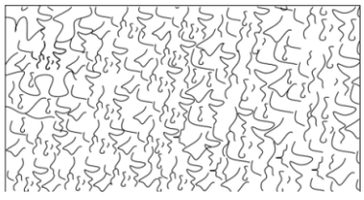
(2) Manifold (Distributes melt): Provides a streamlined channel to evenly distribute the melt to the island.

(3) Island: with the manifolds serves to create an equal pressure drop from the die inlet to all points across the die exit.

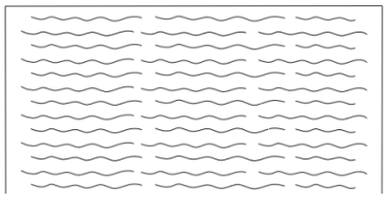
(4) Die lip: wide slit across the die that provides the final sizing of the melt.

8. **Quenching Tank:** After partial orientation in Die, polymer melt is quenched rapidly in water bath to prevent melt relaxation. Fast cooling promotes a finer crystalline structure of polymer in the film which in turn improves the performance of film during the stretching operation, apart from rendering better physical properties
9. Wet film is passed through water removal devices like scrapers, suction blowers, Air knives & Nip rollers etc. to ensure complete dryness before slitting process.
   - Freeze
   - Facilitates-Better Orientation & better Physical properties.
   - Quench Water Temperature for PP- 20 to 55^{o}C
   - Air Gap(Die & water gaps) - 20 to 55mm
   - Quench Water Temperature for HDPE- 20 to 35^{o}C
   - Air Gap(Die & water gaps) - 20 to 35mm
10. Film slitting in specific width tapes as per end use requirement in the slitting unit.
    Preparation of slitting spacer assembly depends on:
    - Tape Quality
    - GPD
    - Size of Spacer
    - Size of Blade
    - Filler Percentage

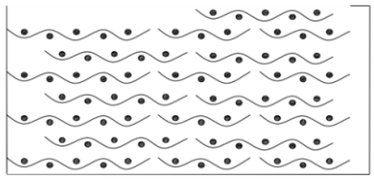
11. **Holding Unit:** The main function of first godet holding unit is to hold the tapes, which are generally engage from 3 or 2 rolls.
12. **Edge Trim Unit:** End tapes of both sides having higher thickness are milled through cutters and flown back to main hopper.
13. **Hot Air Oven:** Hot air is re-circulated inside the oven through heater blower system at velocity 10-20 meter/sec and oven temperature 120° to 160 °C. Uniform temperature distribution in entire oven area is critical for stretching of all tapes at constant temperature.
14. **Orientation Process:** During Stretching, macromolecules are given an Orientation in draw direction. Crystalline structure determines the orienting ability. Polymer is annealed subsequently in stretched condition to keep the orientation intact. A higher degree of orientation will produce tape of higher tenacity but poor elongation.



No orientation



Orientation with Uniaxial Stretching



Orientation with incorporation of CaCO masterbatch

15. **Stretching of Tapes:** Passing on 2 set of godets by virtue of different rotational speed of godets in presence of Stretching of tapes in presence heating media results in molecular/Chain orientation and greatly increases the mechanical strength of tapes.
16. **Annealing of Tapes:** Tapes passing on set of Hot & Cool godets, rotating at speed lower than stretching godets speed provide relaxation to the tapes. Reduce Shrinkage to retain the orientation.
    - Annealing temperature range between 70° to 110°C

    Stress Releasing & Shrinkage Control: Hot Godets Ensure relaxation of tapes and reduce shrinkage property of tapes.

    For application requiring low shrinkage of tapes
    - Residual shrinkage less than 7 % -4 Hot Godets
    - Residual shrinkage less than 2 % -6 Hot Godets

    Two Cool Godets: Provide cooling to tapes for before winding.
17. Suction of broken tapes at Holding/ ISU/ Annealing Units through suction mouths and final collection in Waste Collection Box.
18. The Stretched tapes are then wounded on the bobbins with the help of winders.

Notes

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Lorex 1400 hs - Plant setting

Tape making process
- Tape Plant Extrusion line

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3. Contribute quality extrusion in Tape Plant Line

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Unit 3.1 - Process parameter of Tape Plant
Unit 3.2 - Process Troubleshooting
Unit 3.3 - Formulative Assessment

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Key Learning Outcomes

At the end of this module, you will be able to:

1. Explain the Process Parameters related to Tape Plant.
2. Fill the Log Sheet with details about the Tape Plant Parameters.
3. Understand about Process Troubleshooting
4. Understand about Procedure for Die Maintenance.
5. Solve questions related to Tape Plant.

UNIT 3.1: Process Parameters of Tape Plant

Unit Objectives

At the end of this unit, you will be able to:

1. Explain the Process Parameters related to Tape Plant.
2. Fill the Log Sheet with details about the Tape Plant Parameters.

3.1.1: Process Parameters & Log Sheet of Tape Plant

A. Process Parameter of Tape Plant:

1. Process Percentage of recipe (%) 1 M – Material (PP & HDPE)

Additives, Filler, UV,)

2. Process Temperature

2 M - Machine setting

A. Temperature (Extruder)

B. Pressure

Extruder Temperature in °C

For PP

Barrel					Screen Changer		Melt Pump		Die						
Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	SCH	Ad 2	Melt Pump	Ad 2	Zone D1	Zone D2	Zone D3	Zone D4	Zone D5	Zone D6	Zone D7
210°	230°	240°	250°	260°	260°	260°	260°	260°	260°	260°	260°	260°	260°		

For HDPE

Barrel					Screen Changer		Melt Pump		Die						
Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	SCH	Ad 2	Melt Pump	Ad 2	Zone D1	Zone D2	Zone D3	Zone D4	Zone D5	Zone D6	Zone D7
200°	220°	230°	240°	250°	250°	250°	250°	250°	250°	250°	250°	250°	250°		

Pressure – There are four types of Pressures indicated in tape line and it is measured in Bar.

- (P-1) Melt Pressure before Breaker plate
- (P-2) (Inlet pressure at melt pump
- (P-3) Outlet /Constant Pressure
- (P-4) Die-lip Pressure (if auto gauging die is available)

3. Water Bath Temp and Feeder Box Temp.

4. Nip Roller, Top roller and Holding roller Ratio.

5. Size of slitting unit and formula of spacers. Formula for Spacer size calculation (mm)

Tape width, Spacers & Blades are measured in mm (millimeter)

Spacer width + Blade Thickness = Unstretched tape width (A_1) = $\sqrt{\text{Stretch Ratio}}$ X Final Tape width (A_2)

6. Hot Air oven Temperature

For PP 140° to 164° and HDPE 125° to 140°

7. Stretching Ratio (4 to 8)

8. Annealing Temperature 70 to 110°

B. Log-sheet details: Though most of HMI controls/computer records all process control data, it is important to know relevance of parameters vis-à-vis Tape quality. In this exercise, significance of all parameters would be explained.

PROCESS CONTROL LOG SHEET

Date:- Time:-

Raw Material input:- Lot No.

Plant No.

	Raw Material	Brand Name	Grade	Batch No.	Qnty (kg)	Initial Width(mm)	
1	PP/HDPE					Final Width(mm)	
2	$CaCo_3$					Spacer Size (mm)	
3	M.B					No. of Tapes	
4	UV						
5	TIO_2						
6	M.F Comp.						
7	R.P (Reprocess)						
8	Other						

Temperacture(°c)

Sl No.		Actual	Set	Parameters	Mtr/Min	Amp
1	Barrel 1			Holding Unit		
	2			Stretching Unit1st		
	3			Stretching Unit 2nd		
	4			Annealing Unit		
	5			Nip Roller		
2	Screen Cha.			Top Roller		
3	Adapter-A			Screw rpm		
	Adapter-B			Melt Pump		
4	Die 1			P-1		
	2			P-2		
	3			P-3		
	4			Stretching Ratio		
	5			% Relaxion		
	6			Quality		
	7			Time		
5	Melt Pump Pressure			Denier		
6	Sleeve Temp.			Strength		
7	Quenching Temp.			GPD(Gram per denier)		
8	Hot A.O Temp.			Elongation		
9	Annealing Temp.			Tape width		

BETA GAUGE

Sl No.	Min	Max	Avg

Remarks:-

UNIT 3.2: Process Troubleshooting on Tape Plant

Unit Objectives

At the end of this unit, you will be able to:

1. Understand about Process Troubleshooting

3.2.1: Process Troubleshooting on Tape Plant

Due to improper process parameter setting or improper material or machine malfunctioning, different type of process defects are observed during tape manufacturing operation.

Few observations are as follows-

i. Low Strength and Elongation Less or high

ii. Puncture in the film

iii. Tape breakage

iv. Denier and Tape width variance

v. Roughness in the film

vi. Fibrillation in the Tape

vii. Screen Chocking

MACHINE-PROCESS PARAMETERS

A. Temperature

B. Pressure

Extruder Temperature P-1 (Melt)

Die Temperature P-2 (Inlet/Operator)

P-3 (Outlet/Die)

C. Quenching Temperature

D. Hot air oven Temperature

E. Stretching Ratio

F. Annealing Temperature

Less Tape Strength/Tenacity

1) Raw Material property

2) Die-barrel temperature higher.

3) Improper temperature of oven/platen/ quench water.

4) Improper Air gap (Optimum)

5) Low stretch ratio

6) Mesh choking

7) Film roughness

8) Particles issuing on the Film.

ELONGATION LESS OR MORE

1) Stretch ratio high/low.
2) Air gap is very less/more.
3) Hot Air Oven Temperature (Optimum)
4) Annealing Ratio high/low.

Puncture In the Film

1. Raw material
A. Foreign particles, Dust
B. Moisture
2. Reprocess
A. Contamination
B. Moisture
C. High %
3. Less temperature of Die and Barrel
A. Set temp. Itself is less.
B. Due to any electrical fault i.e., thermocouple
4. Mesh Chocked

Tape Breakage

1. Particles in Raw Material
2. Moisture
3. High Stretch Ratio
4. Improper Temperature (setting-Barrel, Die, Quench water, Oven)
5. More Denier Variation
6. Variation in Godet speeds.
7. Mechanical Damage of tapes.

Denier Variation

1) Improper mixing of raw material (filler)
2) Improper Temperature setting, Die, Barrel, Oven, Platen (Check uniformity of temperature on hot plate)
3) Temperature of Die zone varying.
4) Wrong Spacers
5) Blades Flickering
6) Die-lip gap not adjusted properly
7) Speed variation in Godets.
8) Improper Roller gap.

Roughness In the Film

1) Raw Material property Additives $CaCo_3$ and Master batch.
2) Low Barrel and Die Temperature
3) Low set Temperature

4) Due to electrical fault
5) Excessive Reprocess Material. SCREEN CHOCKING
6) Raw material : Foreign particles/dust
7) Actual temperature of Barrel, screen changer area much less than the set temperature.
8) Reprocessed Material
9) Dirty(Not pure)
10) high %
11) High percentage of colour M.B.
12) Mesh combination is not proper.

Fibrillation In the Tape

1) Less % of Antifab
2) High Stretch Ratio
3) High Strength & less Elongation%
4) Excessive winder tension
5) Wrinkles on the Tapes
6) Check sharpness of blades on spacer.
7) Colour variation in tape
8) Improper mixing of material
9) Denier Variation
10) Improper temperature setting of Die
11) Godet speed variation
12) Chocking of Die-lip surface.

TYPICAL MACHINE RELATED TROUBLE SHOOTING

Extruder

1) Belt Tension (V Belt)
2) Water circulation in feeder box and sleeve by water flow indicators
3) Die lip to be covered if m/c is stopped
4) Cleaning of Die is to be done after every6-12 month depending upon Material processed.
5) Oiling & greasing schedule
6) Typical Machine Related Trouble Shooting Water Bath
7) Contact & pressure of Nip rubber roller and Draw roller (Steel)
8) Grinding schedule of rubber roller (recommended 6 month) roller Inspection of Airline & pneumatic Valves
9) De scaling of water tank

Holding unit

1) Contact between godet and rubber roll
2) Tension of flat belt Stretching & Annealing Unit

3) Contact between godet and rubber roll
4) Tension of flat belt
5) Rotary union greasing schedule
6) Air pressure of FRL (filter regulation and lubrication)

GENERAL CHECK POINT BEFORE START UP THE TAPE PLANT

1) Ensure proper heating in Extruder & supply of
2) Chilled water in Feeder sleeve, Feeder box, Main Gear box & Auto screen changer before start of machine
3) Ensure one-hour continuous chilled water supply in Feeder sleeve, Feeder box, Main Gear box & Auto screen changer after stopping of machine.
4) Clean the Die lip only by inserting the Copper Sheet followed by Stearic acid/ Silicon spray.
5) Check the tape thickness across the film and set uniform Die lip opening to avoid Denier variation.

GENERAL CHECK POINT BEFORE START UP THE TAPE PLANT

1) Check the piping layout of Airline and chilled water line.
2) Check air/ water leakage in machine
3) Check the function of pneumatic system in all units.
4) Set the working pressure for individual unit-
5) F.R.L. 6 to 10 Bar
6) Loader 4 Bar
7) Six Station Cutter 2-3 Bar
8) H.A.O. 5-6 Bar

GENERAL CHECK POINT OF TAPE PLANT

1) Check the spacer width equal size while making the cutter rail.
2) Always engage the Static Bar during running of plant.
3) If material is not conveying in Loader, clean the filter or check the air pressure

Scan the QR code to see the related video

PP Tape Fibrillated Extrusion Plant

Flat Yarn Extrusion Line & Raffia Tape Stretching Line

UNIT 3.3: Formulative Assessment

Unit Objectives

At the end of this unit, you will be able to:

1. Solve questions related to Tape Plant.

3.3.1: Formulative Assessment

Objective Types

Q.1: Manufacturing of PP/HDPE Tape in Tape Plant is a?

a) Injection Moulding b) Blow Moulding c) Cast Film Extrusion d) Blown Film Extrusion

Q.2: Which Plastics material to be used for making Raffia Tape?

a) PVC b) LDPE c) PP d) PC

Q.3: Full form of MPM in Tape Plant?

a) Round Per meter b) Meter per Minute c) Minute per month d) None

Q.4: Function of Thermocouple in Tape Plant is for measuring?

a) Density b) Melt Pressure c) MFI D) Temperature

Q.5: Which type of Screw is recommended for producing HDPE Tape?

a) Universal Screw b) Barrier Screw c) HD Barrier d) Twin screw

Q.6: Denier is grammage of .....length of Tape.

a) 800-meter b) 1000-meter c) 9000-meter d) 1000 meter

Q.7: Function of Melt pump in Tape is?

a) Melting of material b) Filtration of material c) Uniform Conveying of molten material d) none

Q.8: Technical name of Raffia tape is?

a)Biaxially oriented b) Triaxially Oriented c) Monoaxially oriented d) none

Q.9: In which part of Tape Plant Orientation/Stretching of tape done?

a)Screen Changer b) Die c) Hot Air Oven d) Annealing godet

Q.10: Melting Temperature of PP is?

a)230 b) 130 - 135 c) 160 - 165 d) None

Q.11: Which material will generate more pressure during processing in Tape Extruder?
a)PP b) HDPE c) Both a & b d) none

Q.12: Purpose of "Annealing" in Tape Plant is to?
a) Decrease pressure b) Increase pressure c) Reduce Shrinkage d) Increase shrinkage

Q.13: Output of Tape Plant if Tape denier is 800, line speed of machine is 380mpm & no. of tape is 246?
a)400kg/hr b) 498kg/hr c) 600kg/hr d) 240kg/hr

Q.14: formula to calculate spacer size in tape plant is?
a)S.R. X Tape width b) S.R./Tape width c) $\sqrt{Stretch\ Ratio}$ X Tape width d) None

Q.15: Which pressure in Extruder of Tape Plant is called Melt pressure?
a)P-3 b) P-1 c) P-2 d) P-4

Q.16: Which additive/MB is used for Anti-fibrillation of PP tape?
a)TiO2 MB b) Filler MB c) Colour Mb d) UV MB

Q.17: Full forms of PP?
a) Polypropylene b) Polyethylene c) Polyamide d) none

Q.18: Total no. of tape in tape plant if working width of die is 1400mm & spacer size is of 5.8mm?
a) 136 b) 360 c) 236 d) 224

Q.19: Which part of the Tape Plant is called Heart of extruder?
a) Melt Pump b) Die c) Barrel d) Screw

Q.20: What is sequence order of temperature setting in different Barrel zones of Tape Plant?
a) Decreasing order b) Constant at all c) Increasing order d) none

Subjective Type:

1. Write all stages of Tape Manufacturing of Tape Plant?
2. Write down formula for calculation of Tape plant output (Kg/hr)
3. Write all the specification of Tape Plant Model Lorex E75B800?
4. Spacer size to make 2.54mm final tape width?
5. What is quenching & write all parameters of quenching of tape plant?
6. What is significance of orientation/Stretching of Tape inside HAO?
7. What is the purpose of "Annealing" in Tape Plant?

8. To produce Low denier of tape (around 500), which processioning parameter to be optimized in tape plant?
9. Write all parameters to increase the Tensile strength of tape?
10. Write any four difference of Lorex & Duotec Model of Tape plant?
11. Brief about P1, P2 & P3 pressure in Tape Plant?
12. What is Filter Mesh? Write any one combination sequence of filter mesh used in Tape Plant?
13. If die width of any tape plant is 1750mm then what is working width of film?
14. If Lorex E120B 1600 Tape plant is running at 450mpm in 600denier & 2.1mm tape width, then calculate output of tape plant (kg/hr)?
15. Write all Parts name of Tape Plant from CDMU to Winder?
16. Write any main differences between CM, CE & Autoroto Winder?
17. How can minimize or control the wastage of tape plant?
18. Draw sketch of Tape Plant Screw and mention its technical terms?

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TEXTILE SECTOR SKILL COUNCIL
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PERFECTING SKILLS

4. Maintain work area, tools and machines in raffia sector

Unit 4.1 - Department House Keeping

Unit 4.2 - Machine Cleanliness & Maintenance

Unit 4.3 - Self Discipline in Cleanliness Culture

Unit 4.4 - Do's & Don'ts

TSC/N9011

Key Learning Outcomes

At the end of this module, you will be able to:

1. Understand how to maintain tools.
2. Understand how to maintain machine.
3. Understand what is cleanliness.
4. Understand how to maintain house keeping.

UNIT 4.1: Department House Keeping

Unit Objectives

At the end of this unit, you will be able to :

1. Perform and maintain a good housekeeping in the department.
2. Follow the cleaning checklist correctly.

4.1.1: Importance of Department Housekeeping

- **Safety**: Proper housekeeping reduces the risk of accidents and injuries by keeping walkways clear and ensuring that equipment is stored safely.

- **Efficiency**: A clean and organized workspace allows for smoother operations, reducing downtime caused by misplaced tools or materials.
- **Quality Control**: Cleanliness helps maintain the quality of the film by preventing contamination from dust, debris, or other foreign particles.
- **Equipment Longevity**: Regular cleaning and maintenance of equipment prevent wear and tear, extending the lifespan of machinery.
- **Compliance**: Adhering to housekeeping standards ensures compliance with industry regulations and safety standards.
- **Morale**: A tidy work environment boosts employee morale and productivity, creating a more pleasant and professional atmosphere.
- **Problem Identification**: A well-maintained area makes it easier to spot potential issues with equipment or processes early, allowing for timely interventions.

UNIT 4.2: Machine Cleanliness & Maintenance

Unit Objectives

At the end of this unit, you will be able to :

1. The importance of machine cleanliness and the maintenance of the Tape Plant

4.2.1: Importance of Machine Cleanliness

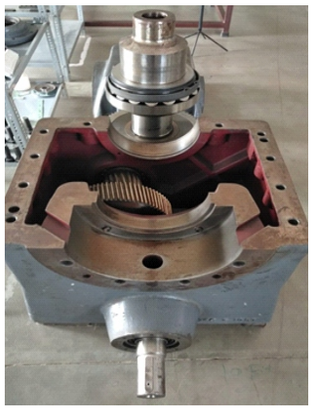
Maintaining machine cleanliness is crucial for several reasons:

1. **Efficiency**: Clean machines operate more efficiently, reducing downtime and increasing productivity. Dirt and debris can cause mechanical issues, leading to decreased performance
2. **Safety**: Regular cleaning helps prevent accidents by ensuring that all parts are functioning correctly and that there are no obstructions or hazardous buildups
3. **Product Quality**: Clean machines produce higher quality products by minimizing the risk of contamination. This is especially important in industries like food processing and pharmaceuticals
4. **Equipment Longevity**: Keeping machines clean reduces wear and tear, extending their lifespan and reducing the need for costly repairs or replacements
5. **Compliance**: Adhering to cleanliness standards is often a regulatory requirement, ensuring that operations meet industry-specific guidelines and avoid legal issues
6. **Cost Savings**: Preventative cleaning can save money in the long run by avoiding breakdowns and maintaining optimal machine performance

4.2.2: Maintenance of Tape Plant

General Maintenance of machine:

1) Change the oil required parts (extruder gearbox, melt pump gearbox, water bath gear box, holding unit gear box, stretching unit & annealing unit gearbox and others) as per lubrication schedule.
2) Use the same oil & grease as recommended in the lubrication schedule.
3) Check all required parts and grease then as recommended in lubrication schedule whenever it is required.



4) Clean the filters on the hopper loader at least once within 3-4 days.
5) Always keep the panels as well as machine dust free by using the compressed air.
6) Remove the scale from the cool Godets, screen changer, feeder sleeve and the cooling coil of the extruder gear box, at least once in a weak, by using de-scaling compound.
7) Check the rubber rollers surface if irregular running.

8) Clean the water bath rubber roller & pressure rollers to gate the maximum life of it.

Bearings: All bearings of various units of the plant enclosed with cover plates, wherever necessary. They are of permanent lubrication type and require no maintenance. Bearings not falling under permanent lubrication should be lubricated periodically or during overhauls as recommended by bearing manufacturers.

Gear box / gear motors: Before putting into operation, all gear boxes must be filled with gear oil, if required. The oil level should be up to the marking of the site glasses mounted on the gear box.

1) During operation, the marked oil level should be reached.
2) Oil level in the gear should be regularly checked and filled if required.
3) It is important that oil level during operation should always be up to the marking of sight glasses.
4) Oil changing as per lubrication schedule.

Maintenance of the extruder parts:

Dismantling of extruder screw E75 / E90: To the dismantling screw, it is required to set the temperature of the extruder at different zones likes - screen changer, melt pump, adaptor & die etc. Temperature set above melting point of the processing polymer. After set temperature is achieved at different units mentioned above has to be dismantled very carefully. The screw extractor is a threaded rod. Supplied as standard equipment used for pushing / dismantling the extruder screw(left hand thread). The lock nut is a special type of nut, which has both external & internal threads on it. This special nut is fastened in to the tapped hole. At the end of the output 23 driving shaft. The threaded rod (also called screw extractor) is allowed to move forward with the help of a spanner resulting in the forward with the help of a spanner resulting in the forward movement of the extruder screw. The pipe extension and the adopter can be introduced as an extension piece for the further movement of the extruder screw. As the extruder screw approaches half the way out of the barrel. It can be then easily taken out by the hand, Wearing a good quality leather gloves. After the dismantling of the screw, it should be placed on the two wooden horses and can be cleaned while still hot. Proper care should be taken to prevent any damages and to avoid accidents.

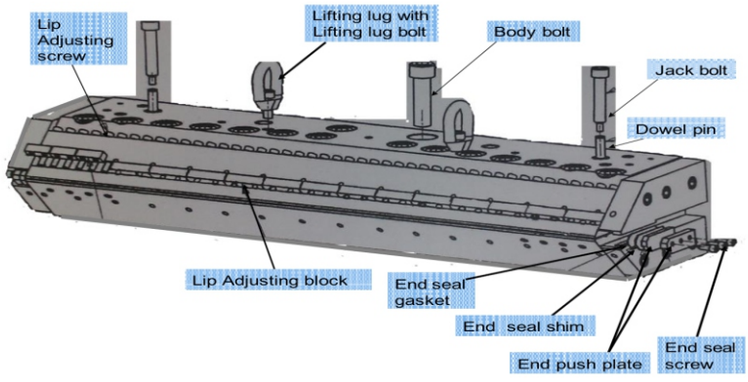
Dismantling of feeder sleeve: Stop the tape plants after flushing all inside raw material. Please insure that there should not raw material in the hopper / feeder box housing. Remove the all bolt for dismantling the die, melt pump, screen changer, barrel & placed it at ground on safe & clean location. Empty the hopper loader & remove it from the it's position. Remove all water line connection from the feeder box housing. Remove the screw lock bolt (by rotating in clock wise direction) from the main gearbox. Remove the screw with the help of screw extractor & clean it. After removing of screw, put the heating off & remove the all connections of barrel heaters properly take out. Provide proper support of barrel & feeder box housing. (By hanging with wire ropes). Remove all the bolts of feeder box housing from the main gear box and placed it at ground on safe and clean position. Strike the feeder sleeve with nylon hammer & take out from feeder box housing. Fix newly supplied feeder sleeve at the same position & fixed it in the feeder box housing accordingly. Follow same process for re-assembly of all remove parts. Please apply molykote paste in the all bolts during re-assembly.

Cleaning of the extruder screw: Under normal conditions, the extruder screw does not require cleaning, as the feed channels are automatically kept clean by the continuous flow of fresh material. The cleaning of extruder screw has to be performed during the dismantling of the screw. As the screw extractor forced the extruder screw out, the position is cleaned by using a soft rug (jute rope) and applies Stearic acid on it.

Cleaning of extruder barrel: After the removal of the extruder screw, the barrel should be cleaned with the cylindrical wire brush, While steel hot. Pushing & pulling of the brush is done inside the barrel for the cleaning

Die maintenance

Recommended spare part list:



Sr. No.	Description	Sr. No.	Description
1	Body bolts	10	End seal screw
2	End plate bolts	11	Lifting eye
3	Jack bolts	12	Lifting lug bolt
4	Dowel pin	13	Deckle
5	Lip adjusting screw	14	Bracket
6	Lip adjusting block	15	Seal bar
7	End push plate	16	Gasket seal
8	End seal plate	17	Deckle screw
9	End seal gasket	18	Scraper

Die Disassembly: It is easy to loosen / open the die body bolts while die is in its operating position. In this position, with the extruder NOT running, loosen body bolts with Allen key with about 1.5 meter long pipe. After loosening of bolts, further disassembly may be made at or remote from the extruder. The both die halves should be fully supported throughout disassembly as well as other mating parts.

- Shut off die and adaptor heater controllers.
- Remove leads & thermocouples from the die.
- Check dowel pin engagement.
  Dowel pins should be engaged to maximum 9.5 mm in the half to be lifted away from matting half and adaptor.
- Remove end seal screws to drop out end seal gasket & plates.
  - If adaptor bolt circle encompassed both die halves, remove adaptor bolts for the half to be fitted.
- Place soft non-metallic protective shim between lips to prevent damage to the lip.
- Separate die halves using a lifting eye bolt to be fitted with lifting lugs.
  If the halves do not separate easily, engage jack bolts provided. Jack the die apart, taking small turns on alternate jack bolts unit adhesion of the plastic between die halves is overcome.
- All die and adaptor flow surfaces are now exposed for cleaning.
  Do not use torch or extreme high temperatures to remove plastics from die, deckle, lips, etc. Heating above die operating temperature may cause damage.
  It is not necessary to touch the lip adjusting system to disassemble the die.
  Die manufactured with the feature as part of removable lip must have all lip adjusting screws and screws heaters blocks removed to expose the lip retaining bolts.

Die Clean up:

The different thermoplastics being processed behave differently. Some lift out easily, already formed a moulded shape inside. Others may need jet of air thrown at plastic, while pulling from exposed material side. Do not use torch or extreme high temperatures to remove plastics from die, deckle, lips etc. Heating above die operating temperature may cause damage. Some other materials may stick to the metal firmly and shall be scraped out using brass or aluminium tools. Once the bulk of the plastics is stripped or scraped from the die. The remaining material should be scoured from all flow surfaces and seal surfaces using brass wool or any other suitable soft material. The last two cleaning operations are most easily performed while the die is still hot.

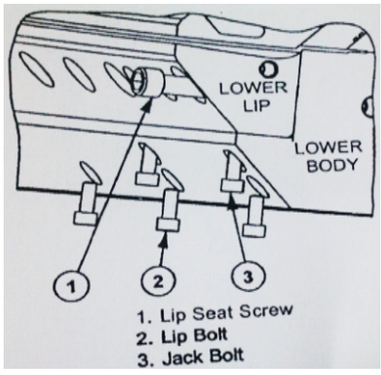
Die Clean up Tool kit:

Sr. No.	Description	Quantity	Remarks
1	Scraper	2	------
2	Filler gauge	1set	Range: 0.02, 0.03, 0.05, 0.06, 0.08, 0.1, 0.13, 0.18, 0.2, 0.4, 0.5, 0.6, 0.8
3	Brass hand brush	3	------
4	Anti seize compound	200gm	With brush(applicator)
5	Allen key with handle	1	8 mm (for lip adjustment)
6	Allen key	1	6mm, 8mm,10mm, 14mm, 17mm, 22mm.

Die reassembly: It is recommended that both die halves should be at same temperature before reassembling failure of doing so, would cause problems all the surfaces are to be ensured for absolute cleanliness before die reassembly. Proper reassembly method and use of high quality anti-seize lubrication is recommended.

- Dowel pins engagement to be ensured with removable half of the die, up to 9.5mm maximum.
- Make sure jack bolts have are removed.
    - Loosely fitted thin protective material is recommended to be put in between the lips of the two halves of die, to prevent any damage.
- Carefully bring die halves together using dowel pins, using proper lifting arrangement and lifting hooks.
- Now, in this position, body bolts are to be inserted & hand tightened.
- Remove lifting device, eye bolts and protective shims.
    - If die bodies have a seal groove and rod type seal between the halves, body bolts should be tightened to compress seal. Then carefully take apart die to check for seal alignment. If any seal material has flashed out onto the seal surface, trim excess away with a razor blade of other sharp tool.
        - Insert and tighten any adaptor bolts which have been removed.
        - Insert end seal pressure plates and bolts, and tighten the end seal screw as explained in set up / operation part of this manual. It is recommended to use new end seal for each reassembly.
- Refer setup/ operation section of this manual for start up information.

Disassembly of removable lip:



Before lip removable, use of soft protective non metallic material between lips is recommended to prevent damage of lips.

- Remove end seal plates and gaskets.
- Remove lip socket screw no. 1
  Guard against lip falling, during disassembly process
- Remove lip bolts no. 2
- Jack bolts no. 3 in to the thread hole near each end of lip. This will push lip out of die body.
- Remove lip carefully so as not to damage flow surface by contact with opposite die half.
  As per die clean up instruction given in this manual, a thorough cleaning of die and lip is to be done.

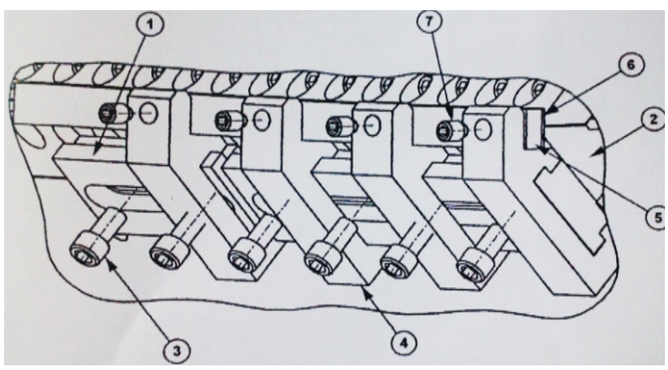
Reassembly of removable lip:

The lip shall be replaced, after proper cleaning of lip, lip seat, tapping and holes etc.

Follow surfaces of the lips and adjustments sides of lips shall be protected against any damage, using non-metallic material.

- Jack bolt from lip, to be removed.
- Slide lip in to space provided into die body.
- Adjust lip in die body and align bolts holes. Time for linear expansion for lip due to temperature difference, is to be allowed.
  - Insert lubricated lip adjusting screws & tight them to recommended torque values. Make sure lip is flushed with end of die before tightening. Tighten centre bolt first than alternates towards end of die.
- Remove proactive material from lip gap.
- Tighten lip seat screws first to hot torque values, than tighten lip bolts to hot torque values, after die is heated to operating temperature.

External deckle system (fixed):



If the die is supplied with the standard fixed deckle, it should be installed and adjusted before the die has started to extrude plastic

- It is very difficult to seal on lip surface that are coated with plastic or any other material. Fasten the "tee" shaped bracket (1) to the die with the lower die body(2) with the socket head screws (3) supplied with the unit. Side deckle (4) on the "tee" bracket & space approximately 25mm.
- Install seal bar (5) with special filled Teflon seal (6) against die lips. Angle cut relief on bar towards extruded shet.

Over tightening of grub screws shall be avoided so that deckle deformation or seal deformation does not happen.

- Do not tighten grub screws (7) uniformly at operating temperature to affect a good seal against lips. There seal material should be replaced when the deckle is adjusted for different block-off widths.

Maintenance water bath rubber rollers

Material for rubber rollers are selected with rich experience on different processing condition. Life of the rubber roller's material depends on following parameter.

1) Water quality
2) Different materials being process
3) Additives used with processed material
4) Line speed

Regrinding frequency of rubber roller is recommended after every 3-4 months, depending on the condition of the surface.

Maintenance of the Edge Trim Recycling Unit:

Sieve Change: The sieve screen can only be changed when the motor has been switched off and has stopped. On the front of the machine housing there are four bolts which lock the cover in position. After the cover has been removed, the sieve screen can be drawn out. When inserting the new sieve screen, care is to be taken that it is pushed fully into the housing, otherwise the granulator cover will not hold it in position or will not seal completely.

Removing the knife: The screws are removed, intake throat taken off the granulator housing and the housing cover opened. After fixing the knife shaft so that it does not turn, the knives are removed with a socket wrench. The fixed knives are located in slots in the wall of the housing and each one is held by Allen screws. The same knives should always be placed in the same slots.

Setting the knives (after they have been sharpened):

If the granulator knives are not sharpened at the manufacturer's plant, then care is to be taken to keep the same angle on the cutting edge, steel is to be kept as cool as possible during sharpening and complete uniformity of weight must be obtained (danger of unbalanced knives).If due to regular sharpening the size of the rotating knives falls below 45 mm, then they must be replaced. The reverse procedure to removal is followed when replacing the knives. When this has been completed, the rotor is turned, so that the rotor knives slowly pass the fixed knives. Eventual variations of distance of the fixed knives to the rotary knives (caused by inaccurate grinding of the fixed knives), can be evened out by the insertion of strips of paper.

After wards the rotary knives are set uniformly at a distance of 0.1-0.4 mm to the fixed knives. Always make sure that the knife fixing screws are securely tightened down, where by if possible locate the same screw in the same hole on the rotor (better for the thread) and oil the thread each time the screws are removed.

The fact that the rotary knives are set at an angle ensures that a good shear cut is made

The distance between the rotating and fixed knives can be determined best with the help of a thin piece of cardboard. This indicates that optimum setting has been made. Before start-up, whilst the housing is still open, it is absolutely necessary to turn the rotor by hand and make sure that the knives are not rubbing against each other.

Cleaning the granulator: In order to be able to thoroughly clean the machine, the housing can be lifted up after the fixing screws on the motors flange have been removed. The knife rotor itself can be easily removed from the shaft. When the rotor is replaced, the locking screw must be once more tightened.

Maintenance of the holding unit / intermediate stretching unit / stretching & annealing unit:

The drive motor of holding, intermediate stretching, stretching & annealing unit should be removed every 4-6 months from the gearbox and kluber non – stick paste or loctite anti - seize is to be applied at the interface. This is mandatory to ensure easy removal of the motor. Draining the old oil from the gear box.

This should be done very carefully so that no dust / iron particles are left inside the gearbox. While assembly, the input shaft should move freely. Drive belts are to be periodically checked for tightening and adjustment are to be done.

For dismantling the normal godet, proceed as follows:

a) Remove the normal godet cover
b) Support the normal godet with crane / fork lift with proper packings.
c) Now open the feeder ring screw with torque wrench, socket extension rod.

For dismantling the hot godet, processed as follows:

a) Open the back cover & k-flange & inner ring. Remove the rotary union.
b) Remove the flange pipe from the hot godet cover
c) Remove the hot godet cover.
d) Open screw to remove flange cover from the hot godet
e) Support the hot godet with crane / forklift with proper pickings.
f) Now open the feeder ring screw with torque wrench, socket extrusion rod.

For dismantling the cool godet, processed as follow:

a) Open the back cover & remove the rotary union.
b) Remove the cool godet cover.
c) Open water connections for inlet & outlet lines; remove PU tube transparent from inside.
d) Also open water connections inlet & outlet to remove male elbow, male connector from the distributor
e) Support cool godet with crane / fork lift with proper packings.
f) Now open the feeder ring screw with torque wrench, socket extension rod.

Maintenance the rubber rollers: Material for rubber rollers are selected with rich experience on different processing conditions.

- Life of rubber rollers material depends on the following parameters—
  a) Different materials being processed.
  b) Additives used with processed material
  c) Line speed etc.

Maintenance of the hot air oven: The design of hot air oven is such that the maximum sense of operating safety is offered with a minimum degree of maintenance.

At the time of routine maintenance, HAO in tapeline is a rate case & the root cause was detected as malfunctioning of one of the pneumatic cylinders. The following precautionary measures may be taken to avoid such problem.

1) When air supply is given to open the tunnel, in case the upper tunnel does not open, does not repeat the process.
2) Check the air supply and as certain whether any pneumatic cylinders is defective.
3) No attempt should be made to open the tunnel if there is any defective pneumatic cylinder is also must for trouble free operation.
4) Periodically cleaning of pneumatic pipes lines and pneumatic cylinders is also must for trouble free operation.

a) Cleaning: From the time to time it will be necessary to clean the HAO tunnels .The remnants may be brushed off with the wire brush or a scrapper & brush them in the direction of the tape path on to the lower suction screen and if necessary the remnants can be removed through the opening of the lower set of heater. For this maintenance purpose, upper tunnel is to be opened with maximum opening stroke, which is achieved by pressing both push buttons simultaneously. After opening, mechanical blocks are strongly recommended to be placed for extra precaution.

b) Replacement of the rubber bending : In the replace the rubber bending, the upper tunnel of the hot air oven must be opened completely.

c) Replacement of the push button: The front bottom cover should be taken off, when replacing the push button (use for actuating small stroke).

d) Replacement of the temperature sensor:

1) Disconnect all electrical connection.
2) Open the rear sheet cover at the tape entry side of the oven.
3) Remove the insulation (glass wool) in that area.
4) Cut the balancing lead and remove the temperature sensor
5) Properly connect the balancing lead with the new / replaced temperature sensor.

e) Replacement of the heating element:

1) Disconnect all electrical connection
2) Open the rear sheet cover at the tape exit side of the oven.
3) Remove the insulation in that area
4) Disconnect the wirings and take out the heater assembly properly

f) Clean the ventilators: The bottom & top ventilators must be checked periodically at an interval of once every two month for every tapes remnant that may have accumulated around the impeller. If above is not taken care of, damage may result in impeller as well as motor.

Attention: Upon re-installation, all screw threads must be greased with a heat resistant grease for up to 300*c

Maintenance hot oil unit: After switching off and draining the oil from the unit.

1) Clean the connecting pipes and filters installed there in
2) Clean and check functioning of level switch.
3) Check safety devices, possibly set them again,
4) Clean the pump, check seals, possibly replace/ retighten them.
5) Check electrical component, possibly replace/ retighten them
6) Fill the unit with fresh heat transfer oil.
7) Make a test run & check functioning of all controls

Trouble shooting:

No.	Problem	Potential solution
1	Pump is leaky.	Tighten all connections. If necessary changes ferrules/seals
2	Pump is working but does not convey.	Check direction of rotation, check filling level.
3	Pump does not work	Pilot lamp 'pump' Check oil level, relay and the fuses. Does not light up.
4	Heating does not obtain the max.	Check the fuses and current temperature. Consumption of the unit, if necessary changes the heaters.
5	Pilot lamp oil label low lights up.	Check the filling level and function of float switch, if necessary, change the float switch.
6	Heating does not work.	The safety thermostat may have operated and bolted the heating. Press the bolt switch given on the thermostat.

Scan the QR code to see the related video

Raffia Tape Plant

UNIT 4.3: Self Discipline in Cleanliness Culture

Unit Objectives

At the end of this unit, you will be able to :

1. know about Self Discipline in Cleanliness Culture.

4.3.1: Self Discipline

- Wear PPE provided by company
- Keep necessary display boards wherever necessary
- Avoid putting the waste on floor
- Highlight if any parts found damage to superior
- Notice any abnormal condition while cleaning and inform to superior Support to co-worker to finish the task in time
- Complete your task without disturbing co-workers

Scan the QR code to see the related video

Safety Attitudes

UNIT 4.4: Do's & Don'ts in Tape Plant

Unit Objectives

At the end of this unit, you will be able to :

1. Know about Do's & Don'ts in Tape Plant.

4.4.1: Do's & Don'ts

Do's :

1. **Maintain Equipment Regularly**: Regular maintenance of the extruder, die, and cooling rolls is crucial to prevent breakdowns and ensure consistent film quality
2. **Control Temperature Precisely**: Ensure the plasticizing temperature is carefully controlled, with gradual increases from the barrel's feed section to the die ends
3. **Use High-Quality Raw Materials**: Select appropriate grades of raw materials and ensure they are free from contaminants to avoid defects in the final product
4. **Monitor Melt Pressure**: Keep an eye on melt pressure to ensure stable extrusion and uniform film thickness
5. **Clean Die Lips and Manifold**: Regularly clean the die lips and manifold to prevent debris buildup, which can cause uneven film thickness
6. **Optimize Cooling**: Maintain low cooling roll temperatures to improve film gloss and transparency. Ensure even cooling to avoid defects
7. **Adjust Air Knife Properly**: Set the air knife gaps correctly and ensure even airflow to achieve uniform film thickness
8. **Use Antistatic Agents**: For films used in automatic packaging, add antistatic agents to minimize static issues

Don'ts :

1. **Avoid Excessive Recycled Material**: Limit the addition of recycled material to less than 15-20% and ensure it is added uniformly to prevent quality issues
2. **Don't Ignore Uneven Thickness**: Address any issues with uneven film thickness promptly, as they can lead to wrinkles and poor roll quality
3. **Avoid High Winding Tension**: Excessive winding tension can cause the film roll to be too tight, leading to defects
4. **Don't Overlook Cleaning**: Neglecting to clean the cooling rolls and other equipment can result in defects like white spots and poor transparency
5. **Avoid Fast Extrusion Speeds**: High extrusion speeds can lead to insufficient cooling and poor film quality
6. **Don't Use Poor Quality Raw Materials**: Using low-quality raw materials can result in defects such as crystal points and poor transparency

Notes

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5. Working in a team in raffia sector

TSC/N9012

Key Learning Outcomes

At the end of this module, you will be able to:

1. understand how to work as team.
2. understand how to work with self responsibility.
3. understand what is communication.
4. understand different between Discussion Vs Argument

UNIT 5.1: Advantage of Team Work

Unit Objectives

At the end of this unit, you will be able to :

1. Lead a team and perform well to achieve the goal.
2. Communicate the message among team members without affecting the theme of content.

5.1.1: Team

- TEAM means **T**ogether **E**ach **A**chieve **M**ore
- Risk and time delay task can be easily completed by working as team.
- Working with team gives more benefits than working with individual
- Working with team will save time in achieving the target
- We can know more details /information about the task from our team members.
- Mutual understanding between members will improve
- We can overcome unwanted conflict
- Physical support will be get from members
- Level of deviation will be minimized
- Confidence level increases with team to achieve the target

Fig. 5.1.1.1: Team Work

UNIT 5.2: Being a Successful Team Player

Unit Objectives

At the end of this unit, you will be able to know:

1. How to become a successful team player.

5.2.1: A Successful Team Player

- Cooperating with other team members is main criteria for a successful team player
- Avoid implementing your thoughts and ideas without discussing with other members about pros and cons
- Have open discussion among the members to avoid misunderstanding
- Lead the team with involvement and interest
- Support and guide the members in difficult situation

Scan the QR code to see the related video

Industrial Safety

UNIT 5.3: Faith in Team Work

Unit Objectives

At the end of this unit, you will be able to know:

1. The Important things to follow in Team work.

5.3.1: Faith in Team Work

- Believe other team members
- Allow other members to talk in discussion

Fig. 5.3.1.1: Group discussion

- Respect their views

UNIT 5.4: Initiate for Development

Unit Objectives

At the end of this unit, you will be able to know:

1. The important things to initiate development.

5.4.1: Development

- Come forward to take task
- Prepare action plan before starting the task
- Consider the company policy / Standards in preparation of action plan
- Explain to team members about the task
- Give necessary support to others to understand the policy / standard's
- Get their suggestion
- Encourage the team members
- Give importance of their points even though it is not much worth

Fig. 5.4.1.1: Development

UNIT 5.5: Effective Communication

Unit Objectives

At the end of this unit, you will be able to know:

1. The important things for effective communication.

5.5.1: Effective Communication

- When working as a team, communication plays a vital role for the success of the task
- Miscommunication among the team members leads to breakdown the task
- You should clearly communicate the management policy to others if they are not clearly understood
- Communicate the message to other members politely and clearly
- If any problem faced during the task, inform to the superior immediately with proper details like machine no., area, etc.
- While communicating to other departments, provide clear information about machine number, process details, time etc.

UNIT 5.6: Active Involvement in Discussion

Unit Objectives

At the end of this unit, you will be able to know:

1. The important things for active involvement in discussion.

5.6.1: Involvement in Discussion

- Before starting the task, have a discussion among the team members about the task and plan
- Involve with interest in the discussion
- Make everyone to take part in the discussion
- Avoid unnecessary/ useless talks which is not relevant to the task

Fig. 5.6.1.1: Useless talk to avoid during discussion (Red marked)

- You initiate the discussion
- Get information instead of questioning in discussion
- Give chance to other members to talk
- Listen their talk keenly
- Any controversy appears in discussion, find a way and means to solve the problem by involving oneself
- If necessary seek your superior's guidance to solve the matters of discussion

UNIT 5.7: Discussion Vs Argument

Unit Objectives

At the end of this unit, you will be able to know:

1. The difference between discussion and argument

5.7.1: Discussion Vs Argument

- Discussion is a good thing for long time. It will create good relationship between members of a team and also improves our concentration and involvements.
- Argument in a team creates bad remark about a team and will leads to loss of time. Sometimes it creates conflict and bad remarks about some ones.
- Discussion makes team members to improve their knowledge
- Argument makes team members to disappoint
- Discussion leads to creativities of good thoughts
- Argument leads to unnecessary worries
- Discussion helps to achieve the task easily
- Argument spoils the task completion

Fig. 5.7.1.1: Group discussion and Argument (Positive and Negative)

UNIT 5.8: Ethics in Discussion

Unit Objectives

At the end of this unit, you will be able to know:

1. The importance of ethics in discussion.

5.8.1: Ethics

- Self-discipline is must to work as a team
- Give attention in discussion
- Avoid interrupting while other members talking
- One person to talk at a time in discussion
- Others should observe the points
- Any points need clarification ask politely
- If different opinion comes, express it gently
- Accept the opinion without resistance for the sake of team work
- Appreciate others view
- Initiate the changes /Acceptance from you

UNIT 5.9: Commitment on Collective Decision

Unit Objectives

At the end of this unit, you will be able to know:

1. The importance of commitment on collective decision.

5.9.1: Commitment

- Discussion is carried out to get a best output of activity to achieve the task
- Discussion is made to get a common point's of follow up to achieve the task
- Discussion is made to involve all members to take part in task
- Once the decision is taken together, each and every one of the team to work towards it
- No other discussion to be carried out once the decision is take
- Periodical Review meeting to be conducted to know the status of task
- In case of failure in task, take it in positive way and analyses it.
- Avoid critics other and take responsibility on own
- If any changes are required, do it after discussion
- To take part in the discussion with Wholly hearted mind

Fig. 5.9.1.1: Group discussion with involvement

UNIT 5.10: Dos and Don'ts

Unit Objectives

At the end of this unit, you will be able to :

1. know about the dos and don'ts of team work.

5.10.1: Dos and Don'ts

S. No.	Dos	Don'ts
1.	Work as a team	Working independently
2.	Show involvement in discussion	Not showing involvement in discussion
3.	Take decision with discussion	Taking decision on own
4.	Extend co-operation to team members	Not co-operating to team members
5.	Avoid argument during discussion	Making argument in discussion
6.	Don't critics others for failure	Making critics for failure
7.	Avoid interrupting while others talking	Interrupting while others talking
8.	Accept the different opinion to the sake of team	Not accepting the different of opinion
9.	Listen others talk in discussion	Neglecting others talk
10.	Support to team members to complete the task	Not supporting the members to complete the task

Table 5.10.1.1: Dos and don'ts

Tips

- Work with team for better result in a task
- Discuss and achieve the common points with team
- Avoid conflict and argument
- Co-operate with team members would helps to achieve good result
- Understand the company policy and prepare the plan to achieve the task
- Have Periodical review meeting and discuss the status of task
- Avoid critics and encourage team members in case of failure

Self-Assessment

- What are the advantages of team work?
- How to be a successful team player?
- Brief about effective communication
- Distinguish 'Discussion Vs Argument'
- Brief about ethics of discussion
- Mention some does & don't (Any Five)

Exercise

- Form a team and act as a team member as well as team leader
- Communicate a comment to colleague as per the superior instruction for effective communication

Notes

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& ENTREPRENEURSHIP

N·S·D·C
RE IMAGINE FUTURE

6. Maintain health, safety and security at work place in raffia sector

TEXTILE SECTOR SKILL COUNCIL
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PERFECTING SKILLS

Unit 6.1 - Ensure the Health and Safety Instructions at Workplace

Unit 6.2 - Personal Protection Equipment

Unit 6.3 - Follow up of Work Specification Guideline and Procedures

Unit 6.4 - Tips to Healthy Life,

Unit 6.5 - Care on Environmental

Unit 6.6 - Unsafe Conditions at Workplace,

Unit 6.7 - Material Storage

Unit 6.8 - Methods of Waste Disposal

Unit 6.9 - Self Discipline in Safety

Unit 6.10 - Prevention of Unsafe Condition

Unit 6.11 - Fire Fighting

Unit 6.12 - First Aid

Unit 6.13 - Planning and Implement Safety Techniques

Unit 6.14 - Dos and Don'ts

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Key Learning Outcomes

At the end of this module, you will be able to:

1. Understand the importance of health and safety.
2. Understand how to be part of a safe working atmosphere.
3. Understand how to lead a healthy life.
4. Understand how to identify hazards and act proactively to avoid accidents.
5. Understand the different type of fire and extinguishing methods.
6. Understand the importance of first aid and general procedure of first aid.

UNIT 6.1: Ensure the Health and Safety Instruction at Work Place

Unit Objectives

At the end of this unit, you will be able to :

1. Meticulously follow the safety instructions.
2. Maintain a healthy life without any bad habits.
3. Identify the hazards in advance and could initiate preventive measure.
4. Handle the emergency situation like fire, personal accident etc.
5. Be a self disciplined with respect to Health and safety.

6.1.1: Health and Safety Instruction at Work Place

- In workplace Instructions related to Health and safety is communicated through various methods like Sign boards, Text message displays, Lighting, Alarms, etc.
- Communication through Sign boards, Text message, Lighting, Alarms etc., attracts and reaches the person immediately
- The exhibits are kept in critical places

Fig. 6.1.1.1: Safety Sign Display boards "way to preparatory"

Fig. 6.1.1.2: Safety Sign Displays

Fig. 6.1.1.3: Safety Display as Text

Fig. 6.1.1.4: Emergency signal lamp

Fig. 6.1.1.5: Emergency signal Siren

- Understand the instruction given or displays in the work place
- If not clear with the instruction, get guidance from your superior
- Health and safety class is conducted for new comers before inducting into the job to educate about it
- Follow the health and safety instructions properly

UNIT 6.2: Personal Protection Equipment (PPE)

Unit Objectives

At the end of this unit, you will be able to :

1. Use PPE's perfectly.
2. Know the importance and uses of PPE's.

6.2.1: Personal Protection Equipment (PPE)

- Self-protection is must while working in or near moving parts and machines
- Wear the safety protection tools like Cap, ear plug, nose mask, shoe, apron, provided by the organization before entering into the work spot
- Carelessness in wearing causes injuries and health decease
- Some of the important PPE's used in industries are as under

Fig. No.	Image of PPE	Name and usage
Fig. 6.2.1.1:		**Head cap :** To protect our head and hair (plaiting or loose hair) not to get in moving parts
Fig. 6.2.1.2:		**Nose mask :** To protect from micro dust Use the face mask cleanly Don't use other's mask Use good quality mask
Fig. 6.2.1.3:		**Ear plug :** To protect our hearing ability by blocking the noise entering in to ears Wear the ear plug correctly. Wash the ear plug frequently
Fig. 6.2.1.4:		**Apron / Over coat :** To avoid loose wears caught in moving / rotating parts and cause personal accident. Wear the apron/Over coat tightly, Correctly and without loose ends
Fig. 6.2.1.5:		**Shoe :** To protect our feet from hit injuries due to Falling objects and tumble down etc. Protects also while stepping in Electrical line, slippery area. Avoid wearing damage Shoe. Wear correct size shoe.

UNIT 6.3: Follow up of Work Specification Guideline and Procedures

Unit Objectives

At the end of this unit, you will be able to :

1. Know the organization guidelines and procedures to be followed.

6.3.1: Work Specification Guideline and Procedures

- For every activity, there is specific guidelines or procedures to do the work without any deviation or defect
- Guidelines and procedures are prepared based on the working condition and availability of sources
- Following the guidelines lead to trouble free, defect free, accident free working atmosphere
- Also it keeps us in safe guard from personal accidents and also our people working in and around
- By Following the guidelines or procedures, a uniform method of working is spelt out in work places
- Operator should refer the guideline in case of any doubt
- Operator should fully understand the guidelines or procedures. Any clarification sought in this regard must be sorted out by superior
- So strictly follow the activities in line with the approved guidelines and procedures without fail
- Besides oneself, one has to ensure the follow-up of our team and coworkers around us since deviation from guidelines/procedures by our team member or coworkers cause untoward incident
- Whenever you found procedure deviation, immediately ask the respective person to correct himself by explaining the importance and its cause and effect
- Based on internal nonconformity and accidents, the safety procedure is normally reviewed, revised and notified to all concern . So, one has to check for that changes regularly and ensure the revised follow-up without fail
- Also the changes should be conveyed to every team member, incoming operator and other coworkers around us

UNIT 6.4: Tips to Healthy Life

Unit Objectives

At the end of this unit, you will be able to :

1. Follow the tips for healthy life.

6.4.1: Tips to Healthy Life

- Healthy life makes us to live longer with wealthy life and Health is wealth
- Healthy life is important for human being to work actively and effectively
- Self discipline and good habits are most important for our healthy life
- Drink sufficient water which is a simple preventive medicine to avoid lot of our health related problems
- Always eat with happiness, maintain limit and avoid improper timings
- When one enters the work spot, try to leave everything in the mind concerning outside problems
- Ensure a balanced diet and avoid excess fat, sugar, salt, spice etc., Also in the other end don't starve of required nutrients
- Be happy always. Happiness is our decision and in any situation we can be happy if we strongly believe that our happiness doesn't depend on others and materials

Fig. 6.4.1.1 Good Habits

Fig. 6.4.1.2 Discipline

- Avoid intoxicants like consuming alcohol, Tobacco, drugs etc .,
- Keep yourself clean by following good habits like Brushing teeth, Bathing, Wearing washed cloth, etc. daily for healthy life
- Always maintain your surroundings spic and span, airy, and free from congestion, unwanted materials, waste etc .,
- Make others feeling happy with your posture

Fig. 6.4.1.3 Mill surroundings with spic and span

UNIT 6.5: Care on Environmental

Unit Objectives

At the end of this unit, you will be able to :

1. The information of care on the environment.

6.5.1: Environmental Care

- Safe and good Environment is most important for not only human being, entire life of our mother earth
- In our universe out of crores and crores of planets only our earth supports life. It is god's gift and everyone is responsible to keep our environment clean, safe and good
- If environment gets polluted, it means that entire life will be under threat of extinction, especially as a human being we have more responsibilities in protecting our environment
- Changes needed in our life style for being environmental friendly are
- Avoid any kind of wastages (Energy, Materials, Water, Human and machine resource etc.) leading to dumping in backyard/squeezing the cost of production
- Avoid over usage of everything (Energy, Materials, Water, Nature, Renewable sources etc.) and use it economically since the availability becomes scarce
- Dispose of all kinds waste as per standard and with safe procedures

Fig. 6.5.1.1: Disposal of waste in waste trolley

- In our work spot, we can do lot of things related to the above points like
- Unnecessary usage of lights, fans and idle machines may be switched off wherever possible
- Water wastages may be avoided everywhere
- Utilize effectively and achieve maximum efficiency in Draw frame machines
- Avoid the micro dust in the air by cleaning frequently etc.,
- Support the organization's environment management system through dedicated follow up of its procedures and with proactive suggestions
- Last but not least, we have always to spread the news about safe environment awareness to the extent that we are able to do. Like educate our family members, our team, our neighbors, our colleagues, even unknown person caught in our sight

UNIT 6.6: Unsafe Conditions at Work Place

Unit Objectives

At the end of this unit, you will be able to :

1. know about the unsafe conditions of work place.

6.6.1: Unsafe Conditions

- Unsafe condition leads to accident causing damage of machine parts or human parts
- Permanent Damage in human parts affects our healthy life
- You should be able to know the safe / Unsafe condition of spot or activities in work area
- Any unsafe condition found in the work sport, it should be immediately corrected or addressed properly to the superior or concerned person
- If you feel any abnormal sound or smell in work spot correct it or inform to concerned person
- Any abnormal conditions in parts, activities, feel etc. correct it immediately. If the corrective action is beyond your limit, inform to superior or concerned persons immediately and get the guidance
- Also get clarification from superior and be thorough of the situation for avoiding the repetition
- When you inform to your superior or concerned person, mention clearly the place, machine no, condition etc., correctly
- In necessary give the information through written form also

Scan the QR code to see the related video

Implementing Health & Safety in Workplace

UNIT 6.7: Material Storage

Unit Objectives

At the end of this unit, you will be able to :

1. Store the materials as per the organizational guidelines with safety.

6.7.1: Material Storage

- Material, equipment and tools are to be kept in proper way / method that not affecting the condition of the material (any damage), the surroundings and disturbance to movements
- Some basic material storage concept as per 5S are (Japanese techniques for material storage / good housekeeping and work culture)
- Remove all unwanted materials from working area. Even occasionally / rarely used materials also to remove from working area
- Identify and allocate a suitable place for individual material. If required special storage racks, stands, to design for individual materials for user friendly handling. While allocation of place and or design of storage items consider the below points
- For frequently used material to store in a place easy to retrieve
- Heavy material to store in bottom racks to avoid accidents
- Light material may store in higher place
- For consumables items in store in a visible manner and mark reorder level & Quantity
- On any occasion stored material need not be disturbed for taking / storing another material nearby
- Try to design that the storage place should easy enough to identify and put back after its use. Like a tools storage box shown below
- Ensure any kind of loss during storage
- Inflammable, dangerous and hazardous material should be stored as per government norms & regulations and take extra care to avoid any kind of accidents
- Display the storage material details in a suitable manner, it may be written display or signs, material identity, outer line drawing, etc.
- Train each and every individual to follow the procedures defined for storage of materials and ensure its strict follow-up
- Take safety measures like keeping fire extinguisher, providing alarms, keeping caution displays, properly in dangerous places like electrical panel
- Also suitable first aid arrangement should be kept for ready use in need of place in the storage area.

Fig. 6.7.1.1: Extinguisher kept in the wall with necessary identification

UNIT 6.8: Methods of Waste Disposal

Unit Objectives

At the end of this unit, you will be able to :

1. dispose the wastes in proper method.

6.8.1: Waste Disposal Methods

- As per the standard operating procedure ensure the waste disposal, considering no damages for person, place, machine and environment.
- Understand the procedure clearly. In case of any clarification required get guidance form superior.
- Dispose the waste then and there with proper method and keep the work spot clean.
- Before disposal ensure proper weighment and recording the data.
- Use proper tools, trolleys, to dispose the waste
- Use sweeping brush stick to clean the floor with easy handling

Fig. 6.8.1.1: Clean work area

Fig. 6.8.1.2: Waste box used for waste collection

- Use bins to collect the waste materials produced in production process
- Transport it to the godown or the mentioned place using suitable transport equipment

UNIT 6.9: Self-Discipline in Safety

Unit Objectives

At the end of this unit, you will be able to :

1. know the self-discipline in safety.

6.9.1: Self-Discipline in Safety

- Most of the risk and accident or damage happens due to human error
- Human error like mishandling of tools, not following the procedures, Negligence, Carelessness etc. cause more risk to the life
- Operator should maintain self discipline like following the code of work, following the rules and regulations of the organization correctly or as prescribed in stand alone manuals
- Wear personal protection equipment provided to eliminate the safety risk

UNIT 6.10: Prevention of Unsafe Condition

Unit Objectives

At the end of this unit, you will be able to :

1. know about the prevention of unsafe conditions.

6.10.1: Prevention of Unsafe Condition

- Machine is used for a continuous process around the clock and there are some sorts of wear and tear in running parts in due course and have the chances of getting damages
- Under machine maintenance activities, the machines are diagnosed to find out any wear and tear of parts in advance for its replacement
- Machines, tools, equipment trolleys are handled by various operator which may lead to parts damages for which suitable guards must be provided
- Such kinds of conditions are leading to unsafe condition, if not corrected, replace it in time
- Operator should able to find out the unsafe conditions and kind of possible hazards in the machine and surrounding of the machine
- Give more importance for even a small deviation in safety aspects like improper lighting, lighting with low lux, Safety cover damage / missing / open condition, leakage in air / chemical solution, etc., and immediate action should be initiated for correction
- List out the parts/ area/ spot to be checked in patrolling like gauge, indicators, stuff level, safety door conditions etc., as per the superior instruction
- Go around the machine and work spot in periodical intervals and check the parts and condition to know the actual situation
- Give importance for abnormal sound, smell heat etc., which may cause potential hazard
- Don't keep or stack any material on the alley ways, near electrical panels, fire extinguishers, emergency exits etc., to avoid accidents and put in difficult situation during emergency evacuation
- Don't keep inflammable things near electrical panel
- Ensure that the emergency exit door is designed in such a way that it should be opened on pushing it when come from inside to ease the emergency evacuation
- Any unsafe condition noticed should be corrected immediately . If necessary, place a warning display about the condition till its correction ticed should be corrected immediately. If necessary, place a warning display about the condition till its correction
- Inform superiors or concerned person with proper details immediately to take action against
- Keep the tools and equipments in its specified place after use.
- Avoid keeping unwanted materials in work place which disturb the work and some time leads to accident
- Always ensure the effectiveness of corrective action in practical way by cross checking

UNIT 6.11: Fire Fighting

Unit Objectives

At the end of this unit, you will be able to :

1. know the types of fires and its fire fighting equipments
2. know the action to be taken during the fire accident

6.11.1: Fire Fighting

- Fire is dangerous hazard causing major loss to materials, material part or human body
- Operator should take more care on this type of hazards
- To protect from the fire hazard and to control the hazard, operator should have awareness about safety
- Fire is a combination of fuel, heat and oxygen. In this heat and oxygen are not visible and it can be felt only. On the other hand, Fuel is only visible
- Always avoid a situation or action combining these three at a time to avoid fire hazards
- Fire is classified based on the fuels

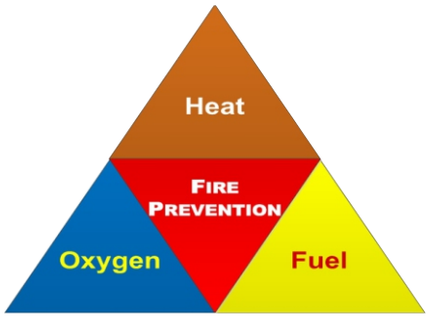

Fig. 6.11.1.1: Fire Triangle - Prevent Heat, Fuel & Oxygen connection

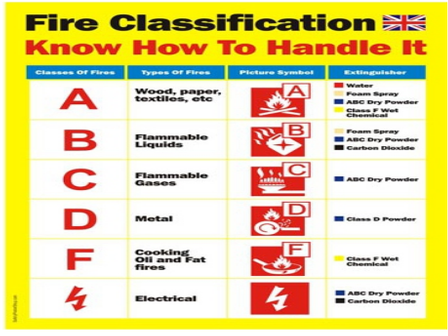

Fig. 6.11.1.2: Classification of fire

- Each type of fire should be extinguished with proper extinguisher like water type, foam type, powder type, and gas type
- Improper usage of extinguisher makes the condition serious instead of solving it
- At any cost water should not be used as extinguisher for electrical fire
- Operator should aware of fire type and extinguishing methodology
- Operator should take part in the mock drill conducted by the safety persons and knows how to handle the emergency situation
- Operator should know to safe guard the material form fire accident and to give first aid treatment to the victim of fire accident
- Also operator should know the emergency exit, evacuation procedure, safe assembly point location and its importance to safe guard yourself and others
- After noticing the fire immediately cut off all electric supply near the area by switching of main supply and announce through fire alarm and run for the help with shouting as "Fire, Fire "to communicate all nearby
- Low intensity of fire can be extinguished with fire extinguisher & water hose reel. For fire of high intensity, fire hydrant is to be used

- If the fire is beyond our control, inform to Fire service persons for attending it. Contact detail of our India's fire service is 101. Ambulance service 102. Normally it is displayed in the entrance of any industry
- Give proper information like type of fire, its intensity, Location, easy / shortest way, Landmark to reach. Proper information of its location makes them to act quickly
- Timing is so important in extinguishing the fire. Earlier action eases the extinguishing. Delay even a minute give a place for spreading the fire and may cause huge loss to life and property

Fig. 6.11.1.3: Different type of fire extinguisher

Fig. 6.11.1.4: Fire Hose reel - for small fire

Fig. 6.11.1.5: Water hydrent -For big fire

Fig. 6.11.1.6: Display boards for emergency exit

- In case of emergency, everyone should exit from the spot and assemble in the "Emergency Assembling Point", which helps to ensure that everyone comes out from danger

Fig. 6.11.1.7: Emergency evacuation plan

Fig. 6.11.1.8: Safe assembling point

- Also help others to evacuate from the spot when a fire is broken out
- At time of danger situation, gives 1st importance to life and then material if possible
- Also during fire, try to remove the nearby material to avoid spreading of fire. If couldn't remove immediately, use fire extinguisher over them

UNIT 6.12: First Aid

Unit Objectives

At the end of this unit, you will be able to :

1. know what is First aid and its importance.
2. know the first aid materials and its uses.

6.12.1: First Aid

- First aid is an action taken to save the life of victim from fatal injury time with available sources
- Injuries causes fatal if treatment is not taken / given in time
- Operators should be able to do first aid in time of accident to save a life. Necessary to have first aid training from authorized first aid trainer
- Conduct first aid to others after ensuring your safety first
- Carefully do the first aid as per the procedure
- Keep in mind that victim should be taken to nearest hospital after doing first aid without fail
- Ensure the availability of the first aid kit box in important places and also at the possible hazard causing places
- Ensure the First aid kit is properly identified with specified symbol.

Fig. 6.12.1.1: Symbol to remember for First Aid (+symbol)

- Ensure the availability of basic common medicine and tools like cotton, bandage, plaster, scissor, torch, ointments, etc. in first aid box

Fig. 6.12.1.2: Important first aid things to keep in first aid box

UNIT 6.13: Planning & Implement Safety Techniques

Unit Objectives

At the end of this unit, you will be able to :

1. Know the importance of planning and safety technique procedures

6.13.1: Planning & Implement Safety Techniques

- Planning is a procedure of steps to follow without causing or lead to cause accident
- Planning is framed with different measures based on the nature of work, working environment, equipment and tools and product processed
- Operator should know the different measures to curb the hazard
- Proper planning avoids accident and ensure a safe working environment
- Even though the safety is an individual's care, it should be followed by whole team
- So know the safety plans thoroughly and communicate to others also to follow
- Quality systems like SS, ISO-9000, ISO-1400 help to create a safe working environment
- Sufficient fire extinguisher is to be provided wherever necessary
- LOTO system is to be used in all running machine and electrical related work places

Fig. 6.13.1.1: LOTO (Lock Out Tag Out)

- LOTO is a full proof safety system. Any machine stopes for any maintenance/ repair/ service work to lock the main electrical switch to avoid unexpected machine running
- Refilling offire extinguisher as per schedule to follow exactly
- Assembly point to mark with proper display to reach in case of emergency. Assembly point location and its way to be shown in the mill entrance and all over department
- Selection of assembling points should be such that it can be reaches from all direction and all places with some ease
- Periodic training/ awareness classes and mock drill on safety to be conducted Necessary fire fighting training to be conducted and making others to take part Give prime importance to implement the safety techniques
- Don't compromise the deviation in implementation and follow up
- Plan to give first aid training for sufficient person and ensure that at least one first aid trained person should be in each department and each shift
- Display caution boards where ever necessary

Fig. 6.13.1.2: Some of the model safety caution boards

- Conduct frequent meeting and give awareness to all
- Ensure whatever implemented is followed correctly by periodical check/ check list

UNIT 6.14: Dos and Don'ts

Unit Objectives

At the end of this unit, you will be able to :

1. know about the Dos and Don'ts related to Health & Safety.

6.14.1: Dos and Don'ts related to health & safety

Some Dos and Don'ts related to Health & Safety.

S. No.	Dos	Don'ts
1.	Check the safety points during shift take over time	Not checking the safety points during take over shift
2.	Wear PPE while in work spot	Working without PPE
3.	Follow the safety rules	Neglecting the safety rules
4.	Get proper instruction from superior before starting the work	Start working without superior's instruction
5.	Ensure the correct RH% in department	Not bothering about RH%
6.	Follow the indication lamp signals for interruption	Working in assumption
7.	Keep the exhaust creel clean	Dumping waste in exhaust creel
8.	Use trolley for doffing	Not using trolley for doffing
9.	Replace the tools In specified place after use	Keeping the tools some wear lese.
10.	Dispose the waste in periodically as per the instruction	Not following the instruction.
11.	Clean the machine as per the schedule using tools	Not following the schedules
12.	Keep the alley way neat	Keeping materials in alley way/foot path
13.	Doing fire fighting with knowledge	Doing without knowledge

Table 6.14.1.1: Dos and don'ts

Tips

- Maintain good health. Then only you can achieve best result
- Work with wearing PPEs properly would be safety for you
- Classification of fires like A, B, C, D, F and extinguishing procedures
- Known about water type, foam type, powder type and gas type fire extinguishers
- Usage of emergency exit at emergency period would be safe to all
- About assembling point and its importance
- First Aid methods and its importance

Self-Assessment

- What is PPE?
- Give some points for healthy life
- What are the types of fire?
- What are the types of fire extinguishers?
- What is the purpose of emergency exit?
- What is LOTO?
- Brief about First aid
- What are the basic common materials to keep in first aid box?

Notes

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7. Comply with industry and organizational requirements in raffia sector

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Key Learning Outcomes

At the end of this module, you will be able to:

1. understand about self–development how to develop yourself.
2. understand how to raise in the career ladder.
3. understand about team work and how to be a best team player.
4. understand about organizational standards.
5. understand about 5s and Kaizen and its importance in your career.
6. understand about nonconformity and its disposal procedure.
7. understand about importance of industry standard

UNIT 7.1: Self-Development

Unit Objectives

At the end of this unit, you will be able to :

1. develop yourself in your career through proper planning and execution
2. be a good team player and patient listener to others views.
3. maintain your work place neat and tidy through 5S.
4. develop small Kaizens.
5. handle the non-conformities.
6. work according to the Organization standards.
7. comply to the industrial standards

7.1.1: Self-Development

- **Value of your Job**
  - Textile is a combined process of cloth manufacturing
  - Cloth is the second commodity full filling the whole humanity in the world after food
  - Especially in Indian culture Cloth is more important than food
  - Textile process is known as a process of holiness to mankind
  - So, be proud to be a part of the textiles.

- **Responsibility**
  - Work with self-interest, involvement, dedication, sincerity. Take ownership of your machine, process, delivered product for the stipulated time period of your shift
  - Take responsibility for your every action.
  - Maintaining the machine always in best maximum productive condition
  - Checking the performance in terms of productivity and quality of material
  - Maintaining the cleanliness of the machine

- **Positive Attitude and Continual Improvement**
  - Think positively in all aspects. For any kind of deviation in your assigned work, accept it as generously with whole hearted mind and correct it to avoid it in future
  - Try to make efforts to simplify the work methods and systems to reduce strain, improve quality and productivity
  - Try to solve the deviations / non-conformity in your process / machine.
  - Interact with others and get positive matters from them
  - Don't bother about the negative matters and Just ignore it
  - Always work for the sake of organizations development
  - Development of organization and yourself are interdependent. If the organization grows, you will also grow
  - Take initiative to implement the procedures and think innovative for betterment

- **Learning**
  - Think that every day is a learning day and every situation is for learning
  - We can learn lot of things from our surroundings, Happenings, persons, Mistakes, etc.,
  - Don't think that the point is from whom, think that the point is what and whether it would create goodness for anyone
  - Learning will complete only when it is tried / applied. Before application ensure through learning
  - During initial try, ensure some close observation / follow-up and fine tune the things needed to make it success
  - If fails after dedicated efforts mean, no need to disappoint, as most of the success are learnt from failures
  - Learn and make others to learn for the improvement of yourself and the organization. Also the purpose of learning will fulfill only when it is shared
- **Career Growth**
  - Know about your career growth and fix a target line to reach it
  - Based on target draft an action plan with time line to reach that target
    - What is the additional education required
    - What are all the skill set required
    - Financial requirement
    - Time to learn and develop the education and skill
  - Execute the plan meticulously as per the time line and quality of learning
  - Once you got the required education and skill, inform the management about your new learning. It will lead to your self-development in your career
- **Follow-up of Statutory and Mandatory Procedures**
  - Understand the rules and regulations specified in the standing order applicable to the mills and follow them properly right from reporting for duty to Handover the duty
  - Don't violate safety regulations at any situation, do not fail to wear personal protective equipments while working in the shop floor
  - Don't violate the disciplinary procedures and follow the code of conduct

UNIT 7.2: Team Work

Unit Objectives

At the end of this unit, you will be able to :

1. know what is Team Work.
2. know the qualities required for a good team member and benefits of team work.

7.2.1: Team Work

- "TEAM" the word itself tells us that if you work **T**ogether**, E**ach will **A**chieve **M**ore benefits
- Working with team gives lot of benefits and the impact of result is more than working independently
- It is always better to work with team

7.2.2: Qualities Required for a Team Member

- Should have immense faith in Team and Team work
- Ability to communicate effectively and politely
- Ability of Adoptability to changes & cooperating with members and others
- Mind of respecting voice of another member's
- Sharing of views and ideas to others & ability of open discussion among members
- Able to convince others point if it is not suitable, avoid arguments and have a productive discussion

7.2.3: Benefits of Team Work

- Target and Task can be completed in time with ease
- Risk factor will reduce. Quality, quality consistency productivity will improve
- Accidents and waste level will reduce
- Moral support in working improve confidence level
- Anyone may not know everything but everyone may know something is the base for any Team work. This will lead to new innovative things for a identical problem / situation
- Learn new things through common discussion in a team
- Different kind of Interpretation for a same subject lead to wide open our mind
- Good attitudes like, patient hearing and understand others point of view, helping others Positive approach, cession etc.
- New idea emerges from team work
- Individual ability increases with team work

UNIT 7.3: Organizational Standards

Unit Objectives

At the end of this unit, you will be able to :

1. know the importance of organizational standards.

7.3.1: Organizational Standards

- Organizational standards are the outline of the way in which business is to be conducted and govern what is deemed as acceptable behavior in the workplace
- Organizational standards are established related to
  - Customer service
  - Code of conduct
  - Human resources issues
  - Quality assurance
  - Legislative issues
  - Marketing material and communication
  - Documenting standards like, Mission, Vision, workplace policy and procedures.
  - Standard operating procedures
- Organizational standards includes lean management, 5S, ISO-9000, ISO-14000, Kaizen, Quality circle etc.,
- We should know about the organization standards related to our work before starting
- Any clarification needed in understanding the standards, feel free to get guidance from your superior or concerned person
- Implement and follow the standards applicable for your work and work environment without deviation
- Observe the performance and behavior of the colleagues, helpers and others inside the factory and motivate them to follow the rules and regulations, work instructions, safety practices, etc.,
- Whenever there is any violation / deviation immediately motivate to follow the organizational standards meticulously
- Always update yourself about the changes effected in the organizational standards and be the first one to implement and follow the new changes
- Any changes required in the organizational standard, based on internal nonconformity, Customer compliant, Accidents, etc., should conveyed to concern for necessary amendment

UNIT 7.4: Industrial Standards

Unit Objectives

At the end of this unit, you will be able to :

1. know the importance of Industrial standards.

7.4.1: Industrial Standards

- Industrial standards are established in line with labour legislations of State and Central Government, safety standards of inspector of factories, fire precautions, fire fighting, first aid, ISO standards, environment standards, National Occupations Standards, etc.,
- Industrial standards are also known as a set of criteria within an industry relating to the standard functioning and carrying out of operation in their respective fields of production
- Generally, it is nothing but a statutory / mandatory requirement that should be followed by every member
- It providers an orderly and systematic formulation, adoption or standards used in industry
- You should know the industry standard very well related to your job, safety, and welfare
- Understand the points given clearly and act accordingly
- If you need any clarification to understand, get guidance from the concerned person or from your superior
- Align the industrial standard with organizational standard and work accordingly
- Working as a team, make others also to follow the standards and motivate them to complete the task successfully

Scan the QR code to see the related video

Health and Safety hazards

UNIT 7.5: 5S

Unit Objectives

At the end of this unit, you will be able to :

1. know what is “5S” and 5S techniques.
2. know the detailed explanation of 5S and benefits of 5S.

7.5.1: 5S

- 5 'S' is a Japanese technique of house keeping
- It is a general concept
- It is a systematic and methodical approach allowing teams to organize their workplace in the safest and most efficient manner
- It can be implemented in all Educational Institutions, Factories, Hotels, Hospitals, Offices, Banks and ever where including home

7.5.2: 5'S' TECHNIQUE

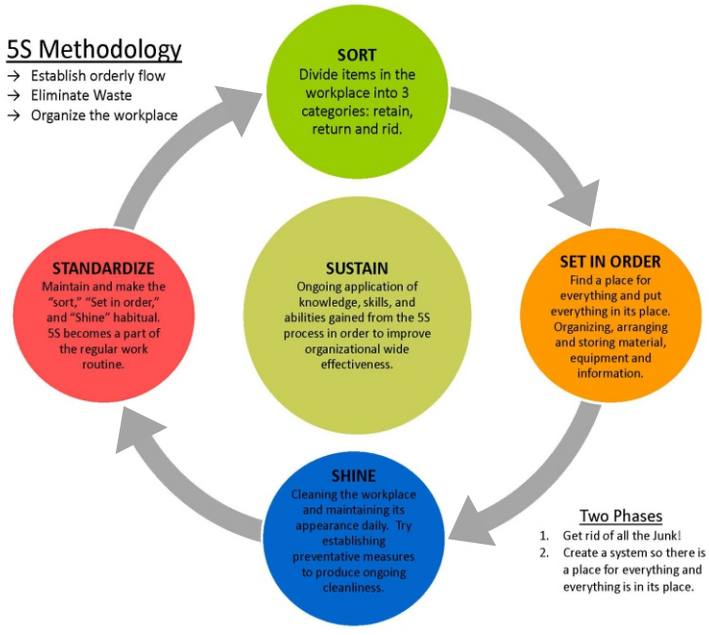

Fig. 7.5.2.1: 5S implementation step by step

- First S-SEIRI – Sort (1S)
- Second S-SEITON –Straighten (2S)
- Third S-SEISO – Shine (3S)
- Fourth S-SEIKETSU – Standardize (4S)
- Fifth S-SHITSUKE – Sustain (5S)

7.5.3: 1S - SEIRI - Sort

- Sort out & separate the material which is needed & not needed in the area
- Distinguishing between necessary and unnecessary things, and getting rid of what you do not need
- Ask superior to tag all items which they don't think are needed - this improves understanding about need and use
- Classify all equipment and materials by frequency of use to help decide if it should be removed- place 'Red Tag' on items to be removed
- Establish a 'holding area' for items that are difficult to classify- hold item for allotted period to enable others not on 5S team to review
- Needed or wanted material alone to keep and all other unwanted materials to be disposed or destroyed. Some materials will be in good condition but not need for us. Such materials to be stored in separate place
- Some model visual photos of Seiri activities

Fig. No. & Location	Before	After
Fig. 7.5.3.1: Service room		
Fig. 7.5.3.2: Tools rack in service room		

7.5.4: 2S - SEITON - Straighten

- It is the practice of orderly storage of materials so the right item can be picked efficiently (without waste), at the right time
- Identify and allocate a place for all the materials needed for your work based on usage Assign fixed places and fixed quantity
- Arrange materials in such a way easy to access by everyone
- Make it compact

- Fix a place for everything and keep in its place after use
- Place heavy objects to be stored in a easy assessable height
- Identify the ally way and storage area with proper colour line
- Decide how things should be put away, and obey those rules
- Arrange items that are frequently needed rarely needed so that they are ready & easy to use
- Keep the frequently needed materials nearer to work place at reachable distance
- Keep the Rarely needed materials in distance clearly identify locations for all items so that anyone can find them & return them once the task is completed
- Some visual photos of before and after of Seiton

Fig. No. & Location	Before	After
Fig. 7.5.4.1: Tools box in service room		
Fig. 7.5.4.2: Rack in service room		

7.5.5: 3S - SEISO - Shine

- Create a clean worksite without garbage, dirt and dust, so problems can be more easily identified (leaks, spills, excess, damage, etc)
- Identify the root causes for dirtiness, and correct it
- Keep tools and equipment clean and in top condition, ready for use at anytime
- Cleaning should be a practice of daily activity. At least 5 minutes per day
- Follow the cleaning schedules correctly
- Use chart with signatures/initials if any shows that the action or review has taken place
- Ensure proper lighting to see dirt and dust easily
- Clean the workplace & equipment on a regular basis in order to maintain standards & identify defects.
- Check the condition of the equipments

- If any damage or defected tools or equipments found, replace it with new one
- Avoid dumping unnecessary materials in work spot
- Dispose the waste in time
- Model photo showing the before and after Seiso

Fig. No. & Location	Before	After
Fig 7.5.5.1: Model photo of M/c cleanliness		

7.5.6: 4S-SEIKETSU - Standardize

- Setting up standards for a neat, clean, workplace
- Standardization of best practices through 'visual management'
- Make abnormalities visible to management
- Keep each area consistent with one another
- Standards make it easy to move workers into different areas
- Create process of how to maintain the standard with defined roles and responsibilities
- Make it easy for everyone to identify the state of normal or abnormal conditions - place photos on the walls, to provide visual reminder
- Revisit the first three of the 5S on a frequent basis and confirm the condition of follow up using standard procedures


Fig. 7.5.6.1: some model picture shows the order of arrangements with standard

7.5.7: 5S - SHITSUKE - Sustain

- Implementing behaviors and habits to maintain the established standards over the long term, and making the workplace organization the key to managing the process for success
- Toughest phase is to Sustain-many falls short of this goal
- Establish and maintain responsibilities- requires leader commitment to follow through
- Every one sticks to the rules and makes it a habit
- Participation of everyone in developing good habits and buy-in
- Regular audits and reviews
- Get to root cause of issues
- Aim for higher 5S levels - continuous improvement Keep to the rules to maintain the standard & continue to improve every day

7.5.8: Benefits of 5S

- 5S are particularly effective because they want to improve the housekeeping of your workshops and the rest of your premises in order to obtain the following advantages
- Improve safety
- Improve the working atmosphere and environment
- Improve the quality of work and products
- Enable efficient maintenance
- Enhance your image and customer trust
- Prepare the launch of other methodologies
- Improves material retrieval time
- Savings in space consumption
- Maintain the morality of individual

UNIT 7.6: Kaizen

Unit Objectives

At the end of this unit, you will be able to :

1. know what is “Kaizen”.
2. know the steps of Kaizen and its benefits.

7.6.1: Kaizen

- Kaizen is the practice of continuous improvement
- Kaizen focuses on applying small, daily changes that result in major improvements overtime
- Kaizen methods can be used to improve the results of any firm and can also be used
- Kaizen (continual improvement) creates a culture where employees throughout the organization are actively engaged with improving productivity
- Word "kaizen", where "kai" = change "zen" = good, simply means "change for better”
- Growth is nothing but improvement in activity
- Think that any activities need improvement
- There are two ways of improvement
- Improvement can be achieved by investigating big things for change of situation.
- Improvement can be achieved by doing some small-small changes in current situation with continuous manner also
- The second concept of continual improvement of current process called kaizen. Kaizen tells us don't wasteever your day without improving wherever possible. This leads the organization people in disciplinary manner and it is bound to work with importance of time, skill and quality

7.6.2: Steps for Kaizen

- **There are four main steps in Kaizen. They are**
  - Step 1 – Identifying the current situation
  - Step 2 – Planning and Preparation
  - Step 3 – Implementation
  - Step 4 – Follow up
- **Step 1: Identifying Current Situation**
  - Understand the existing processes and dependencies.
  - Identify all the activities currently involved in developing a new product. Observe the process first
  - Identify Value Added (VA) and Non-Value Added (NVA).
  - Generally creates more questions than answers
- **Step 2: Planning and Preparation**
  - Identify the correct area in the organization that requires the immediate implementation of rapid improvement event

- After identifying the most appropriate production, administrative or a specific segment in the workplace, the focus should be given in particular to "waste elimination" issue prevailing in that department for implementing the kaizen event.
- After identifying the problematic area, the managers have to build a team of employees
- Prior to the training, the entire team should be completely aware of the organization's rapid improvement process and given appropriate training on the process
- The duration of kaizen events varies depending on the length of the process involved and depth of the problem

- **Step 3: Implementation**
  - The first and foremost work of the team is to identify and clearly understand the "current state" of the targeted process
  - This would give the team members a common and a clear picture of problem that they are aiming to solve
  - Why-Why analyze to understand the root cause of a problem step by step
  - The team members would raise queries on the aim of the process, and clearly observe the wastes, reasons for waste and analyze it
  - The most appealing and fruitful ideas are selected and suggested for implementation

- **Step 4: Follow up**
  - This is the very important phase in the kaizen event as this ensures that the improvements are consistent and not just for time being
  - On completion of kaizen event, the team members should keep track of performance as a routine in terms of metrics measures to record the gains
  - In general, the follow up kaizen events are conducted in 30 to 90 days after the first kaizen event in aim of assessing the performance and locate the follow-up changes that should undertaken to maintain the consistency in performance and development

Fig. 7.6.2.1: Kaizen Before – Used for single department – Front of the wall

Fig. 7.6.2.2: Kaizen After- Used for both departments. Front and Back of the wall

UNIT 7.7: Non-Conformities

Unit Objectives

At the end of this unit, you will be able to :

1. know what is Non-conformity.
2. know the types of non-conformity and its disposal methods.

7.7.1: Non-Conformities

- Failure to conform to accepted standards, conventions, rules, or laws is non-conformities
- Non-conformity comes in Product, Procedure and Document
- In quality management a non-conformity (also known as a defect) is a deviation from a specification, a standard, or an expectation. Nonconformities are classified as critical or major or minor
- Anything which does not meet customer requirement is also called non-conformity

7.7.2: Non- Conformity in Product

- Any product which does not meet the requirement in Quality, Quantity, Shape and Size is known as product non-conformity
- Failure in timely delivery to the subsequent process is also nonconformity
- Sliver material with the irregularity not meeting the requirement of subsequent process is a non-conforming product
- Sliver material with dirt and stain is a non-conforming product

7.7.3: Non-Conformity in Procedure

- Deviation of activities to the procedure is known as procedure of non-conformity
- Not following the cleaning schedule is procedure of non-conformity
- If a work is done without complying with the standard work instruction, it is a procedure of non-conformity
- If roller settings, draft and critical items differing from standard, it is a procedure of non conformity
- If a document is changed without proper approval from concern authority mean it is a procedure non-conformity

7.7.4: Non-Conformity in Document

- If documents are not updated means it is document non-conformity
- Job card not filled or partly filed job card are document non-conformity
- If the working procedure is not updated according to the process is called procedure non conformity
- If the roller settings, draft, critical items are not updated in the standard operating procedure mean, it is a documentation non-conformity

7.7.5: Disposal of Non-Conformity

- Disposal of non-conformity is two procedures
  - Disposal of non-conformity
  - Disposal of non-conforming product
- Disposal of non-conformity is a temporary correction of the problem example replacing the worn-out wheel, belt etc.,
- Disposal of non-conforming product is identified faulty material correction / disposal as per standard procedure
- Extra care to take while disposing the non-conforming product to avoid wrong faulty product get delivered to the customer
- Procedure for disposal method to be clearly defined
- For any disposal get concerns form the superior
- Disposal record should be signed by the superior then and there
- Ensure the corrective action followed by disposition and conform the effectiveness of disposition / corrective action immediately

UNIT 7.8: Do’s and Don'ts

Unit Objectives

At the end of this unit, you will be able to :

1. know about the Do’s and Don'ts in the department.

7.8.1: Do’s and Don'ts

S. No.	Dos	Don'ts
1.	Work with self interest	Work without interest
2.	Set Career goal, plan and execute	Be comfort in the existing and no efforts for self development
3.	Work as a team	Working independently
4.	Discuss about the problem	Argue about the persons
5.	Listen others voice in team	Neglecting members voice
6.	Follow 5S procedure meticulously	Think it is a burden
7.	Doing small small Kaizens	Doing routine and no efforts for improvement / development
8.	Dispose the non-conformity as per the procedure	Disposing the non-conformity as like wish
9.	Understand the rules and regulation of the organization	Working without understanding the rules and regulation
10.	Contamination polluted water to be treated in effluent	Discharging the contaminated polluted water to open land/ plantation
11.	Proper PPE to wear when handling chemicals to avoid occupational decease	Neglecting the PPE

Table 7.8.1.1: Do’s and Don'ts

Tips

- Learn from everything and try then and there for self-development
- Fix a career target, plan for it with time line and work towards it for career development
- Always work as a team and be a good team player
- Listen to alternate ideas and be a first one to good changes
- Learn about organizational standards and follow meticulously. Discuss the standards what you have known with superiors and understand clearly
- Be a best follower of any system and take leadership when it is offered through, 5s zone head, Quality circle head etc.,
- Pursue the standards daily which makes some positive inspiration to others to follow you
- Know about the industry standard and follow strictly

Self-Assessment

- Brief about Career development
- What are the qualities required for team members?
- What are the benefits in Team work?
- Mention some of the organizational standards
- Brief about 5S
- Brief about Kaizen
- How to handle nonconformity?
- What precaution to take to prevent occupational decease in the unit.

Notes

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RE IMAGINE FUTURE

TEXTILE SECTOR SKILL COUNCIL
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PERFECTING SKILLS

8. Annexure

QR Codes - Video Links

Module No.	Unit No. and Title	Page No.	QR Code Link	QR Code
1. Taking charge & handing over the shift to Tape Plant operator	Unit 1.1 Introduction	3	www.youtube.com/watch?v=3PDIybCdcqY	Technical Textiles: A Sunrise Segment in the Textile Ecosystem
	Unit 1.3 Formula's related to Tape Plant	15	www.youtube.com/watch?v=uelilpnXVzk	Tape Stretching Line - PP/HDPE Tapes for Woven Sacks
		15	www.youtube.com/watch?v=Q2EXV6bsgVI	Tape plant - 1600 Deo teck - woven sack machine
2. Running Tape plant line	Unit 2.2 Tape plant process description	24	www.youtube.com/watch?v=m8eJW0saK0U	Lorex 1400 hs - Plant setting
		24	www.youtube.com/shorts/jpQXqRM8zXY	Tape making process - Tape Plant Extrusion line
3. Contribute quality extrusion in Tape Plant line	Unit 3.2 Process Troubleshooting	40	www.youtube.com/watch?v=_CFbqoq3RoI	PP Tape Fibrillated Extrusion Plant
		40	www.youtube.com/watch?v=SxG01SxN1qk	Flat Yarn Extrusion Line & Raffia Tape Stretching Line

Module No.	Unit No. and Title	Page No.	QR Code Link	QR Code
4. Maintain work area, tools and machines in raffia sector	Unit 4.2 - Machine Cleanliness & Maintenance	57	www.youtube.com/watch?v=jql7oa9FTNg	Raffia Tape Plant
	Unit 4.3 Self Discipline in Cleanliness Culture	61	www.youtube.com/watch?v=5_IFz7FEZ9E	Safety Attitudes
5. Working in a team in raffia sector	Unit 5.2 Being a successful team player	65	www.youtube.com/watch?v=OPs4MQOlZAQ	Industrial Safety
6. Maintain health, safety and security at work place in raffia sector	Unit 6.6 Unsafe Conditions at Workplace	83	www.youtube.com/watch?v=9S_i3uTfaTw	Implementing Health & Safety in Workplace
7. Comply with industry and organizational requirements in raffia sector	Unit 7.4 Industrial Standards	102	www.youtube.com/watch?v=5ubPG7_Tq8Q	Health and Safety hazards

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