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APPAREL MADE-UPS HOME FURNISHING
SECTOR SKILL COUNCIL

# Participant Handbook

Sector
**Apparel**

Sub-Sector
**Apparel**

Occupation
**Machine Embroidery Operation**

Reference ID: **AMH/Q0801, Version 4.0**
**NSQF level: 3**

## Embroidery Machine Operator

**Published by**

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> Skill development of the new generation is a national need and is the foundation of Aatmnirbhar Bharat

**Shri Narendra Modi**
Prime Minister of India

# Certificate

## COMPLIANCE TO QUALIFICATION PACK – NATIONAL OCCUPATIONAL STANDARDS

is hereby issued by the

**APPAREL, MADE-UPS & HOME FURNISHING SECTOR SKILL COUNCIL**

for

## SKILLING CONTENT: PARTICIPANT HANDBOOK

Complying to National Occupational Standards of

Job Role/ Qualification Pack: **'Embroidery Machine Operator'** QP No. **'AMH/Q0801, NSQF Level 4'**

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(Apparel, Made-Ups & Home Furnishing Sector Skill Council)

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The preparation of this handbook would not have been possible without the Fashion Industry's support. Industry feedback has been extremely encouraging from inception to conclusion and it is with their input that we have tried to bridge the skill gaps existing today in the industry.

This participant handbook is dedicated to the aspiring youth who desire to achieve special skills which will be a lifelong asset for their future endeavours.

## About this book

Welcome to the "Embroidery Machine Operator" training programme. This PHB is designed to provide participants with comprehensive knowledge about the principles and practices of maintaining security, ensuring vigilance, and safeguarding premises. It also focuses on planning, executing, and managing routine security tasks, conducting inspections, and verifying the integrity of individuals and documents as part of field operations.

This Participant Handbook is designed based on the Qualification Pack (QP) under the National Skill Qualification framework (NSQF) and it comprises of the following National Occupational Standards (NOS)/ topics and additional topics.

1. AMH/N0801: Carry out different types of embroidery stitches using an embroidery machine
2. AMH/N0802: Embroider decorative designs using embroidery machine
3. AMH/N1003: Contribute to achieve quality in embroidery work and Greening of Job Roles
4. AMH/N0102: Maintain work area, tools and machines and Greening of Job Roles
5. AMH/N0103: Maintain health, safety and secure work place with Gender and PwD Sensitization
6. DGT/VSQ/N0101: Employability Skills (30 Hours)

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# 1. Introduction and Orientation to Embroidery Machine Operator

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Unit 1.1 - Introduction to the role of Embroidery Machine Operator

AMH/N0801

## Key Learning Outcomes

**By the end of this module, the participants will be able to:**

1. Explain the roles and responsibilities of an 'Embroidery Machine Operator'.
2. Explain the relation between the work role and the overall manufacturing process.
3. Describe various employment opportunities in the apparel industry for an 'Embroidery Machine Operator.'
4. Describe the production process and the specific work activities that relate to the whole process.

# UNIT 1.1: Introduction to the role of Embroidery Machine Operator

## Unit Objectives

**By the end of this unit, the participants will be able to:**

1. Give a detailed brief of the Apparel, Made-Ups and Home Furnishing sector in India.
2. Explain what embroidery is and its types.
3. Describe the garment production process and outline the specific tasks performed by an Embroidery Machine Operator within that process.
4. List the roles and responsibilities of an 'Embroidery Machine Operator'.
5. Explore various employment opportunities in the apparel industry for an Embroidery Machine Operator.
6. Enlist the technical terms commonly used in embroidery work.

## 1.1.1 Apparel Manufacturing Sector

The apparel manufacturing sector in India is one of the biggest industries in the country. It includes making clothes like shirts, pants, dresses, uniforms, and traditional wear. It also includes items we use at home, such as bed sheets, towels, curtains, cushion covers, and tablecloths. Many factories and small units across India manufacture these garments for both domestic consumption and export to other countries.

This sector provides employment to millions of people, particularly women and workers in rural areas. It includes many types of work such as stitching, cutting, embroidery, ironing, checking, and packing. India is renowned for its skilled workers and exquisite designs, which is why clothing made in India is in high demand worldwide.

The apparel industry in India is growing every year. With an increasing number of people purchasing clothes in India and other countries, there is a growing need for more workers and enhanced skills. New machines, better training, and government support are helping this sector grow fast. It is a strong part of India's economy and offers good job opportunities for skilled workers.

**Market Size and Growth:**

- **Current Value:** The Indian apparel market size was valued at USD 115.70 billion in 2024. The broader Indian textile and apparel market was valued at USD 222.08 billion in 2024.
- **Projected Growth:** The Indian apparel market is projected to grow to USD 171.60 billion by 2034, exhibiting a compound annual growth rate (CAGR) of 4% from 2025 to 2034.

Source: textileinsights.in

*Fig. 1.1.1: Apparel manufacturing unit*

India is known around the world for its beautiful embroidery, traditional designs, and skilled work. Because of this, there is a high demand for Indian-made clothes and home products in many countries.

The work in this sector is done by hand and by machines. It requires workers who are careful, skilled, and hard-working. Jobs like those of embroidery machine operators are crucial in maintaining the quality and design of products.

This sector helps many families earn a living and plays an important role in the country's growth.

**Key Strengths and Growth Drivers of India's Apparel Industry**

India's garment and textile industry is strong and growing fast. Here are the main reasons why:

1. **Plenty of Raw Material**

   India grows a lot of cotton, the highest in the world and is also the top producer of jute and jute products. India is also the second-largest producer of silk. India also produces and exports various types of blended and synthetic yarns.

*Fig. 1.1.2: Cotton tree and pre-processed jute plant*

2. **Large Domestic Market**

   India has a big population that buys clothes. People in India now have more money to spend and like to wear new styles. This means there is always high demand for new garments in the local market.

3. **Government Support**

   The government is giving help through special schemes like PLI and PM MITRA Parks. These programs help build better factories, support workers, and attract more companies to invest in India.

4. **Strong Export Business**

   India exports clothes and textiles to many countries, including the USA and those in Europe, making it the sixth-largest exporter of textiles and garments in the world.

5. **Use of New Technology**

   Modern machines and computers are now used in many factories. This makes the work faster, better, and more accurate.


*Fig. 1.1.3: Advanced garment manufacturing technology*

6. **Focus on Sustainability**

   Many companies are now using eco-friendly methods. They are making clothes from organic cotton and trying to reduce waste. This is good for the environment and future generations.

**Apparel, Made-Ups and Home Furnishing Sector Skill Council (AMHSSC)**

The Apparel, Made-Ups, and Home Furnishing Sector Skill Council (AMHSSC) is an organisation that helps people acquire the necessary skills to work in the clothing and home furnishing industry.

AMHSSC (Apparel, Made-Ups and Home Furnishing Sector Skill Council) plays an important role in helping people learn and grow in the garment and home furnishing industry. It creates special training courses for different jobs such as embroidery machine operators, tailors, pressmen, fashion designers, etc. These courses teach workers how to do their jobs in a safe, fast, and correct way.

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*Fig. 1.1.4: AMHSSC logo*

AMHSSC also works with factories and companies to understand what kind of workers are needed. This helps ensure that the training aligns with what the industry is looking for. Trained workers can get jobs in factories, export houses, or even start their own small businesses. By learning the right skills, workers can make better-quality products, feel more confident, and earn more money. In this way, AMHSSC connects skilled workers with good job opportunities and supports their future growth.

## 1.1.2 Embroidery

**What is Embroidery?**

Embroidery is the art of making designs or patterns on cloth using thread. It is used to decorate clothes, bedsheets, curtains, bags, and many other fabric items. The thread can be of different colours, and sometimes beads, stones, mirrors, or sequins are also added to enhance the design's beauty.

*Fig 1.1.5: Hand embroidered*

Embroidery can be done by hand or by using a machine. In factories, embroidery machines are used to make the work faster and neater. These machines follow a design and stitch it carefully on the fabric. Embroidery adds beauty and value to the product, and people enjoy wearing clothes with high-quality embroidery work.

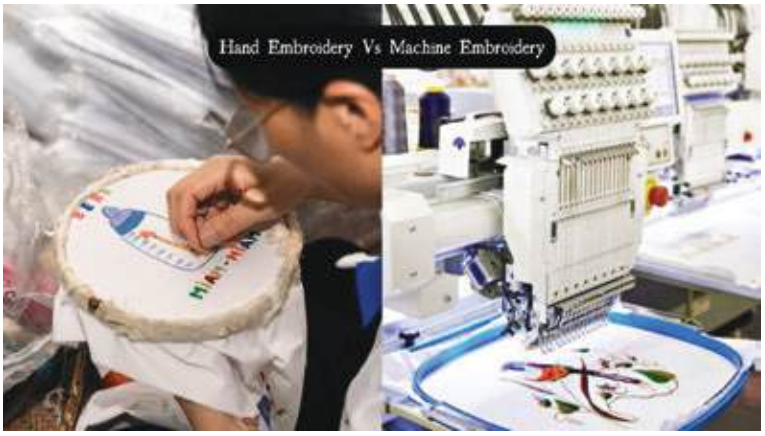


*Fig 1.1.6: Hand embroidery vs Machine embroidery*

Machine embroidery, also known as computer embroidery, is the process of stitching decorative designs onto fabric using an embroidery machine. These machines use software to upload and interpret digital designs, allowing precise stitching directly onto garments. A computer-generated pattern or drawing is transformed into beautiful embroidery using programmed stitches. Machine embroidery is widely used in the apparel industry by top clothing brands for its speed, consistency, and quality.

**Types of Embroidery Machines**

There are two main types of machine embroidery techniques:

1. **Free-Motion Machine Embroidery**

   Free-motion embroidery is done using a basic zigzag sewing machine. In this method, the operator manually guides the fabric under the needle to create the design. The machine does not move the fabric automatically — instead, the user controls the fabric's movement to form patterns. This

technique requires skill and coordination, as the stitches are formed by adjusting the machine settings and moving the fabric tightly and precisely.

2. **Computerised (Computer-Controlled) Machine Embroidery**

   Most modern embroidery machines are computerised and specially designed for high-speed, precision embroidery. These machines automate the process and follow pre-programmed designs.

   - **Common types include:**
     - **Single-Head Embroidery Machines:** Have one embroidery head and are suitable for small-scale or customised production.
     - **Multi-Head Embroidery Machines:** Contain multiple heads to produce several identical designs at once, ideal for bulk production.

## 1.1.3 Garment Production Process

The garment production process involves several key steps to transform fabric into finished clothing. Trained workers do each step, and one of those key roles is the Embroidery Machine Operator. Here is how a garment is usually made:

**Step 1:** Designing - First, the fashion designer or company decides what kind of garment they want to make. They create a design on paper or a computer. This includes the style, size, colour, fabric type, and sometimes embroidery patterns.

**Step 2:** Fabric Selection and Sourcing - The right fabric is chosen based on the design. For example, cotton, silk, polyester, or denim. Then the fabric is purchased or brought to the factory.

**Step 3:** Fabric Inspection - Before using the fabric, workers check it for any damage, stains, or colour differences. Good quality fabric is approved for use.

**Step 4:** Fabric Spreading - Large rolls of fabric are spread evenly on long cutting tables. This helps in cutting the fabric properly.

**Step 5:** Cutting - Patterns are marked on the fabric using chalk or a marker. Then, the fabric is cut into parts like sleeves, collars, front, and back.

**Step 6:** Embroidery (if required) - If the design includes embroidery, the cut fabric pieces are sent to the Embroidery Section.

**Step 7:** Stitching - After embroidery, all the cut pieces are stitched together using sewing machines. This step forms the complete garment.

**Step 8:** Checking (Quality Control) - Every garment is carefully checked to make sure there are no defects like open stitches, stains, or missing buttons. If needed, small corrections are made.

**Step 9:** Finishing - The garment is pressed, threads are trimmed, labels are attached, and it is folded properly.

**Step 10L:** Packing - The finished garment is packed in poly bags or boxes, ready for sale or delivery.

**Step 11:** Dispatch - Finally, the packed garments are sent to shops, warehouses, or directly to customers in India or other countries.

The Embroidery Machine Operator works in the middle of this process, after fabric cutting and before stitching. They run the embroidery machine that stitches beautiful designs on cloth. They prepare the fabric, set the thread, load the design, and start the machine. They carefully watch the machine while it works to make sure the stitching is neat and there are no mistakes.

They also check the finished embroidery, clean the machine, and fix small problems like thread breaks or needle changes. Their primary responsibility is to ensure that the embroidery is completed properly, on time, and of high quality.

*Fig 1.1.7: Embroidery Machine Operator*

## 1.1.4 Roles and Responsibilities of an Embroidery Machine Operator

Here are the main duties of an Embroidery Machine Operator:

**Understand the Design**

- Before starting, carefully look at the embroidery design. Know where the design will go on the fabric, what colours to use, and what kind of stitches are needed.

**Prepare the Machine**

- Set up the embroidery machine with the correct thread colours and place the fabric tightly in the frame or hoop so the design comes out neat.

**Operate the Machine**

- Start the machine and let it stitch the design on the fabric. Keep watching the machine to make sure the thread doesn't break and the stitching is going right.

**Do Basic Maintenance**

- Clean the machine daily to keep it working well. Change needles or threads when needed and report any big problems to the supervisor.

**Check Quality**

- After embroidery is done, check the design to make sure it looks good. Trim extra threads and fix small mistakes if possible.

**Keep the Workplace Clean**

- Keep your machine area clean and tidy. Put threads, scissors, and other tools in their proper places after work.

**Follow Safety Rules**

- Be careful while using the machine. Do not touch moving parts, and always follow safety instructions to avoid injury.

*Fig 1.1.8: Duties of an embroidery machine operator*

## 1.1.5 Various Employment Opportunities for Embroidery Machine Operators in the Apparel Industry

An Embroidery Machine Operator has several employment opportunities in the growing apparel industry. They can find work in garment factories, where embroidery is done on a large number of clothes such as kurtis, shirts, sarees, and uniforms.

Many export houses hire skilled operators to add embroidery to garments meant for international markets. Fashion boutiques and designer studios also employ embroidery machine operators to create custom, detailed work on special orders.

With experience, an operator may work from home or start a small embroidery business, taking orders from nearby shops or tailors. They may also find jobs in job-work units that handle embroidery work for other companies.

Some operators get work through government skill projects or training centres that connect trained workers with employers. Overall, the role offers steady job options and even opportunities for self-employment and growth.

## 1.1.6 Technical Terms Commonly Used in Embroidery Work

Here is a table listing commonly used technical terms in embroidery work:

| S. No. | Term | Meaning |
|---|---|---|
| 1 | Stitch Density | How close the stitches are placed together in a design. |
| 2 | Stitch Length | The distance between two stitches. |
| 3 | Stitch Width | The side-to-side size of a stitch, mostly in zig-zag stitching. |
| 4 | Tension | Tightness of the thread during stitching. |
| 5 | Needle Size | The thickness of the needle is chosen based on the thread and fabric. |
| 6 | Thread Count | Shows how thick or thin a thread is. |
| 7 | Bobbin | A small reel that holds the lower thread inside the machine. |
| 8 | Hooping | Fixing fabric in a frame or hoop to keep it tight while stitching. |
| 9 | Stabiliser | A material placed under fabric to prevent stretching or shifting. |
| 10 | Digitising | Converting a design or image into machine-readable embroidery format. |
| 11 | Jump Stitch | A thread moves between parts of a design without making a stitch. |
| 12 | Thread Break | When the thread snaps or cuts during embroidery. |

| S. No. | Term | Meaning |
|---|---|---|
| 13 | Underlay Stitches | The first layer of stitches supports the top design. |
| 14 | Fill Stitch | Stitch type used to fill large areas in a design. |
| 15 | Satin Stitch | Smooth, shiny stitch used for outlines, letters, and narrow parts. |
| 16 | Colour Change | Changing thread colour during stitching as per the design. |
| 17 | Registration | Accurate alignment of stitches to avoid overlapping or gaps. |
| 18 | Framing | Holding fabric using a frame for even tension during embroidery. |
| 19 | Backing | Another word for stabiliser – support material behind fabric. |
| 20 | Needle Penetration | How the needle goes through the fabric – must be clean and accurate. |

*Table 1.1.1: Commonly used technical terms in embroidery work*

## Summary

- The embroidery machine operator is responsible for stitching decorative designs on fabric using industrial embroidery machines.
- Job roles in this field require attention to detail, patience, and the ability to follow design instructions accurately.
- The embroidery process requires an understanding of tools, threads, fabrics, and computerised embroidery systems.
- Each organisation provides work instructions through job sheets or verbal directions from the supervisor.
- Communication with team members and reporting of problems is essential for a smooth workflow.
- Operators should know their duties, limits of responsibility, and when to seek support from seniors.
- Proper workspace setup helps improve safety, comfort, and productivity.
- The operator must learn to use specification sheets and samples to meet design requirements.
- Adherence to work targets and timelines ensures productivity and customer satisfaction.
- The job requires maintaining discipline, following organisational rules, and taking pride in workmanship.

## Exercise

**Multiple-choice Question:**

1. What is the main responsibility of an embroidery machine operator?
   a. Dyeing fabric
   b. Stitching clothing by hand
   c. Operating and monitoring embroidery machines
   d. Designing new machines

2. Which document lists job responsibilities and daily tasks?
   a. Instruction card
   b. Thread catalogue
   c. Design map
   d. Job sheet

3. What should an operator do first before starting the day's work?
   a. Leave the machine idle
   b. Check and prepare the work area
   c. Call the supervisor
   d. Thread all machines randomly

4. Who should be contacted if there is a doubt regarding the job process?
   a. Fellow operator
   b. Machine manufacturer
   c. Security guard
   d. Supervisor or line manager

5. Why is it important to follow design specifications?
   a. To finish work faster
   b. To use less thread
   c. To ensure accurate embroidery output
   d. To avoid using scissors

**Descriptive Questions:**

1. Explain the job role of an embroidery machine operator.
2. Describe the importance of following the job sheet instructions.
3. List any three key responsibilities of an operator during production.
4. What is the role of a supervisor in embroidery operations?
5. Describe how an operator should prepare before starting machine work.

## Notes

Scan the QR codes or click on the link to watch the related videos

https://youtu.be/ddisteV3tOo?si=uFDW4QKnItoOKknY

Textile Sector in India

https://youtu.be/_DkEQuBrWf8?si=1mxVoQOyAqYov2e8

The Story Behind Embroidery | What is Embroidery?

https://youtu.be/QaS4sI0n5Qg?si=f49xb-wPLdagICvk

Garments Full Production Process

https://youtu.be/6XMG1SfFCc8?si=PvDmFX7iI5Es5EHk

Embroidery computer machine

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# 2. Carry out Different Types of Embroidery Stitches Using an Embroidery Machine

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## Key Learning Outcomes

**By the end of this module, the participants will be able to:**

1. Identify different types of embroidery stitches.
2. Discuss different types of fabric.
3. Demonstrate the use of different types of tools in the embroidery process.
4. Use various types of thread varying in thickness and shade for embroidery stitches.
5. Operate the embroidery machine safely.
6. Create various types of embroidery designs and stitches using the embroidery machine.
7. Identify different types of defects in the embroidered product.
8. Perform basic maintenance and troubleshooting of the embroidery machine.
9. Explain how to minimise and dispose of the waste materials in the approved manner.
10. Respond appropriately if the embroidery does not meet product specifications and take corrective action.

# UNIT 2.1: Basics of Embroidery Materials and Tools

## Unit Objectives

**By the end of this unit, the participants will be able to:**

1. List various types of fabrics, materials, and accessories used in embroidery.
2. Identify various trims, threads, and needle types used in machine embroidery.
3. Differentiate between thread types based on thickness, shade, and size.
4. Identify the different parts of a needle and their specific uses in embroidery.
5. Explain the relationship between thread, needle, and cloth for achieving quality embroidery.
6. List the problems encountered when working on different types of materials.
7. Identify various types of embroidery.
8. Explain different types of embroidery techniques and the associated stitch types.
9. List common factors affecting stitching and embroidery.
10. Explain how to select the appropriate tools and materials as per the given embroidery design specifications.

## 2.1.1 Types of Fabrics

A fabric is a material made by interlacing or otherwise combining fibres, threads, or yarns. It's essentially what cloth is made of. Each fabric has its own unique feel, strength, and response to thread and the machine. An embroidery machine operator must know the features of each material to get a neat and strong design.

- **Cotton Fabric:** Cotton is soft and easy to work with. It is strong and can handle machine embroidery well. It does not stretch and is best for simple and detailed designs.

*Fig. 2.1.1: Embroidery on cotton fabric*

- **Silk Fabric:** Silk is smooth and shiny. It looks rich but is delicate and slippery. It needs careful handling, slow machine speed, and the right needle to avoid damage.

*Fig. 2.1.2: Embroidery on silk fabric*

- **Wool Fabric:** Wool is thick and warm. It can take heavy threads and bold designs. However, it may need a stronger needle and a thicker thread.

*Fig. 2.1.3: Wool fabric*

- **Polyester Fabric:** Polyester is strong, dries quickly, and does not wrinkle easily. It is suitable for fast stitching, but the thread tension must be right to avoid puckering.

*Fig 2.1.4: Polyester Fabric*

- **Linen Fabric:** Linen is natural, breathable, and has a rough texture. It holds embroidery well and is good for medium to large patterns.

*Fig. 2.1.5: Natural linen fabric*

- **Denim:** Denim is thick and heavy. It can handle strong stitching and looks good with contrast threads. The operator must use a sharp needle and heavy-duty thread.

*Fig. 2.1.6: Denim fabric*

- **Net and Organza:** These are lightweight and transparent fabrics. They are delicate and need a stabiliser underneath while stitching. Slow speed and fine needles are used for these.

*Fig. 2.1.7: Embroidery on Organza*

- **Velvet:** Velvet is thick and soft with a pile. It can be tricky to embroider because the thread can sink into the surface. A proper frame and high-lift foot help in this case.

*Fig. 2.1.8: Zari embroidery on velvet fabric*

- **Stretch or Knitted Fabrics:** These fabrics stretch easily. Without stabilisers, the design may get pulled or look uneven. Use ballpoint needles and soft thread for best results.

*Fig. 2.1.9: Ribbed knit fabric*

- **Leather and Faux Leather:** These are strong and stiff. Only simple designs with less stitching should be done. Special needles and a slow speed are needed to avoid tearing.


*Fig. 2.1.10: Genuine leather and faux leather*

## 2.1.2 Threads

Threads are the most important part of embroidery. They form the design on the fabric. Different types of threads are used depending on the fabric, design, and look needed. They vary in thickness, strength, colour, and shine. Let's learn about each:

| Thread Type | Characteristics | Use in Embroidery | Image |
|---|---|---|---|
| **Cotton Thread** | Soft, matte finish, strong, easy to handle | Suitable for traditional and simple designs on cotton or natural fabrics.<br>Gives a natural look, is good for everyday use, and is easy for beginners. |  |
| **Polyester Thread** | Strong, slightly shiny, resists shrinking and fading | Used for machine embroidery on synthetic and stretch fabrics.<br>Long-lasting, colourfast, ideal for factory and commercial use. |  |
| **Rayon Thread** | High shine, soft, smooth, low strength, not colourfast | Best for decorative embroidery and vibrant designs.<br>Adds a rich and beautiful finish, great for logos, festive wear, and home décor. |  |
| **Metallic Thread** | Shiny and glittery, has a metal or plastic coating, slightly stiff | Used to create sparkle and highlight areas in special designs.<br>Makes embroidery stand out, ideal for party wear, requires slow, careful stitching. |  |
| **Nylon Thread** | Clear or fuzzy, strong, not heat-resistant, not colourfast | Rarely used, only for special effects |  |

| Thread Type | Characteristics | Use in Embroidery | Image |
|---|---|---|---|
| **Silk Thread** | Very shiny, strong, soft, natural fibre | Used for premium or luxury embroidery work<br>Elegant, smooth look; gives a high-quality finish |  |

*Table 2.1.1: Types of threads used in embroidery*

**Difference between Thread Types Based on Thickness, Shade, and Size**

In embroidery, using the correct thread is very important. Threads come in different thicknesses, shades (colours), and sizes, and each one is used for a different purpose. Understanding the difference helps the operator get neat, strong, and beautiful embroidery results.

**Thread Thickness**

The thickness of threads used in embroidery machines is primarily indicated by a system called "thread weight" (wt).

"The higher the thread weight number, the FINER (thinner) the thread. The lower the thread weight number, the THICKER (heavier) the thread."

**Common thread weights used in machine embroidery:**

1. **40 Weight (40wt)**
   - **Characteristics:** This is by far the most common and versatile thread weight for machine embroidery. It offers a good balance between visibility, strength, and detail.
   - **Use:** Most pre-digitised embroidery designs are created with 40wt thread in mind, meaning the stitch density is set to provide adequate coverage without being too bulky. It's suitable for a vast majority of embroidery projects on various fabrics.
   - **Needle Size:** Typically paired with a 75/11 or 80/12 embroidery needle.

*Fig. 2.1.11: 40 Weight (60wt) thread*

2. **60 Weight (60wt)**
   - **Characteristics:** This thread is finer than 40wt. It's less visible and creates more delicate lines.
   - **Use:** Ideal for:
     - **Small lettering:** Especially text smaller than 0.25 inches.
     - **Intricate details:** Where you need very fine lines or subtle outlines.
     - **High-density designs:** Where using a 40wt might create too much bulk or stiffness.
     - **Underlays:** Sometimes used as a bobbin thread for delicate fabrics.
   - **Needle Size:** Generally requires a 65/9 or 70/10 embroidery needle.

*Fig. 2.1.12: 60 Weight (60wt) micro-embroidery thread*

3. **30 Weight (30wt)**
   - **Characteristics:** This thread is thicker and heavier than 40wt. It provides greater coverage and a more pronounced, bolder look.
   - **Use:** Best for:
     - **Large designs or fills:** Where you want a rich, textured appearance and quick coverage.
     - **Decorative stitching:** To make stitches stand out.
     - **High-contrast embroidery:** For example, a white design on black fabric, where you need full coverage to prevent the fabric from showing through.
   - **Considerations:** If you use 30wt thread on a design digitised for 40wt, the stitches might become too dense, leading to a lumpy appearance, stiffness, or thread breaks. You may need to adjust the design's density or stitch length if your machine or software allows it.
   - **Needle Size:** Requires a larger needle, typically a 90/14 or 100/16 embroidery or topstitch needle.

*Fig. 2.1.13: 30wt cotton thread*

While "weight" (wt) is common for general embroidery threads (polyester, rayon), one might also encounter:

1. **Denier (d):** Used for synthetic threads (like polyester and rayon). It measures the weight in grams of 9,000 meters of thread. Higher denier numbers indicate thicker threads.
2. **Tex (Tex):** Measures the weight in grams of 1,000 meters of thread. Higher Tex numbers indicate thicker threads. A 40wt thread is roughly Tex 25.
3. **Number System (No. or #):** This is less common in modern machine embroidery but exists, particularly with some older or specialised threads. Similar to the weight system, a smaller number typically indicates a heavier thread.


*Fig. 2.1.14: 902wt bobbin thread*

**Why Thread Thickness Matters**

- **Appearance:** Thick threads create bold, visible stitches. Thin threads give finer details and a softer look.
- **Stitch Density:** Using the wrong thickness can affect design quality. Thick threads may overcrowd stitches; thin threads may leave gaps.
- **Needle Fit:** The thread must pass smoothly through the needle eye. If it's too thick, it may break or shred.
- **Fabric Match:** Thick threads can damage delicate fabrics. Use finer threads for light or soft materials.
- **Tension Settings:** Adjust thread tension when changing thread thickness to avoid loose or tight stitches.
- **Durability:** Thicker threads are stronger and better for items that are washed or used often.

**Thread Shade (Colour)**

Shade means the colour of the thread. Embroidery threads come in many colours, from light to dark. The embroidery machine operator should match the thread colour to the design or as per the supervisor's instructions. Some designs may need multiple colours for a better look.

**Thread Size (Length and Spool Size)**

Threads come in different lengths and are wound on spools of different shapes and sizes. The right choice depends on how much embroidery work is done every day.

1. **Thread Length (Yards/Meters)**

   Embroidery thread is sold in different lengths. The length tells how much thread is on the spool. It is usually measured in yards (yd) or meters (m).

   - **Mini Spools (Around 500 yards / 450 meters)**
     - **Use:** For trial designs, new colours, or samples.
     - **Pros:** Easy to store and not costly.
     - **Cons:** Not suitable for bulk work. Runs out quickly and needs frequent rethreading.

- **Standard Spools (Around 1,000 yards / 900 meters)**
  - **Use:** Suitable for small jobs or single-colour small logo embroidery.
  - **Pros:** Good for short runs and easy to handle.
  - **Cons:** Not enough for large, dense designs. May need changing during stitching.
- **Large Spools / Mini Cones (2,500 to 5,000 yards / 2,250 to 4,500 meters)**
  - **Use:** Best for regular production and commonly used colours like white, black, or red.
  - **Pros:** Fewer thread changes. More cost-effective per meter.
  - **Cons:** Needs more storage space. May need a thread stand for smooth feeding.
- **Industrial Cones (10,000 yards / 9,000 meters and more)**
  - **Use:** Perfect for high-volume, nonstop industrial embroidery work.
  - **Pros:** Very economical. Ideal for long production runs.
  - **Cons:** Cannot be used directly on regular machines. Needs an external thread stand or a special multi-needle machine setup.

*Fig. 2.1.15: 60wt embroidery thread 5000 meter cone*

2. **Spool Size (Physical Shape and Fit)**

   The shape and size of the thread spool also matter. It should fit properly on the machine or thread stand. This helps the thread move smoothly and avoids breaks or tangles.

   - **Home-Use Spools**
     - **Shape:** Flat top and bottom.
     - **Use:** For domestic machines. Not suitable for industrial machines.
     - **Note:** These are too small and not ideal for long jobs.
   - **Mini King Spools / Mini Cones**
     - **Shape:** Rounded top and bottom like a cone.
     - **Use:** Can work on industrial machines with a thread stand.
     - **Note:** Good for medium-level production. Unwinds smoothly from the top.
   - **Large Industrial Cones**
     - **Shape:** Tall cone, wide base to narrow top.
     - **Use:** Made for industrial embroidery machines running at high speed.
     - **Note:** Always use with a thread stand. Thread feeds easily without twisting or tangling.

## 2.1.3 Different Types of Trims

Trims refer to decorative additions or elements attached to the fabric to enhance the design. They add texture, colour, and uniqueness to embroidery work. Trims can be sewn, glued, or embroidered directly onto the fabric using special attachments or techniques.

**Below are the different types of trims commonly used in embroidery:**

1. **Lace Trim:** Lace trim is a fine, net-like fabric with beautiful patterns. It is soft and elegant, often used on borders and edges of garments. It adds a delicate and classy look to embroidery, especially in bridal and women's clothing.

*Fig. 2.1.16: Lace trim*

2. **Beaded Trim:** This trim has tiny beads stitched together in a line. It adds a shiny, raised effect to the embroidery. Beaded trims are often used in party wear and festive clothes to make the design look rich and sparkling.

*Fig. 2.1.17: Beaded trim*

3. **Sequin Trim:** Sequins are small, shiny discs that reflect light. They are attached in rows to create sequin trims. These trims give a bright and shiny look and are commonly used in dance costumes, blouses, and sarees.

*Fig. 2.1.18: Sequin trim*

4. **Fringe Trim:** Fringe trim has loose threads or strings hanging down like tassels. It adds a soft movement to the garment and is mostly used in scarves, stoles, or decorative clothing. It gives a stylish and boho look.

*Fig. 2.1.19: Fringe trim*

5. **Pom-Pom Trim:** Pom-pom trim includes small, round, soft balls attached in a line. These trims are fun and colourful, often used in kids' wear, home décor items like cushions, and festive clothing to add a playful touch.

*Fig. 2.1.20: Pom-pom trim*

6. **Ribbon Trim:** Ribbon trims are flat fabric strips, usually made of satin or cotton. They are used as borders or to make shapes in embroidery. Ribbons come in many colours and widths and are easy to stitch onto fabric.

*Fig. 2.1.21: Ribbon trim*

7. **Cord/Dori Trim:** Cord or dori trim is made of thick thread or twisted yarn that looks like a rope. It is stitched along the outlines or borders of a design to make it stand out. This trim is common in traditional or ethnic embroidery.

*Fig. 2.1.22: Dori trim*

8. **Zari Trim:** Zari trims are made from metallic threads that look like gold or silver. These trims are very shiny and add richness to embroidery. They are widely used in festive and wedding clothes like lehengas and sarees.

*Fig. 2.1.23: Zari trim*

9. **Mirror Trim:** Mirror trims include tiny mirrors stitched into fabric using colourful threads. These mirrors catch the light and shine beautifully. Mirror trims are used in traditional Indian embroidery, such as Kutch or Rajasthani designs.

*Fig. 2.1.24: Mirror trim*

10. **Tassel Trim:** Tassel trims have bunches of threads tied at one end and hang freely. These are stitched along the edge of dupattas, shawls, or curtains to add a fancy and flowing effect. Tassels come in many colours and sizes.

*Fig. 2.1.25: Tassel fringe trim*

11. **Scallop Trim:** Scallop trim has curved or wave-like edges that look very neat and decorative. It is often used on necklines, sleeves, and the bottom of dresses. It gives a clean and stylish finish to embroidery.

*Fig. 2.1.26: Golden sequin scallop trim*

12. **Ric-Rac Trim:** Ric-rac is a zig-zag-shaped trim, usually made from cotton or polyester. It is fun, simple, and easy to stitch. It is often used in kids' clothing, aprons, and home decorations to add a playful look.

*Fig. 2.1.27: Ric-Rac Trim*

Each of these trims adds a unique style and value to embroidery. Choosing the right trim depends on the design, fabric, and purpose of the final product.

## 2.1.4 Embroidery Needles

Different fabrics need different types of needles. Choosing the right needle improves the quality of embroidery, reduces thread breakage, and protects the fabric from damage. It also ensures smooth machine operation.


*Fig. 2.1.28: Pack of embroidery needles*

**Anatomy of Needles Used in Machine Embroidery**

A machine embroidery needle may look small, but it has many parts, and each part has an important job. Understanding the parts of the needle helps embroidery operators choose the right needle and avoid problems during stitching.

Main parts of an embroidery needle:

1. **Shank:** The shank is the top part of the needle that fits into the machine. In industrial embroidery, the shank is usually round. The machine holds the needle firmly from this part to ensure smooth and stable stitching during high-speed operation.
2. **Shaft:** The shaft is the long, thin part below the shank. It moves up and down to push the needle through the fabric. The thickness of the shaft depends on the needle size. Thicker shafts are used for heavy fabrics and thick threads, while thinner shafts are for delicate fabrics and fine threads.
3. **Groove:** A narrow groove runs down the front of the shaft. This groove guides the top thread smoothly down to the eye and protects it from friction. A properly shaped groove helps reduce thread breaks.
4. **Scarf:** The scarf is a small dip or notch at the back of the needle, just above the eye. It allows the hook inside the machine to catch the thread easily and form a clean stitch. A good scarf helps prevent skipped stitches.
5. **Eye:** The eye is the small hole near the bottom of the needle through which the thread passes. Embroidery needles have a larger and smoother eye than regular sewing needles. This helps the thread pass through more easily, reducing the chances of fraying or breaking, especially at high speeds.
6. **Point (Tip):** The point is the sharp part of the needle that enters the fabric. Different types of points are used for different materials.

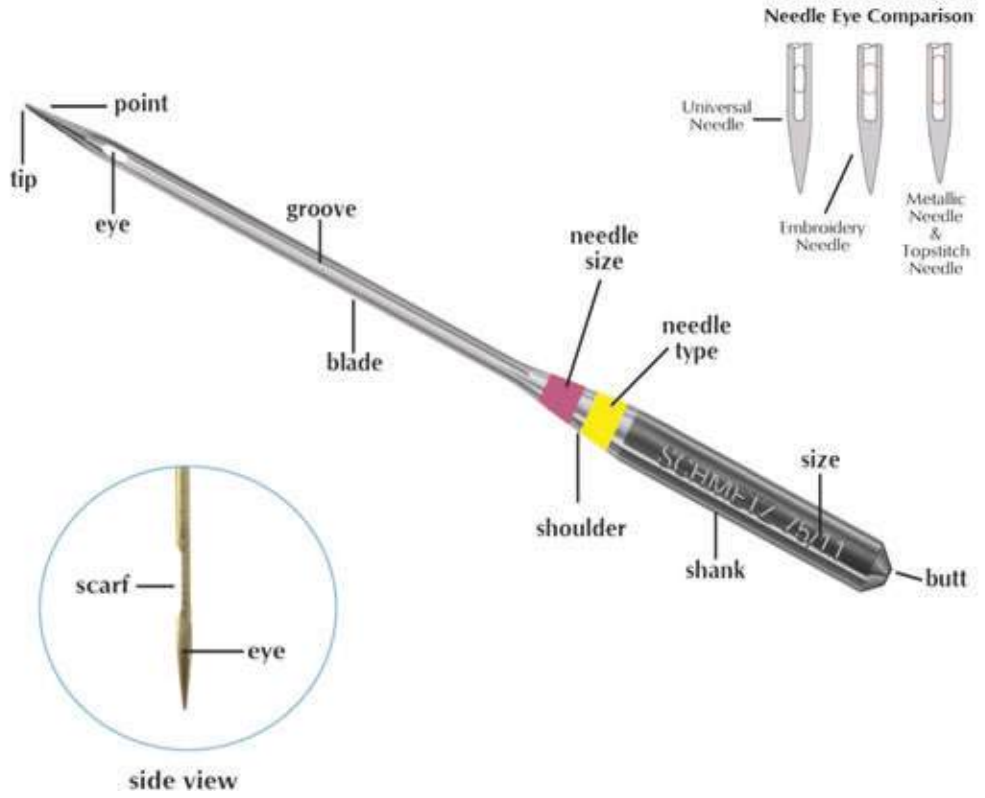



*Fig. 2.1.29: Parts of an embroidery needle*

**Some of the common types of needles for machine embroidery are:**

| Point Type | Characteristics | Best For | Caution |
|---|---|---|---|
| **Sharp Point** (R, RG, Microtex) | Very sharp and precise tip | Tightly woven fabrics like **denim, twill, poplin, canvas,** or for **small lettering** | Not suitable for knits – may damage the fabric. |
| **Ballpoint** (SES, SUK, Stretch) | Rounded tip | Knit or stretch fabrics like **jersey, fleece, t-shirts** | Not ideal for tightly woven fabrics – may bend or skip stitches |
| Universal | Slightly rounded tip (between sharp and ballpoint) | Works for many **woven and light knit fabrics** | Not the best for detailed embroidery – better to use specialised needles |

*Table 2.1.2: Types of needles*

**Specialty Needles – For Specific Threads or Materials**

| Needle Type | Characteristics | Use |
|---|---|---|
| **Metallic Needle** | Extra-large eye and smooth coating (e.g., Teflon) | Use with metallic threads, which are fragile and prone to shredding |
| **Jeans/Denim Needle** | Strong shaft and sharp point | Embroidering on heavy fabrics like jeans, canvas, and bags |

| Needle Type | Characteristics | Use |
|---|---|---|
| **Leather Needle** | Wedge-shaped (chisel point) | Cuts through leather and vinyl without tearing – creates clean holes |
| **Topstitch Needle** | Extra-large eye and deep groove | Ideal when using thick threads or multiple strands |
| **Titanium-Coated Needle** | Gold-coloured, very strong and heat-resistant | Use for dense designs, tough fabrics, or when using sticky stabilisers – lasts much longer. |

*Fig 2.1.3: Specialty needles*

## 2.1.5 Stabilisers

Stabilisers are materials used to support fabric during the embroidery process. Their main purpose is to prevent the fabric from shifting, stretching, or puckering while the needle stitches through it. Without a stabiliser, the design may become misaligned, distorted, or messy. Depending on the type of fabric and complexity of the design, different stabilisers are used. The three main types of stabilisers used in machine embroidery are tear-away, cut-away, and water-soluble.

*Fig. 2.1.30: Stabilisers used in machine embroidery*

**Tear-away stabilisers** are made from a paper-like material that is placed underneath the fabric before stitching. They are ideal for stable, non-stretch fabrics such as cotton, denim, or canvas. After embroidery, the excess stabiliser is gently torn away from the back of the design.

Tear-away stabilisers are quick and easy to use, especially for simple or low-density designs. However, they are not suitable for stretchy or delicate fabrics, as they may tear or cause distortion if not handled carefully.


*Fig. 2.1.31: Tear-away stabiliser*

**Cut-away stabilisers** offer stronger and longer-lasting support compared to tear-away types. These are non-woven fabric-like sheets that are also placed under the material before embroidery begins. Once stitching is complete, the excess stabiliser is carefully trimmed with scissors, but a portion remains on the back of the fabric permanently.

Cut-away stabilisers are best suited for knit, stretchy, or delicate fabrics, such as jersey, t-shirts, or infant wear, where stability is crucial to prevent fabric distortion. They are especially useful when working with complex or dense embroidery patterns.

*Fig. 2.1.32: Cut-away embroidery stabilisers*

**Water-soluble stabilisers** are a special kind of stabiliser that dissolves completely in water. They can be used under the fabric for support or on top of textured fabrics such as towels or velvet to prevent stitches from sinking into the pile. It is commonly used for embroidery on sheer fabrics, such as organza and tulle, or when creating free-standing lace designs. After stitching, the stabiliser is removed by rinsing or soaking the fabric in warm water. These stabilisers leave no residue, making them ideal for decorative or delicate projects, though they require careful storage to avoid accidental exposure to moisture.

Each stabiliser plays a vital role in ensuring a clean and professional finish in embroidery. Choosing the right stabiliser based on fabric type and design complexity is essential for achieving high-quality results.


*Fig. 2.1.33: Water-soluble stabiliser*

## 2.1.6 Other Accessories Used in Embroidery

Several important accessories are used along with the embroidery machine to help create clean, neat, and beautiful designs. These tools not only support the embroidery process but also ensure the quality and safety of the work.

| Accessory | Purpose / Use | Image |
|---|---|---|
| **Frames / Hoops** | Hold the fabric tightly so it doesn't move during stitching. |  |
| **Scissors** | Cut threads neatly and close to the fabric without damaging the design. |  |
| **Measuring Tape / Ruler** | Measure and mark the correct placement of embroidery designs |  |
| **Marking Tools** | Draw design outlines on fabric using chalk or fabric pens before stitching. |  |
| **Bobbin and Bobbin Case** | The bobbin is a small spool that holds the bobbin thread, also known as the under thread.<br>The bobbin case holds the bobbin and is inserted into the machine's hook system. |  |

| Accessory | Purpose / Use | Image |
|---|---|---|
| **Thread Stand** | Hold and manage embroidery threads smoothly during machine operation. |  |

*Table 2.1.4: Accessories used for embroidery*

## 2.1.7 Relationship between Thread, Needle, and Cloth in Embroidery

The **thread, needle,** and **cloth** must match each other to get neat and strong embroidery. These three work together like a team. If one is not right, the embroidery can go wrong, with thread breaks, skipped stitches, or damage to the fabric.

### Thread and Needle

The thickness of the thread must match the size of the needle. A thick thread needs a needle with a larger eye and deeper groove so the thread can pass smoothly without breaking. A thin thread works better with a smaller needle.

- If the needle is too small for a thick thread, it will cause thread shredding or breaks.
- If the needle is too large for a thin thread, the stitches may be loose or the fabric may get damaged.

### Needle and Cloth

Different fabrics need different needle types and sizes.

- Sharp-point needles are best for hard or woven fabrics like denim or canvas.
- Ballpoint needles are better for soft or stretchable fabrics like T-shirts or jerseys.
- A heavy fabric needs a thicker needle to pass through smoothly.
- A thin or delicate fabric needs a fine needle to avoid tearing or puckering.

Using the wrong needle for a fabric can cause holes, skipped stitches, or fabric damage.

### Thread and Cloth

The thread type and thickness should suit the fabric type.

- For light fabrics, use fine threads like 60 wt or 40 wt for clean and soft stitches.
- For thick or heavy fabrics, use stronger threads like 30 wt or polyester threads that can handle the material.
- Shiny threads (like rayon or trilobal polyester) work well for decorative stitching on smooth cloth.
- Strong threads (like regular polyester) are better for items that need to be washed or used often.

If the thread is too heavy for the fabric, it may cause puckering or stiffness. If too light, the stitches may not be visible enough or may wear out quickly.

| Cloth Type | Recommended Needle Type & Size | Recommended Thread Type & Thickness | Why This Match Works |
|---|---|---|---|
| **Thin Fabric (e.g., voile, chiffon)** | Fine needle (Size 65/9 or 70/10) with sharp point | Fine thread (60 wt rayon or polyester) | Prevents holes and puckering; gives soft, clean stitches |
| **Medium Fabric (e.g., cotton, poplin)** | Medium needle (Size 75/11 or 80/12) sharp or ballpoint | Standard embroidery thread (40 wt rayon or polyester) | Balanced needle and thread for good stitch quality and fabric handling |
| **Stretch/Knit Fabric (e.g., jersey, T-shirts)** | Ballpoint needle (Size 75/11 or 80/12) | Polyester thread (40 wt or soft thread) | Ballpoint slides between yarns; avoids holes and skipped stitches |
| **Heavy fabric (e.g., denim, canvas)** | Strong needle (Size 90/14 or 100/16) with sharp point | Thick thread (30 wt polyester or cotton) | Strong thread and needle penetrate thick fabric easily, giving bold stitches. |
| **Delicate fabric (e.g., silk, satin)** | Fine needle (Size 65/9) with sharp point | Smooth thread (rayon or silk, 60 wt or 40 wt) | Prevents damage to fine fabric and gives a clean finish |
| **High-Wear Items (e.g., bags, uniforms)** | Medium to heavy needle (Size 80/12 – 100/16) | Strong polyester or trilobal polyester thread (30–40 wt) | Durable thread and strong needle resist breaking during heavy use and frequent washing |

*Table 2.1.5: Relationship between thread, needle, and cloth*

## 2.1.8 Problems with Different Types of Materials

Here are some of the common problems that embroidery machine operators may face when working on different types of materials:

| Fabric Type | Common Problems | Reason | Suggested Solution |
|---|---|---|---|
| **Thin/Lightweight Fabrics (e.g., chiffon, organza)** | Puckering, fabric gathers | Fabric too delicate for dense stitching | Use water-soluble/cut-away stabiliser; reduce stitch density |
| **Stretchy Fabrics (e.g., t-shirt, Lycra)** | Design distortion, stretching | Fabric moves during embroidery | Use a ballpoint needle, cut-away stabiliser, and hoop tightly |
| **Heavy/Thick Fabrics (e.g., denim, canvas)** | Needle breaks, thread shredding | The needle struggles to penetrate thick fabric | Use a larger needle, strong thread (e.g., polyester), and slow speed |
| **Slippery Fabrics (e.g., satin, silk)** | Fabric shifting, misaligned design | Fabric slides in the hoop | Use adhesive or tear-away stabiliser, and hoop tightly |
| **Terrycloth/Towels** | Stitches sink, design unclear | Looped surface covers stitches | Use a water-soluble topping during embroidery |

| Fabric Type | Common Problems | Reason | Suggested Solution |
|---|---|---|---|
| **Knitted Fabrics (e.g., sweaters)** | Thread pulling, stretching | Loose knit moves under the needle | Use ballpoint needle, cut-away stabiliser, slow speed |
| **Velvet/Pile Fabrics** | Sinking stitches, damaged fabric surface | The pile is too thick or soft | Use a water-soluble topping, a low-pressure needle |
| **Waterproof/ Coated Fabrics (e.g., raincoats)** | Visible holes, cracking fabric | The coated surface doesn't recover from needle puncture | Use a fine needle, low-density design |
| **Sheer/Transparent Fabrics (e.g., net, mesh)** | Fabric tears, loose stitches | Not enough support for stitches | Use a strong water-soluble stabiliser, light stitch design |
| **Quilted/Multi-layer Fabrics** | Misaligned design, needle deflection | Layers shift or resist the needle | Use a sharp needle, stabilise layers before embroidery |

*Table 2.1.6: Common problems encountered with different types of materials*

*Fig. 2.1.34: Fabric damaged during machine embroidery*

## 2.1.9 Types of Embroidery

There are many styles of embroidery used in India and around the world. Each style has its own look, design, and method. Here are some popular embroidery styles:

**Zardozi:** This is a rich and heavy embroidery done with gold or silver thread. It is used on wedding dresses, sherwanis, and festive clothes.

*Fig. 2.1.35: Banaras zardozi*

**Chikankari:** A soft and delicate style from Lucknow. It is usually done with white thread on light fabrics like cotton or georgette.

*Fig. 2.1.36: Lucknow chikankari*

**Kantha:** A simple hand embroidery from West Bengal, using running stitches. It is mostly done on sarees, dupattas, and bedsheets.

*Fig. 2.1.37: Kantha embroidery of Bengal*

**Phulkari:** A colourful embroidery from Punjab. It uses bright threads and makes beautiful floral patterns on shawls and suits.

*Fig. 2.1.38: Phulkari embroidery from Punjab*

**Mirror Work (Shisha):** This style uses small mirrors with thread embroidery. It is popular in Gujarat and Rajasthan and is used on blouses, kurtis, and bags.

*Fig. 2.1.39: Shisha embroidery*

- **Aari Work:** This embroidery is done using a hooked needle called "aari." It creates fine, chain-like stitches and is often used for bridal and party wear.

*Fig. 2.1.40: Aari's work*

- **Computer/Machine Embroidery:** This is done using embroidery machines. The design is made on a computer and stitched neatly on the fabric by the machine. It is fast and used for making large quantities.

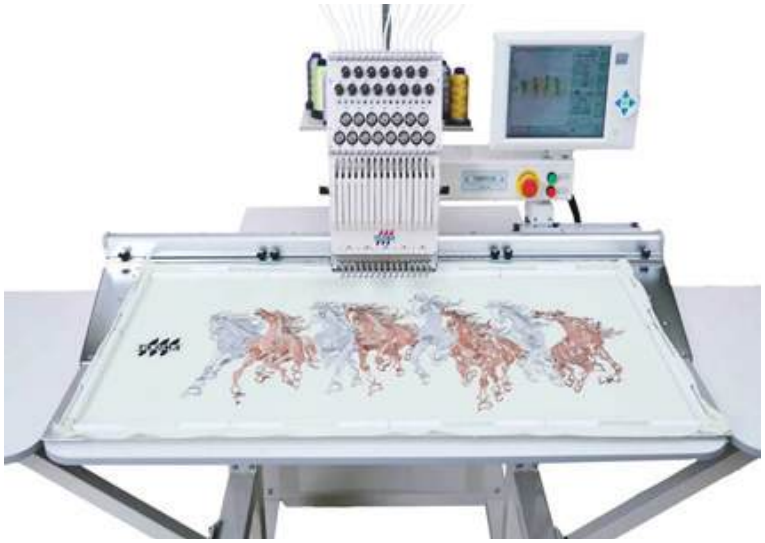


*Fig. 2.1.41: Computer/machine embroidery*

## 2.1.10 Types of Embroidery Techniques and their Stitch Types

Different embroidery techniques are used for different looks, textures, and purposes. Each technique uses specific stitch types that help create clean, strong, and beautiful embroidery.

1. **Satin Stitch Embroidery**

   This technique is used to create smooth, shiny, and raised designs. It is perfect for stitching letters, small logos, and borders. The thread is placed closely in a zig-zag pattern, known as the satin stitch. This type of stitch gives the embroidery a clean and polished look.


*Fig. 2.1.42: Satin stitch*

2. **Fill Stitch Embroidery**

   Fill stitch is used when a large area needs to be covered with thread. It is great for big designs, solid shapes, or logos. The common stitch types used in fill embroidery are tatami stitch, brick stitch, and random fill stitch. These stitches are repeated in patterns to cover the fabric evenly without making it too thick.

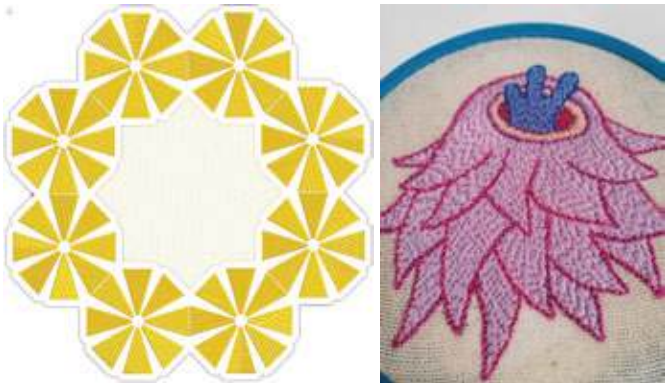


*Fig. 2.1.43: Tatami stitch and Brick stitch filling*

3. **Running Stitch Embroidery**

   A running stitch is a simple technique that uses small, straight stitches placed one after another. It is primarily used for outlining a design or creating sketch-style embroidery. Variations like bean stitch or triple stitch are used when stronger or more visible outlines are needed.

*Fig. 2.1.44: Bean stitch*

**4. Appliqué Embroidery**

Appliqué involves stitching fabric pieces onto a base fabric to make a design. This technique saves thread and gives a textured look. Common stitches used in appliqué include the straight stitch, zig-zag stitch, and satin stitch, which hold the fabric edges firmly and create a neat design.

*Fig. 2.1.45: Appliqué embroidery*

**5. 3D Puff Embroidery**

This embroidery technique creates a raised or three-dimensional effect using foam under the stitches. It is often used for caps and bold lettering. A wide and dense satin stitch is used to cover the foam completely, creating a bold, puffy design.

*Fig. 2.1.46: 3D puff embroidery*

**6. Chenille Embroidery**

Chenille gives a soft, looped texture and is often seen on school jackets or sweatshirts. It uses chain stitch or loop stitch, giving a fluffy and velvet-like finish. Special chenille machines are used for this style.

*Fig. 2.1.47: Chenille embroidery*

**7. Chain Stitch Embroidery**

Chain stitch creates a series of looped stitches that look like chains. It is decorative and works well for borders and artistic patterns. This stitch adds a handmade look to the embroidery and can be done by specialised machines.

*Fig. 2.1.48: Chain stitch*

**8. Sequin or Bead Embroidery**

In this technique, shiny sequins or beads are added to the fabric to create sparkle and texture. The thread locks the sequins in place using a lock stitch or zig-zag stitch. This type of embroidery is common in fashion or festive clothing.

*Fig. 2.1.49: Sequin embroidery*

**9. Cross-Stitch Embroidery**

This traditional technique uses X-shaped stitches to make designs. It looks like a net or grid pattern and is often used for pictures, alphabets, or borders. Some modern embroidery machines can do this using digital designs.

*Fig. 2.1.49: Cross-stitch machine embroidery*

**10. Free-Motion Embroidery**

In free-motion embroidery, the operator moves the fabric freely under the needle, like drawing with thread. It uses mostly straight stitches and allows for creativity. This technique requires good control and practice.

## 2.1.11 Common Factors Affecting Stitching and Embroidery

There are various factors that affect the stitching and embroidery. The most common of them are listed below:

| | |
|---|---|
| **Thread Quality** | If the thread is weak, old, or low-quality, it can break easily or cause uneven stitches. Always use good quality thread for smooth embroidery. |
| **Needle Type and Condition** | The wrong type of needle or a blunt needle can damage the fabric, break the thread, or miss stitches. The needle should match the thread and fabric being used. Change needles regularly. |
| **Fabric Type** | Different fabrics behave differently during embroidery. Stretchy, slippery, or very thin fabrics may cause puckering or poor stitch quality. Use the correct stabilizer to support the fabric. |
| **Stabilizer Use** | Without the right stabilizer, the fabric can move or stretch, leading to uneven stitches or design shifting. Choose tear-away, cut-away, or water-soluble stabilizer as per fabric type. |
| **Thread Tension** | If the tension is too tight or too loose, the stitches will not form properly. It may cause looping, thread breakage, or uneven stitch quality. Adjust the tension carefully for each fabric and thread. |

| | |
|---|---|
| **Machine Speed** | Running the machine too fast can cause skipped stitches or thread breaks, especially on detailed designs. A steady speed gives better control and stitch quality. |
| **Design Quality (Digitizing)** | Poorly digitized designs can lead to broken threads, thick stitching, or gaps. Good design files are made by professionals and are balanced for machine use. |
| **Hooping (Frame Setting)** | If the fabric is not hooped tightly and evenly, it may move during stitching. This causes the design to shift or distort. Always hoop the fabric firmly. |
| **Bobbin and Bobbin Tension** | A wrongly wound bobbin or incorrect bobbin tension can cause thread bunching or broken stitches. Always check the bobbin thread and case regularly. |
| **Lint or Dirt in Machine** | Dust, thread bits, or lint can block the needle area or thread path. This causes thread breakage and poor stitching. Clean the machine often. |
| **Wrong Needle Size** | A needle that's too thick or too thin for the thread and fabric will not stitch correctly. Use the right size needle as per thread thickness and fabric type. |
| **Poor Maintenance** | Lack of oiling, cleaning, or regular check-ups can cause the machine to run rough, skip stitches, or stop suddenly. Keep the machine in good condition. |

*Fig. 2.1.50: Factors affecting stitching and embroidery*

## 2.1.12 Selecting Tools and Materials as per the Embroidery Design

Selecting tools and materials as per design helps avoid thread breaks, skipped stitches, and fabric damage. Here is a step-by-step approach:

**Step 1:** Understand the Design Specifications

Before starting any embroidery work, the operator must carefully inspect the design. This includes the size of the design, the type of stitches used (such as satin, fill, or zig-zag), the number of colour changes, and the type of fabric to be embroidered. Knowing whether the design is light or heavy helps decide what tools and materials are best for the job.

**Step 2:** Choose the Right Fabric

The fabric should match the design's weight and type. Light designs work well on soft fabrics, such as cotton or polyester. Heavy or dense designs require strong fabrics, like denim or canvas. If the fabric is stretchy, like jersey or knit, the operator should be extra careful and use suitable tools to avoid puckering.

**Step 3:** Select the Suitable Needle

The needle size and type depend on the fabric and thread used. Thin needles, such as size 65/9, are suitable for fine fabrics. Medium sizes like 75/11 work for general embroidery. Thick needles, such as 90/14, are used for working with heavy materials. For woven fabrics, sharp-point needles are best. For stretchable or knit fabrics, ballpoint needles should be used.

**Step 4:** Pick the Correct Thread

The operator must choose the right thread based on the design and fabric. Rayon thread gives a shiny finish, while polyester is strong and colourfast. Cotton thread has a soft look, and metallic thread adds decoration. The thickness of the thread, like 40wt or 30wt, should match the needle and design details.

**Step 5:** Use the Right Stabiliser

A stabiliser supports the fabric while stitching. For thin fabrics, tear-away or cut-away stabilisers are useful. For transparent or delicate fabrics, water-soluble stabilisers are best. Stretchy or thick fabrics may need two layers of stabiliser to keep the design in place and prevent shifting.

**Step 6:** Frame or Hoop the Fabric Properly

The hoop should be the correct size for the design. The operator must make sure the fabric is tightly and evenly hooped, without wrinkles or slack. A properly hooped fabric helps in clean stitching and reduces errors during embroidery.

**Step 7:** Match the Bobbin Thread and Adjust Tension

Use a lighter-weight bobbin thread to get smooth stitching on the back. The operator should check and adjust the machine tension according to the type of fabric and thread. Proper tension helps in forming neat and balanced stitches.

**Step 8:** Keep Accessories Ready

The operator should keep small scissors, thread stands, a measuring tape, and fabric chalk nearby. These tools facilitate cutting, marking the fabric, and managing the thread smoothly during the embroidery process.

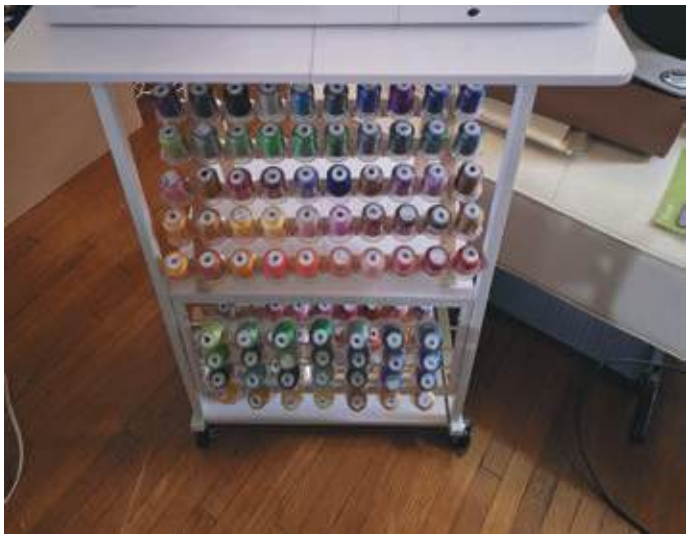


*Fig. 2.1.51: Thread stand*

# UNIT 2.2: Operating the Embroidery Machine

## Unit Objectives

**By the end of this unit, the participants will be able to:**

1. Identify the various attachments used in embroidery machines and their corresponding functions.
2. Demonstrate how to set up the embroidery machine correctly according to the given design requirements.
3. Operate the embroidery machine to create various embroidery designs and patterns.
4. Perform basic decorative stitch techniques using the embroidery machine.
5. Perform basic decorative stitch techniques (dotted stitch, round stitch) using the embroidery machine.
6. Create round leaf designs using the appropriate embroidery technique.
7. Carry out specialised embroidery techniques such as cut work and appliqué using an embroidery machine.
8. Perform embellishment-based embroidery, such as mirror work and Dori work, with precision.
9. Identify and apply suitable colour combinations as per the design.
10. List the elements of zig-zag machine embroidery.
11. Demonstrate how to adjust the top tension in the embroidery machine.
12. Detect common defects or errors in the embroidered product and take corrective actions.
13. Conduct operations at a rate that maintains workflow continuity.
14. Identify if the embroidery does not meet product specifications and take corrective action.

## 2.2.1 Introduction to Embroidery Machines

An embroidery machine is a specialised type of sewing machine designed to create decorative patterns and designs on fabric using threads. Unlike regular sewing machines, which are primarily used for stitching seams or joining fabric pieces, embroidery machines are designed to decorate clothing, fabrics, and other textile products with logos, floral patterns, monograms, or custom artwork.

*Fig. 2.2.1: Double-head and single-head embroidery machine*

In industrial settings, commercial or computerised embroidery machines are used. These machines are fast and can stitch complex designs with great accuracy. They are programmed using special embroidery software and can run continuously for large production work.


*Fig. 2.2.2: Industrial embroidery machine (multiple heads)*

These machines utilise various types of needles, threads, stabilisers, and hoops, depending on the fabric and design. They can stitch in many directions and perform special stitch types like satin, fill, and zig-zag stitches.

Here is a table showing the common parts of an embroidery machine and their functions:

| Components | Function |
|---|---|
| **Head** | The main part where needles, thread, and stitching happen. |
| **Needle Bar** | Holds the needle and moves it up and down to stitch. |
| **Thread Tension Discs** | Control the tightness or looseness of the thread. |
| **Presser Foot** | Presses the fabric down to keep it in place during the stitching process. |
| **Bobbin Case** | Holds the bobbin that supplies the lower thread. |
| **Thread Stand** | Holds the spools of thread used in the machine. |
| **Control Panel / Touch Screen** | Allows the operator to select and manage designs and settings. |
| **Hoop / Frame** | Holds the fabric tightly in place while the machine embroiders. |
| **Pantograph / Frame Rail** | Moves the hoop left, right, forward, and backward as per the design path. |
| **Hook Assembly** | Helps form the stitch by catching the top thread and looping it with the bobbin. |
| **Trimmer** | Automatically cuts thread after stitching is complete. |
| **Take-Up Lever** | Pulls the thread back after a stitch is made to avoid slack. |
| **Motor** | Powers the machine to run all mechanical movements. |

| Components | Function |
|---|---|
| **Sensors** | Detect thread breaks, errors, and positioning problems. |
| **Oil Reservoir** | Holds oil to lubricate the machine's moving parts. |
| **Thread Guides** | Direct the thread smoothly from the spool to the needle. |
| **Embroidery Arm** | Moves the hoop during embroidery to follow the design pattern. |
| **Light** | Illuminates the stitching area for better visibility. |
| **Emergency Stop Button** | Stops the machine immediately in the event of an error or emergency. |
| **USB Port / Design Input Port** | Loads embroidery designs from external devices or computers. |

*Table 2.2.2: Components of a commercial embroidery machine*

*Fig. 2.2.3: Head of an embroidery machine*

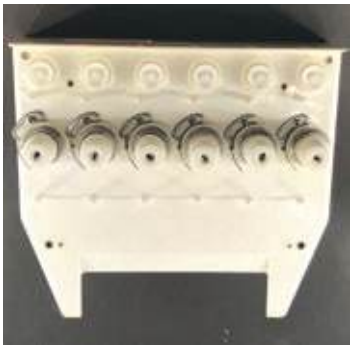


*Fig. 2.2.4: Tension box*

*Fig. 2.2.5: AC servo motor and driver*

*Fig. 2.2.6: Rotary hook*

*Fig. 2.2.7: Needle bar driver*

*Fig. 2.2.8: Needle bar*

*Fig: Embroidery machine circuit board (PCB)*

*Fig: Cam set*

*Fig: Embroidery machine control panel*

*Fig: Head frame*

Here is a list of various attachments used with commercial embroidery machines for different kinds of embroidery work:

| Attachment | Use / Function | Image |
|---|---|---|
| **Cap Frame Attachment** | Used for embroidering on caps and hats. Holds the curved surface tightly in place. |  |
| **Tubular Hoop** | Ideal for t-shirts, sweatshirts, and other tubular garments. Prevents hoop marks. |  |
| **Sequin Device** | Attaches sequins during embroidery. Used for decorative and fashion embroidery. |  |

| Attachment | Use / Function | Image |
|---|---|---|
| **Boring Device** | Used for cutwork embroidery. It cuts small holes and stitches around them. |  |
| **Chenille Attachment** | Used to produce chenille embroidery, giving a fluffy, looped texture. |  |
| **Taping Device** | Applies flat tape/ribbon to fabric and stitches it in place for a decorative effect. |  |
| **Laser Positioning Tool** | Helps accurately align the start point of the embroidery design. |  |

| Attachment | Use / Function | Image |
|---|---|---|
| **Clamping Frame Attachment** | Used for shoes, bags, and thick or irregular-shaped items. Holds without hooping. |  |
| **Foam / 3D Puff Cap Attachment** | Helps stitch over foam for raised, 3D embroidery effects, especially on caps. |  |
| **Quilting Frame** | Used for quilting embroidery, where fabric, batting, and backing are stitched together. | |
| **Flat Frame** | Used for flat fabrics, such as towels, bed sheets, and panels. Offers stable embroidery. | |
| **Cord/Cording Attachment** | Feed cord or thick thread into the needle area for raised or textured effects. | |
| **Border Frame / Endless Hoop** | Used for continuous border designs on large fabrics like curtains or sarees. | |
| **Multi-Needle Head Attachment** | Allows multiple colours to be stitched without changing the thread manually. | |
| **Zig-Zag Attachment** | Adds the ability to perform zig-zag or decorative satin stitches. | |

*Table 2.2.3: Attachments of an embroidery machine*

## 2.2.2 Setting up an Embroidery Machine

Here is a step-by-step, detailed process for correctly setting up a commercial embroidery machine according to the design requirements. This helps in achieving clean and error-free embroidery output.

1. **Understand the Design Requirements**
   - Check the design file provided (usually in .DST, .PES, .EXP, etc. formats).
   - Confirm details such as:
     - Number of colours
     - Type of stitches (satin, fill, running stitch, etc.)
     - Size of the design
     - Placement on the garment/fabric (centre chest, cap front, sleeve, etc.)
   - Understand the fabric type and thread type suitable for the design.

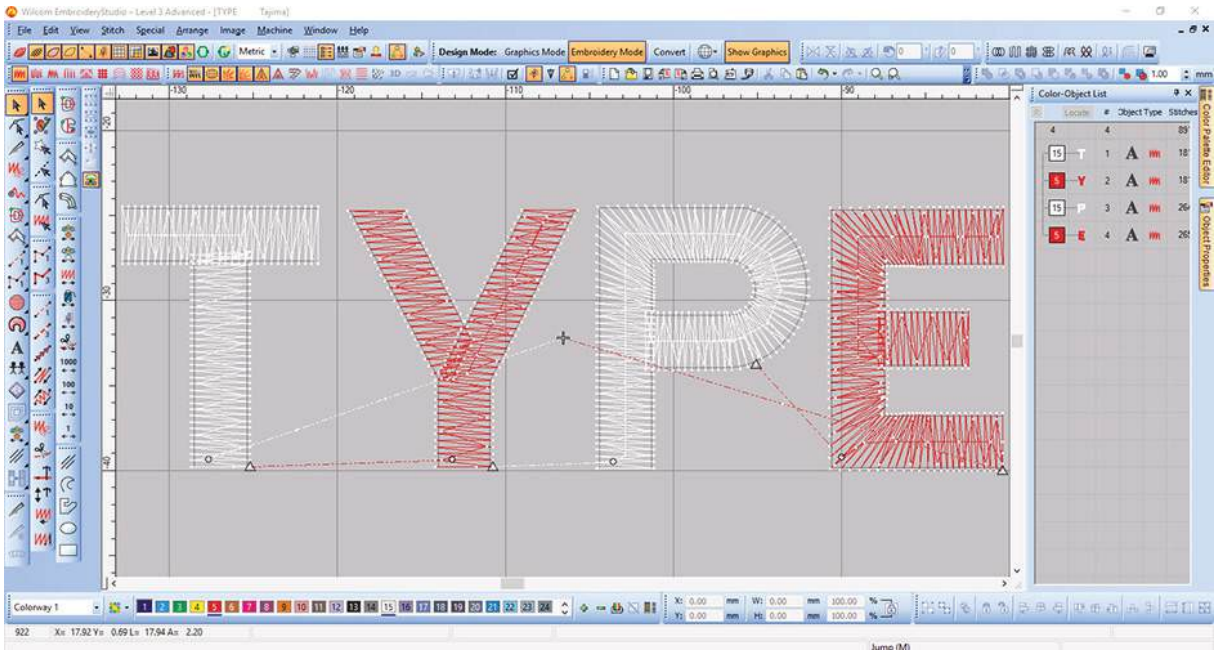



*Fig. 2.2.3: Digital embroidery file creation (software interface)*

## 2. Prepare the Design File

- Switch on the embroidery machine


*Fig. 2.2.4: On/Off switch on the embroidery machine*

- Load the design into the embroidery machine using a USB drive, a Computer/Laptop connection, or a Memory card (older models)

*Fig. 2.2.5: USB drive attached to the embroidery machine*

- Navigate options using the arrow keys.

*Fig. 2.2.6: Selecting design file*

- Select the desired design file on the Design Management screen.


*Fig. 2.2.7: Design management options*

- Open the design on the machine screen and check orientation, position, and scale.


*Fig. 2.2.8: Loading design*

- Set the start point (needle position) to the centre or a specific point, as specified in the design.


*Fig. 2.2.9: Selecting the starting point*

**3. Select Appropriate Hoops/Frames**

- Choose the right hoop or frame depending on the fabric and design size:
  - Small hoop for small designs
  - Large or border hoop for large designs
  - Cap frame for cap embroidery
  - Clamp frame for shoes, bags, and other items.

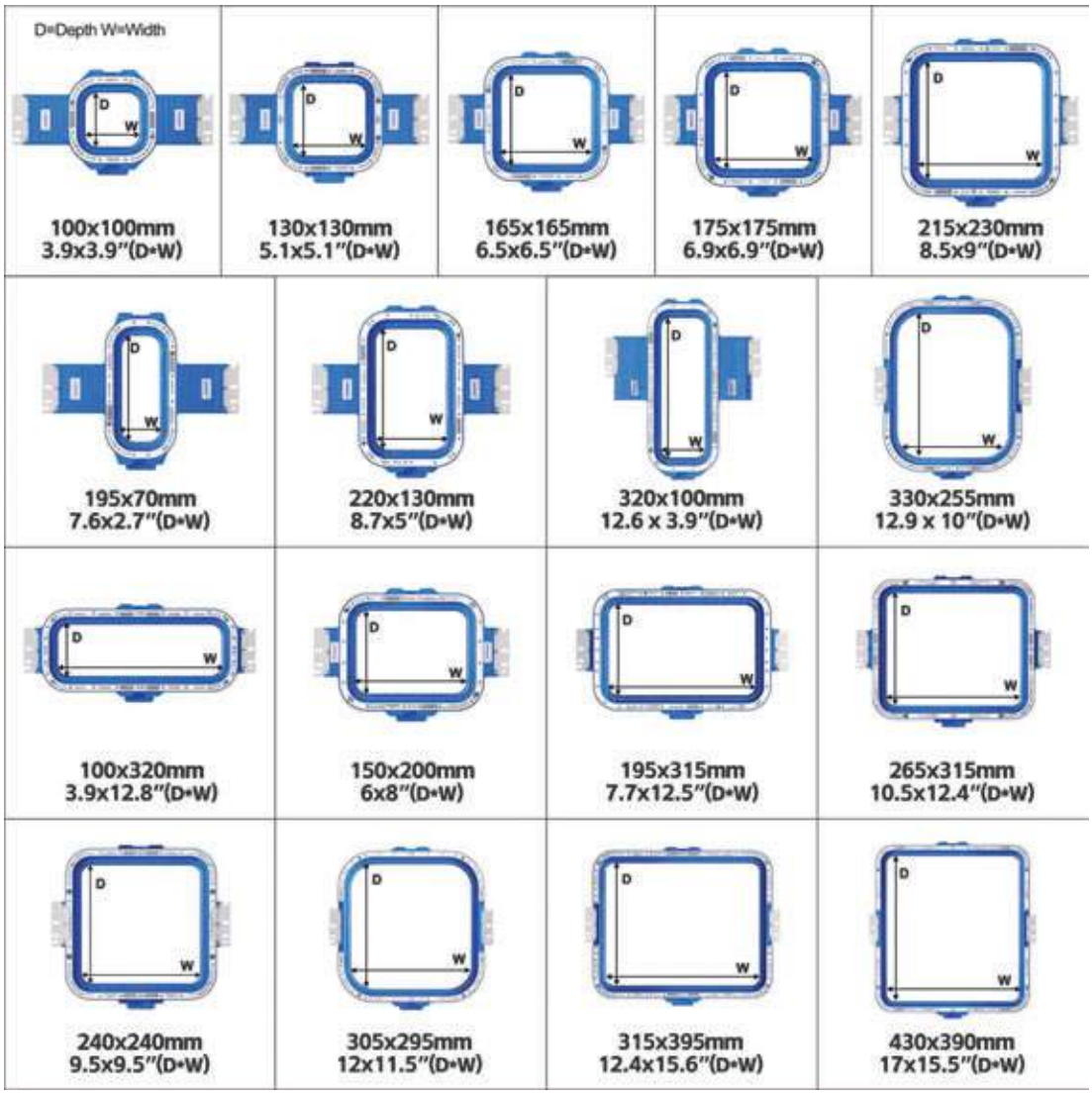



*Fig. 2.2.10: Different types of magnetic embroidery hoops*

- Make sure the fabric fits tightly in the hoop without wrinkles or slack.

*Fig. 2.2.11: Setting up fabric in the hoop*

**4. Stabilise the Fabric**

- Select and cut the correct stabiliser (based on fabric and design):
  - Tear-away for firm woven fabrics
  - Cut-away for stretch/knit fabrics
  - Water-soluble for delicate or sheer fabrics
- Place stabiliser under or ov0065r the fabric as needed.
- Hoop the fabric along with the stabiliser tightly and evenly. Make sure the fabric grain is straight.

**5. Load the Hoop into the Machine**

- Carefully insert the hooped fabric into the embroidery machine arm.

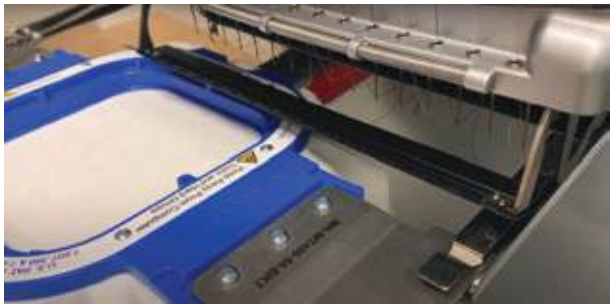


*Fig. 2.2.12: Loading hooped fabric into the embroidery machine arm*

- Lock it securely so it doesn't move during stitching.

*Fig. 2.2.13: Locking mechanism*

- Double-check alignment with a laser pointer or manual positioning tools.
- Perform a frame-out test (move the frame to ensure the needle won't hit the hoop during stitching).

**6. Thread the Machine**

- Match each colour section of the design with the correct thread cone.
- Thread the embroidery machine. Follow the steps below:

**Step 1:** Put the spool on the stand and pass the thread through the rack hole one by one

**Step 2:** Pass the thread through the thread tensioner

**Step 3:** Lift off the tension plate and pass the thread through the tensioner hole

**Step 4:** Pass the thread through the threading tube (using a threading tool)

**Step 5:** Pass the thread through the presser and tension knob

**Step 6:** Pass the thread through the thread clamp and inspection wheels

**Step 7:** Pass the thread through the presser and the protective cover


**Step 8:** Raise the spring bar

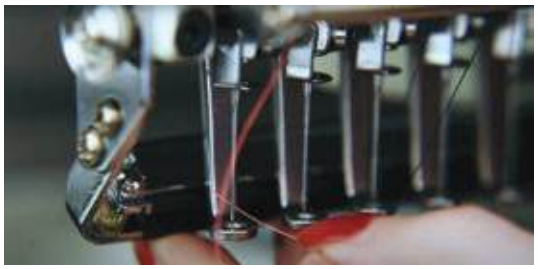
| | |
|---|---|
|  <br>**Step 9:** Pass the thread through the component's hole |  <br>**Step 10:** Restore the spring bar |
|  <br>**Step 11:** Take up the thread through the hole |  <br>**Step 12:** Pass the thread through the needle |
|  <br>**Step 13:** Pass the thread through the presser foot hole |  <br>**Step 14:** Fix the thread on the thread clamp |

*Table 2.2.4: Threading the embroidery machine*

**7. Insert Bobbin and Check Tension**

- Check for the bobbin. Follow the steps below to unload and load the bobbin:

| | |
|---|---|
|  <br>**Step 1:** Remove the bobbin cover |  <br>**Step 2:** Pull out the bobbin (along with the bobbin case) from its slot |

| | |
|---|---|
|  <br>**Step 3:** Take out the empty bobbin from the bobbin case |  <br>**Step 4:** Place a pre-wound bobbin or manually wound bobbin into the bobbin case |
|  <br>**Step 5:** Pass the extended thread through the tensioner on the bobbin case |  <br>**Step 6:** Insert the bobbin in the embroidery machine. |

*Table 2.2.5: Installing and replacing the bobbin*

- **Check Needle and Thread Compatibility**
  - Ensure the needle is not bent or dull.
  - Make sure the needle size matches the thread thickness.
  - Check that the needle eye is clean and smooth to prevent thread breaks.

*Fig. 2.2.14: Checking needle compatibility*

- **Set Machine Parameters**
  - Set the following based on design and material:
    - Speed (typically 600–900 stitches per minute for detailed work)
    - Stitch density and pull compensation
    - Thread trim settings
    - Jump stitch settings
  - Save settings under a design-specific name if your machine allows.


*Fig. 2.2.15: Adjusting machine parameters*

- **Do a Test Stitch**
  - Run the design on a scrap piece of the same fabric and stabiliser.
  - Observe:
    - Thread tension (top and bobbin)
    - Design accuracy and clarity
    - Any puckering, thread breaks, or missed stitches
  - Make any adjustments to speed, tension, or needle as needed.

**Note:** The steps may slightly vary for different makes and models of embroidery machines.

## 2.2.3 Operating the Embroidery Machine

Once the machine has been properly set up, it's time to begin stitching. The following are the steps:

1. **Load the Hooped Garment onto the Machine**

   Carefully place the hooped garment onto the machine's arms, making sure it locks securely into place. The fabric inside the hoop should be smooth, tight, and wrinkle-free. Check that no extra fabric is caught underneath the hoop. A properly mounted and secured hoop prevents movement during stitching, which is important for maintaining design accuracy.

2. **Perform a Design Trace**

   Use the machine's trace function to check if the design fits well within the hoop area. The needle will move around the edges of the design without stitching. This visual outline helps you confirm the design is correctly placed and centred. If needed, you can adjust the hoop or the design position to avoid mistakes before stitching begins.

3. **Set the Sewing Speed**

   Adjust the machine's speed according to the type of fabric and the level of detail in the design. Slower speeds are preferable for delicate fabrics or intricate patterns, as they help prevent issues such as puckering or thread breakage.

**Embroidery Machine Speed Settings by Fabric Type**

| Fabric Type | Recommended Speed (SPM) | Key Considerations | Tips |
|---|---|---|---|
| **Cotton & Polyester** | 600–800 | Durable; good for beginners. Watch thread tension and needle heat. | Test at 750 SPM on cotton T-shirts to check for puckering or snapping. |
| **Silk & Satin** | 400–600 | Delicate; prone to puckering. Use a fine needle, light thread, and stabiliser. | Slow to 450 SPM for smooth stitching on satin gowns. |
| **Denim & Canvas** | 700–900 | Thick; requires a strong needle/thread. Monitor for strain or skipped stitches. | Use a 90/14 needle at 850 SPM on denim jackets for clean results. |
| **Linen & Wool** | 500–700 | Linen wrinkles; wool resists fast stitching. Stabilise and adjust tension. | Set to 550 SPM on wool to avoid bunching and ensure quality. |
| **Leather & Vinyl** | 400–600 | Mistakes are permanent. Use a leather needle, long stitches, and a tear-away stabiliser. | Use 500 SPM for accurate stitching on leather handbags. |

*Table 2.2.6: Speed settings based on fabric*

*Fig. 2.2.15: Speed control option on the control panel*

4. **Start the Embroidery**

   Once everything is ready, press the start button to begin the embroidery process. The machine will stitch the design automatically, following the programmed colour sequence and changing threads if needed. You'll see the design come to life on the fabric as the machine works.

5. **Monitor the Embroidery Process**

   Keep an eye on the machine while it's stitching. Watch for signs of problems such as thread breaks, skipped stitches, bird nesting, or puckering. Many modern machines display real-time data, including stitch count, speed, and error alerts. If something goes wrong, stop the machine and fix the issue before continuing to avoid damage to the garment or the design.

## 2.2.4 Executing Dotted Stitch on an Embroidery Machine As per the Given Pattern

The dotted stitch (also called running stitch dots or single stitches placed apart) is used in embroidery to create light effects, texture, or small decorative spots. Here's how an embroidery machine operator can execute dotted stitches step-by-step:

**Step 1:** Load the Design with Dotted Stitch

Start by loading the embroidery design that includes dotted stitches. Use a USB drive, memory card, or the machine's internal system to upload the design. Verify on the screen that the correct design has been selected.

**Step 2:** Choose the Right Needle and Thread

Use a sharp embroidery needle, usually size 75/11 or 80/12, for accurate and clean stitching. Pair it with a standard 40-weight embroidery thread, either polyester or rayon, depending on the desired finish. Pick a thread colour that will show clearly against the fabric to make the dotted effect stand out.


*Fig. 2.2.16: 75/11 embroidery needle pack*

**Step 3:** Hoop the Fabric Properly

Place the fabric and a suitable stabiliser (cutaway or tearaway) into the embroidery hoop. Make sure the fabric is tight and smooth with no wrinkles or slack. Proper hooping is very important because any movement can make the dots appear misplaced or uneven. Attach the hoop firmly to the machine.

*Fig. 2.2.17: Hooping the fabric*

**Step 4:** Set Machine Parameters

Adjust your machine settings according to the fabric and stitch type. For dotted stitches, reduce the sewing speed to around 500–600 stitches per minute for better accuracy. Maintain medium thread tension to avoid pulling or looping.

If the machine has settings for stitch length, set it between 0.5 mm and 1.0 mm for sharp, clean dots. A stitch length of approx. 0.5 mm gives a clean dot effect. Avoid increasing the stitch length too much, or the stitch will no longer look like a dot. There's no need to manually adjust the stitch length on the machine if it's already defined in the design file.

Ensure the jump stitch trimming is enabled so the machine cuts threads when moving between distant dots. Set the jump trim threshold to around 3–4 mm to avoid unwanted thread trails. This means if the next stitch is more than 3 mm away, the machine will trim the thread between them. For stitches closer than 3 mm, the machine may not trim, as the jump is minimal and won't affect the design.

**Step 5:** Start Embroidery

Once everything is ready, start the machine. It will stitch each dot one by one as per the design. The machine may stop between each dot to jump to the next stitch point.

**Step 6:** Monitor the Process

Watch for thread breaks, missed stitches, or any fabric shifting. If jump threads are forming between dots, plan to trim them neatly after the embroidery is complete.

**Step 7:** Finishing

After the stitching is complete, remove the hoop from the machine and unhoop the fabric. Gently tear or cut away the stabiliser from the back. Use small embroidery scissors to trim any jump threads between the dots, especially if auto-trimming was not used.

## 2.2.5 Creating Round Leaf and Pointed Leaf Designs

**Creating Round Leaf Designs**

- **Select the Design:** Choose a digitised embroidery design file that has round leaf shapes. These usually have smooth, curved edges.
- **Choose Satin or Fill Stitch:** Round leaves often use satin stitch for narrow designs or fill stitch for wider leaves. Satin gives a smooth, shiny finish to curves.
- **Set Stitch Density:** Use medium stitch density (e.g., 0.4 mm) to get full coverage without stiffness. This helps the curves look smooth and natural.
- **Adjust Stitch Direction:** Use a curved stitch angle to follow the round shape of the leaf. This makes the embroidery look more natural and professional.
- **Test and Embroider:** Run a test on scrap fabric to ensure curves are smooth and there's no puckering. Adjust speed (around 600–700 spm) and tension as needed, then proceed with the final stitch-out.


*Fig. 2.2.18: Round leaf design*

**Creating Pointed Leaf Designs**

- **Select the Design:** Load a digitised file with pointed leaf shapes. These have sharp tips and defined angles.
- **Use Tapered Satin Stitch:** For narrow pointed leaves, tapered satin stitches work best—thicker in the centre and narrowing to a fine point at the tip.
- **Increase Stitch Angle Variation:** Use angled stitch directions that follow the natural direction of the leaf to maintain sharp and clean edges.
- **Adjust Pull Compensation:** Apply pull compensation (e.g., 0.2–0.3 mm) to prevent gaps at the tips, as stitches may pull in during embroidery.
- **Slow Down the Machine:** Run the machine at a slower speed (around 500–600 spm) to improve accuracy around sharp points and avoid missed stitches or breakage.

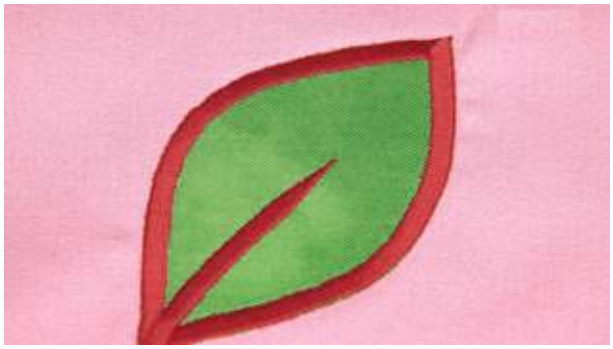


*Fig. 2.2.19: Pointed leaf*

## 2.2.6 Carry Out Round Stitch Embroidery

The first step in using an industrial embroidery machine for round stitch embroidery is to load the appropriate digital design that has circular features. Make sure the fabric is hooped securely and that the appropriate needle and thread are chosen according to the pattern and material. Round areas usually require **satin stitches** for small shapes or **fill stitches** for larger circles.

Adjust machine settings like stitch density, pull compensation, thread tension, and speed for clean and smooth stitching. Use the trace function to check placement and ensure the design fits within the hoop area before starting.

Once everything is set, press the start button to begin stitching. Watch the machine carefully as it works, checking for thread breaks or fabric puckering. The machine will follow the design to complete the round areas with even and continuous stitching. After completion, remove the hoop, trim any excess threads, and inspect the round stitch area for accuracy and smoothness. This process ensures neat and professional-looking round stitch embroidery.

**Recommended Machine Settings for Round Stitch Embroidery:**

1. **Stitch Density**
   - Set between 0.40 and 0.45 mm (for satin stitches).
   - For fill stitches, 0.30 to 0.40 mm.
   - Lower density (higher number) for light fabrics, higher density (lower number) for thicker fabrics or bold designs.
2. **Pull Compensation**
   - Set to 0.1 to 0.2 mm or 5–10% of column width.
   - This helps prevent distortion or narrowing of round shapes, especially on stretchy or thick fabrics.
3. **Top Thread Tension**
   - Should be balanced – not too tight or too loose.
   - Start with a medium tension setting, and adjust until the bobbin thread is slightly visible on the backside but not pulled to the top.
4. **Sewing Speed**
   - Set to 600–700 stitches per minute for precise and clean round shapes.
   - Use lower speeds for detailed or small round elements to avoid errors.

## 2.2.7 Performing Cutwork Embroidery Using the Embroidery Machine

Cutwork embroidery combines beautiful stitching with fabric cut-outs to create elegant, lace-like designs. It requires both precision and care while using an embroidery machine. Below is a step-by-step guide to perform cutwork embroidery accurately:

**Step 1:** Prepare the Fabric and Stabiliser

Select the fabric required by the design and attach a water-soluble or heat-away stabiliser underneath. This will support the fabric during cutting and stitching. Hoop the fabric firmly so it remains tight and flat.

**Step 2:** Load the Design and Select the Cutwork Pattern

Load the digitised cutwork design into the embroidery machine. Make sure the design has been digitised specifically for cutwork, where cutting areas and stitching steps are clearly separated.

**Step 3:** Stitch the Placement Line

Start the machine to stitch the placement line—this outlines where the cutwork will happen. Once done, stop the machine.

**Step 4:** Cut Inside the Placement Area

- Remove the hoop (without unhooping the fabric) and carefully cut away the inner fabric within the stitched placement lines.
- Use a solder iron or small, sharp scissors, depending on the fabric material. Be careful not to cut through the stabiliser or the stitches.

**Step 5:** Return the Hoop and Stitch the Design

Place the hoop back into the machine. Start the next steps of stitching—the machine will now sew the satin or decorative edge stitches to finish the cut area, securing it cleanly.

**Step 6:** Complete the Embroidery

Let the machine finish the rest of the design. Once done, remove the hoop and gently take off the stabiliser (wash away or heat away as required).

**Step 7:** Final Touches

Trim any thread tails and inspect the cut areas. The final embroidery will have neat open spaces and secure borders as per the design.

*Fig. 2.2.20: Cutwork machine embroidery design*

## 2.2.8 Appliqué Work Using an Embroidery Machine

Appliqué embroidery is a popular method in industrial embroidery setups to add fabric patches onto a base fabric, reducing stitch density while giving a bold, textured design. It is highly efficient for bulk production, as industrial embroidery machines can automate most steps with precision.

Initially, the embroidery design must be digitised specifically for appliqué, including placement stitches, tack-down stitches, and border stitches (usually satin). Once the fabric is hooped and loaded onto the multi-head industrial embroidery machine, the operator runs the design. The machine at first stitches a placement outline.

*Fig. 2.2.21: Placement outline*

At this point, the operator places the pre-cut appliqué fabric over the outline. Many advanced factories use laser-cut appliqué shapes to save time and ensure accuracy.

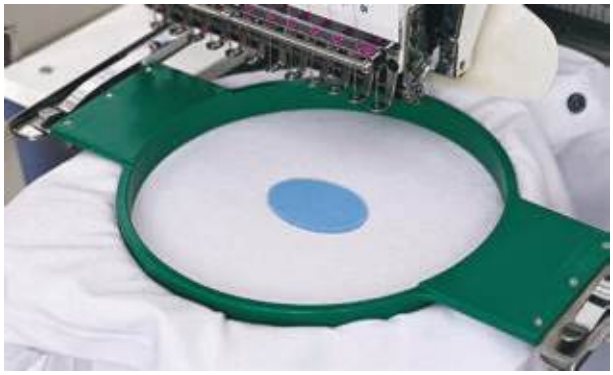


*Fig. 2.2.22: Placing pre-cut appliqué fabric*

The machine then sews a tack-down stitch to hold the appliqué fabric in place. If pre-cut fabric is not used, the operator can trim the excess fabric manually or with laser tools attached to the machine.

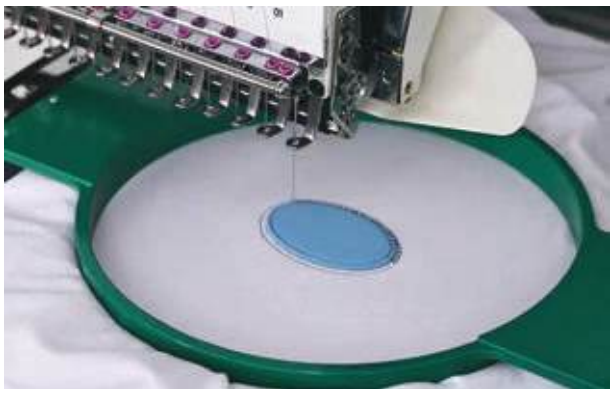


*Fig. 2.2.23: Stitching appliqué fibre*

Finally, the machine completes the border stitches—often satin or zigzag—to seal the appliqué edges and finish the design neatly. If using blank or plain appliqué fabric, the machine can also embroider decorative elements, text, or motifs directly onto the appliqué area as part of the design.

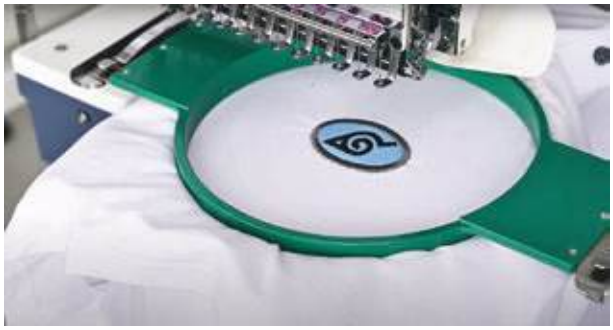


*Fig. 2.2.24: Final design*

In an industrial setting, the process is fast and highly repeatable. Machines with automatic thread trimming, multi-needle heads, colour-changing functions, and high-speed capability allow for consistent appliqué work across hundreds of pieces. This makes appliqué ideal for logos, emblems, uniforms, home textiles, and fashion garments in mass production.

## 2.2.9 Mirror Work Using an Embroidery Machine

Mirror work, also known as shisha embroidery, traditionally involves attaching small reflective mirrors to fabric for a decorative effect. In an industrial setting, mirror work can be done using an embroidery machine with pre-prepared mirror patches. This process is suitable for bulk production, especially in garments, home decor, and ethnic fashion.

To start the process, the operator must first mark the spots where the mirrors will be placed according to the design. Small round mirrors (plastic or glass) are used, and they should be clean and flat. The fabric is hooped tightly and correctly so the machine can stitch smoothly around the mirror.

A special embroidery file (digitised design) made for mirror work is loaded into the machine. This design includes a placement stitch, a tack-down stitch, and decorative stitches to hold the mirror. The embroidery machine first runs a small circular placement stitch on the fabric. This shows where the mirror needs to be placed. The operator places the mirror in the centre of this circle.

Next, the machine sews a tack-down stitch around the edge of the mirror to hold it in place. The operator must make sure the mirror doesn't move during this process. Some machines may require lowering the speed slightly for better control.


*Fig. 2.2.25: Mirror work using an embroidery machine*

Once the mirror is secured, the machine makes decorative stitches (like satin or zigzag stitches) over the edges of the mirror. These stitches cover the edges and give a neat finish. The operator should monitor the process to avoid needle breakage or thread issues.

The same steps are followed for each mirror in the design. The operator ensures correct mirror placement and smooth stitching for every piece.

## 2.2.10 Dori Work Embroidery

Dori work embroidery is a decorative technique where a thick cord or thread (called “dori”) is stitched onto fabric to form raised outlines or patterns. In commercial embroidery machines, this is done using a special attachment known as a couching foot or dori guide. This method is popular in traditional and designer embroidery for its bold and elegant appearance, and it is widely used in bulk production for garments and home decor.

At first, the embroidery machine operator prepares the fabric by hooping it tightly and attaching the dori guide to the machine. The design file made specifically for Dori's work is loaded into the machine. These designs are digitised to direct the needle to stitch over the cord, securing it to the fabric. The dori is carefully fed into the guide, and the starting point is secured with a small stitch or tape to prevent it from slipping.

Once everything is set up, the operator starts the embroidery machine at a moderate speed. The machine stitches over the dori using zig-zag or straight stitches, depending on the design. It’s important to monitor the process closely to ensure the cord lies flat and follows the design path accurately.

*Fig. 2.2.26: Dori's work embroidery*

Throughout the process, the operator checks that the dori feeds smoothly and that there are no loose sections or missed stitches. If the design requires layering or multiple dori lines, the steps are repeated for each new layer.

## 2.2.11 Identifying and Applying Suitable Colour Combinations

Using the right colour combinations is very important in embroidery work. Good colour matching makes the design look beautiful, balanced, and as per the customer's requirement. The embroidery machine operator must follow the colour details given in the design file or by the designer.

First, the embroidery machine operator should carefully check the embroidery design. Most designs come with a colour chart that tells which thread colour to use for each part. The operator should pick threads that match these colours closely. If exact matches are not available, similar shades can be chosen, keeping in mind the overall look of the design.

Next, the operator arranges the threads in the same order as shown in the design. It's important to check how the colours will look on the fabric being used. For example, dark colours show better on light fabric and light colours stand out on dark fabric. The operator should avoid using too many bright or dull colours together unless mentioned in the design.

*Fig. 2.2.27: Threads of different colours*

**Some basic colour tips can help:**

- Red and gold look rich and festive.
- Blue and silver give a cool and calm feel.
- Green with pink or orange looks vibrant and traditional.

*Fig. 2.2.28: Pink embroidery on green apparel*

Once the threads are selected, the operator sets them in the right order on the embroidery machine. Care should be taken that the machine changes threads as per the colour sequence in the design.

## 2.2.12 Zig-Zag Machine Embroidery

Zig-zag machine embroidery is a type of decorative stitching where the needle moves from side to side in a zig-zag motion instead of going straight. This stitching is created using a special setting or function on the embroidery machine that allows the needle to swing left and right.

In industrial embroidery machines, zig-zag stitching is used to make borders, fill patterns, and attach decorative elements like cords (dori), appliqués, or sequins. It gives strength and style to the design. The width and length of the zig-zag stitches can be adjusted based on the design and fabric type.

Zig-zag embroidery adds bold, visible patterns and is useful for creating curved shapes, edges, and special textures in embroidery work.

Here are the main elements of zig-zag machine embroidery using an industrial embroidery machine:

1. **Zig-Zag Stitch Movement:** This is the side-to-side needle motion that creates the zig-zag stitch pattern. The width and density can be adjusted depending on the design.
2. **Stitch Width Control:** This setting decides how wide the zig-zag pattern will be. A wider width is used for bold outlines or thick decorative lines, while a narrower width is used for delicate stitching.
3. **Stitch Length Control:** This adjusts how close or far apart the stitches are. Shorter stitch length gives a dense and neat finish; longer stitches give a looser look.
4. **Needle and Thread Type:** The needle must be suitable for zig-zag motion, and the thread should match the design requirement and fabric type to avoid breakage or skipped stitches.
5. **Fabric Stabilisation:** A stabiliser or backing is placed under the fabric to keep it from stretching or shifting while stitching the zig-zag pattern.
6. **Hooping and Tension:** The fabric must be hooped tightly with no wrinkles. Proper tension ensures smooth zig-zag stitching without puckering or thread loops.
7. **Presser Foot for Zig-Zag:** A special presser foot designed for zig-zag stitches is used. It allows free movement of the needle side to side without obstruction.
8. **Design Settings:** The embroidery design must be digitised to include zig-zag stitch paths. The machine follows these programmed settings to create the pattern.
9. **Machine Speed:** Speed should be adjusted depending on the material and stitch width. A slower speed may give better control for wide or decorative zig-zag stitches.

## 2.2.13 Adjusting Top Tension in the Embroidery Machine

Adjusting the top thread tension in an embroidery machine is important to get neat and balanced stitches. If the tension is too tight, the thread may break. If it's too loose, the design may look uneven or messy. Good tension keeps the top and bottom threads balanced so that the stitches sit perfectly in the fabric without loops or pulls.

The operator should start by sewing a tiny test pattern onto a piece of leftover fabric. This helps to check the quality of the stitches. If the bobbin thread is visible on the top side of the fabric, it means the top tension is too tight. If the top thread is showing on the bottom side or forming loops, the top tension is too loose. Proper tension will lock both threads neatly in the middle of the fabric.

A tension gauge can be used to determine the precise thread tension. It measures how much force is needed to pull the top thread through the machine.


*Fig. 2.2.29: Using a tension gauge*

The operator threads the machine normally and places the thread into the gauge. For most polyester or rayon threads, the tension reading should be between 120 and 150 grams. If the reading is too high or low, the top thread tension needs to be adjusted.

*Fig. 2.2.30: Tension gauge reading*

The machine's tension dial or knob should be turned to change the tension. Turning the dial clockwise will increase (tighten) the tension, while turning it counterclockwise will decrease (loosen) the tension. The operator should make small adjustments and test again until the stitches look balanced.

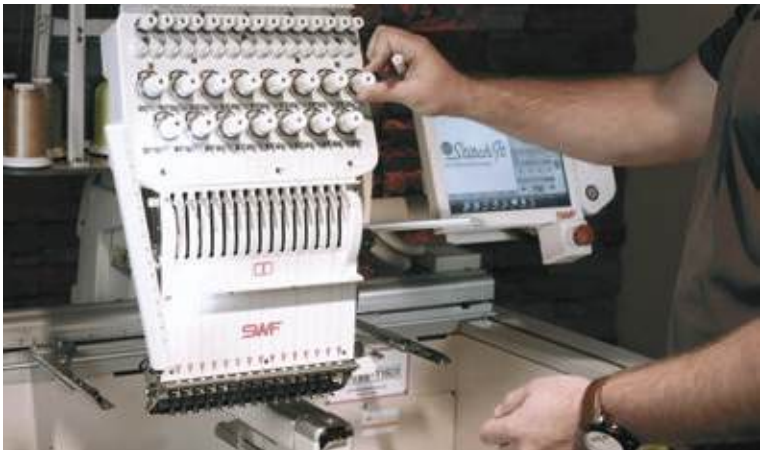


*Fig. 2.2.31: Adjusting the tension knob*

Proper top tension helps produce strong, smooth embroidery without any thread breakage or uneven stitching.

## 2.2.14 Common Defects in Embroidered Product

In embroidery work, especially in industrial production, certain defects or errors can occur due to machine faults, incorrect settings, poor-quality materials, or operator mistakes. Recognising these issues early and taking the right corrective actions is crucial to maintain product quality and reduce wastage.

Below are some common embroidery defects and their corresponding corrective actions

| S. No. | Fault/Defect | Probable Causes | Corrective Actions |
|---|---|---|---|
| 1 | Thread Breakage | High tension, Low-quality thread, Damaged needle or thread guides | Adjust thread tension, use quality thread, replace the needle and check the thread path |
| 2 | Skipped Stitches | Bent or dull needle, Loose fabric, Machine timing off | Replace the needle, Rehoop the fabric tightly, and get timing checked by a technician |
| 3 | Fabric Puckering | Loose hooping, Wrong stabiliser, High stitch density | Hoop fabric tightly, use a suitable stabiliser, and reduce stitch density |
| 4 | Misaligned Design | Fabric shifted, Incorrect hooping, Design not centred | Rehoop securely, use alignment tools, Trace and set the correct start point |
| 5 | Bird Nesting (Thread Bunching) | Wrong threading, Loose top tension, and Bobbin issues | Re-thread properly, adjust top tension, check bobbin case and hook area |
| 6 | Uneven or Loose Stitches | Tension imbalance, Wrong needle, Thread quality issue | Adjust top and bobbin tension, use a proper needle, and replace poor-quality thread |
| 7 | Thread Fraying | Burrs in the thread path, Thread tension too high, Cheap thread | Smooth thread path, Lower tension, Use good-quality thread |
| 8 | Gaps in Fill or Satin Stitches | Low stitch density, Poor underlay, Fabric stretch | Increase density, add underlay, use a better stabiliser and tight hooping |
| 9 | Loops on Fabric Top | Loose top tension, Tight bobbin tension | Tighten top tension, loosen bobbin tension slightly |
| 10 | Needle Breakage | Wrong needle for fabric, Needle hit the hoop, Too high speed | Use the correct needle, check hoop clearance, and Lower stitching speed |
| 11 | Uneven Thread Colour (Shading) | Different dye lots, Poor lighting, Wrong thread number | Use the same lot number, inspect under good lighting, and verify thread numbers before use |
| 12 | Missing Design Details | Design not fully loaded, Thread break skipped a section, Wrong colour order. | Reload design, Re-stitch the missed part, check and set the correct colour sequence. |
| 13 | Holes in Fabric | Sharp needle on delicate fabric, High stitch density, Old fabric | Use a ballpoint needle, reduce density, and avoid weak fabric |
| 14 | Ghosting/Double Lines | Loose hoop, Fabric movement, Machine vibration | Tighten the hoop, stabilise the fabric, and place the machine on a firm surface. |

| S. No. | Fault/Defect | Probable Causes | Corrective Actions |
|---|---|---|---|
| 15 | Design Doesn't Match Sample | Wrong design version, Incorrect settings, Wrong thread colour | Load the correct file, use proper settings, check colour sequence and thread codes |

*Table 2.2.7: Common embroidery defects and corrective actions*

## 2.2.15 Maintaining a Steady Rate of Operation to Ensure Workflow

Maintaining a consistent rate of operation is important to keep the embroidery work flowing smoothly without delays or backlogs. An operator must start by understanding the production schedule, design requirements, and machine capabilities. Before beginning the task, all tools and materials like threads, bobbins, needles, and fabric should be prepared and organised. This avoids time wastage in searching for supplies during production and ensures continuous operation.

Each task must be carried out with focus and efficiency. Operators should aim to follow a rhythm while working—neither too fast, which may lead to mistakes, nor too slow, which can delay the entire production line. Tasks should be performed in a logical sequence: setting up the machine, loading the design, hooping the fabric, checking tension and settings, and starting the machine. Monitoring the embroidery process actively helps catch any issues early.

To avoid frequent stoppages, minor issues such as thread breaks or skipped stitches should be addressed immediately, while major problems should be reported promptly to a supervisor or technician. Operators should also develop time management habits, such as taking short, planned breaks without disturbing the flow of work. This reduces fatigue and maintains performance throughout the shift.

Good coordination with other team members is also necessary. If an operator finishes ahead of time, they can assist others or begin the next task to prevent workflow disruptions. Communicating with supervisors to clarify doubts and align on expectations ensures all operators are working toward the same goal.

## 2.1.16 Identifying Deviations from Specifications and Taking Corrective Action

In embroidery work, it is important to ensure that every finished piece matches the product specifications. Operators must first carefully check the embroidered design against the original artwork or design sample. They should observe elements like colour accuracy, stitch density, alignment, thread quality, and fabric placement. Any mismatch, such as off-centre design, incorrect thread colour, broken stitches, or puckering of the fabric, must be noted immediately.

If the embroidery does not meet the given specifications, the operator must stop further processing of that piece. The issue should be identified—whether it is a machine setting error, thread tension problem, hooping issue, or incorrect material used. Based on the type of fault, the operator must take the necessary corrective steps. This may include re-threading the machine, changing the needle, adjusting the design placement, or replacing the damaged fabric. If needed, a test run can be done before restarting full production.

In the event that the error is beyond the operator's control, they must inform the supervisor or technician promptly. Faulty embroidered pieces should be clearly marked and set aside, and the necessary details must be recorded in accordance with company procedures. By identifying problems early and taking timely action, the operator ensures that the final product meets quality standards and avoids material wastage or workflow delays.

# UNIT 2.3: Basic Maintenance and Troubleshooting of Embroidery Machine

## Unit Objectives

**By the end of this unit, the participants will be able to:**

1. Describe the procedure to follow when a needle breaks.
2. Identify various faults with the embroidery machine and discuss their remedies.
3. List the logical sequence of events to follow if a machine ceases to function correctly.
4. Describe the elements of care and maintenance of an embroidery machine.
5. Apply safe working practices while working with the embroidery machine.

## 2.3.1 Replacing a Broken Needle

When a needle breaks on an embroidery machine, it is important to follow a step-by-step procedure to ensure safety and prevent damage to the fabric or machine. Acting quickly and carefully helps maintain the quality of the embroidery work.


*Fig. 2.3.1: Broken needle*

**Here is a step-by-step guide on how to replace a broken needle:**

**Step 1:** Stop the machine immediately and turn off the power

- As soon as the needle breaks, the operator should press the stop button to halt the machine. This prevents further damage to the fabric, design, or machine parts. Switch off the embroidery machine to avoid accidental movement while changing the needle.


*Fig. 2.3.2: Power and emergency stop button*

**Step 2:** Remove broken needle parts

- Use a screwdriver to loosen the screw that holds the broken needle in place.


*Fig. 2.3.3: Using a screwdriver to loosen the broken screw*

- Carefully remove the broken needle piece using pliers.


*Fig. 2.3.4: Using pliers to remove the broken piece*

- Check for any small broken parts that may have fallen into the machine or on the fabric. Remove them carefully.

**Step 3:** Check the fabric and design

- Inspect the hooped fabric to ensure it is not torn or damaged. Also, check that the design is still properly aligned and no stitches are missing or ruined.

**Step 4:** Insert a new needle

- Choose the correct type and size of needle as per the thread and fabric being used.

*Fig. 2.3.5: Choose a needle with the same specifications*

- Insert the new needle into the needle holder with the flat side facing the correct direction (as per the machine type).

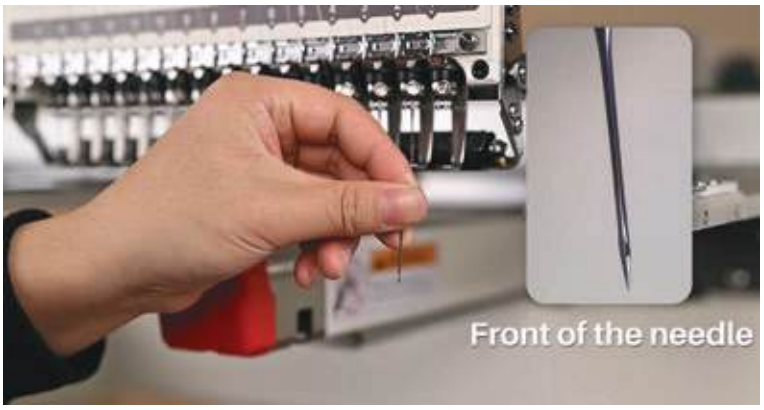



*Fig. 2.3.6: Front face of the needle*

- Tighten it securely using the needle clamp screw.

*Fig. 2.3.7: Tightening the new needle with a screwdriver*

**Step 5:** Rethread the machine

- Rethread the top thread through the new needle. Make sure the thread is properly guided through all thread paths and tension discs.

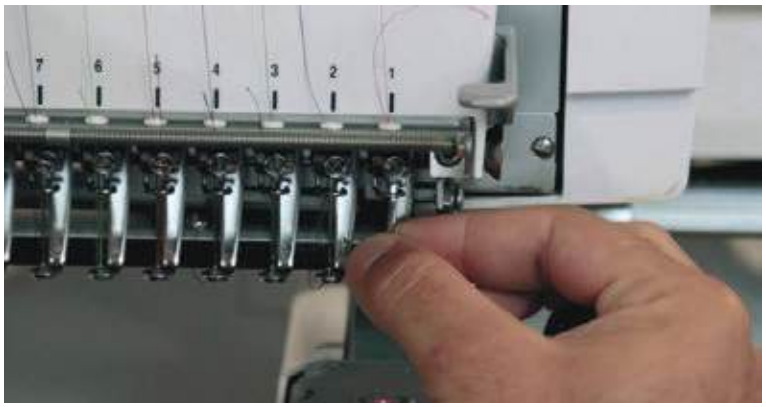



*Fig. 2.3.8: Rethreading the new needle*

**Step 6:** Resume Embroidery

- Move the machine to the point where the embroidery stopped and resume the stitching carefully.

## 2.3.2 Embroidery Machine Faults and Remedies

One of the most common problems is thread breakage, which usually happens due to tight thread tension, using poor-quality or old thread, a damaged needle, or using the wrong needle size. To fix this, the embroidery machine operators should adjust the thread tension, replace the needle, and always use good-quality thread suited for the design and fabric.

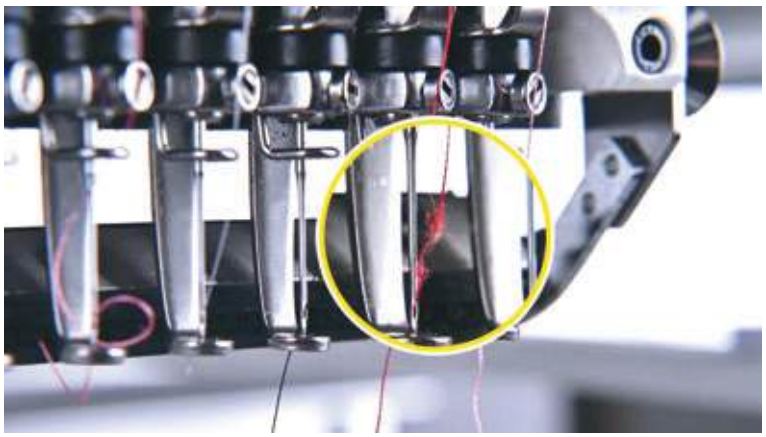


*Fig. 2.3.9: Thread breakage*

Skipped stitches occur when the needle is bent or dull, the thread is not threaded properly, the fabric is not tight in the hoop, or the wrong type of needle is used. The solution is to change the needle, re-thread the machine carefully, and ensure the fabric is hooped tightly.

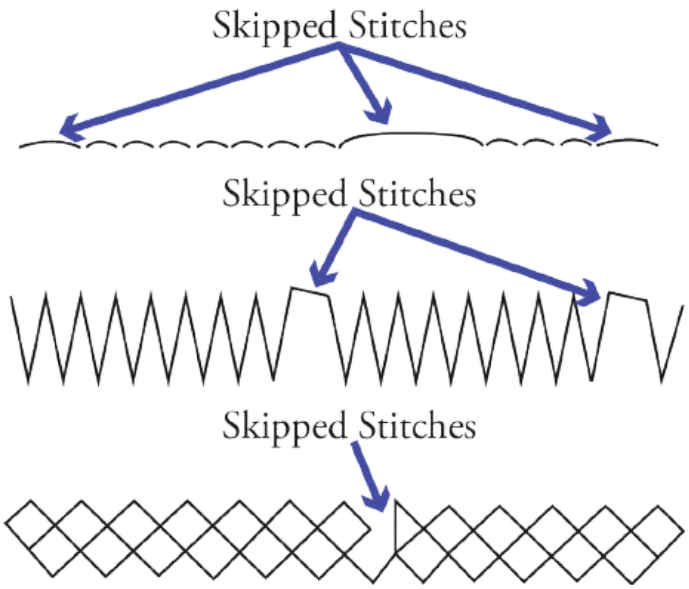



*Fig. 2.3.10: Skipped stitches*

If bird nesting (a bunch of threads collecting under the fabric) happens, it could be due to incorrect threading of the top thread, loose bobbin tension, or a dirty bobbin case. This can be resolved by re-threading the top thread properly, adjusting the bobbin tension, and cleaning the bobbin area.

*Fig. 2.3.11: Bird nesting*

A broken needle is often caused by the hoop hitting the needle, stitching through thick fabric with a fine needle, tight thread tension, or using the wrong needle. The remedy is to use the correct needle size, secure the hoop properly, and adjust thread tension as needed.

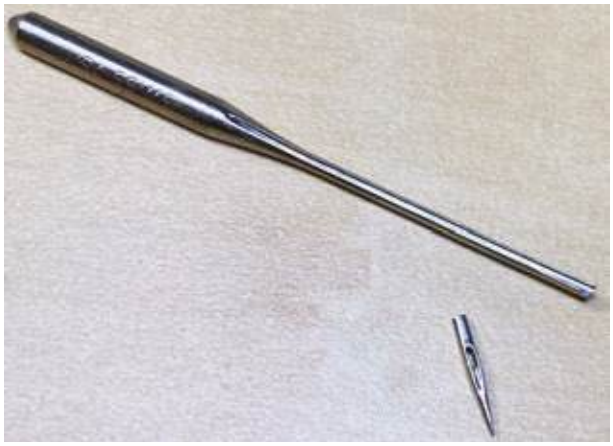


*Fig. 2.3.12: Broken needle*

Fabric puckering usually results from the fabric not being hooped tightly, high stitch density, no stabiliser or backing, or excessive thread tension. To avoid this, hoop the fabric snugly, reduce stitch density, use proper backing, and set thread tension correctly.


*Fig. 2.3.13: Fabric puckering*

Sometimes the top thread appears loose or loops on the fabric. Looping likely occurs when the top tension is too loose, the thread is not seated properly in the tension disks, or the bobbin tension is too tight. Operators should re-thread correctly and balance the tensions.

*Fig. 2.3.14: Looping*

Sometimes, wrong thread colours appear in the design. This may happen if the colour change sequence is not set correctly, the needle threading is wrong, or the machine settings don't match the design. To fix it, double-check the colour sequence and needle threading.

Design misalignment happens if the fabric moves during stitching, the hoop is loose, or the machine isn't calibrated properly. Ensuring the fabric is tightly hooped and checking the hoop lock can help, and calibration may be needed for precise stitching.


*Fig. 2.3.15: Design misalignment*

If the bobbin thread shows on top of the design, the top tension is likely too loose or the bobbin thread is too tight. Adjusting both tensions until they balance correctly will solve the issue.

*Fig. 2.3.16: Bobbin thread shows on top*

When the hoop moves or slips, it is often because the hoop is not locked properly, the wrong hoop size is used, or the machine is stitching at a very high speed. Operators should secure the hoop firmly, use a suitable hoop, and reduce the speed when necessary.

Thread fraying or shredding can be due to a rough needle eye, too much thread rubbing, or tight tension. Changing the needle, checking the thread path, and reducing tension can help prevent breakage.

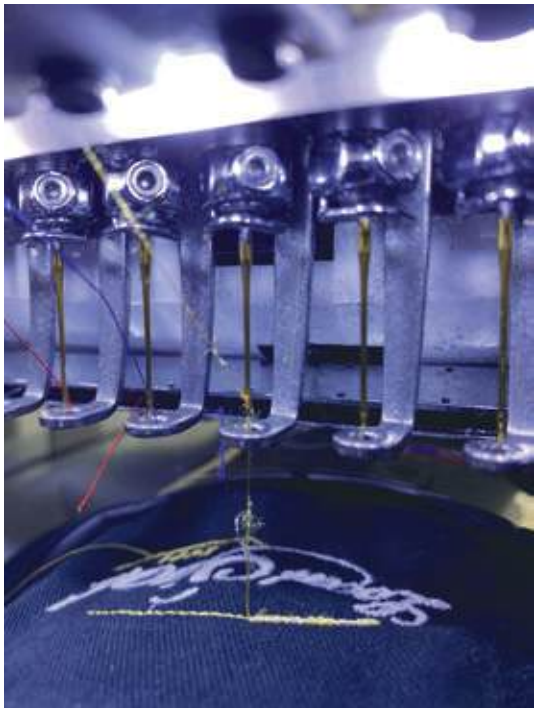


*Fig. 2.3.17: Thread fraying or shredding*

If stitches are not forming properly, the problem could be with hook timing, a bent needle, or incorrect needle positioning. A technician may be needed to adjust the timing, and the needle should be changed or repositioned correctly.

*Fig. 2.3.18: Stitches not forming properly*

Strange or loud machine noises may come from dry parts, loose screws, or lint and dust buildup. Regular oiling (as per the machine manual), tightening screws, and cleaning the inside will keep the machine running smoothly.

If the machine won't run, it could be due to the emergency stop being pressed, a loose power connection, or a corrupted design file. Always check the emergency stop, power cables, and try reloading or changing the design.

Finally, if the machine freezes during stitching, the design file may be too complex, the software may have crashed, or memory may be full. In this case, try using a simpler design, restarting the machine, and clearing old files.

## 2.3.3 Steps to Follow if the Embroidery Machine Stops Working

An embroidery machine may stop functioning due to several common issues. Power supply problems are often the first cause; the machine might be unplugged, the switch turned off, or the fuse blown. Fluctuations in voltage can also cause sudden shutdowns. Sometimes, the emergency stop button may be pressed by accident, halting all operations. Thread-related issues like thread breakage or an empty bobbin are also frequent causes. The machine usually stops automatically when these occur to prevent faulty stitching. Similarly, a broken or bent needle can trigger the machine to stop as a safety measure.

Other technical reasons include design file errors, where a corrupted or incompatible file causes the system to freeze. Misalignment of the hoop or a fabric jam can interrupt the stitching process. Most modern machines have built-in sensors that detect such errors — including bobbin issues, thread absence, or wrong needle position — and stop the machine. Overheating due to extended use or lack of lubrication may also cause stoppage. Loose parts, like screws or belts, and software problems, such as memory overload, can also lead to machine failure.

When an industrial embroidery machine suddenly stops, the operator should follow a clear and safe step-by-step approach to find and fix the issue:

**Step 1:** Ensure Operator Safety First

- Immediately turn off the machine using the main power switch and wait for all moving parts to come to a complete stop.
- Do not touch any hot or moving parts while the machine is still powered. Remember, safety is always the first priority.

**Step 2:** Check Power Supply

- Check if the power cord is properly connected to the socket.
- Test the socket with another device (like a mobile charger or lamp) to ensure power is reaching it. If there is no power, check the fuse or circuit breaker and reset it if needed.

**Step 3:** Check Emergency Stop and Main Switch

- See if the emergency stop button is pressed. If yes, release it by turning or pulling it out (based on the machine model). Also, confirm that the main power switch on the machine is turned on.

**Step 4:** Observe Error Messages or Sounds

- Look at the machine's display panel for any error codes or messages.
- Some machines may beep or show lights when a problem is detected. Refer to the machine manual or error chart to understand what the message means.

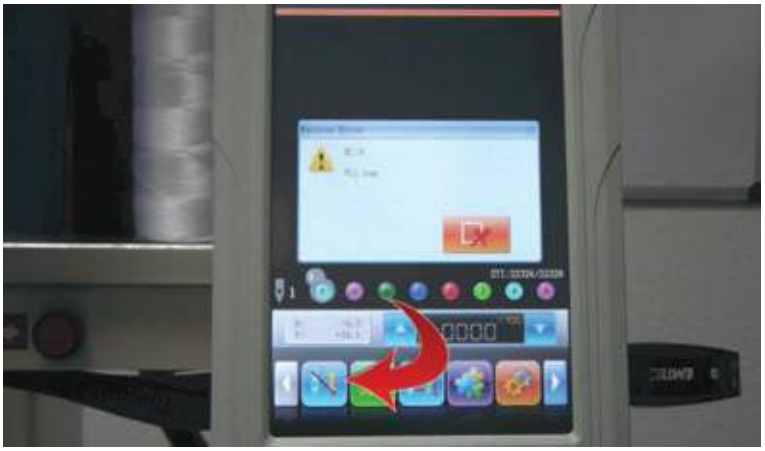


*Fig. 2.3.19: Error message on display screen*

**Step 5:** Check the Thread and Bobbin

- See if the upper or bobbin thread is broken, tangled, or finished. Re-thread the machine carefully, following the correct path. Ensure the bobbin is correctly placed, has enough thread, and spins freely.

**Step 6:** Inspect Needle

- Look closely at the needle for any breakage, bending, or looseness. If damaged, replace it with a new needle of the same type and size. Insert it with the groove side facing out and tighten the screw securely.

**Step 7:** Check Fabric and Hoop Position

- Make sure the fabric is flat, properly hooped, and not sagging or wrinkled. Also, ensure that the hoop is firmly locked in the machine arms and hasn't moved out of place.

**Step 8:** Restart the Machine and Reload the Design

- If all physical checks are clear, turn the machine back on.
- Reload the embroidery design from a USB or internal memory. Confirm that the file format matches what the machine supports.

**Step 9:** Do a Test Stitch

- Before restarting the actual garment, try stitching the design on a scrap fabric. This helps to check if everything is working well and avoids ruining the main piece.

**Step 10:** Inform the Technician or Supervisor

- If the problem still continues, report the issue to the supervisor or maintenance technician. Do not open machine parts or panels unless properly trained to do so.

## 2.3.4 Care and Maintenance of an Embroidery Machine

Caring for and maintaining an industrial embroidery machine is crucial to keep it functioning smoothly, prevent costly breakdowns, and ensure high-quality stitching. Regular care helps the machine last longer and produce cleaner, more precise embroidery.

Below are the detailed elements of proper care and maintenance:

1. **Daily Cleaning**

   Dust, thread bits, and fabric lint build up quickly in and around the machine. This can clog moving parts and cause thread breakage or poor stitching.

   - Clean the needle area, presser foot, and bobbin case with a soft brush after every shift.
   - Use compressed air carefully to blow out dust from hard-to-reach areas (but not into the bobbin case where it can push lint deeper).
   - Wipe the machine surface with a soft, dry cloth.

*Fig. 2.3.20:: Dirt accumulation in the bobbin area*

2. **Proper Oiling**

   The embroidery machine has many moving metal parts that need lubrication to prevent wear and tear.

   - Lubricate the machine as per the manufacturer's instructions.
   - Use only the recommended embroidery machine oil/lubricant. Never use cooking oil or sewing machine oil, unless specified.


*Fig. 2.3.21: Embroidery machine oil*

- Common points to oil include the needle bar, hook area, rotary hook, bobbin area and thread take-up parts.
- Always wipe away extra oil before restarting stitching to prevent fabric stains.

*Fig. 2.3.22: Oiling bobbin area*

*Fig. 2.3.23: Oiling the internal spring mechanism*

**3. Needle Care and Replacement**

The needle should be checked and changed regularly.

- Use the correct needle type and size for the fabric and thread being used.
- Insert the needle properly — groove side facing out — and tighten it firmly with a screwdriver.

**4. Thread Path Maintenance**

Threads can cause lint and residue to collect along the thread path.

- Inspect and clean the thread guides, tension disks, and tension springs weekly.
- Ensure there are no snags or rough edges along the thread path that can break the thread.

**5. Bobbin and Bobbin Case Cleaning**

The bobbin area collects lint quickly and needs special attention.

- Remove the bobbin case and clean it daily with a brush or soft cloth.
- Check for roughness or damage inside the case, which can cause thread breakage.
- Ensure the bobbin is wound evenly and fits snugly in the case.

*Fig. 2.3.24: Tools for basic maintenance tasks*

6. **Tension Check and Adjustment**

   Poor tension causes loops, puckering, or uneven stitches.

   - Check both upper and bobbin thread tension regularly.
   - Use a tension gauge if available to test bobbin tension precisely.
   - Adjust tension settings gently and only as needed for the fabric and thread in use.

7. **Regular Software and Design File Check**

   Faulty designs or outdated software can cause stitching problems.

   - Make sure embroidery design files are properly loaded and in the correct format.
   - Delete unused or corrupted files from the machine.
   - Update the machine's software/firmware if recommended by the manufacturer.

8. **Monthly Technical Inspection**

   In addition to daily care, a deeper inspection should be done every few weeks.

   - Check belts, screws, and motors for looseness or wear.
   - Inspect and clean the rotary hook and shuttle area.
   - Look for colour leaks or unusual machine sounds while running.

9. **Maintenance Records**

   Keeping a maintenance log is very helpful.

   - Record oiling, needle changes, thread issues, and any breakdowns or repairs.
   - This helps technicians identify patterns and prevent bigger problems.

**10. Things to Avoid**

Never pull fabric while stitching — it can bend the needle or damage the embroidery.

- Do not force parts open or operate with missing screws or loose parts.
- Avoid using low-quality threads or needles, which may damage the machine.

Regular care and attention to these elements keep the embroidery machine running efficiently, reduce production downtime, and result in high-quality embroidery work, especially in industrial setups where machines operate for long hours.

## 2.3.5 Safety Practices while Working with Industrial Embroidery Machines

Safe working practices are very important for embroidery machine operators to prevent injury and keep the workplace organised and efficient. Here are the key safety measures that should be followed while performing embroidery tasks:

1. **Keep Work Area Clean and Organised:** The workspace around the embroidery machine should be free from clutter, loose threads, needles, and tools. A clean area prevents accidents like slipping or tripping and also improves work efficiency.
2. **Handle Needles and Tools Carefully:** Always handle needles, scissors, tweezers, and other sharp tools with care. When changing a needle or trimming threads, use the right tool and keep fingers away from the moving parts of the machine.
3. **Turn off the Machine When Not in Use:** Before cleaning, oiling, or changing threads or needles, switch off the machine. This prevents accidental start-up and reduces the risk of injury.
4. **Use Safety Guards Properly:** Do not remove or disable any safety covers or guards on the machine. These parts are there to protect the operator from moving parts and reduce the chance of injury.
5. **Wear Proper Clothing:** Avoid wearing loose clothes or long scarves while operating the machine, as they can get caught in moving parts. Always tie back long hair neatly.
6. **Store Accessories Safely:** Keep all accessories like bobbins, needles, and threads in designated containers or drawers. Do not leave them scattered on the table or floor.
7. **Use Tools for Threading and Cleaning:** Use tweezers or a thread guide when threading the needle instead of fingers, especially when the needle is sharp. Use a soft brush or cloth to clean dust and thread pieces from the machine.
8. **Follow Manufacturer's Instructions:** Always read and follow the machine's user manual for instructions on operation, maintenance, and safety. Do not try to repair the machine unless trained to do so.
9. **Be Alert and Focused:** Never operate the embroidery machine when feeling sleepy, distracted, or unwell. Always stay alert and focused while the machine is running to avoid accidents.

**Safety Features in Industrial Embroidery Machines**

Industrial embroidery machines are designed with several safety features to protect the operator during high-speed operations and to reduce the risk of accidents. These safety features ensure smooth functioning of the machine while maintaining a safe working environment.

One of the key features is the **emergency stop button,** which instantly halts the machine in case of any malfunction or danger. This is especially useful during unexpected movements or needle jams.


*Fig. 2.3.25: Emergency stop button*

Another safety element is the **thread break detection sensor,** which alerts the operator if the upper or bobbin thread breaks, helping avoid fabric damage or misalignment in the design.

Most machines come with **automatic needle stop** functions that prevent the needle from moving when the cover is opened or when an error occurs. Additionally, **protective covers and guards** are placed over moving parts like the needle bar and rotary hooks, shielding the operator from accidental contact. **Overload protection** is another feature that shuts the machine off if the motor becomes overheated or stressed, which helps avoid electrical damage or fire hazards.

Some machines also have **automatic power-off** functions that shut the system down after a certain period of inactivity. **Clear warning indicators,** such as digital alerts or lights, inform the operator of issues like thread jams, open covers, or low bobbin levels. **Secure hoop locking mechanisms** ensure the fabric stays tight and stable during operation, preventing movement that could affect design quality or cause injury.

These features, when used correctly, not only keep the operator safe but also support consistent and high-quality embroidery output.

# UNIT 2.4: Waste Management in Embroidery Works

## Unit Objectives

**By the end of this unit, the participants will be able to:**

1. Follow the correct guidelines for the storage and disposal of waste materials.
2. Demonstrate ways to minimise material wastage during embroidery operations.

## 2.4.1 Correct Guidelines for Storage and Disposal of Waste Materials

Proper storage and disposal of waste materials during embroidery work is essential for maintaining a clean, safe, and efficient workspace. Waste generated from embroidery includes leftover threads, broken needles, fabric scraps, used bobbins, packaging materials, and empty spools. If not handled properly, these can cause clutter, accidents, or machine damage.

**Storage of Reusable Materials**

The first step is to separate reusable items from actual waste. Leftover threads, fabric scraps, and test swatches should be sorted and stored in clearly labelled containers. Threads of common colours can be saved in small boxes or bags for future use in samples or repairs. Fabric remnants that are still clean and usable should be folded neatly and placed on designated shelves or bins. Reusing materials not only saves cost but also reduces waste.

*Fig. 2.4.1: Leftover fabric waste*

Small boxes or drawers should be maintained for storing frequently used items like spare needles, bobbins, cleaning brushes, oiling cloths, and maintenance tools. These must be stored safely in dry, dust-free areas to avoid rust and damage. Any open containers should have lids to prevent dust and contamination.

**Disposal of Non-Usable and Hazardous Waste**

Items like broken needles, used tools, damaged bobbins, and worn-out parts are sharp and hazardous. These must be disposed of in a strong, puncture-resistant container (like an old tin box or thick plastic jar). Never throw such items in open bins, as they can injure someone handling the garbage. Once

the container is full, it should be sealed and handed over to the appropriate scrap or hazardous waste collectors as per local safety guidelines.

Colour-stained cloths, used tissues, and cleaning rags should be kept in a separate bin, especially because they may be flammable or release harmful chemicals. These must not be mixed with paper or plastic waste.

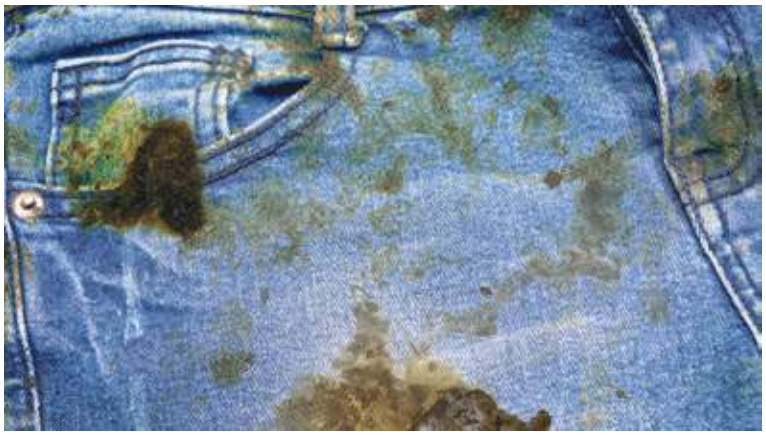


*Fig. 2.4.2: Oil stains on clothes*

**Managing General Waste**

General waste like empty thread spools, paper or plastic packaging, and unusable fabric scraps should be collected in dustbins with lids. It is best to use different bins for different types of waste—one for paper, one for plastic, one for fabric, and one for general trash. This makes waste disposal easier and more environmentally friendly.

*Fig. 2.4.3: Empty thread cones*

**Regular Waste Clearance**

Waste should not be allowed to build up at the workstation. Embroidery operators must clear the waste from their machines and tables at the end of every shift. The floor area must be swept and cleaned to remove loose threads and fabric pieces, which can cause slips or get sucked into machine motors. Waste bins must be emptied daily or as needed, especially when working in shifts or on bulk production.

*Fig. 2.4.4: Segregation of waste for collection*

**Follow Workplace and Environmental Guidelines**

Operators should follow any specific waste management policies set by the workplace. Some embroidery units may have rules for disposing of textile waste, recycling plastic spools, or managing used machine colour. It's important to follow these rules to maintain safety, meet legal requirements, and reduce harm to the environment.

## 2.4.2 Ways to Minimise Material Wastage during Embroidery Operations

Minimising material wastage during embroidery operations is important to save costs, reduce errors, and ensure smooth production. One of the most effective ways to prevent wastage is by carefully planning the design. Before starting embroidery, the operator should understand the design's size, colour sequence, and fabric placement. Previewing the design on the machine helps to detect errors early and avoid mistakes that may damage fabric or waste thread.

Using test swatches is another helpful method. Before stitching on the final fabric, operators should run the design on a similar piece of fabric to check the results. This practice allows for adjustments in thread tension, design placement, or colour choice without risking the main fabric. It prevents rework and saves both time and materials.

Choosing the correct needle and thread for the type of fabric is also important. The wrong needle size or thread type can lead to thread breaks, skipped stitches, or tearing of the fabric. This not only wastes materials but also causes delays. Similarly, proper hooping of fabric ensures that it is held tight and flat, preventing distortion or misalignment during embroidery.

*Fig. 2.4.5: Embroidery machine maintenance*

Maintaining the embroidery machine regularly reduces unexpected faults. A clean and well-coloured machine with the correct settings performs better and avoids common problems like bird nesting or needle breaks. Well-maintained machines help operators produce quality work with fewer errors and less waste.

Thread trimming should be done efficiently. Operators should avoid unnecessary cutting during colour changes or jump stitches. Machines with automatic thread-trimming features should be used wisely to reduce leftover thread waste. Planning the layout of fabric pieces smartly is also key to saving fabric. When doing bulk work, placing multiple pieces close together on the fabric can help minimise fabric scraps.

Lastly, reusable scraps from previous jobs can be stored for test runs or small designs, rather than being thrown away. Following standard operating procedures and quality checks ensures consistency and prevents faulty output.

## Summary

- Embroidery machines can be used to perform various stitches such as round stitch, zig-zag, dotted stitch, and satin stitch.
- The operator must identify the correct needle, thread type, and machine setting for each type of stitch.
- Stitch types vary depending on the fabric and design; using incorrect settings may spoil the design.
- Special techniques like mirror work, appliqué, and Dori work require specific tools and machine attachments.
- Proper hooping and fabric tension are critical to achieving neat and accurate stitch outcomes.
- Operators must understand how to load the correct design file and set machine parameters.
- Thread breakage, skipped stitches, and misalignment can occur if settings are incorrect or the fabric is not hooped properly.
- Designs must be executed precisely as per the artwork and sample provided.
- Test runs help in checking tension, colour sequence, and design accuracy before bulk production.
- Monitoring the machine during operation helps in identifying and solving issues in real-time.

## Exercise

**Multiple-choice Question:**

1. Which stitch is commonly used for outlining a design?
   a. Running stitch
   b. Satin stitch
   c. Chain stitch
   d. Cross stitch

2. What is needed to create a dotted stitch?
   a. Thick thread
   b. Large needle
   c. Regular gaps between small stitches
   d. A special needle type

3. Which tool is used to cut threads neatly?
   a. Hammer
   b. Scissors
   c. Measuring tape
   d. Brush

4. Which needle part helps catch the thread loop?
   a. Shank
   b. Scarf
   c. Eye
   d. Groove

5. What is stabilizer used for in embroidery?
   a. To add colour
   b. To soften the fabric
   c. To keep fabric firm during stitching
   d. To increase thread tension

**Descriptive Questions:**

1. Describe how to perform a round stitch using the embroidery machine.
2. List different types of embroidery stitches and their use.
3. What is the function of a stabiliser in embroidery?
4. Explain the importance of needle type in stitch quality.
5. How does thread thickness affect embroidery?

## Notes

Scan the QR codes or click on the link to watch the related videos

https://www.youtube.com/watch?v=lbZA4mo-08g

Types Of Fabric Names and Pictures

https://youtu.be/QOh2xECA63M?si=rlVVM8QNnVqrhcsg

Sewing Thread Used in Apparel Manufacturing

https://youtu.be/OHmjUCOQXUQ?si=uhrrwZEWZFKL2n8K

Types of Embroidery Needles

https://youtu.be/46FxzGPACq4?si=4b_rL9XlHC-_lNJq

Trims And Accessories? Different Types Of Trimmings And Accessories Used In Apparel Industry

https://youtu.be/qK6HNiBecQI?si=BNhCKZwhbn697SIP

Traditional Embroideries of India

https://youtu.be/Q1tb_q1i6lA?si=TNm6qs2rGTj63xcA

6 Basic Hand Embroidery Materials and Tools

https://youtu.be/hVw1WVacVZo?si=-ZQqrVDbfJ9XgXwi

20 Basic Hand Embroidery Stitches Sampler for Absolute Beginners

Skill India
कौशल भारत-कुशल भारत

सत्यमेव जयते
GOVERNMENT OF INDIA
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N·S·D·C
RE IMAGINE FUTURE

# 3. Embroider Decorative Designs Using Embroidery Machine

APPAREL MADE-UPS HOME FURNISHING
SECTOR SKILL COUNCIL

Unit 3.1 - Preparation for Embroidery Operations

Unit 3.2 - Performing High Quality Embroidery Work

AMH/N0802

## Key Learning Outcomes

**By the end of this module, the participants will be able to:**

1. Identify the job roles, responsibilities, and scope of work relevant to operating embroidery machines.
2. Prepare the workspace by ensuring cleanliness, safety, and readiness for embroidery tasks.
3. Obtain and interpret work instructions and design specifications accurately before starting the task.
4. Select and prepare materials as per design requirements, ensuring they are defect-free and suitable.
5. Operate the embroidery machine efficiently, following operational guidelines and safety protocols.
6. Follow the design instructions to execute the embroidery work accurately according to the given specifications.
7. Perform embroidery operations using appropriate techniques and machine settings to meet design standards.
8. Inspect completed embroidery work against quality standards and design specifications.
9. Apply quality control procedures and take corrective action for common defects in embroidery products.
10. Document and report work activities, faults, and quality issues as per organisational reporting protocols.

# UNIT 3.1: Preparation for Embroidery Operations

## Unit Objectives

**By the end of this unit, the participants will be able to:**

1. Analyse the job card/sheet to identify one's job role and responsibilities.
2. Review work targets and check for special instructions on the job card/sheet.
3. Identify work targets and review mechanisms based on interactions with supervisors.
4. Select the correct components/fabric/material based on the design requirement.
5. Verify that materials are free from defects and meet the artwork specifications.
6. Verify that the fabric/component is marked and cut according to the required specifications.
7. Check that tools/machines are safe and ready for use.
8. Ensure the work area is free from hazards.
9. Report any defective tools and machines that affect work and identify risks/problems likely to impact services to the relevant person promptly and accurately.

## 3.1.1 Analysing Job Sheet

helps workers understand their specific duties, timelines, and expectations. In industrial settings, particularly in embroidery operations, a job sheet ensures that the operator performs tasks accurately according to the production plan and client specifications.

Generally, a job sheet includes key information such as the job title, a description of the task, materials required, design specifications, quantity to be produced, deadlines, machine settings, and quality standards. It may also contain special instructions from the supervisor or customer, as well as space for recording observations or issues.

For an embroidery machine operator, the job sheet typically includes:

- Design name and code
- Type of fabric to be used
- Thread types and colours required
- Machine settings such as stitch density, speed, pull compensation, and thread tension
- Embroidery area dimensions
- Type of embroidery (e.g., appliqué, mirror work, Dori work)
- Number of pieces to be produced
- Any special instructions like placement, sequence, or customer-specific requirements
- Deadline for completion
- Quality control checkpoints

The embroidery machine operator should pay extra attention to specific points in the job sheet, such as design specifications to prevent errors in pattern execution, thread colour codes and types for clean and accurate finishing, and machine settings to avoid thread breakage or fabric damage. Special care should also be taken regarding the fabric type, as the wrong needle or thread can cause defects. The quantity and timeline must be followed strictly to maintain workflow and meet production targets efficiently.

| Embroidery Machine Operator - Job Sheet | | |
|---|---|---|
| **Job Sheet Info** | **Job Sheet No.** | **EMB/2025/073** |
| | **Date** | **10-July-2025** |
| **Section** | **Field** | **Details** |
| 1. Operator Details | Name of Operator | Ramesh Kumar |
| | Operator ID | EMP1234 |
| | Shift | Morning (8:00 AM - 4:00 PM) |
| | Machine No. | EM-BRO-15X |
| 2. Design Specifications | Design Name | Floral Motif with Appliqué |
| | Design File Name | FLR_APPLQ_07.dst |
| | Design Size | 110 mm x 150 mm |
| | No. of Stitches | 18,400 |
| | Design Placement | Upper Left Chest |
| 3. Fabric Details | Fabric Type | Cotton Lycra |
| | Fabric Colour | White |
| | Fabric GSM | 180 |
| | Backing Type | Tear-away - Medium Weight |
| | Hoop Size | 12 x 8 |
| 4. Thread Details | Thread Colour | Thread Code \| Thread Brand |
| | Red | 1123 \| Anchor Rayon |
| | Green | 1345 \| Anchor Rayon |
| | Yellow | 1002 \| Anchor Rayon |
| | White (Appliqué) | 0001 \| Anchor Cotton |
| 5. Needle & Machine Settings | Needle Type | DBxK5 - Size 75/11 |
| | Top Thread Tension | 180g - 200g |
| | Bobbin Tension | 25g |
| | Stitch Density | 0.35 mm |
| | Pull Compensation | 0.2 mm |
| | Sewing Speed | 750 stitches per minute |
| 6. Special Instructions | | • Ensure no wrinkles in appliqué fabric before stitching.<br>• Trim excess appliqué fabric after tacking.<br>• Mirror work to be done after embroidery completes.<br>• Perform test run before full production. |

| Embroidery Machine Operator - Job Sheet | | |
|---|---|---|
| **Section** | **Field** | **Details** |
| 7. Production Target | Total Quantity | 80 garments |
| | Start Time | 08:00 AM |
| | Expected Completion | 03:30 PM |
| | Supervisor | Ms. Kavita Sharma |
| 8. Quality Control Checks | | • Check design alignment after every 10 garments.<br>• Allow max 3 thread breaks per garment.<br>• Inspect for skipped stitches or colour mismatches. |
| Signatures | Operator Signature | _____ |
| | Supervisor Signature | _____ |

*Fig. 3.1.1: Sample job card/sheet*

## 3.1.2 Identifying Work Targets and Review Mechanisms through Supervisor Interactions

Supervisors usually communicate daily or weekly production goals, specific design requirements, delivery timelines, and any special instructions related to thread types, machine settings, or fabric handling. Embroidery Machine Operators must ask questions if anything is unclear to avoid confusion later during execution.

Supervisors may also explain how and when performance will be reviewed, such as through hourly output checks, quality inspections at specific stages, or regular feedback meetings. The operator should note the frequency of such reviews and specify the performance indicators that will be used (e.g., accuracy of embroidery, speed, or defect rate). If the supervisor provides a written job sheet or task list, the operator must go through it carefully, checking for any updates or remarks. Clear communication, understanding expectations, and seeking clarification when needed ensure that work is carried out efficiently and meets the required standards.

## 3.1.3 Selecting the Correct Components, Fabric, and Material Based on Design Requirements

The selection begins by carefully studying the design specifications provided in the job sheet or artwork. This includes noting the type of stitch, design size, level of detail, and the final use of the product.

The operator should first check the type of fabric mentioned in the job sheet/card, whether it's cotton, silk, denim, net, or any special material. Each fabric behaves differently with threads and stitches. For example, delicate fabrics like silk require fine needles and softer threads, while thicker fabrics like denim may need stronger needles and threads. Matching the right needle and thread type to the fabric avoids damage and ensures smooth embroidery.

Next, the thread type and colour must be selected based on the artwork. It is important to check the thread code and type mentioned in the job sheet. Embroidery threads like rayon, polyester, or cotton are chosen depending on shine, strength, and fabric compatibility. The backing material or stabiliser should also be chosen correctly, depending on the fabric and design—for example, cut-away backing for stretch fabrics and tear-away for woven materials.

By carefully reviewing the instructions and preparing the correct set of materials beforehand, the embroidery machine operator ensures that the embroidery is of high quality, durable, and visually accurate to the original design.

## 3.1.4 Material Pre-Checks

Before starting the embroidery process, it is crucial for the embroidery machine operator to verify that all materials—fabric, threads, needles, and stabilisers—are fault-free and precisely match the artwork or design specifications. This helps in avoiding errors, wastage, and defects in the final product.

1. **Inspecting Fabric for Faults:**

   The operator should first examine the fabric surface closely under good lighting. They must look for visible issues such as:

   - Holes or tears
   - Stains or marks
   - Uneven dye or colour patches
   - Loose threads or fraying edges

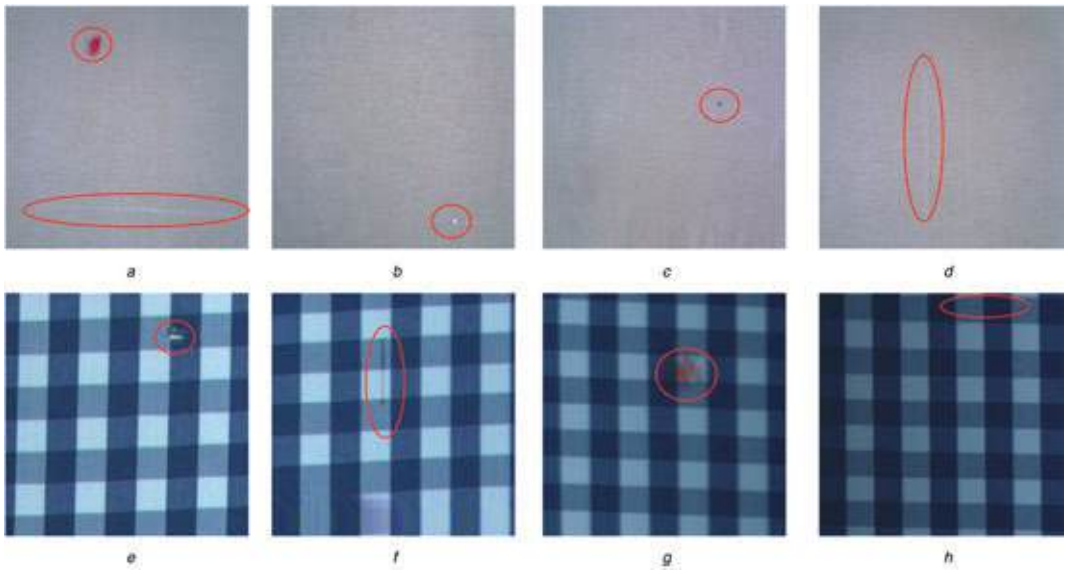


*Fig. 3.1.2: Fabric defects (holes and stains)*

   For example, if the fabric has a stain in the area where the design will be stitched, it can spoil the appearance of the final embroidery. If the fabric has weak spots, it may tear during the stitching process.

2. **Matching Fabric Type with Design Requirements:**

   The fabric must match what is mentioned in the job sheet. If the design is intended for cotton fabric and the operator mistakenly uses silk or net, it may result in puckering, incorrect stitch formation, or difficulty during embroidery.

*Fig. 3.1.3: Inspecting fabric for defects*

3. **Checking Threads:**

   Threads must be checked for:

   - Correct type (e.g., polyester, rayon, cotton)
   - Correct colour code as per the design
   - Even thickness and no knots or frays

   For instance, if the design requires a glossy finish, rayon or polyester thread should be used. Using cotton thread instead may result in a dull appearance. Also, using the wrong colour thread may result in a mismatched or unattractive pattern.

4. **Verifying Stabilisers or Backing Materials:**

   The backing material must be suitable for the fabric and design. The wrong stabiliser can cause shifting or wrinkles in the design. For heavy embroidery on stretch fabric, a strong cut-away stabiliser is preferred, whereas light embroidery on firm fabric may need only a tear-away stabiliser.

5. **Needle Compatibility:**

   Verify that the needle is suitable for both the fabric and thread. A thick needle on thin fabric can leave holes. A blunt needle may skip stitches or damage the fabric. Refer to the job sheet or standard guidelines to select the correct needle size and type (e.g., ballpoint for knits, sharp-point for woven fabrics).

6. **Cross-Check with Design Specifications:**

   **Finally, compare all materials with the design/artwork sheet and job card. Ensure that:**

   - Thread colours match the design palette
   - Fabric type and shade match the sample
   - Required accessories, such as sequins or mirror pieces (if applicable), are available and correct.

## 3.1.5 Importance of Verifying Fabric is Marked and Cut According to the Required Specifications

In embroidery operations, verifying that the fabric or component is marked and cut according to the required specifications is a critical step that directly affects the quality, accuracy, and overall finish of the embroidered product.

Firstly, correct marking ensures proper design placement on the fabric. Embroidery patterns are often aligned with specific parts of a garment or product, such as logos on the chest, motifs on sleeves, or borders along the edges. If the markings are incorrect or missing, the design may be stitched in the wrong location, resulting in misaligned or rejected pieces.

Secondly, accurately cut components are essential for maintaining the uniformity and size of the final product. If the fabric is not cut to the right measurements, it can cause fitting issues, overlapping seams, or excess fabric, which can distort the embroidery design during hooping or stitching. This is especially important in mass production, where consistency across hundreds of pieces is expected.

Also, correct marking and cutting help avoid the wastage of materials. Fabric is often expensive, and errors in cutting may result in large amounts of unusable scraps. By checking the specifications beforehand, operators can prevent costly mistakes and reduce rework.

Moreover, following the cutting and marking instructions ensures that the embroidery matches the artwork sample or customer requirement. This is crucial for meeting quality standards, brand guidelines, and client satisfaction.

Lastly, for operations involving layering or appliqué, correct markings guide the placement of fabric pieces or trims, ensuring neat stitching and proper coverage. This also helps align different parts of the design when working on multi-hoop or large-frame embroidery.

## 3.1.6 Checking Tools and Machine Readiness

Before starting any embroidery work, it is very important for the embroidery machine operator to check that all tools and machines are safe and ready for use. This ensures smooth operation, prevents machine damage, and avoids waste of fabric and thread. A careful check helps maintain the quality of the embroidery and also keeps the workplace safe.

The first step is to visually inspect the embroidery machine. The operator should look for any loose wires, broken plugs, or visible cracks or leakages in the machine. Dust, thread lint, or fabric pieces around the needle area or thread path should be cleaned.

*Fig. 3.1.4: Lint accumulation*

The machine should be placed properly on a stable surface and connected securely to the power supply. Once turned on, the display screen and control buttons should work normally. If any error messages or blinking lights appear, the machine should not be used until checked by a technician.


*Fig. 3.1.5: Error message on the display panel*

Next, the needle and threading system must be checked. The needle should be straight, sharp, and fitted tightly in the needle bar.

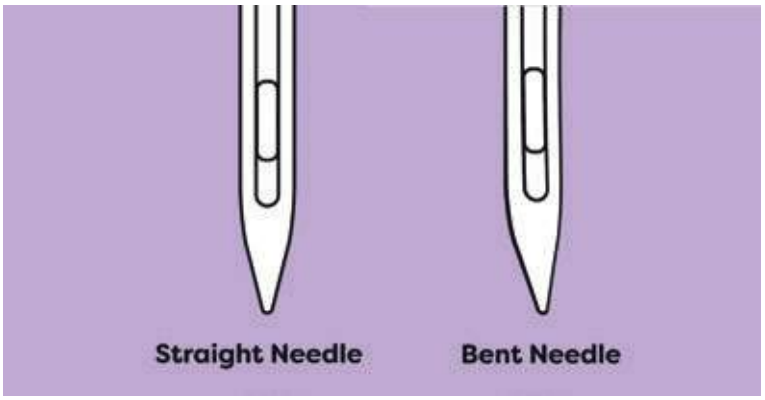


*Fig. 3.1.5: Straight and bent needles*

The threading of both the top thread and bobbin should be correct. The operator must ensure the thread moves smoothly through the tension discs without getting stuck. Using a damaged needle or incorrect threading can lead to thread breakage, skipped stitches, or fabric damage.

It is also important to check the embroidery hoop or frame. It should be clean, unbroken, and firmly attached to the machine. A loose or cracked hoop can cause the fabric to shift during embroidery, resulting in errors in the design. The operator must test that the hoop locks securely in place and does not shake when the machine moves.

All necessary accessories, such as scissors, tweezers, extra needles, bobbins, and threads, should be kept ready. The operator must also confirm that the correct type of stabiliser is available for the fabric being used. If time allows, a small test run on a sample fabric is helpful. This test helps check if the machine is stitching correctly, the thread tension is suitable, and the design is aligned properly.

*Fig. 3.1.6: Scissors and tweezers*

## 3.1.7 Ensuring Hazard-Free Work Area

Ensuring that the work area is free from hazards is an important step for embroidery machine operators. A clean, organised, and safe workspace helps prevent accidents, improves efficiency, and protects both the worker and the machine.

Below are detailed steps to make sure the work area is safe and hazard-free:

1. **Clear the Work Surface:** The operator should remove any unnecessary items, such as scraps of fabric, old threads, broken needles, packaging materials, and tools not in use, from the table. A clutter-free table gives space for proper fabric handling and prevents items from getting caught in the machine.

*Fig. 3.1.7: Clean and clutter-free workplace*

2. **Organise Tools and Materials:** All necessary tools, such as scissors, thread cutters, tweezers, screwdrivers, and extra needles, should be kept in a designated place, like a tool organiser or drawer. Threads, bobbins, and fabric rolls must be stored properly to prevent them from falling or getting tangled. Keeping everything in its place reduces the risk of cuts or injuries from sharp tools and saves time during embroidery work.

*Fig. 3.1.8: Organised drawer*

3. **Check Electrical Connections:** Industrial embroidery machines run on electricity, so all plugs, sockets, and wires should be checked regularly. Loose or exposed wires must be reported immediately. Power cords should not be lying across walkways where someone could trip over them. Also, avoid overloading sockets with multiple plugs.

*Fig. 3.1.9: Improper power unit*

4. **Ensure Proper Lighting and Ventilation:** The embroidery area should be well-lit, allowing the operator to see the fabric, needle, and design clearly. Poor lighting can lead to eye strain or mistakes in stitching. Good ventilation is also necessary to keep the air fresh, especially if any fabric treatment sprays or lubricants are used.
5. **Keep the Floor Clean and Dry:** The floor around the machine must be kept free of thread clippings, pieces of stabiliser, or fabric scraps that may cause slipping. If any water or oil spills occur, they should be wiped up immediately to prevent accidents.
6. **Follow Safe Machine Practices:** Before starting the machine, ensure that all moving parts are covered, safety guards are in place, and emergency stop buttons are functioning properly. Loose clothing, hair, or jewellery should be tied back or removed to avoid getting caught in the machine. The operator should sit or stand in a proper posture to avoid back and neck strain.

7. **Label and Store Waste Materials Properly:** Store waste materials, such as broken needles, used bobbins, and damaged fabrics, in separate bins. Sharp items must be discarded in a marked container to avoid injuries. Chemical-based products, if used, should be stored in their original containers with clear labels.

A hazard-free area helps prevent accidents, protects the machine from damage, and allows for smooth and uninterrupted embroidery operations.

## 3.1.8 Reporting Procedure

Reporting defective tools and machines, as well as any risks that may affect embroidery work, is essential for maintaining smooth operations and ensuring safety. An embroidery machine operator must follow a clear and timely process to ensure that the right person is informed and the issue is resolved without delay.

**Step 1:** Recognise the Problem Early

The operator should stay alert during machine operation. If the machine exhibits signs such as unusual noise, thread breakage, jamming, needle vibration, or display panel errors, it may indicate a defect. Similarly, if tools like scissors, thread cutters, or tension gauges are not functioning correctly or are damaged, they should be reported.

**Step 2:** Stop the Machine if Needed

Suppose the issue may cause damage to the fabric, machine, or harm the operator (e.g., a broken needle, loose screws, or a faulty motor). In that case, the operator should immediately press the emergency stop button to halt the embroidery process.

**Step 3:** Inform the Relevant Person

Every organisation has a chain of command. The operator should report the problem to the immediate supervisor, the floor in charge, or the maintenance technician, depending on the company structure. If unsure, the operator should check the reporting chart, usually displayed near the workstation.

**Step 4:** Provide Accurate Details

When reporting, the operator should give complete information, such as:

- Machine number or tool name
- Description of the problem (e.g., “thread keeps breaking due to misaligned needle plate”)
- When the problem started
- Whether the work has been stopped or continued
- Any previous attempts to fix the issue

This helps the technician or supervisor take the correct action quickly.

**Step 5:** Use the Reporting Format or Logbook

If the company maintains a maintenance log, daily checklist, or digital reporting system, the operator should fill out the necessary form or entry. For example, a maintenance ticket or issue log may require:

- Operator’s name and shift
- Date and time of the issue
- Type of fault

- Immediate action taken
- Signature of the person informed

**Step 6:** Follow Up If Required

If the problem is not resolved immediately, the operator should follow up or check back with the concerned person to avoid delays in work. In some cases, a replacement tool or alternate machine may be provided temporarily.

**Step 7:** Report Risks That May Affect Service

If the operator notices anything that may impact quality or delay delivery—such as repeated machine breakdowns, shortage of spare parts, power failures, or defective raw materials—they must inform the supervisor early. This helps the company take preventive steps and manage timelines effectively.

# UNIT 3.2: Performing High Quality Embroidery Work

## Unit Objectives

**By the end of this unit, the participants will be able to:**

1. Operate the embroidery machine skillfully and according to the guidelines.
2. Optimise the layout and positioning of materials for smooth flow.
3. Carry out test sews.
4. Identify elements of the embroidery artwork.
5. Identify the key elements of quality control in embroidery work.
6. Follow design specifications and instructions accurately.
7. Produce embroidery designs that accurately match artwork specifications and design samples.
8. Perform all embroidery operations with precision and attention to detail.
9. Inspect embroidered products against design and quality specifications.
10. Discuss the importance of leaving the work area safe and secure after completing work.

## 3.2.1 Operating Embroidery Machine Skilfully

Operating an embroidery machine skillfully and in accordance with guidelines is essential for maintaining quality, ensuring a smooth workflow, and preventing damage to the machine or fabric. The operator must begin by preparing the machine correctly. This involves selecting the appropriate embroidery design file and loading it into the machine's memory.

The correct hoop size should be chosen based on the design dimensions, and the fabric should be hooped tightly without wrinkles. Threads of the right colour and type, along with the suitable needle, must be installed to match both the fabric and design requirements. A full bobbin should be inserted properly before starting.

Next, the machine settings must be carefully adjusted. The operator should set parameters such as stitching speed, stitch density, pull compensation, and thread tension according to the fabric type and design complexity. For example, delicate fabrics require slower speeds and lower tension to avoid puckering or thread breakage. Using the design specification sheet, the operator ensures that all settings align with the instructions provided.

Before running the embroidery, a trace function should be used to check whether the design fits well within the hooped area. A test run on a scrap piece of similar fabric can help verify the stitch quality and make any necessary adjustments. Once confirmed, the operator can start the embroidery, ensuring continuous supervision of the process. The operator must watch for problems such as thread breaks, skipped stitches, or machine errors and should know how to pause the machine and address issues if they arise.

Safety is also a priority. The operator must avoid placing hands near the needle while the machine is running and ensure that clothing or accessories do not interfere with the machine. The surrounding workspace should be clean and free from obstacles to prevent accidents.

After stitching, the operator should carefully remove the fabric, trim any excess threads, and check the completed design for accuracy and quality. This includes ensuring the correct use of colour, alignment, and consistency with the approved artwork.

## 3.2.2 Optimising Layout and Positioning of Materials for Smooth Flow

The workstation and supplies must be carefully arranged to ensure effective and continuous embroidery operations. This helps save time, reduce errors, and improve overall productivity. Proper layout and positioning of materials allow the embroidery machine operator to work smoothly without unnecessary delays or confusion.

Firstly, all materials needed for the embroidery work—such as fabric rolls, threads, needles, bobbins, and design sheets should be arranged near the machine within easy reach. Items that are used frequently should be placed in the front or top of storage drawers or racks, so the operator doesn't waste time searching. Keeping colour-coded threads in an organised manner (e.g., using a thread stand or rack) helps the operator quickly select the correct thread when changing colours.

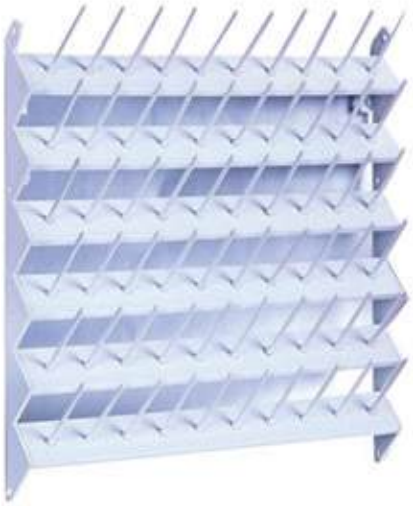

*Fig. 3.2.1: Wall mount thread stand*

Secondly, hooped fabrics should be lined up in order if multiple pieces are to be embroidered. A staging area near the machine can be set up for this purpose. As one-piece finishes, the next can be picked up immediately without delay. Used or embroidered pieces should have a separate collection space to avoid mixing with unstitched ones.

The machine workstation must be kept clutter-free with enough working space around it. Materials should be kept off the floor to avoid safety hazards. When using multiple machines in a commercial setup, their arrangement should allow for the free movement of the operator and provide easy access to all machines.

Lastly, verifying that the design files are already loaded and the required threads are mounted beforehand ensures that embroidery starts without interruption. This organised and systematic layout helps maintain a steady workflow and supports the timely delivery of embroidered products.

## 3.2.3 Carrying Out Test Sewing in Embroidery

Test sews are trial stitches performed on a sample piece of fabric before beginning the actual embroidery on the final garment or product. They help check the design alignment, thread tension, stitch quality, and overall appearance. Test sews are essential to avoid mistakes, reduce material waste, and ensure that the embroidery comes out exactly as planned.

**How to Carry Out Test Sews?**

**Step 1:** Prepare a Sample Fabric

Choose a piece of fabric that matches the type, thickness, and texture of the final fabric. This helps ensure that the test results will accurately reflect how the design will look on the actual product.

**Step 2:** Hoop the Fabric Properly

Place the sample fabric in a hoop just as you would do with the final garment. Make sure it is tightly hooped, flat, and wrinkle-free. Secure the hoop onto the embroidery machine arms.

**Step 3:** Load the Design

Select and load the embroidery design into the machine. Check the colour sequence, stitch type, and size of the design to make sure everything matches the job sheet or specifications.

**Step 4:** Set the Machine Parameters

Adjust the stitch speed, thread tension, pull compensation, and stitch density based on the fabric and design. These settings should match what is planned for the final product.

**Step 5:** Run the Test Sew

Start the embroidery machine and allow it to complete the design on the sample fabric. Watch the process carefully to check for thread breaks, misalignment, skipped stitches, or fabric puckering.

**Step 6:** Inspect the Outcome

After stitching, examine the test sew. Ensure the stitches are neat, the threads have the correct tension, and the design is centred and aligned. Compare it with the artwork or design specifications.

**Step 7:** Make Adjustments if Needed

If there are any issues, adjust the settings or re-hoop the fabric and try again. Once the test sew looks perfect, it is safe to proceed with actual embroidery on the final fabric.

Test sews save time, reduce mistakes, and help maintain high embroidery quality, especially in industrial setups where bulk production is carried out.

## 3.2.4 Understanding and Following Embroidery Artwork and Design Specifications

The operator of the embroidery machine must accurately understand the artwork and adhere to the design parameters and instructions to produce high-quality embroidered work. This guarantees that the finished product adheres to the necessary design, maintains consistency, and steers clear of errors.

Embroidery artwork is a visual guide or file that contains all the necessary details for creating a design. The operator should carefully examine the following elements:

- **Design layout:** The overall shape, structure, and composition of the design.
- **Stitch types:** The kinds of stitches used (e.g., satin stitch, fill stitch, running stitch, etc.).
- **Colour sequence:** The order in which thread colours are to be used in the design.
- **Design size:** The width and height of the design to be stitched.
- **Placement guide:** The location on the fabric where the design should be stitched.
- **Special elements:** Any additional features like appliqué areas, cut work sections, or mirror placements.

For example, if a floral motif is being embroidered, the artwork may specify which petal is done in satin stitch, the colour of each part of the flower, and the exact placement on the fabric.

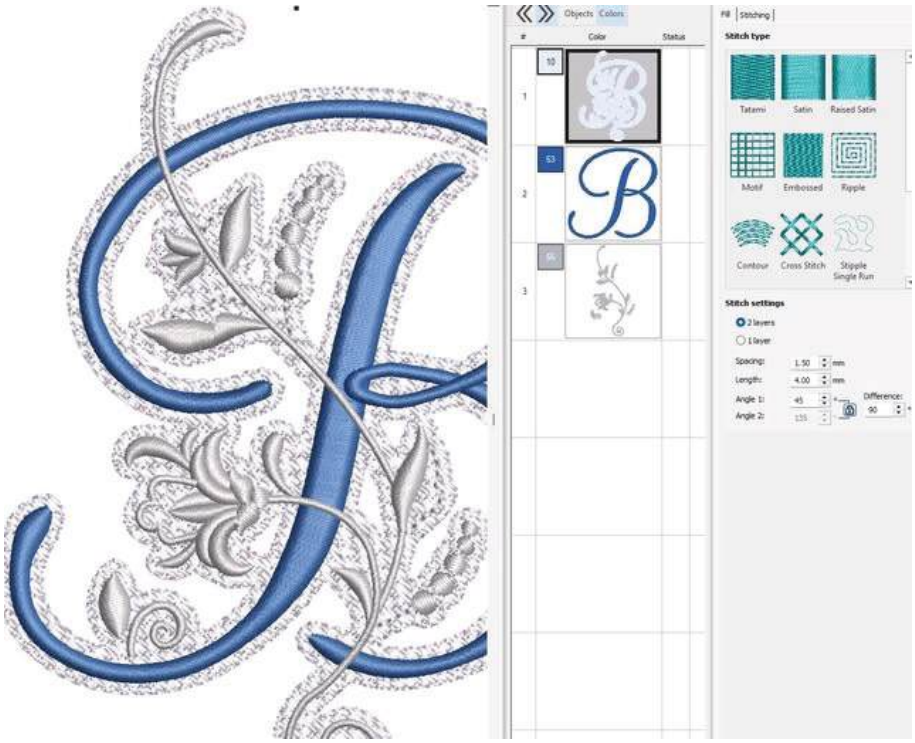

*Fig. 3.2.2: Elements in an embroidery artwork*

Once the embroidery artwork is clearly understood, the embroidery machine operator must refer to the design specification sheet or job sheet to begin the embroidery process. This sheet contains essential information that helps the operator carry out the work accurately and efficiently. One of the first steps is to load the correct design file into the embroidery machine. The file name or number should exactly match what is mentioned in the job sheet to avoid any errors in stitching.

Next, the operator should check the colour codes and thread types listed in the design instructions. The correct thread cones must be selected and arranged in the order required by the machine. Any mismatch in thread type or colour can affect the appearance and finish of the embroidery.

After thread preparation, the operator needs to set the correct hoop size. The hoop must align with the design's placement and dimensions, ensuring that the fabric is held taut and the embroidery is positioned correctly. Incorrect hooping can lead to shifting, misalignment, or damage to the fabric.

Following this, the operator should adjust machine settings such as speed, stitch density, and thread tension. These settings depend on the type of fabric and the design complexity. For example, dense designs or delicate fabrics may require slower speeds and lighter tension.

Lastly, if the design involves special embroidery techniques, such as mirror work or appliqué, the operator must attach the correct machine accessories. Any special instructions, including double stitching or reduced speed for specific areas, should be followed precisely to ensure high-quality output and avoid mistakes during production.

## 3.2.5 Key Elements of Quality Control in Embroidery Work

Quality control in embroidery work is essential to ensure that every design is stitched accurately, cleanly, and meets the required standards. Several key elements contribute to maintaining high quality in embroidery, especially in industrial settings where bulk production is involved. These elements help detect errors early, reduce rework, and ensure customer satisfaction.

1. **Design Accuracy:** The first and most important element is ensuring that the embroidery design matches the approved artwork. The digitised file must be carefully reviewed to confirm that shapes, lines, text, and colour placements are as per specifications. Any distortion, misalignment, or wrong scaling in the design should be identified before stitching.
2. **Thread Quality and Colour Consistency:** Using high-quality threads that are strong, colourfast, and suitable for machine embroidery is vital. The thread should not break or fray during the stitching process. It's also important that the colours match the design chart and remain consistent across all garments, especially in bulk orders.
3. **Fabric Compatibility:** The fabric must be suitable for the embroidery work. The operator should ensure that the needle, thread, tension, and design settings are correctly matched to the type of fabric being used. If the fabric is too thin or stretchy and not hooped correctly, it may lead to puckering, distortion, or damage.
4. **Hooping and Stabilisation:** Proper hooping keeps the fabric taut and stable during embroidery. The use of the correct backing or stabiliser helps hold the fabric firmly, preventing shifting or pulling. Quality control involves verifying that the hooping is tight and the stabiliser is suitable for the fabric and design complexity.
5. **Stitch Quality:** Stitches should be even, tight, and neat. There should be no loose threads, skipped stitches, bird nests, or overlapping. Thread tension should be balanced to avoid pulling or sagging. Operators must inspect for issues such as broken threads, improper trimming, or an unclean finish after embroidery.

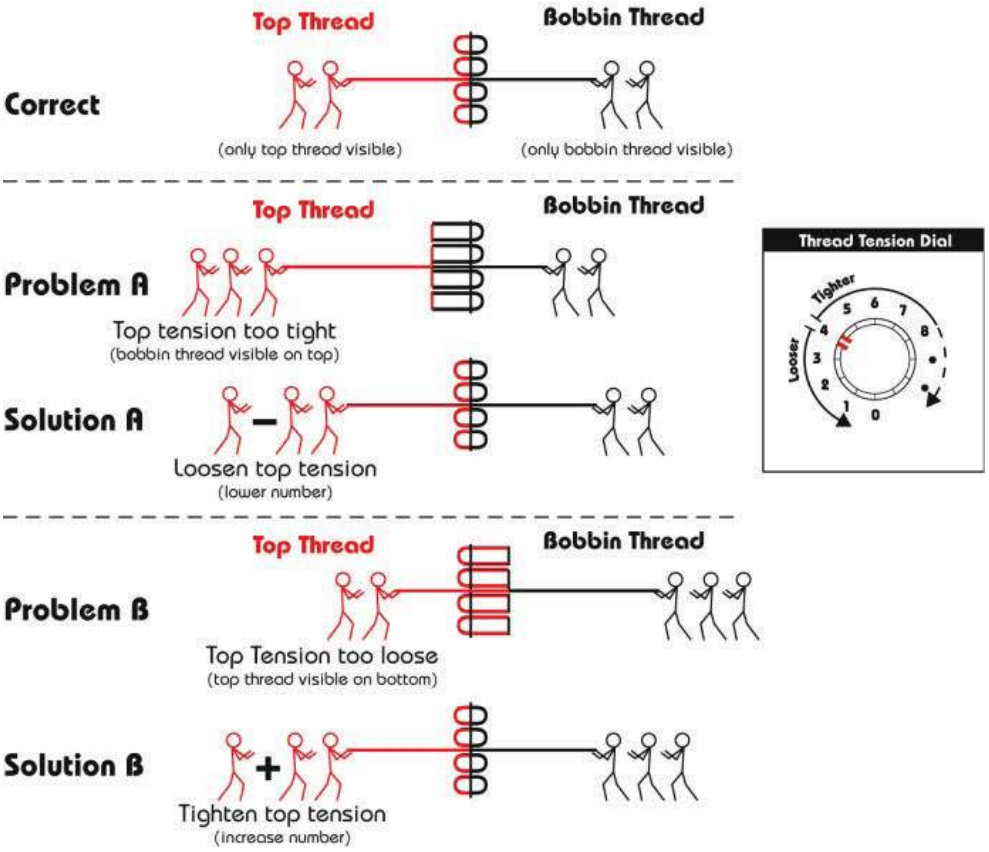


*Fig. 3.2.3: Thread tension adjustment*

6. **Machine Calibration and Settings:** Embroidery machines must be properly set up and calibrated for each job. This includes correct speed, stitch density, needle size, and thread tension. Quality control involves ensuring machines are operating with the right settings to prevent errors and maintain uniform output.
7. **Consistency across Units:** In bulk embroidery work, all pieces must be uniform in appearance. Quality control involves sampling and inspecting a few items from each batch to ensure consistency in stitch quality, thread colour, and design placement.
8. **Design Placement:** Designs must be positioned accurately on the fabric or garment to ensure optimal visual impact. Quality checks should ensure that the embroidery is centred, straight, and stitched in the correct location, as specified in the design layout.
9. **Finishing and Cleaning:** After embroidery, the fabric should be trimmed neatly to ensure a clean finish. Loose threads, extra stabiliser, and backing should be removed. If needed, light ironing or pressing is done. The finished embroidery should look clean and professional with no smudges or damage.
10. **Final Inspection and Documentation:** Before final packing, a thorough inspection of each embroidered piece ensures that all quality standards are met. Faulty items should be separated and reworked if possible. Quality reports and inspection records should be maintained to trace any issues and improve future processes.

## 3.2.6 Ensuring Design Accuracy and Precision in Embroidery Operations

The operator must adhere to a meticulous inspection and verification procedure, both before and during sewing, to ensure that the embroidered pattern meets the artwork criteria. To ensure the embroidered design matches the artwork specifications, the embroidery machine operator must carefully study the design artwork and the accompanying job sheet. These documents provide key details such as the size, position, colour sequence, and type of stitches to be used.

The embroidery machine operator should double-check that the design file loaded into the machine matches the file name or number given in the job sheet. A mismatch at this stage can lead to incorrect stitching and wastage of both time and materials.

Before starting the embroidery, it's essential to perform a trace function on the machine. This shows the boundary of the design to verify that it fits well within the hoop and is aligned correctly. The operator should also confirm that the thread colours and types are correct according to the colour sequence chart and that all cones are threaded in the correct order. Any variation in thread shades or texture can cause the final design to look different from the original sample.

Machine settings such as stitch density, pull compensation, and thread tension must be properly adjusted to suit both the fabric type and the design complexity. Fine or stretchy fabrics need careful handling to prevent distortion. The operator should use the correct needle size and attachments based on the artwork requirements. Test sews on a scrap piece of the same fabric are strongly recommended before stitching on the actual garment to check for accuracy and alignment.

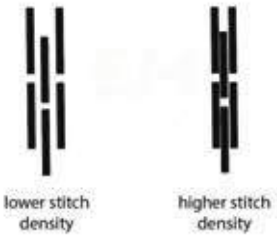


*Fig. 3.2.4: Stitch density*

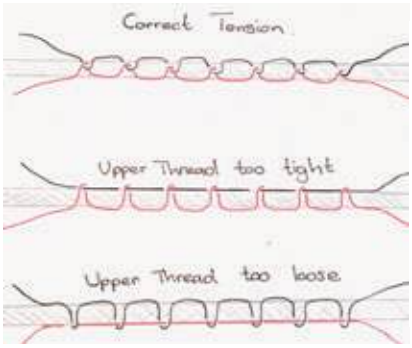


*Fig. 3.2.5: Thread tension*

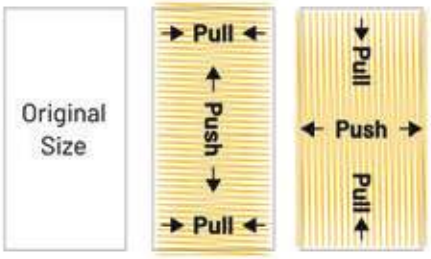


*Fig. 3.2.6: Pull compensation*

Creating designs that conform to the original specifications also involves precision in every operation. The operator must closely monitor the embroidery during production, pausing the machine immediately if thread breaks, skipped stitches, or fabric puckering occur.

## 3.2.7 Inspecting Embroidered Products Against Design and Quality Specifications

Inspecting embroidery work is an important step to ensure the final product meets the required design and quality standards. The embroidery machine operator should conduct this inspection carefully after the embroidery process is complete, before the product proceeds to the next stage of production.

First, compare the embroidered design with the original artwork or sample. Check whether the shape, size, and placement of the design are accurate. Inspect the alignment and ensure the design has been stitched in the correct location on the fabric. For example, if a logo is to be embroidered on the chest of a T-shirt, it must not be off-centre or too low.

Next, examine the thread colours. Ensure the threads used match the colour codes specified in the job sheet or design specification. Even a slight variation in colour can change the appearance of the design and reduce quality.

Then, inspect the stitching quality. The stitches should be even, tight, and smooth. There should be no skipped stitches, loose threads, bird-nesting (thread tangling under the fabric), or bunching of the fabric. If the design involves special techniques, such as appliqué or mirror work, ensure that the added elements are secure and cleanly stitched.

Also, check for fabric damage. Sometimes, incorrect needle type or tension can cause holes or puckering in the fabric. If any such defect is found, it should be reported and corrected.

Finally, refer to the quality checklist or the job sheet to confirm all design and quality points have been met. This step ensures that the embroidered product is ready for the next stage or final delivery.

## 3.2.8 Significance of Leaving the Work Area Safe and Secure After Work Completion

Leaving the work area safe and secure after completing embroidery tasks is essential for maintaining a productive, hazard-free, and organised work environment. This practice not only ensures the safety of the embroidery machine operator and coworkers but also protects valuable tools, machines, and materials from damage or misuse.

Firstly, clearing the work area reduces the risk of accidents. Loose threads, scissors, needles, or fabric scraps left unattended can lead to slips, trips, or injuries. By properly disposing of waste materials and storing sharp tools in designated places, operators help prevent workplace hazards. For example, placing scissors in a toolbox instead of leaving them on the table avoids accidental cuts.

Secondly, turning off and securing machines is critical. If embroidery machines are left running or plugged in, they can cause overheating, short circuits, or accidental starts. Operators should switch off the machine, unplug it if necessary, and cover it with a dust cover to keep it clean and safe. This extends the machine's life and reduces maintenance needs.

Thirdly, organising tools and materials for the next shift enhances efficiency. When thread cones, needles, hoops, and fabrics are stored properly, the next operator can begin work without delay or confusion. Labelling items and returning them to their designated storage space helps maintain workflow and reduces the time wasted searching for equipment.

Lastly, a clean and secure work area reflects professionalism and discipline, showing respect for the tools and the work environment and fostering a culture of responsibility and teamwork among workers. In industrial settings where multiple operators use the same machines, this becomes even more crucial for smooth shift transitions and consistent production quality.

## Summary

- Decorative embroidery includes creating artistic designs such as leaves, flowers, motifs, and borders.
- The design is first analyzed from the artwork or sample and matched with the job sheet.
- Machines are set up with correct threads, hoop sizes, and attachments based on the design.
- Embroidery is done using techniques like round stitch, pointed leaf stitch, and cutwork.
- The operator must operate the machine at the correct speed and tension for best results.
- Double stitching or slow speed may be used for delicate fabrics or complex designs.
- Minor faults like skipped stitches or loose threads must be corrected during operation.
- The final design should closely match the given specifications in size, position, and appearance.
- Clean finishing and accurate alignment improve the quality of the product.
- The operator must handle the fabric with care to avoid distortion, puckering, or damage.

## Exercise

**Multiple-choice Question:**

1. What should be checked before starting embroidery?
   a. Whether the machine is new
   b. That the needle is rusty
   c. That the light is turned on
   d. That fabric is correctly hooped

2. Which technique uses fabric pieces to form part of the design?
   a. Appliqué
   b. Cut work
   c. Mirror work
   d. Dori work

3. What is the purpose of tracing the design before stitching?
   a. To clean the fabric
   b. To decorate the needle
   c. To change thread colours
   d. To ensure proper placement

4. What helps to avoid puckering during embroidery?
   a. Loose hooping
   b. Strong lighting
   c. Proper tension and speed
   d. Skipping stitches

5. What should an operator do during the embroidery process?
   a. Leave the machine unattended
   b. Monitor the stitching for errors
   c. Pull the fabric
   d. Constantly increase speed

**Descriptive Questions:**

1. Describe the steps to complete a cutwork embroidery design.
2. What precautions should be taken when doing mirror work?
3. Explain the process of setting up the machine for pointed leaf design.
4. What steps are involved in executing appliqué work?
5. Why is it important to check fabric tension and hooping?

## Notes

Scan the QR codes or click on the link to watch the related videos

https://youtu.be/Btim8PVvMIs?si=jFuIXwtO5WJVMECt

51 Major fabric faults and fabric inspection

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# 4. Contribute to achieve quality in embroidery work and Greening of Job Roles

APPAREL MADE-UPS HOME FURNISHING
SECTOR SKILL COUNCIL

Unit 4.1 - Maintain Quality Standards in Embroidery Production

Unit 4.2 - Inspect, Rectify and Report to Ensure Product Quality

AMH/N1003

## Key Learning Outcomes

**By the end of this module, the participants will be able to:**

1. Follow organisational procedures and guidelines related to embroidery operations, quality systems, equipment handling, and safety protocols.
2. Identify different types of embroidery faults and defects, understand their causes, and apply appropriate methods to detect, rectify, and report them.
3. Use the correct tools, materials, and embroidery components as specified in the job, while maintaining tolerance levels and preventing contamination.
4. Perform in-process quality checks, sort and track materials, and inspect completed embroidery products against design and quality standards.
5. Make timely adjustments to embroidery machine settings to correct identified faults and ensure design specifications are met.
6. Mark, segregate, and report faulty or rejected materials and products in accordance with the organisation's quality procedures.
7. Maintain workflow and productivity while adhering to safe working practices and personal responsibility limits.
8. Document inspection findings, quality checks, workflow disruptions, and improvement suggestions as per organisational formats.

# UNIT 4.1: Maintain Quality Standards in Embroidery Production

## Unit Objectives

**By the end of this unit, the participants will be able to:**

1. Follow organisational procedures and guidelines related to quality and safety.
2. Identify and apply the quality systems and embroidery processes practised within the organisation.
3. Discuss the importance of operating embroidery machines as per manufacturer's instructions and standard operating procedures.
4. Discuss how to work safely and at an efficient rate to maintain consistent workflow and productivity.
5. Recognise the impact of incorrect machine settings and apply methods to avoid contamination of stitched/embroidered products.
6. Apply allowed tolerances in embroidery processes to maintain quality.
7. Identify various types of faults in the embroidery work, understand their causes, and describe suitable corrective methods.
8. List types of problems with quality and how to report them to appropriate people.
9. Present ideas for improvement to the supervisor or line manager.

## 4.1.1 Organisational Procedures and Guidelines Related to Quality and Safety

Every embroidery machine operator must follow the company's rules and instructions to ensure the work is safe and of good quality. These are called organisational procedures and guidelines. Following them helps avoid accidents, saves time, reduces mistakes, and ensures the final product looks neat and correct.

**Safety Guidelines**

The operator should always follow safety instructions while working on the embroidery machine. These include:

- **Wearing proper clothing:** Avoid loose clothes or accessories that may get caught in the machine.
- **Keeping the work area clean:** A clean floor and table prevent slips, falls, and damage to materials.
- **Using tools and machines carefully:** Only use tools for the purpose they are meant for, and always handle them properly.
- **Turning off the machine:** The machine must be switched off when not in use, or during maintenance, to avoid any risk.
- **Reporting damaged tools or unsafe situations:** If any machine, wire, or tool appears to be broken or unsafe, the operator must immediately inform the supervisor.

**Quality Guidelines**

To maintain high quality in embroidery work, the operator must:

- **Follow the job sheet carefully:** This includes checking design instructions, thread colours, fabric type, and machine settings.
- **Use the correct materials:** Using the wrong thread or fabric can result in poor-quality embroidery.
- **Inspect the fabric and threads:** Ensure there are no stains, cuts, or loose threads before beginning.
- **Perform test runs if needed:** A small test on extra fabric helps ensure the machine is functioning correctly and the design appears as intended.
- **Inspect the final product:** Verify that the design aligns with the artwork and that there are no loose threads, skipped stitches, or errors.
- **Handle materials with care:** The embroidery must be kept clean and safe from damage or dirt at all times.

The embroidery machine operator contributes to the creation of high-quality designs, maintains workplace safety, and prevents waste or rework by adhering to these basic guidelines on a daily basis. These guidelines also show that the operator is responsible and serious about their work.

## 4.1.2 Understanding and Using Quality Systems in Embroidery Work

Every organisation follows specific steps to ensure the embroidery work is neat, accurate, and matches the design. These steps are called quality systems. They help the embroidery machine operator do the job properly, avoid mistakes, and produce good-quality products.

**Identifying Quality Systems**

The embroidery machine operator must first comprehend the organisation's quality systems in order to guarantee that the embroidery work satisfies the required quality. These systems guide how work should be done, outline the steps to follow, and provide guidance on how to avoid errors.

One of the primary tools for understanding quality expectations is the job sheet. The job sheet contains key information, such as the embroidery design pattern, thread colours, fabric type, quantity to be produced, and the delivery timeline. By carefully reading the job sheet before starting work, the operator can prepare the necessary materials and plan the tasks effectively. It is also important for the operator to follow instructions given by the supervisor. These instructions may include design specifications, machine settings, thread tension, speed levels, or any special steps to follow during embroidery. Listening carefully and asking questions when in doubt helps avoid mistakes.

Another way to understand the required quality is to check the provided sample. A finished sample product or a printed design image is often shown before the embroidery begins. The operator must examine the sample closely and match each detail during their work.

Finally, many organisations provide training or on-the-job learning to help workers understand and follow quality standards. During such training, operators may be taught how to handle tools, perform test stitches, inspect work for defects, and report problems. Following this learning helps the operator maintain quality at every step of embroidery.

**Applying Quality Systems**

Once the operator understands what is expected, they must:

- Use the correct thread and fabric as mentioned in the job sheet.
- Set the embroidery machine properly, including the right needle, thread tension, and speed.
- Perform a test stitch to verify that the design appears correctly and matches the sample.
- Watch the stitching process to spot thread breaks, fabric folds, or errors in the design early.
- Inspect the product after embroidery is done – checking for correct design placement, colour, stitch finish, and neatness.
- Separate damaged or faulty pieces and report them to the supervisor for rework or correction.

## 4.1.3 Importance of Operating Embroidery Machines as per Manufacturer's Instructions and SOPs

Every embroidery machine is made by a company called the manufacturer. The manufacturer provides a guidebook or manual that explains how to set up, use, clean, and take care of the machine. These are known as manufacturer's instructions.

When an operator follows these instructions, it helps to:

- Avoid mistakes in the embroidery design
- Prevent damage to the fabric or machine
- Keep the machine in good condition
- Ensure personal safety
- Complete the work faster and correctly

A manufacturer's instruction manual for an industrial embroidery machine usually contains several important sections to help the operator use the machine safely and effectively. It begins with a machine overview that includes the model description, parts diagram, and technical details such as stitch speed and power supply. Installation instructions explain how to safely set up the machine and connect it properly. Threading instructions guide the operator step-by-step on how to thread the needle and bobbin, including thread types. There is also a section on needle and bobbin handling, covering how to insert them and adjust tension.

The manual includes machine settings, such as speed and stitch adjustments, and explains hooping techniques to prevent errors. In design loading, it teaches how to import and position embroidery files. Routine maintenance and safety guidelines outline how to clean the machine and ensure safety during operation. Troubleshooting tips help resolve common issues, including thread breaks or error messages.

Lastly, it provides warranty and service details for repairs and support. This manual helps the operator follow standard procedures and achieve good quality work.

Standard Operating Procedures (SOPs) are created by the company based on the type of work, fabric, machine model, and customer needs. They include:

- How to read the job sheet
- How to start the machine
- Which thread to use for a particular design

- What to do if there is a thread break
- Steps to clean and shut down the machine after work

Even a new operator can understand what to do and how to do it correctly by following these SOPs. It helps maintain the same quality of work for all products and saves time by reducing confusion.

## 4.1.4 Working Efficiently and Safely on Embroidery Machines

An embroidery machine operator must follow a steady routine without rushing or making mistakes. Working at the right speed helps in completing the work on time and maintaining high quality, while also ensuring safety.

The operator should start by preparing everything before turning on the machine. This includes checking the fabric, threads, needles, and design file. If everything is ready, the operator can work smoothly without stopping again and again.

The machine should be used as per the supervisor's instructions and company guidelines. Running the machine too fast can cause errors like broken threads, skipped stitches, or damage to the fabric. So, it is better to work at a speed that the machine can handle without problems. Slow and steady work reduces the chance of mistakes and keeps the machine in good condition.

If a problem arises, such as a needle breaking or a thread getting stuck, the embroidery machine operator should stop the machine and address the issue before continuing. This helps avoid damage and keeps the work safe.

*Fig. 4.1.4: Emergency stop button*

The operator should also avoid distractions and maintain a neat work area. A clean and organised space saves time and helps the operator focus more effectively.

## 4.1.5 Impact of Incorrect Machine Settings

Embroidery machine operators must always check that the machine is set correctly before starting work. If the machine settings are wrong, it can lead to many problems in the final product and even damage the machine or fabric.

For example, if the thread tension is too tight, the thread may break or cause the fabric to gather and wrinkle. If it is too loose, the stitches may look messy and uneven. If the speed setting is too high for delicate fabric, it can tear or stretch the material. On the other hand, too slow a speed can delay the work and affect productivity. Wrong needle type or size can damage the fabric or skip stitches. If the hoop is not aligned properly, the design may not match the artwork, or the stitching may shift.

Incorrect stitch density may result in excessive stitching in a small area, making the design appear stiff or causing thread bunching. If the density is too low, the design may look incomplete. Improper machine calibration or design file loading can lead to misplacement of the design on the fabric.

Hence, it is crucial for the operator to double-check the machine settings, follow the instructions from the job sheet, and conduct a test sew before commencing the actual embroidery. This helps to maintain the quality of work and prevent wastage.

## 4.1.6 Methods to Avoid Contamination of Stitched/ Embroidered Products

Contamination can include dust, dirt, stains, oil marks, or even thread and fabric particles, which can spoil the look and value of the finished item. To maintain the cleanliness and quality of embroidered products, it is important for the embroidery machine operator to take proper care while working.

Below are some simple methods to avoid contamination:

- **Keep Hands and Work Area Clean:** The operator should always wash or clean hands before touching fabrics. The work table and surrounding area should be free from dust, food, oil, or ink stains. Using clean cloth or gloves when handling white or light-coloured fabrics can prevent finger marks and dirt.

*Fig. 4.1.5: Dirty and oil stained hands*

- **Use Clean Tools and Machines:** Needles, scissors, bobbins, and other tools must be free from rust, grease, and lint. The embroidery machine should be cleaned regularly, especially the needle area and thread path, to prevent oil or dust from transferring onto the fabric.
- **Store Fabric Properly:** Fabrics should be stored in clean, dry places, away from moisture and direct sunlight. They should be covered or placed in clean containers to protect from insects, dust, or accidental spills.

- **Avoid Eating or Drinking near Work Area:** Food particles, oily hands, or accidental spills can easily damage the fabric. Operators should eat and drink in designated areas, not at the machine or fabric storage area. Also, avoid smoking in the work area, as flying sparks may burn the fabric and cause a fire.

*Fig. 4.1.6: Oil stain on fabric*

- **Use Protective Covers:** While the fabric is not being worked on, it should be covered with a clean cloth or plastic sheet. Finished products should be covered or packed immediately to prevent exposure to dirt or damage from handling.
- **Handle with Care during Hooping and Stitching:** When hooping or positioning the fabric, ensure the surface is clean and avoid placing the fabric on dirty or oily areas. Ensure threads used are clean and not frayed or dusty.

## 4.1.7 Applying Tolerances in Quality Management

**What is Tolerance in Quality?**

In embroidery, tolerance refers to the small amount of variation allowed in the final product without affecting its quality or appearance. It is the acceptable limit beyond which a product is no longer considered good. For example, if the design should be 10 cm wide, but it comes out 9.8 cm or 10.2 cm, it may still be acceptable. This small variation is called tolerance.

**Why is Tolerance Important?**

Every embroidery job must meet a quality standard. However, even slight differences in thread thickness, fabric stretch, or machine movement can cause minor changes in the output. Tolerance helps the operator understand what changes are okay and what is not. It saves time and prevents waste when the difference is too small to matter.

**How to Apply Allowed Tolerances in Embroidery**

It is important for the machine operator to apply the allowed tolerances correctly to maintain quality in embroidery work. Tolerances are small limits or ranges within which slight differences in size, position, or stitch are accepted without affecting the overall look or quality of the design.

First, the operator must carefully read and understand the job sheet. This sheet includes important details such as the design size, thread colours, stitch type, placement, and sometimes the allowed tolerance range (like ±2 mm). Before starting any work, the operator should make sure they are clear about these details.

Using proper machine settings is another important step. Incorrect settings can result in the design being stitched too tightly or too loosely, leading to size or shape changes. The operator must set the correct tension, speed, and stitch density based on the fabric type and design to avoid going beyond the tolerance range.

Hooping must be done properly to keep the fabric firm and flat. If the fabric is not hooped evenly, it can shift during stitching, which may cause the design to move out of place or change its size. The operator should always hoop the fabric tightly and check that it is secure before starting the machine.

It is helpful to do a test run before beginning the main production. This allows the operator to stitch a sample and measure it to see if it falls within the allowed tolerance. If everything looks correct, they can proceed with confidence.

After completing the embroidery, the operator must measure the finished work using a ruler or template to check the size and placement. If the design falls within the allowed limits, it is accepted. If not, it may need to be adjusted or redone.

Finally, if the operator is unsure about the tolerance, they should always consult with their supervisor. It is better to clarify in advance than to risk producing faulty work.

## 4.1.8 Faults in Embroidery Work

In embroidery, maintaining quality is very important. Even small faults can mar the design's appearance or damage the fabric. An embroidery machine operator must learn to identify various types of faults, understand their causes, and know how to rectify or prevent them.

| S. No. | Fault | Appearance & Impact | Common Causes | Corrective Actions |
|---|---|---|---|---|
| 1 | Thread Breakage Marks | Gaps or missing parts in the design. Design appears broken or incomplete. | Thread snapped during stitching; poor restart alignment | Use good-quality thread, reduce machine speed, check tension, and align design carefully before restarting. |
| 2 | Skipped Stitches | Gaps in stitching, design appears weak and patchy. | Loose fabric, improper tension, poor hooping | Tighten hooping, adjust upper thread tension, ensure correct needle and fabric combo. |
| 3 | Puckering | Wrinkles around the embroidery; design looks uneven and unprofessional. | No stabiliser used, uneven hooping, too dense stitches | Use appropriate stabiliser, hoop fabric tightly, reduce stitch density if needed. |
| 4 | Misalignment of Design | Design looks crooked; parts like eyes or letters are out of place. | Fabric movement during stitching, misaligned hoop or design | Use proper hooping method, secure fabric well, double-check design position. |

| S. No. | Fault | Appearance & Impact | Common Causes | Corrective Actions |
|---|---|---|---|---|
| 5 | Uneven Stitch Density | Some areas are thick with stitches; others are thin. Design looks patchy. | Poor digitising, tension issues, machine speed variations | Ensure consistent tension, verify digitised design quality, avoid excessive speed changes. |
| 6 | Loose Stitches | Loops or slack threads visible on fabric. Design appears messy and may unravel. | Loose tension, low thread quality, poor fabric stability | Adjust thread tension, use quality thread, apply stabiliser correctly. |
| 7 | Thread Loops on Underside | Loops or bunches of thread appear on the fabric back; messy and prone to snags. | Loose bobbin tension, improper threading | Re-thread machine properly, adjust bobbin tension, check for lint or threading errors. |
| 8 | Registration Issues (Gaps/ Overlaps) | Design outlines don't meet properly or overlap. Appearance is unbalanced. | Fabric shift, bad hooping, poor digitising | Use tighter hooping, apply stabiliser, ensure digitising quality and alignment. |
| 9 | Incorrect Thread Colour | Parts of the design are stitched with wrong colours; doesn't match sample or client request. | Wrong thread loaded, operator error | Double-check thread colour before starting; follow colour sequence sheet. |
| 10 | Uneven or Wavy Borders | Borders are not straight or smooth; design looks unprofessional. | Fabric shifting, thread tension problems, low-quality hooping | Re-hoop fabric properly, maintain correct tension, slow down stitching speed if needed. |
| 11 | Excess Thread Trims | Loose threads hanging from design; untidy and can catch on things. | Auto-trim not working, operator missed trimming | Check auto-trim settings, manually trim if needed, inspect designs during QC stage. |
| 12 | Fabric Damage (Due to Stitching) | Small holes or worn-out spots on or near embroidery area; weakens the product. | Too many dense stitches in one area, repeated needle hits | Reduce stitch density, use correct needle size, change needle frequently. |
| 13 | Off-Centered Design Placement | Design stitched too high, low, or off to one side; looks badly positioned. | Wrong hoop position, incorrect design setup | Measure and mark placement carefully before hooping; use templates if available. |

*Table 4.1.1: Faults in embroidery work and their corrective actions*

## 4.1.9 Reporting Quality Issues

Reporting quality issues is an important part of the embroidery machine operator's job. If a problem is noticed in the embroidery work, the operator should inform the right person immediately. This helps to fix the issue quickly and avoid more damage or mistakes in the work.

The operator should first stop the machine if the problem is serious, such as wrong thread colour, design misalignment, or puckering of the fabric. Then, they should check the job sheet or sample to be sure the issue is not part of the design. If it still looks wrong, they must report it to the supervisor or team leader.

The individual can show the faulty piece and clearly explain what is wrong. For example, they can say, "The design outline is not matching," or "The thread keeps breaking and the stitches are loose." It is helpful to point out the exact spot on the fabric where the problem is seen.

If the operator is not sure about a fault, they should still ask the supervisor for help. It is better to ask than to continue with a mistake. Reporting early helps prevent waste and saves time. The individual must also follow any company rules/SOP for recording the issue, such as filling out a fault report or clearly marking the faulty item before setting it aside.

## 4.1.10 Presenting Ideas for Improvementx

Presenting ideas for improvement is a valuable way for an embroidery machine operator to help the team work more effectively and produce high-quality embroidery. Suppose the operator has a suggestion to make the process easier, faster, or improve the design quality. In that case, they should share it with the supervisor or line manager clearly and respectfully.

First, the individual should consider the idea thoroughly. It can be about saving thread, reducing mistakes, speeding up a process, or using a better method for hooping or machine setting. The operator can observe the issue during daily work and note what can be changed.

Next, the operator should choose a suitable time to speak with the supervisor — when the workload is not too heavy or during a break. They should speak politely and explain the idea in a step-by-step manner. For example, they can say, "Sir/Madam, I noticed that when we use this hoop, the fabric stays tighter and stitching is cleaner. Can we use it more often?" or "If we check the thread cones in the morning, we can avoid breaks during production."

It helps to provide examples or demonstrate how the idea has worked in the past. The individual should also be open to feedback. Sometimes, the supervisor may accept the idea or suggest some changes.

# UNIT 4.2: Inspect, Rectify and Report to Ensure Product Quality

## Unit Objectives

**By the end of this unit, the participants will be able to:**

1. Discuss suitable rectification measures for faults in materials or components such as creasing, staining, damage, or incorrect assembly.
2. Test, sort, track feed, and examine work in progress for deviations.
3. Apply suitable inspection methods and techniques to accurately detect faults.
4. Identify modifiable defects and rework them to meet the desired standard.
5. Take corrective action when materials fail to meet the required standards.
6. Mark, segregate, and place rejected items/materials in designated locations.
7. Report quality issues, rejected materials, and faulty components to the responsible person promptly.
8. Report disruptions caused by other production areas to maintain workflow continuity and ensure uninterrupted production.
9. Complete and maintain required documentation and records.

## 4.2.1 Rectification Measures for Faults in Materials

Suitable rectification measures for faults in materials or components such as creasing, staining, damage, or incorrect assembly are given below:

1. **Creasing of Fabric**

   **What to Do:**

   - Light creases can be removed using a steam iron before hooping the fabric.
   - Always iron in the right direction and use the correct heat setting to avoid burning.
   - If the crease does not go away, the fabric may not be usable for embroidery and should be reported to the supervisor.

*Fig. 4.2.1: Creasing in fabric*

**How to Prevent:**

- Store fabric flat or rolled, not folded.
- Do not overload or press down on fabric bundles.

**2. Staining on Fabric or Thread**

**What to Do:**

- If the stain is small and washable, gently clean it using a damp cloth or mild soap before embroidery.
- For oil or ink stains, inform the supervisor. The fabric may need to be replaced.

**How to Prevent:**

- Keep hands clean while working.
- Make sure the embroidery area and machines are free from oil, food, or dust.
- Cover the fabric when not in use.

**3. Damaged Fabric or Component**

**What to Do:**

- If fabric is torn, has holes, or is thin, it should not be used for embroidery. Set it aside and inform the supervisor.
- If only a small area is damaged and can be cut without affecting the design size, the fabric may be trimmed and reused, but only after checking with the supervisor.

**How to Prevent:**

- Handle fabric carefully during cutting, hooping, and stitching.
- Do not use dull scissors, broken hoops, or sharp machine parts that may damage the fabric.

*Fig. 4.2.2: Torn fabric*

**4. Incorrect Assembly or Wrong Fabric Placement**

**What to Do:**

- If the fabric was hooped incorrectly, unstitch (if possible) and re-hoop it properly before restarting the embroidery.
- If the embroidery is done in the wrong area, report it and do not proceed. Rework may or may not be possible, depending on the design.

**How to Prevent:**

- Always double-check the job sheet for design position and direction.
- Use marks or guides to ensure correct hooping.

These simple actions help maintain quality and reduce waste. Any problem that cannot be easily fixed should always be reported to the supervisor or line manager.

## 4.2.2 Test, Sort, Track Feed, and Examine Work in Progress for Deviations

Embroidery machine operators must carefully inspect their work as it is being done. This helps catch any mistakes early and fix them before it's too late. The operator can follow these easy steps to test, sort, track feed, and examine the work in progress:

1. **Test the Machine and Design Before Production**

   Before starting the full production run, the operator should always do a test sew on a sample fabric. This helps check if the design is stitching correctly, the thread colours are right, and the fabric is properly hooped. If there is any problem, it can be corrected before real production starts.

2. **Sort the Materials Properly**

   The operator should sort all threads, fabrics, and bobbins needed for the design. Keeping materials organised makes it easy to find the right items. For example, thread cones should be kept in colour order, and cut fabrics should be stacked neatly to avoid mixing.

3. **Track the Fabric Feed**

   The fabric must move smoothly in the machine without slipping or bunching. The operator should check that:

   - The fabric is properly hooped and tight
   - The frame moves freely as the machine stitches
   - The machine sensors are working properly, especially in computerised embroidery

   If the fabric shifts or gets stuck, the design may be stitched in the wrong place. This must be stopped immediately.

4. **Examine the Embroidery Regularly**

   During production, the operator should check each piece after stitching. Things to examine include:

   - Design size and position
   - Thread tension and colour
   - Stitch quality (no loose, skipped, or overlapping stitches)
   - Fabric damage (like holes, burns, or stains)

   Even small mistakes can be caught early if the operator checks regularly, rather than waiting until the end.

5. **Look for Deviations**

   A deviation means something is not matching the design or job sheet. The operator should compare the stitched design with the sample or job card. If the embroidery is not within the allowed tolerance (e.g., size is off by more than 2mm), then it must be stopped and reported to the supervisor.

6. **Report and Fix Problems Early**

   If the operator sees any problem—like thread mismatch, design shift, or a wrong fabric—they should pause the work and inform the supervisor. Early action helps avoid waste and saves time.

## 4.2.3 Inspection Methods and Techniques to Detect Faults

Here are some simple and useful inspection methods that an embroidery machine operator can use to check for faults in embroidery work:

1. **Visual Inspection**

   The operator carefully looks at the embroidery with their eyes to find any mistakes. They check for:

   - Missing or extra stitches
   - Wrong thread colours
   - Uneven stitching
   - Loose threads or knots
   - Dirty spots or stains on the fabric

   This is the most common and easiest method to use during and after embroidery.

2. **Touch and Feel**

   By gently touching the fabric and embroidery with their fingers, the operator can feel:

   - Uneven surface
   - Loose or bumpy areas
   - Stiffness caused by wrong stitching

   This helps detect faults that are hard to see but easy to feel.

3. **Using a Measuring Scale or Template**

   A simple ruler or shape template is used to check if:

   - The size of the design matches the job sheet
   - The design is placed correctly on the fabric
   - The stitches are within the allowed tolerance range

   This method helps maintain accuracy and uniformity.

4. **Backside Checking**

   The operator turns over the fabric to check the back side of the embroidery. This helps to:

   - Spot loose or hanging threads
   - Check if stitches are strong and neat from the back
   - Find thread bunching or knots that are not visible from the front

5. **Sample Comparison**

   The operator compares the final product with an approved sample or photo. This shows if the embroidery looks the same in design, colour, shape, and quality.

   These inspection techniques help ensure high-quality embroidery and reduce the chance of faulty products reaching the customer.

## 4.2.4 Identifying Modifiable Defects and Reworking on Them

Embroidery work can sometimes have small problems, called defects. Not all defects mean the product must be rejected. Some defects can be corrected. These are called modifiable defects. An embroidery operator should learn how to find these defects early and fix them properly.

To identify such defects, the operator should compare the embroidery with the approved sample piece or job sheet, which shows the correct design size, thread colours, stitch type, and placement. By closely checking the edges and corners of the design, turning the fabric to inspect the back, matching the colours, and using a ruler to confirm the correct size and position, the operator can spot defects early and decide if they can be fixed.

If the operator is not sure whether a defect can be fixed, it is best to ask the supervisor or quality checker. It avoids wasting time and materials.

Here's how an embroidery machine operator can fix different types of modifiable defects:

| Type of Defect | How to Rework It |
|---|---|
| **Missing stitches** | Run a small re-stitch manually or using the machine if possible. |
| **Loose threads** | Trim extra threads carefully with small scissors. |
| **Broken thread in one area** | Restart the machine from the break point (use design tracking function) |
| **Thread colour mistake** | Remove incorrect part with seam ripper and redo stitching. |
| **Slight misalignment** | Check if it's within allowed tolerance; if not, re-hoop and correct the section. |

*Table 4.2.1: Rectifying modifiable defects*

**Note:** Reworking should be done carefully so the fabric is not damaged or over-stitched.

Once the defect is corrected, the operator should recheck the design to confirm that the correction appears neat and clean, and that the design now matches the sample or allowed standard.

## 4.2.5 Taking Corrective Action for Poor Quality Materials

When materials do not meet the required quality standards, it is important for the embroidery machine operator to take quick and proper action. Using damaged or faulty materials can compromise the design, cause machine issues, and lower the final product's quality.

The embroidery machine operator should begin by carefully checking all materials before use. This includes fabric, threads, backing, and needles. If there are signs of staining, creasing, holes, wrong colours, or weak threads, the operator should stop using them immediately.

Once a fault is found, the operator must report the issue to the supervisor or line in-charge. It is important to clearly explain the problem, such as "the fabric has stains" or "the thread colour does not match the job sheet." Showing the faulty material helps in understanding the issue better. After reporting, the operator should request a replacement material. Before using the new material, they must check it again to confirm that it meets all the design and quality requirements.

In some organisations, the issue may also need to be recorded in a logbook or form for tracking. This helps the team avoid repeating the same issue in the future.

Taking quick action on faulty materials saves time, reduces waste, and protects the embroidery machine from damage. It also helps maintain high quality and customer satisfaction.

## 4.2.6 Marking, Segregating, and Placing Rejected Items/Materials

Marking, separating, and placing rejected embroidery items or materials in the correct location is crucial to maintaining a well-organised work area and preventing confusion. Here is how an embroidery machine operator can do this:

1. **Marking Rejected Items**

   If an embroidered item or material is found to have faults that cannot be fixed, it must be clearly marked.

   - The operator can use a red sticker, tag, or marker to show that the item is rejected.
   - This marking should be done in a visible spot on the item but without damaging the embroidery or fabric.
   - Some workplaces may use a stamp that says “Rejected” or “Defective.”

2. **Segregating the Rejected Items**

   After marking, rejected items should be separated from the good ones.

   - The operator should not keep rejected items near finished products to avoid mix-up.
   - There may be a special tray, box, or bin labelled “Rejected” or “Defects” for this purpose.
   - This helps in identifying and rechecking them later, or sending them for repair or disposal.

3. **Placing in Designated Location**

   All rejected materials or embroidery items should be kept in a designated area only.

   - The operator should follow the workplace rule and place the marked items in the correct bin or shelf.
   - These areas are usually labelled clearly and placed away from the work area.
   - This ensures safety, smooth workflow, and no mistakes during packing or delivery.

## 4.2.7 Reporting Issues to Supervisor

Reporting problems quickly and clearly is crucial to maintaining smooth and high-quality embroidery work. An embroidery machine operator should know how to report various issues to the appropriate person.

When an embroidery operator notices a quality issue or rejected material, it is important to report it immediately. This could be a stitching mistake, wrong thread colour, or damaged fabric. The operator should stop the work and inform the supervisor or line in-charge without delay. If the workplace uses a quality logbook or a simple report form, the operator should also document the problem in that logbook or form. Quick reporting helps avoid larger mistakes and keeps the work on track.

If any component, such as a thread, needle, hoop, or fabric, is found to be faulty, the operator should not continue using it. Instead, they should show the faulty part to the supervisor and request a replacement or repair. Using damaged or poor-quality materials can spoil the design and waste time. Informing the right person early helps save effort and ensures better results.

Sometimes, the embroidery work is delayed due to problems from other sections, such as missing fabric from the cutting area or wrong design files from the design team. In such cases, the operator should clearly inform the supervisor or production head. They should explain what is missing, from which section, and how it is affecting their work. This way, the supervisor can take prompt steps to resolve the issue and help maintain a smooth workflow.

## 4.2.8 Documentation and Record Keeping

Embroidery machine operators must complete and maintain proper documentation and records to help track their work and ensure quality. These records are useful for supervisors, quality checks, and future reference. Keeping records neat and updated also shows that the work has been done correctly.

Some common documents the operator may need to fill out include:

**Job Sheet**

- This shows the design details, fabric type, thread colours, number of pieces, and deadlines. The operator should tick off or sign when the job is done.

**Production Log**

- A record of how many pieces were embroidered during the shift. It may also show time taken per piece.

**Quality Check Report**

- This report includes any faults found during work, how they were fixed, and whether the final product meets quality standards.

**Fault or Defect Repor**

- If the operator finds damaged fabric, wrong threads, or machine faults, they must record the details and report them.

**Rejected Material Record**

- If any fabric or stitched item is rejected, the operator must write down the reason and quantity, and mark it properly before placing it in the rejected area.

**Machine Maintenance Log**

- If the machine is cleaned, oiled, or parts are changed, it should be recorded with the date and reason.

*Fig. 4.2.3: Common documents an embroidery machine operator needs to maintain*

The embroidery machine operator should write clearly and in the correct place to maintain these records properly. Each record or form has specific sections that need to be filled out. The handwriting should be neat so that others can easily read and understand the information.

The individual should use a pen if required, or tick and check boxes as instructed by the supervisor. It is essential to follow the instructions on how to complete the records to avoid confusion.

Records must be filled in daily or at the end of the job. Delaying this can lead to forgetting important details. Regular and timely entries ensure that all information is accurate and complete.

If the embroidery machine operator is unsure about what to write, they should not guess. It is better to ask the supervisor for help. This avoids mistakes and keeps the records correct.

Keeping proper records helps in solving problems quickly. It also shows that the individual is doing their work with care and responsibility. Well-maintained records support smooth operations and quality checks in the embroidery unit.

## Summary

- Quality is maintained by following the artwork, thread colours, size, and stitch type as per design sheet.
- The operator checks materials and threads before use to ensure they are defect-free.
- Faults like misalignment, wrong colour, thread tension issues, or loose threads are common in embroidery.
- Each defect must be identified, reported, and corrected using standard methods.
- Regular quality checks are carried out during and after stitching to ensure product matches specifications.
- Documentation of quality checks helps in tracking production standards.
- Tolerances (e.g., ±2 mm in size or placement) are allowed and must be respected.
- Modifiable defects can be reworked while non-repairable defects must be rejected and reported.
- Operators must inform supervisors of disruptions in workflow from other production areas.
- A good quality product meets the customer's expectations and enhances brand image.

## Exercise

**Multiple-choice Question:**

1. What is the main purpose of a quality check?
   a. To clean the machine
   b. To decorate the workplace
   c. To ensure the product meets standards
   d. To increase thread usage

2. Which of these is a common embroidery defect?
   a. Perfect stitch
   b. Puckering
   c. Even trimming
   d. Straight tension

3. What should be done with defective materials?
   a. Reuse them without checking
   b. Report and replace them
   c. Hide them
   d. Continue working with them

4. Who should be informed when embroidery does not meet specifications?
   a. The customer
   b. The helper
   c. The supervisor
   d. The security staff

5. What is the use of a tolerance in embroidery work?
   a. To save electricity
   b. To control design errors within limits
   c. To measure thread thickness
   d. To choose needles

**Descriptive Questions:**

1. Explain how to perform a visual inspection of embroidery work.
2. List common defects found in embroidery and how to correct them.
3. What is meant by "tolerance" in embroidery?
4. Describe how to report a fault in embroidery to a supervisor.
5. What actions should be taken when materials don’t meet quality standards?

## Notes

Scan the QR codes or click on the link to watch the related videos

https://youtu.be/nSGVF4HHtNg?si=4RjORVfRRQEKQeZb

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# 5. Maintain Work Area, Tools and Machines

Unit 5.1 - Effective Communication and Team Work

Unit 5.2 - Safe Handling of Tools, Equipment and Cleaning Work Area

Unit 5.3 - Operation and Maintenance of Machines and Tools

AMH/N0102

## Key Learning Outcomes

**By the end of this module, the participants will be able to:**

1. Maintain clean and safe work environment.
2. Identify and use tools, machines, and cleaning equipment appropriately.
3. Carry out basic maintenance of equipment.
4. Follow organisational procedures for communication and record-keeping.
5. Minimize waste and ensure proper disposal.
6. Adopt greening practices and conserve resources.

# UNIT 5.1: Effective Communication and Team Work

## Unit Objectives

**By the end of this unit, the participants will be able to:**

1. Explain the importance of effective communication with colleagues and supervisors.
2. Describe ways of resolving problems within the work organisational area.
3. Describe the lines of communication, authority and reporting procedures.
4. Discuss the importance of teamwork in the apparel industry.

## 5.1.1 Importance of Effective Communication with Colleagues and Supervisors

What is Effective Communication?

Effective communication is the process of sharing information clearly and accurately so that the message is received and understood as intended. It involves not only speaking or writing well but also actively listening, understanding the other person's point of view, and responding appropriately. In a workplace like the apparel industry, effective communication ensures that tasks are done correctly, efficiently, and safely.

**Elements of Effective Communication**

- **Sender:** The person who initiates the message. The sender must be clear about what they want to communicate.
- **Message:** The information, idea, or instruction being communicated. It should be clear, concise, and relevant.
- **Medium/Channel:** The method used to deliver the message, such as verbal (spoken), written (notes or emails), visual (signs), or non-verbal (gestures).
- **Receiver:** The person or group who receives and interprets the message. Their understanding is crucial for effective communication.
- **Feedback:** The response from the receiver that confirms whether the message was understood correctly. Feedback helps clarify doubts and improve communication.
- **Context/Environment:** The situation or setting in which communication takes place. Noise, distractions, and workplace stress can all impact the quality of communication.

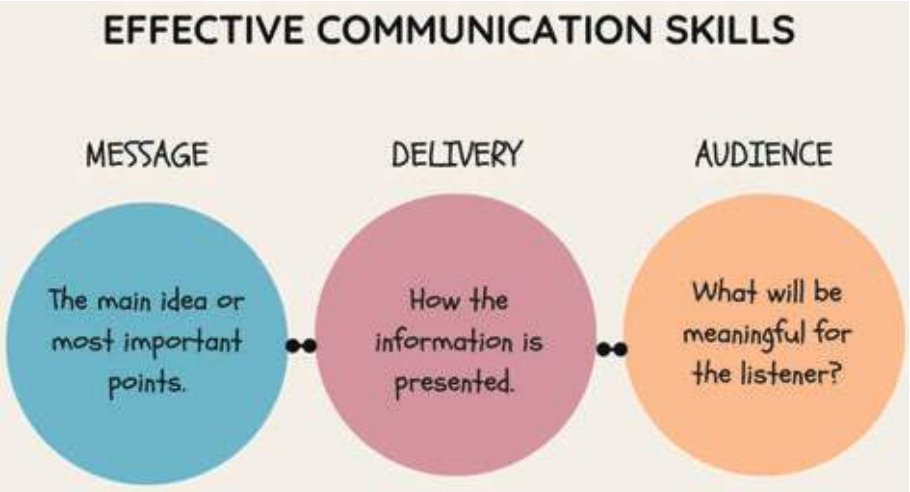


*Fig. 5.1.1: Effective communication outline*

Effective communication begins with using clear and simple language, ensuring that everyone can easily understand the message. It's important to avoid complicated words, especially when giving instructions or safety information. Another key part is active listening—this means paying full attention to the speaker, not interrupting, and making sure you understand what they are saying. Good communication also includes using the right body language and tone of voice. For example, keeping eye contact, using a polite tone, and having a calm posture helps show that you are respectful and serious about what you are saying.

Respect and courtesy are also important in communication. Even when people disagree, speaking politely helps maintain good working relationships. Communication must also be timely—sharing the right information at the right time, such as reporting a machine problem promptly, helps prevent more significant issues. Lastly, giving and receiving honest feedback in a respectful way helps everyone learn and do their job better. These basic habits make communication more effective and help improve teamwork in the workplace.

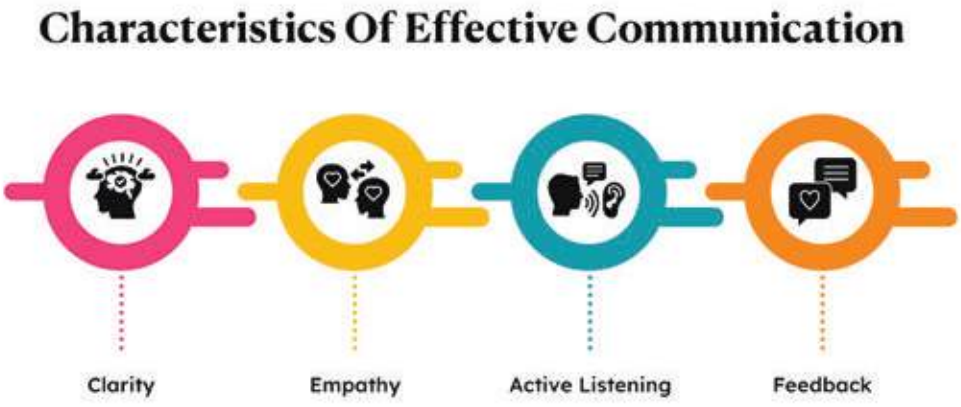


*Fig. 5.1.2: Characteristics of effective communication*

**Importance of Effective Communication in Apparel Industry**

Effective communication is crucial in the apparel industry to ensure smooth operations, safety, and productivity. When workers communicate clearly with colleagues, it facilitates task coordination, prevents misunderstandings, and maintains workflow efficiency, especially in team-based activities such as stitching, cutting, and quality checking.

Communication with supervisors is equally important for reporting issues, receiving instructions, and seeking guidance. For instance, if a machine malfunctions or raw material is delayed, informing the supervisor promptly helps in quick decision-making and minimizes production downtime.

Good communication also promotes a positive work environment. It builds trust, reduces workplace stress, and encourages cooperation among team members. In safety-related situations, clear communication is crucial for preventing accidents and ensuring a prompt response to hazards.

## 5.1.2 Resolving Problems at Workplace

Resolving problems effectively in the workplace is crucial for maintaining productivity, fostering teamwork, and promoting a positive environment. In the apparel industry, problems can arise from delays, equipment faults, miscommunication, or quality issues. Here are some simple and effective ways to handle such problems:

1. **Identify the Problem Clearly:** The first step is to understand what the problem is and how it affects the work. For example, if there's a stitching error or delay in fabric delivery, workers or supervisors must recognise it early.
2. **Communicate with the Right Person:** The problem should be reported to the concerned person—this could be a supervisor, team leader, or maintenance staff. Clear and timely communication helps solve the issue faster.
3. **Discuss and Find the Cause:** Finding the root cause helps prevent the problem from happening again. For example, if a machine keeps breaking down, it may need maintenance or replacement parts.
4. **Work Together as a Team:** Solving workplace issues often requires teamwork. Workers, supervisors, and maintenance staff can share ideas and help each other fix the issue quickly.
5. **Follow Company Procedures:** Each organisation has set procedures for handling problems. This could include filling out a complaint form, logging an issue in the system, or following safety steps.
6. **Stay Calm and Respectful:** Keeping a calm and respectful attitude helps reduce conflict and encourages better cooperation. Avoid blaming others and focus on solving the problem.
7. **Take Corrective Actions:** Once a solution is decided, immediate action should be taken. This could mean repairing a machine, adjusting the work schedule, or correcting a stitching error.
8. **Learn from the Problem:** After solving the problem, it's helpful to understand what can be done better next time. This helps improve future performance and prevents the same issue from recurring.

## 5.1.3 Lines of Communication, Authority, and Reporting Procedures in the Apparel Industry

In the apparel industry, clear lines of communication, authority, and established reporting procedures are crucial for maintaining smooth operations, ensuring safety, and facilitating timely decision-making.

**Lines of Communication**

This refers to the path through which information flows within the organisation. Workers typically communicate with their immediate supervisors or team leaders for day-to-day instructions or concerns. Supervisors then relay important messages to production managers or department heads. Communication can be verbal, written, or digital (like reports or emails), and it must always be clear, respectful, and timely.

Here's a simple flow chart showing the lines of communication in the apparel industry:

**Top Management**

(Factory Owner / Director)

↓

**Production/Operations Manager**

↓

**Department Heads**

(Cutting, Stitching, Embroidery, Finishing, etc.)

↓

**Line Supervisors**

↓

**Team Leaders / Coordinators**

↓

**Machine Operators / Workers**

Vertical Communication flows from top to bottom (instructions and policies) and bottom to top (feedback and reports). Horizontal Communication can also occur between departments (e.g., Cutting Dept. ↔ Stitching Dept.) for coordination.

**Authority Structure**

The chain of authority defines who is responsible for making decisions and giving instructions. For example, operators report to the line supervisor, who reports to the production manager. Each level of authority has specific responsibilities and the power to make decisions within their role. Respecting this hierarchy helps maintain order and discipline in the workplace.

**Reporting Procedures**

Reporting involves informing the relevant authority about issues such as delays, machine faults, safety hazards, or quality problems. Workers are expected to follow established procedures, such as completing logbooks, using complaint forms, or reporting directly to supervisors. Timely and accurate reporting ensures quick action, avoids production losses, and maintains safety standards.

## 5.1.4 Importance of Teamwork in the Apparel Industry

Teamwork is vital in the apparel industry, where the production process involves numerous interdependent tasks, including designing, cutting, stitching, finishing, and quality checking. Each stage must work in harmony with the others to meet deadlines, maintain quality, and ensure customer satisfaction.

When team members work together, tasks are completed more efficiently. For example, a stitching operator must rely on the cutting team to supply accurate fabric pieces, while the finishing team depends on stitching being done correctly and on time. Effective teamwork ensures a continuous flow of work with fewer delays or mistakes.

Teamwork also helps solve problems quickly. Workers can support one another, share ideas, and assist when someone is struggling with a task or facing a machine issue. This not only improves productivity but also fosters a positive work environment where people feel valued and motivated.

*Fig. 5.1.3: Collaboration at workplace*

Good teamwork encourages learning and skill sharing. New or less experienced workers can learn from others on the team, improving overall performance. It also promotes safety, as team members watch out for one another and follow procedures correctly.

# UNIT 5.2: Safe Handling of Tools, Equipment and Cleaning Work Area

## Unit Objectives

**By the end of this unit, the participants will be able to:**

1. Demonstrate the procedure of handling materials, machinery, equipment and tools safely and correctly to maintain a clean and hazard-free working area.
2. Display correct lifting and handling procedures.
3. Ensure that the correct machine guards are in place.
4. Discuss the significance of maintaining a comfortable position with correct posture while working.
5. Report any unsafe or damaged equipment and other dangerous occurrences to the authorised personnel.
6. Use cleaning equipment and methods appropriate for the work to be carried out.
7. Explain the importance of storing cleaning equipment safely at the designated place after use.
8. Discussed the importance of switching off the machine when not in use.

## 5.2.1 Importance of Handling Materials, Machinery, Equipment, and Tools Safely

In the apparel industry, proper handling of materials, machinery, equipment, and tools is essential to ensure safety, maintain productivity, and produce high-quality garments. The key reasons for this importance include:

1. **Prevention of Accidents and Injuries:** Sewing machines, cutting tools, pressing equipment, and other machinery used in garment manufacturing can cause serious injuries if not handled properly. Safe practices reduce risks like cuts, burns, or electric shocks.
2. **Ensuring Smooth Workflow:** Properly organized tools and clean workstations help avoid delays, material misplacement, and confusion. This contributes to an efficient and continuous production flow.
3. **Protecting Materials from Damage:** Fabrics and accessories must be stored and handled with care to prevent contamination, wrinkling, or tearing. Mishandling may lead to wastage and increased production costs.
4. **Maintaining Machine Longevity:** Regular cleaning, proper usage, and correct storage of machines and tools reduce breakdowns and extend their service life, minimising repair costs and downtime.
5. **Enhancing Product Quality:** Clean and hazard-free working areas reduce the chance of defects or dirt marks on garments, helping to meet quality standards and customer expectations.
6. **Compliance with Health and Safety Regulations:** Following safety protocols ensures adherence to industry regulations and labour laws, avoiding penalties and promoting a healthy workplace culture.
7. **Boosting Worker Morale and Productivity:** A well-maintained and safe environment fosters confidence and focus among workers, resulting in higher morale and better overall performance.

## 5.2.2 Correct Lifting and Handling Procedures

In the apparel industry, workers often lift and move materials such as fabric rolls, bundles of cut pieces, sewing components, cartons of garments, and tools. Incorrect lifting and handling can cause physical strain, musculoskeletal injuries, and reduce workplace efficiency. Therefore, understanding and following correct manual lifting and handling procedures is essential.

**Step 1:** Approach the Load Correctly

The apparel worker begins by standing close to the object, such as a bundle of cut fabric, a box of finished garments, or a roll of material. Standing too far away from the load can cause unnecessary stretching, which may lead to muscle strain.

**Step 2:** Position the Feet and Body Properly

The worker keeps their feet shoulder-width apart, placing one foot slightly forward for better balance. This stable stance helps prepare for a smooth and safe lift. The object is aligned with the body to avoid awkward twisting.

**Step 3:** Bend the Knees, Not the Back

Bending from the knees while keeping the back straight is crucial. At this stage, the worker lowers their body by bending the knees—not the waist—while keeping the spine in a neutral position. This technique prevents stress on the lower back and supports safe lifting.

*Fig. 5.2.1: Safe lifting technique*

**Step 4:** Get a Firm Grip

Using both hands, the worker grips the load firmly. Whether lifting fabric bundles, embroidery machines, or cartons of accessories, it is important to ensure a secure hold to prevent dropping or sudden imbalance. Gloves may be worn if the item has sharp edges.

**Step 5:** Lift Smoothly Using Leg Muscles

The worker lifts the object by straightening the legs gradually while keeping the load close to the body. The back remains straight throughout. The power of the lift comes from the legs and hips—not the back—reducing the risk of injury.

**Step 6:** Carry with Control and Avoid Twisting

While walking, the load is kept at waist level and close to the body. The worker moves slowly and avoids twisting the upper body. If a direction change is needed, the worker turns by moving their feet, not their torso.

**Step 7:** Set Down the Load Safely

To place the item down, the worker reverses the lifting process—bending the knees and lowering the item gently while keeping the back straight. This prevents sudden dropping or strain when putting down the object.


*Fig. 5.2.2: Don't's of manual handling and lifting*

In cutting sections, workers should follow these steps while lifting fabric rolls or stacking cut layers. In the stitching units, handling sewing machine components or transferring garment pieces requires similar care. In packaging and dispatch, moving boxes of finished products is done using these safe manual handling practices. These manual lifting and handling techniques are a critical safety skill in the apparel industry, where manual tasks are common.

## 5.2.3 Machine Guards in the Apparel Industry

Machine guards are protective devices or barriers fitted to machines to prevent accidental contact with moving parts, sharp edges, or hazardous areas. In the apparel industry, where high-speed sewing machines, cutting equipment, and embroidery machines are commonly used, machine guards play a vital role in protecting workers from injuries such as cuts, entanglements, and punctures.

**Examples of Machine Guards in the Apparel Industry**

- **Needle Guards on Sewing Machines:** These guards are transparent covers placed near the needle area to prevent fingers from accidentally coming in contact with the moving needle while allowing visibility for stitching.

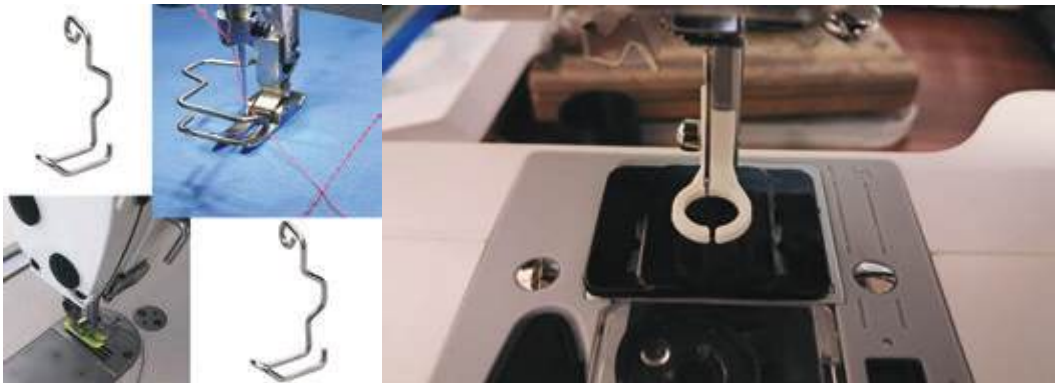

*Fig. 5.2.3: Needle guard in sewing machine and embroidery machines*

- **Finger Guards on Overlock Machines:** Installed near the presser foot or moving loopers, these prevent the operator's fingers from getting too close to the stitching area during high-speed operation.
- **Belt and Pulley Covers:** Enclosures are placed over belts, pulleys, and drive shafts of machines, such as industrial sewing machines, to prevent entanglement with loose clothing, thread, or hair.

*Fig. 5.2.4: Belt and pulley covers in industrial sewing machines*

- **Blade Guards on Cutting Machines:** On straight knife or rotary cutting machines, blade guards protect workers from direct contact with the sharp cutting blade while handling fabric.
- **Guard Rails on Embroidery Machines:** Rails or covers are placed around the needle area or thread path to prevent the operator's hands or accessories from entering the danger zone.

**How to Ensure That the Correct Machine Guards Are in Place**

Each machine comes with specific instructions regarding the type, size, and position of guards. Operators and supervisors in the apparel industry must first refer to the manufacturer's guidelines to ensure that the correct machine guards are in place.

Before beginning any shift or operation, a daily pre-use inspection is carried out by the operator. This includes checking all machine guards for signs of wear, damage, or improper alignment. If any part of the guard is missing or defective, it must be reported immediately and rectified before the machine is used. This proactive approach prevents accidents and minimises downtime.

Operators are strictly instructed never to bypass or remove any machine guards during operation. Even temporary removal can expose workers to serious hazards. This practice is reinforced through regular supervision and discipline to promote a strong safety culture across the production floor.

Routine maintenance checks are an essential part of ensuring machine safety. Supervisors arrange scheduled inspections, during which all machines are audited for safety compliance. If a guard is found to be worn out or malfunctioning, it is promptly repaired or replaced. These checks help maintain operational efficiency and worker safety.

Training and awareness sessions are regularly conducted for all apparel workers. These sessions explain the function and importance of each machine guard and highlight the risks involved in operating unguarded machinery. This helps workers understand their role in maintaining a safe environment.

Finally, the use of Lock-Out/Tag-Out (LOTO) procedures is enforced during machine maintenance or repair. This ensures that machines are completely shut off and cannot be started accidentally. Only trained and authorised personnel are permitted to remove the guards under controlled conditions, further reducing the risk of injury.

## 5.2.4 Importance of Working in a Comfortable Position and Maintaining Correct Posture

In the apparel industry, where workers often spend long hours operating sewing machines, cutting fabric, or handling garments, maintaining a comfortable working position and correct posture is critical for both health and productivity. Ergonomics—the science of designing the workplace to fit the worker—plays a vital role in reducing physical strain and improving efficiency.

Working in a comfortable position helps reduce fatigue, muscle tension, and discomfort. When a worker sits or stands in a natural and relaxed posture, the body uses less energy, allowing them to work longer without pain or stress. For example, a sewing machine operator who sits with proper back support and arm alignment is less likely to experience shoulder or lower back pain.

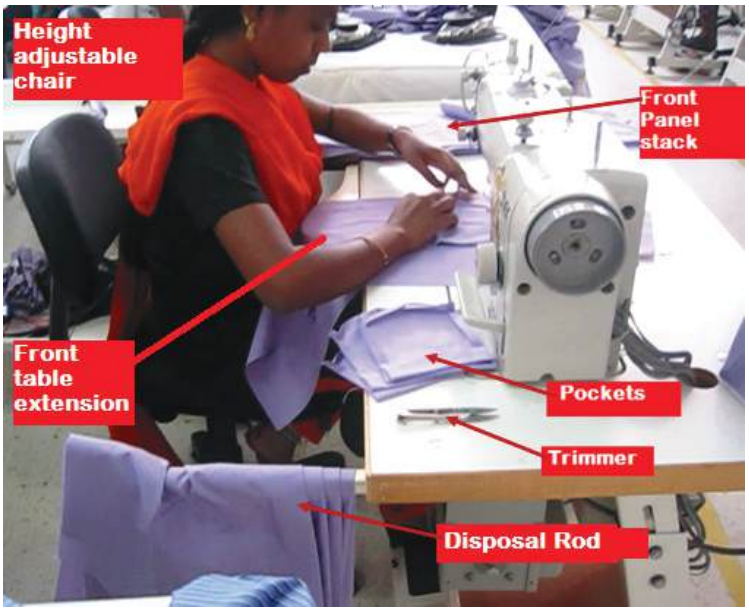


*Fig. 5.2.5: Ergonomic workstation of a sewing machine operator*

Correct posture minimises the risk of musculoskeletal disorders (MSDs), which are common in the garment industry due to repetitive motions, awkward sitting positions, and extended working hours. Keeping the back straight, shoulders relaxed, elbows close to the body, and feet flat on the ground ensures that the spine and joints are properly aligned. This reduces pressure on the neck, back, and wrists.

*Fig. 5.2.6: Work-related musculoskeletal disorders (MSDs)*

Ergonomic workstations—such as adjustable chairs, proper table heights, footrests, and task lighting—support good posture and allow workers to adapt their position throughout the day. For instance, a cutting table at the right height prevents workers from bending excessively, while anti-fatigue mats can reduce stress on the legs for those who stand during work.

**Observe the image below.**

1. **Sewing Machine Operator – Good Ergonomic Practice**

   The worker is sitting upright with her back supported by the chair, and arms positioned comfortably at the machine level. Her elbows are close to her body, and her head is slightly inclined forward, indicating a relatively good ergonomic posture. This reduces strain on the back and shoulders, making it a sustainable working position.


*Fig. 5.2.7: Body postures of workers in the apparel industry*

2. **Sewing Machine Operator – Poor Ergonomic Posture**

   This worker is leaning forward excessively with a twisted torso and unsupported back, as indicated by the arrow. The chair appears to lack proper back support, and her posture may lead to back pain and shoulder strain over time. This is a poor ergonomic setup that should be corrected with better chair design and posture training.

3. **Folding and Sorting Workers – Standing Posture with Repetitive Movements**

   The workers are standing while performing repetitive hand tasks. Their posture appears upright, but there's a risk of fatigue due to prolonged standing and repetitive arm movements. Anti-fatigue mats and adjustable worktable height could improve ergonomic comfort in this scenario.

4. **Ironing Worker – Moderate Ergonomic Risk**

   The male worker is bending slightly forward while ironing garments. While his standing posture is not extreme, continuous leaning and repetitive arm movement can cause back and shoulder discomfort. An adjustable table height and more upright stance would help reduce ergonomic stress.

In addition to physical benefits, maintaining proper posture improves concentration and overall performance. Workers who are physically comfortable are less distracted by pain and more focused on quality and speed. This results in fewer errors and higher production output.

## 5.2.5 Reporting Unsafe Equipment and Other Dangerous Occurrences to Authorised Personnel

In the apparel industry, ensuring workplace safety involves not only using equipment properly but also actively reporting any unsafe conditions or damaged machinery. Timely reporting helps prevent accidents, protects workers, and maintains smooth production flow.

Workers are often the first to notice hazards on the production floor. Reporting these issues to a supervisor, safety officer, or maintenance staff ensures that they are addressed before causing harm. Ignoring damaged tools or unsafe occurrences can lead to injuries, machine breakdowns, or fire hazards.

Examples of Unsafe or Damaged Equipment and Occurrences

- **Damaged Sewing Machine Needle or Guard**

  A worker notices that the needle on a sewing machine is bent or the needle guard is missing. Continuing to use the machine may cause needle breakage or injury. The operator must stop work and inform the line supervisor immediately so that maintenance can be arranged.

- **Damaged Electrical Wires on Ironing Equipment**

  An ironing worker sees exposed or frayed wires near the iron or power cord. This poses a risk of electric shock or fire. The issue should be reported to the electrical maintenance team, and the equipment should not be used until repaired.

- **Oil Leakage from a Machine**

  A emboridery machine is leaking oil onto the floor, creating a slipping hazard. The worker should report the leak, mark the area to alert others, and wait for the housekeeping or maintenance team to clean it and fix the leak.

*Fig. 5.2.8: Blocked fire exit*

- **Overheated Motor or Unusual Noise**

  If an industrial sewing machine starts overheating or making unusual noises, it may indicate mechanical failure. Operating such equipment without inspection can result in a breakdown or even fire. It must be turned off and reported right away.

- **Blocked Fire Exit or Missing Fire Extinguisher**

  A worker notices that a fire exit is blocked by cartons or that a fire extinguisher is missing from its holder. These are serious safety violations and should be reported to the floor supervisor or safety manager immediately.

**How to Report**

- Inform the immediate supervisor or floor in charge verbally or through a logbook.
- Use incident reporting forms if required by company policy.
- For serious risks, alert the safety officer or maintenance department directly.

Reporting unsafe or damaged equipment is a shared responsibility in the apparel industry. Workers must be encouraged and trained to report hazards without fear. A proactive approach helps create a safer and more efficient workplace for everyone.

## 5.2.6 Using and Storing Cleaning Equipment in Apparel Industry

In the apparel industry, maintaining cleanliness is not only a matter of hygiene but also directly impacts product quality, worker safety, and equipment efficiency. To achieve this, it is essential to select and use cleaning equipment and methods that are appropriate for the specific task and the nature of materials being handled.

Different areas in an apparel manufacturing unit have distinct cleaning needs. For instance, in sewing sections, where fabric threads, lint, and dust accumulate quickly, vacuum cleaners with fabric filters or lint rollers are ideal for keeping machines clean without dispersing particles into the air. This helps maintain smooth machine operation and prevents dust from contaminating finished garments.

*Fig. 5.2.9: Cleaning sewing machine using vacuum cleaner*

In cutting and finishing areas, brooms, dry mops, or industrial floor sweepers are used to remove fabric scraps and dust. For regular sanitisation, disinfectant sprays or mops with cleaning solutions are employed, especially on floors and shared surfaces such as tables, trolleys, and shelves. These cleaning agents help reduce the spread of germs and maintain a hygienic working environment.

For cleaning delicate parts of machinery, such as embroidery heads, sensor panels, or thread paths, soft brushes are preferred. Using water or harsh chemicals in such areas can damage sensitive electronic components or leave residues that interfere with machine function. Therefore, choosing a dry and gentle cleaning method is critical.

*Fig. 5.2.10: Cleaning sewing machine using soft brush*

In garment handling or packing sections, where cleanliness is essential to prevent staining or contamination of finished products, microfiber cloths, gloves, and dust-free cloths are used to wipe down surfaces. Workers may also use anti-static tools to remove fine particles from synthetic fabrics.

The correct use of cleaning methods and equipment not only helps maintain cleanliness but also prevents damage to machinery, avoids product contamination, and extends the life of both tools and garments. It also enhances worker morale by creating a safe and pleasant work environment, which in turn contributes to improved focus and efficiency.

Storing cleaning equipment safely at the designated place after use is crucial in the apparel industry for maintaining a safe, efficient, and hygienic work environment. It helps prevent workplace accidents by keeping walkways clear—tools like brooms, mops, or buckets left carelessly can cause slips, trips, and falls. Proper storage also protects the equipment from damage. For instance, hanging mops to dry prevents bacterial growth and extends their lifespan.

*Fig. 5.2.11: Proper storage of cleaning materials*

An organised storage area reflects cleanliness, discipline, and professionalism on the shop floor, promoting a healthy atmosphere for garment production. Additionally, when cleaning tools are returned to their designated place, they remain easy to locate and are ready for use, reducing delays and enhancing efficiency. Finally, safe storage practices support compliance with safety and quality standards, which are often evaluated during audits and inspections in the apparel industry.

## 5.2.7 Importance of Switching Off the Machine When Not in Use

Switching off machines when not in use is a crucial safety and efficiency practice in the apparel industry. Garment production involves continuous operation of sewing machines, cutting machines, embroidery units, and pressing equipment, all of which are powered by electricity and contain moving or heated parts. Leaving these machines running unnecessarily can lead to several risks and inefficiencies.

Firstly, it helps prevent accidents. An unattended running machine poses a serious safety hazard. A person passing by or returning to the workstation may accidentally come in contact with the moving parts, such as needles, belts, or blades, leading to injuries. Switching off the machine eliminates this risk and creates a safer working environment.

Secondly, it reduces wear and tear on equipment. Machines that run continuously without use experience unnecessary strain on motors, belts, and other components. Over time, this can lead to faster breakdowns and higher maintenance costs. Turning off the machine when idle helps extend its operational life and ensures smoother functioning.

Thirdly, it conserves energy and reduces electricity bills. The apparel industry often operates on a large scale, with multiple machines running simultaneously. Even small steps, such as switching off machines during breaks or downtime, contribute to significant energy savings over time, supporting both cost efficiency and environmental responsibility.

Moreover, switching off hot equipment like irons or fusing machines prevents fire hazards and overheating. Leaving such equipment on when unattended can result in burns, accidental fabric damage, or even electrical fires.

Lastly, it fosters discipline and professionalism on the shop floor. Workers who adopt this habit demonstrate responsibility and awareness of safety protocols, which contribute to a positive and efficient workplace culture.

# UNIT 5.3: Operation and Maintenance of Machines and Tools

## Unit Objectives

**By the end of this unit, the participants will be able to:**

1. Identify different types of cutting machines, such as scissors, straight knives, band knives, and laser cutting machines.
2. Identify various machines used for layering and spreading processes.
3. Define procedures to conduct maintenance of tools and equipment.
4. Identify common faults with equipment and the methods to rectify them.
5. Use materials efficiently to minimise wastage and dispose of waste safely at the designated location.
6. Evaluate the different ways to conserve energy in the apparel sector.
7. Explain the importance of greening solutions, procedures, policies, legislation and regulations.

## 5.3.1 Different Types of Cutting Machines

Here is a list of different types of cutting machines and tools commonly used in the apparel industry:

| Type | Name of Cutting Tool/Machine | Images | Common Use/Application |
|---|---|---|---|
| **Manual Tools** | Scissors |  | Sampling, trimming threads, and small-scale cutting. |
| | Rotary Cutter |  | Cutting fabric layers, pattern work. |
| **Semi-Automatic Machines** | Straight Knife Cutting Machine |  | Mass production, cutting multiple fabric layers. |

| Type | Name of Cutting Tool/Machine | Images | Common Use/Application |
|---|---|---|---|
| | Round Knife Cutting Machine |  | Curved patterns, lightweight fabrics. |
| | Band Knife Cutting Machine |  | Precision cutting of complex shapes and trimming. |
| | Die Cutting Machine |  | Cutting small uniform parts like collars and cuffs. |
| **Advanced Cutting Machines Automated/ CNC Systems** | Fabric Laser Cutting Machine |  | Intricate patterns, synthetic fabrics, precision cutting. |
| | CNC Fabric Cutting Machine |   | High-volume production with precision. |

*Table 5.3.1: Cutting machines and tools used in the apparel industry*

## 5.3.2 Machines Used for Layering and Spreading

Here is a list of various machines used for layering and spreading processes in the apparel industry, along with their descriptions and common uses:

1. **Manual Spreading Table**

   This is a long, flat table where fabric is spread manually by workers. It provides a stable surface for laying fabric layers accurately before cutting.

*Fig. 5.3.1: Manual spreading table*

2. **Manual Spreader**

   A manual spreader is used to assist workers in pulling fabric smoothly across the spreading table. It helps reduce physical strain and maintain better alignment.

*Fig. 5.3.2: Turntable manual spreader*

3. **Semi-Automatic Spreading Machine**

   This machine combines manual guidance with some motorised features to help spread fabric more efficiently. It improves speed and consistency over fully manual methods.

*Fig. 5.3.3: Semi-automatic spreading machine*

**4. Automatic Spreading Machine**

An automatic spreading machine evenly and quickly spreads fabric layers with minimal human effort. It ensures precise tension control, layer alignment, and high productivity.

*Fig. 5.3.4: Automatic spreading machine*

**5. Spreading Machine with Conveyor**

This machine includes a conveyor system that automatically moves fabric across the table. It ensures smooth, continuous spreading and minimises fabric shifting.

**6. Ply Separator**

A ply separator is used to gently lift and separate each fabric layer to avoid sticking or misalignment. It is especially useful when layering delicate or different fabric types.

**7. End Cutter**

This machine cuts fabric across the width after each layer is spread. It provides clean, straight edges and ensures consistent layer lengths for cutting.


*Fig. 5.3.5: Edge cutter*

**8. Cloth Relaxing Machine**

Used before spreading, this machine allows fabric to relax and release tension. This helps prevent fabric shrinkage or distortion after cutting and sewing.

*Fig. 5.3.6: Fabric relaxing machine*

9. **Fabric Roller Stand**

   A fabric roller stand is used to hold fabric rolls during the spreading process. It helps reduce worker fatigue and speeds up roll handling.

*Fig. 5.3.7: Motor-driven roll stand*

These machines and tools help in accurate, wrinkle-free, and aligned fabric spreading, which is essential for quality cutting and minimal wastage in garment production.

## 5.3.3 Maintenance of Common Tools and Equipment in Apparel Industry

Regular maintenance of tools and equipment in the apparel industry is essential to ensure safety, efficiency, and consistent product quality. Below are the general procedures followed for maintaining common machines like sewing machines, cutting tools, and pressing equipment:

1. **Cleaning After Use**

   Operators clean machines and tools daily after use. This includes removing lint, fabric dust, and thread clippings from sewing machines, cutting tools, and work surfaces using brushes, cloths, or vacuum cleaners. Clean machines run smoother and last longer.

2. **Lubrication**

   Moving parts of sewing machines and cutting machines are lubricated as per the manufacturer's instructions. Proper oiling reduces friction, prevents wear and tear, and ensures smooth operation.

3. **Inspection for Wear and Damage**

   Tools such as scissors, machine needles, blades, and ironing equipment are inspected regularly for signs of damage, dullness, or malfunction. Damaged parts are replaced promptly to prevent poor-quality output or injuries.

4. **Adjustment and Calibration**

   Machines are adjusted and calibrated to maintain precision. For example, sewing machines need correct tension settings, stitch length, and needle alignment. Pressing machines are checked for accurate temperature and pressure settings.

5. **Storage of Tools**

   After cleaning, tools like scissors, measuring tapes, and machine attachments are stored in designated places to prevent damage and ensure easy access. Proper storage avoids rusting, bending, or accidental loss.

6. **Scheduled Preventive Maintenance**

   Technicians or maintenance staff perform preventive maintenance at scheduled intervals. This may include checking belts, motors, gears, and electrical connections to avoid unexpected breakdowns.

## 5.3.4 Common Equipment Faults and Rectification Methods

Here is a list of common faults with equipment used in the apparel industry, along with the methods to rectify them:

| S. No. | Equipment Type | Fault | Possible Causes | Rectification Method |
|---|---|---|---|---|
| 1 | Sewing Machine | Not stitching properly | Wrong needle, lint, poor threading, wrong tension | Re-thread machine, change needle, clean machine, adjust tension |
| 2 | Sewing Machine | Needle breaking frequently | Wrong needle type, bent needle, pulling fabric | Replace needle, use correct type, do not pull fabric |
| 3 | Cutting Machine | Not cutting cleanly / blade dull | Dull/misaligned blade, lack of sharpening | Sharpen/replace blade, align properly, schedule blade maintenance |
| 4 | Iron / Pressing Machine | Not heating properly | Faulty thermostat, power issue | Replace thermostat, check plug/fuse, service as needed |
| 5 | Any Machine | Unusual noise | Loose or worn parts, lack of lubrication | Lubricate, tighten screws, replace worn parts |
| 6 | Sewing Machine | Fabric jamming | Wrong tension, feed dog issue, threading problem | Clean feed dog, re-thread, adjust tension |
| 7 | Any Equipment | Overheating | Continuous use, dust, poor ventilation | Allow cooling, clean vents, service regularly |
| 8 | Computerized Machines | Display panel not working | Loose wires, software crash, power fault | Check cables, restart machine, call technician |
| 9 | Embroidery Machine | Hoops not holding fabric | Worn or wrong size hoop | Replace hoop, use correct hoop for fabric |

| S. No. | Equipment Type | Fault | Possible Causes | Rectification Method |
|---|---|---|---|---|
| 10 | Embroidery Machine | Thread breakage or design misalignment | Incorrect thread tension, needle issue, poor digitizing | Adjust tension, use proper needles, check digitizing quality |
| 11 | Embroidery Machine | Machine stops suddenly | Overheating motor, software error, sensor fault | Let it cool, restart system, report to technician |
| 12 | Steam Press / Iron | Steam not releasing | Clogged steam vents or low water level | Clean steam vents, refill water tank |
| 13 | Fusing Press | Uneven fusing or wrinkles in fabric | Incorrect temperature/ pressure/time setting | Calibrate machine settings correctly |
| 14 | Finishing Equipment | Burn marks on garments | Excessive heat or pressing time | Adjust temperature, reduce dwell time |
| 15 | Thread Trimming Machine | Threads not cutting cleanly | Dull blades or jammed mechanism | Sharpen/replace blade, clean cutter head |

*Table 5.3.2: Equipment faults and rectification in the apparel industry*

## 5.3.5 Efficient Material Usage and Safe Waste Disposal Practices

**Using Materials Efficiently to Minimise Wastage**

Efficient material usage starts with accurate planning, measurement, and cutting. Workers are trained to follow fabric layout plans (markers) closely, ensuring maximum fabric utilisation and minimal leftover scraps. Using the correct tools and techniques, such as precision cutting machines, sharp scissors, and computerised layout systems, helps reduce errors and rework.

Additionally, reusing leftover fabric pieces for smaller components (like pockets or trims) and separating reusable materials from waste supports sustainability. Efficient handling also includes careful storage to avoid damage from moisture, dust, or pests, which could lead to wastage.


*Fig. 5.3.8: Recycling of fabric waste*

**Safe Disposal of Waste at Designated Locations**

All types of waste, fabric scraps, threads, broken needles, packaging material, or chemical waste must be disposed of in designated bins or collection areas. Sharp or hazardous waste should be discarded in clearly labelled containers to prevent injury. Waste segregation (into biodegradable, recyclable, and hazardous categories) is often encouraged or mandated by industry standards and local regulations.

*Fig. 5.3.9: Fabric scrap*

Safe disposal practices help keep the workplace clean and organised, reduce the risk of accidents (such as tripping or fire hazards), and support environmental compliance. Workers are also expected to report overflowing or misused waste bins to the supervisor for timely action.

## 5.3.6 Energy Conservation Methods in the Apparel Sector

In the apparel sector, energy conservation is crucial for reducing costs and promoting sustainability. One effective approach is to utilise energy-efficient machines, such as modern sewing and cutting equipment with low power consumption and standby modes. Additionally, workers should be trained to switch off lights and machines when not in use, and the use of motion sensors or timers can help reduce unnecessary energy consumption.

Maximising natural light and ventilation reduces the need for artificial lighting and air conditioning. Using LED lighting instead of traditional bulbs also lowers electricity consumption and provides better illumination. Regular maintenance of machines, including cleaning, lubrication, and timely repairs, ensures they run efficiently and consume less power.

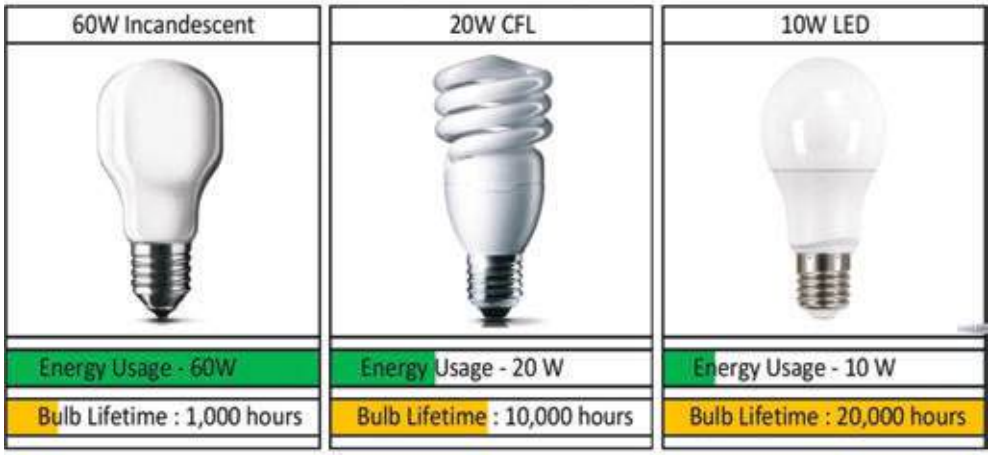


*Fig. 5.3.10: Power consumption comparison*

Avoiding idle running of equipment and properly managing air compressors and HVAC systems by cleaning filters and repairing leaks can significantly reduce energy waste. Lastly, adopting renewable energy sources, such as solar panels, helps reduce dependence on the power grid and supports eco-friendly operations.

*Fig. 5.3.11: Solar panel installed on factory rooftop*

Together, these practices help the apparel industry improve efficiency, reduce energy bills, and maintain a safer and greener workplace.

## 5.3.7 Importance of Greening Solutions, Procedures, Policies, Legislation, and Regulations

Adopting greening solutions and complying with environmental policies and regulations is crucial for promoting sustainable practices and minimising environmental impact. Greening solutions—such as utilising organic fabrics, recycling materials, reducing water and energy consumption, and employing eco-friendly dyeing methods—help conserve natural resources and mitigate pollution.

Following standard procedures and company policies related to waste management, energy efficiency, and chemical handling ensures that day-to-day operations are both environmentally responsible and cost-effective. These practices also improve the company's reputation and marketability, as consumers increasingly prefer sustainable brands.

Compliance with environmental legislation and regulations—such as pollution control laws, labour safety standards, and regulations governing the handling of hazardous materials—is legally required. It protects the environment, ensures worker safety, and prevents penalties or legal action. Staying updated with such regulations also helps businesses remain competitive and aligned with global sustainability goals.

## Summary

- A clean, well-organized work area improves safety and efficiency.
- Tools and attachments must be cleaned and stored properly after use.
- Machines must be cleaned, oiled, and maintained as per schedule to avoid breakdown.
- Lifting, handling, and storing of materials must follow safe procedures to prevent injury.
- Eco-friendly practices like reducing waste, saving electricity, and using sustainable materials are encouraged.
- Cleaning should be done using appropriate equipment and without contaminating fabrics.
- Damaged tools or equipment must be reported immediately to the supervisor.
- Operators must switch off machines when not in use to save energy and prevent accidents.
- Waste threads, papers, and materials should be disposed of in designated bins.
- Greening of job roles involves following environmental safety rules and using resources responsibly.

## Exercise

**Multiple-choice Question:**

1. Which tool is used to clean a machine?
   a. Needle
   b. Brush
   c. Hoop
   d. Ruler

2. Where should cleaning tools be stored after use?
   a. Anywhere
   b. Under the machine
   c. At a designated place
   d. On the table

3. What should be done with fabric waste?
   a. Throw outside
   b. Leave on table
   c. Dispose in a marked bin
   d. Burn it

4. Why is regular maintenance important?
   a. To keep machine dirty
   b. To waste time
   c. To improve machine life and performance
   d. To stop machine use

5. What is one way to reduce energy consumption?
   a. Use extra lighting
   b. Turn off machines when not in use
   c. Increase machine speed
   d. Avoid cleaning

**Descriptive Questions:**

1. List steps to clean an embroidery machine.
2. Why is greening important in the apparel industry?
3. How can waste materials be disposed safely?
4. What routine checks should be done on embroidery tools?
5. How does regular maintenance help in better production?

## Notes

Scan the QR codes or click on the link to watch the related videos

https://youtu.be/KNS-iE4y5y4?si=67D-kfOzIqH7lFcE

Effective Communication?

https://youtu.be/xfKChjTHXnA?si=YpoTJ5CM-Se29Uaj

Machine Used in Garments Factory

Skill India
कौशल भारत-कुशल भारत

सत्यमेव जयते
GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT
& ENTREPRENEURSHIP

N·S·D·C
RE>IMAGINE FUTURE

# 6. Maintain Health, Safety and Secure Workplace with Gender and PwD Sensitisation

APPAREL MADE-UPS HOME FURNISHING
SECTOR SKILL COUNCIL

Unit 6.1 - Health, Safety, Emergency Preparedness and Workplace Hygiene

Unit 6.2 - Gender Sensitisation and Inclusion of Persons with Disabilities (PwD)

AMH/N0103

## Key Learning Outcomes

**By the end of this module, the participants will be able to:**

1. Identify and report health and safety hazards at the workplace.
2. Follow emergency response procedures, including evacuation, fire safety and first aid.
3. Show how to store and handle materials, chemicals, and equipment safely as per manufacturer and workplace norms.
4. Maintain personal health, hygiene and lifestyle practices to promote workplace safety.
5. Comply with organisational safety, shutdown, and environmental procedures.
6. Discuss about gender equality and PwD inclusion in the workplace.

# UNIT 6.1: Health, Safety, Emergency Preparedness and Workplace Hygiene

## Unit Objectives

**By the end of this unit, the participants will be able to:**

1. Report unsafe equipment and dangerous occurrences to concerned personnel.
2. Identify malfunctions in machinery and equipment, and take the necessary actions or report them if unrectifiable.
3. Identify, handle, and store machine oil, chemicals, or ink used in embroidery processes.
4. List various health and safety-related practices applicable at the workplace.
5. Describe layout of the plant and details of emergency exits, escape routes, emergency equipment and assembly points.
6. Identify signage related to health and safety and their meaning.
7. Describe actions to take in the event of an evacuation procedures or actual accident, emergency or fire.
8. Perform basic first aid and CPR when required.
9. State the importance of sound health, hygiene and good habits.
10. Describe ill-effects of alcohol, tobacco and drugs.

## 6.1.1 Reporting Unsafe Equipment and Dangerous Occurrences to Concerned Personnel

If an operator or worker finds that any equipment is not working properly or is unsafe to use—such as broken wires, missing guards, sharp edges, oil leaks, or unusual sounds —they must report it immediately. Unsafe equipment can cause injury or spoil the product.

Similarly, if there is a dangerous situation, such as a fire, electric shock, chemical spill, or slipping hazard, the operator must inform the supervisor, maintenance staff, or safety officer without delay.

**Steps to Report:**

- Stop using the machine if it is unsafe or malfunctioning.
- Inform the nearest supervisor or team leader at once.
- Describe the problem clearly – what happened, when, and which machine is affected.
- If needed, show the faulty part or unsafe area so that the issue can be checked quickly.
- Do not try to fix electrical or mechanical faults without permission.
- Place a "Do Not Use" sign or warning (if available) on the machine until it is repaired.
- Follow safety instructions given by the supervisor.

Timely reporting helps avoid accidents, protects others, and ensures a smooth production flow.

## 6.1.2 Identifying Malfunctions in Machinery and Equipment and Taking Necessary Actions

In the apparel industry, machines are used continuously in processes such as cutting, stitching, finishing, and printing. Therefore, it's important for workers to identify malfunctions early and take the necessary steps to prevent delays, material damage, or workplace accidents.

### Recognizing Signs of Malfunction

Workers must stay alert to any unusual behaviour of machines. Signs of malfunction may include abnormal sounds, unusual vibrations, overheating, machine speed issues, or visible signs like smoke, oil leakage, or fabric getting jammed. In computerized machines, display panel errors or sudden shutdowns may also indicate a problem. Being able to recognize these early helps avoid bigger mechanical failures.

### Immediate Actions to Take

As soon as a problem is noticed, the machine should be stopped immediately. If the issue seems unsafe, the power supply must be disconnected. The worker should try to remove any fabric or material caught in the machine carefully. If the problem is minor—like a thread jam or loose screw—it can be corrected safely by the operator. However, this should only be done if it does not require special tools or technical knowledge.

### Report Unrectifiable Problems

If the issue cannot be fixed by the operator, it must be reported immediately to the supervisor or maintenance staff. The worker should describe the issue clearly—mentioning when it started, what actions were taken, and any unusual observations. A tag or label stating "Out of Order" should be placed on the machine to prevent others from using it until it is repaired.


*Fig. 6.1.1: Out of order tag*

### Follow Company Protocol

Every organization has its own set of procedures for handling machinery faults. Workers must follow these properly—this might include logging the problem in a maintenance register, filling a report form, or updating it in a system. Following these steps ensures that the issue is tracked and resolved efficiently by the responsible personnel.

## 6.1.3 Identifying, Handling, and Storing Machine Oil, Chemicals, or Ink Used in Embroidery Processes

In the embroidery process, machine oil, cleaning chemicals, and special inks (used in printing or marking designs) are commonly used. Proper identification, handling, and storage of these substances are essential to ensure safety, prevent contamination of fabrics, and maintain machine efficiency.

Each chemical, oil, or ink used in the embroidery process must be clearly labeled with its name, usage instructions, and hazard warnings. Workers should be familiar with Safety Data Sheets (SDS) provided by the supplier, which outline safe usage, first aid measures, and storage guidelines. For example, embroidery machine oil is typically light and colourless, while design inks may vary in colour and thickness.

When using oils or chemicals, workers must wear appropriate protective gear like gloves and aprons to avoid skin contact. Spills should be cleaned immediately using absorbent cloths or safety absorbents. Inks or chemicals should never come in contact with fabric or embroidery threads, as they may cause staining or defects. Hands should always be washed after handling such substances, especially before touching any garment material.

All oils, inks, and chemicals must be stored in their original, labeled containers with tight-fitting lids. They should be kept in a cool, dry, and well-ventilated area away from direct sunlight and heat sources. Flammable or hazardous substances must be stored in designated cabinets or shelves, as per factory safety standards. It's also important to keep them out of the sewing or embroidery zones to avoid accidental contamination.

Proper management of machine oil, chemicals, and ink helps maintain both product quality and worker safety in embroidery operations.

## 6.1.4 Health and Safety-Related Practices Applicable at the Workplace

In the apparel industry, ensuring health and safety at the workplace is essential to protect workers from injuries, maintain hygiene, and promote a productive environment. Several practices are followed to minimize risks and ensure the well-being of all employees.

1. **Use of Personal Protective Equipment (PPE):** Workers are required to wear appropriate PPE such as masks, gloves, aprons, and safety shoes, depending on their job roles. For example, operators handling cutting machines may need gloves, while those exposed to fabric dust may need masks.
2. **Proper Machine Handling and Maintenance:** Operators must be trained to use machines correctly and avoid bypassing any safety features. Machines should be regularly inspected and maintained to prevent malfunctions or accidents.
3. **Clean and Organized Work Areas:** Maintaining cleanliness helps prevent slips, trips, and fire hazards. Waste materials, threads, and tools must be disposed of or stored properly to keep the production floor hazard-free.
4. **Emergency Procedures and First Aid:** All workers should be aware of emergency exits, fire extinguisher locations, and evacuation plans. A first aid box must be readily available, and at least some staff should be trained in basic first aid.
5. **Safe Handling and Storage of Chemicals:** Oils, cleaning agents, and inks should be handled using protective gear and stored in designated areas. Spills must be cleaned immediately to avoid slips or fabric damage.

6. **Reporting Unsafe Conditions:** Workers must be encouraged to report any faulty equipment, damaged wires, loose flooring, or any other unsafe condition to the supervisor immediately. Quick reporting can prevent serious accidents.

## 6.1.5 Interpreting the Plant Layout

In the apparel industry, understanding and interpreting the plant layout is essential for maintaining a safe working environment. The layout map, usually displayed in visible areas such as entrances, production floors, and near notice boards, provides crucial information that guides workers during daily operations and emergency situations. Here's how each part of the layout can be interpreted:

1. **Emergency Exits**

   Emergency exits are clearly marked on the plant layout using green symbols and labeled as "EXIT" or “EMERGENCY EXIT.” These doors are designed for immediate evacuation and must not be blocked or locked during working hours.


*Fig. 6.1.2: Emergency door*

**Workers should:**

- Familiarize themselves with the nearest exit from their workstation.
- Never place materials or trolleys in front of these exits.
- Participate in regular evacuation drills to practice using these exits safely.

2. **Escape Routes**

   Escape routes are shown on the layout as arrows or bold lines connecting different work areas to the emergency exits. These routes provide a clear direction to exit the building quickly and safely.

**Key points include:**

- Escape routes should be wide, well-lit, and free from obstructions at all times.
- Workers should not leave personal belongings or fabric bundles in these areas.
- The layout may include alternative routes in case the main route is blocked—workers must be aware of both.
- Signs along the escape routes on the actual floor (like floor markings or wall signs) should match those on the layout.


*Fig. 6.1.3: Evacuation plan*

### 3. Emergency Equipment Locations

The plant layout includes symbols or colour codes showing the placement of essential emergency equipment:

- **Fire Extinguishers:** Marked with a red fire symbol; used to control small fires before they spread.


*Fig. 6.1.4: Types of fire extinguishers*

- **Fire Alarms:** Often marked with a bell symbol; these are used to alert all workers in case of a fire.


*Fig. 6.1.5: Fire alarm*

- **First Aid Boxes:** Indicated with a green cross; these should be easily accessible for minor injuries.


*Fig. 6.1.6: First aid box*

- **Emergency Showers or Eye Wash Stations:** In chemical or dyeing areas, these are marked with special icons and used in case of exposure.


*Fig. 6.1.7: Eye wash station*

- **Circuit Breakers and Electrical Shut-Offs:** Marked on the layout to allow trained personnel to cut off power in an emergency.

4. **Assembly Points**

Assembly points are designated safe locations outside the factory building where workers gather after evacuating. These are marked on the layout with a people icon or the label "ASSEMBLY POINT." Important practices include:

- Every worker should know their assigned assembly point.
- After evacuation, supervisors conduct headcounts to ensure no one is left inside.
- Workers must stay at the assembly point until they are instructed it is safe to return.


*Fig. 6.1.8: Assembly point*

5. **Additional Safety Features to Interpret on the Layout**
   - **Hazard Zones:** Areas like boiler rooms, chemical storage, or cutting zones may be highlighted to indicate high-risk locations.
   - **Restricted Access Areas:** Marked with caution signs; only authorized personnel are allowed in these zones.
   - **Stairways and Elevators:** Their locations help plan vertical evacuation where applicable.
   - **Emergency Contact Info:** Some layouts include numbers to call in case of injury or fire.

The layout are updated whenever there are changes in the facility or relocation of emergency equipment.

## 6.1.6 Signage Related to Health and Safety

Here's a table showing common health and safety signage relevant to the apparel industry:

| Signage | | Meaning | Where Used |
|---|---|---|---|
|  | Emergency Exit | Shows the route to safely exit during an emergency | All work areas – near doors, halls, and evacuation points |
|  | Fire Extinguisher | Indicates location of fire extinguisher | Near machines, storage areas, and entrances |
|  | First Aid | Indicates availability of first aid services | Cutting rooms, embroidery sections, and retail back office |
|  | No Smoking | Smoking is strictly prohibited in this area | Fabric storage, chemical handling sections, and shop floors |
|  | Wear Safety Gloves | Gloves must be worn while handling chemicals or machinery | Dyeing, finishing, and oiling areas |

| Signage | | Meaning | Where Used |
|---|---|---|---|
|  | Wear Eye Protection | Protect your eyes from possible hazards | Laser cutting, embroidery with fast-moving needles |
|  | High Voltage Area | Danger of electric shock or high voltage | Electrical panels, power supply rooms |
|  | Slippery Surface | Floor is slippery – proceed with caution | Cleaning zones, wet process areas, near washrooms |
|  | No Entry | Only authorized personnel are allowed | Stockrooms, machinery maintenance zones, or staff-only sections |
|  | Wear Face Mask | Protect against dust, fumes, or airborne particles | Ironing, cutting, packaging, or retail during health advisories |

*Table 6.1.1: Common health and safety signage*

## 6.1.7 Actions to Take During Emergency

In the event of an emergency such as fire, accident, chemical spill, or natural disaster, immediate and correct actions can save lives and reduce harm. Workers in the apparel industry must be trained and prepared to respond properly. Here are the key actions to take:

1. **Stay Calm and Alert Others:** When an emergency or fire breaks out, the first step is to stay calm and quickly raise an alarm. Inform nearby coworkers and supervisors. If trained, activate the nearest fire alarm or use the public address system if available.
2. **Follow the Evacuation Plan:** Immediately stop work and follow the pre-defined evacuation route shown in the plant layout. Do not run or panic. Help others—especially the elderly, injured, or those unfamiliar with the route. Avoid using elevators and use stairs wherever required.
3. **Use Emergency Exits:** Exit through the nearest emergency door as marked on signage. Do not try to retrieve personal belongings. Ensure doors are not blocked and assist those needing help.
4. **Assemble at the Designated Assembly Point:** Once outside, proceed to the designated assembly area. Stay with your team or department. Supervisors will take attendance to ensure everyone is accounted for. Do not return to the building until authorities give permission.
5. **Assist First Aid or Firefighting if Trained:** If you are trained in first aid or fire extinguisher use, and it is safe to do so, provide help. For example, extinguish a small fire using the correct extinguisher or administer basic first aid to an injured colleague.
6. **Report the Incident:** Report the details of the emergency to your supervisor or the emergency response team. Provide accurate information about what happened, who was involved, and where it occurred.
7. **Cooperate with Emergency Services:** Follow all instructions given by emergency personnel like firefighters, ambulance staff, or police. Do not interfere with their operations.

Regular safety drills and training sessions are essential to reinforce these procedures.

## 6.1.8 First Aid

First aid is the immediate and temporary care given to a person who has been injured or suddenly taken ill, before professional medical help is available. It aims to preserve life, prevent the condition from worsening, and promote recovery.

In the apparel industry, where workers may face risks like cuts, burns, falls, or eye strain, first aid plays a critical role in reducing the severity of injuries. For example, applying pressure to a bleeding wound, using a cold compress for a burn, or helping someone who has fainted are all basic first aid measures.

Having trained first aiders, accessible first aid kits, and a clear emergency response plan ensures a safer workplace for all employees.

**First Aid Techniques**

Here are simple and essential first aid techniques for handling different types of injuries that may occur in a apparel industry:

1. **For Cuts or Wounds**
   - Clean the wound gently with clean water to remove dirt or fabric particles.
   - Stop bleeding by applying firm pressure using a clean cloth or sterile bandage.

- Disinfect with antiseptic and cover with a sterile dressing or bandage.
- For deep or bleeding wounds that do not stop within 10 minutes, seek medical help immediately.

*Fig. 6.1.9: Applying antiseptic on wound*

**2. For Burns (Heat, Steam, or Chemical)**

- Cool the burn immediately under running cool (not cold) water for at least 10–20 minutes.
- Do not apply ice, oil, or toothpaste.
- Cover the burn with a clean, non-stick dressing or cloth.
- For chemical burns, rinse with water thoroughly and remove contaminated clothing.
- Seek medical attention for large or serious burns.


*Fig. 6.1.10: First aid for burns*

**3. For Broken Bones or Fractures**

- Do not move the injured area unless necessary.
- Support the limb with a soft pad or splint if trained.
- Apply cold packs to reduce swelling (avoid placing ice directly on skin).
- Keep the person calm and still, and call for emergency help.

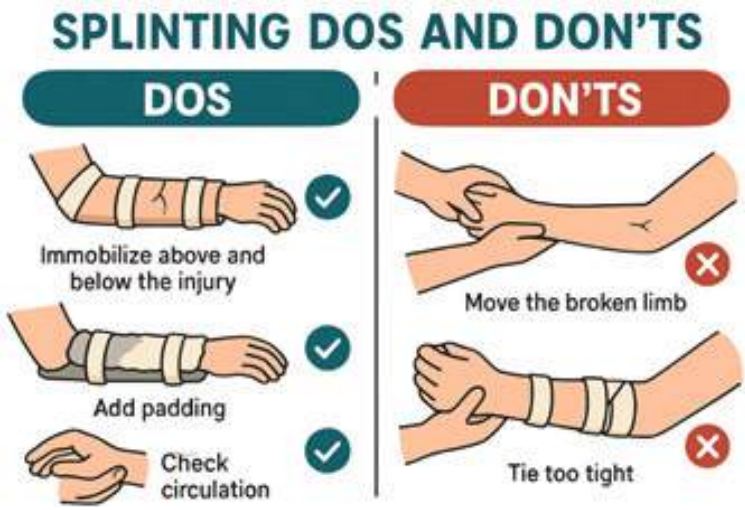


*Fig. 6.1.11: Dos and Don't's for fractures*

**4. For Heart Attack or Stroke**

- If someone shows signs like chest pain, shortness of breath, or numbness on one side of the body:
  - Call emergency services immediately.
  - Make the person sit in a comfortable position and keep them calm.
  - Loosen tight clothing and reassure them.
- If the person becomes unconscious and you are trained, start CPR (Cardiopulmonary Resuscitation).

*Fig. 6.1.12: Heart attack*

**5. For Head Injuries**

- Keep the person still and watch for signs like dizziness, vomiting, or confusion.
- Apply a cold compress to reduce swelling.
- Do not give food or drink.
- Seek medical help immediately, especially if the person loses consciousness or shows unusual behaviour.

## 6.1.9 CPR (Cardiopulmonary Resuscitation) Procedure

CPR is a life-saving emergency procedure performed when a person's breathing or heartbeat has stopped. It helps maintain circulation and oxygen flow until professional medical help arrives. The image you shared illustrates the Primary CPR Steps clearly.

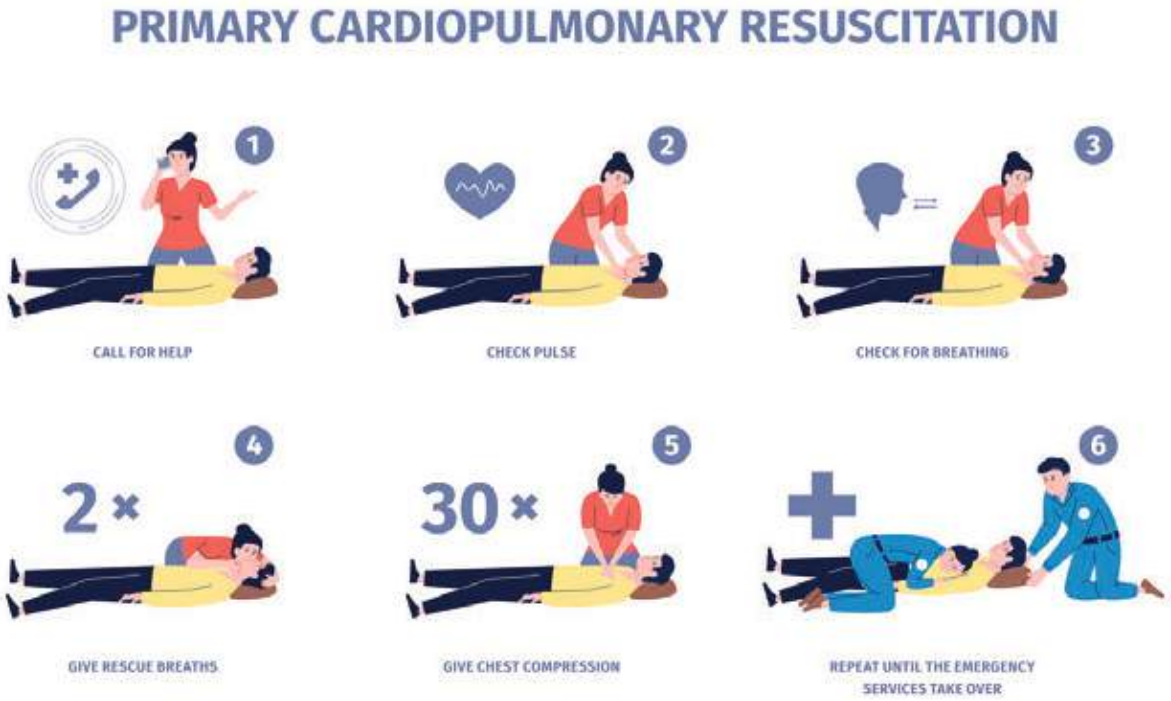


*Fig. 6.1.13: Cardiopulmonary Resuscitation procedure*

**Below is a detailed explanation of each step:**

**Step 1:** Call for Help

The first step is to immediately call emergency services or ask someone nearby to call. This ensures that professional help is on the way while you begin first aid. If you're alone, call for help first before starting CPR.

**Step 2:** Check Pulse

Place two fingers gently on the person's neck (carotid artery) or wrist to check for a pulse. Do this quickly—within 10 seconds. If there is no pulse or it is irregular, continue to the next steps.

**Step 3:** Check for Breathing

- Look, listen, and feel for breathing:
- Look at the chest for movement.
- Listen for breath sounds.
- Feel for air movement from the nose or mouth.
- If the person is not breathing or only gasping, they need CPR.

**Step 4:** Give Rescue Breaths (2 Times)

- Tilt the head back slightly to open the airway.
- Pinch the nose shut.

- Give 2 rescue breaths into the mouth (each lasting about 1 second), watching for the chest to rise.
- If the chest doesn't rise, reposition and try again.

**Step 5:** Give Chest Compressions (30 Times)

- Place both hands in the center of the chest.
- Push hard and fast at a depth of about 2 inches (5 cm).
- Perform 30 compressions at a rate of 100–120 compressions per minute.
- Allow the chest to fully return between compressions.

**Step 6:** Repeat Until Help Arrives

Continue the cycle of:

- 30 chest compressions
- 2 rescue breaths
- Repeat this cycle until the person regains breathing, you are too exhausted, or emergency services take over.

This CPR method is essential in emergencies like cardiac arrest, drowning, or electric shock incidents -common risks even in industrial settings like the apparel industry.

## 6.1.10 Importance of Sound Health, Hygiene, and Good Habits

Maintaining sound health, hygiene, and good habits is essential for personal well-being and workplace efficiency, especially in industries like apparel where physical activity, focus, and cleanliness play vital roles. Good health allows individuals to perform tasks effectively without fatigue or frequent illness. This reduces absenteeism and increases productivity.

Proper hygiene—like regular handwashing, clean clothing, and a tidy work environment—prevents the spread of infections and keeps both workers and products safe. It also ensures compliance with workplace safety and quality standards. Practicing good habits such as regular exercise, healthy eating, sufficient sleep, and staying hydrated helps improve concentration, stamina, and overall morale. Together, these habits support a safe, efficient, and professional work culture.

## 6.1.11 Ill-Effects of Alcohol, Tobacco, and Drugs

The consumption of alcohol, tobacco, and drugs has several harmful effects on health, behaviour, and workplace performance. Alcohol affects the central nervous system, leading to poor coordination, impaired judgment, and slower reaction times. Regular or excessive drinking can damage the liver, heart, and brain, and may lead to addiction. At the workplace, alcohol consumption increases the risk of accidents and reduces efficiency.


*Fig. 6.1.14: Warning on cigarette box*

Tobacco, especially when smoked, harms nearly every organ in the body. It causes lung diseases, heart problems, and various cancers. Chewing tobacco is equally dangerous and can cause oral cancer. It also leads to bad breath, stained teeth, and overall poor hygiene, which is especially undesirable in customer-facing roles or clean environments like the apparel industry.

Drug use, whether illegal or misuse of prescription drugs, can severely alter brain function, causing mood swings, aggression, anxiety, and even hallucinations. Long-term use damages organs and weakens the immune system. Drug addiction can lead to absenteeism, frequent mistakes, and unsafe practices at work.

# UNIT 6.2: Gender Sensitisation and Inclusion of Persons with Disabilities (PwD)

## Unit Objectives

**By the end of this unit, the participants will be able to:**

1. Explain why gender and PwD awareness is important at workplace.
2. Comply with gender and PwD-related instructions as per organisational policy.
3. Discuss how to accommodate employees with disabilities at the workplace.
4. State the environmental management system-related procedures to be followed at the workplace.
5. Respect diversity and contribute to creating a safe and inclusive workplace.

## 6.2.1 Gender and PwD Awareness

**What is Gender and PwD Awareness?**

Gender awareness means understanding that both men and women have equal rights and opportunities in the workplace. Everyone should be treated with respect, no matter their gender.

PwD awareness means being kind and respectful towards Persons with Disabilities (PwD). These are people who may have physical, mental, or learning difficulties. They also have the right to work and be treated fairly like everyone else.

**Why is Gender and PwD Awareness Important at the Workplace?**

Gender and Persons with Disabilities (PwD) awareness is important in the workplace because it helps create a respectful and supportive environment. When everyone is treated equally—regardless of gender or disability—the workplace becomes more friendly and comfortable. It also helps build better teamwork, as people learn to understand and support one another's differences. This makes it easier to work together and complete tasks smoothly.

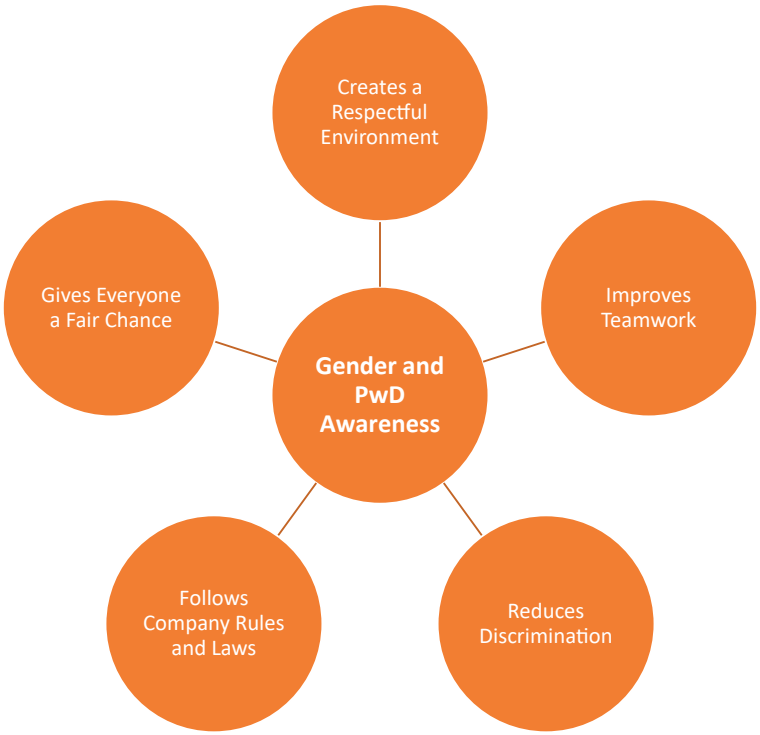


*Fig. 6.2.1: Importance of Gender and PwD awareness at workplace*

Awareness also reduces chances of discrimination, bullying, or unfair treatment. It helps all employees feel safe and valued. Respecting everyone is not just the right thing to do—company rules and government laws also require it. When workers are treated fairly, they have equal opportunities to utilise their skills and advance in their careers. This makes the workplace stronger and more successful for everyone.

## 6.2.2 Gender Equality

Gender Equality means giving equal rights, responsibilities, and opportunities to people of all genders — women, men, and individuals of diverse gender identities. It ensures that a person's gender does not determine their access to education, employment, decision-making, or personal freedom.

In the workplace, gender equality means fair treatment in hiring, salaries, training, and promotions. For example, both men and women should be able to work in any department or role — whether it is in stitching, quality control, or as supervisors — based on their skills, not their gender.

Gender equality also includes creating a respectful and safe environment for everyone, preventing discrimination, and encouraging equal participation. It helps build inclusive and productive teams, reduces conflicts, and promotes mutual respect.

Achieving gender equality is not just about women's rights; it benefits the entire organization and society by using the full potential of all individuals.

Here are some common stereotypes related to gender equality, especially relevant to workplaces like the apparel industry:

1. **"Men are better at technical or supervisory roles."**

   This stereotype assumes only men can handle machines, maintenance, or leadership roles, which discourages skilled women from being considered or promoted.

2. **"Women are more suitable for stitching or soft tasks."**
   It limits women to repetitive or light-duty roles, even if they have potential to work in quality checks, pattern making, or production planning.
3. **"Only men should work late or handle shifts."**
   This belief prevents women from equal work opportunities and career growth in factory settings.
4. **"Women are emotional and less reliable under pressure."**
   This stereotype can cause unfair judgments during hiring or performance evaluations.
5. **"Household responsibilities are a woman's job."**
   This affects both genders. Women may be expected to juggle both home and work, while men may be discouraged from taking family leave or flexible hours.
6. **"Leadership roles are for men."**
   This discourages women from aspiring to be supervisors or managers, despite being qualified.

These stereotypes create barriers to gender equality and must be challenged through awareness, training, and fair workplace policies.

## 6.2.3 Gender-Neutral Language at the Workplace

Gender-neutral language avoids bias toward any particular gender and promotes inclusivity and respect for all employees, regardless of their gender identity. Using inclusive language helps create a professional and supportive work environment where everyone feels valued and respected.

Examples of Gender-Neutral Terms:

| Instead of | Use |
|---|---|
| **Chairman** | **Chairperson** |
| **Salesman** | **Salesperson / Sales Executive** |
| **Foreman** | **Supervisor** |
| **Manpower** | **Workforce / Staff** |
| **He/She** | **They / The person** |
| **Maternity Leave** | **Parental Leave** |
| **Policeman** | **Police Officer** |
| **Craftsman** | **Artisan / Craftsperson** |

*Fig. 6.2.2: Gender-neutral terms*

Using gender-neutral language is a small but powerful step toward building an equitable workplace, especially in industries like apparel, where people of all genders contribute equally to production, design, and leadership.

## 6.2.4 Persons with Disabilities (PwD)

PwD stands for Persons with Disabilities. It refers to individuals who have long-term physical, mental, intellectual, or sensory impairments which may hinder their full and effective participation in society on an equal basis with others.

In the workplace, including the apparel industry, PwDs may include individuals who are visually or hearing impaired, have limited mobility, or face cognitive challenges. Employers are encouraged to provide equal opportunities, accessible infrastructure, and reasonable accommodations—such as modified workstations, flexible schedules, or assistive tools—to support their inclusion.

Promoting employment for PwDs is not only a legal and ethical responsibility, but it also brings diverse talents and perspectives into the workforce, improving creativity, problem-solving, and workplace culture.

**Types of Disabilities**

The Government of India, under the Rights of Persons with Disabilities Act, 2016, officially recognizes the following 21 types of disabilities:

| Sl. No. | Type of Disability | Description |
|---|---|---|
| 1. | Blindness | Complete loss of vision. |
| 2. | Low Vision | Visual impairment even after treatment or correction. |
| 3. | Leprosy Cured Persons | Persons cured of leprosy but with residual disability. |
| 4. | Hearing Impairment | Partial or complete hearing loss. |
| 5. | Locomotor Disability | Disability of bones, joints, or muscles leading to movement restriction. |
| 6. | Dwarfism | Adult height of 4 feet 10 inches or less. |
| 7. | Intellectual Disability | Limitations in intellectual functioning and adaptive behaviour. |
| 8. | Mental Illness | Any mental disorder other than intellectual disability. |
| 9. | Autism Spectrum Disorder | Neuro-developmental condition affecting communication and behaviour. |
| 10. | Cerebral Palsy | Movement and posture disorder due to brain damage. |
| 11. | Muscular Dystrophy | Group of genetic diseases causing muscle weakness. |
| 12. | Chronic Neurological Conditions | Such as multiple sclerosis, Parkinson's disease, etc. |
| 13. | Specific Learning Disabilities | Dyslexia, dyscalculia, etc., affecting ability to learn. |
| 14. | Multiple Sclerosis | Autoimmune disease affecting the brain and spinal cord. |
| 15. | Speech and Language Disability | Difficulty in speaking or expressing clearly. |
| 16. | Thalassemia | Inherited blood disorder causing anemia. |
| 17. | Hemophilia | Blood clotting disorder. |
| 18. | Sickle Cell Disease | Genetic disorder affecting red blood cells. |
| 19. | Multiple Disabilities | More than one of the above-mentioned disabilities. |

| Sl. No. | Type of Disability | Description |
|---|---|---|
| 20. | Acid Attack Victim | Physical disfigurement or trauma due to acid attack. |
| 21. | Parkinson's Disease | Progressive nervous system disorder affecting movement. |

*Table 6.2.1: Types of disabilities recognized by GoI*

These categories help ensure that persons with disabilities (PwDs) receive the rights, support, and welfare measures they are entitled to under law.

## 6.2.5 Accommodate Employees with Disabilities at the Workplace

Creating an inclusive and accessible workplace for Persons with Disabilities (PwDs) is essential for ensuring equal opportunity, productivity, and dignity. Here are key ways to accommodate employees with disabilities in the apparel industry or any workplace:

1. **Modify Physical Workspaces:** Workstations, aisles, entrances, and restrooms should be wheelchair-accessible. Install ramps, handrails, and wider doors. Adjustable tables and seating may be provided for persons with mobility impairments.

*Fig. 6.2.3: Inclusive workspace*

2. **Provide Assistive Devices:** Offer screen readers for the visually impaired, hearing aids or visual alerts for the hearing impaired, and ergonomic tools for those with motor disabilities. These aids help PwDs perform tasks efficiently.
3. **Flexible Work Schedules:** Allow flexible hours or remote work where possible for employees undergoing treatment or managing fatigue due to their disability. This improves attendance and job satisfaction.
4. **Assign Suitable Job Roles:** Match roles based on the individual's ability and strength, not assumptions. For example, a person with a hearing impairment can excel in data entry, stitching, or quality inspection roles.
5. **Sensitize Co-workers:** Conduct regular awareness and sensitivity training for all employees to build empathy, break stereotypes, and encourage collaboration with PwD colleagues.
6. **Ensure Clear Communication:** Use sign language interpreters, visual instructions, or written communication when needed. Avoid relying only on verbal or auditory methods of instruction.

7. **Offer Equal Training and Growth Opportunities:** Ensure that PwDs have access to training, skill development, and promotion opportunities like any other employee. Adapt learning materials to suit different needs.
8. **Follow Legal Compliance:** Adhere to the Rights of Persons with Disabilities Act, 2016, and related workplace guidelines, including reservation in jobs, accessibility norms, and non-discrimination policies.

Providing reasonable accommodations not only supports legal compliance but also creates a respectful and diverse work culture that benefits everyone.

## 6.2.6 Environmental Management System (EMS) Procedures

An Environmental Management System (EMS) helps workplaces minimize negative environmental impacts and comply with sustainability regulations. In the apparel industry, following EMS-related procedures is essential to ensure efficient use of resources and reduce pollution. One of the key procedures is proper waste management. Waste must be segregated into recyclable and non-recyclable categories such as fabric scraps, plastic, paper, and hazardous waste. These should be disposed of or recycled through authorized methods, helping keep the environment clean and compliant with local regulations.

Energy conservation is another major area. Employees must ensure that machines, lights, and fans are switched off when not in use. Using energy-efficient lighting and maintaining machinery regularly can significantly reduce power consumption. Likewise, water conservation practices such as installing low-flow taps, promptly repairing leaks, and reusing water in dyeing or washing units help reduce water waste. Employees should be trained in basic water-saving habits.

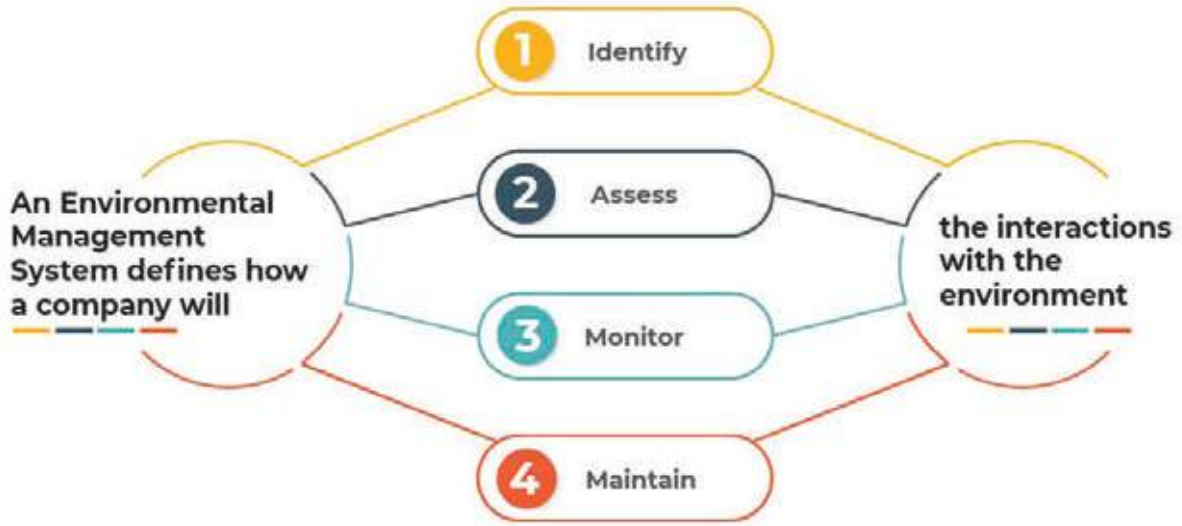


*Fig. 6.2.4: Environmental Management System (EMS)*

Safe chemical handling is crucial in textile processing. All chemicals, such as dyes or machine oils, should be stored in properly labelled containers and handled using recommended PPE. Adherence to MSDS (Material Safety Data Sheet) guidelines ensures safety and environmental protection. Additionally, pollution control measures such as maintaining air filters, reducing noise pollution through machine servicing, and using ear protection in loud environments help maintain a healthy workspace.

Using sustainable materials like organic or recycled fibers also supports EMS goals by reducing the environmental footprint. All procedures and environmental performance should be well documented and regularly monitored through internal audits. Emergency preparedness, such as having spill kits for chemical leaks and trained staff to manage accidents, is also essential. Together, these EMS procedures create a safer, more sustainable, and legally compliant workplace in the apparel sector.

## 6.2.7 Respecting Diversity and Contribute to Creating a Safe and Inclusive Workplace

Respecting diversity means valuing and appreciating differences in gender, age, culture, disability, religion, language, and background. In the apparel industry, where workers often come from varied social and cultural groups, it is important to create a workplace where everyone feels included, safe, and respected.

One way to promote inclusivity is by treating all colleagues equally and with dignity, regardless of their background or appearance. Using polite language, listening to others' views, and avoiding stereotypes or offensive jokes helps build a respectful work culture. Supporting co-workers with disabilities by offering assistance and showing patience also encourages inclusion.

A safe and inclusive workplace is created by preventing discrimination and harassment. This means speaking up or reporting to a supervisor if someone is being mistreated. Following company policies related to diversity, equal opportunity, and anti-harassment is essential. Additionally, respecting cultural practices, languages, and dress choices of fellow workers helps everyone feel accepted and valued.

Team members should also be encouraged to work together, share tasks fairly, and celebrate achievements as a group. When employees feel accepted and supported, it increases cooperation, reduces conflicts, and improves productivity. Ultimately, respecting diversity benefits both individuals and the overall success of the organization.

## Summary

- Every employee must follow the safety guidelines provided by the company to prevent accidents.
- Unsafe machines, wires, or chemical spills must be reported to the responsible person immediately.
- Emergency exits, fire extinguishers, and first aid kits should be known and accessible to all.
- Employees should participate in safety drills and understand the layout of escape routes.
- Machine oil, chemical inks, and e-waste must be handled, stored, and disposed of carefully.
- Cleanliness, personal hygiene, and safe work posture are important for long-term health.
- Safety signs and symbols at the workplace must be followed strictly.
- Operators should avoid use of tobacco, alcohol, and drugs to stay alert and fit for work.
- Sensitization toward gender and persons with disabilities (PwD) creates a respectful and fair workplace.
- Effective communication and teamwork help in maintaining a safe and inclusive work environment.

## Exercise

**Multiple-choice Question:**

1. What is First Aid?
   a. Final treatment
   b. Home remedy
   c. Immediate help before medical care
   d. Only for doctors

2. What should you do if you see an oil spill on the floor?
   a. Ignore it
   b. Clean it or inform someone
   c. Walk over it
   d. Cover with cloth

3. Which symbol means fire extinguisher nearby?
   a. Green cross
   b. Yellow triangle
   c. Blue square
   d. Red circle with hose

4. What is the safe way to lift heavy material?
   a. Bend your back
   b. Use your knees
   c. Pull with one hand
   d. Ask someone else

5. Who should be informed in case of emergency?
   a. Supervisor or emergency team
   b. Family members
   c. Delivery person
   d. Customer

**Descriptive Questions:**

1. What steps should be taken during a fire or emergency?
2. Why is proper posture important while working?
3. Describe how to safely handle machine oil and chemicals.
4. What are safety signs and why are they important?
5. Explain the importance of gender and disability sensitisation in the workplace.

## Notes

Scan the QR codes or click on the link to watch the related videos

https://youtu.be/Qyy0Svl1kZI?si=MVRhGKsP9oUBfAUp

PPE - Personal Protective Equipment

https://youtu.be/Qyy0Svl1kZI?si=MVRhGKsP9oUBfAUp

What is CPR?

Skill India
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# 7. Employability Skills

DGT/VSQ/N0101

Employability Skills is available at the following location

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

Employability Skills

Skill India
कौशल भारत-कुशल भारत

सत्यमेव जयते
GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT
& ENTREPRENEURSHIP

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RE IMAGINE FUTURE

APPAREL MADE-UPS HOME FURNISHING
SECTOR SKILL COUNCIL

# 8. Annexure

| Module No. | Unit No. | Topic Name | Page No | Link for QR Code (s) | QR code (s) |
|---|---|---|---|---|---|
| **Module 1: Intro-duc-tion and Ori-entation to Em-broi-dery Ma-chine Op-erator** | Unit 1.1: In-troduction to the role of Embroidery Machine Operator | 1.1.1 Appar-el Manufac-tur-ing Sector | 13 | https://youtu.be/-ddisteV3tOo-?si=uFDW4QKnItoOKknY | Textile Sector in India |
| | | 1.1.2 Em-broi-dery | 13 | https://youtu.be-/_DkEQuBrWf8-?si=1mxVoQOyAqYov2e8 | The Story Behind Embroidery \| What is Embroidery? |
| | | 1.1.3 Gar-ment Pro-duction Pro-cess | 13 | https://youtu.be/-QaS4sI0n5Qg-?si=f49xb-wPLdagICvk | Garments Full Production Process |
| | | 1.1.4 Roles and Respon-sibil-ities of an Embroi-dery Ma-chine Op-er-ator | 13 | https://youtu.be/-6XMG1SfFCc8-?si=PvDmFX7iI5Es5EHk | Embroidery computer machine |
| **Module 2: Carry out Different Types of Em-broi-dery Stitches Using an Em-broi-dery Ma-chine** | Unit 2.1: Ba-sics of Em-broidery Ma-terials and Tools | 2.1.1 Types of Fabrics | 98 | https://www.youtube.com/-watch?v=lbZA4mo-08g | Types Of Fabric Names and Pictures |

| Module No. | Unit No. | Topic Name | Page No | Link for QR Code (s) | QR code (s) |
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| | | 2.1.2 Threads | 98 | https://youtu.be/-QOh2xECA63M-?si=rlVVM8QNnVqrhcsg | Sewing Thread Used in Apparel Manufacturing |
| | | 2.1.3 Differ-ent Types of Trims | 98 | https://youtu.be/-OHmjUCOQXUQ-?si=uhrrwZEWZFKL2n8K | Types of Embroidery Needles |
| | | 2.1.4 Em-broi-dery Needles | 98 | https://youtu.be/-46FxzGPACq4-?si=4b_rL9XlHC-_lNJq | Trims And Accessories? Different Types Of Trimmings And Accessories Used In Apparel Industry |
| | | 2.1.6 Other Ac-cessories Used in Em-broidery | 98 | https://youtu.be/-qK6HNiBecQI-?si=BNhCKZwhbn697SIP | Traditional Embroideries of India |
| | | 2.1.9 Types of Embroi-dery | 98 | https://youtu.be/-Q1tb_q1i6lA-?si=TNm6qs2rGTj63xcA | 6 Basic Hand Embroidery Materials and Tools |

| Module No. | Unit No. | Topic Name | Page No | Link for QR Code (s) | QR code (s) |
|---|---|---|---|---|---|
| | | 2.1.10 Types of Embroi-dery Tech-niques and their Stitch Types | 98 | https://youtu.be/-hVw1WVacVZo-?si=-ZQqrVDbfJ9XgXwi | 20 Basic Hand Embroidery Stitches Sampler for Absolute Beginners |
| **Module 3: Embroider Decorative Designs Using Em-broi-dery Ma-chine** | Unit 3.1: Preparation for Em-broi-dery Opera-tions | 3.1.1 Mate-rial Pre-Checks | 122 | https://youtu.be/-Btim8PVvMIs-?si=jFulXwtO5WJVMECt | 51 Major fabric faults and fabric inspection |
| **Module 4: Contribute to achieve quality in em-broi-dery work and Green-ing of Job Roles** | Unit 4.1: Maintain Quality Standards in Embroidery Production | 4.1.8 Faults in Embroi-dery Work | 143 | https://youtu.be/-nSGVF4HHtNg-?si=4RjORVfRRQEKQeZb | Are You Making These Machine Embroidery Mistakes? |
| **Module 5: Main-tain Work Area, Tools and Ma-chines** | Unit 5.1: Ef-fective Communi-ca-tion and Team Work | 5.1.1 Im-por-tance of Effec-tive Commu-nica-tion with Colleagues and Supervi-sors | 174 | https://youtu.be/-KNS-iE4y5y4-?si=67D-kfOzIqH7lFcE | Effective Communication? |
| | Unit 5.3: Op-eration and Main-tenance of Machines and Tools | 5.3.1 Differ-ent Types of Cut-ting Ma-chines | 174 | https://youtu.be/-xfKChjTHXnA-?si=YpoTJ5CM-Se29Uaj | Machine Used in Garments Factory |

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| **Module 6: Maintain Health, Safety And Secure Workplace with Gender and PwD Sensi-tisation** | Unit 6.1: Health, Safety, Emergen-cy Preparedness and Workplace Hygiene | 6.1.4 Health and Safety-Related Practices Applicable at the Work-place | 201 | https://youtu.be/-Qyy0Svl1kZI-?si=MVRhGKsP9oUBfAUp | PPE - Personal Protective Equipment |
| | | 6.1.9 CPR (Cardiopul-monary Re-suscitation) Procedure | 201 | https://youtu.be/-Qyy0Svl1kZI-?si=MVRhGKsP9oUBfAUp | What is CPR? |

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