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MINISTRY OF SKILL DEVELOPMENT
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APPAREL MADE-UPS HOME FURNISHING
SECTOR SKILL COUNCIL

Participant Handbook

Sector
Apparel

Sub-Sector
Apparel, Made-Ups & Home Furnishing

Occupation
Production

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Industrial Engineer-Apparel

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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

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for

SKILLING CONTENT: PARTICIPANT HANDBOOK

Complying to National Occupational Standards of

Job Role/ Qualification Pack: **'Industrial Engineer-Apparel'**

QP No. **'AMH/Q2001, NSQF Level 6'**

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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 "Industrial Engineer-Apparel" 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/N2001: Select fabrics, trims and accessories as per specific product category
2. AMH/N2002: Supervise, Analyse and Evaluate Performance on Sewing Floor
3. AMH/N2003: Research and Resolve production problems to implement better production system
4. AMH/N2004: Manage data, forms and instructions for recording, evaluating and reporting quality and reliability data
5. AMH/N0621: Adhere to industry, regulatory, and organizational standards and embrace environmentally sustainable practices
6. AMH/N1605: Maintaining a healthy, safe and secure working environment in the organization with Gender and PwD Sensitization
7. DGT/VSQ/N0103:Employability Skills (90 Hrs.)

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1. Introduction and Orientation to Industrial Engineer (IE)

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Unit 1.1 - Role and Scope of an Industrial Engineer (IE) in Apparel Manufacturing

AMH/N2001

Key Learning Outcomes

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

1. Describe various employment opportunities for an 'Industrial Engineer (IE)' in the apparel industry.
2. Describe the relationship between work role of an 'Industrial Engineer (IE)' and the overall manufacturing process.
3. Describe the production process and the specific work activities that relate to the whole process.
4. Explain the roles and responsibilities of an 'Industrial Engineer (IE)'.

UNIT 1.1: Role and Scope of an Industrial Engineer (IE) in Apparel Manufacturing

Unit Objectives

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

1. Describe various employment opportunities for an Industrial Engineer (IE) in the apparel industry.
2. Explain the roles and responsibilities of an Industrial Engineer (IE).
3. Examine the relationship between the Industrial Engineer's work role and the overall manufacturing process.
4. Analyse the production process and describe specific work activities involved.

1.1.1 Employment Opportunities for Industrial Engineer

An Industrial Engineer (IE) is a professional who focuses on optimising processes, systems, and resources to improve efficiency, productivity, and quality within an organisation. In the context of manufacturing, especially in industries like apparel production, an industrial engineer plays a key role in ensuring that operations run smoothly and cost-effectively. Industrial engineers study the way work is done, identify waste or inefficiencies, and implement strategies to enhance performance. Their work involves time and motion studies, line balancing, workflow design, resource planning, and data analysis. They also help develop standard operating procedures (SOPs) and support the implementation of quality and lean manufacturing practices. Thus, an industrial engineer acts as a bridge between the shop floor and management, using engineering principles and data-driven approaches to improve productivity, reduce costs, and ensure timely delivery of quality products.

Employment Opportunities for Industrial Engineers in Apparel

Industrial Engineers have diverse opportunities across various departments in apparel manufacturing, including:

Department	Job Role
Production Planning	Line planning, capacity forecasting
Industrial Engineering	Method study, time study, efficiency analysis
Quality Assurance	Process audits, defect analysis
Merchandising	Costing and resource optimisation
Lean Implementation Teams	Waste elimination, continuous improvement

1.1.2 Roles and Responsibilities of an Industrial Engineer

The responsibilities of an Industrial Engineer in apparel manufacturing typically include:

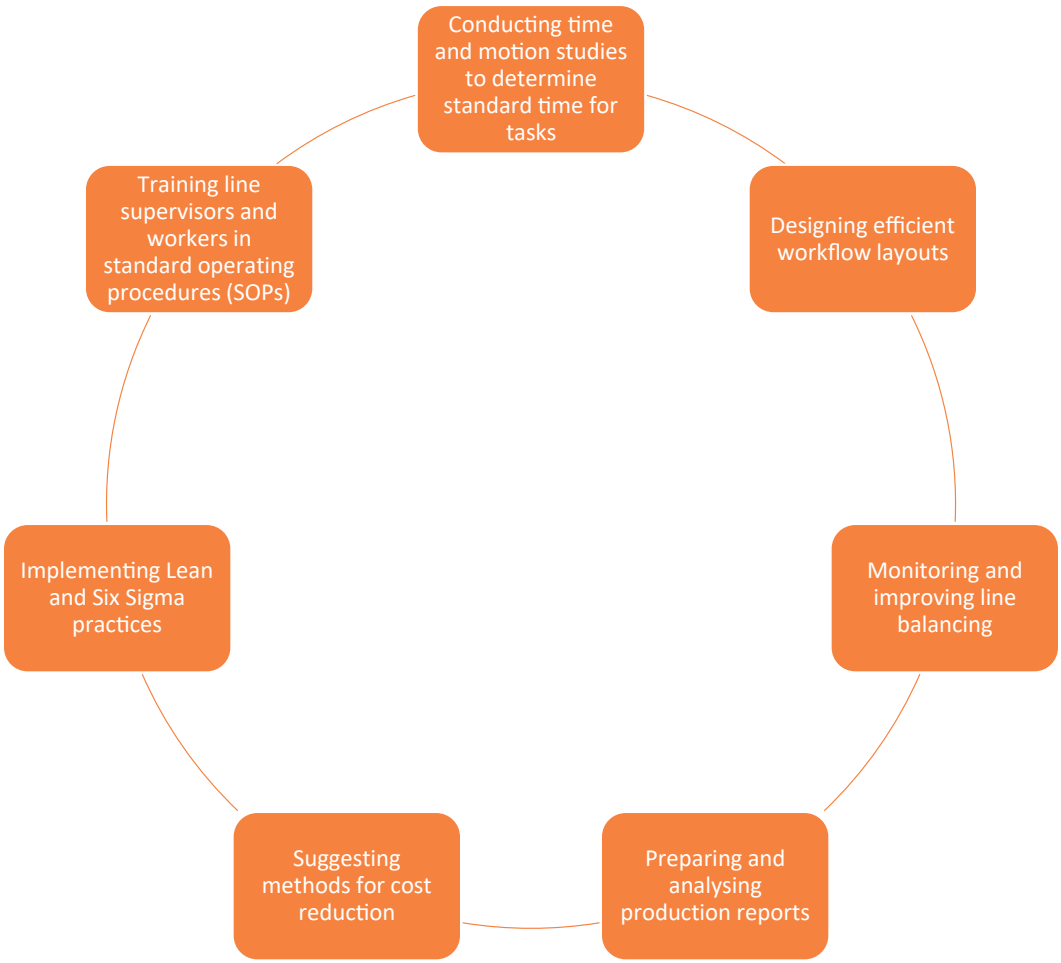

Fig. 1.1.1: Responsibilities of an Industrial Engineer

1.1.3 Relationship with the Manufacturing 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 10. 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.

IEs serve as the bridge between management and the shop floor. Their data-driven decisions help align production activities with delivery timelines, quality goals, and cost constraints.

Stage in Manufacturing	IE Contribution
Pre-Production Planning	Line setup, SAM (Standard Allowed Minute) calculation
Production Execution	Workstation efficiency monitoring
Quality Control	Process audits, root cause analysis
Post-Production	Downtime and performance analysis

Table 1.1.1: IEs contribution in Manufacturing of Garments

In garment production, the Industrial Engineer (IE) ensures that every step runs efficiently, cost-effectively, and on time. They plan the line setup, calculate production targets (SAM), monitor worker and machine performance, conduct process audits to maintain quality, and analyze downtime to improve future productivity. In short, IEs act as the link between management goals and shop floor execution, balancing delivery timelines, quality, and cost.

1.1.4 Work Activities in the Production Process

Industrial Engineers are actively involved in each phase of the apparel production process, ensuring optimised performance:

- **Pre-Production:** Layout planning, machine allocation
- **Cutting and Stitching:** Time measurement, bottleneck identification
- **Finishing and Packing:** Takt time calculation, productivity checks
- **Reporting:** MIS reporting, KPI monitoring (e.g., efficiency %, DHU)

Summary

- Industrial Engineers (IEs) focus on improving productivity, efficiency, and quality in apparel manufacturing.
- They analyse workflows, perform time and motion studies, and develop optimal production strategies.
- IEs play a central role in coordinating various stages of the apparel production process.
- They work in departments such as production planning, quality assurance, and lean implementation.
- Key responsibilities include line balancing, performance monitoring, and process optimisation.
- IEs use tools like SAM (Standard Allowed Minute), KPI tracking, and efficiency analysis.
- Their efforts lead to cost reduction, better resource utilisation, and improved delivery timelines.
- Industrial Engineers help ensure the factory operates competitively in a fast-paced apparel market.

Exercise

Multiple-choice Question:

1. What is the primary goal of an Industrial Engineer in apparel manufacturing?
   a. Designing garments
   b. Improving sewing techniques
   c. Optimising production efficiency
   d. Purchasing raw materials

2. Which of the following is a common tool used by IEs?
   a. Heat press
   b. Time and motion study
   c. Tailoring machine
   d. Fabric dyeing unit

3. Which department is an Industrial Engineer least likely to work in?
   a. Production Planning
   b. Finance
   c. Quality Control
   d. Lean Implementation

4. Line balancing helps to:
   a. Increase machine downtime
   b. Improve workflow efficiency
   c. Reduce garment quality
   d. Increase fabric usage

5. The performance of a production line is commonly measured using:
   a. Pantone shades
   b. Inventory count
   c. Efficiency percentage
   d. Colour matching tools

Descriptive Questions:

1. What is the role of an Industrial Engineer in the apparel manufacturing industry?
2. What are the main responsibilities of an Industrial Engineer on a garment production floor?
3. How does an Industrial Engineer contribute to improving workflow in apparel manufacturing?
4. What is the significance of using time and motion studies in garment production?
5. What types of employment opportunities are available for Industrial Engineers in the apparel sector?

Notes

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

https://youtu.be/lvDrmg0UmOM?si=HohNf0NnjXDA_pV5

Beginning Engineers Industrial Engineering

https://youtu.be/bw9IsTj5VuQ?si=-XKnjQyNMQGmWNEz

Role of Industrial Engineers in Industry

https://youtu.be/AezKyDdoHvw?si=smtLYW82eSlH567C

What is Industrial Engineering

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2. Select Fabrics, Trims and Accessories as per Specific Product Category

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Unit 2.1 - Business Planning and Strategy

Unit 2.2 - Design, Tools and Equipment

Unit 2.3 - Procedures, Reporting and Regulations

Unit 2.4 - Analysis, Estimation and Decision-Making

AMH/N2001

Key Learning Outcomes

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

1. Analyse the business plan and strategy against implementation procedure and success factors.
2. Prepare operation bulletin to estimate SAM (Standard Allowed Minute) with productivity at the costing stage, cost analysis in consultation with relevant stakeholders.
3. Determine worker functions and responsibilities by studying operations sequence, material flow, functional.
4. Plan and establish the sequence of operations to fabricate and assemble parts or products and to promote efficient utilization.
5. Regulate workflow schedules according to established manufacturing sequences and lead times to expedite production operations.
6. Communicate to the concerned authority about production plan and standards.
7. Analyse detailed instructions, drawings, or specifications to explain how devices, parts, equipment, or structures are to be fabricated, constructed, assembled, modified, maintained, or used.
8. Classify defects as critical and non-critical.
9. Analyse risk assessment processes.

UNIT 2.1: Business Planning and Strategy

Unit Objectives

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

1. Analyse the business plan and strategy in relation to implementation procedures and success factors.
2. Estimate Standard Allowed Minute (SAM) using operation bulletin to evaluate productivity during costing.
3. Conduct cost analysis in consultation with relevant stakeholders.
4. Assess worker roles and responsibilities by examining operation sequences and material flow.
5. Plan and structure the sequence of operations to promote efficient fabrication and assembly.
6. Regulate workflow schedules according to production lead times and manufacturing sequences.
7. Communicate the production plan and standards to the concerned authority.

2.1.1 Business Planning and Strategy: Core Concepts

In the Indian apparel sector, a business plan and strategy for selecting fabrics, trimmings, and accessories must be carefully aligned with the execution technique and key success elements to ensure competitiveness and profitability. The strategy usually starts with a market analysis to determine current fashion trends, consumer preferences, and seasonal demands, followed by sourcing decisions that balance cost, quality, and lead times. Implementation entails working with dependable suppliers, guaranteeing quality compliance, and maintaining effective supply chain management. Timely procurement, sustainable sourcing techniques, vendor relationships, and the ability to adjust rapidly to market changes are all key success elements. A well-aligned plan ensures that the materials chosen not only match design and quality standards, but also contribute to brand positioning, operational efficiency, and customer pleasure.

Aspect	Description
Business Plan	A document that outlines the business goals, market analysis, and operational strategy.
Strategy Implementation	Steps taken to ensure the business plan is executed effectively on the shop floor.
Success Factors	Critical factors such as lead time, cost control, and quality determine production success.

Business Plan to Execution Flowchart

A business's implementation procedure consists of a defined sequence of procedures for translating strategic plans into effective action. It starts with creating a comprehensive business plan that specifies goals, target markets, and competitive positioning. Resource allocation follows, ensuring that the appropriate financial, human, and material resources are allocated efficiently. The production strategy specifies how goods or services will be produced to fulfil quality and cost objectives. Operation execution subsequently implements the plan through day-to-day actions. Finally, monitoring and feedback guarantee continual evaluation, which allows for timely modifications to improve performance and achieve desired results.

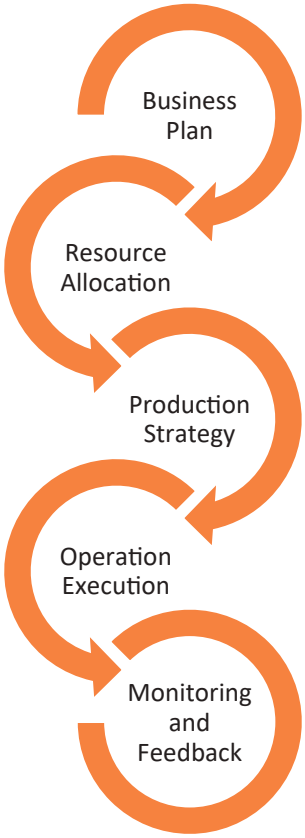


Fig. 2.1.1: Implementation Procedure in a Business

2.1.2 SAM (Standard Allowed Minute)

SAM is the time value assigned to a specific task, used for planning labour cost and productivity. It is calculated based on the Operation Bulletin.

Operation	Machine Used	SAM (min)
Attach Collar	Flat Lock Machine	1.50
Stitch Sleeve	Overlock Machine	1.20
Hem Bottom	Flat Lock Machine	0.80
Button Attachment	Button Machine	0.70
Total		**4.20**

Sample Table: Operation Bulletin and SAM

Formula:

- SAM = (Basic Time + Allowances)

Where:

- Basic Time = Observed Time × Rating Factor
- Allowances = Fatigue, Delay, and Contingency

2.1.3 Cost Analysis with Stakeholders

Cost components include:

- Fabric and trims
- Labour (based on SAM)
- Overheads (utilities, rent, etc.)
- Profit margin

Stakeholders	Role in Costing
IE Team	Provides productivity and time estimates.
Merchandising Department	Supplies garment specs and buyer requirements.
Finance/ Costing Team	Finalises cost sheet, including material and labour cost estimates.

Table 2.1.1: Cost Analysis with Stakeholders

2.1.4 Worker Roles, Operation Sequence & Material Flow

Understanding who does what, when, and how is critical for efficiency.

Operation	Worker Role	Material Flow
 **Fabric Spreading**	Spreader	Raw fabric → Cutting
 **Cutting**	Cutter	Cut panels → Bundling

Operation	Worker Role	Material Flow
 **Sewing**	Sewing Machine Operator	Bundles → Assembly Line
 **Finishing**	Quality Checker	Finished goods → Packing

Table 2.1.2: Operation and Worker Responsibilities

2.1.5 Sequencing Operations

Proper sequencing avoids bottlenecks and ensures efficient production.

Activity	Preceding Task	Following Task
 **Attach Sleeve**	Join Shoulder	Sew Side Seams
 **Stitch Collar**	Join Shoulder	Top Stitch Collar

Activity	Preceding Task	Following Task
 **Button Placement**	Complete Placket	Button Attachment

Table 2.1.3: Sequencing Operations

2.1.6 Workflow Scheduling

Regulating the flow of work depends on:

- **Lead time:** Time between order confirmation and delivery
- **Capacity:** Number of machines and operators available
- **Sequence:** Logical operation flow

Week	Activity	Target Units
Week 1	Cutting and Bundling	5,000
Week 2	Sewing	4,800
Week 3	Finishing and Packing	4,500

Sample Table: Workflow Schedule

2.1.7 Communication of Production Plan

IEs must clearly share timelines, operation specs, and targets with:

- Production Supervisors
- Line Managers
- Quality Controllers

Suggested Tools:

- Gantt Charts

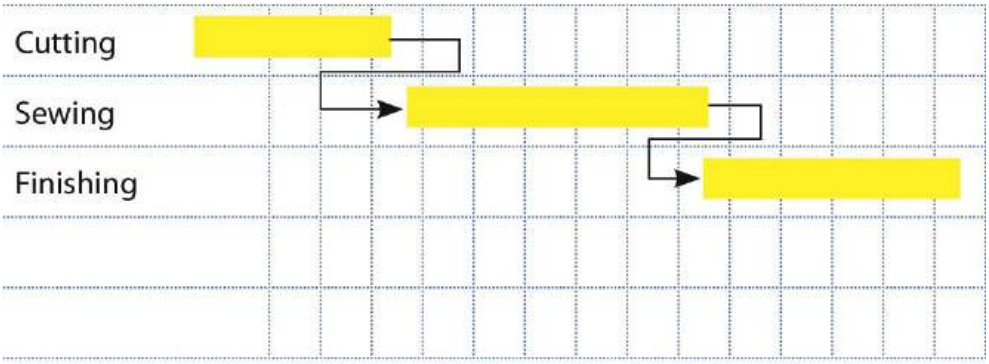


Fig. 2.1.2: Gantt Chart for Monitoring the Status of Fabric

- **Line Layouts**

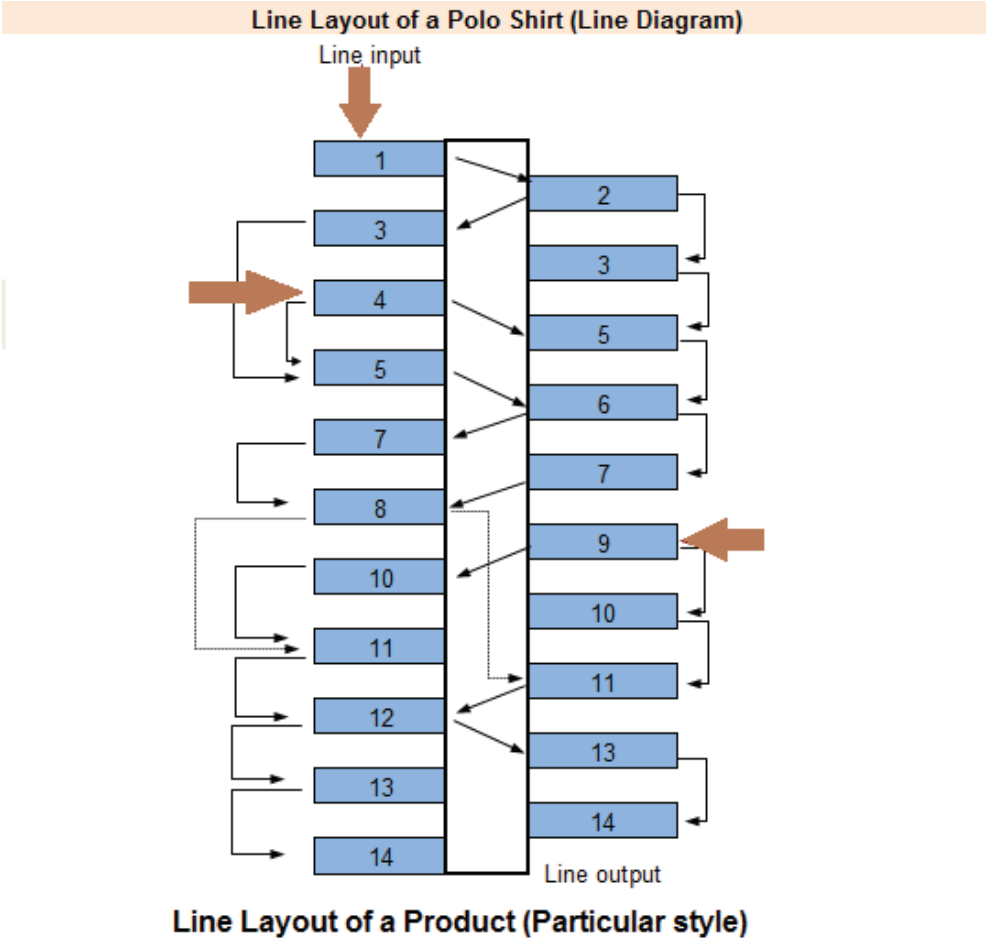


Fig. 2.1.3: Line Layout in a Garment Industry

- **Production Dashboard Displays**

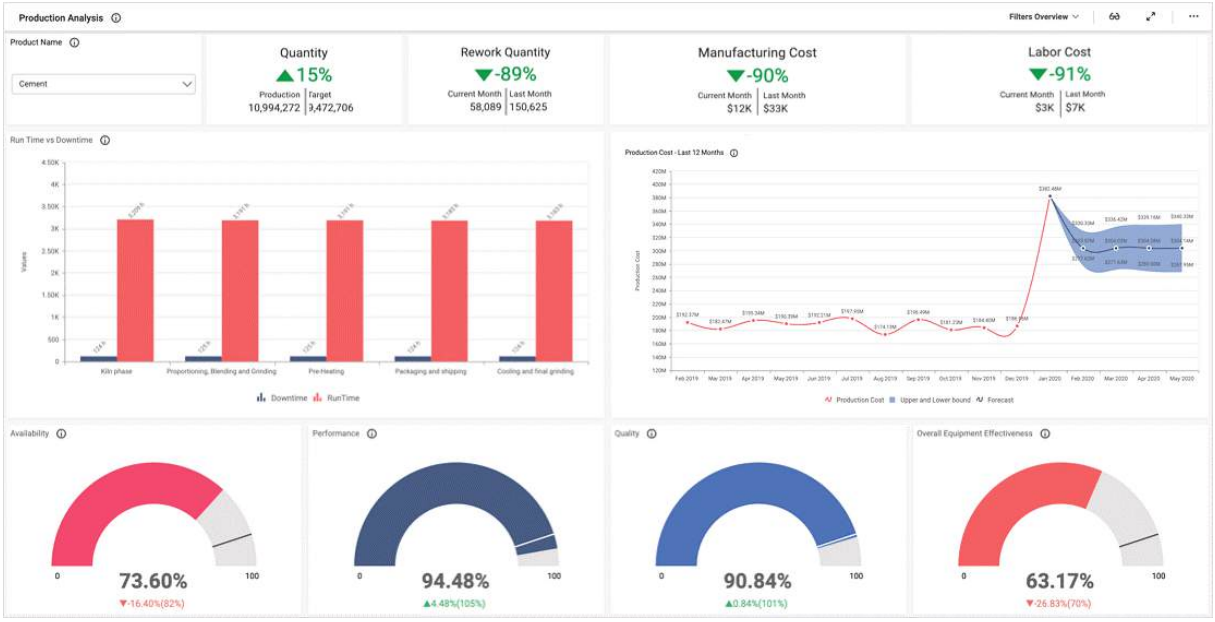


Fig. 2.1.4: Production Dashboard

UNIT 2.2: Design, Tools and Equipment

Unit Objectives

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

1. Analyse detailed instructions, drawings, or specifications to explain fabrication and assembly processes.
2. Classify and differentiate critical and non-critical defects.
3. Identify machine specifications and relevant organisational regulations.
4. Identify product requirements in terms of construction specifications and quality standards.
5. Design layout of equipment, materials, and workspace to optimise efficiency using drafting tools and software.
6. Evaluate the accuracy and precision of production and testing equipment to formulate corrective actions.
7. Identify critical defect zones during inspection processes.

2.2.1 Fabrication and Assembly Interpretation

Industrial Engineers play a crucial role in decoding and interpreting technical documents that translate fashion designs into practical manufacturing steps. This ensures that the assembly line functions smoothly, aligns with product quality standards, and meets production efficiency targets.

Document	Purpose
Garment Specifications	Detailed material, fit, tolerances, and construction requirements
Engineering Drawings	Provide a visual breakdown of garment structure, seams, and component positions
Assembly Line Instructions	Define step-by-step operations for efficient line balancing
Tech Packs	Comprehensive package including all above elements with added details

Table 2.2.1: Key Technical Documents

2.2.2 Defect Classification

Defects are divided into Critical and Non-Critical categories.

Defect Type	Description	Examples
Critical Defects	Defects that make the garment unfit for use	Broken stitch in structural seam, wrong size label
Non-Critical	Minor defects that may affect aesthetics but not function	Uneven thread trimming, minor stains

Table 2.2.2: Categories of Defects

2.2.3 Machine Specifications and Safety Standards

In the Indian apparel industry, machine specifications and safety standards are crucial for ensuring high-quality production, operator safety, and compliance with regulatory requirements. Machine specifications typically include details such as stitch types, speed (measured in stitches per minute), needle size compatibility, thread tension systems, lubrication requirements, and energy efficiency ratings. Modern machines often feature programmable settings, automatic thread cutting, and computerized controls for precision and productivity. Safety standards, guided by the Bureau of Indian Standards (BIS) and international norms like ISO, require protective guards for moving parts, emergency stop buttons, proper earthing, and regular maintenance schedules. Operators must be trained in safe handling, use of personal protective equipment (PPE), and adherence to ergonomic guidelines to prevent strain or injury. Compliance not only reduces accidents and downtime but also enhances efficiency, product quality, and worker well-being in the apparel manufacturing process.

IEs must:

- Identify correct machines for operations (e.g., lockstitch, overlock)
- Understand capacity, RPM, needle type, and feed mechanism
- Follow safety standards: needle guards, emergency stops, ergonomic setups

Machine Type	Operation	Key Specification
 **Single Needle Lockstitch**	Basic seaming	Stitch length, needle type
 **Flatlock Machine**	Hemming & decorative seams	Thread tension, seam width
 **Flatlock Machine**	Edge finishing	Stitch per inch (SPI), knife function

Table 2.2.3: Machine Specifications

2.2.4 Product Requirements and Quality Standards

Product requirements and quality standards focus on meeting customer expectations while complying with national and international benchmarks. Key requirements include accurate sizing, consistent stitching quality, colourfastness, fabric strength, and proper finishing. Quality standards are guided by the Bureau of Indian Standards (BIS) and export regulations like ISO, AQL (Acceptable Quality Level), and buyer-specific guidelines. These ensure durability, comfort, and safety of garments through strict checks on raw materials, workmanship, and final inspection. Maintaining these standards is essential for brand reputation, export competitiveness, and customer satisfaction.

Key Requirements in product and quality standards are as follows:

1. **Accurate Sizing and Fit**
   - Garments must strictly follow the approved size specifications to ensure a consistent fit across all production batches. This includes adherence to measurements in length, width, and overall proportions as per the buyer's tech pack.
   - Size tolerance levels are defined to allow minimal deviation from specifications, ensuring uniformity and customer satisfaction.
2. **Consistent Stitching Quality**
   - Stitching must be uniform, with correct Stitches Per Inch (SPI) and proper seam construction to prevent puckering, skipped stitches, or uneven seams.
   - Correct ply alignment must be maintained during sewing to avoid twisting or mismatched seams in the final garment.
3. **Colourfastness and Shade Consistency**
   - Fabrics must undergo testing to ensure colourfastness to washing, rubbing, perspiration, and light exposure.
   - Garments from the same lot must have uniform shades to avoid noticeable differences when displayed or worn together.
4. **Fabric Strength and Durability**
   - Fabrics are tested for tensile strength, tear resistance, and seam slippage to ensure long-lasting wear.
   - The garment must withstand normal wear and washing cycles without losing shape, tearing, or showing premature wear.
5. **Proper Finishing and Presentation**
   - All threads must be trimmed neatly, labels and tags attached securely, and ironing/pressing done to remove wrinkles before packing.
   - Trims and accessories such as zippers, buttons, and snaps must be attached securely and function smoothly.

Quality Standards and Compliance

- **Bureau of Indian Standards (BIS):** Governs domestic production quality, covering textile fibre quality, dye safety, and performance standards.

Fig. 2.2.1: Bureau of Indian Standards (BIS)

- **ISO Standards:** Ensure international compliance in quality management, process control, and product consistency.

Fig. 2.2.2: ISO Standards Logo

- **AQL (Acceptable Quality Level):** Used to determine the allowable number of defects in a batch, helping maintain uniformity in bulk production.
- **Buyer-Specific Standards:** Many brands issue their own guidelines detailing fabric specifications, testing protocols, acceptable defect levels, and finishing requirements.

2.2.5 Layout Planning for Efficiency

In the apparel manufacturing industry, layout planning is a critical function carried out by Industrial Engineers (IEs) to optimize workflow, reduce waste, and enhance overall productivity. The arrangement of machines, workstations, storage areas, and movement paths directly influences operator performance, production speed, and product quality. Effective layout planning considers not only the physical arrangement of the shop floor but also the smooth coordination between different production processes.

IEs use drafting tools or CAD (Computer-Aided Design) software to create precise and detailed layouts that ensure:

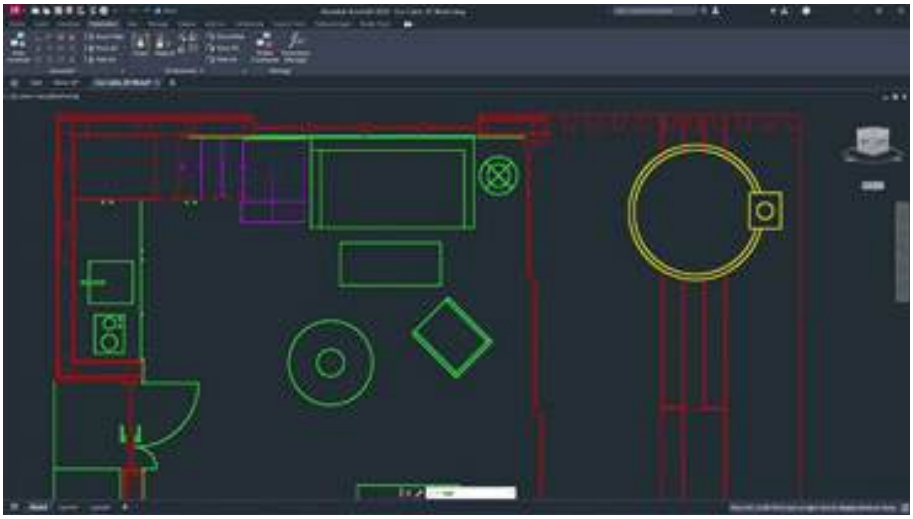


Fig. 2.2.3: CAD (Computer-Aided Design) Software

1. **Minimising Material Handling**
   - Strategic placement of machines, cutting tables, storage racks, and assembly lines to reduce unnecessary movement of raw materials, work-in-progress, and finished goods.
   - Clear pathways and proximity between dependent processes (e.g., cutting, sewing, finishing) to avoid backtracking and overlapping movements.
   - Use of conveyors, trolleys, or material bins to speed up transportation between stations.
   - **Benefits:** Reduces production time, lowers handling costs, and minimizes the risk of fabric damage or contamination.
2. **Reducing Operator Fatigue**
   - Designing workstations to be ergonomically friendly, ensuring operators have easy access to tools, materials, and machines without overreaching or bending excessively.
   - Appropriate seating and table heights to reduce strain on the neck, shoulders, and lower back.
   - Logical sequence of operations so that operators perform tasks in a comfortable, repetitive flow without unnecessary interruptions.
   - **Benefits:** Enhances operator comfort, reduces workplace injuries, and maintains steady productivity throughout shifts.
3. **Improving Throughput**
   - Arranging machines and processes in a progressive order that follows the garment manufacturing sequence—from cutting and sewing to finishing and packing—without delays or bottlenecks.
   - Allocating sufficient space for each operation to ensure smooth handling of garments between stages.
   - Designing layouts that allow quick response to changes in production volumes or style variations by enabling flexible line configurations.
   - **Benefits:** Speeds up the production cycle, ensures timely order completion, and increases daily output without compromising quality.

Tools and Methods Used in Layout Planning

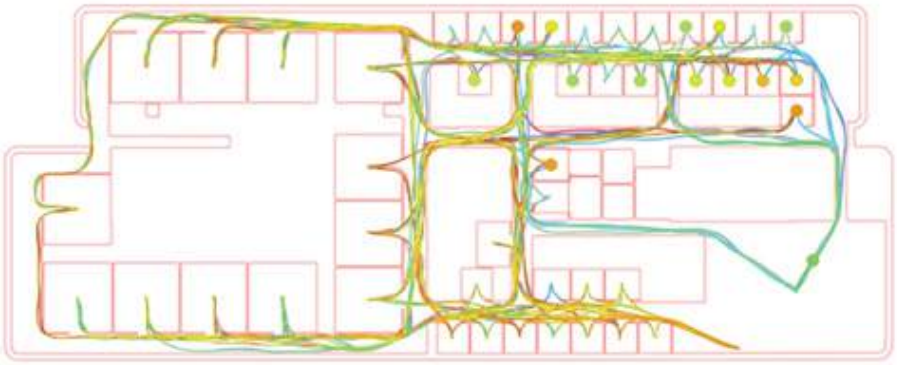
- **Drafting Tools:** Used for creating manual floor plans during initial planning or for small-scale production units.

Fig. 2.2.4: Drafting Tools

- **CAD Software:** Allows digital simulation of layout arrangements, making it easier to visualize movement flows, calculate space utilization, and test different configurations before implementation.

Fig. 2.2.5: 2D CAD Software

- **Time and Motion Studies:** Helps identify workflow inefficiencies and guides machine positioning for maximum productivity.



- **Spaghetti Diagrams:** Visual tools that track actual movement of materials and workers to eliminate unnecessary travel distances.

Importance of Efficient Layout Planning

- Minimizes waste of time, energy, and resources.
- Improves worker morale and safety by reducing physical strain and workplace congestion.
- Enhances the ability to meet strict delivery deadlines.
- Provides flexibility for future scaling or changes in product mix.

IEs use drafting tools or CAD software to design workspace layouts to:

- Minimise material handling
- Reduce operator fatigue
- Improve throughput

Layout Element	Optimisation Goal
Equipment Spacing	Ensure smooth operator movement
Material Flow	Reduce backtracking
Visibility	Supervision and quality control

2.2.6 Equipment Accuracy and Calibration

Regular testing ensures machine output accuracy:

- Use gauges to check stitch width and length
- Maintain needle calibration
- Document any variances and take corrective actions

Tool/ Instrument	Purpose	Action Required
 **Stitch Gauge**	Check SPI	Adjust feed rate
 **Needle Alignment Jig**	Check needle positioning	Realign or replace the needle
 **Thread Tension Meter**	Check uniformity	Adjust tension knobs

2.2.7 Defect Zones in Inspection

In the apparel industry, defect zones are critical areas of a garment where faults are most likely to occur during production, such as the collar, cuffs, placket, seams, hemline, pockets, and neckline. These zones are inspected carefully since defects like open seams, skipped stitches, uneven hems, fabric defects, or misaligned patterns are commonly found in them and can significantly impact garment quality and customer satisfaction.

An Industrial Engineer (IE) plays a vital role in identifying and inspecting these defect zones by developing systematic inspection checkpoints, using quality control tools like defect maps, and training operators to recognize potential issues early. The IE also analyses defect data to trace root causes, whether they arise from machinery, methods, or operator practices, and implements corrective actions to reduce rework and rejection. By standardizing inspection processes and integrating defect zone analysis into production planning, the IE ensures that garments meet quality standards while minimizing waste and improving overall efficiency.

IEs identify defect-prone zones:

- **Collars and cuffs (alignment issues):** In garment manufacturing, Industrial Engineers (IEs) pay special attention to defect-prone zones since these areas have a higher probability of quality issues if not monitored carefully. For example, collars and cuffs are highly visible parts of a garment where alignment issues, twisting, or improper stitching can easily occur, making them critical zones for inspection.
- **Side seams (puckering):** Side seams are key area where defects such as seam puckering, uneven seam allowances, or mismatched patterns can negatively affect both the appearance and comfort of the garment.
- **Armholes (fit issues):** Armholes often face problems related to poor shaping, incorrect seam balance, or misalignment, which directly lead to fit issues and wearer discomfort.

IEs use defect data, inspection guidelines, and root cause analysis to closely monitor these zones, helping to ensure that the garments not only meet aesthetic requirements but also maintain durability and functionality. By focusing on these sensitive zones, IEs contribute significantly to reducing rejections, rework, and customer complaints.

Zone	Typical Defect	Preventive Measure
Collar Area	Misalignment, puckering	Use collar shapers, proper SPI
Side Seam	Seam slippage	Reinforce with stay tape
Hemline	Twisting	Accurate folding and pressing

Table 2.2.4: Defect Zones

UNIT 2.3: Procedures, Reporting and Regulations

Unit Objectives

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

1. Identify authorised personnel to report issues beyond job responsibilities.
2. Identify inter-departmental material movement procedures.
3. Explain the concept of logistics and supply chains within a manufacturing context.
4. Identify compliance guidelines to be followed by vendors.
5. Identify organisational reporting procedures, formats, and their periodicity.
6. Identify the escalation matrix as follows within the organisation.
7. Interpret tools, templates, and processes used for recording and monitoring deviations.

2.3.1 Reporting Structure and Escalation Matrix

Role	Responsibility	Escalation Level
Machine Operator	Reports of equipment malfunction	Level 1
Line Supervisor	Reports deviation from standard operating procedure	Level 2
Quality Controller	Reports quality deviations in products	Level 2
Production Manager	Escalates significant production delays	Level 3
IE or Compliance Officer	Escalates major non-compliance issues	Level 4

2.3.2 Material Movement Procedure

The Material Movement Procedure in the apparel industry ensures the smooth and accountable transfer of raw materials, work-in-progress, and finished goods across different production stages. Each transition is documented through gate pass slips, barcode scanning (in automated setups), or material transfer notes to maintain accuracy and traceability. This procedure helps prevent material loss, ensures timely availability at the next process, supports inventory control, and enables industrial engineers to monitor workflow efficiency while minimizing delays and errors in production.

Proper inter-departmental flow ensures production continuity.

Flow Diagram:

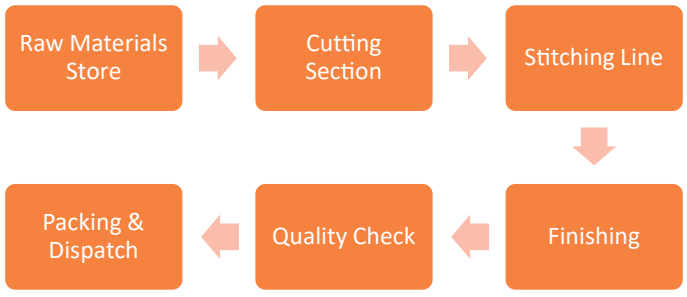


Fig. 2.3.1: Inter-departmental flow of fabric

In the apparel industry, transition points—the stages where materials or semi-finished goods move from one process to another—must be properly documented to maintain accountability, traceability, and quality control. Each transition point must be documented using:

- **Gate pass slips:** These are physical documents issued when materials move from one department to another, such as from cutting to sewing or sewing to finishing. They serve as a formal record of movement, ensuring that materials are accounted for at each stage and preventing loss, mix-ups, or unauthorized transfers.
- **Barcode scanning (if automated):** In factories with automation, barcode scanning systems are used to digitally record the movement of fabric rolls, bundles, or finished garments. Each item or bundle is tagged with a unique barcode, which, when scanned, updates the production tracking system in real time. This not only improves accuracy and reduces manual errors but also helps IEs monitor work-in-progress and identify bottlenecks quickly.
- **Material transfer note:** This is an internal document used to authorize and confirm the transfer of goods between sections or departments. It usually contains details such as item description, quantity, date, source, and destination. By maintaining these notes, factories ensure smooth workflow, proper inventory management, and accountability for all materials transferred during the production process.

2.3.3 Logistics and Supply Chain

In garment manufacturing, inbound logistics refers to the efficient management of all materials and resources that enter the factory, such as fabrics, trims, threads, buttons, zippers, and packaging materials. This involves supplier coordination, timely transportation, customs clearance (for imports), proper storage, and quality checks to ensure that the right materials are available in the right quantity and condition before production begins.

On the other hand, outbound logistics deals with the movement of finished garments from the factory to buyers, distribution centres, or retail outlets. It includes final inspections, packaging, labelling, documentation, warehousing, and transportation management to meet customer delivery schedules. Both inbound and outbound logistics are critical for maintaining smooth operations, reducing lead times, controlling costs, and ensuring that the final product reaches the customer on time and in the required quality standards.

Inbound and outbound logistics within garment manufacturing:

Logistics Type	Description	Key Functions
Inbound	Raw material procurement and inventory	Vendor coordination, storage
Outbound	Finished goods dispatch	Packaging, loading, and delivery logistics
Internal	Material movement within the plant	Kanban system, inventory control

Table. 2.3.1: Types of Logistics

2.3.4 Vendor Compliance Guidelines

Vendor Compliance Guidelines in the Indian Apparel Industry are a set of standards and practices that suppliers must adhere to in order to do business with apparel manufacturers and global buyers. These guidelines cover multiple dimensions to ensure ethical, sustainable, and quality-driven operations. At the core are social compliance requirements, which include adherence to labour laws, fair wages, no

child or forced labour, safe working conditions, and proper working hours as per the Factories Act, 1948 and international conventions like ILO standards.

Environmental compliance is equally critical, requiring vendors to follow norms related to waste disposal, water treatment, restricted chemical usage (as per REACH or ZDHC guidelines), and adoption of eco-friendly practices in line with global sustainability goals. On the quality compliance front, vendors must meet buyer-defined standards for fabric quality, stitching, colourfastness, labelling, and packaging to ensure consistency across orders. Additionally, security compliance such as adherence to C-TPAT (Customs-Trade Partnership Against Terrorism) or equivalent norms is required for exports. Regular audits—social, technical, and environmental—are conducted by buyers or third-party agencies to ensure vendors maintain these standards. For Indian apparel manufacturers, strict adherence to these compliance guidelines not only builds trust with international buyers but also enhances competitiveness in global markets.

Vendors must comply with:

- **Labour laws:** Vendors must follow regulations related to fair wages, working hours, health and safety, and prohibition of child or forced labour. Compliance ensures ethical treatment of workers and adherence to Indian laws like the Factories Act, 1948, as well as international labour standards.
- **Environmental and sustainability policies (e.g. ZDHC):** Vendors are required to adopt eco-friendly practices, such as proper wastewater treatment, safe chemical management, and reduced emissions, in line with initiatives like Zero Discharge of Hazardous Chemicals (ZDHC). This ensures environmentally responsible manufacturing and global sustainability compliance.
- **Standard testing protocols (e.g. AATCC, ISO):** Vendors must ensure garment and fabric quality through internationally recognized testing methods, such as AATCC for colourfastness and shrinkage, and ISO standards for strength, durability, and safety. These protocols guarantee consistency, reliability, and buyer confidence in the final product.

Compliance Area	Requirement
Labour	No child labour, fair wages
Environmental	Effluent treatment, sustainable dyes
Documentation	Purchase orders, invoices, and test reports

Table 2.3.2: Compliance Criteria

2.3.5 Reporting Procedures and Formats

Report Type	Format	Frequency
Production Progress	Excel/ ERP input	Daily
Quality Inspection	Checklist format	Per batch
Delay Reports	Incident form	As occurred

Table 2.3.3: Reporting Procedures and Formats

Tools: Google Forms, ERP systems (e.g., SAP, Zedonk), MIS dashboards

2.3.6 Deviation Monitoring Tools

Root Cause Analysis (RCA) templates: These are structured documents used to investigate and determine the underlying cause of a problem or deviation in production processes. Instead of addressing surface-level symptoms, RCA templates help identify the actual source of an issue to prevent its recurrence. These templates typically include sections such as the problem statement, data gathered, suspected causes, analysis methods, and proposed corrective actions. In a garment manufacturing context, for instance, if a batch of garments fails quality checks due to uneven stitching, an RCA can help trace the issue back to a misalignment in machine calibration or a lack of operator training, allowing the organisation to implement lasting corrective measures.

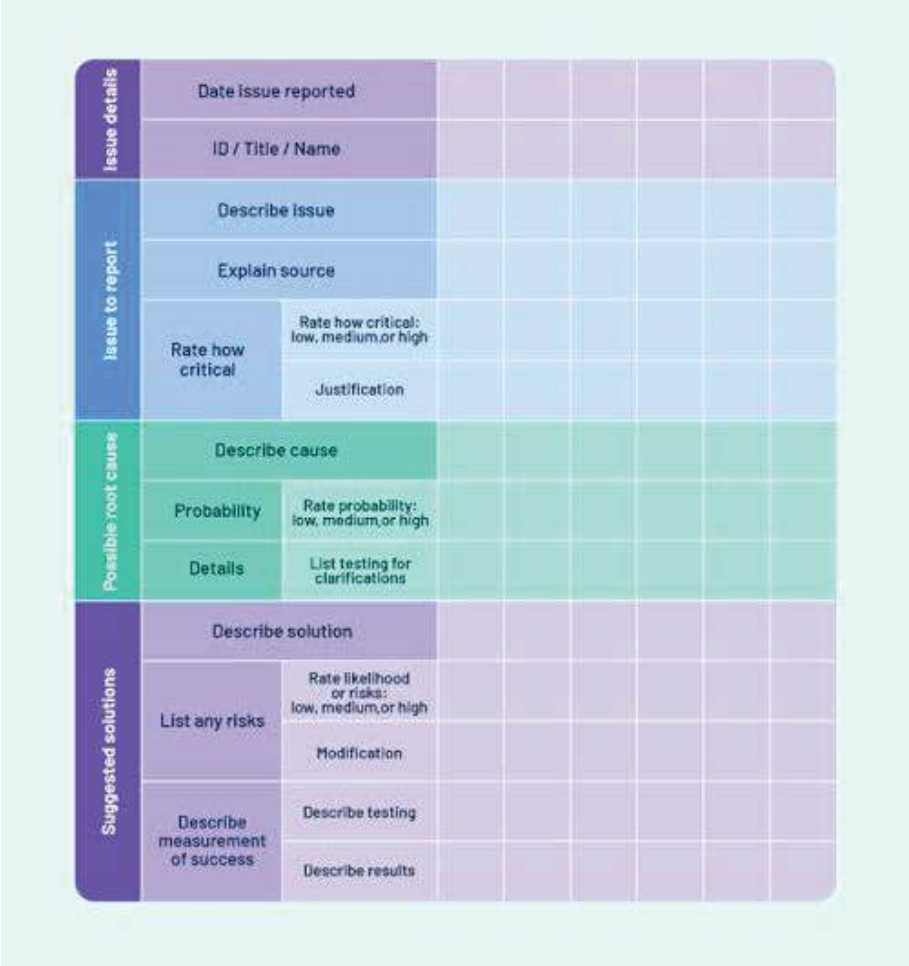


Fig. 2.3.2: Root Cause Analysis Template

Fishbone (Ishikawa) diagrams: The Fishbone Diagram, also known as the Ishikawa Diagram, is a visual tool that aids in categorising potential causes of a problem into major groups such as Man, Machine, Method, Material, Measurement, and Environment. This diagram resembles the skeleton of a fish, with each "bone" representing a category of possible contributing factors. It is particularly useful during team brainstorming sessions, allowing participants to explore a wide range of reasons behind a deviation. For example, if there is an increase in garment defects, the fishbone diagram helps identify whether the issue lies in the quality of materials used, the sewing techniques, or external environmental factors like humidity affecting the fabric.

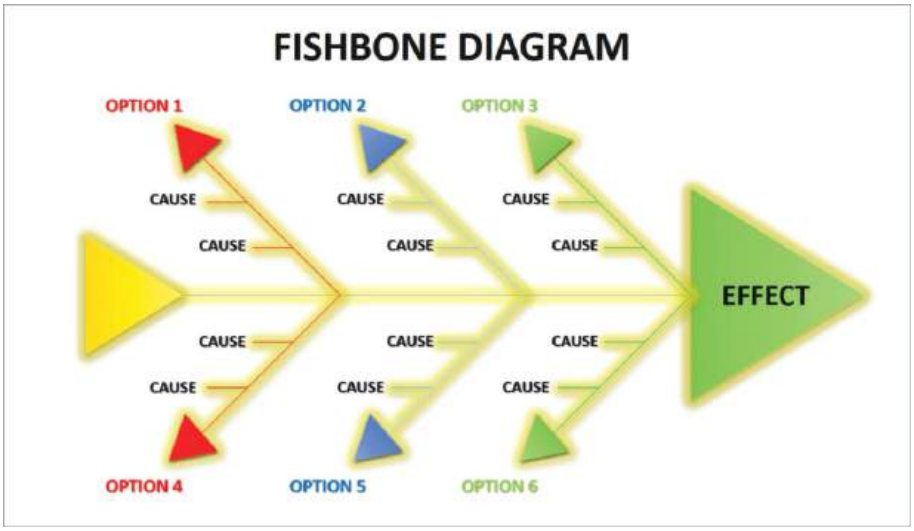


Fig. 2.3.3: Fishbone Diagram

5 Whys Tool: The 5 Whys Tool is a simple yet effective method for discovering the root cause of a problem by repeatedly asking the question "Why?"- typically five times. This technique helps drill down through layers of symptoms until the actual root cause is uncovered. For instance, if there is a delay in order delivery, the first "Why" may reveal that the product was not ready. The second "Why" might show a delay in stitching, followed by reasons such as machine breakdown, missed maintenance schedules, and eventually pointing to the lack of a proper maintenance system. This method encourages deep thinking and reveals issues that might not be immediately obvious.

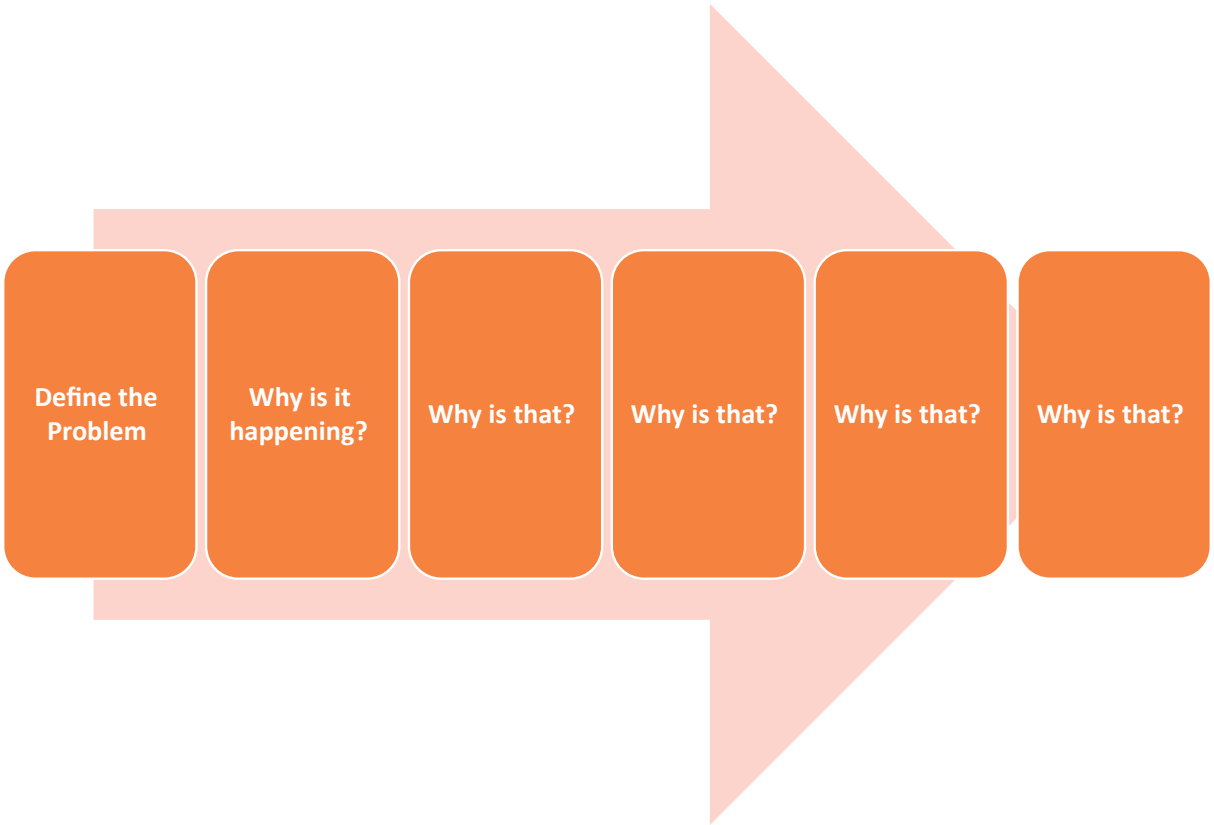


Fig. 2.3.4: The 5 Whys Root Cause Analysis

Non-conformance logbooks: These are formal records used to document any deviations from standard procedures or specifications within the manufacturing process. These logs usually contain details such as the nature of the deviation, the date and time it occurred, the department responsible, corrective actions taken, and verification or approval by a supervisor or quality control officer. By maintaining these records, organisations can track recurring problems, ensure accountability, and prepare data for audits and reviews. For example, if a pattern of needle breakage is observed during embroidery, a non-conformance logbook entry helps monitor the frequency and determine whether the issue is due to poor-quality materials or equipment wear.

ANNEXURE-I

NON-CONFORMANCE REPORT

Non-Conformance Report Number :	
Initiation Department :	**Against :**
Detail of Non-Conformance: **Initiated By** **(Sign. / Date)**	
Root Cause for NCR **Concerned dept.** **(Sign. / Date)**	
Corrective Actions : **Concerned Department Head/Designee** **(Sign/ Date)**	

Fig. 2.3.5: Non-Conformance Report

UNIT 2.4: Analysis, Estimation and Decision-Making

Unit Objectives

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

1. Estimate sizes, distances, and quantities to determine time, cost, resources, or materials for tasks.
2. Analyse variables involved in mathematical calculations and decision-making processes.
3. Examine organisational charts, statements, and project-related information.
4. Plan delivery schedules based on production forecasts, substitutions, storage capacity, and maintenance needs.

2.4.1 Estimation of Sizes, Distances, and Quantities in Production Planning

Estimation is a key competency in production planning. Estimating sizes, distances, and quantities enables the team to determine time, cost, and resources for garment manufacturing tasks.

Example of Estimation Tasks in a Garment Unit

Task	Estimation Required	Impact
Cutting fabric for 500 shirts	Fabric meterage, shrinkage allowance	Prevents fabric shortage or excess
Stitching duration for a batch	Average time per garment x number of units	Sets realistic shift and delivery targets
Thread requirement estimation	Stitch length, seam type, fabric thickness	Ensures sufficient raw materials

2.4.2 Mathematical Variables for Decision-Making

Analysing variables is essential to forecast production outcomes and make efficient decisions. This includes evaluating performance indicators, calculating costs, and optimising time usage.

Common Mathematical Variables in Garment Manufacturing

Variable	Purpose
Machine efficiency (%)	Determines production capacity
SAM (Standard Allowed Minutes)	Measures the time required to complete a task
Rejection rate (%)	Quality control analysis
Operator productivity	Helps in incentive planning and shift management

Example: Operator Efficiency Calculation

Formula:

- Efficiency (%) = (SAM x Output x 100) / (Working minutes x Number of Operators)
- This calculation helps identify training needs, reward high performers, and plan resources more effectively.

2.4.3 Organisational Charts and Project Information

Organisational charts and reports provide clarity on workflow, accountability, and departmental coordination. Understanding this information is critical for planning and aligning team efforts with overall project timelines.

Sample Organisational Chart (Garment Manufacturing Unit)

This chart helps identify the correct authority for approvals, issue reporting, and decision-making.

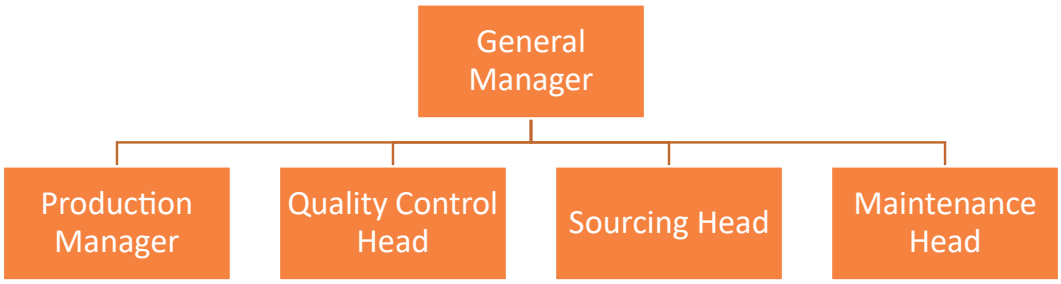


Fig. 2.4.1: Organisational Chart

Reading Project Reports

Project documents include production schedules, inventory levels, and cost breakdowns. By reviewing these, IE professionals can detect:

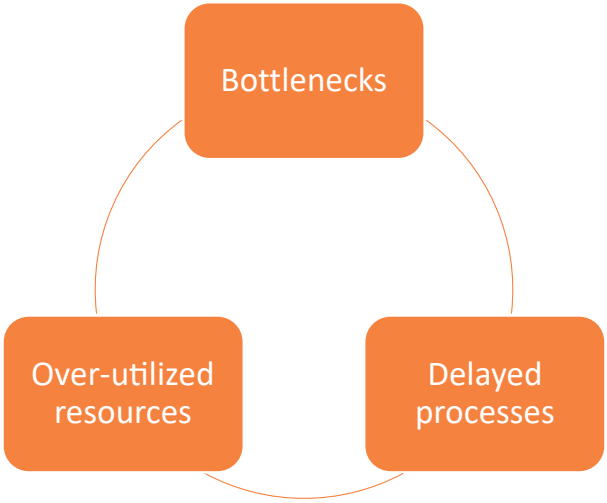


Fig. 2.4.2: Aspects that can be avoided through the review of project reports

Case Example: A weekly project tracker might show that finishing is lagging, requiring shift adjustments or support from another team.

2.4.4 Delivery Schedules Using Forecasts and Constraints

Effective delivery planning depends on interpreting production forecasts, handling raw material substitutions, understanding storage constraints, and planning for maintenance.

Factors Impacting Delivery Planning

Factor	Implication on Delivery
Production forecast	Determines order allocation and labour planning
Substitute materials	Helps continue production when original input is delayed
Storage space	Influences raw material and finished goods inventory
Machine maintenance	Requires downtime planning to avoid workflow disruption

Example: Delivery Planning Table

Order ID	Forecast Qty	Available Raw Material	Maintenance Window	Delivery Date
1245	2000 units	85%	2 days (finishing line)	18 Aug 2025

In such cases, planners may:

- Advance stitching to create buffer
- Use alternate fabric/trim (with buyer approval)
- Adjust logistics timelines

Summary

- Business plans are critically analysed to align operational procedures with success factors and productivity goals.
- Standard Allowed Minute (SAM) estimations and cost analyses are used to evaluate efficiency and support accurate pricing.
- Fabrication and assembly processes are interpreted from detailed drawings, operation bulletins, and specifications.
- Equipment layout and workspace design are optimised using drafting tools and software to enhance production flow.
- Material movement procedures, compliance guidelines, and supply chain concepts are understood within manufacturing contexts.
- Organisational reporting protocols, escalation matrices, and deviation monitoring tools are implemented for regulatory adherence.
- Sizes, distances, and material quantities are estimated to determine timelines, cost requirements, and resource needs.
- Delivery schedules are strategically planned based on production forecasts, substitutions, storage capacity, and maintenance cycles.

Exercise

Multiple-choice Question:

1. Which of the following is used to evaluate productivity during the costing process in apparel manufacturing?
   a. KPI
   b. SAM (Standard Allowed Minute)
   c. Fishbone Diagram
   d. Gantt Chart

2. What is the primary purpose of designing the layout of equipment and workspace using drafting tools?
   a. To create aesthetic designs
   b. To reduce noise levels
   c. To optimise efficiency and production flow
   d. To recruit new workers

3. What type of defect needs immediate corrective action due to its impact on product usability or safety?
   a. Minor defect
   b. Aesthetic defect
   c. Non-critical defect
   d. Critical defect

4. Which of the following tools is most appropriate for identifying root causes of a production deviation?
   a. Gantt Chart
   b. Fishbone Diagram
   c. Pareto Chart
   d. Control Chart

5. What is the key focus when designing the layout of equipment and workspace in a production facility?
   a. Decoration
   b. Storage space
   c. Optimising efficiency
   d. Increasing workforce

Descriptive Questions:

1. Explain the process of preparing and analysing a business plan in the context of apparel manufacturing.
2. Describe how layout planning using tools or software can optimise equipment, materials, and workspace arrangements in a garment production unit.
3. Discuss the role of operation bulletins in determining Standard Allowed Minute (SAM) and how these impacts costing and productivity.
4. What are the key procedures involved in inter-departmental material movement?
5. Analyse how accurate estimation and decision-making influence delivery schedules, resource allocation, and overall production planning.

Notes

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

https://youtu.be/OXQm-da6W9Y?si=64gT8KA9KIfZ5zjo

SAM Calculation for Young Engineers in Garment Industry

https://youtu.be/NZDa8qpAlUc?si=J99PNJHMsLmJYmbq

Types of sewing machines used in apparel industry

https://youtu.be/TEZ6FPKbtKg?si=JapNCVUktOjfaJMw

The Apparel Logistics Group - Apparel Third Party Logistics Services

Skill India
कौशल भारत-कुशल भारत

सत्यमेव जयते
GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT
& ENTREPRENEURSHIP

N·S·D·C
RE>IMAGINE FUTURE

3. Supervise, Analyse and Evaluate Performance on Sewing Floor

APPAREL MADE-UPS HOME FURNISHING
SECTOR SKILL COUNCIL

Unit 3.1 - Production Planning and Flow

Unit 3.2 - Quality, Performance, and Evaluation

Unit 3.3 - Organisational Ethics and Documentation

Unit 3.4 - Communication and Software Tools

AMH/N2002

Key Learning Outcomes

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

1. Explain the operations sequence, material flow, functional statements to evaluate the production flow process.
2. Set goals and targets as per production directives for all operators in a production line.
3. Explain the elements of a professional code of ethics and standards of practice.
4. Interpret framework and guidelines prescribed by the organization for redressal of queries and problems.
5. Interpret documentation requirements for performance evaluation of operations and operators.

UNIT 3.1: Production Planning and Flow

Unit Objectives

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

1. Describe the operations sequence, material flow, and functional statements to assess the production flow process.
2. Set goals and targets for all operators based on production directives.
3. Review production schedules, engineering specifications, and orders to examine manufacturing methods and activities.
4. Evaluate the precision and accuracy of production and testing equipment and layout to formulate corrective actions.
5. Monitor all operator activities to ensure optimisation and goal achievement.
6. Select a suitable measuring system for operators based on assigned goals and targets.
7. Ensure strict adherence of operator activities to production guidelines.

3.1.1 Operation Sequence and Material Flow

Operation Sequence refers to the chronological order in which different operations are carried out on the shop floor. It typically includes stages like fabric spreading, cutting, sewing, assembling, fin-ishing, and packing. Each operation is planned step by step to ensure smooth workflow and mini-mum delays. Key Importance of operational sequence in the apparel industry includes the following:

- Ensures smooth workflow and systematic production
- Reduces bottlenecks and idle time on the production floor
- Helps in accurate line balancing and operator allocation
- Improves productivity and efficiency of garment assembly
- Facilitates time study and cost estimation
- Aids in identifying defect-prone operations for quality control

Material Flow involves the physical movement of raw materials and semi-finished goods through the various stages of production. A well-organized material flow ensures that resources move smoothly without unnecessary delays, backtracking, or congestion, thereby reducing production time and costs. Effective material flow planning helps maintain continuity, supports line balancing, minimizes handling, and ensures timely delivery of garments to the next stage in the process. Key Importance of the Material flow are as follows:

- Ensures timely availability of materials at each production stage
- Reduces handling time and unnecessary movement
- Prevents material shortages, delays, and production stoppages
- Supports better inventory management and tracking
- Improves overall efficiency and reduces operational costs
- Enhances coordination between departments for smooth workflow

Key Components of Operation Se-quence	Description
Input Point	Where raw material enters the production line
Workstations	Each stage of operation (e.g., stitching, finishing)
Output Point	Final product completion point

Example: For a shirt - Operation sequence may involve:

Fig. 3.1.1: Operation sequence for a shirt

In the case of a shirt, the operation sequence defines the logical order of assembly to maintain efficiency and quality. It begins with stitching the collar, as collars are intricate parts that need precision before attachment. Next, sleeves are attached to ensure proper alignment with the armholes. Once these are in place, side seams are stitched to join the front and back panels together, followed by hemming to secure raw edges and give the shirt a neat finish. Finally, finishing operations such as thread trimming, pressing, and final inspection are carried out to ensure the garment meets quality standards before packing. This sequence highlights the importance of following a structured workflow to reduce rework and maintain consistency.

3.1.2 Goals and Targets for Operators

Setting clear goals ensures production aligns with timelines, quality, and output expectations. Operators in the apparel industry are given clear goals and targets to ensure smooth production, main-tain quality, and meet delivery deadlines. These typically include:

- **Daily Production Targets:** Completing a set number of pieces per shift based on Standard Minute Value (SMV) and line efficiency.
- **Quality Goals:** Achieving zero-defect output or maintaining defect levels within acceptable limits to reduce rework and rejection.
- **Efficiency Targets:** Working at an optimal speed while minimizing idle time, material wastage, and unnecessary handling.
- **Skill Development Goals:** Continuously improving sewing speed, accuracy, and the ability to handle multiple operations or machines.
- **Team Contribution Targets:** Supporting line balancing, coordinating with helpers and checkers, and contributing to overall line efficiency.
- **Safety and Compliance Goals:** Following safety guidelines, maintaining machine discipline, and en-suring compliance with organizational standards.

Goal Type	Description
S-Specific	Targeted tasks (e.g., 40 collars/day)
M-Measurable	Quantifiable outputs (e.g., 10 shirts/hour)
A-Achievable	Based on operator's skill & equipment
R-Relevant	Matches production directives
T-Time-bound	Deadlines or shift-based targets

Table 3.1.1: SMART Goal Framework for Operator Targets

The apparel industry's operators are given clear goals and targets to ensure smooth production, maintain quality, and meet delivery deadlines. These goals include daily production targets, quality goals, efficiency targets, skill development goals, team contribution targets, and safety and compliance goals. The SMART Goal Framework for Operator Targets helps operators set specific, measurable, achievable, relevant, and time-bound goals, ensuring smooth operations and compliance with organizational standards.

3.1.3 Schedules and Specifications

Schedules refer to the planned timelines and allocation of activities across different stages of apparel production. For supervisors and IEs, scheduling is essential to ensure smooth workflow, timely order completion, and maximum utilization of resources. It involves planning daily, weekly, and monthly production activities, assigning tasks to operators, and coordinating with departments like cutting, sewing, finishing, and packing. Proper scheduling minimizes delays, avoids bottlenecks, and keeps production aligned with buyer deadlines.

Industrial Engineers follow structured schedules to ensure smooth production flow and target achievement:

- **Daily Planning:** Prepare operation bulletins, line layouts, and style-wise production targets before the shift begins. This ensures operators know their assigned tasks and required output.
- **Shift Monitoring:** Continuously observe production lines, check operator performance, and address bottlenecks immediately to avoid delays.
- **Routine Checks:** Conduct time studies, motion analysis, and quality inspections at different stages to maintain efficiency and consistency.
- **Progress Tracking:** Review hourly or bi-hourly production reports against set targets and reallocate resources when needed to maintain balance.
- **End-of-Day Review:** Summarize overall production performance, document efficiency percentages, note rework/rejections, and identify causes of downtime for future improvements.

Specifications outline the technical and quality requirements that garments must meet as per buyer and industry standards. For supervisors and IEs, specifications include details like stitching stand-ards, seam types, tolerances, fabric quality, finishing requirements, and packaging instructions. Specifications act as a reference point for quality inspections, operator training, and process control. Adhering to these ensures that garments are consistent, defect-free, and compliant with buyer ex-pectations.

IEs must possess specific skills, responsibilities, and knowledge to achieve production excellence:

- **Technical Expertise:** Strong understanding of garment construction techniques, SMV (Standard Minute Value) calculations, and machine capabilities to set realistic targets.
- **Quality Standards:** Ensure production follows buyer specifications, apply quality checkpoints, and use defect mapping techniques to reduce rework and rejections.
- **Process Optimization:** Plan efficient material flow, minimize unnecessary handling, and design meth-ods to enhance line productivity.
- **People Management:** Allocate operators based on skill, provide on-the-job training, motivate workers, and resolve team-level issues.
- **Data-Driven Decisions:** Analyse production data, efficiency charts, and defect trends to implement corrective actions and drive continuous improvement.

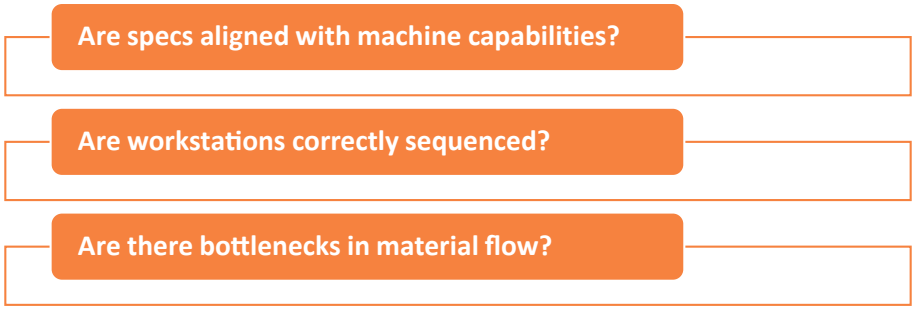


Fig. 3.1.2: Checklist for Review

3.1.4 Equipment Accuracy and Layout

In apparel production, the accuracy of equipment directly affects the quality, consistency, and efficiency of garment manufacturing. Machines such as sewing machines, cutting machines, pressing units, and automated systems must function with precision to ensure correct stitching, seam placement, and fabric cutting. Even minor inaccuracies can lead to defects, rework, and production delays, making regular calibration, maintenance, and monitoring of equipment essential.

Accurate equipment is critical for maintaining product quality and consistency in apparel production.

- **Calibration and Maintenance:** Sewing machines, cutting machines, pressing equipment, and measuring tools must be calibrated regularly to avoid defects caused by misalignment, incorrect tension, or worn-out parts.
- **Quality Assurance:** Precision in equipment ensures uniform stitch density, accurate seam allowances, and proper finishing, directly affecting garment fit and durability.
- **Productivity Impact:** Well-maintained and accurate equipment reduces downtime, minimizes rework, and increases operator confidence in achieving set production targets.
- **Safety Compliance:** Regular accuracy checks prevent machine malfunctions that may lead to operator injuries or workplace hazards.

The layout of a production floor determines how smoothly materials, operators, and processes flow within the factory. A well-planned layout minimizes unnecessary material handling, reduces opera-tor fatigue, prevents congestion, and enhances overall productivity. Industrial Engineers design lay-outs based on product type, workflow requirements, and available space to achieve maximum effi-ciency while ensuring safety and compliance.

The layout of machines, materials, and workstations defines how smoothly production flows on the factory floor.

- **Workflow Efficiency:** A properly designed layout ensures minimum backtracking, reduced material handling, and smooth movement of work-in-progress garments from one operation to the next.
- **Line Balancing:** Arranging equipment in sequence according to the operation flow helps supervisors and IEs balance operator workloads and maintain consistent output.
- **Space Utilization:** Optimal use of floor space improves accessibility, reduces congestion, and pro-vides a safer working environment.
- **Flexibility:** Layouts should allow easy adjustments when switching between styles, handling rush or-ders, or scaling production volumes.
- **Integration with Technology:** In modern factories, layouts often include automation systems (like conveyor belts or overhead transporters) that further streamline the production process.

Corrective Actions may include:

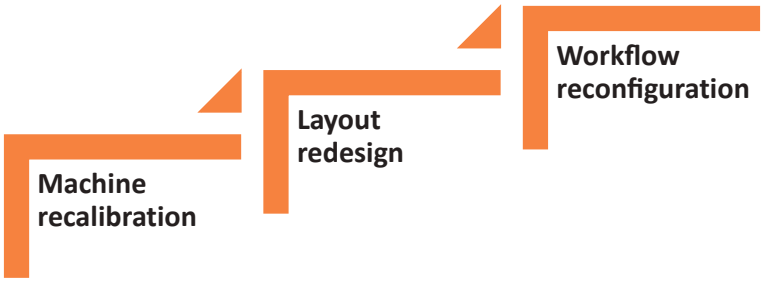


Fig. 3.1.3: Corrective Actions for Equipment Accuracy

3.1.5 Operator Activities

Operators are the backbone of garment manufacturing, directly responsible for executing produc-tion tasks. Their activities cover a wide range of responsibilities to ensure quality, productivity, and efficiency.

- **Understanding Work Instructions:** Reading job tickets, style sheets, or supervisor instructions to know the operation details, required specifications, and production targets.
- **Machine Setup and Handling:** Preparing and operating sewing machines, cutting tools, or pressing equipment correctly, including threading, tension adjustment, and minor troubleshooting.
- **Sewing and Assembly Operations:** Performing designated stitching tasks such as joining seams, attaching collars, hemming, or topstitching according to the operation sequence.
- **Material Handling:** Receiving cut components, bundling pieces, and passing work-in-progress gar-ments to the next stage with accuracy and care.
- **Quality Checking During Work:** Monitoring one's own output for defects like skipped stitches, seam puckering, or uneven finishing, and correcting errors immediately.
- **Maintaining Production Targets:** Working towards daily output goals while minimizing idle time and maintaining efficiency.
- **Workplace Discipline:** Following safety rules, maintaining personal hygiene, and keeping machines and workstations clean and organized.
- **Continuous Improvement:** Participating in training, learning new operations, and upgrading skills to handle different garment styles or machines.
- **Coordination with Team:** Supporting helpers, checkers, and other operators to maintain smooth ma-terial flow and contribute to line balancing.

Aspect	Indicator
Output Quantity	Number of pieces completed
Quality Check	Defects per batch
Time Utilisation	Idle time vs. active time
SOP Adherence	Following documented procedures

Table 3.1.2: Key Monitoring Metrics

3.1.6 Suitable Measuring System for Operators Based on Assigned Goals and Targets

Selecting the right measuring system is essential to track operator performance effectively, ensure fair assessments, and support continuous improvement. A well-chosen system helps link operator output to production goals clearly and quantitatively.

Criteria	Explanation
Nature of Task	Complex tasks may need minute-level tracking (e.g., Standard Al-lowed Minutes - SAM), while repetitive tasks may use unit-based output counting.
Skill Level	New operators may need a simplified metric system to track learning curves; experienced operators can be evaluated using advanced met-rics.
Production Volume	High-volume lines may use productivity ratios; low-volume lines may focus on defect rates or precision.
Technology Available	If digital tracking tools (e.g., MES or RFID systems) are available, more accurate and automated measures can be adopted.

Table 3.1.3: Key Considerations for Selection

Common Measuring Systems Used

Measuring System	Description
Standard Allowed Minute (SAM)	Time assigned for completing a task under normal working conditions; used for setting targets and evaluating time efficiency.
Efficiency %	(Actual Output / Target Output) × 100 – Helps identify high and low performers.
Piece Rate	Number of garments produced per hour or shift.
UCL & LCL (Upper and Lower Control Limits)	Used in Statistical Process Control to assess variation and consistency in output.

Table 3.1.4: Measuring System Used

3.1.7 Adherence of Operator Activities to Production Guidelines

Operators in the clothing industry are required to adhere closely to production requirements in order to guarantee efficiency, quality, and consistency. This adherence entails following the specified operation sequence, according to standard operating procedures (SOPs), and preserving the required stitch quality, seam allowances, and finishing standards. Operators contribute to fewer faults, less rework, and compliance with customer specifications by coordinating their everyday operations with production rules. Additionally, it guarantees efficient material flow, improved coordination with quality checkers and supervisors, and the accomplishment of predetermined production goals. In addition to increasing overall line efficiency, strict adherence increases dependability in fulfilling delivery commitments and preserving client happiness.

Maintaining discipline and standardisation on the sewing floor is crucial for consistent quality, operator safety, and process efficiency. Production guidelines include all the protocols, procedures, and standards that operators must follow during their tasks.

Category	Examples
Technical SOPs	Step-by-step sewing procedures, machine settings, thread type, and stitch type.
Safety Norms	Use of protective equipment, proper posture, and awareness of emergency ex-its.
Quality Control Checks	In-process checks, self-inspection, and flagging of defective parts.
Time Discipline	Adherence to breaks, punch-in/punch-out times, and shift duties.
Material Handling	No dragging of fabric, no over-stacking, careful transport of finished goods.

Table 3.1.5: Key Production Guidelines

Strategies to Ensure Adherence:

1. **Daily Briefings to Reinforce SOPs and Targets:** At the beginning of each shift, supervisors or Industrial Engineers conduct short meetings with operators to communicate daily production goals, review Standard Operating Procedures (SOPs), and highlight any style-specific instructions. This practice ensures clarity, keeps operators aligned with quality standards, and reinforces discipline on the shop floor.
2. **Supervisor Monitoring on the Shop Floor:** Continuous supervision helps ensure operators are following the correct methods, operation sequences, and safety practices. Supervisors monitor stitch quality, seam allowances, and productivity, providing immediate guidance or corrective feedback to avoid defects and rework.
3. **Use of Visual Aids like Posters, Charts, and Dashboards Near Workstations:** Visual reminders such as defect maps, quality checkpoints, operation diagrams, and productivity dashboards placed near operator stations act as quick references. They help operators recall correct methods, remain aware of quality expectations, and stay focused on daily output targets.
4. **Surprise Audits to Check Guideline Compliance:** Periodic unannounced checks are conducted by quality teams or supervisors to ensure that SOPs, safety practices, and production standards are be-ing followed. Surprise audits help identify gaps, discourage negligence, and encourage operators to maintain consistent adherence to guidelines at all times.

5. **Feedback System Where Operators Can Report Issues or Seek Clarification:** An open communication channel, such as suggestion boxes, digital reporting, or direct supervisor interaction, allows operators to raise concerns, report difficulties, or seek clarification about production instructions. This system helps in quickly resolving bottlenecks, boosting operator confidence, and ensuring smooth adherence to guidelines.

UNIT 3.2: Quality, Performance, and Evaluation

Unit Objectives

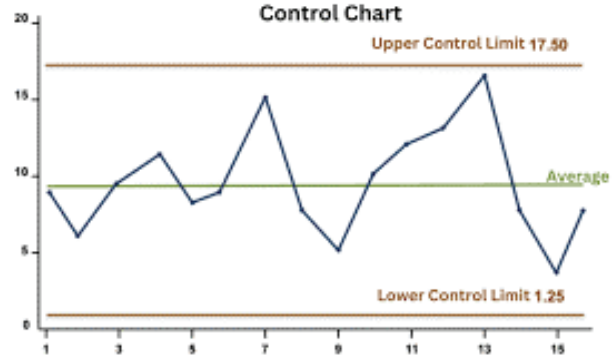
By the end of this unit, the participants will be able to:

1. Analyse statistical data and product specifications to determine standards and establish quality and reliability objectives.
2. Evaluate the performance of operators using defined metrics in line with production guidelines.
3. Create quantified measures and metrics to analyse operator performance.
4. Interpret framework and guidelines for operator performance evaluations as prescribed by the organisation.
5. Analyse the process flow used for performance evaluation and documentation.
6. Interpret documentation requirements for evaluating operations and operators.

3.2.1 Statistical Data and Product Specifications

Industrial Engineers and floor supervisors are responsible for analysing data to ensure products meet quality and reliability standards. This involves:

- **Understanding Product Specs:** Each garment has specifications like size tolerance, stitch per inch, thread quality, fabric type, and seam placement.
- **Using Statistical Tools:** Techniques like Control Charts, Mean-Time-To-Failure (MTTF), and Standard Deviation help monitor product consistency and identify deviations.

Tool	Purpose
 **Control Charts**	Monitor process stability and identify variations

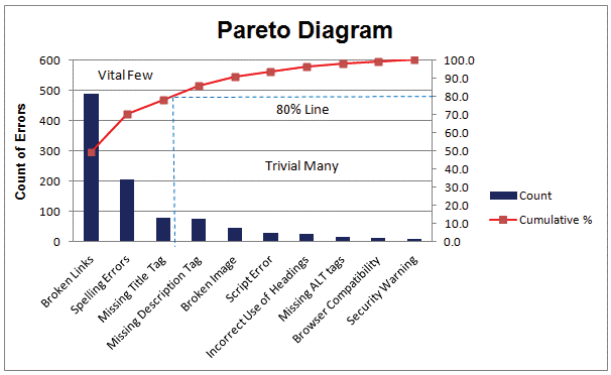
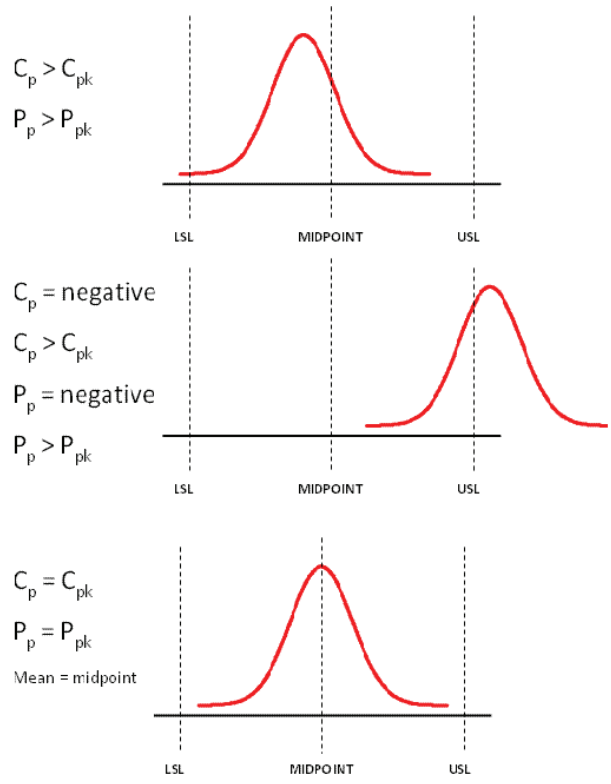
Tool	Purpose
 **Pareto Analysis**	Identify major defects contributing to the majority of problems
 **CP and CPK (Process Capability Indexes)**	Measure how well a process meets specifications

Table 3.2.1: Statistical Tools

3.2.2 Performance of Operators

The performance of operators directly influences the efficiency, quality, and delivery timelines of apparel manufacturing. Operator performance is usually assessed on multiple parameters that reflect both productivity and compliance with organizational standards.

- **Productivity Output:** Measured by the number of pieces completed within a shift compared to the set target or Standard Minute Value (SMV). High-performing operators consistently meet or exceed production goals without compromising quality.

- **Quality of Work:** Evaluated through defect rates, rework percentages, and adherence to buyer spec-ifications. Operators with strong performance maintain accuracy in stitching, seam alignment, and finishing, resulting in fewer quality rejections.
- **Efficiency Levels:** Calculated by comparing actual time taken for operations with standard time. Effi-cient operators use correct techniques, avoid unnecessary motions, and minimize idle time on ma-chines.
- **Adaptability and Skill Versatility:** Performance also depends on an operator's ability to handle different machines, switch between styles, and learn new operations quickly during style changeo-vers or rush orders.
- **Workplace Discipline:** Punctuality, adherence to safety practices, machine maintenance, and orga-nized workstations are essential indicators of consistent operator performance.
- **Team Contribution:** Good performers not only achieve personal targets but also support team goals by cooperating in line balancing, assisting co-workers, and ensuring smooth material flow.

Operators must be evaluated using objective and measurable performance indicators. These in-clude:

1. **Efficiency Percentage:** (Actual Output / Target Output) × 100

   This indicator measures how effectively an operator meets the assigned production target. For ex-ample, if the target is 100 pieces per shift and the operator produces 90, the efficiency percentage is 90%. It reflects the operator's speed, consistency, and ability to maintain the planned pace of pro-duction.

2. **Defect Rate:** (Defective Pieces / Total Output) × 100

   This metric evaluates the quality of an operator's work. A lower defect rate indicates that the opera-tor produces garments with fewer errors, reducing rework and wastage. For instance, if 5 defective pieces are found out of 200 stitched, the defect rate is 2.5%. Monitoring this helps in balancing productivity with quality.

3. **SAM-Based Productivity:** Comparing Output Against Time Standards

   Standard Allowed Minutes (SAM) are pre-defined time values for each operation based on motion and time studies. SAM-based productivity measures how closely an operator's output matches these standards. If an operator achieves or exceeds the expected SAM value, it shows efficiency in both time utilization and technique.

Metric	Description	Use
Output per hour	Measures quantity	Highlights production speed
First-Time Pass Rate (FTPR)	Measures how many units pass without rework	Reflects quality
Downtime Log	Tracks machine/operator inactivity	Aids in root cause analysis

Table 3.2.2: Key Operator Performance Metrics

3.2.3 Quantified Measures and Metrics

Performance must be quantified using clear benchmarks and thresholds. Metrics should be:

- **SMART:** Specific, Measurable, Achievable, Relevant, and Time-bound
- **Aligned with Role:** Tailored to each operation (e.g., sewing, ironing, quality checking)
- **Easily Trackable:** Via real-time dashboards, manual logs, or performance sheets

Operator Role	Suggested Metrics
Stitcher	Pieces per hour, Rework percentage
Quality Checker	Defect detection rate, False rejection rate
Pressing Operator	Burn mark rate, Output consistency

3.2.4 Framework and Guidelines for Operator Evaluations

Each organisation prescribes an evaluation framework which includes:

- **Frequency:** Daily, weekly, monthly evaluations
- **Scoring System:** Points assigned to different criteria (e.g., 10 points for quality, 10 for efficiency)
- **Performance Categories:** E.g., Excellent, Good, Satisfactory, Needs Improvement
- **Corrective Measures:** Retraining, counselling, skill enhancement programs

Frameworks ensure evaluations are standardised, transparent, and aligned with HR and production policies.

Evaluation Category	Weightage (%)	Tool
Output Efficiency	40%	 **SAM Tracker**
Quality Compliance	30%	 **Audit Sheets**

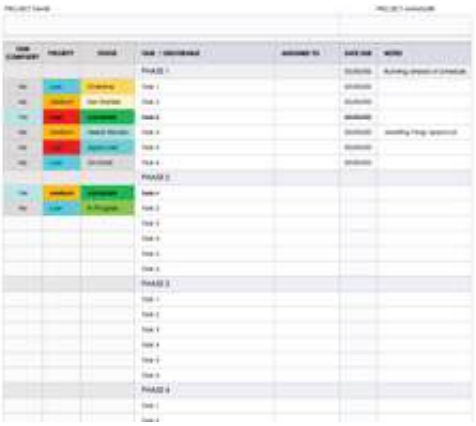
Evaluation Category	Weightage (%)	Tool
Teamwork and Discipline	20%	 **Supervisor Feedback**
Adherence to SOP	10%	 **Checklist**

Table 3.2.3: Performance Evaluation

3.2.5 Process Flow for Evaluation and Documentation

A structured evaluation and documentation process ensure transparency, accuracy, and continuous improvement in operator performance management. The evaluation process should be seamless and timely to avoid workflow disruptions. A typical flow includes:

Fig. 3.2.1: Process Flow

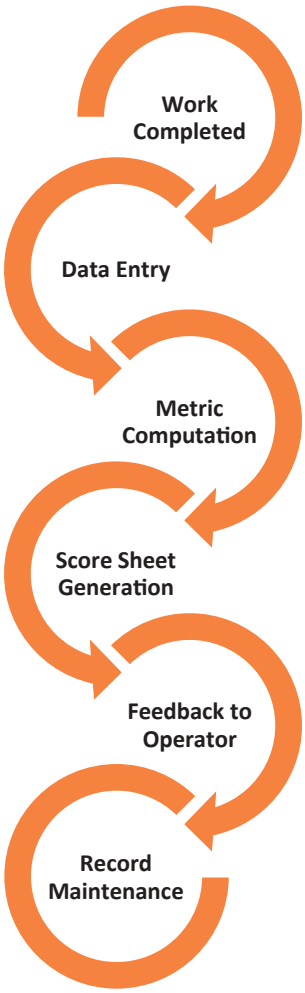


Fig. 3.2.2: Evaluation Process

3.2.6 Documentation Requirements for Evaluating Operations

In apparel production, proper documentation is essential for maintaining consistency, accountabil-ity, and transparency in operator performance evaluation. Records must capture quantitative data such as daily output, efficiency percentage, defect rates, downtime logs, and SAM-based productivi-ty, as well as qualitative observations like adherence to SOPs and workplace discipline. Standardized formats such as performance sheets, operation bulletins, and defect registers help ensure uniform data collection across lines and shifts. Digital tools, including MIS dashboards or barcode scanning, further improve accuracy and real-time tracking. Well-maintained documentation not only supports fair performance appraisal but also provides valuable insights for supervisors and industrial engi-neers to identify skill gaps, training needs, and process improvements

Proper documentation is critical for:

- Legal Compliance
- Transparency
- Training Needs Identification
- Appraisal and Promotion

Type of Documentation	Purpose
Performance Scorecards	Individual productivity and quality tracking
Skill Matrix	Mapping operator competency
Training Logs	Record of training provided based on evaluation
Rework/ Defect Logs	Tracking recurring quality issues

Table. 3.2.4: Types of Documents

All documents must be:

- Signed and verified by supervisors
- Maintained securely (digitally or in locked cabinets)
- Accessible during audits or reviews

UNIT 3.3: Organisational Ethics and Documentation

Unit Objectives

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

1. Explain the elements of a professional code of ethics and standards of practice.
2. Identify the documentation requirements for procedures related to assigned roles and responsibilities.
3. Escalate all documentation and relevant support materials to the human resources department for official records.
4. Interpret organisational frameworks and guidelines for addressing queries and concerns.
5. Identify the documentation mechanisms available for redressal within the organisation.
6. Maintain documentation related to redressal procedures.

3.3.1 Elements of a Professional Code of Ethics and Standards of Practice

A professional code of ethics serves as a guiding framework that defines the standards of conduct expected from individuals in a workplace. Key elements typically include integrity, which emphasizes honesty and transparency in all professional dealings; accountability, which ensures responsibility for one's actions and decisions; and confidentiality, which protects sensitive organizational and client information. It also highlights fairness and respect, promoting equality, inclusivity, and non-discrimination in the workplace. Another crucial element is compliance with laws and policies, requiring adherence to industry regulations, safety standards, and organizational rules. Together, these elements build trust, strengthen professional credibility, and create an ethical work culture that supports long-term organizational success.

A professional code of ethics provides the foundation for expected behaviour in the workplace. Adherence to these values promotes trust, efficiency, and fairness across teams.

Element	Description
Integrity	Being honest and transparent in all work-related activities
Accountability	Taking responsibility for one's decisions and actions
Confidentiality	Respecting privacy and sensitive information
Respect and Fair Treatment	Treating all colleagues and workers fairly, regardless of rank
Compliance	Following all organisational policies and legal regulations

3.3.2 Documentation Requirements for Assigned Roles and Responsibilities

It is crucial for the Indian garment sector to document assigned roles and duties to guarantee clarity, accountability, and efficient departmental coordination. Job descriptions, SOPs, and duty matrices must clearly outline the responsibilities of every position, from operators and assistants to supervisors, quality checkers, and industrial engineers. Such paperwork guarantees adherence to labour laws and

buyer needs, aids performance evaluation, and helps prevent overlap or confusion. Additionally, it serves as a point of reference for audits, training, and process enhancements, all of which eventually boost production's effectiveness and consistency in quality.

Each role on the sewing floor has defined documentation needs to ensure clarity, traceability, and responsibility.

Role	Key Documents
Supervisor	Daily shift reports, output logs, defect records, and incident logs
Quality Controller	Audit sheets, rework reports, and quality KPIs
Line Operator	Attendance sheets, hourly production counts (if self-logged)
Industrial Engineer	Efficiency reports, line balancing charts, capacity logs

Table 3.1.1: Key Documents Requirements

All documentation must include:

Fig. 3.3.1: Requirements for documentation

3.3.3 Documentation to the Human Resources Department

For transparency and official recordkeeping, certain types of documentation must be escalated to the HR department, including:

- Employee grievances
- Disciplinary actions taken
- Appraisal and performance records
- Attendance and leave approvals
- Training and upskilling certificates

Example: If an operator receives three warnings for non-compliance with safety norms, the records must be forwarded to HR for documentation under the employee's file. Proper escalation ensures that actions taken at the floor level are aligned with organisational policies and legal frameworks.

3.3.4 Organisational Frameworks for Queries and Concerns

Organisations have defined procedures for handling employee queries, operational concerns, and feedback. This includes:

- **Whom to approach:** Employees must have a clear understanding of the reporting hierarchy when raising queries or concerns. For operational or production-related issues, the immediate supervisor or floor in-charge is typically the first point of contact. For more sensitive matters such as workplace harassment, payroll disputes, or policy violations, employees may approach the HR department directly. This structured approach ensures that concerns are addressed by the most relevant authority without unnecessary delays.
- **Timelines:** Effective frameworks define specific timelines within which concerns must be acknowledged and resolved. For example, operational queries like machine breakdowns or material shortages should be addressed within 24 hours to avoid production delays. More complex concerns, such as compliance violations or disciplinary cases, may have a longer resolution timeline but should still follow a set deadline, such as 48–72 hours. Defined timelines build trust, prevent escalation, and demonstrate organizational commitment to problem-solving.
- **Documentation required:** To ensure accountability and traceability, all concerns should be formally documented. Employees may be required to fill out a complaint or query form, provide supporting evidence such as photos of defects, attendance logs, or written statements, and submit them to the concerned authority. Proper documentation not only creates a record for future reference but also supports fair investigation and resolution of issues in line with organizational policies and buyer compliance requirements.

Type of Concern	Reporting Authority	Timeline
Wage discrepancy	HR Manager	2 working days
Harassment complaint	Internal Complaints Committee	3-5 working days
Safety issue	Safety Officer / Line Supervisor	Immediate
Machinery defect	Maintenance Head	1 working day

Table 3.3.2: Types of Queries and Concerns and its Solution

3.3.5 Documentation Mechanisms for Redressal

Organisations provide formal and informal mechanisms for redressing grievances. Supervisors should know how to:

Fig. 3.3.2: Duties of a supervisor

A supervisor in the apparel industry plays a key role in grievance handling by logging grievances through forms or HRMS portals, tracking the status of grievance redressal to ensure timely resolution, and maintaining confidentiality and non-retaliation to protect employee trust. They must also provide required support documents such as witness statements, photos, or reports to aid in fair investigation and resolution.

Mechanism	Features
Grievance Register	Physical logbook maintained by the HR department or supervisor
Online Portals	A digital system where complaints can be filed and tracked
Suggestion Box	An anonymous mechanism for employees to raise issues
Email Escalation	Direct communication to concerned managers or HR

Table 3.3.3: Types of Mechanism

3.3.6 Documentation Related to Redressal Procedures

Proper documentation is a critical part of grievance redressal systems, ensuring that every concern raised by employees is handled transparently and fairly. Documentation includes recording the initial grievance, maintaining evidence such as forms, witness statements, or photographs, and tracking the steps taken during investigation and resolution. These records provide accountability, serve as a reference for audits or compliance checks, and help organizations monitor recurring issues to improve workplace policies. Well-structured documentation ensures that the redressal process is systematic, unbiased, and aligned with both organizational guidelines and legal requirements.

All steps taken to resolve a complaint or workplace issue should be documented thoroughly to maintain an audit trail.

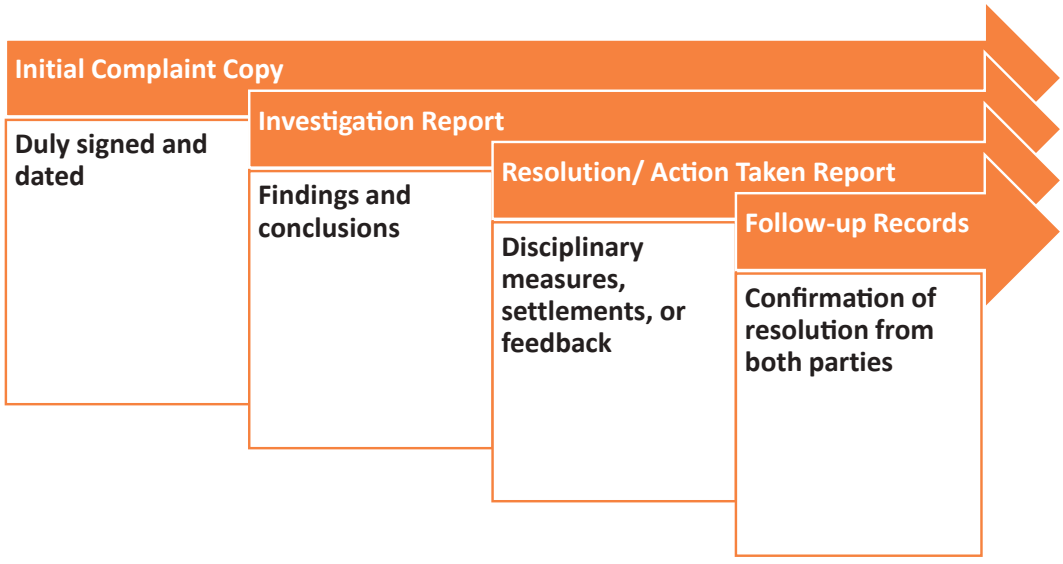


Fig. 3.3.3: Steps Taken for Handling a Conflict

Such documentation safeguards the organisation against future disputes and proves adherence to fair labour practices.

Redressal Log Sheet

Date	Name	Complaint	Action Taken	Follow-Up Status	Closed (Yes/ No)
01/07/2025	R. Devi	Verbal harassment by a co-worker	Issued a warning to the accused	Confirmed resolu-tion	Yes

Table 3.3.4: Sample Template

A Redressal Log Sheet is a structured document used to record, track, and monitor grievances raised by employees in the apparel industry. It ensures that every complaint is formally acknowledged, properly investigated, and appropriately resolved.

For example, in the provided entry, an employee named R. Devi reported verbal harassment. The organization responded by issuing a warning to the accused, confirmed the resolution through follow-up, and marked the case as closed. This structured approach builds transparency, fairness, and trust in the redressal system.

UNIT 3.4: Communication and Software Tools

Unit Objectives

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

1. Analyse subordinate reporting executives' queries and document them using the prescribed organisational format.
2. Provide timely and necessary feedback to concerned line supervisors.
3. Explain the basic functions of software tools and formats such as MS Word, Excel, PowerPoint, MIS, GSD, and PMTS as per organisational standards.

3.4.1 Subordinate Reporting and Documenting Queries

On the sewing floor, multiple subordinate staff members - including line operators, quality checkers, and maintenance personnel - frequently raise queries regarding workflow, defects, absenteeism, material shortages, and machine breakdowns.

Key Steps in Query Analysis

1. **Identify the Nature of the Query:** Understand if the issue is technical, managerial, or related to per-sonnel.
2. **Assess Urgency and Impact:** Prioritize queries that affect line productivity or worker safety.
3. **Consult Related Records:** Use past production logs, attendance sheets, or quality audit data for con-text.
4. **Document the Query:** Use organisational formats such as query forms, logbooks, or email templates.

Example: A line operator reports a repeated needle breakage issue. The supervisor checks machine settings, documents the issue using the Equipment Fault Log, and escalates to the maintenance department.

Date	Raised By	Query	Analysis Done	Status	Remarks
29/07/2025	S. Kumar	High rejection in line 4	Checked bundle defects	Resolved	Tooling issue fixed

Sample Table: Query Documentation Format

3.4.2 Feedback to Line Supervisors

Timely feedback allows supervisors to take corrective action and improve floor-level efficiency. Feedback can relate to:

- Production Deviations (e.g., falling short of daily targets)
- Quality Concerns (e.g., recurring stitch defects)
- Behavioural Issues (e.g., absenteeism or non-cooperation)
- Compliance Matters (e.g., improper use of PPE or violation of SOPs)

Feedback Process:

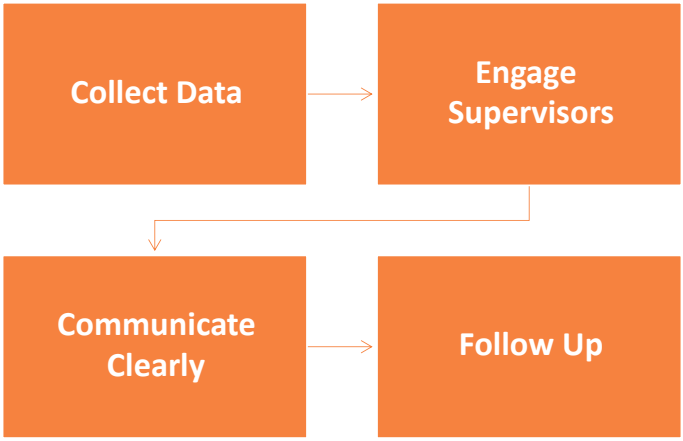


Fig. 3.4.1: Steps included in the feedback process

1. **Collect Data:** Review production sheets, quality audits, or visual inspections.
2. **Engage Supervisors:** Call for a quick floor huddle or one-on-one meeting.
3. **Communicate Clearly:** Use specific language and give constructive suggestions.
4. **Follow Up:** Monitor whether corrective action is taken and document it.

3.4.3 Basic Software Tools in Apparel Production

Software tools help streamline communication, monitor performance, analyse data, and present reports. Supervisors must be familiar with basic digital tools used in the apparel industry.

1. **MS Word**
   - Used for drafting shift reports, incident records, SOPs, and notices.
   - Can include tables, checklists, and templates.

   Example: Creating a defect summary report for the week using Word's table formatting.

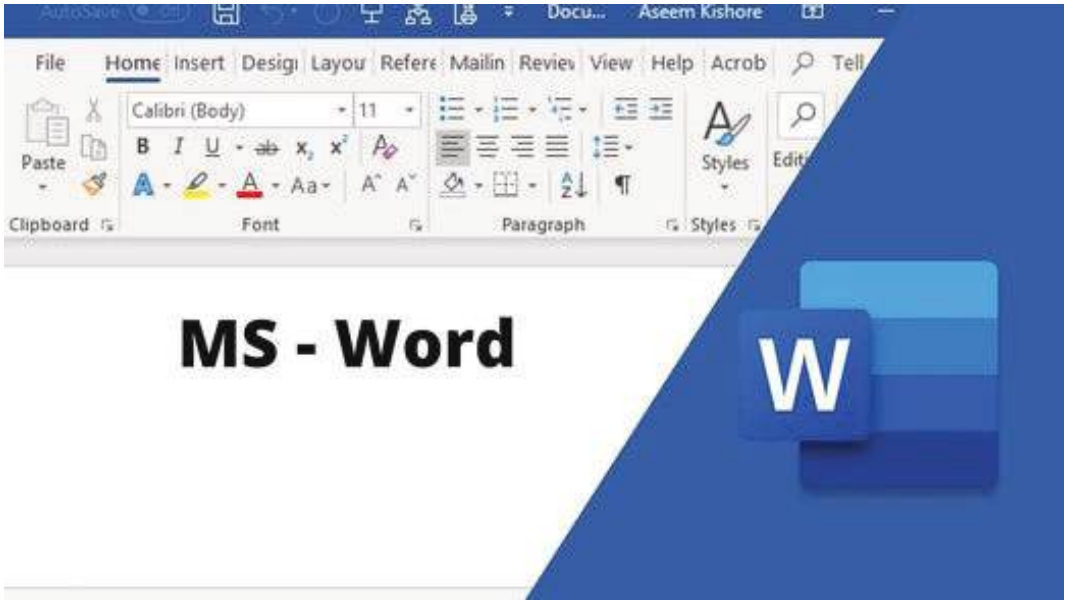


Fig. 3.4.2: MS Word

2. MS Excel

- Essential for production planning, tracking efficiency, maintaining logs, and data analysis.
- Functions: Sum, Average, Conditional Formatting, Charts, Pivot Tables.

Example: Track daily line output versus target using Excel and visualise the data with bar charts.

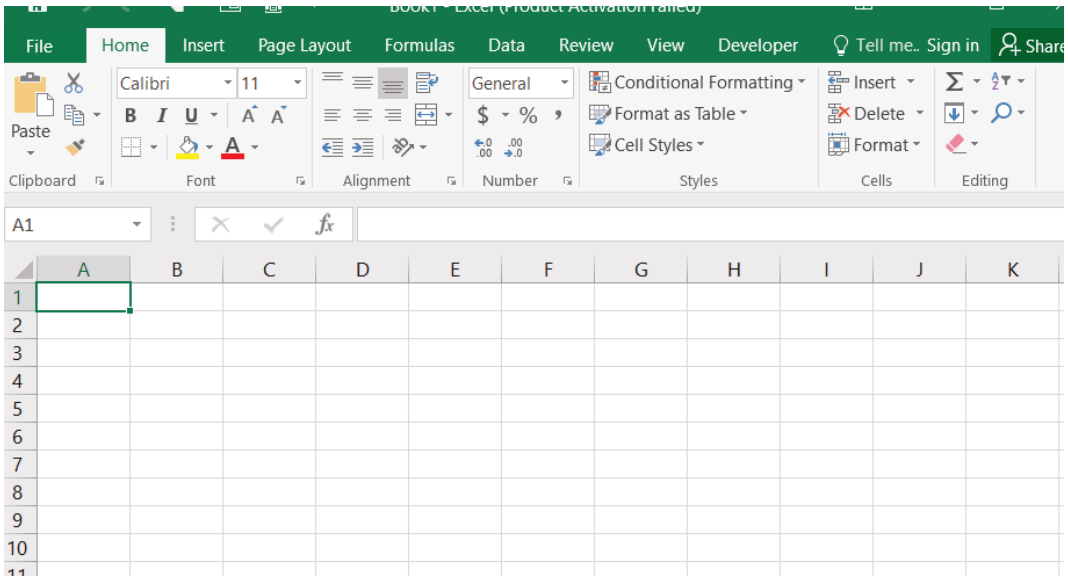


Fig. 3.4.3: MS Excel

3. MS PowerPoint

- Used for presenting updates during weekly review meetings.
- Helps in communicating trends, achievements, and areas of improvement visually.

Example: Presenting a monthly summary of rework trends with images and charts.

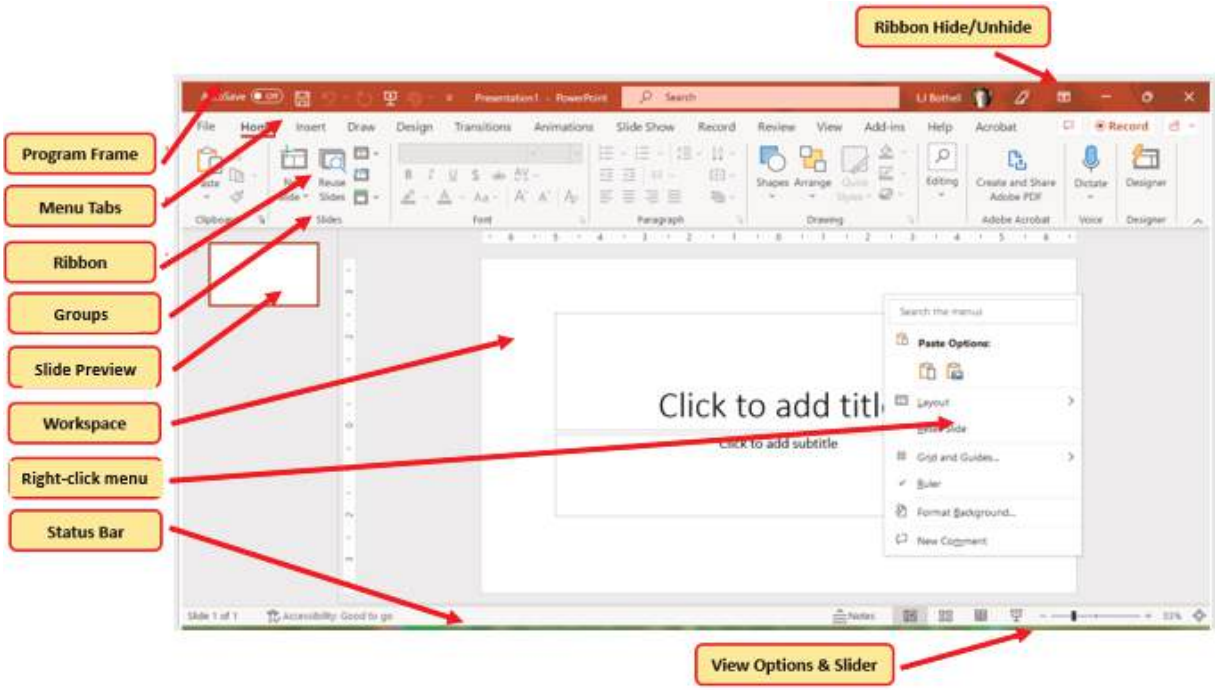


Fig. 3.4.4: MS PowerPoint

3.4.4 Industry-Specific Tools: MIS, GSD, and PMTS

1. **MIS (Management Information System)**
   - Collects and reports key performance metrics like output, rejection rates, and absenteeism.
   - Usually integrated with ERP systems.

MIS Report	Purpose
Daily Output Report	Track shift-wise performance
Rejection Summary	Analyse quality defects
Attendance Logs	Monitor workforce availability

Table 3.4.1: MIS Report

A Management Information System (MIS) in the apparel industry is a structured system that collects, processes, and analyses production, quality, and workforce data to support decision-making. It provides managers and industrial engineers with real-time insights on efficiency, output, defect rates, inventory, and timelines. By centralizing information through digital dashboards or reports, MIS helps in monitoring performance, identifying bottlenecks, ensuring compliance, and improving overall productivity across the production floor.

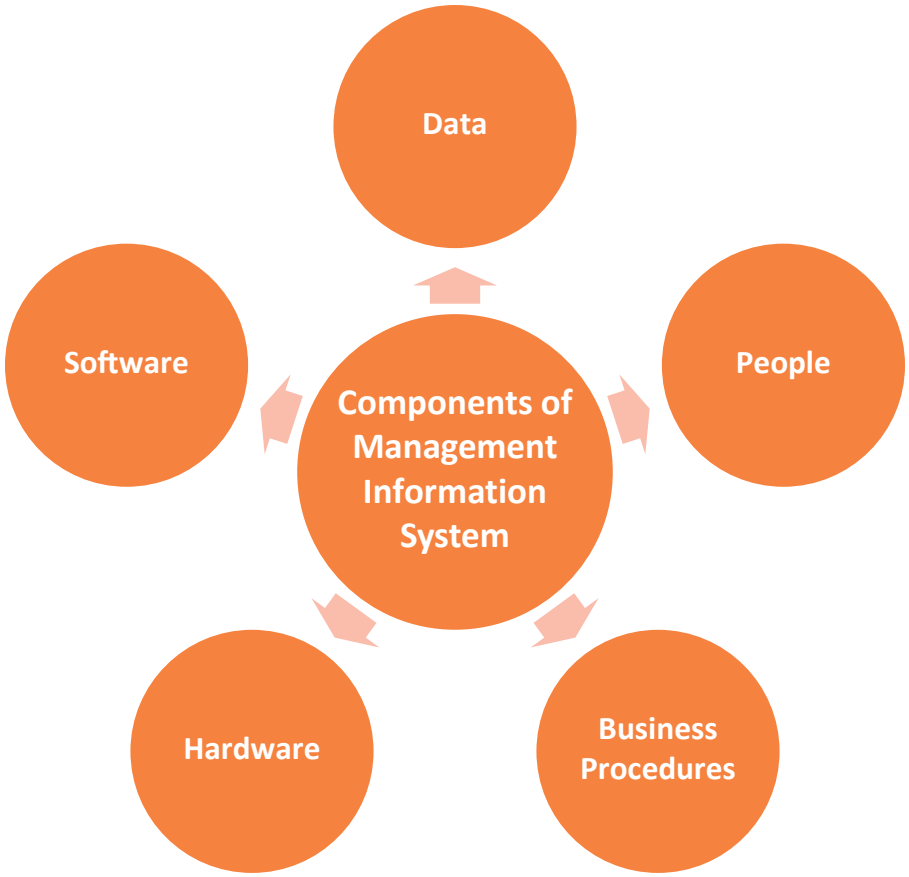


Fig. 3.4.2: Components of MIS

2. **GSD (General Sewing Data)**
   - Used for work measurement and determining Standard Minute Values (SMV).
   - Breaks down each operation into motions and assigns time values.

   Purpose: Helps in line balancing, manpower planning, and costing.

   Example: Attaching collar = 0.65 SMV. If an operator does 30 collars/hour, efficiency = (30 × 0.65)/60 × 100 ≈ 32.5%

3. **PMTS (Predetermined Motion Time System)**
   - A system used to set time standards for manual tasks without direct observation.
   - Breaks tasks into basic motion elements like reach, grasp, move, and release.

   Benefit: Increases objectivity and helps improve productivity standards.

Motion Element	Time (in TMU)
Reach	6 TMU
Grasp	4 TMU
Move	10 TMU

Table 3.4.2: Predetermined Motion Time Elements

Summary

- Production performance monitoring involves tracking key metrics such as productivity, efficiency, and line balance to ensure targets are met consistently.
- Data collection tools like production reports, downtime logs, and defect tracking sheets are vital for making informed decisions and identifying bottlenecks.
- Performance metrics, including output per operator, SAM (Standard Allowed Minute), and rejection rates, help evaluate individual and line performance.
- Root cause analysis methods (e.g., Fishbone diagrams, 5 Whys) are used to identify underlying issues affecting quality, delay, or machine utilisation.
- Corrective and preventive actions (CAPA) must be systematically implemented to address production issues and avoid recurrence.
- Effective communication between supervisors, quality teams, and workers ensures transparency, coordination, and quick resolution of operational issues.
- Continuous improvement practices such as lean manufacturing, 5S, and Kaizen foster a culture of productivity and waste reduction on the shop floor.

Exercise

Multiple-choice Question:

1. Which of the following best describes the purpose of production monitoring on the sewing floor?
   a. To verify employee attendance
   b. To track raw material consumption
   c. To ensure timely output and identify performance gaps
   d. To finalise export orders

2. What tool is commonly used for root cause analysis of a production issue?
   a. Packing Slip
   b. Fishbone Diagram
   c. SAM Calculation
   d. Garment Specification Sheet

3. What does SAM stand for in garment manufacturing?
   a. Sewing and Merchandising
   b. Standard Allowed Minutes
   c. Stitch and Measure
   d. Sample Approval Mechanism

4. A delay in production due to frequent machine breakdowns affects which key performance aspect the most?
   a. Operator training time
   b. Garment design innovation
   c. Workflow continuity and delivery schedule
   d. Purchase order generation

5. Which software tool is most commonly used for performance tracking and generating MIS reports in garment production units?
   a. Adobe Illustrator
   b. MS Excel
   c. AutoCAD
   d. CorelDRAW

Descriptive Questions:

1. Explain the importance of monitoring production efficiency on the sewing line.
2. Describe how a production supervisor can use a Fishbone Diagram and the 5 Whys method to analyse frequent stitching defects.
3. What are the key steps involved in implementing a corrective and preventive action (CAPA) system after identifying a production issue?
4. Discuss how lean manufacturing tools contribute to continuous improvement in garment production units.
5. Create a sample daily performance monitoring table for a 5-operator sewing line, indicating target vs. achieved output and any downtime.

Notes

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

https://youtu.be/KCfwX98EWIc?si=nrQlkEiucV3rr2fk

MS Word Full Course in Just 90 Minutes

https://youtu.be/0t2Maqm5DSk?si=l3jta03ZpVJCpBBJ

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RE IMAGINE FUTURE

4. Research and Resolve Production Problems to Implement Better Production System

APPAREL MADE-UPS HOME FURNISHING
SECTOR SKILL COUNCIL

Unit 4.1 - Standards, Procedures, and Specifications

Unit 4.2 - Production Systems and Problem Management

Unit 4.3 - Productivity, Operations, and Efficienc

AMH/N2003

Key Learning Outcomes

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

1. Explain specifications for garment construction.
2. Explain quality systems and other processes practised in the organisation.
3. Explain the various types of problems associated with different kind of production system and how to report them to appropriate people.
4. Interpret safe working practices and organisational procedures.
5. Analyse labour utilisation standards, and cost analysis systems to develop efficiency and productivi-ty.
6. Describe the importance of complying with written instructions.
7. Provide feedback regarding methods for improving utilisation of personnel, material, and utilities.
8. Interpret the organisation's tools, templates and processes for export marketing-related operations.
9. Interpret routing guidelines.
10. Explain the invoice in instructions and process.

UNIT 4.1: Standards, Procedures, and Specifications

Unit Objectives

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

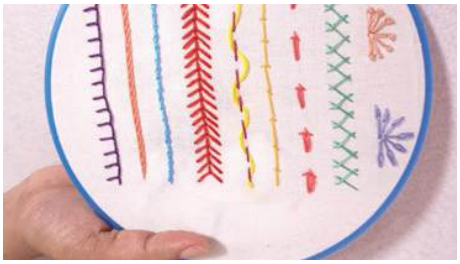
1. Describe specifications for garment construction.
2. Explain quality systems and related processes practiced in the organisation.
3. Interpret safe working practices and organisational procedures.
4. Describe the importance of complying with written instructions.
5. Identify the organisation's policies, procedures, guidelines, and standards.
6. Interpret the manufacturer's guidelines for machine operation.
7. Interpret required manufacturing standards and procedures.
8. Explain invoice instructions and associated processes.
9. Interpret routing guidelines for production flow.
10. Interpret the organisation's tools, templates, and export marketing processes.

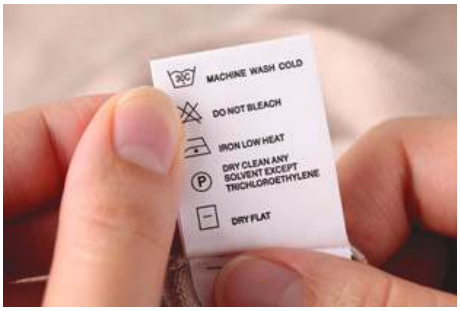
4.1.1 Garment Specifications and Manufacturing Standards

Garment specifications serve as a technical blueprint that governs the construction, aesthetics, and performance of each apparel item. These specifications ensure uniformity across the production line and align the manufacturer's output with buyer expectations.

Common Elements in a Garment Specification Sheet:

Component	Description
 **Size and fit**	Standardised body measure-ments for each size (S, M, L, XL, etc.)

Component	Description
 Stitch Type	E.g., Lockstitch, Overlock, Flat-lock, Chain Stitch
 Fabric Type	GSM, fibre composition, stretch recovery, and shrinkage
 Fabric Type	Single needle, double needle, flat seam, etc.
 Trim and Accessories	Zippers, buttons, interlining, la-bels, etc.

Component	Description
HIGH WAIST 7/8 TIGHT — Fabric: SUBLIMATED COMPRESSIVE INT — Factory/ Vendor: YOTEX POINT OF MEASURE / TOL J+ / S-TARGET / S-SAMPLE / DIFF C01 WAIST OPENING WIDTH — 1/4 — 9 1/2 — 9 1/4 — - 1/4 C02 WAISTBAND SEAM WIDTH — 1/4 — 13 — 13 — 0 C03 CENTER FRONT WB HEIGHT — 1/8 — 3 3/4 — 3 3/4 — 0 C05 CENTER BACK WB HEIGHT — 1/8 — 4 1/2 — 4 3/4 — 1/4 C06 HIP - 8" DOWN FROM TOP EDGE OF WB — 3/8 — 14 1/2 — 14 1/2 — 0 C07 INSEAM - FROM CENTER OF GUSSET — 1/4 — 24 1/4 — 24 1/2 — 1/4 C08 THIGH - 1" DOWN FROM CENTER OF GUSSET — 1/4 — 7 3/4 — 7 1/2 — - 1/4 C09 KNEE - 13" DOWN FROM CENTER OF GUSSET — 1/4 — 5 1/4 — 5 3/8 — 1/8 C11 LEG OPENING — 1/4 — 3 7/8 — 4 — 1/8 C13 FRONT RISE - CENTER OF GUSSET TO TOP OF WAISTBAND — 1/4 — 9 — 9 1/8 — 1/8 C14 BACK RISE - CENTER OF GUSSET TO TOP OF WAISTBAND — 1/4 — 13 3/4 — 13 1/2 — - 1/4 C17 GUSSET LENGTH — 1/8 — 2 1/2 — 2 1/4 — - 1/4 **Tolerances**	Allowable deviations (e.g., chest width ± 0.5 cm)
 **Packaging Requirements**	Polybag size, folding type, label-ling, barcode placement

Manufacturing standards refer to guidelines such as:

- **ISO 9001 (Quality Management)**

Fig. 4.1.1: ISO 9001 Logo

- **SA8000 (Social Accountability)**

Fig. 4.1.2: SA 8000

- **WRAP (Worldwide Responsible Accredited Production)**

Fig. 4.1.3: WRAP logo

4.1.2 Quality Control Systems and Safe Work Practices

Quality assurance (QA) and quality control (QC) processes form a structured system designed to minimise defects and maximise customer satisfaction.

Key QC Processes and Their Functions:

Process	Description
Incoming Material Inspection	Verifies fabric, trims, and accessories before use
Inline Inspection	Mid-process checks to catch and correct issues early
End-line Inspection	Final garment check before packing
AQL (Acceptable Quality Limit)	Statistical method for sampling inspection
Defect Categorization	Critical, major, and minor faults are logged and report-ed

Safe work practices are inseparable from quality. Organisations must institutionalize procedures such as:

- **Wearing PPE (gloves, masks, safety goggles)**

Fig. 4.1.4: Components in a PPE kit

- **Regular fire and evacuation drills**

Fig. 4.1.5: Fire drill procedure

- **Use of machine guards and emergency stop mechanisms**

Fig. 4.1.6: Use of machine guards to protect workers from machine injury

- **Ensuring lighting, ventilation, and cleanliness in workspaces**

Fig. 4.1.7: Proper lighting in the workspace

4.1.3 Organisational Policies, SOPs, and Production Routing

Standard Operating Procedures (SOPs) and Work Instructions ensure consistency across teams. These written documents guide:

- Machine settings for specific operations
- Stitching sequences (e.g., shoulder join → side seam → sleeve attach)
- Quality inspection points
- Role-based responsibilities

Benefit	Explanation
Reduces Variability	All operators follow the same procedure
Easier Training	New workers can be trained using visual or written instruc-tions
Ensures Compliance	Aligns with buyer and audit expectations
Promotes Efficiency	Reduces time spent on decision-making or error correction

Table 4.1.1: Benefits of SOPs

Production routing defines how materials flow through various departments. It ensures timely movement and avoids bottlenecks.

Production routing in the apparel industry is the planned sequence that defines how raw materials, cut parts, and semi-finished garments move through various departments such as cutting, sewing, finishing, and packing. It acts as a roadmap for material flow, ensuring that each component passes through the right operation at the right time. By establishing a clear route, it prevents misplacement of materials, minimizes delays, and avoids bottlenecks that could disrupt the production schedule. Proper routing also helps supervisors and industrial engineers track work-in-progress, balance workloads across lines, and maintain smooth coordination between departments, ultimately leading to efficient use of resources and on-time delivery.

Example Production Routing Sequence:

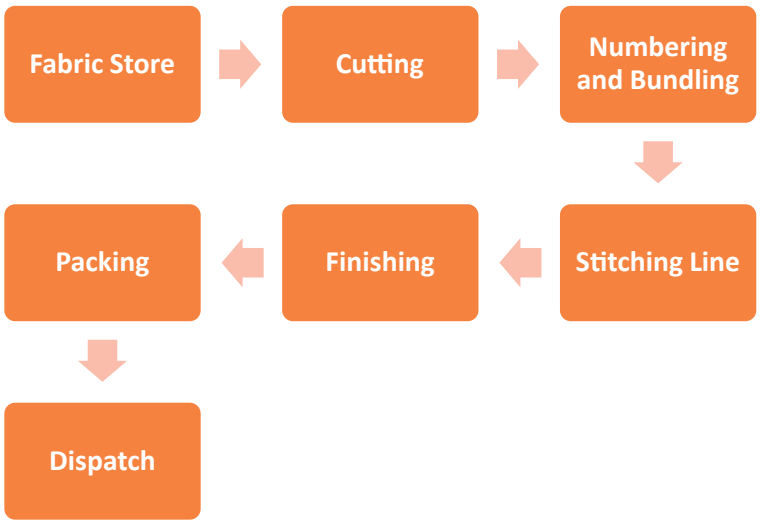


Fig. 4.1.8: Process of Production Routing

4.1.4 Manufacturer's Guidelines and Invoice Instructions

Machines such as single needle lockstitch, flatlock, or buttonhole machines come with manuals de-tailing:

- Oil lubrication points and intervals
- Needle types and sizes
- Thread compatibility
- Safety precautions
- Troubleshooting common issues

Machine manuals are essential reference documents provided by manufacturers that guide operators, mechanics, and supervisors in the correct use and upkeep of sewing and allied machinery. These manuals typically include information on machine installation, operating procedures, safety precautions, troubleshooting steps, and preventive maintenance schedules.

Sample Table of a Machine Manual:

Machine Part	Maintenance Required	Frequency
 **Shuttle Hook**	Clean and oil	Daily
 **Needle Bar**	Check alignment and oil	Weekly
 **Belt Tension**	Inspect for slack/ friction	Weekly

Table 4.1.2: Machine Manual

Invoice instructions are equally essential for the production and dispatch departments. An invoice might contain:

- PO Number and Style Code
- Buyer's Address
- Payment Terms (e.g., Net 30, LC at sight)
- Delivery Instructions (split shipments, bulk dispatch)
- Tax and HS Codes

Failure to follow invoice instructions may lead to customs delays, buyer disputes, or payment holdups.

4.1.5 Templates, Documentation Tools, and Export Requirements

Standardized templates and documentation tools play a vital role in maintaining consistency, accu-racy, and compliance across production and business processes. Templates such as production sheets, quality checklists, and redressal logs ensure uniform recording of data, while digital docu-mentation tools like ERP systems or MIS dashboards streamline real-time tracking and reporting. Additionally, for global trade, adherence to export requirements, including packing lists, commercial invoices, certificates of origin, buyer-specific compliance documents, and export licenses, is essential to meet international regulations and buyer standards. Together, these practices strengthen trans-parency, improve efficiency, and build credibility in both domestic and international markets.

Organisations use standardised templates for:

- Daily Production Reports
- Defect Logs
- Downtime Sheets
- Skill Assessment Forms

Sample Template: Daily Production Report

Operator Name	Operation	Target	Achieved	Defects	Remarks
Raju	Sleeve Attach	80	78	2	NA
Meena	Neck Rib	70	72	1	NA

Benefits of a Standardised Template

Fig. 4.1.9: Benefits of a Standardised Template

For export houses, knowledge of export marketing processes and documentation is crucial:

- Packing List (Quantity, Carton Dimensions)
- Commercial Invoice (FOB/CIF Value)
- Bill of Lading/ Airway Bill
- Country of Origin Certificate
- Compliance Documents (Social Audit, Chemical Testing Reports)

Failure to furnish accurate export documentation may lead to:

UNIT 4.2: Production Systems and Problem Management

Unit Objectives

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

1. Analyse different types of production systems and examine their feasibility for specific product requirements.
2. Discuss various types of problems associated with different production systems and explain how to report them to the appropriate personnel.
3. Identify reporting procedures in case of faults in own or other processes.
4. Identify the appropriate authority to refer problems that exceed own responsibility.
5. Carry out process re-engineering and set production benchmarks.
6. Apply statistical methods and perform mathematical calculations to identify manufacturing process problems.

4.2.1 Garment Production Systems

Garment manufacturing units adopt different types of production systems depending on product types, batch sizes, cost, and flexibility requirements. Understanding their characteristics helps in choosing the right system for the right context.

Production System	Description	Best Suited For	Advantages	Challenges
Progressive Bundle System (PBS)	A traditional system where pieces move in bundles from operation to operation	Large batch production	Easy implementation, low training required	High WIP, low flexibility
Unit Production System (UPS)	Uses overhead conveyors to move one garment at a time	Mid-size production with moderate variety	Reduced WIP, better control	Higher initial investment
Modular Production System	Small teams handle complete units or parts of them	High-variety, low-volume production	High flexibility, faster feedback loop	Requires skilled labour and training

Table 4.2.1: Types of Production Systems

4.2.2 Management of Production Problems

Production-related issues can arise at multiple stages - planning, execution, quality checks, or machine operations. Timely detection and structured reporting are essential for resolution.

Here are some common production problems in the apparel industry:

- Machine breakdowns and poor maintenance
- Fabric defects (shrinkage, colour variation, holes)
- High defect rates in stitching and finishing
- Imbalanced production lines causing bottlenecks

- Shortage or delay of raw materials and trims
- Inaccurate operation sequence planning
- Low operator efficiency or skill gaps
- Poor quality control and rework requirements
- Inconsistent workflow and material movement
- Non-compliance with buyer standards or audits

However, the basic managerial solutions that could be integrated by the IEs to mitigate the production problems are provided in the list below:

- Preventive maintenance and timely machine servicing
- Strong quality control through inline and end-line inspections
- Effective line balancing and workload distribution
- Skill development and operator training programs
- Robust vendor management and material planning

4.2.3 Fault Reporting and Escalation Procedures

Every organisation should have a structured escalation matrix for fault reporting to avoid downtime and ensure safety and accountability.

Problem Type	Responsibility	Report To
Machine Malfunction	Operator	Maintenance Supervisor
Quality Deviation	Line Quality Checker	Quality Control Head
Bottleneck in Line	Line Supervisor	Production Manager
Labour Shortage	HR Representative	Operations Manager
Process Deviation	Production Engineer	Technical Head

Table 4.2.2: Escalation Matrix for Problem Reporting

4.2.4 Process Re-engineering and Benchmarking

Process re-engineering refers to the fundamental rethinking and radical redesign of manufacturing processes to achieve improvements in productivity, quality, cost, speed, and service.

It goes beyond just fixing bottlenecks or making small process improvements - it is about transforming workflows to meet new demands, technologies, or organisational goals.

Step	Description
Identify Core Processes	Select key processes that are underperforming or are critical to operations
Analyse Existing Workflows	Use flowcharts and process maps to break down current process steps
Spot Inefficiencies and Waste	Identify non-value-adding tasks (idle time, redundancies, delays, etc.)

Step	Description
Redesign Process Flow	Reconstruct steps to eliminate waste and simplify operations
Implement New Process	Deploy the redesigned process with new SOPs, layout changes, or technologies
Monitor and improve	Track performance using KPIs and improve iteratively

Table 4.2.3: Key Steps in Process Re-engineering

Old Process	Re-engineered Process	Benefit
Manual fabric cutting	CAD-based automated cutting	Precision, reduced material wastage
Bundled piece movement (PBS)	Modular production with cross-trained teams	Reduced handling time, improved flexibility
Quality inspection at end of line	In-line quality checks at multiple stations	Early defect detection, less rework
Manual line balancing	Use of line balancing software	Optimal workforce utilisation

Table 4.2.4: Common Examples in the Apparel Sector

What is Benchmarking?

Benchmarking involves setting performance standards or benchmarks based on internal historical data, industry best practices, or competitors' performance. These benchmarks act as targets for productivity, quality, time, or cost.

Benchmark Type	Example in Garment Production
Time Benchmark	Stitching one shirt collar should take no more than 1.5 minutes
Efficiency Benchmark	Line efficiency must be maintained above 80%
Quality Benchmark	Defects per hundred units (DHU) must be < 2%
Cost Benchmark	The cost of manufacturing one unit must not exceed ₹40

Table 4.2.5: Types of Benchmarks in Production

4.2.5 Statistics for Problem Identification

Statistics help quantify problems, detect patterns, and establish cause-effect relationships in the production system. Instead of relying on intuition or trial and error, data-driven analysis makes problem identification more precise and actionable. Statistical tools help pinpoint root causes of production inefficiencies.

Commonly Used Tools:

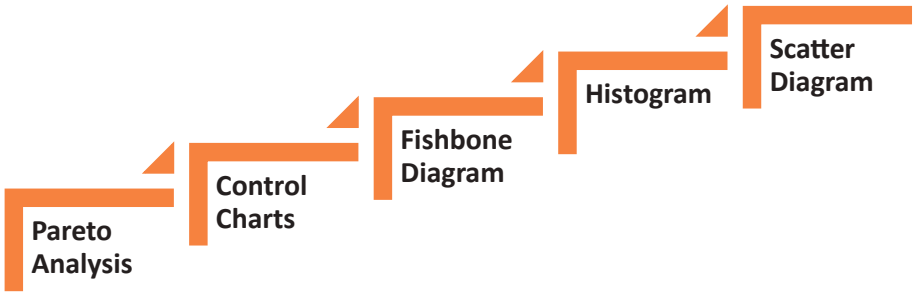
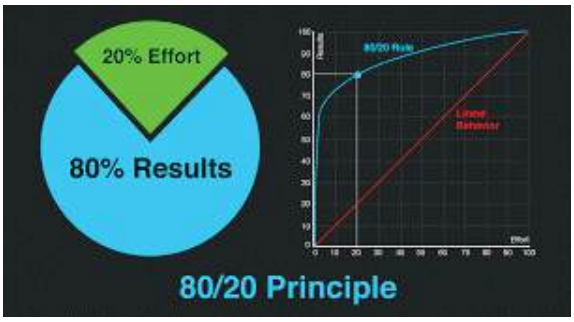
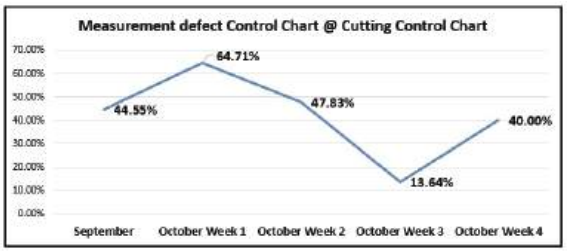
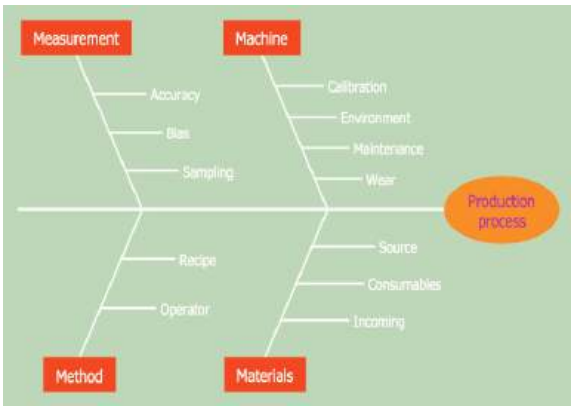


Fig. 4.2.1: Tools for problem identification

Tool	Purpose	Tool
 **Pareto Analysis (80/20 Rule)**	Prioritise problems by frequency or impact	80% of quality defects come from 20% of operations
 **Control Charts**	Monitor process variation over time	Stitch length variation outside control limits indicates machine issue
 **Fishbone Diagram (Ishikawa)**	Identify root causes of problems	Low line efficiency traced to poor layout, untrained labour, and old machines

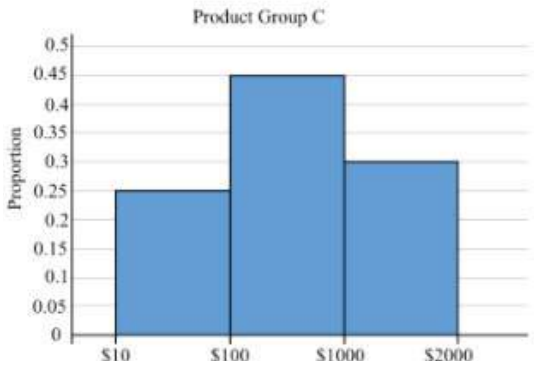
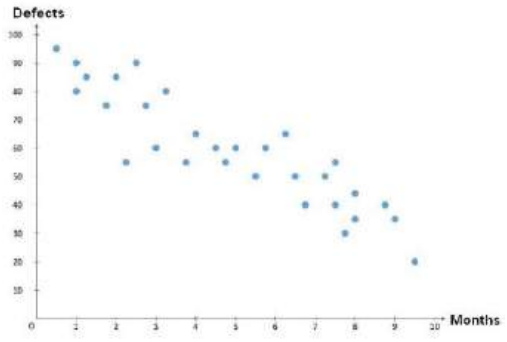
Tool	Purpose	Tool
 **Histogram**	Visualise data distribution	Helps in analysing frequency of defects per type
 **Scatter Diagram**	Check correlation between variables	Correlate operator skill level with defect rate

Table 4.2.6: Key Statistical Tools in Manufacturing

Benefits of Statistical Tools in Garment Production:

- Enables fact-based decision making
- Early identification of problems before they worsen
- Supports process stability and consistency
- Aids in root cause analysis and corrective action planning

UNIT 4.3: Productivity, Operations, and Efficiency

Unit Objectives

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

1. Analyse labour utilisation standards and cost analysis systems to enhance productivity.
2. Provide feedback on methods to improve utilisation of personnel, materials, and utilities.
3. Develop garment manufacturing methods in alignment with organisational goals.
4. Identify the sequence of operations in the garment manufacturing process.
5. Evaluate the method to adopt for machine operations.
6. Review the production process based on method and machine requirements.

4.3.1 Labour Utilisation and Cost Analysis

Labour Utilisation

Labour utilisation refers to how effectively the workforce is engaged in productive work during a given time period. High labour utilisation ensures that employee skills and time are used efficiently. It involves aligning operator skills with the right tasks, ensuring balanced workloads across production lines, and monitoring efficiency through metrics like output per hour and efficiency percentage.

Formula:

Labour Utilisation (%) = (Productive Time ÷ Total Time Available) × 100

Cost Analysis

This involves breaking down the total cost of production into its components - labour, material, overheads - and identifying where savings can be made. It typically includes direct costs such as fabric, trims, accessories, and direct labour, along with indirect costs like machine depreciation, factory overheads, utilities, and administrative expenses. Industrial engineers and production managers use cost analysis to identify cost-saving opportunities, optimize resource allocation, and ensure competitive pricing while maintaining quality.

Cost Component	Description	Example
Labour Cost	Wages paid to workers per unit of output	₹10 per shirt
Material Cost	Fabric, thread, buttons	₹30 per shirt
Overhead Cost	Rent, utilities, maintenance	₹5 per shirt
Total Cost	Sum of all above	₹45 per shirt

Table 4.3.1: Cost Analysis

4.3.2 Use of Personnel, Materials, Utilities

Efficient use of personnel, materials, and utilities is critical for smooth production, cost control, and timely delivery. Each element must be managed effectively to avoid waste, ensure quality, and maintain productivity.

- **Personnel:** Operators, helpers, supervisors, quality checkers, industrial engineers, mechanics.
- **Materials:** Fabrics, sewing threads, buttons, zippers, labels, trims, packaging materials.
- **Utilities:** Electricity, water, steam (for ironing/finishing), compressed air, lighting, HVAC systems.

To enhance productivity, feedback must be collected from the floor and management, and applied through structured problem-solving.

Aspect	Improvement Method	Result
Personnel	Multi-skilling operators, clear work instructions	Flexibility, fewer delays
Materials	Lean inventory system, quality checks at entry	Reduced wastage, better quality output
Utilities	Optimise electricity and water usage	Cost savings, sustainability

Table 4.3.2: Improvement for Production

4.3.3 Manufacturing Methods and Organisational Goals

Organisations have specific goals such as low defect rate, faster delivery, or sustainable production. Manufacturing methods should align with these.

Goal	Method Developed
Reduce delivery time	Implement lean and just-in-time systems
Improve quality	In-line inspection, better training
Sustainability	Use of eco-friendly fabric, minimise water use

Table 4.3.3: Example

4.3.4 Sequence of Operations in Garment Manufacturing

The sequence of operations is the order in which various processes are carried out in garment manufacturing. A standard sequence ensures consistency and smooth flow. A deviation in sequence can cause delays or errors, hence mapping operations correctly is vital.

Fig 4.3.4: Sequence of operations in manufacturing a garment

Sequence of Operation in Shirt Production

Step No.	Operation	Description
1	Cutting	Fabric is cut into required shapes
2	Sewing	Components like collars, sleeves attached
3	Finishing	Ironing, thread trimming
4	Quality Control	Checking dimensions and defects
5	Packing	Final product is folded and packed

4.3.5 Machine Operation Methods

In the apparel industry, machine operation methods refer to the standardized ways in which sewing and allied machines are used to carry out production processes efficiently and safely. These methods ensure consistency in stitch quality, minimize defects, and optimize production speed.

Each machine (lockstitch, overlock, buttonhole, etc.) has specific uses. Choosing the right method ensures high speed, low breakdown, and quality output.

Key machine operation methods include the following list:

Standard Operating Procedures (SOPs)

- **Clear instructions on how each machine (e.g., lockstitch, overlock, flatlock, buttonhole) should be operated.**

Operation Standardization

- **Using time and motion studies to define the most efficient method of performing each task.**

Work Aids and Attachments

- **Utilizing folders, guides, and special machine attachments to improve accuracy and reduce operator fatigue.**

Ergonomic Workstation Setup

- **Arranging machines, chairs, and work tables for operator comfort and efficiency.**

Preventive Maintenance Practices

- **Ensuring machines are regularly oiled, cleaned, and adjusted for smooth functioning.**

Safety Methods

- **Training operators in safe machine handling, needle guard use, and emergency stop practices.**

Fig. 4.3.5: Key machine operation methods

These methods not only improve productivity but also help maintain quality standards, reduce production downtime, and ensure worker safety. Key considerations include the following list:

- Machine capability (e.g., only overlocks can do edge-finishing)
- Operator skill

- Garment material type
- Operation complexity

Garment Component	Recommended Machine	Why
Seams	Single Needle Lockstitch	Precise and clean stitching
Side Finishing	Overlock Machine	To prevent fraying
Button Holes	Button Hole Machine	Accurate and fast buttonhole creation
Bottom Hem	Flat Lock Machine	Ideal for stretch fabrics and seamless finish

4.3.6 Process of Reviewing the Production Process

This involves evaluating efficiency, identifying bottlenecks, and suggesting improvements.

Aspects to Review:

- Man-to-machine ratio
- Machine downtime
- WIP (Work in Progress) inventory
- Line balancing issues

Checkpoints	Observations	Action Needed
Line balance	Operators idle in certain areas	Redistribute work evenly
Machine maintenance	2 machines down per shift	Schedule preventive maintenance
Output vs Target	120 pcs vs 150 pcs	Identify slow process or skill gaps
Quality Issues	6% DHU observed	Conduct training on defective operations

Table 4.3.4: Sample Production Review Checklist

Summary

- Production systems such as Progressive Bundle, Modular, and Unit Production Systems are assessed for their suitability based on product complexity, order size, and required flexibility.
- Problem management involves identifying production faults early, categorizing them by severity, and reporting them to the correct authority within the organisation.
- Re-engineering of processes focuses on eliminating inefficiencies, improving layout and flow, and enhancing output quality, supported by benchmarking key performance indicators.
- Statistical and mathematical tools like Pareto charts, control charts, and basic efficiency calculations support data-driven problem-solving and continuous improvement.
- Labour and cost analysis help identify areas of underutilisation, enabling supervisors to optimise workforce deployment and reduce unnecessary overheads.
- Manufacturing methods and machine alignment are reviewed to ensure operations are sequenced properly, reducing time losses and maintaining quality consistency.
- Feedback mechanisms and structured reviews encourage frontline workers to suggest process improvements, thereby fostering a culture of shared productivity responsibility.

Exercise

Multiple-choice Question:

1. Which production system is most suitable for large-scale, mass production with minimal product variation?
   a. Batch production system
   b. Unit production system
   c. Progressive bundle system
   d. Made-to-order production

2. When a fault occurs that exceeds the worker's scope of responsibility, it should be reported to:
   a. The customer directly
   b. The next available operator
   c. The designated supervisor or quality control officer
   d. The finance department

3. What is a key benefit of process re-engineering in a garment production unit?
   a. Increasing fabric consumption
   b. Delaying output for better quality
   c. Removing non-value-adding activities
   d. Hiring additional labour

4. Labour utilisation analysis helps in:
   a. Planning marketing campaigns
   b. Estimating wastage in cloth
   c. Evaluating workforce efficiency
   d. Scheduling holidays

5. Which of the following is an essential component of improving method and machine alignment in production?
   a. Raw material cost
   b. Operator lunch schedule
   c. Work-study analysis
   d. Export compliance

Descriptive Questions:

1. What are the key characteristics of different garment production systems, and how is the feasibility of each system assessed for a specific product?
2. How are production-related faults identified, reported, and escalated in a garment manufacturing setup?
3. What steps are involved in re-engineering a production process, and how does it help in setting new performance benchmarks?
4. How are labour utilisation standards and cost analysis systems used to enhance productivity in garment production?
5. What is the role of method selection and machine alignment in achieving operational efficiency in the apparel industry?

Notes

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

https://youtu.be/tLSqEvjzquo?si=i4KfNz09u8DRK1gI

M-37.Apparel quality analysis – initial inspection, quality standards and specifications in raw mate

https://youtu.be/xcHgdSh_T-o?si=F0DWE0dO9sHFqp0I

TYPES OF GARMENT PRODUCTION SYSTEMS

https://youtu.be/KQRWHPupdxQ?si=F56tPpruZtvGhvcY

Pareto Principle 80 20 Rule | Pareto's law 80 20 Rule Explained

https://youtu.be/7MPm_jDApc8?si=cLA25iukVSMydBkX

OPERATION BREAKDOWN IN APPAREL INDUSTRY

Skill India
कौशल भारत-कुशल भारत

सत्यमेव जयते
GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT
& ENTREPRENEURSHIP

N·S·D·C
RE IMAGINE FUTURE

5. Manage Data, Forms and Instructions for Recording, Evaluating and Reporting Quality and Reliability Data

APPAREL MADE-UPS HOME FURNISHING
SECTOR SKILL COUNCIL

Unit 5.1 - Organisational Framework and Communication

Unit 5.2 - Documentation Methods and Reporting Systems

Unit 5.3 - Storage, Retrieval, and Maintenance Practices

AMH/N2004

Key Learning Outcomes

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

1. Describe the organisation's policies and procedures.
2. Explain the protocol to obtain more information on work-related tasks.
3. Identify the documentation and reporting formats of the organisation.
4. Interpret the documentation framework related to industrial engineering.
5. Interpret the protocol and format for reporting work-related risks/ problems.
6. Analyse the method of obtaining/ giving feedback related to performance.
7. Interpret the process for offering/ obtaining work related assistance.
8. Explain the record keeping method followed in the organisation.
9. Explain how to evaluate information collected during the inspection.
10. Supervise the process of documentation of various processes.
11. Document the Operation Bulletin created to estimate SAM with productivity at the costing stage.
12. Record special and new operations via video and build a database for operations with Sewing Data Analysis software.
13. Explain the importance of teamwork and harmonious working relationships.

UNIT 5.1: Organisational Framework and Communication

Unit Objectives

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

1. Describe the organisation's policies and procedures.
2. Explain the protocol to obtain more information on work-related tasks.
3. List the documentation and reporting formats used by the organisation.
4. Interpret the documentation framework related to industrial engineering.
5. Interpret the protocol and format for reporting work-related risks or problems.
6. Analyse the method of obtaining and providing feedback related to performance.
7. Interpret the process for offering or obtaining work-related assistance.
8. Explain the importance of teamwork and harmonious working relationships.

5.1.1 Organisational Policies, Procedures, and Communication Protocols

Understanding and adhering to an organisation's policies and procedures is critical for maintaining workplace efficiency, safety, and compliance.

Key Organisational Policies Typically Include:

Policy Area	Description
Quality Assurance	Guidelines for maintaining product quality at every production stage.
Health, Safety and Environment	Procedures to ensure worker safety and minimize environmental risks.
Communication and Reporting	Protocols on internal communication and escalation procedures.
Data Privacy and Confidentiality	Handling sensitive information in compliance with company and legal standards.
Work Ethics and Conduct	Expected professional behaviour and team collaboration norms.

5.1.2 Documentation and Reporting Framework

Documentation is central to maintaining traceability and consistency in industrial operations. It facilitates communication, evaluation, and accountability.

Document Type	Purpose	Format/ Tool
Daily Production Report (DPR)	Logs daily output, defects, downtime	Excel, MIS software

Document Type	Purpose	Format/ Tool
Quality Control Checklist	Used at various stages to verify compliance with quality standards	Printed sheets, Tablets
Feedback Forms	Used for collecting employee/ supervisor input on processes	Google Forms, Paper Forms
Risk or Incident Report	Documents hazards, near-misses, or equipment failure	Standardised Risk Format
Work Instructions (WI)	Detailed guidance on how to perform specific tasks	Visual/step-by-step formats
Task Assignment Logs	Allocation of roles, responsibilities, and deadlines	Excel Sheets, Digital Logbooks

Table 5.1.1: Common Documentation Formats

5.1.3 Work-Related Communication and Feedback Mechanisms

Effective work-related communication and structured feedback mechanisms are essential for smooth production flow, teamwork, and problem-solving. Communication occurs vertically (between management, supervisors, and operators) and horizontally (between departments such as cutting, sewing, and finishing). Clear communication helps prevent misunderstandings and ensures all team members are aligned on objectives, timelines, and expectations. Feedback mechanisms, such as supervisor check-ins, suggestion boxes, performance reviews, and grievance reporting systems, allow workers to share concerns, suggest improvements, and receive guidance. These practices build transparency, strengthen trust, and ensure that production issues are quickly identified and resolved, leading to higher efficiency and quality.

Methods of Obtaining Information and Assistance:

- **Standard Operating Procedures (SOPs):** Written guidelines that provide step-by-step instructions for tasks.
- **Work Instructions/Operation Bulletins:** Detailed instructions given for specific styles, operations, or production targets.
- **Supervisor/Line In-Charge Support:** Direct guidance and problem-solving assistance from immediate supervisors.
- **Training Sessions & Demonstrations:** Hands-on learning opportunities to clarify methods and improve skills.
- **Digital Tools & MIS Dashboards:** Real-time data access on production, quality, and inventory for quick decision-making.
- **HR or Admin Support:** Assistance for policies, grievances, or welfare-related queries.

Feedback Type	Purpose	How It is Given/ Received
Performance Feedback	Supervisor's review of operator efficiency and quality	Review meetings, scorecards

Feedback Type	Purpose	How It is Given/ Received
Process Improvement	Suggestions from workers on process optimisation	Suggestion box, digital submissions
Peer-to-Peer Feedback	Promotes team coordination and collaboration	Group discussions, anonymous forms

Table 5.1.2: Feedback Channels

5.1.4 Teamwork and Harmonious Workplace Relationships

Teamwork is essential in industrial environments to avoid bottlenecks and ensure smooth production. It also boosts morale and helps in problem-solving.

Strategies to Promote Harmonious Work Culture

- Conduct regular team meetings and cross-functional reviews.
- Encourage inclusive participation during brainstorming or quality circles.
- Resolve conflicts quickly using internal grievance redressal mechanisms.
- Celebrate milestones and recognise individual and team achievements.

5.1.5 Industrial Engineering Documentation

In an industrial engineering context, documentation assists in process planning, productivity improvement, and cost control.

Examples of IE-Related Documents

Document	Purpose
Standard Operating Procedure (SOP)	Defines time and motion standards for tasks
Line Layout Plan	Maps workstation positioning for efficiency
Method Study Sheets	Analyses worker movements and suggests improvements
Production Planning Sheet	Schedules materials, machines, and labour per line needs
Control Charts	Track process variations for quality control

UNIT 5.2: Documentation Methods and Reporting Systems

Unit Objectives

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

1. Explain the record-keeping methods followed in the organisation.
2. Monitor the documentation process for various organisational functions.
3. Document the operation bulletin to estimate SAM with productivity at the costing stage.
4. Demonstrate the process of recording special or new operations using video and sewing data analysis software.
5. Explain how to evaluate information collected during inspections.
6. Demonstrate report writing methods and techniques.
7. Ensure all reports and documents are prepared as per the specified format.
8. Maintain and store all reports in a safe and secure condition as per organisational norms.
9. Maintain confidentiality of reports, data, and analysis where applicable.
10. Document the operation bulletin as per the organisation's procedure and protocol.
11. Record relevant information using appropriate data management software effectively.
12. Check and validate the operation bulletin and SAMs on the production floor to regulate unnecessary operations.

5.2.1 Organisational Record-Keeping and Documentation Practices

Organisations typically maintain several categories of records across departments such as production, quality, maintenance, and HR. Record-keeping ensures accountability, compliance, and data integrity.

Types of Records and Their Purposes

Record Type	Purpose	Storage Format
Production Logs	Record daily output, line efficiency, breakdowns	Digital/Printed formats
Quality Inspection Sheets	Log of defects, inspection remarks, acceptance/ rejection status	Tablets, Paper checklists
Operation Bulletins (OB)	Standard process flow with SAM values per operation	Excel, IE Software
Maintenance Records	Track machine service schedules and repairs	Maintenance Log Systems
Training Records	Document employee skill levels and training completions	HRM software/ manual files

5.2.2 Monitoring and Managing the Documentation Process

Supervisors and industrial engineers must routinely monitor documentation across various functions to:

- Ensure forms are filled correctly and consistently.
- Validate entries and identify discrepancies.
- Coordinate between departments to streamline data flow.
- Maintain updated documentation aligned with real-time floor changes.

Common Monitoring Tools:

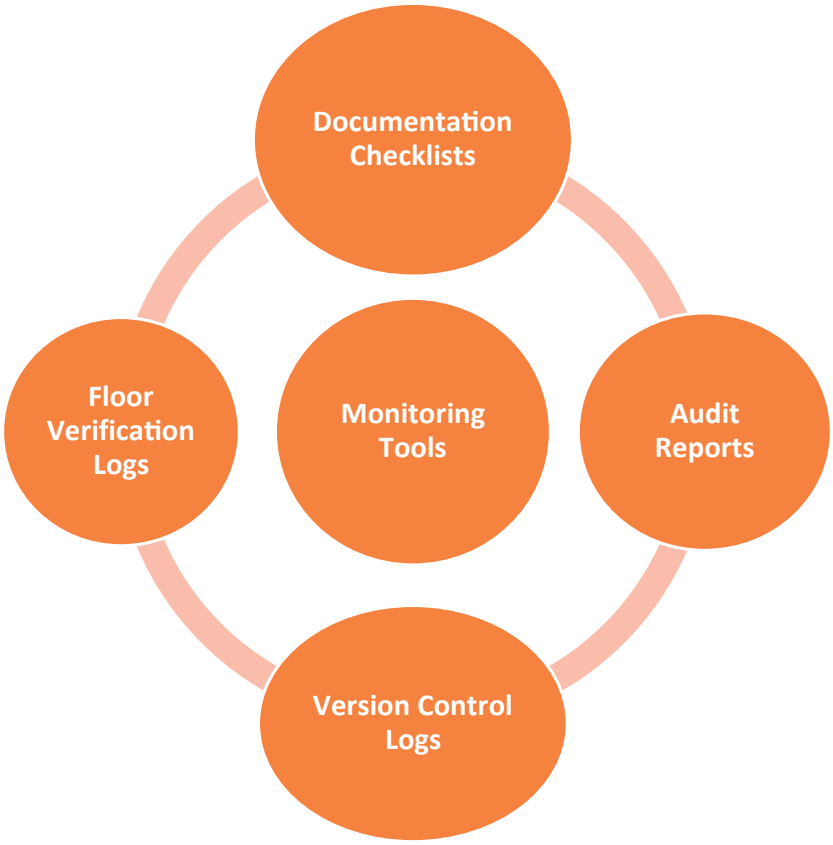


Fig. 5.2.1: Monitoring Tools

- **Documentation Checklists:** These are structured tools used to ensure that all necessary documents, tasks, or data entries have been properly completed and recorded. A documentation checklist typically includes a list of required documents or procedures, alongside columns for verification, dates, remarks, and responsible personnel. It ensures consistency, helps avoid omissions, and is especially useful during audits or quality inspections. For example, a checklist for a production line may include operation bulletins, quality log sheets, and layout plans, ensuring everything is updated and in use.
- **Audit Reports:** These summarize the outcomes of internal or external audits conducted to verify compliance with operational, quality, safety, or documentation standards. These reports usually contain findings, non-compliance issues, corrective action plans, and compliance scores. They are essential for identifying gaps in processes, initiating improvements, and ensuring accountability among team members. Regular audits help maintain a standardised workflow and can cover product quality, process efficiency, documentation accuracy, and even safety practices.

- **Version Control Logs:** These logs track every change made to official documents such as operation bulletins, SOPs, quality manuals, or training guides. Each time a document is revised, a new version is created and recorded along with details such as the version number, update date, reason for change, and the person responsible. Version control prevents the use of outdated or incorrect information and ensures that everyone on the production floor is referring to the latest and approved document, which is crucial for maintaining accuracy and efficiency in operations.
- **Floor Verification Logs:** These logs are used to confirm that documented processes and standard operating procedures are being followed correctly on the production floor. They typically include observations related to machine setups, operator compliance with instructions, display of quality control checklists, and whether operation bulletins are being referred to and followed. Supervisors or quality officers use these logs to note any deviations, take corrective actions, and document follow-ups, thus ensuring real-time adherence to protocols.

5.2.3 Operation Bulletin (OB) and SAM at Costing Stage

An Operation Bulletin (OB) is a foundational industrial engineering document used to define and standardize operations on the production floor. It contains:

- Garment style information
- List of all operations (sewing, pressing, inspection)
- Machine types
- Operator skill category
- SAM for each task

NO	OPERATION	M/C	S.M.V	TGT	MAN REQ	MAN ALCT	Plan Work Station
1	CARE LABEL ATTACH	SNL	0.12	500	0.36	0.5	1
2	PLACKET ATTACH POSITION MARK	MNL	0.25	240	0.74	0.5	1
3	PLACKET ROLLING & MARK	SNL	0.32	188	0.95	1	1
4	PLACKET ATTACH	SNL	0.4	150	1.19	1	1
5	PLACKET CUT & NOSE TK	SNL	0.27	222	0.8	1	1
6	FRONT & BACK PART MATCH	MNL	0.15	400	0.45	0.5	1
7	SHOULDER JOINT	4OL	0.3	200	0.89	1	1
8	NOSE NECK RIB MEASURE & CUT	MNL	0.2	300	0.59	0.5	1
9	NOSE NECK RIB TK WITH BODY	SNL	0.32	188	0.95	1	1
10	NOSE NECK RIB JOIN	4OL	0.32	188	0.95	1	1
11	NECK TS	FL	0.25	240	0.74	0.5	1
13	PLACKET CLOSE & 1/16 UPPER	SNL	0.32	188	0.95	1	1
12	PLACKET CLOSE & 1/16 LOWER	SNL	0.32	188	0.95	1	1
14	PLACKET BOX	SNL	0.4	150	1.19	1	1
15	NECK PIPING	FB	0.23	261	0.68	1	1
16	MAIN LBL ATTACH WITH CORNER FOLD	SNL	0.32	188	0.95	1	1
17	SLV HEM	FL	0.33	182	0.98	1	1
18	SLEEVE AND BODY MATCH	MNL	0.15	400	0.45	1	1
19	SLEEVE JOINT	4OL	0.45	133	1.34	1	1
20	ARM HOLE T/S	FL	0.32	188	0.95	1	1
21	SIDE SEAM	4OL	0.7	86	2.08	2	2
22	SLEEVE CLOSE & OPEN TACK	SNL	0.37	162	1.1	1	1
22	BODY HEM	FL	0.33	182	0.98	1	1
22	BUTTON HOLE	BH	0.3	200	0.89	1	1
22	BUTTON ATTACH MARK	BS	0.27	222	0.8	1	1
22	BUTTON PUSH	MNL	0.2	300	0.59		
22	FINAL THREAD CUT & STICKER REMOVE	MNL	0.5	120	1.49	1	1
			8.41		**25**	**25**	**27**

Fig. 5.2.2: Operation Bulletin of a T-shirt

Sample Operation Bulletin Table

Operation No.	Description	Machine Type	SAM (min)	Skill Level	Work Aids
1	Shoulder Join	Overlock	0.50	Skilled	None
2	Sleeve Attach	Single Needle	0.75	Semi-skilled	Guiding Edge
3	Bottom Hem	Flatlock	0.60	Skilled	Folder

Purpose at Costing Stage

Estimating SAM at the costing stage helps calculate:

Fig. 5.2.3: Benefits of estimating SAM at the costing stage

5.2.4 Recording of Special or New Operations Using Technology

Special Operations are non-routine or complex tasks that are not part of standard sewing or assembly processes. They usually require additional skills, equipment, or handling. Examples include:

- Embroidery placement and applique work.
- Attaching special trims, beads, sequins, or lace.
- Garment dyeing or special wash processes (acid wash, enzyme wash).
- Bonding, seam sealing, or ultrasonic joining for activewear.

New Operations are recently introduced processes, methods, or machine-based operations that are not yet standardized within the factory. They arise due to new buyer requirements, changes in garment design, or adoption of advanced machinery. Examples include:

- Laser cutting of fabric for precision finishing.
- Digital printing instead of screen printing.
- Automated pocket setting or collar attaching machines.
- Use of robotics or AI-enabled sewing systems.

New or non-standard operations (e.g., a newly introduced seam type or finishing process) require proper analysis and standardization.

Industrial engineers now use advanced tools to record and analyse these operations with higher accuracy:

- Video Time Study Software (e.g., Camtasia, Ergo Timer, UMT Plus) for capturing cycle times and operator motion analysis.

Fig. 5.2.4: Camtasia Software Logo

- Motion Capture & Wearable Sensors to track operator movement and ergonomics in special tasks.

Fig. 5.2.5: Wearable Sensors

- RFID & Barcode Tracking to record handling times for trims and accessories.

Fig. 5.2.6: RFID & Barcode Tracking

- AI-Based Productivity Tools for real-time data collection from sewing machines and automated stations.

Fig. 5.2.7: Machine Learning in Textile Industry

- Digital Production Monitoring Systems (e.g., GPRO, Pro-SMV) to log SMV (Standard Minute Value) and efficiency for new operations.

Fig. 5.2.8: Production Monitoring System

5.2.5 Data Evaluation and Report Writing

Collected data from quality checkpoints or final audits must be analysed to:

- Identify trends in defects
- Recognize recurring issues with machines or operators
- Guide corrective and preventive actions (CAPA)

Sample Evaluation Format

Parameter	Defects Observed	Frequency	Root Cause	Action Taken
Stitch Skipping	12	High	Needle damage	Needle changed, retrain
Uneven Seams	6	Medium	Operator error	Skill upgrade training

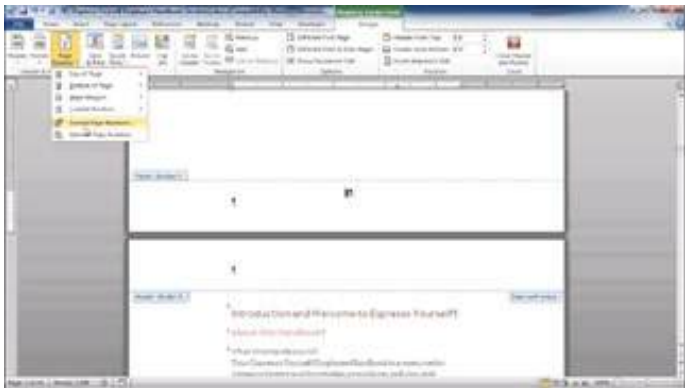
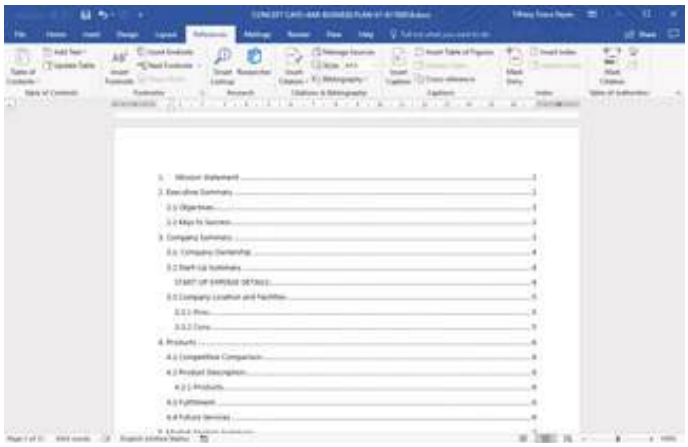
Report Writing Techniques:

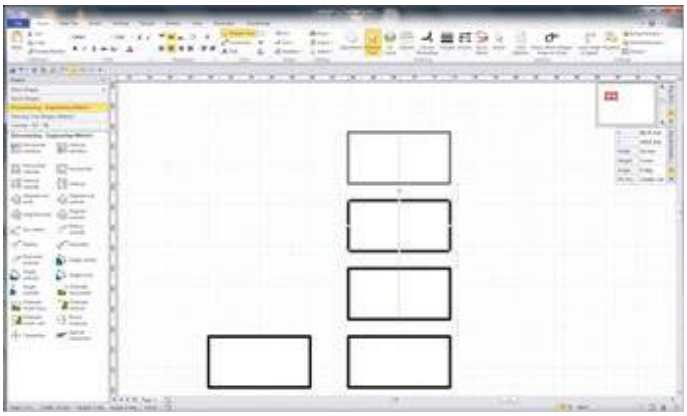
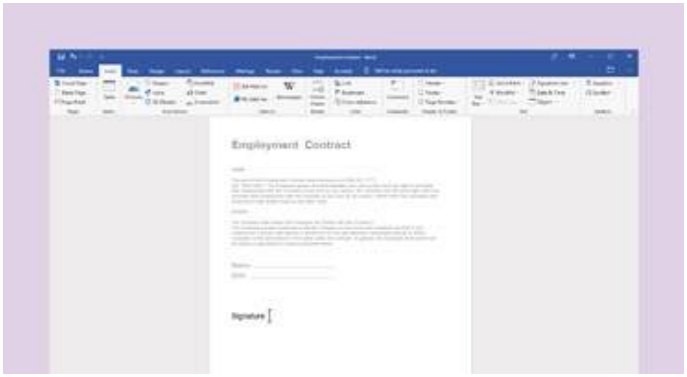
- Use structured templates (Introduction, Observation, Analysis, Conclusion, Recommendations).
- Maintain objectivity.
- Include data charts and root cause analysis tools like fishbone diagrams or Pareto charts

5.2.6 Report Formatting, Storage, and Confidentiality

All documents and reports must adhere to the organisational template and protocol to ensure uniformity and compliance.

Formatting Essentials

Element	Requirement
 **Header/ Footer**	Company name, report title, date, preparer details
 **Table of Contents**	For longer reports

Element	Requirement
 **Visual Aids**	Charts, graphs, photos for better comprehension
 **Signature/ Approval Line**	To validate and authorise

Storage and Confidentiality Norms:

- Store reports in centralised digital repositories or secured physical archives.
- Restrict access to sensitive documents via password protection or role-based access.
- Maintain data confidentiality under NDAs or internal data-sharing policies.

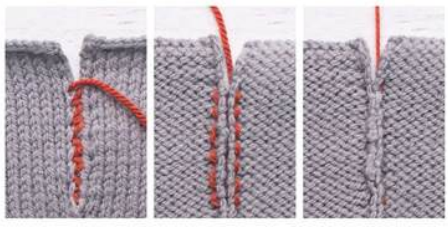
5.2.7 Operation Bulletins and SAM

Once an Operation Bulletin (OB) is prepared - outlining all steps in the manufacturing process, Standard Allowed Minutes (SAM) for each operation, machine types, and manpower required - it is crucial that the OB undergoes validation in real-world conditions on the production floor. This ensures that the documented plan is both realistic and efficient under actual working environments. Validation helps identify discrepancies between estimated and observed times and allows managers to refine production plans accordingly.

Key Steps in Validation

1. **Time Study in Normal Conditions:** Time measurements are taken for each operation performed by average-skilled operators under standard working conditions (not rushed or slowed down). This real-time observation helps assess whether the estimated SAMs are accurate or need revision.

2. **Comparative Analysis:** Observed times are compared with the original estimates from the OB. If the variance is significant (e.g., more than ±10–15%), it indicates the need for either process adjustment, skill development, or OB modification.
3. **Workflow Streamlining:** During validation, redundant or unnecessary operations may be discovered—such as overlapping steps or repeated handling of garments. These inefficiencies should be removed to optimize the process.
4. **SAM Adjustment and Training:** If observed times are consistently higher than estimated SAMs, it may reflect unrealistic planning or lack of operator skill. In such cases, either the SAM should be revised upward, or the operator must be retrained to meet standard performance. Similarly, if the observed time is much less, the OB can be updated for better target setting.

Operation	Estimated SAM	Observed Time	Variance (%)	Action Taken
 **Collar Stitching**	1.0 min	1.2 min	+20%	Adjust SAM or provide retraining to operator
 **Label Attachment**	0.4 min	0.3 min	-25%	Update OB to reflect improved efficiency
 **Side Seam Joining**	1.5 min	1.6 min	+6.7%	Acceptable; monitor over time

Operation	Estimated SAM	Observed Time	Variance (%)	Action Taken
 **Button Fixing**	0.8 min	1.1 min	+37.5%	Investigate if tooling or method needs change
 **Final Pressing**	2.0 min	1.9 min	-5%	Keep as is; within tolerance

Table. 5.2.9: Validation Process Table

Why Validation Matters:

Prevents Bottlenecks

Accurate SAMs and OBs help balance production lines and avoid overburdening or underutilizing operators

Improves Costing Accuracy

SAMs feed into labour costing models; incorrect SAMs can result in flawed cost estimates

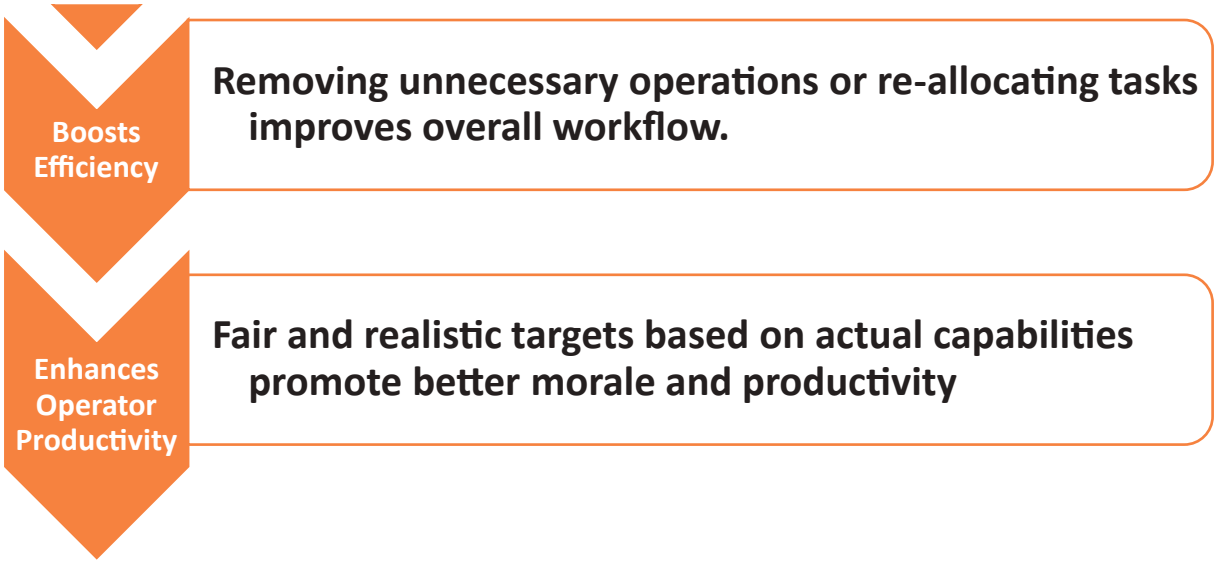
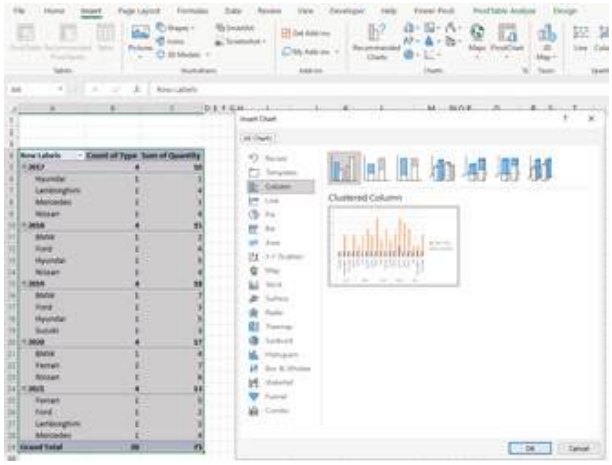


Fig. 5.2.9: Importance of Validation

5.2.8 Data Management Software and Digital Tools

Using appropriate software enhances accuracy, enables real-time updates, and promotes analytical insights.

Commonly Used Software in Apparel/ Manufacturing Documentation:

Software	Functionality
 **Excel/MIS**	Data entry, charting, report generation
GSD/CloTime	Time and motion study, SAM estimation

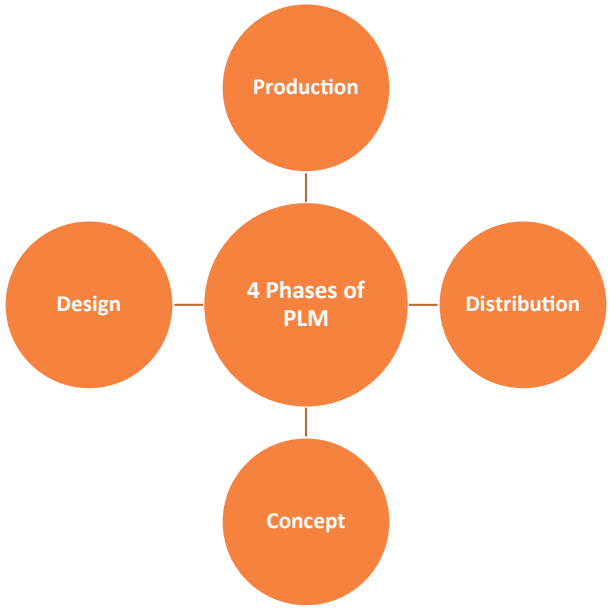
Software	Functionality
 **PLM (Product Lifecycle Mgmt.)**	Version control, process flow mapping
 **ERP (e.g., SAP)**	Integrated business reporting and operations

Table 5.2.10: Commonly Used Software

Best Practices:

- Regular backups
- Data access protocols
- Continuous training of staff

UNIT 5.3: Storage, Retrieval, and Maintenance Practices

Unit Objectives

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

1. List the guidelines for the storage of records.
2. Maintain documents such as standard operating procedures according to organisation norms.
3. Store the records, SOPs, and analysis documents for easy retrieval when required.
4. Store the information following organisational norms.

5.3.1 Guidelines for Storage of Records

Proper storage of records is essential for compliance, traceability, and smooth business operations. Records may include production reports, quality inspection logs, compliance documents, export papers, and employee files. To ensure systematic documentation, organisations usually define protocols for the classification, labelling, archiving, and access control of various types of records.

Criteria	Standard Practice
File Classification	Categorised by department, project, date, and document type (e.g., SOPs, audits).
Format	Digital (PDF, Excel, Word) or Physical (paper-based) as per organisational practice.
Labelling	Clearly labelled with file name, code, revision date, and owner department.
Storage Location	Stored in centralised document repositories or cloud-based platforms.
Retention Period	Specified in document control policy; usually 3–7 years or per legal/ regulatory norms.

Table 5.3.1: Storage Guidelines

The following table presents a Record Classification Scheme that outlines how different types of documents are categorized, stored, and retained across departments in the apparel industry.

Document Type	Department	File Format	Retention Period	Storage Location
SOPs	Production	PDF/ Hardcopy	5 years	SOP Folder, Drive/ Archive
Quality Inspection	QA/QC	Excel	3 years	QMS Software, SharePoint
SAM & OB Documents	IE Dept.	Excel/Printed	5 years	OB File Cabinet

Table 5.3.2: Record Classification Scheme

5.3.2 Maintenance of Standard Operating Procedures (SOPs)

SOPs are essential documents outlining standard methods to perform tasks safely and efficiently. These must be regularly reviewed, updated, and stored in a manner that ensures availability and traceability.

Maintenance Steps:

- SOPs are assigned version numbers and revision dates.
- Updates are approved by concerned authorities before implementation.
- A record of obsolete SOPs is maintained separately to avoid accidental usage.
- SOPs are made accessible to all relevant departments.

Sample Table for SOP Maintenance Log has been provided below:

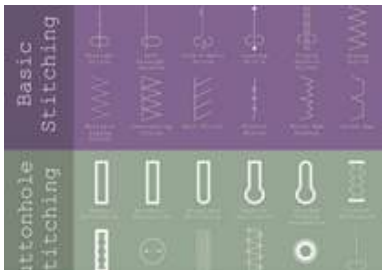
SOP Name	Version	Last Revised	Department	Status	Remarks
 **Stitching Guidelines**	V2.1	10-May-2024	Production	Active	Updated workflow steps
 **Pressing Procedure**	V1.0	15-Jan-2023	Quality	Archived	Replaced by new version
 **Packing Protocol**	V3.0	01-Jul-2025	Logistics	Active	Includes new carton sizes

Table 5.3.3: SOP Maintenance Log

5.3.3 Storing Records, SOPs, and Analysis Documents for Retrieval

Proper storage ensures quick retrieval of records for decision-making, audits, or quality reviews.

Retrieval Best Practices:

Fig. 5.3.1: Practices to retrieve data

- **Indexing:** Assign a unique code or tag to each document for searchability.
- **Digitisation:** Scan physical documents and store them in cloud or document management systems.
- **Access Control:** Assign access rights to avoid unauthorised modification or deletion.
- **Backups:** Maintain regular backups (physical and cloud-based) to prevent data loss.

Document Name	Storage Platform	Access Level	Backup Frequency
OB - Style #456	Google Drive	IE Manager Only	Weekly
Quality Inspection Logs	Internal Server	QA Team and Manager	Daily
Training Records	HRMS System	HR Dept Only	Monthly

Table 5.3.4: Sample Table: Digital Storage and Access Protocol

5.3.4 Organisational Norms for Information Storage

Organisations follow defined data security, confidentiality, and retrieval norms. These norms comply with internal SOPs and external regulations like ISO 9001 or GDPR (where applicable).

Common Norms:

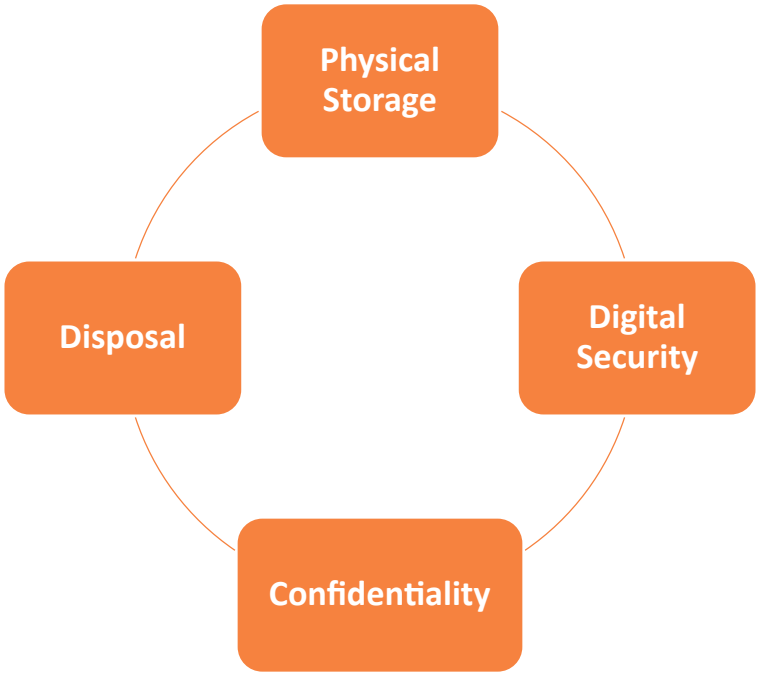


Fig. 5.3.2: Common Organisational Norms for Information Storage

- **Physical Storage:** Use fireproof cabinets, lockable drawers, and climate-controlled storage.
- **Digital Security:** Use encryption, password protection, role-based access, and audit logs.
- **Confidentiality:** Sensitive data (e.g., employee performance, costing sheets) must be marked "Confidential" and shared only on a need-to-know basis.
- **Disposal:** Obsolete documents are shredded or digitally purged as per retention policy.

Example: Confidentiality Practice for Sensitive Documents

Document Type	Classification	Access By	Storage Method
Salary Records	Confidential	HR and Accounts Head	Password-protected folder
SAM with Costing	Restricted	IE and Production Head	Secured shared drive
Audit Non-Conformance Log	Internal Use Only	QA, Compliance Officer	Printed file and digital backup

Summary

- Operation Bulletins (OB) and Standard Minute Values (SAM) are key tools in documenting and standardising each operation in garment manufacturing to ensure time and cost efficiency.
- SAM values must be validated on the floor by observing actual operator performance under normal conditions and updating the OB accordingly.
- Monitoring tools like documentation checklists, audit reports, and floor verification logs help track compliance and identify gaps in execution.
- Version control is essential for ensuring the most current documents are used, with proper archival of outdated versions.
- Validation processes help to refine OBs by removing redundant tasks and ensuring estimated SAM aligns with real-time performance.
- Record storage and retrieval practices should align with organisational norms, ensuring confidentiality, traceability, and regulatory compliance.
- Standard Operating Procedures (SOPs) and analysis documents must be maintained in structured formats with proper indexing, security, and scheduled backups for effective document management.

Exercise

Multiple-choice Question:

1. What is the primary purpose of a Standard Minute Value (SAM)?
   a. To calculate material costs
   b. To estimate time required for an operation
   c. To check garment size
   d. To determine defect rates

2. Which of the following is NOT a common document monitoring tool?
   a. Documentation Checklist
   b. Floor Verification Log
   c. Sewing Machine Calibration
   d. Audit Report

3. What does version control in documentation help prevent?
   a. Loss of raw materials
   b. Operator absenteeism
   c. Use of outdated documents
   d. Fabric shrinkage

4. In document storage, indexing refers to:
   a. Increasing file size
   b. Creating file backups
   c. Assigning unique identifiers for easy retrieval
   d. Printing extra copies

5. What action is appropriate if observed SAM is significantly lower than estimated SAM during validation?
   a. Discard the OB
   b. Reduce operator wages
   c. Update OB to reflect efficiency
   d. Eliminate the operation

Descriptive Questions:

1. Explain the steps involved in preparing and validating an Operation Bulletin (OB) and SAM on the production floor.
2. Discuss the importance of version control and audit trails in the documentation process.
3. Describe the best practices for storing and retrieving SOPs and analysis documents in a manufacturing unit.
4. What are the various monitoring tools used to ensure effective implementation of documented processes on the production floor?
5. What are the organisational norms that must be followed while maintaining and storing documents like OBs, SOPs, and inspection records?

Notes

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

https://youtu.be/i_nAab4p6xw?si=6tqtbJe5sO4b14Nk

TYPES OF OPERATION BULLETIN

https://youtu.be/gBXJ_PhlADQ?si=LISAOAkEuLWYjyqj

Enterprise Resource Planning (ERP) in 15 minutes

Skill India
कौशल भारत-कुशल भारत

सत्यमेव जयते
GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT
& ENTREPRENEURSHIP

N·S·D·C
RE IMAGINE FUTURE

6. Adhere to Industry, Regulatory, and Organizational Standards and Embrace Environmentally Sustainable Practices

APPAREL MADE-UPS HOME FURNISHING
SECTOR SKILL COUNCIL

Unit 6.1 - Ethics, Values and Workplace Conduct

Unit 6.2 - Regulations, Responsibilities and Reporting

Unit 6.3 - Sustainability, Resource Efficiency and Waste Management

AMH/N0621

Key Learning Outcomes

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

1. State the importance of having an ethical and value based approach to governance.
2. State benefits to self and the organisation due to practice of values and ethics.
3. State the importance of punctuality and attendance.
4. State customer specific requirements mandated as a part of the work process.
5. State country/customer specific regulations for the apparel sector and their importance.
6. State reporting procedure of the organisation in case of deviations.
7. State limits of personal responsibility.
8. Report any possible deviation to regulatory requirements.
9. Clarify doubts on policies and procedures, from the supervisor or other authorized personnel.
10. Explain importance of greening solutions, procedures, policies, legislation and regulations.
11. Discuss the significance of specified usage of resources at work area.
12. Evaluate the different ways to conserve energy in Apparel sector.

UNIT 6.1: Ethics, Values and Workplace Conduct

Unit Objectives

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

1. Explain the importance of an ethical and value-based approach to governance.
2. Describe the personal and organisational benefits of practising values and ethics.
3. Explain the significance of punctuality and attendance at the workplace.
4. Discuss the limits of personal responsibility in a professional environment.
5. Clarify doubts regarding workplace policies and procedures from supervisors or authorised personnel.
6. Follow organisational policies and procedures within the limits of one's authority.
7. Carry out work functions in line with organisational standards, including greening solutions, procedures, policies, and regulations.
8. Provide support to supervisors and team members in maintaining organisational considerations.

6.1.1 Ethics and Values in the Workplace

Ethics and values are fundamental principles that guide human behaviour. In an organisational context, these principles help establish a consistent, respectful, and trustworthy work environment. Ethics refer to the rules and standards governing professional conduct, while values are the internal beliefs that shape individual behaviour.

Practicing ethical behaviour in the workplace involves:

- Respect for colleagues and company property
- Integrity in handling work responsibilities
- Transparency in communication
- Accountability for one's actions

Organisational benefits of ethical practices:

Adopting ethical practices in an organization brings long-term and sustainable benefits. It helps in building trust among employees, customers, and stakeholders by ensuring fairness and transparency. Strong ethical standards also strengthen the brand reputation, making the company more reliable and appealing in the market. By complying with laws and regulations, organizations achieve reduced legal risks, avoiding penalties and disputes. Furthermore, an ethical work environment motivates employees, encourages accountability, and leads to improved productivity across operations.

Fig. 6.1.1: Advantages of ethical practices for an organisation

Benefits to the Organisation	Description
Trust Building	Builds trust between employees and management
Brand Reputation	Enhances corporate image in the market
Reduced Legal Risks	Prevents violations and disputes
Improved Productivity	Encourages a culture of responsibility and self-discipline

Table 6.1.1: Benefits of ethical practices

Personal benefits of ethics at work

Personal Impact	Example
Career growth	Ethical employees are considered for promotions and leadership roles
Job satisfaction	Working in a value-driven organisation increases morale
Respect from peers	Ethical behaviour earns admiration and trust

6.1.2 Workplace Conduct and Personal Responsibility

Maintaining professional conduct is not limited to work output but includes:

- **Punctuality:** Being on time for work, meetings, and task deadlines reflects reliability.
- **Regular Attendance:** Absenteeism affects not just individual performance but team output.
- **Professional Attitude:** Respecting diversity, showing courtesy, and maintaining a positive tone in interactions.

Acceptable vs. Unacceptable Conduct

Conduct Type	Acceptable Behaviour	Unacceptable Behaviour
Punctuality	Arriving 5-10 minutes early for tasks	Regular late arrivals
Communication	Listening actively, responding politely	Interrupting, yelling, ignoring
Appearance	Following dress code and hygiene standards	Unkempt appearance, ignoring safety gear
Work Ethics	Finishing work on time, helping colleagues	Blaming others, avoiding responsibilities

Limits of Personal Responsibility

Employees are expected to:

- Understand their job roles and act within their designated authority.
- Clarify ambiguous tasks with supervisors.
- Avoid taking decisions that require managerial oversight without permission.
- Report any unethical practice or risk, rather than ignoring it.

6.1.3 Organisational Policies, Communication, and Authority

Every organisation has defined policies and procedures to maintain operational discipline. Employees must:

- Familiarise themselves with the Code of Conduct, attendance policies, and safety rules.
- Approach authorised personnel (supervisor, HR officer, floor in-charge) for any clarification.
- Avoid relying on peer interpretations of rules - always check official sources.

Whom to Approach for Policy Clarification

Concern Area	Authorised Personnel to Approach
Leave or attendance	HR Department
Equipment malfunction	Technical Supervisor or Maintenance Head
Task or instruction doubt	Line Manager or Team Leader
Workplace safety	EHS Officer (Environment, Health & Safety)

6.1.4 Organisational Standards and Greening Practices

Sustainable practices are increasingly embedded into workplace responsibilities. Employees should:

- Adhere to environmental guidelines (reduce paper use, save energy, reuse/recycle where possible).
- Avoid wastage of materials and resources.
- Report any process that may harm the environment or violate compliance standards.

Fig. 6.1.2: Sustainable green practices for the workplace

Area	Sustainable Practice	Rationale
Paperwork	Use digital documents, e-signatures, and cloud storage instead of printing	Reduces paper waste and costs
Lighting	Turn off lights when not needed or use motion sensors	Saves electricity
Waste Management	Segregate waste (biodegradable, recyclable, hazardous); follow recycling protocols	Promotes responsible disposal
Resource Use	Avoid excessive use of water, glue, thread, packaging materials	Minimises material wastage
Equipment	Report leakages, overheating, or faulty machines	Prevents energy loss and hazards
Transport	Encourage carpooling, cycling, or public transport	Reduces emissions

Table 6.1.2: Best Practices for Greening the Workplace

UNIT 6.2: Regulations, Responsibilities and Reporting

Unit Objectives

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

1. Describe customer-specific requirements that are part of the work process.
2. Explain country or customer-specific regulations applicable to the apparel sector and their significance.
3. Interpret legal, regulatory and ethical requirements specific to the apparel industry.
4. Identify the procedures to follow when legal, regulatory or ethical requirements are not met.
5. Report possible deviations from regulatory requirements to the concerned authority.
6. State the internal reporting procedure for handling deviations in the organisation.

6.2.1 Customer-Specific Requirements

Customers often outline specific requirements related to product quality, safety, packaging, labelling, and workplace ethics. These may vary depending on the market.

Requirement Type	Examples
Product Compliance	Fabric composition, durability, wash care
Workplace Conditions	No child labour, fair wages, safe environment
Quality Control	Needle detection test, stitch consistency, colour fastness
Labelling Norms	Country of origin label, washing instructions, sizing
Packaging	Use of recycled/ recyclable packaging materials

Table 6.2.1: Common Customer-Specific Requirements

6.2.2 Country-Specific and Industry Regulations

Each country has statutory compliance frameworks governing labour rights, environmental safety, product standards, and export-import regulations. In addition, global industry standards (such as ISO, SA8000, and WRAP) may apply.

Key Indian Regulations for the Apparel Sector

Law / Regulation	Focus Area
Factories Act, 1948	Working hours, health & safety, welfare provisions
Minimum Wages Act, 1948	Payment of minimum wages to workers
Child Labour (Prohibition) Act	Prohibition of child labour below 14 years
ESI Act / PF Act	Social security contributions for employees

Law / Regulation	Focus Area
The Legal Metrology Act	Proper labelling of finished products
Environmental Regulations (CPCB norms)	Control of air, water, and noise pollution during manufacturing

Table 6.2.2: Key Regulations

6.2.3 Ethical Standards in the Apparel Industry

Ethical compliance in the apparel industry is about more than simply following the law—it requires every worker and stakeholder to uphold principles of honesty, fairness, integrity, and social responsibility in their daily work. While laws provide a minimum standard of behaviour, ethics represent the moral compass that guides workplace decisions, especially in situations where formal rules may not offer clear guidance.

Ethical practices create a culture of trust, safeguard worker dignity, ensure product quality, and build the brand's reputation in both domestic and international markets.

Key Ethical Expectations from Apparel Workers and Staff

1. **Avoid Misrepresentation of Work**
   - Workers must report issues such as defective stitching, improper sizing, or colour mismatches rather than concealing them.
   - Any attempt to cover up errors, whether to meet production targets or avoid penalties, can lead to product recalls, customer dissatisfaction, or even loss of contracts.

   Ethical Action: Report quality issues immediately to supervisors. Ensure corrective measures are taken instead of hiding the flaws.

2. **No Discriminatory Behaviour**
   - Discrimination based on caste, religion, gender, age, physical ability, or social background is unethical and often illegal.
   - All workers must be treated equally in terms of work assignments, wages, promotions, and access to facilities.

   Ethical Action: Foster an inclusive environment. Speak up if you witness unfair treatment of colleagues.

3. **Reject Bribery or Gifts**
   - Accepting money, gifts, or favours from vendors, suppliers, customers, or auditors in return for preferential treatment or false reports is unethical.
   - Even a small favour, such as a lunch or free samples, may create a conflict of interest or damage the credibility of internal decisions.

   Ethical Action: Politely decline offers of gifts or money and report such incidents to supervisors or the compliance team.

4. **Avoid Unethical Sourcing**
   - The use of raw materials from conflict zones, child labour, or exploitative suppliers is unethical and damages the reputation of the brand.
   - Materials should be sourced from suppliers that uphold fair trade, environmental standards, and labour rights.

   Ethical Action: Verify supplier credentials and report sourcing practices that seem unethical or unlawful.

Importance of Ethical Conduct During Audits

Audits are formal inspections conducted by clients, government bodies, or third-party certifiers to ensure compliance with laws and ethical standards. These may be announced or surprise audits.

- Transparency is essential. Attempting to mislead auditors by hiding records, training workers to lie, or staging temporary improvements is unethical.
- Providing truthful data, showing actual working conditions, and being open about areas of improvement builds long-term trust with clients.

Ethical Action: Be honest and cooperative during audits. Do not alter documentation or provide false information.

Why Ethical Standards Matter:

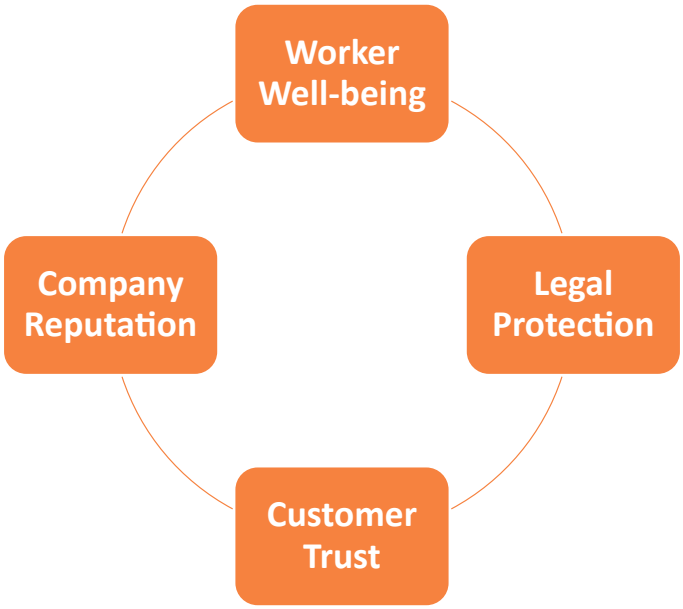


Fig. 6.2.1: Importance of Ethical Standards

- **Worker Well-being:** Ensures safe, fair, and respectful working conditions.
- **Legal Protection:** Prevents fines, factory shutdowns, or blacklisting due to unethical practices.
- **Customer Trust:** Global buyers and retailers increasingly demand ethical sourcing and production.
- **Company Reputation:** One unethical incident can lead to long-term reputational and financial loss.

Do's	Don'ts
Report quality defects honestly	Hide flaws in production
Treat all colleagues with respect	Discriminate or harass
Follow fair sourcing protocols	Use illegal or conflict-zone suppliers
Cooperate truthfully during audits	Bribe or lie to auditors
Refuse gifts and report bribery	Accept gifts/favours from vendors

Table 6.2.3: Do's and Don'ts for Ethical Behaviour

6.2.4 Handling Deviations from Regulations

Despite best efforts, violations may occur - intentionally or unintentionally. Employees must know what to do when such incidents happen.

Examples of Deviations:

- Poor ventilation or unsafe equipment on the shop floor
- Use of banned chemicals or non-compliant dyes
- Underage workers detected during inspection
- Mislabelled garments being packed for export

Action Plan for Employees for implementing the deviations from the regulations are as follows:

1. Stop the process or task if unsafe or non-compliant.
2. Report the issue immediately to the supervisor or compliance officer.
3. Document the nature of the deviation.
4. Cooperate during the internal investigation or audit.

6.2.5 Reporting of Deviations to Authorities

External Reporting:

In some situations, especially serious legal violations (such as child labour or serious environmental breaches), the matter may need to be reported to:

- Labour Department
- Pollution Control Board
- Customer/ Client Compliance Cell
- Third-Party Audit Body

Reporting must follow the chain of command, and whistle-blowers should be protected under the company's policy.

6.2.6 Internal Reporting Procedures

Every organisation will have a defined procedure for internal escalation of non-compliance or ethical violations. This includes:

Step	Action
Observation	Employee observes a deviation
Initial Report	Inform immediate supervisor or team leader
Documentation	Fill in non-compliance form/ log sheet
Escalation	Supervisor informs Compliance Officer or HR
Investigation	Internal team conducts root cause analysis
Corrective Action	Required training, process change, or disciplinary action initiated
Monitoring	Regular follow-up to ensure issue is resolved

Table 6.2.4: Steps for Internal Reporting Procedures

Summary Checklist for Employees

Task	Description
Know legal and customer regulations	Stay updated on workplace safety, wage laws, and quality norms
Follow SOPs	Avoid shortcuts or rule-bending
Stay ethical	Be transparent during audits; no bribery or false reporting
Report issues	Know when and how to escalate violations
Document properly	Fill non-compliance logs and incident reports clearly
Support compliance culture	Encourage teammates to act responsibly

UNIT 6.3: Sustainability, Resource Efficiency and Waste Management

Unit Objectives

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

1. Discuss the importance of greening solutions, relevant policies, and environmental regulations.
2. Evaluate the importance of resource usage and methods for energy conservation in the apparel sector.
3. Make conscious and sustainable decisions to promote an effective and green workplace.
4. Discuss the need to switch off machines when not in use for energy efficiency.
5. Demonstrate the correct method of handling and storing waste materials such as paper, sketches, colouring tools, and electronic waste.
6. Demonstrate the process of segregation of waste according to type and disposal guidelines.

6.3.1 Importance of Greening Solutions, Policies, and Environmental Regulations

In today's environmentally conscious world, the apparel industry is under increasing pressure to adopt sustainable practices, not only to meet legal standards but also to demonstrate social responsibility and environmental stewardship. Greening solutions are essential strategies that help reduce the ecological footprint of apparel manufacturing and promote long-term resource sustainability.

1. **Reducing Energy and Water Usage**

   Apparel production, particularly textile processing, consumes large amounts of energy (for running machines, heating, and lighting) and water (for dyeing, washing, and finishing processes).

   - By using energy-efficient machines, LED lighting, and solar panels, factories can lower their dependence on fossil fuels and reduce greenhouse gas emissions.
   - Implementing water recycling systems, rainwater harvesting, and low-water-use dyeing technologies can significantly decrease water wastage and prevent contamination of natural water sources.

   This not only cuts operational costs but also helps conserve critical natural resources.

Fig. 6.3.1: Solar panels to save energy

2. Using Non-Toxic, Biodegradable Chemicals

Traditional chemical dyes, bleaches, and finishing agents used in the apparel industry often contain harmful substances like azo dyes, formaldehyde, or heavy metals. These can cause serious health hazards to workers and pollute soil and water.

- Greening solutions encourage the use of eco-certified chemicals that are non-toxic and biodegradable.
- Such alternatives break down safely in the environment, pose fewer risks to human health, and reduce the burden of chemical waste disposal.

Using safe chemicals also ensures that products meet global sustainability certifications (e.g., OEKO-TEX, GOTS), increasing their marketability.

3. Minimising Textile and Packaging Waste

The apparel industry generates significant waste at various stages - from fabric offcuts during cutting to plastic in packaging. Unused materials typically end up in landfills or incinerators, contributing to environmental degradation.

- Greening strategies promote cutting optimisation techniques, pattern efficiency, and upcycling of waste fabric into accessories or new garments.
- Packaging can be redesigned to use recyclable or compostable materials, such as paper-based wraps instead of plastic polybags.

By managing waste at the source, companies can reduce disposal costs and improve their sustainability performance.

Fig. 6.3.2: Textile Fabric Waste

4. Adopting Eco-Friendly Machinery and Materials

Sustainable apparel production involves investing in machines and materials that support long-term ecological balance.

- Eco-friendly machinery includes those that consume less power, produce less noise or heat, and have higher operational efficiency.

- Fabrics made from organic cotton, bamboo, hemp, or recycled polyester are preferred over resource-intensive or synthetic alternatives.

Such machinery and materials not only ensure compliance with green manufacturing standards but also enhance the brand's ethical image and appeal to eco-conscious consumers.

Greening solutions refer to sustainable methods integrated into day-to-day operations to reduce the environmental impact of industrial activities. In the apparel sector, these practices involve:

- Reducing energy and water usage.
- Using non-toxic, biodegradable chemicals.
- Minimising textile and packaging waste.
- Adopting eco-friendly machinery and materials.

Fig. 6.3.3: Sustainable Manufacturing of Apparel

5. Relevant Policies and Regulations

India has enacted environmental regulations applicable to industries:

- Environment Protection Act, 1986
- Hazardous Waste Management Rules
- Water (Prevention and Control of Pollution) Act, 1974
- Solid Waste Management Rules, 2016

6.3.2 Resource Usage and Energy Conservation Methods

Efficient use of energy, water, and raw materials in the apparel sector not only saves costs but also reduces the carbon footprint. Key practices include:

Resource	Energy Conservation Methods
Electricity	Use energy-efficient LED lighting, solar power, and automatic shutdown systems
Machines	Turn off idle machines, and schedule maintenance to avoid overuse
HVAC systems	Use programmable thermostats and energy-efficient models
Water	Reuse greywater where possible, install low-flow fixtures

Table 6.3.1: Resource Usage and Energy Conservation Methods

6.3.3 Sustainable Workplace Decisions

Sustainability is driven not just by management but also by the daily actions of employees. Workers can:

- Choose digital communication over printing.
- Reuse or upcycle scraps, leftover fabric, or packaging materials.
- Support eco-certified suppliers.
- Opting for public transport or carpooling where possible.
- Raise concerns about wasteful practices or chemical usage.

Switching Off Machines When Not in Use

- This simple habit is among the most cost-effective energy-saving practices:
- Sewing machines, cutting machines, steam irons, and lighting should be turned off during breaks or shift changes.
- Auto-shutdown timers can be installed on frequently used machines.
- Encouraging this practice reduces electricity costs, extends equipment life, and prevents fire hazards.

Handling and Storing Waste Materials Properly

In a design or production facility, multiple types of waste are generated. Mishandling them can cause safety hazards, violate waste disposal rules, and contribute to environmental degradation.

Waste Type	Proper Handling Practice
 **Paper and Sketches**	Store in dry containers; reuse clean paper; avoid excessive printing
 **Colouring Tools**	Close lids to avoid spills; dispose of used pens/ crayons in designated bins

Waste Type	Proper Handling Practice
 **Chemical Containers**	Store in ventilated, fire-safe areas; label clearly
 **E-Waste (e.g., damaged machines, batteries)**	Do not mix with regular trash; send to certified e-waste recyclers

Table 6.3.2: Types of Waste and its Handling Techniques

6.3.4 Waste Segregation and Disposal

Segregation at source is the foundation of efficient waste management. Workers must be trained to separate waste into proper categories:

Type of Waste	Disposal Bin/ Action
 **Biodegradable (food, paper)**	Green bin - Compost or biodegradable disposal

Type of Waste	Disposal Bin/ Action
 **Non-Biodegradable (plastic, metals)**	Blue bin - Recyclable waste
 **Hazardous (chemicals, dyes, batteries)**	Red bin - Follow hazardous waste guidelines
 **Electronic Waste**	Separate collection and handover to e-waste recyclers

Table 6.3.3: Waste Segregation

Step-by-Step Waste Segregation Process

- Identify the type of waste.
- Place in designated container (colour-coded).
- Label bins clearly for ease of identification.
- Ensure bins are covered and cleaned regularly.
- Follow organisational or municipal disposal schedules.

Fig. 6.3.4: Types of bins for waste disposal

Impact of Green Practices

Action	Impact
Turn off unused equipment	Saves energy and costs
Reuse or recycle materials	Reduces landfill burden
Proper waste segregation	Enables efficient recycling and safe disposal
Follow environmental guidelines	Prevents pollution and legal penalties
Raise awareness	Builds a green work culture

Table 6.3.4: Impact of Green Practices

Summary

- Ethical values such as honesty, punctuality, and respect for rules promote a disciplined and responsible work culture.
- Employees must understand and follow organisational policies and clarify doubts through proper channels.
- Compliance with legal, regulatory, and customer-specific standards is essential in the apparel industry to avoid penalties and maintain trust.
- Ethical behaviour includes avoiding bribery, discrimination, misrepresentation of work, and using ethically sourced materials.
- Greening solutions such as reducing energy and water consumption, using eco-friendly materials, and minimising waste help reduce environmental impact.
- Waste materials like fabric scraps, paper, and electronic waste must be handled, segregated, and disposed of according to established guidelines.
- Team cooperation and proper reporting of any unsafe or non-compliant practices contribute to a positive and sustainable workplace.

Exercise

Multiple-choice Question:

1. Which of the following is an example of unethical behaviour in the workplace?
   a. Reporting defects honestly
   b. Providing support to coworkers
   c. Misrepresenting completed work
   d. Following environmental guidelines

2. What is the correct method to manage waste in the apparel sector?
   a. Burn all waste material
   b. Segregate and dispose of waste as per guidelines
   c. Dump waste outside the factory
   d. Store all types of waste together

3. What is one of the key reasons for adopting greening practices in the workplace?
   a. To reduce profit margins
   b. To increase production waste
   c. To minimise environmental impact
   d. To avoid teamwork

4. Which of the following is NOT an ethical responsibility at work?
   a. Avoiding bribery
   b. Discriminating based on gender
   c. Respecting organisational policies
   d. Reporting unsafe behaviour

5. What should an employee do if unsure about a policy or procedure?
   a. Ignore the rule
   b. Leave the task incomplete
   c. Ask a supervisor or authorised person for clarification
   d. Ask a friend outside the company

Descriptive Questions:

1. Explain the importance of following ethical values and workplace conduct in a professional environment.
2. Discuss how greening practices in the apparel industry contribute to environmental sustainability. Give examples.
3. What are customer-specific and country-specific regulations, and why must they be followed in the apparel sector?
4. Describe how employees should handle situations where they notice a violation of legal or ethical standards in the workplace.
5. List the types of waste typically generated in the apparel industry and explain how proper segregation and disposal can be managed.

Notes

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

https://youtu.be/Aqqk1FUyIrw?si=lmAJ27MHJzVcA---

What is Workplace Ethics?

https://youtu.be/K6ppCC3lboU?si=jljDL9HoQ2ZavJfn

What is Waste Management?

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GOVERNMENT OF INDIA
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RE IMAGINE FUTURE

7. Maintaining a Healthy, Safe and Secure Working Environment in the Organisation PWD & Gender Sensitivity Requirements

APPAREL MADE-UPS HOME FURNISHING
SECTOR SKILL COUNCIL

Unit 7.1 - Workplace Safety Protocols and Compliance

Unit 7.2 - Risk Identification and Response

Unit 7.3 - Inclusivity and Environment-Friendly Practices

AMH/N1605

Key Learning Outcomes

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

1. Explain health and safety related practices applicable at the workplace.
2. Explain importance of complying with health, safety, gender and PWD related instructions applicable to workplace
3. Explain gender equality in apparel industry.
4. Describe the layout of the plant and details of emergency exits, escape routes, emergency equipment and assembly points.
5. Follow environment management system related procedures.
6. Comply with health and safety related instructions applicable in the workplace.
7. List potential hazards, risks and threats based on the nature of operations.
8. List potential risks due to own actions and methods to minimise these.
9. Report hazards and potential risks/ threats to supervisors or other authorised personnel.
10. Seek clarifications, from supervisors or other authorised personnel in case of perceived risks.
11. State reporting protocol and documentation required.
12. Describe occupational health and safety risks and methods.
13. State organisational procedures for safe handling of equipment and machine operations.
14. Explain various personal protective equipment and their method of use.
15. Report unsafe equipment and other dangerous occurrences.
16. List details of personnel trained in first aid, fire-fighting and emergency response.
17. Describe actions to take in the event of a mock drill/ evacuation procedures or actual accident, emergency or fire.
18. Participate in mock drills/ evacuation procedures organised at the workplace.
19. Undertake first aid, fire-fighting and emergency response training.
20. Report any service malfunctions that cannot be rectified.

UNIT 7.1: Workplace Safety Protocols and Compliance

Unit Objectives

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

1. Describe workplace health and safety practices and their significance in maintaining a secure environment.
2. Explain the importance of complying with health, safety, gender equality, and disability-related workplace protocols.
3. Examine occupational risks and describe methods to manage health and safety hazards effectively.
4. Explain safe handling and operation procedures for equipment and machinery as per organisational guidelines.
5. Identify personal protective equipment and explain its correct use according to safety standards.
6. Describe the workplace layout, including emergency exits, escape routes, assembly points, and emergency equipment.
7. Report hazards, unsafe equipment, dangerous occurrences, and service malfunctions to authorised personnel.
8. Follow emergency instructions during fire, accidents, or drills and participate in evacuation procedures.
9. Describe appropriate responses during mock drills, evacuation exercises, and actual emergency situations.
10. State reporting protocols, required documentation, and the importance of seeking clarification when needed.

7.1.1 Health and Safety Protocols in the Workplace

Every organisation must implement safety guidelines based on national and organisational standards. These guidelines aim to:

- Prevent injuries and health hazards.
- Promote a culture of safety awareness.
- Ensure safe operation of tools and machinery.
- Prepare employees for emergency situations.

Area	Safety Practice
General Conduct	No running, pushing, or misuse of equipment
Machinery	Follow start-up and shutdown procedures
Electricals	Do not handle with wet hands or exposed wires
Housekeeping	Maintain clean, unobstructed pathways
Ergonomics	Use chairs with back support, and take regular breaks

Table 7.1.1: Key Safety Practices

7.1.2 Gender and Disability Compliance at the Workplace

In Indian apparel companies, gender and disability compliance at the workplace has become an important aspect of ethical and legal business practices. With a workforce dominated by women in shop floors and a growing focus on inclusivity, companies are required to adhere to laws such as the Sexual Harassment of Women at Workplace (Prevention, Prohibition and Redressal) Act, 2013 and the Rights of Persons with Disabilities Act, 2016. Beyond legal mandates, global buyers increasingly expect factories to demonstrate fair treatment, equal opportunities, and accessible working conditions. Compliance not only ensures protection of rights but also promotes diversity, improves productivity, and strengthens the international reputation of Indian apparel manufacturers.

1. **Gender Sensitivity**

   Gender equality means fair treatment of all employees regardless of gender. This includes:

   - Equal access to promotions and leadership roles.
   - Prevention of workplace harassment (as per the POSH Act).
   - Gender-neutral language in communication.
   - Facilities like separate restrooms, changing areas, and safe reporting mechanisms.

Fig. 7.1.1: Sexual Harassment of Women at Workplace (Prevention, Prohibition and Redressal) Act, 2013

2. **Sensitivity Towards Persons with Disabilities (PWD)**

   The workplace should be accessible and inclusive for persons with disabilities:

   - Install ramps, elevators, and wide doors.
   - Provide accessible restrooms and seating areas.
   - Assign buddies or assistants where necessary.
   - Modify machinery or assign alternate tasks based on capability.

Fig. 7.1.2: Rights of Persons with Disabilities Act, 2016

7.1.3 Occupational Hazards and Risk Management

Occupational hazards may include physical, chemical, mechanical, biological, and ergonomic risks.

Hazard Type	Example	Prevention
 **Physical**	Noise, heat, slipping, and machinery accidents	Use of earplugs, proper ventilation
 **Chemical**	Fabric dyes	Use gloves, proper storage
 **Mechanical**	Sewing machines	Guarding and training

Hazard Type	Example	Prevention
 **Biological**	Dust from textiles	Masks, regular cleaning
 **Ergonomic**	Repetitive strain	Adjustable seating, break schedules

Table 7.1.2: Occupational hazards and its Mitigation Strategies

7.1.4 Safe Equipment Handling and Use of PPE

All tools and machines must be used as per the manufacturer's and organisation's guidelines. Safe handling includes:

- Wearing personal protective equipment (PPE).
- Not using damaged tools.
- Turning off machinery before cleaning or servicing.

PPE Item	Use
 **Safety gloves**	Prevent cuts, burns

PPE Item	Use
 **Safety goggles**	Protect eyes from debris
 **Earplugs/ Earmuffs**	Protect from high noise
 **Face masks**	Avoid inhaling dust/chemicals
 **Safety shoes**	Prevent injuries from falling objects

Table 7.1.3: Common PPE and Their Uses

7.1.5 Workplace Layout, Emergency Preparedness, and Evacuation

Understanding the layout of the workplace is crucial for emergency response:

- Emergency exits must be unobstructed and clearly marked.
- Escape routes should be displayed on floor plans.
- Assembly points must be designated outside the building.

Emergency Equipment

Equipment	Use
 **Fire extinguisher**	Put out small fires
 **Fire alarms**	Alert all staff quickly
 **First-aid kits**	Immediate medical help

Equipment	Use
 **Emergency lights**	Provide visibility during outages

Table 7.1.4: Emergency Equipment and its Uses

UNIT 7.2: Risk Identification and Response

Unit Objectives

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

1. Identify potential hazards, risks, and threats based on operations and personal actions, and explain methods to minimise them.
2. Detect and rectify basic equipment malfunctions and monitor work processes for signs of risk or danger.
3. Describe possible workplace accidents and emergencies, and outline appropriate response actions.
4. Discuss the maintenance of a hazard-free workspace through regular inspections, walk-throughs, and proactive safety behaviour.

7.2.1 Hazards, Risks, and Threats at the Workplace

Hazards, risks, and threats at the workplace of the apparel industry are closely linked to the nature of manufacturing activities such as cutting, sewing, finishing, and packaging. Workers are often exposed to physical hazards like sharp tools, heavy machinery, poor ergonomics, and fire risks, as well as chemical hazards from dyes and cleaning agents. Risks also extend to workplace stress, long working hours, and inadequate safety practices. Additionally, threats such as non-compliance with safety regulations or lack of emergency preparedness can impact both workers' well-being and business continuity. Addressing these issues through regular risk assessments, training, and compliance with safety standards not only safeguards workers but also enhances efficiency and credibility in the competitive apparel export market.

Type of Hazard	Examples	Possible Effects
Physical	Noise, radiation, slippery floors	Injuries, long-term health issues
Chemical	Cleaning agents, flammable substances	Burns, respiratory problems
Biological	Mould, bacteria, and viruses	Infections, allergies
Ergonomic	Poor posture, repetitive movements	Musculoskeletal disorders
Psychological	Stress, harassment	Anxiety, depression

Table 7.2.1: Types of Hazards

Risk Minimisation Methods

Strategy	Application
Substitution	Use safer chemicals or equipment
Engineering Controls	Install guards, improve ventilation
Administrative Controls	Rotate jobs, provide training
Personal Protective Equipment (PPE)	Helmets, gloves, goggles

Table 7.2.2: Risk Mitigation Strategies with Appropriate Applications

7.2.2 Equipment Malfunctions and Monitoring Risks

Equipment malfunctions and monitoring risks are critical concerns due to the extensive use of sewing machines, cutting machines, boilers, pressing equipment, and automated systems on the production floor. Malfunctions can lead to production delays, defective garments, safety hazards, and even fire or electrical accidents if not addressed promptly. Risks also arise from inadequate preventive maintenance, lack of operator training, and poor monitoring systems that fail to detect early signs of breakdown. To ensure smooth operations, companies are adopting preventive maintenance schedules, digital monitoring tools, and compliance with safety standards, which not only reduce downtime but also improve product quality and workplace safety.

Signs of Equipment Malfunctions

Equipment Type	Malfunction Sign	Action Required
Electrical Tools	Sparks, overheating, and noise	Switch off, report to the supervisor
Ladders or Platforms	Loose steps, wobbly frame	Remove from use, tag for repair
Machinery	Irregular movement, oil leakage	Stop use, inform maintenance

Table 7.2.3: List of Equipment Malfunctions

Risk Monitoring Practices

- Conduct regular toolbox talks to assess risk before starting work.
- Use checklists for daily equipment and workspace inspections.
- Implement incident reporting systems to flag near-misses and risks.

7.2.3 Workplace Accidents and Emergency Response

Workplace accidents and emergency response are significant aspects of compliance and operational safety. Accidents can occur due to unsafe equipment use, fire hazards, electrical faults, or human error, and without a proper emergency response system, such incidents may escalate quickly. Companies are expected to establish clear safety protocols, train workers regularly, and maintain first-aid and fire safety equipment. Effective preparedness not only reduces injury and loss but also builds trust with workers and international buyers.

Relevant examples in apparel factories include:

- **Fire outbreaks:** caused by fabric dust, lint accumulation, or faulty wiring, requiring fire extinguishers, alarms, and evacuation drills.
- **Needle or cutting injuries:** from sewing and cutting machines, highlighting the need for protective guards and first-aid kits.
- **Chemical spills:** from dyes, bleaching agents, or cleaning solvents, demanding spill response procedures and use of PPE.
- **Boiler or press accidents:** due to pressure build-up or improper handling, necessitating regular inspections and operator training.
- **Stampede during evacuation:** if exits are blocked or drills are not conducted, stressing the importance of clear signage and practiced evacuation plans.

Common Workplace Accidents

Accident Type	Example Scenario	Immediate Action
 **Slips and Trips**	Wet floor in the hallway	Warn others, clean the spill, and place signage
 **Cuts and Lacerations**	Improper handling of sharp tools	Apply first aid and report the incident
 **Electrical Shock**	Faulty wire exposure	Disconnect power, call emergency services
 **Burns**	Hot equipment surface	Cool burn area, seek medical attention

Table 7.2.4: Accident Types and Actions for improvement in the Workplace

Emergency Response Actions

- **Fire:** Pull the alarm, evacuate the area, and use an extinguisher if trained.
- **Medical:** Call a first aider, ensure the injured person is safe.
- **Chemical Spill:** Evacuate area, wear PPE, follow spill response protocol.
- **Evacuation:** Follow marked exits, assist vulnerable individuals.

7.2.4 Hazard-Free Workspace

Creating and maintaining a hazard-free environment is not a one-time task - it is a continuous, proactive process that involves regular monitoring, behavioural change, and active participation from every worker. This section focuses on systematic inspections, safety-conscious work habits, documentation, and accountability as pillars of maintaining workplace safety.

The Importance of a Hazard-Free Workspace

The importance of a hazard-free workspace is directly linked to worker well-being, product quality, and business sustainability. A safe and clean environment reduces the chances of accidents, improves worker morale, and enhances overall productivity. With apparel factories employing large numbers of women and migrant workers, ensuring hazard-free conditions is not just a legal requirement under labour and safety laws but also a key factor in meeting international buyer compliance standards. By eliminating risks such as fire hazards, faulty wiring, poor ergonomics, and unsafe machinery, companies can create a workplace that fosters trust, reduces absenteeism, and delivers consistent output while protecting their brand reputation in global markets.

A hazard-free workspace helps in the following activities:

- Reduces the likelihood of accidents and injuries.
- Improves overall employee morale and productivity.
- Helps ensure compliance with occupational safety regulations (e.g., OSHA, Factories Act).
- Enhances the organisation's reputation and avoids legal liabilities.

Types of Inspections and Walkthroughs

Inspection Type	Frequency	Conducted By	Key Focus
Daily Visual Checks	Daily	Individual Workers	Floors, spills, power cables, and fire exits
Formal Safety Inspections	Weekly/Biweekly	Safety Officer/ Supervisor	Equipment, signage, PPE use, and lighting
Housekeeping Reviews	Monthly	Admin/ Facility Team	Storage areas, cleanliness, waste management
Compliance Audits	Quarterly/Annually	External Auditors	Legal standards, recordkeeping, certifications

Table 7.2.5: Types of Inspection

Sample Daily Safety Checklist

Checkpoint	Status (✓/✗)	Remarks
Clear walkways	✓	All aisles are free from fabric bundles.
No water/ oil spills	✓	Floor is clean and dry.
Fire extinguishers visible and usable	✓	Checked and found within expiry date.
Cables and wires are organised	✗	Loose wires near sewing section need fixing.

Checkpoint	Status (✓/✗)	Remarks
Emergency exits unlocked and accessible	✓	Exit doors open and evacuation path is clear.
First-aid box stocked	✓	Fully equipped with necessary supplies.
Machine safety guards in place	✓	Needle guards and cutting machine covers intact.
Adequate ventilation and lighting	✓	Ventilation fans working, lights functional.
PPE (gloves, masks) available	✗	Some workers reported shortage of masks.
Noise levels monitored	✓	Within acceptable limits.

7.2.5 Effective Walkthroughs

Effective safety walkthroughs are an essential practice to identify hazards, verify compliance, and ensure that the workplace remains safe for all employees. A safety walkthrough involves supervisors or compliance officers systematically inspecting production areas, checking equipment, monitoring worker practices, and recording observations. Unlike routine checklists, walkthroughs focus on real-time conditions and worker behaviour, making them a proactive tool for accident prevention.

Key aspects of an effective safety walkthrough include:

- **Planning and Frequency:** Conducted daily or weekly in high-risk areas such as cutting, sewing, finishing, and boiler sections.
- **Observation of Work Practices:** Ensuring workers use PPE, follow machine safety protocols, and keep workstations organised.
- **Inspection of Critical Equipment:** Checking fire extinguishers, electrical wiring, emergency exits, and machine guards.
- **Worker Interaction:** Engaging with operators to understand challenges and encourage a safety-first mindset.
- **Immediate Action on Unsafe Findings:** Reporting hazards and initiating corrective action without delay.
- **Documentation and Follow-up:** Recording observations, assigning responsibility, and reviewing progress in subsequent walkthroughs.

An effective safety walkthrough involves:

- **Observation:** Look for unsafe acts or conditions (e.g., open drawers, blocked exits).
- **Interaction:** Talk to workers to understand their safety concerns.
- **Documentation:** Note observations with time, location, and possible risk level.
- **Reporting:** Use hazard reporting forms or digital apps to report issues.
- **Follow-up:** Ensure hazards are addressed and rectified promptly.

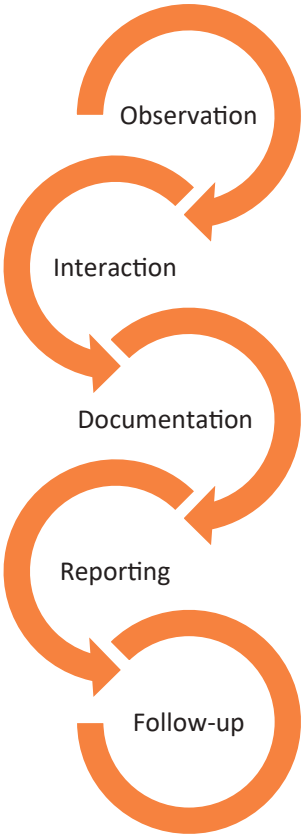

Fig. 7.2.1: 5-step walkthrough process

7.2.5 Effective Walkthroughs

Proactive safety behaviour is about workers and supervisors taking responsibility for preventing accidents before they occur, rather than just reacting after incidents. Since apparel factories involve high-risk areas like cutting, sewing, ironing, and boiler sections, proactive actions by employees can significantly reduce workplace hazards. Encouraging such behaviour creates a strong safety culture that not only protects workers but also boosts productivity and compliance with international buyer standards.

Examples of proactive safety behaviour in apparel factories include:

- **Reporting unsafe conditions immediately:** such as loose wires near sewing machines or blocked emergency exits.

Fig. 7.2.2: Loose Wires in Sewing Machines

- **Using PPE consistently:** workers wearing masks, gloves, or ear protection without waiting for reminders.

Fig. 7.2.3: PPE Kits worn by workers at the Apparel Industry

- **Following safe machine practices:** like switching off sewing machines during needle change or ensuring guards are in place.

Fig. 7.2.4: Turning off beeping sound in Sewing Machine

- **Maintaining cleanliness:** keeping walkways free of fabric scraps, threads, or spilled oil.

Fig. 7.2.5: Maintaining Cleanliness

- **Peer-to-peer reminders:** employees guiding each other to follow safe practices.
- **Participating in safety drills and training:** engaging actively rather than treating them as formality.

Fig. 7.2.6: Safety training

- **Taking ownership of equipment checks:** operators inspecting their machines daily before starting work.

Fig. 7.2.7: Equipment Checks

Characteristics of Proactive Safety Behaviour

- Voluntarily reporting hazards.
- Wearing PPE without reminders.
- Suggesting improvements to processes.
- Correcting minor hazards (e.g., picking up debris).
- Participating in safety training and drills.

Proactive Behaviour	Outcome
Reporting a loose railing	Prevents potential fall incidents
Organising tangled wires	Reduces trip hazards
Asking for help lifting heavy items	Prevents back strain and injuries

Table. 7.2.6: Proactive Safety Behaviour

UNIT 7.3: Inclusivity and Environment-Friendly Practices

Unit Objectives

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

1. Discuss the importance of gender equality and sensitisation programs on gender and disability inclusion in the apparel industry.
2. Explain how to accommodate persons with disabilities in the workplace.
3. Discuss the importance of adopting environment-friendly practices and environmental management system (EMS) procedures applicable at the workplace.
4. Identify and interpret health and safety signage correctly.
5. Discuss undertaking training in first aid, firefighting and emergency response.

7.3.1 Gender Equality and Disability Sensitisation in the Apparel Industry

The apparel industry is one of the largest employment sectors globally, with a significant representation of women and, increasingly, persons with disabilities. Despite its scale and reach, the industry continues to face persistent challenges related to gender inequality, workplace discrimination, and lack of inclusivity for persons with disabilities (PwDs). Issues such as wage disparity, limited leadership opportunities for women, occupational segregation, and inadequate facilities or support systems for disabled workers hinder both individual well-being and overall organisational productivity.

Gender equality and disability sensitisation are critical to fostering a respectful, safe, and productive working environment. Sensitisation programs play a transformative role by challenging stereotypes, promoting empathy, encouraging behavioural change, and aligning industry practices with national and international human rights obligations. In the context of the apparel sector, where women form the majority of the workforce and manual labour is intensive, building awareness and institutional mechanisms for inclusion is both a moral imperative and a business necessity.

Creating a culture of inclusion not only enhances employee morale and retention but also boosts efficiency, innovation, and compliance with labour laws and international standards such as the ILO's Decent Work Agenda and the UN Convention on the Rights of Persons with Disabilities (UNCRPD).

Importance of Gender Equality

Aspect	Why It Matters
Equal Pay	Encourages fairness, boosts morale and retention
Workplace Respect	Reduces harassment and discrimination
Leadership Representation	Drives innovation, improves brand image
Legal Compliance	Aligns with laws like POSH Act, Equal Remuneration Act

Table. 7.3.1: Essential factors of Gender Equality

Gender and Disability Sensitisation Programs

- **Gender Sensitisation:** Awareness programs that dismantle stereotypes and promote respectful interaction between all genders.

Fig. 7.3.1: Girl Rising- Gender Sensitisation Program in Punjab and Rajasthan

- **Disability Inclusion Sensitisation:** Focus on breaking myths, recognising ability over disability, and adjusting communication styles.

Fig. 7.3.2: Workshop held in recognition of Disability Inclusion Sensitisation

Impact of sensitisation program on workplace behaviour

Sensitisation programs on gender, disability, and safety have a direct impact on workplace behaviour by creating awareness, reducing biases, and promoting respectful interactions. Such programs help workers understand rights and responsibilities, encourage inclusive practices, and improve communication between supervisors and employees. As a result, workplaces become safer, more cooperative, and more compliant with legal and buyer requirements, ultimately boosting morale and productivity.

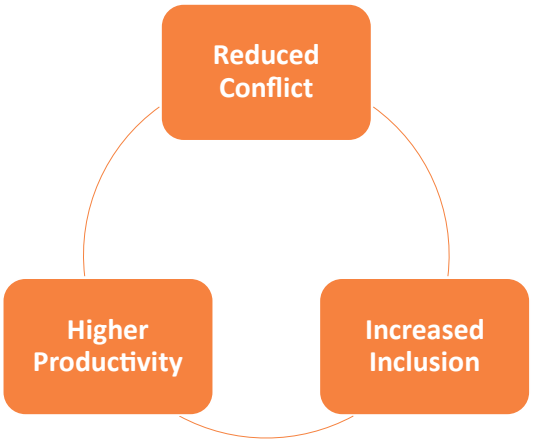

Fig. 7.3.3: Effects of sensitisation program on workplace behaviour

7.3.2 Workplace Accommodation for Persons with Disabilities (PwDs)

Types of Disabilities and Reasonable Accommodations

Disability Type	Accommodation Examples
Physical (mobility issues)	Ramps, adjustable desks, accessible restrooms
Hearing Impairment	Visual alarms, sign language interpreters, captioned training
Visual Impairment	Braille signs, screen readers, tactile pathways
Neurodivergence (e.g., autism, ADHD)	Flexible workspaces, quiet zones, clear instructions

Legal Frameworks Supporting Inclusion

In the apparel sector, legal frameworks supporting inclusion play a vital role in ensuring fair treatment, equal opportunities, and safe working conditions for all employees, especially women and persons with disabilities. These laws not only safeguard worker rights but also help companies meet international buyer compliance requirements.

Key legal frameworks include:

- **The Sexual Harassment of Women at Workplace (Prevention, Prohibition and Redressal) Act, 2013 (POSH Act):** Ensures protection of women employees from harassment, mandates Internal Complaints Committees, and promotes a safe and dignified workplace.

Fig. 7.3.4: Inappropriate Touching to Women at Workplace

- **The Rights of Persons with Disabilities Act, 2016:** Requires non-discrimination in employment, reasonable workplace accommodation, and accessible infrastructure for employees with disabilities.

Fig. 7.3.5: Disability Rights Promotion

- **Factories Act, 1948 & Occupational Safety, Health and Working Conditions Code, 2020:** Provide for health, safety, and welfare measures, ensuring that workplaces are free from hazards and inclusive for diverse workers.

Fig. 7.3.6: Factories Act, 1948 & Occupational Safety, Health and Working Conditions Code, 2020

- **Equal Remuneration Act, 1976 & Code on Wages, 2019:** Mandate equal pay for equal work, eliminating gender-based wage discrimination common in labour-intensive industries like apparel.

Fig. 7.3.7: Equal Remuneration Act

- **Maternity Benefit Act, 1961 (amended in 2017):** Protects women employees by ensuring paid maternity leave and childcare facilities in larger factories. UNCRPD (United Nations Convention on the Rights of Persons with Disabilities)

Fig. 7.3.8: Maternity Benefit Act, 1961 Logo

7.3.3 Environment-Friendly Practices and EMS Procedures

Environment-friendly practices and Environmental Management System (EMS) procedures are becoming increasingly important due to global buyer requirements, sustainability commitments, and regulatory compliance. The apparel sector, being resource-intensive in terms of water, energy, and chemicals, faces pressure to adopt greener practices that reduce environmental impact while maintaining efficiency.

Key environment-friendly practices in apparel factories include:

- **Energy efficiency:** Using modern sewing, cutting, and finishing machines with lower energy consumption; switching to LED lighting and solar power.
- **Water conservation:** Recycling process water, installing water-efficient fixtures, and adopting zero liquid discharge (ZLD) systems in dyeing/finishing units.
- **Chemical management:** Substituting hazardous chemicals with eco-friendly alternatives and ensuring proper storage and disposal.
- **Waste reduction:** Recycling fabric scraps, segregating waste, and promoting circular economy initiatives.
- **Air quality management:** Installing proper ventilation, filters, and emission control systems in production areas.

Practice	Benefit
 **Reducing fabric waste**	Conserves resources, reduces landfill burden
 **Switching to LED lighting**	Saves energy, reduces carbon footprint

Practice	Benefit
 **Using eco-friendly packaging**	Minimises plastic pollution
 **Rainwater harvesting**	Reduces dependency on freshwater
 **Waste segregation**	Enables recycling and safer disposal

Table 7.3.2: Green Practices in the Workplace

Environmental Management System (EMS)

An Environmental Management System (EMS) is a structured framework that helps apparel companies identify, monitor, and reduce their environmental impact through sustainable practices, compliance with regulations, and continuous improvement.

EMS (Environmental Management System) procedures provide a structured approach to implement these practices by:

- Identifying environmental aspects and impacts in operations.
- Setting measurable sustainability objectives and targets.
- Monitoring energy, water, and chemical use regularly.
- Training workers in eco-friendly practices and emergency response for spills or leaks.
- Conducting internal audits and ensuring compliance with ISO 14001 standards or buyer-specific sustainability codes.

Component	Function
Policy	Commitment to sustainability
Planning	Identifying environmental aspects and risks
Implementation	Procedures, responsibilities, and training
Monitoring	Tracking impact, corrective actions
Review	Continuous improvement

Table 7.3.3: EMS Functions

The Plan-Do-Check-Act (PDCA) cycle is a continuous improvement model widely adopted in Environmental Management Systems to help organisations manage their environmental responsibilities in a structured and effective manner. Rooted in quality management principles, PDCA ensures that environmental goals are clearly defined, systematically implemented, regularly evaluated, and continuously improved.

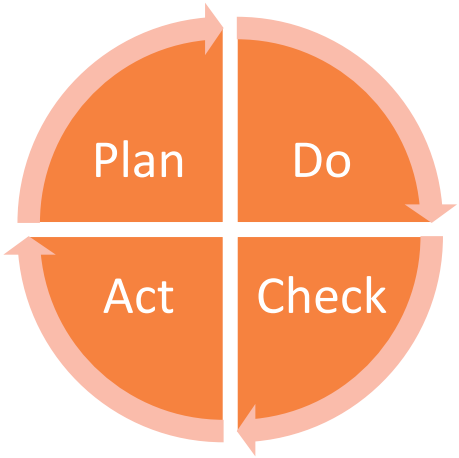

Fig. 7.3.9: Elements of PDCA Cycle

Each element in PCDA represents the following:

- **Plan:** Identify problems, set objectives, and design solutions.
- **Do:** Implement the planned actions on a small scale.
- **Check:** Monitor and evaluate results against objectives.
- **Act:** Standardize successful practices or adjust if needed.

Stage	Description	EMS Application Example
Plan	Identify environmental aspects and set goals, legal requirements, and procedures.	Conduct an environmental audit and set targets to reduce fabric waste by 30%.
Do	Implement the plan through training, operational control, and resource allocation.	Train staff on waste segregation and introduce recycling bins on the production floor.
Check	Monitor and measure progress against objectives; conduct audits.	Review monthly waste reports and conduct internal EMS audits.

Stage	Description	EMS Application Example
Act	Take corrective actions based on findings and update the system for improvement.	Modify fabric cutting processes or invest in waste-reduction machinery if goals are not met.

Table 7.3.4: PDCA Cycle Stages

Importance of PDCA in EMS

Fig. 7.3.10: Importance of PDCA

The PDCA cycle is important because it provides a structured approach for continuous improvement in any workplace. It helps organizations systematically solve problems rather than relying on quick fixes. By promoting regular monitoring and evaluation, it ensures that outcomes are measurable and aligned with goals. The cycle also reduces errors and inefficiencies, leading to higher productivity and quality. Additionally, it fosters a culture of learning and adaptability, encouraging employees to participate in improvement processes. Overall, PDCA strengthens long-term sustainability and competitiveness in dynamic business environments. The importance of PCDA in EMS is listed below:

- It provides a structured approach for continuous improvement in the workplace.
- It helps organizations systematically solve problems rather than relying on temporary fixes.
- It ensures outcomes are measurable and aligned with organizational goals through regular monitoring and evaluation.
- It reduces errors and inefficiencies, leading to higher productivity and better quality.
- It fosters a culture of learning and adaptability among employees.
- It encourages employee participation and ownership in improvement processes.
- It strengthens long-term sustainability and competitiveness in changing business environments.

7.3.4 Health and Safety Signage Interpretation

Health and safety signage interpretation is crucial for guiding workers, many of whom may have limited literacy or come from diverse backgrounds. Signages use standardized colours, symbols, and pictograms to quickly communicate risks, mandatory practices, and safe actions. Proper interpretation ensures that employees can respond appropriately to hazards, follow safe procedures, and act swiftly during emergencies. Understanding workplace signage is critical to avoiding accidents and maintaining order.

Sign Type	Colour	Purpose	Example
 **Mandatory**	Blue/White	Specifies required action	"Wear safety shoes"
 **Mandatory**	Red/White	Indicates forbidden activity	"No smoking"
 **Warning**	Yellow/Black	Indicates a hazard	"Caution: Wet Floor"
 **Emergency**	Green/White	Shows safe conditions or exits	"Emergency Exit"

Sign Type	Colour	Purpose	Example
 **Fire Safety**	Red	Related to fire equipment	"Fire Extinguisher"

Table 7.3.5: Common Signage Types

7.3.5 Training in First Aid, Firefighting, and Emergency Response

First Aid Training

Training in first aid is an essential workplace safety measure that equips employees to respond effectively to accidents or medical emergencies. Since apparel factories involve risks such as machine cuts, burns, chemical exposure, or fainting due to heat and fatigue, trained workers can provide immediate care before professional medical help arrives. First aid training builds worker confidence, reduces the severity of injuries, and ensures compliance with legal and buyer requirements for occupational health and safety. It also strengthens the overall safety culture by preparing employees to protect themselves and their co-workers in emergency situations.

Here are 5 basic elements of First Aid Training in simple pointers:

- Control bleeding from cuts or injuries using pressure and bandages.
- Treat burns by cooling with clean water and covering with a sterile cloth.
- Perform CPR in case of unconsciousness and no breathing.
- Provide immediate care for chemical spills by washing the affected area.
- Handle fractures or sprains by immobilizing the injured part.

Fig. 7.3.11: Steps for performing CPR

Firefighting Basics

Fire Class	Fuel Type	Extinguisher Type
Class A	Paper, fabric	 Water, Foam
Class B	Oil, gasoline	 CO_2, Foam
Class C	Electrical equipment	 CO_2, Dry Powder
Class D	Metals	 Dry Powder

Table 7.3.6: Firefighting Basics

Important Concepts

1. PASS Technique for Fire Extinguishers

The PASS technique is a simple and effective method used to remember how to operate a fire extinguisher during an emergency.

Step	Action	Purpose
P – Pull	Pull the pin at the top of the extinguisher.	Unlocks the operating lever and allows discharge.
A – Aim	Aim the nozzle or hose at the base of the fire.	Targeting the base is crucial to extinguish the fuel source.
S – Squeeze	Squeeze the handle to release the extinguishing agent.	Begins the discharge of the fire suppressant.
S – Sweep	Sweep from side to side at the base of the fire.	Ensures complete coverage and prevents reignition.

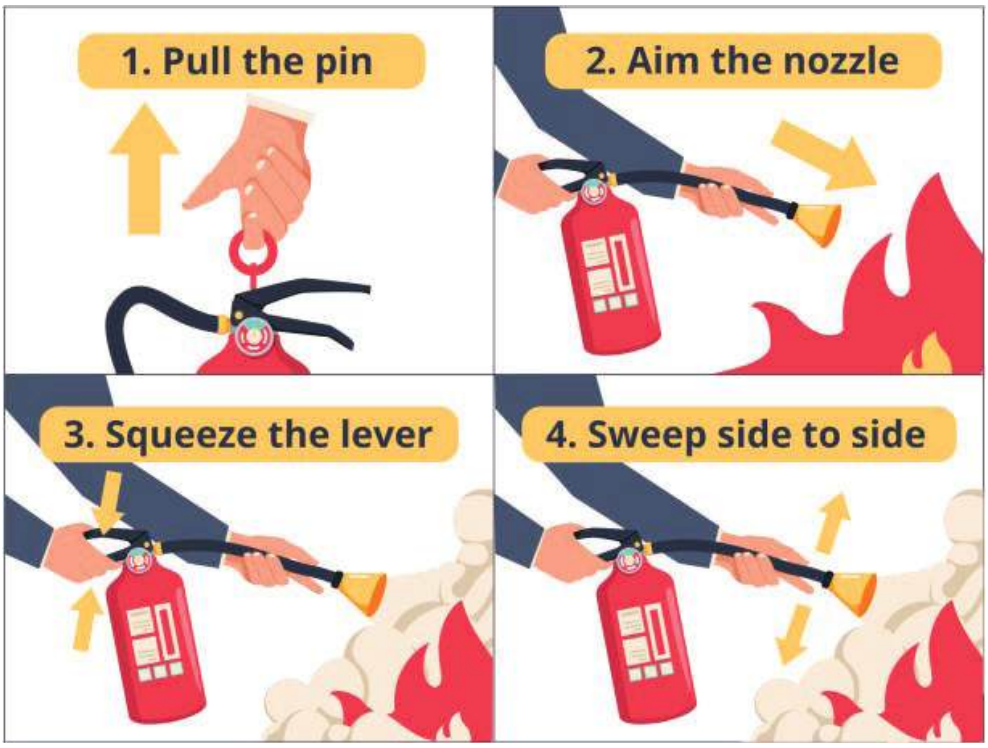

Fig. 7.3.12: PASS Steps

2. Evacuation Drills and Alarm Identification

Effective evacuation protocols ensure that all personnel can safely and quickly exit the premises during a fire or any other emergency.

Evacuation Drills:

- Should be conducted regularly (e.g., quarterly) to ensure preparedness.
- Include clear instructions on exit routes, assembly points, and role assignments.
- Help identify bottlenecks, delays, or hazards in the evacuation process.

Key Elements of an Evacuation Plan

Component	Details
Exit Routes	Clearly marked and unobstructed pathways
Assembly Points	Safe, open areas where employees regroup
Evacuation Wardens	Trained staff responsible for guiding others
Emergency Contacts	Displayed prominently for fire services, etc.

Alarm Identification

- Fire alarms are auditory (sirens/ bells) and visual (flashing lights).
- Employees must recognise different alarms (fire, chemical spill, lockdown) through training.
- Alarm drills should ensure staff can react calmly but quickly upon activation.

Fig. 7.3.14: Fire alarm

3. **Fire Triangle:** Heat, Fuel, Oxygen

The Fire Triangle is a simple model that explains how fire starts and sustains. It shows that three elements are essential for fire: heat (a source of ignition), fuel (something that can burn), and oxygen (usually from the air). When all three are present in the right conditions, a fire can ignite and continue burning. If any one of these elements is removed—by cooling (removing heat), smothering (removing oxygen), or starving (removing fuel)—the fire will be extinguished.

The Fire Triangle is a simple model that illustrates the three essential components required for a fire to ignite and sustain.

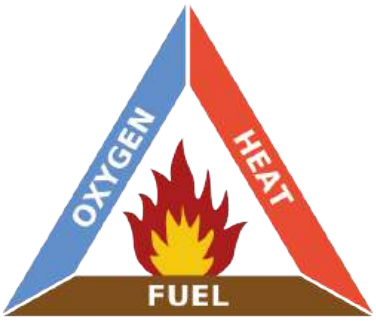

Fig. 7.3.15: Fire Triangle

Element	Role in Fire	Example
Heat	Raises materials to ignition temperature	Sparks, open flames, machinery
Fuel	Material that burns	Cloth, wood, oil, paper
Oxygen	Supports the chemical reaction (combustion)	Air (normally 21% oxygen)

Table 7.3.7: Fire Triangle Elements

If any one element is removed, the fire cannot continue. The Fire Triangle explains that fire needs heat, fuel, and oxygen to start and sustain. In apparel factories, sources like sparks, cloth, and air combine to create fire risks, making control of any one element crucial for prevention.

Fire Suppression Techniques Based on the Triangle

Fig. 7.3.16: Fire suppression techniques

- **Remove heat:** Use water to cool the material.
- **Remove fuel:** Shut off gas supply or remove flammable items.
- **Remove oxygen:** Use a CO_2 extinguisher or fire blanket to smother the fire.

Emergency Response

- Evacuation plan and designated assembly points
- Emergency contact numbers
- Role assignments during emergencies
- Mock drills and role-playing exercises

Summary

- Identifying hazards, risks, and unsafe actions helps prevent workplace accidents and injuries.
- Using personal protective equipment and following equipment safety protocols ensures worker safety.
- Regular inspections, walkthroughs, and prompt reporting maintain a hazard-free work environment.
- Fire safety training, evacuation drills, and understanding alarms prepare employees for emergencies.
- Gender equality and disability sensitisation foster an inclusive and respectful workplace culture.
- Adopting eco-friendly practices and EMS procedures supports sustainability and legal compliance.
- Clear communication, proper documentation, and timely clarification ensure workplace safety and order.

Exercise

Multiple-choice Question:

1. What does the 'A' in the PASS technique for using a fire extinguisher stand for?
   a. Alert
   b. Aim
   c. Assess
   d. Assist

2. Which of the following is NOT a part of the fire triangle?
   a. Fuel
   b. Carbon dioxide
   c. Oxygen
   d. Heat

3. Which of the following is a mandatory colour code used for safety signage in the workplace?
   a. Green for warning
   b. Red for mandatory action
   c. Blue for prohibition
   d. Blue for mandatory action

4. Which cycle is used in Environmental Management Systems (EMS) for continuous improvement?
   a. Observe-React-Act
   b. Plan-Do-Check-Act
   c. Find-Fix-Finish
   d. Design-Develop-Deploy

5. Which of the following actions is appropriate during a fire evacuation drill?
   a. Use the elevator to exit quickly
   b. Panic and run toward the fire
   c. Proceed calmly to the nearest assembly point
   d. Return to your workstation to collect belongings

Descriptive Questions:

1. Explain the importance of gender equality and disability sensitisation in creating an inclusive workplace, especially in the apparel industry.
2. Describe the PASS technique and explain its significance in operating a fire extinguisher safely.
3. What are the key components of the PDCA cycle in EMS, and how do they contribute to sustainable workplace practices?
4. Discuss the importance of regular safety inspections and proactive safety behaviour in maintaining a hazard-free environment.
5. Describe different types of workplace hazards and provide examples of how they can be identified and mitigated.

Notes

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

https://youtu.be/p_9hOqdw75o?si=9carQ06bt6VjguCq

Personal Protective Equipment (PPE)

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8. Employability Skills

DGT/VSQ/N0103

Employability Skills is available at the following location

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

Employability Skills

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9. Annexure

Module No.	Unit No.	Topic Name	Page No	Link for QR Code (s)	QR code (s)
Module 1: Introduction and Orientation to Industrial Engineer (IE) (AMH/ N2001)	Unit 1.1: Role and Scope of an Industrial Engineer (IE) in Apparel Manufacturing	1.1.1 Employment Opportunities for Industrial Engineer	8	https://youtu.be/-lvDrmg0UmOM-?si=HohNf0NnjXDA_pV5	Beginning Engineers Industrial Engineering
		1.1.2 Roles and Responsibilities of an Industrial Engineer	8	https://youtu.be/-bw9IsTj5VuQ-?si=-XKnjQyNMQGmWNEz	Role of Industrial Engineers in Industry
		1.1.3 Relationship with the Manufacturing Process	8	https://youtu.be/-AezKyDdoHvw-?si=smtLYW82eSlH567C	What is Industrial Engineering
Module 2: Select fabrics, trims and accessories as per specific product category (AMH/ N2001)	Unit 2.1: Business Planning and Strategy	2.1.2 SAM (Standard Allowed Minute)	38	https://youtu.be/-OXQm-da6W9Y-?si=64gT8KA9KIfZ5zjo	SAM Calculation for Young Engineers in Garment Industry
	Unit 2.2: Design, Tools and Equipment	2.2.3 Machine Specifications and Safety Standards	38	https://youtu.be/-NZDa8qpAlUc-?si=J99PNJHMsLmJYmbq	Types of sewing machines used in apparel industry

Module No.	Unit No.	Topic Name	Page No	Link for QR Code (s)	QR code (s)
	Unit 2.3: Procedures, Reporting and Regulations	2.3.3 Logistics and Supply Chain	38	https://youtu.be/-TEZ6FPKbtKg-?si=JapNCVUktOjfaJMw	The Apparel Logistics Group - Apparel Third Party Logistics Services
Module 3: Supervise, Analyse and Evaluate Performance on Sewing Floor (AMH/N2002)	Unit 3.4: Communication and Software Tools	3.4.3 Basic Software Tools in Apparel Production	68	https://youtu.be/-KCfwX98EWIc-?si=nrQlkEiucV3rr2fk	MS Word Full Course in Just 90 Minutes
		3.4.4 Industry-Specific Tools: MIS, GSD, and PMTS	68	https://youtu.be/-0t2Maqm5DSk-?si=l3jta03ZpVJCpBBJ	Management Information system, MIS
Module 4: Research and resolve production problems to implement better production system (AMH/N2003)	Unit 4.1: Standards, Procedures, and Specifications	4.1.1 Garment Specifications and Manufacturing Standards	90	https://youtu.be/-tLSqEvjzquo-?si=i4KfNz09u8DRK1gI	M-37.Apparel quality analysis – initial inspection, quality standards and specifications in raw mate

Module No.	Unit No.	Topic Name	Page No	Link for QR Code (s)	QR code (s)
	Unit 4.2: Production Systems and Problem Manage-ment	4.2.1 Garment Production Systems	90	https://youtu.be/-xcHgdSh_T-o-?si=F0DWE0dO9sHFqp0I	TYPES OF GARMENT PRODUCTION SYSTEMS
		4.2.5 Statistics for Problem Identification	90	https://youtu.be/-KQRWHPupdxQ-?si=F56tPpruZtvGhvcY	Pareto Principle 80 20 Rule | Pareto's law 80 20 Rule Explained
	Unit 4.3: Productivity, Operations, and Efficien-cy	4.3.4 Sequence of Operations in Garment Manufacturing	90	https://youtu.be/-7MPm_jDApc8-?si=cLA25iukVSMydBkX	OPERATION BREAKDOWN IN APPAREL INDUSTRY
Module 5: Man-age data, forms and instruc-tions for recording, evaluat-ing and reporting quality and reli-ability data (AMH/ N2004)	Unit 5.2: Documenta-tion Meth-ods and Reporting Systems	5.2.7 Opera-tion Bulletin (OB) and SAM at Costing Stage	114	https://youtu.be/-i_nAab4p6xw-?si=6tqtbJe5sO4b14Nk	TYPES OF OPERATION BULLETIN

Module No.	Unit No.	Topic Name	Page No	Link for QR Code (s)	QR code (s)
		5.2.8 Data Management Software and Digital Tools	114	https://youtu.be/-gBXJ_PhlADQ-?si=LISAOAkEuLWYjyqj	Enterprise Resource Planning (ERP) in 15 minutes
Module 6: Adhere to industry, regulatory, and organizational standards and embrace environmentally sustainable practices (AMH/N0621)	Unit 6.1: Health, Safety, Emergency Preparedness and Workplace Hygiene	6.1.1 Ethics and Values in the Workplace	135	https://youtu.be/-Aqqk1FUyIrw-?si=lmAJ27MHJzVcA---	What is Workplace Ethics?
	Unit 6.3: Sustainability, Resource Efficiency and Waste Management	6.3.4 Waste Segregation and Disposal	135	https://youtu.be/-K6ppCC3lboU-?si=jljDL9HoQ2ZavJfn	What is Waste Management?
Module 7: Maintaining a healthy, safe and secure working environment in the organisation PWD & Gender Sensitivity Requirements (AMH/N1605)	Unit 7.1: Workplace Safety Protocols and Compliance	7.1.4 Safe Equipment Handling and Use of PPE	170	https://youtu.be/-p_9hOqdw75o-?si=9carQ06bt6VjguCq	Personal Protective Equipment (PPE)

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