CHAPTER 5
PROCESS IMPROVEMENT AND LEAN MANUFACTURING

BASIC COMPETENCIES

Students are able to understand and apply the principles of process improvement and lean manufacturing, identify waste elimination procedures, and communicate improvement procedures in English with appropriate terminology in accordance with Toyota Production System standards (Liker, 2004; Womack & Jones, 2003).

LEARNING OBJECTIVES

After studying this chapter, students are expected to:

1. Understand and use lean manufacturing terminology in a procedural context
2. Read and interpret procedural texts about process improvement
3. Identify and write procedures for waste elimination
4. Prepare kaizen reports and improvement proposals in English
5. Apply lean tools through the writing of standard operational procedures

PHASE 1: PRE-ACTIVITY

Warm-up Activity

Think about your daily morning routine:

1. What steps do you take from waking up to leaving for class?
2. Which steps add value to your goal of getting to class prepared?
3. Which steps are wasteful (searching, waiting, unnecessary movement)?
4. How could you improve your morning routine?

Key Insight: This is exactly how Lean Thinking works in manufacturing - identifying and eliminating waste!

Pre-Assessment

Rate your current knowledge (1-5):

- Understanding of waste types in manufacturing: _____
- Knowledge of 5S methodology: _____
- Familiarity with kaizen principles: _____
- Ability to write improvement procedures: _____

PHASE 2: INPUT & EXPLORATION

PROCEDURE TEXT: IMPLEMENTING 5S WORKPLACE ORGANIZATION

Source: Adapted from Liker (2004); Hirano (1995)

Goal: To create and maintain a clean, organized, and efficient workplace that supports continuous improvement and eliminates waste.

Materials/Equipment Needed:

- 5S audit checklist
- Red tags for unnecessary items
- Labels and color-coding supplies
- Cleaning supplies and equipment

- Visual management boards
- Standard operating procedure (SOP) templates

Steps:

Step 1: SORT (Seiri) - Eliminate Unnecessary Items

1. First, gather the team and explain the sorting criteria: necessary, unnecessary, and unknown.
2. Next, examine every item in the work area systematically.
3. Then, attach red tags to all unnecessary or questionable items.
4. After that, move red-tagged items to a designated holding area for evaluation.

Step 2: SET IN ORDER (Seiton) - Organize Remaining Items

1. First, analyze work flow to determine optimal placement for each item.
2. Then, designate specific locations for each tool and material.
3. Subsequently, create visual indicators using labels, colors, and shadow boards.
4. Finally, apply the principle: "A place for everything, and everything in its place."

Step 3: SHINE (Seiso) - Clean and Inspect

1. First, establish cleaning responsibilities for each area.
2. Next, thoroughly clean all equipment, floors, and work surfaces.
3. Then, inspect equipment during cleaning to identify abnormalities.
4. Subsequently, document any problems discovered and schedule repairs.

Step 4: STANDARDIZE (Seiketsu) - Create Consistent Procedures

1. First, document the best practices developed in Steps 1-3.
2. Then, create visual standards showing the correct state of the workplace.
3. After that, develop checklists for daily, weekly, and monthly 5S tasks.
4. Finally, train all team members on the new standards.

Step 5: SUSTAIN (Shitsuke) - Maintain the Discipline

1. First, schedule regular 5S audits using the standardized checklist.
2. Next, post audit results and track improvement trends.
3. Then, recognize teams and individuals who excel in maintaining 5S.
4. Finally, continuously review and improve the 5S system through kaizen.

Warning/Caution:

- Never discard items without proper authorization and documentation.
- Always involve workers in the process - 5S cannot be imposed from above.
- Do not skip the Sustain step - without it, improvements will not last.

COMPREHENSIVE QUESTIONS

Task 1. Read the procedure text above and answer the following questions:

A. Literal Comprehension

1. What is the main goal of implementing 5S?
2. List all five steps of 5S in both English and Japanese terms.
3. What materials are needed to implement 5S?
4. What should be done with items tagged with red tags?

B. Interpretive Comprehension

1. Why is the order of the 5S steps important? Can they be done in a different sequence?
2. Explain why "Shine" involves both cleaning AND inspection.
3. Why is "Sustain" considered the most difficult step to implement?

C. Critical Thinking

1. How could 5S principles be applied to improve your study habits or workspace?
2. What challenges might Indonesian companies face when implementing 5S?
3. Design a 5S implementation plan for a small manufacturing workshop.

BUILDING VOCABULARY

Source: Liker (2004); Womack & Jones (2003); Ohno (1988)

A. Core Lean Manufacturing Terms

No	Term	Definition	Example in Procedure Context
1	**Muda (Waste)**	Any activity that consumes resources without creating value	*"First, identify all muda in the process."*
2	**Kaizen**	Continuous improvement through small, incremental changes	*"Then, apply kaizen principles to improve workflow."*
3	**Gemba**	The actual workplace where value is created	*"Go to gemba to observe the current process."*
4	**Poka-yoke**	Mistake-proofing devices or methods	*"Subsequently, install poka-yoke devices."*
5	**Takt time**	Rate at which products must be completed to meet demand	*"Calculate takt time to balance the production line."*
6	**Value stream**	All activities required to deliver a product to customer	*"Map the entire value stream from order to delivery."*
7	**Jidoka**	Automation with human intelligence; stopping to fix problems	*"Implement jidoka to stop the line when defects occur."*
8	**Andon**	Visual signal system to indicate production status	*"Pull the andon cord if you detect a quality problem."*

No	Term	Definition	Example in Procedure Context
9	**Kanban**	Visual card system for pull-based production control	*"Use kanban cards to signal replenishment needs."*
10	**Heijunka**	Production leveling to balance workload	*"Apply heijunka to smooth production schedule."*

B. Eight Types of Waste (TIMWOODS)

No	Waste Type	Description	Example
T	Transportation	Unnecessary movement of materials between processes	Moving WIP across factory
I	Inventory	Excess raw materials, WIP, or finished goods	Stockpiling components
M	Motion	Unnecessary movement of people during work	Walking to get tools
W	Waiting	Idle time when materials, equipment, or info unavailable	Waiting for machine
O	Overproduction	Producing more than customer demand requires	Making extra units "just in case"
O	Overprocessing	Performing more work than necessary	Over-polishing surfaces
D	Defects	Products requiring rework or causing scrap	Faulty assemblies
S	Skills (unused)	Not utilizing employee knowledge and creativity	Ignoring worker suggestions

GRAMMAR FOCUS:
CONDITIONAL SENTENCES IN PROCEDURES

Source: Adapted from Swales & Feak (2012)

A. Conditional Sentences for Procedures

In procedure texts, conditional sentences are used to describe conditions, consequences, and decision points. They help explain what to do in specific situations.

Type	Structure	Example in Lean Context
Zero Conditional	If + present simple, present simple	*If you detect a defect, stop the line immediately.*
First Conditional	If + present simple, will + base verb	*If inventory falls below reorder point, the system will generate an alert.*

Type	Structure	Example in Lean Context
Imperative Conditional	If + condition, imperative	*If the kanban card is empty, replenish the bin.*

B. Modal Verbs in Procedure Instructions

Modal	Function	Example
Must/Must not	Obligation/Prohibition	*You must wear safety equipment. You must not skip inspection steps.*
Should	Recommendation	*You should check equipment before each shift.*
May/Might	Possibility	*This step may take longer for complex products.*
Can	Ability/Permission	*Any worker can pull the andon cord.*

PHASE 3: PRACTICE & APPLICATION

TASK 2: Waste Identification Exercise

Read each scenario. Identify the waste type, impact, and write an improvement procedure.

Scenario 1:

A warehouse worker walks 2 km per shift moving between storage locations and the packing station because frequently-used items are stored far away.

Waste type: _____ | Impact: _____

Improvement procedure: _____

Scenario 2:

A machine operator produces 500 parts but only 300 are needed. The extra 200 parts are stored for possible future use.

Waste type: _____ | Impact: _____

Improvement procedure: _____

Scenario 3:

Products wait an average of 3 days between process steps even though actual processing time is only 2 hours.

Waste type: _____ | Impact: _____

Improvement procedure: _____

TASK 3: Writing a Kaizen Improvement Procedure

Write a complete procedure text for conducting a Kaizen event using the template:

PROCEDURE: CONDUCTING A KAIZEN EVENT

Goal: _____

Team members required: _____

Materials: _____

Duration: _____

Steps:

Day 1 - Define & Measure:

1. First, _____
2. Next, _____

Day 2 - Analyze & Improve:

3. Then, _____
4. After that, _____

Day 3 - Implement & Control:

5. Subsequently, _____
6. Finally, _____

Warning: _____

PHASE 4: PRODUCTION

TASK 4: Creating a Standard Operating Procedure (SOP)

Create a complete SOP for one of the following lean processes. Use proper procedure text structure with goal, materials, numbered steps with sequence markers, and warnings.

Choose one topic:

- Value Stream Mapping Procedure
- Kanban System Implementation
- Root Cause Analysis using 5 Whys
- Setup Time Reduction (SMED)

Requirements:

- Minimum 8 steps
- Use imperative verbs
- Include sequence markers
- Include at least 2 conditional sentences
- Include warnings/cautions
- Use minimum 5 vocabulary terms from this chapter

PHASE 5: ENRICHMENT

Case Study: Toyota Production System

Source: Liker (2004); Ohno (1988)

Toyota Production System (TPS) is built on two pillars: Just-in-Time (JIT) production and Jidoka (automation with human intelligence). These principles guide procedures throughout Toyota's operations. Any worker can stop the production line by pulling the andon cord if they detect a problem - a procedure that prioritizes quality over short-term productivity.

Source: Liker (2004); Ohno (1988)

Analysis Tasks:

1. Write a procedure for "Responding to an Andon Alert" (250 words)
2. Explain how TPS procedures differ from traditional mass production (200 words)
3. Design a TPS implementation procedure for an Indonesian company (300 words)

PHASE 6: REFLECTION & SELF-ASSESSMENT

Rate your achievement of learning objectives (1-5):

1. Understanding lean terminology: _____
2. Identifying types of waste: _____
3. Writing improvement procedures: _____
4. Using conditionals in procedures: _____
5. Applying 5S methodology: _____