

Lean Manufacturing

What is LM

Lean manufacturing is a methodology that (1) focuses on minimizing waste within manufacturing systems while simultaneously maximizing productivity.

LM objectives

The objectives of LM are to:

- create simple and clear structures in the company,
- increase the importance of the resources at the workplace in order to use them in the most effective way,
- eliminate waste,
- reduce costs,
- improve customer satisfaction.

Elimination of waste

The elimination of waste is core to anything related to lean as a practice. One of the core lean manufacturing principles to follow is to make sure that there is as little waste as possible in and created by everything that you do.

Causes of waste:

- Having standing inventory (wasting space and resources)
- Spreading out your workstations too much, increasing the travel time between them
- Too many workers being assigned to a limited task
- Lacking process automation where it can be used

Lean Manufacturing principles

Heijunka (level production)

Heijunka is a Japanese word which means “leveling production”. In turn, this means that no matter what happens, your output remains the same every day.

The theory is solid – by looking at your average order amount you can keep your production consistent and (2) avoid having to rush to meet a particular order. On days where you produce more than you sell the excess goes into a “fluctuation stock”, with the opposite happening on days where more is sold than produced.

JIT (Just In Time) production

The **ultimate** goal is to have absolutely no inventory, whether that be raw resources or finished products.

Jidoka (detecting defects through automation)

It's the principle that most defects can be automatically detected to completely remove human error from the equation.

Rather than (3) **making an employee check** every product for defects or errors, a machine is set up with checks built in to do the task automatically. When an error is **detected**, an alarm sounds to (4) **let the employees at hand know** that something has gone wrong.

5S workplace organization

5S workplace organization represents Japanese words that describe the steps of a workplace organization process. English **equivalent** words are shown in **parenthesis**.

In simple terms, the five S methodology helps a workplace:

- remove items that are no longer needed (sort),
- organize the items to optimize efficiency and flow (straighten),
- clean the area in order to more easily identify problems (shine),
- implement color coding and labels to stay consistent with other areas (standardize),
- develop behaviors that (5) **keep the workplace organized** over the long term (sustain).

1. Sort (seiri) – **Distinguishing** between necessary and unnecessary things, and getting rid of what you do not need

- Remove items not used in area – **outdated** materials, broken equipment, **redundant** equipment, files on the computer, measurements which you no longer use
- Ask staff to **tag** all items which they don't think are needed – this improves understanding about need and use

2. Straighten (seiton) – The practice of orderly storage so the right item can be picked efficiently at the right time, easy to access for everyone. A place for everything and everything in its place.

- Identify and **allocate** a place for all the materials needed for your work
- Place heavy objects at a height where they are easy to pick from
- Decide how things should be put away

3. Shine (seiso) – Create a clean worksite without garbage, dirt and dust, so problems can be more easily identified (leaks, spills, excess, damage, etc)

- Identify the causes of dirtiness, and correct process
- Only one work activity on a workspace at any given time
- Keep tools and equipment clean and in top condition, ready for use at any time.

4. Standardize (seiketsu) - Setting up standards for a neat, clean, workplace

5. Sustain (shitsuke) - **Implementing** behaviors and habits to maintain the established standards over the long term.

- Every one sticks to the rules and makes it a habit
- Participation of everyone in developing good habits
- Regular audits and reviews

The Five Whys

It is another one of LM tools used to identify the root cause of a problem, which requires participants to continually ask “why?” questions. This questioning (6) allows teams to diagnose problems without any statistical analysis and often identifies multiple root causes and the relationships between them.

Kanban

To visualize your process with a Kanban system, you will need a board with cards and columns. Each column on the board represents a step in your workflow. Each Kanban card represents a work item. When you start working on item X, you pull it from “To Do” column and when it is completed, you move it to “Done”. This way you can easily track progress.

Poka-yoke

Poka is a Japanese term that means mistake-proofing or error prevention. A poka-yoke is any mechanism in any process that (7) helps an equipment operator avoid mistakes. Its purpose is to eliminate product defects by preventing, correcting, or drawing attention to human errors as they occur. A simple poka-yoke example is demonstrated when a driver of the car equipped with a manual gearbox must press on the clutch pedal prior to starting an automobile. The interlock serves to prevent unintended movement of the car.

Exercises

Ex. 1 Find the words in the text corresponding to the definitions. The words are marked red in the text.

1. acting in the same way over time	
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2. concluding, terminal, final	
3. corresponding with another in value, amount, function, meaning	
4. not or no longer needed or useful	
5. put (a decision, plan, agreement, etc.) into effect	
6. recognize or treat (someone or something) as different	
7. at the same time	
8. allocate (a job or duty)	
9. concept, idea, theory	
10. be without or deficient in	

Ex. II Explain the words in English. The words are marked blue in the text.

1. core
2. inventory
3. detect
4. parenthesis
5. outdated
6. tag
7. allocate
8. purpose
9. prior to
10. occur
11. unintended

Ex. III Grammatical forms. Translate the forms into Polish and make your own sentences using them. They are marked green.

1. focus on doing something
2. avoid having to do something
3. make somebody do something
4. let somebody do something
5. keep something + adjective
6. allow somebody to do something
7. help somebody do something

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Mgr Dorota Kulas