

Qualityinfo

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What Is Total Productive Maintenance?

Preventive, not reactive

Lean manufacturing is a philosophy focused on maximizing productivity and eliminating waste while creating a quality product. One of the most powerful strategies in the lean toolbox is total productive maintenance (TPM), a system targeting continuous improvement through a holistic approach to maintenance. Avoid delays in the manufacturing process caused by breakdowns and unplanned maintenance with TPM.

What is total productive maintenance?

As long as equipment and tools have been used, they've needed to be maintained. In manufacturing, maintenance traditionally was approached reactively, and as Steven Borris writes in *Total Productive Maintenance* (McGraw Hill Education, 2006), traditionally the surplus of cheap labor meant no one was particularly worried about efficiency or avoiding breakdowns. Following World War II, however, industries and economies were reassessing business and making drastic changes.

It was during this time that Japan (most notably Toyota) began innovating manufacturing concepts and developing strategies for a productive facility with as little waste as possible. TPM's history began when preventive maintenance was introduced to Japan during the early 1950s. During the next several years, Saiichi Nakajima (known as the father of TPM) integrated that concept with maintenance best practices, small-group improvement activity, and engaged leadership to create the official TPM process.

TPM emphasizes the importance of maintenance in an organization. Too often equipment maintenance is brushed off to the side, and maintenance personnel keep moving from one small task to the next until machines break down and need to get replaced. In a TPM program, maintenance takes on a preventive approach, and continuous efforts keep equipment in best working condition at all times. TPM places the responsibility of routine maintenance (e.g., cleaning equipment, checking gauges, looking at levels) on the machine operator rather than on maintenance personnel.

These are the eight activities, known as the eight pillars of TPM, that are now carried out:

1. *Jishu hozen*: *Jishu hozen* is a Japanese term translating as “autonomous maintenance.” It is the concept that operators should be trained to perform basic and routine maintenance tasks (like cleaning or inspecting), effectively freeing up the maintenance team to focus on more complex tasks. This allows operators to improve their skill, increase their equipment knowledge, and develop a sense of ownership.

2. **Kaizen/focused improvement:** Another Japanese term, *kaizen* means “continuous improvement” and is a critical element of lean. Following the implementation of TPM, it is important to consistently analyze systems and identify waste and nonvalue-adding activities. Each department should have its own designated TPM team that is in charge of setting goals, evaluating progress, and solving related issues.

3. **Early equipment management:** You will gain a better understanding of equipment and maintenance through TPM. Early equipment management (EEM) is the strategy of applying that practical knowledge to the design of new equipment, which benefits your maintenance program, taking into consideration the accessibility of parts, elements that could make for easier changeover, increased safety features, etc.

4. **Safety, health, and environment:** This activity is focused on ensuring that the workplace is safe and free from unnecessary hazards. When designing new equipment or implementing new maintenance procedures, it is important to

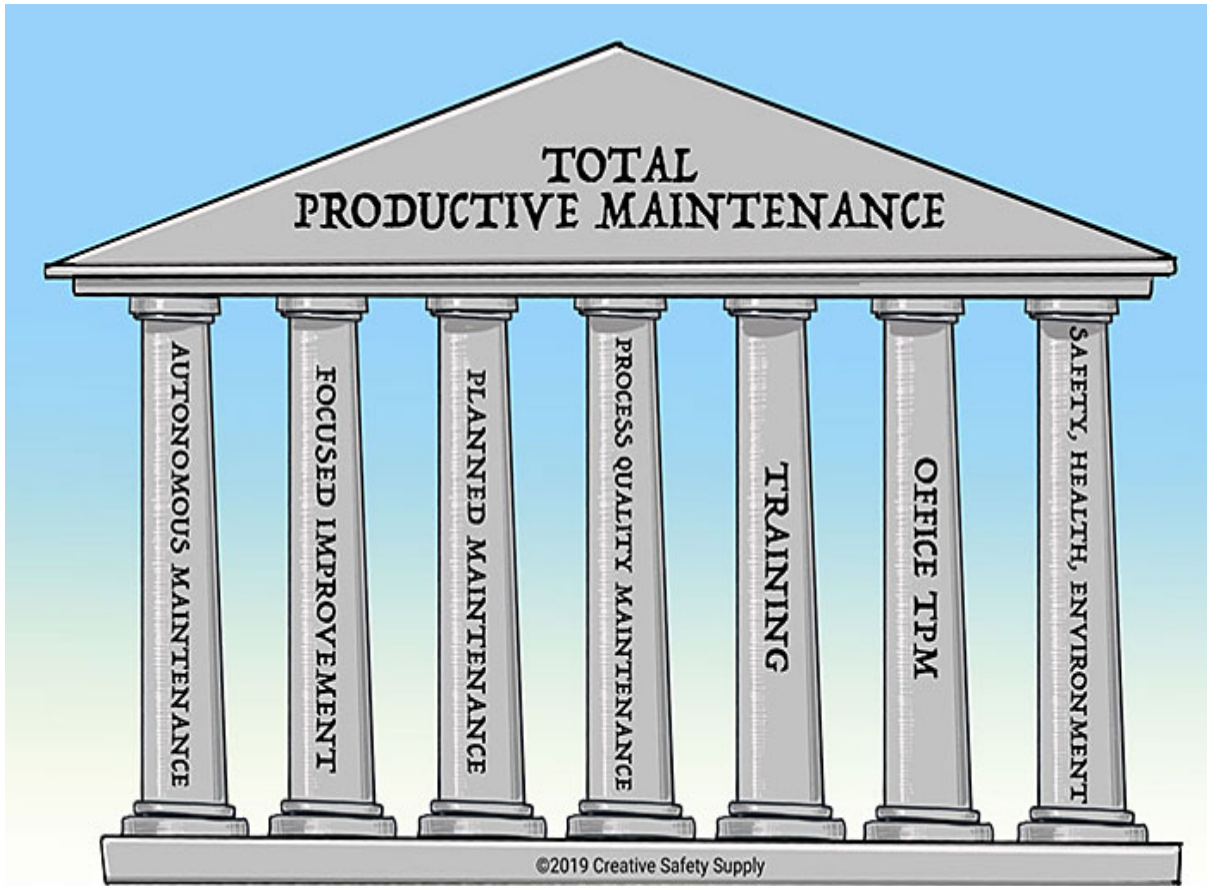
consider how safety may be affected. The goal is zero accidents and is accomplished through risk assessments, hazard analysis, thorough training sessions, and developing safe maintenance procedures.

5. Planned maintenance: Planned maintenance shifts maintenance efforts from reactive to proactive. Instead of servicing equipment after it breaks down, operators consistently perform routine maintenance and conduct inspections to prevent problems and keep repetitive issues from occurring.

6. Quality maintenance: The production process can be designed in a way that detects and prevents errors to eliminate quality defects. You will want to understand the elements of the production process that affect quality and target the root cause of defects with mechanisms built into the process.

7. Training and education: Having an effective training program is essential to the success of TPM. Everyone should know how TPM works and why it is important. Operators are trained on how to perform routine maintenance and identify problems early on; the maintenance team is trained on proactive and preventive maintenance; and managers are trained on how to best support their team with coaching and development.

8. Office TPM: Finally, TPM needs to be supported by the administrative function of the organization. Office TPM aims to improve efficiency by reducing loss that results from lengthy setup times, communication breakdown, idle time, etc.



Why does TPM matter?

TPM is more than just a maintenance program. It allows you to maintain and improve the integrity of the production process. You will find that when everyone in the facility is contributing and engaged in TPM, this lean tool will yield many positive results.

When developing TPM, Nakajima specified that the main objective is to increase and continuously improve the overall equipment effectiveness (OEE) of plant equipment. OEE is a measurement used to evaluate manufacturing productivity; the OEE formula ($\text{Availability} \times \text{Performance} \times \text{Quality}$) allows you to quantify the design capacity and performance of your machines with three manufacturing elements that can be targeted for improvement.

Nakajima also defined the six most common equipment-based losses, the "Six Big Losses." These directly align with the variables of OEE. Unplanned stops and setup/adjustments are considered to be an availability loss; small stops and

slow-running machines are a loss of performance; and production defects or products scrapped/reworked are classified as quality loss. An effective TPM program identifies where the facility is experiencing losses and addresses each one for an overall improved OEE score.

TPM works to improve the quality of the equipment, which in turn improves the quality of the product. With TPM you find both direct benefits like the elimination of waste, reduced costs of manufacturing, and improved quality, as well as indirect benefits, like increased employee morale and job satisfaction.

Total productive maintenance can be a difficult program to implement, and you will need to make sure the environment and culture of your facility is prepared before you begin implementation. It's important to introduce TPM to everyone during the planning stages because the more people you can get on board in the beginning, the better the chances it will succeed. Managers, maintenance personnel, and employees should all learn about how TPM works, their roles in it, and why it's important.

One of the measures you can take to build a strong foundation for TPM is by using the 5S methodology (sort, set in order, shine, standardize, sustain). Adopting 5S will not only help set the standard for how the workplace is organized, but it's also a sustained effort that will make it easier to spot maintenance issues like fluid leaks, damaged parts, etc. By working through the five steps of 5S, you will create an infrastructure and environment for TPM to succeed.

Methods like TPM and 5S have transformed the way the world manufactures; they can help you transform your facility, too.

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