



# Total Productive Maintenance (TPM)

## Extend Equipment Life and Productivity with TPM

It's a manufacturer's nightmare: You have a short shipping window for delivering a huge order to an important customer, and that one machine that always gives you trouble—the older one that makes the parts used in almost every product you manufacture—decides to break down. All of a sudden you can't ship product.

That's where Total Productive Maintenance (TPM) can help. TPM is a process that maximizes the productivity of your equipment for its entire life. It's a proactive method for predicting and preventing unplanned downtime.

One of the critical building blocks in the lean continuous improvement process, TPM can increase a machine's capacity by 25%-60%, reduce maintenance costs by 10%-50%, virtually eliminate overtime shifts, and increase productivity and profits. In addition, TPM allows you to carry lower inventory levels because you don't need to cover unplanned downtime.

Initial data commonly show that, without a TPM program in place, during a 12-hour day, a machine on average is operating only 40 percent of the time. The two major reasons for 75 percent of the breakdowns are improper lubrication and contamination. The rest of the downtime is due to minor stoppages, long setup and adjustment times, breakdowns, and so on.

### TPM: Preventing the Problem

"A lot of people say to me, 'We could do a great job if we could just buy new equipment,'" says Jerry Thiltgen, WMEP manufacturing and maintenance specialist. "My

### Typical benefits of TPM include:

- ▶ Overall Equipment Effectiveness (capacity): **25-65% improvement**
- ▶ Quality defect: **25-50% improvement**
- ▶ Maintenance Expenditure improvement: **10-50%**
- ▶ Percent planned vs. unplanned maintenance increase: **10-60%**

response to that is 'You don't have to. You can do a great job with what you've got.'"

"With TPM, we focus on returning machinery to like-new condition," states Lodahl. "We maximize two things: one is the efficiency of the machine, so we don't have a lot of idling and minor stoppages, and the other is predicting breakdowns and doing repairs before the machine breaks."

That's exactly what happened at Spacesaver Corporation, a Ft. Atkinson based manufacturer of high-quality mobile and stationary shelving systems. When one of their core machines went down for three weeks, they went looking for some protection against downtime. By implementing TPM they not only reduced unplanned downtime, they also picked up a tremendous amount of capacity—it was like money in the bank. Says Thiltgen, "If you implement TPM effectively, you



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can have machines that run at their rated capacity for their entire life in the factory—and the life of the machines will be increased by the attention they're getting.”

## The TPM Process and OEE

A TPM project typically uses a modified kaizen format and can span several weeks.

- ▶ **Training:** A team of people is selected, including machine operators, craft maintenance people, supervisors, and management. The process begins with a day of training, simulations and case studies, plus instruction on how to work in teams. The team also learns how to collect Overall Equipment Effectiveness (OEE) data, a simple but very powerful TPM tool.

OEE is shop floor-collectable data that documents how long a machine is actually running, how long it's down, how many reworks are needed, and so on. OEE provides an easily applied and understandable way of measuring machine utilization. It also serves as a record over time of a machine's performance and can be used over and over again as a reference guide for future troubleshooting. The TPM team then decides which equipment to target first for improvement.

- ▶ **OEE Data Collection:** During the next three weeks, the first OEE data is collected. This is done by the machine operators themselves, on all shifts. This data serves as baseline data for the project and shows where the problems lie.

- ▶ **OEE Data Analysis/Problem Prioritization:** The team meets to analyze the OEE data and prioritize the problems it uncovers. The problems can be categorized according to the “six big losses” that reduce a machine's efficiency: breakdowns, setup and adjustment loss, idling and minor stoppages, reduced speed, defects and rework, and startup and yield loss. From there, the root causes of these problems can be targeted and corrected.

- ▶ **TPM Implementation:** Next the team works to restore the equipment to make it as reliable and productive as it is capable of being. Using the OEE data, high failure rate areas are identified and the necessary repairs performed. Then daily and periodic maintenance schedules are established.

A 5S factory organization and cleanup project is also part of the TPM process. Up to 75 percent of unplanned downtime on machines is caused by contamination or improper lubrication. By keeping the machines clean, contamination and leaks are easily identified and can be corrected immediately.

“At the end of six weeks, the major causes of downtime and degrading of capabilities have been repaired, and the speed and reliability of the machine is restored to like-new condition. We can dramatically show the increase in equipment uptime,” Thiltgen says. To document progress and improvement, the team continues to collect and analyze OEE data from the equipment.

## Making it Work

Using a team of people from the shop floor up – machine operators, craft maintenance people, supervisors, and management– is critical. The team process is integral to the success of TPM, and team training is an important element.

Initially, there may be some resistance to TPM because it changes the way things have been done for many years. Machine operators now have responsibility for the daily maintenance of their machines, after being told for years not to touch them except to produce parts. And the maintenance people feel their territory is being threatened.

But the operators eventually realize that they gain a lot more ownership in the process and their jobs run much more smoothly with fewer breakdowns and stoppages. And the maintenance people realize that they need to save their skills and knowledge for work on major overhauls and revisions to machines, and for coaching the operators on daily maintenance.

“The motivating thing about all this is instant gratification,” says Thiltgen. “In every TPM project I’ve done so far, the team has been so excited about the results that they wanted to start the second project before we’ve finished the first.”

## About WMEP

WMEP is a private, nonprofit consulting organization committed to the growth and success of Wisconsin manufacturers. A leader in Next Generation Manufacturing, WMEP brings best practices to Wisconsin firms to help them achieve world-class performance through innovation and transformation. WMEP receives financial support from the Wisconsin Department of Commerce, and partners with many public and private organizations to serve Wisconsin manufacturers.

**To learn more about how TPM can help your company, call WMEP at 1.877.856.8588.**

