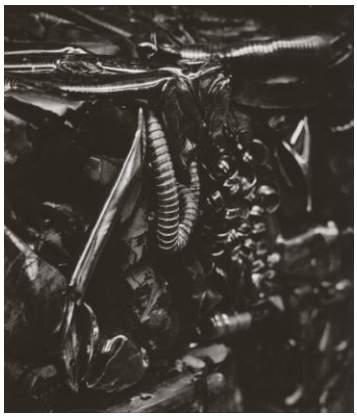
Total Productive Maintenance

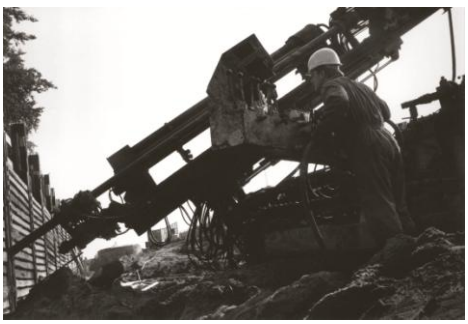
How and Why to Implement TPM in Your Factory

Total Productive Maintenance (TPM) is a maintenance program which involves a focused, defined concept for maintaining plants and equipment. The goal of the TPM program is to increase production while, at the same time, increasing employee morale and job satisfaction. The TPM program closely resembles the popular Total Quality Management (TQM) program. For instance, just as with TQM, total commitment to the program by upper level management is required. Also, employees must be empowered to initiate corrective action. Changes in employee mind-set toward their job responsibilities must happen, which means a change in culture is required. As with any change that requires a culture change, TPM may take a year or more to implement and is an on-going process.



TPM evolved from TQM, which evolved as a direct result of Dr. W. Edwards Deming's influence on Japanese industry. Dr. Deming began his work in Japan shortly after World War II. As a statistician, Dr. Deming initially began to show the Japanese how to use statistical analysis in manufacturing and how to use the resulting data to control quality during manufacturing. The initial statistical procedures and the resulting quality control concepts fueled by the Japanese work ethic soon became a way of life for Japanese industry. This new manufacturing concept eventually became known as Total Quality Management or TQM.

When the problems of plant maintenance were examined as a part of the TQM program, some of the general concepts did not seem to fit or work well in the maintenance environment. Preventative maintenance (PM) procedures had been in place for some time and PM was practiced in most plants. Using PM techniques, maintenance schedules designed to keep machines operational were developed. However, this technique often resulted in machines being over-serviced in an attempt to improve production. The thought was often "if a little oil is good, a lot should be better." Manufacturer's maintenance schedules had to be followed to the letter with little thought as to the realistic requirements of the machine. There was little or no involvement of the machine operator in the maintenance program and maintenance personnel had little training



beyond what was contained in often inadequate maintenance manuals.

The need to go further than just scheduling maintenance in accordance with manufacturer's recommendations as a method of improving productivity and product quality was quickly recognized by those companies who were committed to the TQM programs. We call this concept making a machine run "better than new". To solve this problem and still adhere to the TQM concepts, modifications were made to the original TQM concepts. These modifications elevated maintenance to the status of being an integral part of the overall quality program.

Companies that start TPM are usually focused on zero defects and zero work stoppages. Having spent many years in Operations, our focus was always on zero defects and zero downtime – however, our methods for achieving (or trying to achieve) those goals were usually based on three techniques:

1) When the machine broke down, yell loudly for maintenance!
2) Next, yell loudly at the operator (it must have been his/her fault)!
3) When you found out the parts had to be ordered, yell even louder!

It wasn't real effective, but since you were going to be yelled at for not meeting schedule, it did relieve some of the stress, I suppose. More often than not, when you got around to talking to the operator about what happened, it wasn't unusual to find out that the machine had been acting "funny" for a few days. None of the gauges were off, but something just "didn't feel right" to the person who ran that machine every single day.

Total Productive Maintenance says that when an operator notices any kind of anomaly with the machine, they have to notify the maintenance department immediately, and the maintenance department has to respond immediately to work with the operators to identify the causes of changes in equipment in order to prevent total catastrophic work stoppages.

There are seven steps to basic TPM:

1) Start with a 5S + Safety event on the first work station to implement TPM. Operators must have the ability to spot oil leaks, water leaks, etc., to be able to see the reading on gauges, to have no debris from cutting, etc. that could possibly hinder the operation, and be able to find their tools and information quickly. There should be regulations in place to keep from pushing the machine past its normal operating limits.

2) Maintain the basic equipment conditions. Keep the hydraulic fluid full, tighten loose bolts, etc.

3) Improve maintenance quality and scheduling. If a machine has to be stopped for any scheduled maintenance, do as much required maintenance as possible at one time. It

makes no sense to take a machine off line in May for one type of maintenance, and again in August for a second type.

4) No more quick fixes. Find and fix the root causes of the breakdown. Too many times we quickly fix the symptom to get the machine up and running again knowing it will break again shortly. Root causes may be a result of design weaknesses or consistently overloading, consistently running the machine "hot", etc.

5) Implement Single Minute Exchange of Die (SMED) in order to quickly get the machine back up and running after a shut-down. This means decrease the amount of set-up work that needs to be accomplished while the machine is sitting idle and maximizing the amount of set-up work that can be accomplished while it's running.

6) Train the operators to understand their equipment.

7) Standardize the training for TPM and SMED for all operators.

There are five categories of bottom line losses companies suffer from a non-existent TPM system:

Unexpected breakdown losses	Results in equipment downtime for repairs. Costs can include downtime (and lost production opportunity or yields), labor, and spare parts.
Set-up and adjustment losses	Results in lost production opportunity (yields) that occurs during product changeovers, shift change or other changes in operating conditions.
Stoppage losses	Results in frequent production downtime from zero to 10 minutes in length and that are difficult to record manually. As a result, these losses are usually hidden from efficiency reports and are built into machine capabilities but can cause substantial equipment downtime and lost production opportunity.
Speed losses	Results in productivity losses when equipment must be slowed down to prevent quality defects or minor stoppages. In most cases, this loss is not recorded because the equipment continues to operate.
Quality defect losses	Results in off-spec production and defects due to equipment malfunction or poor performance, leading to output which must be reworked or scrapped as waste.
Equipment and capital investment losses	Results in wear and tear on equipment that reduces its durability and productive life span, leading to more frequent capital investment in replacement equipment.

In summary, Autonomous Maintenance, a key aspect of TPM, trains and focuses workers to take care of the equipment and machines with which they work. TPM addresses the entire production system lifecycle and builds a solid, plant-floor based system to prevent accidents, defects, and

breakdowns. TPM focuses on preventing breakdowns (preventive maintenance), "mistake-proofing" equipment to eliminate product defects and to make maintenance easier (corrective maintenance), designing and installing equipment that needs little or no maintenance (maintenance prevention), and quickly repairing equipment after breakdowns occur (breakdown maintenance).

The goal is the total elimination of all losses, including breakdowns, equipment setup and adjustment losses, idling and minor stoppages, reduced speed, defects and rework, spills and process upset conditions, and startup and yield losses. The ultimate goals of TPM are zero equipment breakdowns and zero product defects, which lead to improved utilization of production assets and plant capacity.

Contact us today to learn how we can help **you** achieve these results!

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