

TPM: Another Three-Letter Program or a Real Improvement Process?

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TOTAL PRODUCTIVE MAINTENANCE... three words that are beginning to dominate the American worker's vocabulary. Is it another trendy program in American management or a true means to actually improve operations?

Some organizations will treat TPM as just another program or as one of many possible treats on a "smorgasbord" of sampling and discarding. For the most part, organizations are beginning to see TPM for what it is - a systematic means to improve quality, delivery, and reduce costs. TPM is accomplished by getting the largest assets of the organization, people and equipment, to work together.

TPM is composed of five major elements: **Reliability Engineering** (maintenance-free design); **Autonomous Maintenance** (operator involvement); **Training** (upgrading the skills and knowledge of operators and maintenance personnel); **Maintenance Excellence** (interval based servicing, planning, scheduling, and condition-based monitoring); and **Equipment Improvement Teams** (problem solving groups). TPM can accomplish more effectively what other quality or maintenance improvement efforts cannot. The success of TPM comes from the synergy of all these elements working together.

Once the elements of TPM are understood and working together, goals and vital phases must be defined. The goals of TPM are to move towards zero breakdowns, zero defects, and lower costs. To accomplish these goals, the three phases of the equipment's life span must be properly observed. The first phase is the acquisition or start-up stage. Improvements consist of designing the best possible equipment, manufacturing it properly, and installing it correctly. **Life Cycle Costs** (LCC) can be reduced by using **Reliability Engineering** to properly design equipment for reliability and accessibility.

One must take into consideration component life expectancy, ergonomics of operator usage, and ease of accessibility for maintaining the equipment. Since 80-90% of the costs of maintaining a piece of equipment is predetermined by the way it was designed and manufactured, there are enormous opportunities to reduce those costs by doing a good job up front and by applying **Reliability Engineering concepts**. Input by managers and engineers working with operators and maintenance personnel is critical.

The second phase, the operational stage, deals with operating and maintaining the equipment in the best manner possible. **Autonomous Maintenance and training** play important roles at this stage. Neglect and abuse can be minimized by ensuring operators have the best skills to operate and set up their equipment. In addition to maintaining basic care of the equipment by keeping it clean, properly lubricated, and physically secured, the operator can serve an important and active role in providing on-site detection by looking for signs of deterioration. Spotting and responding to deterioration in equipment infancy can prevent breakdowns.

The last phase, the wear-out stage, is the period when the equipment's performance is affected by wear and tear. By using **Preventive and Predictive Maintenance (PPM)**, the effects of deterioration can be minimized. A good **Preventive Maintenance** program provides interval or timed servicing of the equipment so the components can be replaced as they wear. Cleaning, lubricating, adjusting, inspecting, repairing, replacing, and testing can decrease deterioration. **Predictive Maintenance** allows the use of technology to monitor wear-out. Coupled with human conditional monitoring (on-site operator inspection), a proactive response to prevent failures can be developed. The best time to address a big problem is when it is small. Corrective maintenance is important since correctly diagnosing and fixing problems is key to minimizing the effects of wear.

Equipment Improvement Teams (small group activities) with cross-functional membership should be applied during all three stages. These teams help in the design of new equipment, assist the operator in conducting basic care and inspection activities, and identify and eliminate the causes to equipment losses. **Training** is applied at all three stages to ensure that everyone involved with the operating and servicing of equipment has high skills and knowledge. Part of the team charge is to help elevate the equipment and optimize its performance by tracking and improving its **Overall Equipment Effectiveness (OEE)**.

Although **Equipment Improvement Teams** are an integral part of successful TPM and equipment life span, the key to the success of TPM is management support. TPM is not a maintenance program. It is a plant-wide process involving everyone. Maintenance is a key player in successful production, engineering, and management. Therefore, all levels of management have to demonstrate commitment to giving resources, time, and patience to allow TPM to take affect.

Most machine failures do not occur by chance; most failures are either caused by or indicated by *deterioration* or *drift* in operating condition, conditions that can often be observed or measured.

The ability to eliminate breakdowns comes from preventing them. Eliminating breakdowns means detecting signs of deterioration or drift. Almost 75% of all breakdowns can be prevented by having the operator closest to the equipment cleaning and inspecting it on a regularly planned basis. Breakdowns can be prevented *only if* we can spot them in the early stages of deterioration. Spotting them means detecting changes in operating conditions or watching for "telltale" trends that point to future problems.

The remaining 25% of breakdowns can be detected by maintenance craftspeople conducting regularly scheduled Preventive Maintenance tasks and applying Predictive Maintenance technology. Modern technology has greatly improved our ability to monitor critical conditions for both failure diagnostics and failure prediction.

Faced with higher asset investment costs and ever-increasing use of more sophisticated process technology, organizations are aggressively implementing these techniques and that allow detection of impending failure or degradation of performance.

In order for TPM to work successfully, there must be synergy of the five major elements defined and properly adapted to the three phases of life span. The driving force behind this success is people. TPM is a **slow culture change** to get people to do the *right* things at the *right* time. This culture change compliments societies' changing attitudes, values, and priorities. TPM is a long term and worthy process...not a three worded jargon and a trendy program!!!!