

## **TOTAL PRODUCTIVE MAINTENANCE** (The Health Care of Machines and Equipment)

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The importance of Total Productive Maintenance (TPM) cannot be overlooked because it plays such an important role in the effectiveness of Lean manufacturing. As in personal health care insurance, TPM may be considered the health care of our manufacturing machine and tools that are required to effectively reduce waste and run an efficient, continuous manufacturing operation, business, or service operation. The cost of regular TPM is very small when it is compared to the cost of a major breakdown.

The main purpose of TPM is to ensure that all equipment required for production is operating at 100% efficiency at all times. Through short daily inspections, cleaning, lubricating, and making minor adjustments, minor problems can be detected and corrected before they become a major problem that can shut down a production line. TPM requires company-wide participation and support by everyone ranging from the top executive to the shop floor personnel.

### **TPM Focus**

Total Productive Maintenance (TPM) is a maintenance program with a newly defined concept for maintaining plants and equipment. The goal of the TPM program is to increase production and at the same time increase employee morale and job satisfaction. It brings maintenance into focus as a necessary and vitally important part of any business or manufacturing operation. It is no longer regarded as a non-profit activity. Down time for maintenance is scheduled as a part of the manufacturing day and, in some cases, as an integral part of the manufacturing process. The goal is to hold emergency and unscheduled maintenance to a minimum.

### **Maintenance Types**

- **Breakdown maintenance** - equipment is repaired only when it breaks down, which could be when it could stop a production line that could be very costly not only from a repair cost but also the cost of the production lost.
- **Preventive maintenance** - a daily maintenance (cleaning, inspection, oiling and re-tightening) program designed to keep the condition of the machines and equipment healthy and prevent failure.

- **Corrective maintenance** - improves machines and equipment so preventive maintenance can be carried out reliably. Design weakness in any equipment must be corrected to improve its reliability.
- **Maintenance prevention** - Weakness of current machines are studied for failure prevention, easier maintenance, safety and ease of manufacturing.

## Breakdowns

A machine's breakdown **true cost** is sometimes difficult to measure. A recent survey showed that the cost for a machine breakdown is more than just the maintenance labor and materials to make the repair. A recent survey showed the actual cost for a breakdown between four to fifteen times the maintenance costs. When the breakdown causes production to stop, the costs are very high because no parts are being produced.

"Machine life shortened by neglect.  
This consists of a lack of  
regular committed maintenance!"



Contributing Factors  
 1. Failure to add oil      3. Grit + Dirt in revolving parts  
 2. Water or oil on sensor      4. Dirt or dust on cooling fan.

How can reliability affect cost? One of the most important areas is the amount of preventable or unnecessary work that occurs in every plant. By reducing this unnecessary work, employee morale increases and translates into greater loyalty and productivity. The impact that reliability has on company earnings can be directly calculated by the reduction in the cost of maintenance.

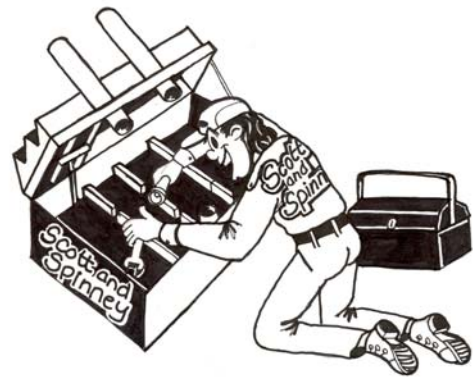
## Causes of Breakdowns

1. **People** – most breakdowns are caused by people who have been poorly trained, poorly supervised, or have forgotten to do some simple maintenance tasks such as lubrication of key parts. Machines do not break themselves; it takes people to do it.
2. **Machines** – consist of a large number of parts and as long as each part is well taken care of there should be no problems. Generally minor problems, such as loose screws, lack of lubrication, etc., are overlooked and start to produce defective parts or fail completely. Larger machine problems are caused by minor problems that have gone bad.

3. **Deterioration** – There are two types of deterioration; **natural** that occurs over a period of time when the machine is well maintained and used properly, and **accelerated** generally occurs when equipment is not properly maintained. Accelerated deterioration occurs when an operator is not doing the job of simple daily maintenance or has not been instructed to do it properly, which shortens the life of the machinery.

### Keeping Trained Personnel

To estimate how valuable a regular maintenance program is to a company, consider the latest industry figures. For each dollar (\$ 1.00) spent on proper maintenance, the company saves the equivalent of twenty dollars (\$ 20.00) of extra profit without extra needed sales when the cost of a breakdown is considered. Maintenance is not really a necessary evil but really a profit center when one considers equivalent sales.



In the middle 1990's the ratio of maintenance personnel to hourly workers in an average company was about 17% and in the late 1990's the average age of all skilled tradesmen was 45-55 years old. This ratio began to fall lately and now stands at a low of 6%. Many companies try to fix the complicated high technology equipment with staff that is not properly trained for this type of equipment. Some companies hire outside contractor at anywhere from \$50.00 - \$100.00 per hour or more, which quickly becomes very costly.