Shape preventive maintenance systems to support TPM goals

Author: Levitt, Joel.
Publication info: Plant Engineering 48.n13 (Oct 1994): p130(2).
Full text: Many industrial plants face the same economic circumstances: Cutbacks have reduced maintenance staffs below the levels necessary to properly care for the plant and its equipment. Staffs cut to the bone have only three alternatives to avoid asset deterioration and its attendant decay in quality and service. They are:

1. Improve maintenance worker productivity

2. Reduce the frequency of maintenance exposures

3. Tap non-maintenance resources (for example, machine operators).

Total Productive Maintenance (TPM) is the logical goal of departments facing such situations because it is designed around the three remedies to avoid deterioration. Elements of TPM improve maintenance worker productivity, reduce exposures, and bring in operators to supplement maintenance activities.

TPM's dual goal is zero defects and zero breakdowns. Achieving these goals requires five elements: maximize equipment effectiveness; establish a preventive maintenance (PM) system that extends over the life of the equipment; implement the program everywhere; involve every employee from workers on the floor to the company president; promote the use of PM as a motivational technique through autonomous maintenance groups.

The first step in implementing TPM is understanding what TPM is trying to accomplish and how PM supports those goals. TPM can be summarized as attention to and elimination of six major factors that lead to production losses. They include downtime from equipment breakdowns; downtime from setup and adjustment; speed losses due to idling and minor stoppages from abnormal sensor operation, work blockages, etc.; slowdowns due to discrepancies between design and actual speeds; process defects; and reduced yield from startup to stable production.

PM is a series of tasks that extends the life of an asset by deferring critical wear through proper lubrication, cleaning, tightening, and adjustment. Cleaning a hydraulic cylinder extends its life. PM also extends life by detecting critical wear and predicting failure in time to fix the problem.

A PM system also includes record-keeping to track PM, downtime, slowdowns/stoppages, failures, and equipment utilization. Procedures must also exist for performing minor or short (no more than 30 minutes) repairs. The PM program should also be equipped with a method for using the frequency and severity of failures to refine PM task lists. A way to continually upgrade skills and improve the process should be part of the system.

TPM requires a PM level most maintenance departments would find impossible at current staffing levels. The only large pool of talent available to carry out task lists are operators. The operator is also the logical person to carry out PM. Operators are closest to the equipment and have a vested interest in the outcome of such an effort. In many plants, TPM operators effectively provide a 20% increase in hours for first line PMs.

In a TPM environment, common PM tasks are divided between operators and maintenance technicians. Some functions that might be assigned to the operator include tightening anchor bolts, adjusting fan belt tension, and adding oil to a circulating pump. Inspection tasks might be shared by the operator and maintenance technician. Looking for water leaks in the plumbing system is a shared responsibility. Major overhaul activities such as removing and replacing a pump would remain within maintenance.

Two task lists are developed, one for operators and one for maintenance technicians. A TPM program must delegate a bulk of PM hours to the operator. Operators must be thoroughly trained. In one plant, operator

training lasted 12 weeks with several sessions held each week. The end result was to make daily and weekly PM tasks a function of production.

Another strategy is to assign daily, weekly, and possibly monthly PM tasks to the operator; and quarterly and annual tasks to the maintenance technician. The advantage of this approach is having routine work handled by someone who is in close contact with the machine. Less routine work is performed by a person with more extensive diagnostic skills. The quarterly inspection can also serve as an audit of the operator's routine work. Breakdowns are typically handled by the maintenance technician with the operator assisting.

Having an operator perform routine tasks has advantages and disadvantages. On the one hand, the operator knows his machine and, in most cases, takes ownership of it. Taking on added responsibilities increases his value as an employee, gives him more control, and increases his motivation to do a good job.

On the other hand, he may not relish extra work, may not like to clean the machine, and might not perform the assigned tasks. He typically has less training and mechanical know-how. The approach could be inadequate PM management.

A major purpose of TPM is to reduce breakdowns. Traditional PM pays more attention to inspecting and detecting critical wear and loose components and focuses less on machine cleanliness. However, a study done by a Japanese plant engineering society found that, even in clean plants, more than half the breakdowns were caused by dirt and looseness. Therefore, cleanliness and tightness should be keystones of a TPM-driven PM system.

TPM brings the elements of good PM together under the banner of increased equipment effectiveness. The operator is a key player, supported technically by a skilled maintenance worker. Given corporate downsizing and the philosophy of doing more with less, maintenance departments are forced to rely more and more on people outside of maintenance. Even in profitable industries, maintenance departments are being squeezed.

Maintenance is not well understood in many plants. Top management often assumes if maintenance would just work a little harder, it could do more with even less. Blurring the lines between operations and maintenance just might free the knowledge locked in the minds of maintenance professionals for the whole organization to use.

Joel Levitt has trained maintenance managers from 1000 organizations. He is a skilled electrician and computer technician and is knowledgeable in psychology. He is a maintenance management seminar leader and founder of Springfield Resources, a company that designs and installs management systems. Direct questions to Levitt at 215-924-0270.

Some TPM information presented here is derived from the writings of Seiichi Nakajima, author of An Introduction to TPM and TPM Development Program, Productivity Press, Cambridge, MA. Another good TPM resource is Total Productive Maintenance, An American Approach by Terry Wireman, published by Industrial Press, New York, NY.