BREAKTHROUGH
Lean Implementation & Training Resource Publication
Brought to you by Lean Manufacturing Solutions Partnership, Inc.

TPM (TOTAL PRODUCTIVE MAINTENANCE)

By Harold Chapman

PRACTICAL TPM

We have experienced many companies that desire to improve their business and financial results, but struggle with implementing an improvement process due to a lack of stability. A large source of this instability is equipment uptime. Our machines must be available to run product when we need them and produce quality parts at an efficient rate. A common approach to achieving this maximum effectiveness is Total Productive Maintenance (TPM).

What is TPM?
The focus of TPM is a broad organizational approach to restoring, maintaining and improving equipment. This is done by bringing the people most familiar with the equipment together in a concentrated effort to increase the Overall Equipment Effectiveness (OEE). Our focus is on the constraint processes taken from the value stream map.

What Performance Indicators are impacted by TPM?
There are many benefits to conducting TPM at a plant. Besides the obvious improvements in associate engagement, teamwork and morale, there are also tangible impacts on some of our basic business metrics. The main business metrics impacted are: Productivity, Inventory Turns, First Pass Yield and Customer Delivery

The impact on Productivity ensures we are producing parts at the most efficient pace for customer consumption. In a value stream depending upon machines to create flow, the equipment availability has a direct tie to overall productivity.
Inventory Turns can be increased if we don't have to accumulate inventory due to a machine or process that can't be trusted to run when needed.

A well maintained machine makes good parts, thus eliminating the burden of scrap and waste costs and eliminates the need for "Hidden Factories" to repair product that is defective. Also, Scrap and Rework within the plant will lead to slip-through to our customer, which will lead to a poor reputation and lost sales long-term.

Finally, we can ship the customer the parts they need when they need them with assurance we are sending quality parts. Thus ensuring the long-term livelihood of our business, this will in turn maintain and create jobs in our community. This has particular significance in today's economy.

MEASURING TPM

How do we measure TPM Success at the Equipment Level? There are many metrics used to show improvement at the equipment level, but we recommend OEE, or Overall Equipment Effectiveness. This metric considers Availability, Performance Efficiency and Quality for the equipment being measured. The world class goal for OEE is 85%. The average OEE across various industries in the United States ranges between 40% and 60%.

The formula for OEE:

OEE = Availability % x Performance Efficiency % x Quality %

Jason Manarchuck Director of New Business Development
11212 Nautical Drive. Knoxville, TN 37934 PHONE: 865.776.9159 FAX: 865.588.1814
www.LMSPI.com Jason@lmspi.com

BREAKTHROUGH
Lean Implementation & Training Resource Publication
Brought to you by Lean Manufacturing Solutions Partnership, Inc.

TPM (TOTAL PRODUCTIVE MAINTENANCE)

By Harold Chapman

MEASURING TPM, Cont'd

To determine the Availability of a piece of equipment, we begin with the number of minutes scheduled for the shift. We recommend capturing OEE by shift to show shift to shift variation in performance. In a single eight hour shift, we will have 480 minutes of scheduled time. We subtract any "planned" time from that time to give us available time. Using the typical break schedule of one 30 minute break and two 15 minute breaks during an eight hour shift, we are left with 420 minutes total available. If we incur 60 minutes of "unplanned downtime", we will have an availability percent of 85.7%. The world class goal of 85% includes preventative maintenance as "unplanned downtime." This is done to prevent machine breakdowns from being converted into preventative maintenance in an effort to merely look good.

Performance Efficiency is a measure of our ability to operate the equipment during the time when it is running. Given the remaining time in the shift, 420 minutes available minus the 60 minutes of downtime, we are left with 360 minutes of operating time.

There are two different methods for determining Performance Efficiency depending on the nature of the product(s) being run. There is the common cycle time approach which is used when the product(s) has a repeatable cycle time between part numbers, and there is the variable cycle time approach, which is used when the cycle times between part numbers vary greatly. We will show the common cycle time approach.

Common Cycle Times are the easiest to measure. If a part takes 1 minute to produce, and we produce 340 parts, we will have used 340 minutes in the allotted 360 minutes; our Performance Efficiency is 88.8%. In a Lean Cell operating to takt, we would use the Takt time in the place of common cycle time.

Measuring Quality percentage is a simple calculation:
1 – (Scrap and Rework/Total Run) X 100%

Where:
Scrap and Rework = All scrap and rework produced for the time period being measured.
Total Run = All product produced including scrap and rework.

It is important to capture rework, since we are concerned with First Pass Yield and not just defect cost. If we run 340 parts total with 40 of them scrap or rework, our Quality rate would be 88.2%.
The resulting OEE in the above example would be Availability % (85.7%) x Performance Efficiency % (88.8%) x Quality % (88.2%), which is 67.1% OEE.

Capturing OEE is the beginning of your journey to creating a TPM culture in your plant. Simply starting to capture OEE will increase your performance, but it will take more effort to change your culture to embrace TPM as a daily part of life. Next month, we will discuss the steps of implementing TPM in the plant.

Jason Manarchuck Director of New Business Development
11212 Nautical Drive. Knoxville, TN 37934 PHONE: 865.776.9159 FAX: 865.588.1814
www.LMSPI.com Jason@lmspi.com