WHAT FACILITY MANAGER SHOULD KNOW ABOUT MAINTENANCE

Submitted by: Tarun Sharma

Date: 03/01/2019

Maintenance:

- ✓ The act of maintaining or the state of being maintained.
- ✓ The work of keeping something in proper condition; upkeep.
- ✓ Care or upkeep, as of machinery or property: With proper maintenance the car WILL last for many years.
- ✓ Any activity – such as tests, measurements, replacements, adjustments and repairs — intended to retain or restore a functional unit in or to a specified state in which the unit can perform its required functions.
- ✓ For material — all action taken to retain material in a serviceable condition or to restore it to serviceability. It includes inspection, testing, servicing, and classification as to serviceability, repair, rebuilding, and reclamation.

Maintenance Management:

- ✓ Management characterizes the process of leading and directing all or part of an organization, often a business one, through the deployment and manipulation of resources (human, financial, material, intellectual or intangible).
- ✓ One can also think of management functionally as the action of measuring a quantity on a regular basis and adjusting an initial plan and the actions taken to reach one's intended goal.
- ✓ This applies even in situations where planning does not take place. Situational management may precede and subsume purposive management.
- ✓ Maintenance management will therefore characterize the process of leading and directing the maintenance organization.
- ✓ Maintenance is defined as the combination of all technical, administrative and managerial actions during the life cycle of an item intended to retain it in, or restore it to, a state in which it can perform the required function (function or a combination of functions of an item which are considered necessary to provide a given service).
- ✓ We can define maintenance management as follows: All the activities of the management that determine the maintenance.
- ✓ Objectives or priorities (defined as targets assigned and accepted by the management and maintenance department), strategies (defined as a management method in order to achieve maintenance objectives), and responsibilities and implement them by means such as maintenance planning, maintenance control and supervision, and several improving methods, including economic aspects in the organization.

Various types of maintenance strategies:

Reactive Maintenance:

- ✓ Reactive maintenance is basically the "run it till it breaks" maintenance mode. No actions or efforts are taken to maintain the equipment, facility, as the designer originally intended to ensure design life is reached.
- ✓ Advantages to reactive maintenance can be viewed as a double-edged sword. If we are dealing with new equipment, we can expect minimal incidents of failure. If our maintenance program is purely reactive, we will not expend manpower dollars or incur capitol cost until something breaks.

Advantages:

- ✓ Low cost.
- ✓ Less staff.

Disadvantages:

- ✓ Increased cost due to unplanned downtime of equipment, unsafe housing
- ✓ Increased labour cost, especially if overtime is needed.
- ✓ Cost involved with repair or replacement of equipment, facility, and housing
- ✓ Possible secondary equipment, facility, or process damage from equipment failure.

Preventive Maintenance:

Preventive maintenance can be defined as follows: Actions performed on a time- or machine-run-based schedule that detect, preclude, or mitigate degradation of a component or system with the aim of sustaining or extending its useful life through controlling degradation to an acceptable level.

Advantages:

- ✓ Cost effective in many capital-intensive processes.
- ✓ Flexibility allows for the adjustment of maintenance periodicity.
- ✓ Increased component life cycle.
- ✓ Energy savings.
- ✓ Reduced equipment or process failure-
- ✓ Estimated 12% to 18% cost savings over reactive maintenance program.

Disadvantages:

- ✓ Increased cost due to unplanned downtime of equipment, problems moving IDP individuals from houses, buildings, facilities, while work is being completed.
- ✓ Increased labour cost, especially if overtime is needed.
- ✓ Cost involved with repair or replacement of equipment.
- ✓ Possible secondary equipment or process damage from equipment failure.
- ✓ Inefficient use of staff resources

Predictive Maintenance:

- ✓ Predictive maintenance can be defined as follows: Measurements that detect the onset of degradation mechanism, thereby allowing causal stressors to be eliminated or controlled prior to any significant deterioration in the component physical state. Results indicate current and future functional capability.
- ✓ Basically, predictive maintenance differs from preventive maintenance by basing maintenance need on the actual condition of the machine, house, facility, rather than on some pre-set schedule, preventive maintenance is time-based.
- ✓ Activities such as changing lubricant are based on time, like calendar time or equipment run time. For example, most people change the oil in their vehicles- every 3,000 to 5,000 miles
- ✓ No concern is given to the actual condition and performance capability of the oil. It is changed because it is time.
- ✓ This methodology would be analogous to a preventive maintenance task. If, on the other hand, the operator of the car discounted the vehicle run time and had the oil analyzed at some periodicity to determine its actual condition and lubrication properties, he/she may be able to extend the oil change until the vehicle had travelled 10,000 miles. This is the fundamental difference between predictive maintenance and preventive maintenance, whereby predictive maintenance is used to define needed maintenance task based on quantified material/equipment condition.
- ✓ The advantages of predictive maintenance are many. A well-orchestrated predictive maintenance program will all but eliminate catastrophic equipment failures. We will be able to schedule maintenance activities to minimize or delete overtime cost. We will be able to minimize inventory and order parts, as required, well ahead of time to support the downstream maintenance needs.
- ✓ We can optimize the operation of the equipment, saving energy cost and increasing plant reliability.

Advantages:

- ✓ Increased component operational life/availability.
- ✓ Allows for pre-emptive corrective actions.
- ✓ Decrease in equipment or process downtime.
- ✓ Decrease in costs for parts and labour.
- ✓ Better product quality.
- ✓ Improved worker and environmental safety.
- ✓ Improved worker moral.
- ✓ Energy savings.
- ✓ Estimated 8% to 12% cost savings over preventive maintenance program.

Disadvantages:

- ✓ Increased investment in diagnostic equipment.
- ✓ Increased investment in staff training.
- ✓ Savings potential not readily seen by management.

Reliability Cantered Maintenance:

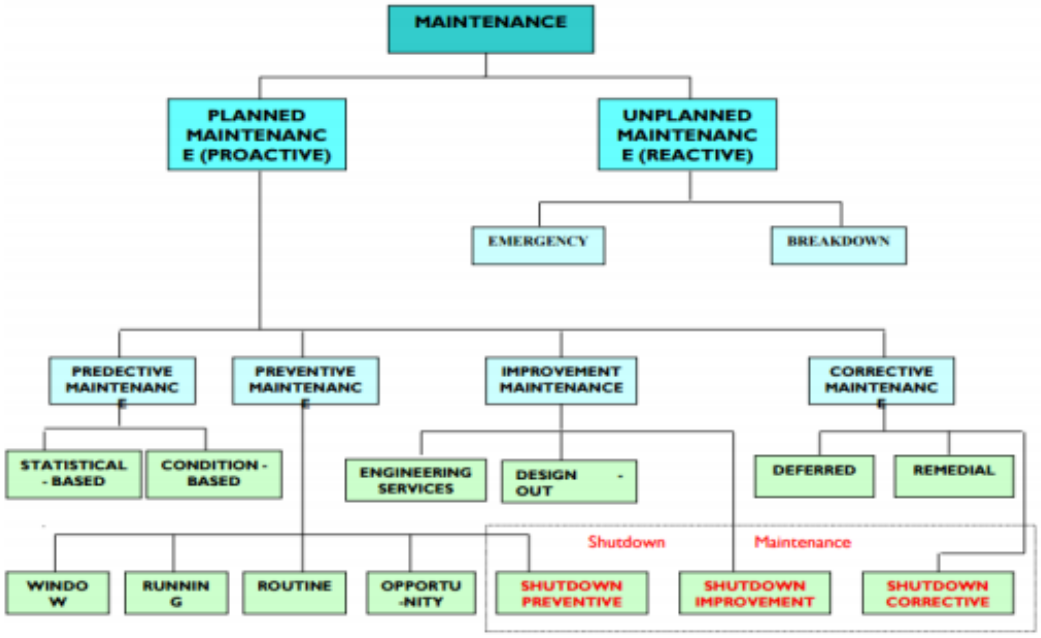
- ✓ RCM: "a process used to determine the maintenance requirements of any physical asset in its operating context.
- ✓ RCM methodology deals with some key issues not dealt with by other maintenance programs.
- ✓ It recognizes that all equipment in a facility is not of equal importance to either the process or facility safety. It recognizes that equipment design and operation differs and that different equipment will have a higher probability to undergo failures from different degradation mechanisms than others.
- ✓ Basically, RCM methodology deals with some key issues not dealt with by other maintenance programs.

Advantages:

- ✓ Efficient.
- ✓ Increased system reliability.
- ✓ Lowered costs due to no unnecessary maintenance.
- ✓ Minimized overhauls.
- ✓ Reduced sudden equipment failures.
- ✓ Maintenance focused on critical components.
- ✓ Incorporates root cause analysis.

Disadvantages:

- ✓ Significant initial costs for training, and equipment.
- ✓ Savings potential not readily seen by management



Maintenance models

Each of the models presented below include several of the previous types of maintenance at the indicated rate. Moreover, all of them include two activities: visual inspections and lubrication. This is because it is demonstrated that these tasks realization in any equipment is profitable. Even in the simplest model (Corrective Model), in which virtually the equipment is left on its own and we do not deal with it until a fault occurs. It is advisable to observe it at least once a month, lubricate it with suitable products to their characteristics. Visual inspections virtually no cost money (these inspections will be included in a range where we have to look at other nearby equipment, so it will not mean we have to allocate resources specifically for this function). This inspection allows us to detect faults in an early stage and its resolution will generally be cheaper as soon as detected. Lubrication is always profitable. Although it does represent a cost (lubricant and labour), it is generally so low that it is more than warranted, since a malfunction due to a lack of lubrication will always involve a greater expense than the corresponding to lubricant application.
With this remark, we can already define the various possible maintenance models.

CORRECTIVE MODEL

This is the most basic model, and includes, in addition to visual inspections and lubrication mentioned previously, the arising breakdowns repair. It is applied, as we will see, to equipment's with the lowest level of criticality, whose faults are not a problem, economically or technically. In this type of equipment is not profitable to devote more resources and efforts.

CONDITIONAL MODEL

It includes the activities of the previous model, and also this model carries out a series of tests that will determine a subsequent action. If after testing we discovered an anomaly, we will schedule an intervention; on the contrary, if everything is correct, we will not act on the equipment. This maintenance model is valid in equipment not to very used, or for equipment that despite being important in the production system the probability of failure is low.

SYSTEMATIC MODEL

This model includes a set of tasks we will perform no matter what is the condition of the equipment , also we will perform some measurements and tests to decide whether to carry out other tasks of greater magnitude, and finally, we will repair faults that arise. It is a model widely used in equipment of medium availability, of some importance in the production system whose failures cause some disruption. It is important to note that equipment subjected to a systematic maintenance model does not have to have all its tasks with a fixed schedule. Just a equipment with this model of maintenance can have systematic tasks that are carried out regardless of the time it have been operated or state of the elements on which it works. It is the main difference with the previous two models in which to perform a maintenance task should be some sign of failure.

How to Start a Preventive Maintenance Program from Scratch?

The point of any preventive maintenance program is to identify equipment failures in their early stages so you, as a maintenance activity can coordinate the man hours and logistics required to prevent breakdowns. Figuring out the best scheduling intervals for different PM tasks can be difficult if you don't have OEM manuals to get you started. Luckily, there have been studies on this topic and I will share with you what seems to be the best way to start you pm program from scratch.

Step 1: Set a PM to CM Ratio For Your PM Program.

The most efficient maintenance activity ever studied, maintained a 6:1 PM to CM ratio when defining PM schedules, meaning one correctable failure was discovered for each PM tasks performed. Here is a good starting point.

To determine preventive maintenance frequency using the 6:1 ratio, take a look at past equipment failures to see if there is a pattern and/or calculate the mean time between failure (MTBF). For example, If it looks like a motor bearing is failing due to brinneling on average every three months, start with a bi-weekly pm schedule for physical inspections or vibration analysis to see if a new bearing or higher quality bearing is needed.

Step 2: Create Your Scheduled Tasks and Procedures.

At this point, brainstorm a running list of PM tasks that are required for the equipment you are trying to maintain based on your experience with that equipment. Create procedures for your tasks to help standardize the process. Then group together like tasks that have the same or similar inspection frequencies (weekly, monthly, yearly etc.) using the 6:1 ratio as a rule of thumb.

Step 3: Test Your Handiwork.

Make sure technicians are aware of their daily workloads and have the time to complete PM tasks according to the procedures you have created for them. Staggering PM's will help manage the work load and makes it so your team does not get overwhelmed with monthly PM's on the first day of every month.

Step 4: Analyze the Results.

- ✓ If you are using maintenance software to manage your preventive maintenance program, analyzing the work histories of you equipment should be easy. Look at the type and frequency of failures that have occurred during the first round of inspections.
- ✓ If there were no correctable faults detected during the first six PM inspections for any task, it could be because of one or both of these reasons:
- ✓ PM procedures are not being followed or the fault detection/assessment abilities of technicians need improvement (start with this).
- ✓ PM inspections are scheduled too frequently and need to be extended in order for the onset of a failure to form. If multiple correctable faults are found within the first six inspections for any task, it could be because of one or both of these reasons:
- ✓ PM procedures are lacking the appropriate tasks needed to prevent the fault (revise your procedures based on the root cause of failures).
- ✓ PM tasks are too infrequent and their scheduled intervals need to be shortened in order to detect the onset of failure sooner.

Step 5: Tweak The Program.

A good metric to measure the effectiveness of your current ratio is the annual maintenance cost per replacement value of an asset.
It looks like this:

$$\frac{\text{(total labor costs + total parts costs + lost production due to downtime)}}{\text{total cost to replace asset}} \times 100$$

Ideally, you want this percentage to be as low as possible. Lower cost of maintenance means your PM program is working as it should i.e. preventing expensive catastrophic equipment meltdowns. Try different ratios to see which one will give you the lowest annual maintenance costs.

5 Reasons To Do Preventive Maintenance.

Preventive maintenance is the core of any maintenance program. Unfortunately, many find it hard to convince others it's worth doing or they can't seem to find the time to stick with it. The truth is, the benefits of PM aren't seen right away and it is hard to quantify its value. However, in the long term, PM proves it's worth because of these five reasons.

Reason 1: Extends Equipment Life

Think of the vehicle you drive.You wouldn't run it for year's without changing the oil would you? Most likely not. You would expect it to dry up and seize within the first year or two. The same goes for facility assets. Scheduled services will extend their useful life.

Reason 2: Reduces Costs

Extended useful life and fewer failures means fewer replacement purchases. There are also reduced costs associated with contracting service professionals. When your in-house staff doesn't have the necessary skills or qualifications to fix critical issues, expensive contracting is the only option. Beyond a reduction in the direct costs of maintenance, there are reductions in indirect costs such as lost productivity and revenue.

Reason 3: Saves Energy

Poorly lubricated mechanical systems, dirty or corroded motors, clogged air filters, these are just a few examples of why energy costs increase over time without preventive maintenance. Manufacturer recommended maintenance schedules should be used to ensure optimal energy savings.

Reason 4: Improves Occupant Experiences

The number one and number two most common facility complaints are because facilities are too hot or too cold. Running equipment to failure will cause occupants to complain, a lot, and will draw unwanted attention to the facilities department. When a proper PM program is in place, the facilities team should become an invisible operation.

Reason 5: Makes Your Job Easier

When things stop becoming emergencies requiring your immediate attention, your work is easier to manage. You'll experience fewer calls, emails, and stops in the hall because something went haywire. Plus, occupants will like you more when facilities are running smoothly and you will feel more in control of what commands your attention.