



Life Cycle of a Preventive Maintenance Program

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Introduction

When a plant embarks on a new program, expectations of immediate payback are often too high. Some managers seem to believe there is a magic switch they can turn on that will solve all their problems — there is no such switch.

Changing the way you do maintenance in a plant is one of the greatest cultural changes an organization can undergo. The work force has usually seen programs come and go with no lasting change. There is no reason for them to expect anything different this time. It will take time and unwavering focus to overcome the cynicism and distrust built up by past programs. The workforce must come to trust the program and understand that it is designed to improve the machinery, not act as a timekeeping system. A maintenance program used as a hammer held over the crafts heads will never reach its full potential.

One action management can take to start gaining that trust is to develop and publish a long range Machinery Improvement Plan. A published plan, with regular follow up and public review of progress towards completion shows the crafts that management is committed. They will start to gain confidence that management fully intends this program to be successful.

When developing a long range Machinery Improvement Plan, an understanding of the stages that new programs go through is helpful. A new preventive maintenance (PM) program is typical.

The Life Cycle

A successful PM program usually goes through four phases. First, there is the initial Installation phase, when information is collected and basic procedures are developed. Following a kick-off training session, the Stabilization phase starts. During this period, the emphasis is on learning to use the system correctly and developing the habit of reporting.

As use of the system becomes routine, the Fine Tuning phase starts. The emphasis shifts to finding and removing weaknesses in the system. The quality of the reporting receives much attention. Once good history is being collected and the daily and weekly routines have become habit, an ongoing Systematic Improvement phase starts.

During the Systematic Improvement phase, maintenance reduction programs are put in place. In these histories is used to identify areas where the program can be improved. These systems identify and correct problems with the machinery, training and logistic support. These improvements increase reliability and availability and reduce costs, leading to

increased production and lowered operating expenses.

Installation Phase

The first phase in developing a planned maintenance system is the installation phase. During this phase, all the equipment that will be covered by the system is inventoried. During the inventory, a numbering system is developed that will uniquely identify each piece of equipment and its components. The list of equipment should be prioritized, taking into account the impact on safety, sales and production of a failure of the machine. A machine failure that causes a danger to either personnel or machinery should take top priority, as should a failure that can cause an irrecoverable loss of sales. Next on the list are those failures that cause a loss in production but no loss in sales. And finally, there are those machines that don't affect production or safety.

Using this list, you should write preventive maintenance (PM) and predictive maintenance (PdM) tasks for each piece of equipment. The tasks may come from the manufactures' manuals, government or industry sources, regulatory requirements or by doing a Reliability Centered Maintenance analysis. Any required written procedures are done at this time also. The crafts people who will be performing the work should review these tasks. After the individual machine task lists are reviewed, the tasks for all machines should be scheduled for the year. This annual schedule should be level loaded across the

year as much as possible, taking into account production schedules, shutdown or outage schedules, redundant equipment, equipment groupings, weather, vacations and holidays, first day of hunting season, etc.

The final step in the Installation Phase is training the workforce in the proper use of the system. This includes reading and understanding the work orders, correctly filling out the forms, the daily and weekly routine that should be followed, and the importance of accurate reporting.

Depending on resources, this phase can take from a couple of months to years. If you don't have the resources to get it done quickly, you are usually better off outsourcing the database development portion of the work.

Stabilization Phase

The second stage of program development is the "Stabilization Phase." For you to realize the full benefit of a maintenance system, you must be able to concentrate on your machinery, not on solving problems in program administration. But before you can do that, the bugs must be worked out of the mechanics of running the system. Your goal during this phase should be to learn to use the system and to develop discipline in both trades people and management.

You will establish the proper handling of the work orders during this period. You will start to move your PM completion rate upwards and learn to trust your PdM analysis. Most importantly, you will

establish "buy in" and commitment by the crafts and put to rest the fear that it is a "time keeping" system. This stage usually lasts between six months and a year.

Fine Tuning Phase

The next stage in the evolution of the PM Program is the Fine Tuning Stage. During the Stabilization Stage, the trades people and managers learned how to use the system. They developed habits that form the discipline needed for a successful program. Using the system is becoming "routine."

Now the emphasis shifts towards finding and addressing specific weaknesses in the program. Look for problems filling out and completing the history information on workorders. Improving the quality of the information gathered also becomes a priority. Is parts usage being reported correctly, is downtime and time to repair being reported, is work being prioritized with PM/PdM being given priority as much as possible. Your objective is to find the spots where the system is not working well and correct those problems. This stage will last from six months to a year.

Continuous Improvement Phase

Now that the program is running smoothly, it's time to start making some long term, permanent improvement in the way maintenance is conducted and in the machinery. This is the Continuous (Systematic) Improvement Stage. Once achieved, it should be active continuously for the life of the plant. During this stage

you will look for and isolate problems in the design of the machines that cause them to fail early, be hard to maintain or cause bottlenecks. You will start using techniques such as Fault Tree Analysis and Failure Modes, Effects and Criticality Analysis (FMECA) to isolate equipment problems. You will systematically adjust the planned maintenance system find the best mix of condition based, time based and run to failure strategies. You may decide to do Reliability Centered Maintenance on certain critical machinery. You may decide to invest in precision maintenance training and practices.

Summary

Instituting a new way of doing maintenance in a plant is a major cultural change. To maximize success, be aware of the workforce's fears and cynicism. A published plan that is publicly reviewed on a frequent, regular basis will go a long way towards gaining acceptance. Start by concentrating on the fundamentals of the operation of the system. As understanding and trust develops, fine tune usage. When enough information is collected, shift emphasis to the machinery. Demonstrate to the crafts that support of the system will pay off in reduced maintenance and greater job satisfaction.