Machinery Management Solutions INC.

Healthcare for production machinery

How much Maintenance is Enough?

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How much Maintenance is enough?

One of the difficulties in the maintenance field is objectively judging how much maintenance is the right amount. The large machines in major industrial installations are inherently reliable and their natural rate of deterioration is very low. A manager can spend very little money over a period of several years without experiencing a marked decrease in availability. He often appears to do a better job than a manager who applies a more comprehensive approach. In the latter case, corresponding expenses are visible, and have an immediate negative impact on the budget. Because machinery information is so hard to gather and present consistently, senior management does not recognize the resulting aging and deterioration until too late.

The problem is to balance the maintenance expenses and needs, while minimizing overall costs. The problem is compounded by the need to adjust capacity to changing economic conditions. But these gains are not free. Done correctly, Ccosts may go up but sales revenue and gross profit will go up faster. Done poorly, sales are lost or money is wasted on unneeded maintenance

Plant design characteristics can create a performance limit for the plant, no matter how effective the maintenance is. However, it is also true that improper, inadequate, or too much maintenance can adversely affect performance. Over-maintenance increases direct and indirect maintenance costs by increasing voluntary production losses, speeding aging due to excess dismantling and re-assembly, and increasing the risks of damage through human error. Given these limitations, how do you establish the optimal maintenance program.?

Develop a good measurement system

A key to finding the right amount of maintenance is a good measurement system. A measurement system is like the control panel of an aircraft. It tells you where you are and what the conditions you are operating in are like. Your measurements should accurately represent the current conditions. Comparing measurements from period to period, looking for trends, will tell you where you are headed. By collecting the right data and displaying it properly, the beneficial impact of maintenance can be quantified in a way that is understood and believed by upper management.

Rank machines by criticality

Not all machines have the same importance to the business. Some are crucial to the production process, others, perhaps most, are not. By ranking the machines based on their business interruption impact helps segment maintenance needs.

Often when first starting a program, the history needed for ranking is either not available or is in a form that is very difficult to use. In that case you have to use other methods.

You can assess the impact of failure of each machine on your business. Assign probabilities to each failure and use the probability along with the projected cost of failure to rank the machines.

Another method is to do a Risk-Priority Ranking. This survey of operations and maintenance personnel asks them to categorize how often each machine fails and what the impact of that failure is. The product of the answers to each of those questions is the Risk-Priority Rank.

Finally, you can ask a cross section of people their opinion of which machines are most important.

Adjust degree of PM based on classification of machine

The next step in segmenting maintenance needs is to determine the degree of maintenance each machine receives. A machine whose failure will affect sales or safety of people or equipment should have a higher degree of PM than a machine whose failure will only affect production but not sales or safety. And that machine will have a higher degree of PM than a machine whose failure will not affect production. See Figure 1.

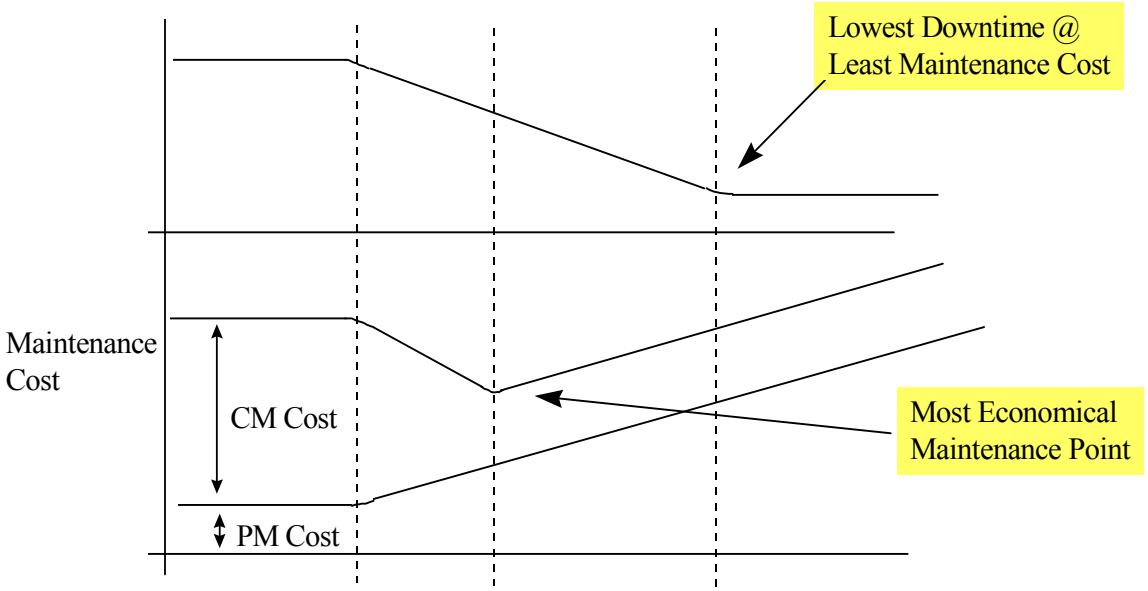

Figure 1

A machine whose failure will immediately impact sales should probably be operated near the point of lowest downtime at least maintenance cost. At the other extreme is a machine whose failure will not affect sales or production — it should be operated near the point of most economical maintenance. If a machine has an impact on production but lost production can usually be recovered without impact on sales, plan for minimum cost of maintenance plus production recovery.

Finally, ask yourself if you even need to do PM on some machines. It may be cheaper to let them run to failure than to PM them.

If a failure of a machine can pose a danger to people or equipment, a degree of maintenance that minimizes or eliminates the danger should be sought.

Factors that can be adjusted to vary the amount of maintenance

What's done

Assess the impact individual tasks have on the machine. Many PM tasks in existing systems are done because they can be, not because they improve reliability, availability, operating cost or life cycle costs. Determine if the cost of doing the task justifies its expense.

Formally plan your work. All work is planned. If it is not pre-planned, then it is planned during execution. Pre-planning insures needed parts, materials and skills are available. Multiple trips to the tool room or store room are eliminated. Crafts are coordinated, avoiding wasted manpower

caused by people standing around waiting. Work planned during execution suffers from false starts, missing parts or information and wasted manpower. Work that is not pre-planned can cost you as much as 25 times more to accomplish.

How often it's done

Most PM tasks are done too often. Use age exploration or some other technique to find the best frequency for your PM tasks.

A reduction in corrective repairs is a side benefit of increasing the PM period. United Airlines found that by using age exploration they could increase the overhaul interval of a hydraulic pump from 6,000 hours to 14,000 hours. They also found that the rate of corrective maintenance was reduced by over half. This reduction was attributed to less intrusion and handling of the pump that could introduce faults and dirt.

Who does it

Should you consider operator performed maintenance? Most operators are capable of performing minor maintenance tasks. Lubrication, cleaning, minor adjustments all are done by operators in some plants. Inspections in particular can involve the machine operators. Once the operators become involved, they will spot problems very early. If they tell maintenance when they first see a problem developing, many failures can be eliminated completely.

Review all the tasks on your machines. Do they all really need the special skills of the maintenance personnel — or can others do the job, freeing highly paid maintenance talent for higher priority work.

How it's done

Another way to find tasks that can be improved is to sort the tasks by the amount of labor required. It's best to use actual historical figures if they are available but planning estimates will work also. Look at the tasks that require a lot of manpower. Is there another way to accomplish the intent of the task without as much manpower. Can the machine be modified to make the task easier?

For example, say a task to inspect the wear on a gear set takes a machinist, 2 riggers and an electrician a total of 12 man-hours. An interfering electric motor must be rigged out of the way, a cover plate is un-bolted and rigged out, the inspection made and then interference is restored. By putting a hinged inspection port in the gear set cover, the inspection could be done in 30 minutes by one machinist.

Other possibilities are changing the route the lubricator or vibration data collector follows when making his rounds to save time, building a special tool or jig to make the task easier, installing an access platform, or even upgrading to a higher grade of lubricant or component which will last longer.

Summary

Too much maintenance can cause as many losses as too little. Any time a machine boundary is broken, potential for contamination and fault introduction exists. By actively pursuing reduced maintenance, failures will be reduced, costs will be reduced and availability improved.