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FOR UTILITIES, A BACK TO BASICS APPROACH TO MAINTENANCE, REPAIR AND OPERATION (MRO) CAN SIGNIFICANTLY REDUCE COST AND RISK

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With today's increased regulations and the pressure to sustain profitability, maintenance operations within Utilities organizations must be nothing short of world class. Faced with enormous challenges, maintenance organizations generally embark on a reliability-centered maintenance (RCM) approach, combined with failure mode effect analysis (FMEA) to achieve its goals. But the high volume of assets (equipment) and the materials demand (MRO inventory) make it a daunting task requiring involvement from everyone across the organization. RCM demands significant initial efforts, and even more to sustain it.

Therefore, establishing and instituting best practices into maintenance processes is key to achieving long-term success. Embracing a "back-to-basics" principle of doing everyday activities well and ceasing all non-value activities will lead to a cost-effective maintenance strategy.

At its core, a cost-effective maintenance strategy addresses the dominant causes of equipment failure. It's a systematic approach to defining a routine maintenance program composed of cost-effective tasks that preserve important functions. By focusing on actions and standardizing the processes, Utilities can quickly drive out waste, maximize time and eliminate non-value activities.

The two elements associated with MRO that must be optimized with Utilities organizations include:

1. Activities – such as inspections, measurements, replacements, adjustments and repairs – intend to restore a functional unit in order to perform required functions.
2. Materials — all supplies used to restore functional units to required conditions.

ACTIVITY OPTIMIZATION

MRO involves two major activities – corrective and preventive maintenance.

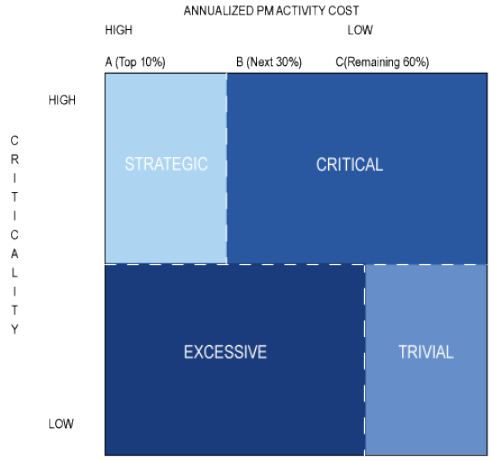
Corrective maintenance (CM) is often most expensive because failed equipment often leads to downtime, and sometimes requires equipment replacement (replacement value). Therefore, organizations must rely on effective preventive maintenance (PM) programs to maintain equipment and prevent costly failures.

Since it is nearly impossible to maintain all equipment at all times, Utilities need to have a value-driven strategy to determine when to perform preventive maintenance. This can be accomplished by identifying equipment criticality, dominant failure modes and causes, and the consequences of failure. The levels of equipment criticality are then reassigned according to the consequences of failure. Some equipment is not critical and left to "run to failure", while others must necessarily be addressed.

Equipment	Criticality per Equipment	Consequence of Failure (CoF)	Criticality with CoF
Process Equipment A	8	10	70
Process Equipment B	8	5	35
Support Equipment C	4	2	8

Table 1 – Example of criticality determination, using a 0-10 scale.

Applying a simple quadrant analysis between criticality of PM activity against its annualized cost, the entire PM activity can quickly be categorized and segmented to determine whether to optimize or to eliminate.



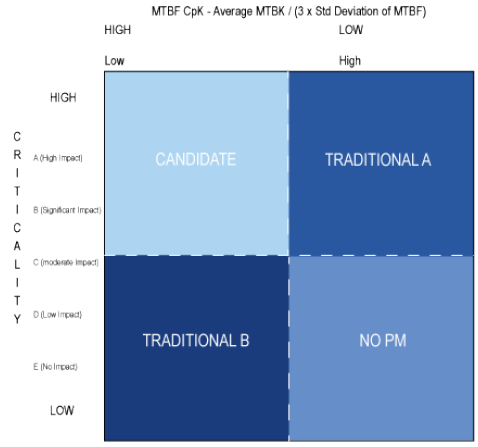
CATEGORY	DEFINITION	RESOLUTION
Strategic Critical	high cost and highly critical	PM effectiveness measures, utilize FMEA/RCM method
Critical	moderate to low cost and highly critical	PM effectiveness measures, utilize FMEA/RCM method
Excessive	high cost and moderate to low critical	increase PM interval, manage by need/exception
Trivial	low cost and low critical	eliminate, delegate to lower cost resource

The PM activities that are categorized as strategic and critical must address dominant failure causes to prevent failures. Failures caused by unlikely events, unpredictable acts of nature, onetime events, etc. should not be taken into account as a risk.

It is not uncommon to find that most PM activities are unnecessary; in fact, it might even add substantial wear to the equipment. In addition, there is no guarantee that the equipment will continue to work at desired conditions, even if the equipment is maintained according to plan. Therefore, the establishment of PM effectiveness measures as a guide to trigger PM activity optimization is essential for a cost-effective strategy.

PM has some advantages over Condition Based Maintenance (CBM) or Predictive Maintenance (PdM), such as easier planning of activities and materials; costs are distributed more evenly; and no initial costs for instrumentations. However, it also has the disadvantage of being less reliable and more expensive due to more frequent part changes. Therefore, the ideal mix of PM and CBM/PdM is highly desirable.

The determination of which assets that should fall under CBM can also be quickly identified by utilizing a quadrant analysis to determine equipment criticality and the mean-time-between-failures (MTBF). The asset selection is extremely important due to high costs and the significant resource demand associated with CBM.



CATEGORY	DEFINITION	RESOLUTION
Candidate	critical, frequent breakdown and high breakdown variation	apply condition monitoring for PdM
Traditional A	critical, occasional breakdown and low breakdown variation	PM at fixed interval
Traditional B	non-critical, frequent breakdown and high breakdown variation	PM at fixed interval or corrective maintenance
No PM	non-critical, occasional breakdown and low breakdown variation	corrective maintenance - run to failure

The assets categorized as “Candidate” are ideal for CBM, and will produce the best return-on-investment. The result is a maintenance program that focuses resources on the assets that would cause the most disruption if failed.

MATERIALS OPTIMIZATION

MRO inventory is generally looked upon by many as a storage area for maintenance materials. However, its function is much more than a materials holding place. Its true intent is to provide on-time delivery of the right materials at the lowest cost.

One of the ways to achieve this stated goal is to optimize the reorder parameters (Min/Max or ROP/ROQ) across all inventory items on a regular periodic interval. But many organizations do not have the resources or the knowledge base to carry out the necessary procedures required to correctly balance the dynamics of material demand. Consequently, organizations are forced to carry excessive inventory (surplus & obsolescence), incur frequent expedition costs (freight), and/or experience unacceptable levels of stock out occurrences.

There are a variety of inventory analytical tools that require very little user interface to optimize reorder parameters and significantly lower inventory cost. An analytical tool’s objective is to gather all pertinent data associated with inventory items and apply algorithms to recommend appropriate reorder parameters across all items in inventory.

CONCLUSION

The challenges of where and how to trim costs while sustaining or increasing service levels and operational excellence exerts enormous pressure on maintenance operations within today's Utilities organizations. The application of back-to-basic principles, couple with some basic analytics tools, can help mitigate much of the pain associated with this challenge.

A cost-effective maintenance strategy can be established simply by taking a step back and doing the basics well, while at the same time ceasing all non-value activities by focusing on:

- understanding that the majority of failures are not linked to the age of an asset;
- managing the process of failure instead of asset lifecycle expectancies;
- assigning criticality based on equipment impact on productivity and cost of equipment failure;
- optimizing PM frequencies and standardizing PM activities based on risk;
- managing assets on Condition-Based Maintenance based on certain selection criteria;
- optimizing inventory reorder parameters on a periodic basis