

Maintenance 102

Reliability based maintenance

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Overview

For innovative organizations, **reliability based maintenance** is the leading strategy for properly maintaining a facility.

A reliability based maintenance program starts by establishing a vision or goal for the contribution that maintenance is to make in a plant. It then brings together the expertise, work processes, and technologies to achieve the vision.

This course outlines a process for approaching reliability based maintenance.

Hint: As you go through the topics in this course, watch for answers to these questions:

- *How do you find the right mix of maintenance strategies?*
- *What is the definition of a critical area?*
- *What are factors in assessing risk?*

- *What is benchmarking, and why would you do it?*

Understanding RBM

Reliability based maintenance, or **RBM**, is an advanced maintenance philosophy that designs balance between **reactive**, **preventive**, **predictive**, and **proactive** maintenance strategies to maximize reliability while reducing operating and maintenance costs.

RBM aims to understand the failure relationships that exist within complex manufacturing systems, and then concentrate resources on what is essential to the continued safe, reliable operation of the plant.

Often this objective results in a short-term increase in maintenance costs while deficient conditions are corrected. Maintenance costs then decrease over the long term — even for critical equipment.

At the same time, RBM minimizes the cost of maintenance and repair to noncritical pieces of equipment.

Finding the right balance

To implement RBM, you have to find the right balance between the various maintenance practices used in your plant.

A four-step process helps you determine this balance:

1. Establishing a vision
2. Plant assessment and benchmarking
3. Reviewing the criticality of each piece of equipment
4. Organizing, implementing, and analyzing

These steps will be executed many times as part of a continuous improvement process. Each step is described briefly in the following pages.

Establishing a vision

Start by defining what you want to accomplish in your maintenance program.

List the business goals you are trying to affect, and set metrics to measure progress towards the vision.

For example, you might set goals such as reducing maintenance costs by 2% of sales, increasing availability 2 days per year, or reducing the number of late maintenance work orders by 75%.

Plant assessment and benchmarking

Next, assess your current capabilities in each of the three major maintenance components:

- maintenance processes
- maintenance resources
- maintenance technology

Use the assessment to identify missing capabilities so you can develop or procure them. Don't forget to include training requirements and subcontracted service needs. Your maintenance technology should be able to support predictive and proactive maintenance.

The assessment also helps you determine future exposure — the loss of critical in-house skill sets, especially through attrition and retirement. The best solution may be to design unique requirements out of the plant.

Benchmarking can be a useful part of your assessment. It compares your operation to other plants — not to outdo them, but to identify best practices and useful strategies that can help you improve.

Here are some examples:

Maintenance cost benchmarks		
General cost ratios	Best practice	Range
Total maintenance cost / total sales	3.4%	1.5 - 5.0%
Total maintenance cost / Estimated Replacement Value	2.3%	2.0 - 5.0%
Maintenance labor cost / total sales	1.5%	0.6 - 2.1%
Maintenance material cost / total sales	1.9%	0.8 - 2.4%

Maintenance benchmarks		
Maintenance Performance	Best Practice	Range
Work order coverage	95%	80 - 95%
Scheduled compliance	>70%	35 - 70%
Preventive maintenance	95%	80 - 100%
Planned work	95%	65 - 95%
Uptime	>78%	48 - 78%
Predictive + preventive maintenance by operators	25%	10 - 25%
Predictive + preventive maintenance labor hours/total maintenance hours	40%	18~40%

The Emerson advantage

Emerson services include benchmarking and development of maintenance performance metrics. These processes are critical for establishing maintenance goals and monitoring progress against goals.

Emerson can also work with you to develop specific plans to optimize maintenance processes, optimize maintenance resources, and identify the technology needed to meet those goals.

Our services and training teams can then help you implement maintenance improvements — or even assume maintenance responsibility in your plant to achieve your maintenance goals.

Reviewing equipment criticality

The third step is to identify critical areas where the equipment is crucial to maintaining the goals of your business. These include areas that generate revenue, environmental or safety areas, and areas that can affect a company's image or reputation should a major failure occur.

This step has two purposes. The first is to understand the true impact of a failure. The second is to assess your ability to respond to a failure, both now and in the future.

Ask yourself these questions about each area:

- What is the risk to safety and the environment?
- What is the cost of secondary damage? Include both direct costs and reduced equipment life.
- What is the cost of a shutdown? Include lost production, waste disposal costs, reprocessing costs, and the startup cost of re-attaining steady-state, on-spec production.
- How old is the equipment? What is the availability of repair parts and support? Is replacement or upgrade needed? Redundancy needs?

This analysis will help you decide the right maintenance strategy. For areas you determine are critical, the maintenance objective should be to eliminate unscheduled outages and unplanned events, usually by moving to preventive and predictive maintenance approaches.

The Emerson advantage

The work processes methodology used by Emerson includes **failure defense planning**. Failure defense planning is a methodical review of the criticality of each piece of equipment in your plant. Individual pieces of equipment are evaluated and the impact of failure is assessed, so you can make an informed decision on the cost and benefits of optimizing each asset.

Organizing, implementing, and analyzing

Organizational alignment is essential for success. Personnel in all major functions of the plant must support the initiative to improve maintenance. Management must also demonstrate its active support and help drive change throughout the implementation process.

The Emerson advantage

Emerson can be your partner throughout the implementation process. Our role can be that of a coach, complementing your personnel and helping with the rollout of your plans. If you prefer, we can take a lead role with full responsibility for various aspects of your program, or even for the full initiative

Ongoing success of your program requires ongoing analysis of maintenance procedures as well as the problems they're designed to resolve. Unless you can identify and eliminate the root causes of problems, you're likely to keep "fixing" the same symptoms over and over again. Your analysis may result in recommendations to revise maintenance practices, use different materials, or change the way equipment is operated