Reducing operations & maintenance costs

Today’s plants are under intense financial pressure. Fewer personnel are expected to operate and maintain more equipment at lower cost, while also delivering higher throughput, higher availability, and higher profits.

It’s a trend that shows no sign of changing. Plants must therefore increase the productivity of their existing maintenance and operations teams, while continuing to look for ways to reduce costs even more.

Benchmarking the opportunity

Fortunately, there are still opportunities for improvement in almost every operation. Industry benchmarks can help you estimate the potential in your own plant.

%RAV. One frequent benchmark of maintenance productivity is annual maintenance cost as a percentage of replacement asset value (RAV). For example, a plant spending $5,000,000 annually to maintain assets that could be replaced for $100,000,000 has a 5% RAV.

The graph shows typical as well as worst- and best-in-class %RAV.¹ For a plant with $250,000,000 in assets to maintain, moving from typical to best-in-class status could mean over $10,000,000 in annual savings.

One benchmark of maintenance productivity is annual spending as a percentage of Replacement Asset Value.

Of course, you still have to keep the plant running smoothly and safely. The goal is to use your maintenance resources more efficiently.

Span of control. For operations, one measure of productivity is the number of loops each operator manages. A typical plant might have 125 loops per operator, so managing 1500 loops would require 48 operators to staff four shifts. In a best-in-class plant, each operator might handle 250 loops – requiring only 24 operators over the same number of shifts. At a fully burdened cost of $80,000 per year for each operator, the savings would approach $2,000,000 annually.
Even greater benefits are possible when operators also have the tools and information to continuously optimize energy use, feedstocks, and other economic factors for the loops they control.

So why aren’t more plants getting these gains today?

**Misdirected maintenance**

One reason is that too much of the work done by maintenance teams is unnecessary, unproductive, or even counterproductive.

- Over half of typical maintenance activities are unnecessary. This includes routine equipment checks as well as preventive maintenance on equipment that doesn’t need it.

- In a typical plant, the maintenance department averages about 30% “wrench time.” The rest of the time they’re doing data entry and retrieval, work-order reporting, and other paperwork. Best-practices plants use automated tools to manage this information more efficiently – increasing wrench time to 50% or more.

- Some maintenance actually reduces equipment reliability. Problems can result from incorrect re-assembly, incorrect tightening, misalignment, or other errors.

**Inefficient maintenance strategies**

Many of these problems could be reduced by adjusting the mix of reactive, preventive, and predictive maintenance strategies so workers can focus on doing the right things at the right time.

1. **Reactive maintenance.** This “fix it when it breaks” strategy has an obvious drawback: the cost to repair (or replace) equipment that’s run to failure is typically much higher than if the problem were detected and fixed earlier – plus the cost of lost production during extended downtime.

2. **Preventive maintenance.** A preventive strategy assumes equipment is relatively reliable until, after some period of time, it enters a “wear-out” zone where failures increase. To postpone this wear-out, equipment is serviced on a calendar- or run-time basis – whether it needs it or not.
However, determining when the wear-out zone might begin has traditionally relied on estimates and averages rather than actual equipment condition. Because of this uncertainty, preventive maintenance schedules are usually very conservative. As a result, maintenance often takes place **too soon**, when there’s nothing wrong.

But there’s an even bigger problem: only about 6% of equipment follows a time-based “wear-out” pattern. For most other equipment, failures typically result from the cumulative effects of events or conditions that can occur at **any** time. That means schedule-based preventive maintenance can also come **too late**, after the damage has begun.

3. **Predictive maintenance.** This third strategy overcomes these drawbacks by constantly monitoring **actual equipment condition** and using the information to predict when a problem is likely to occur. With that insight, you can schedule maintenance for the equipment that needs it – and only what needs it – before the problem affects process or equipment performance.

Best-practices plants improve productivity and reduce costs by emphasizing a predictive maintenance strategy.

**Overwhelmed operators** Operators typically spend much of their time and talent reacting to unexpected situations – a productivity drain that limits the number of loops they can manage effectively.

The problem often begins with instruments, valves, and process equipment – or entire loops – that don’t perform as they should, requiring **intense operator intervention** to maintain control.
And when something goes wrong, the flood of data and alarms can make it harder for operators to find and fix the problem, or even obscure other process conditions and events that need their attention. Better **alarm and alert management** is needed to ensure that the right people get the right information at the right time to guide their actions.

Some plants rely on abnormal situation management programs for this guidance. But greater productivity is possible by focusing on **abnormal situation prevention** – using predictive maintenance and similar strategies to correct or avoid potential problems *before* they require operator intervention.

**Missed opportunities for economic optimization**

Many of the factors that affect plant economics change frequently – from raw material costs to market demand for process outputs. In an ideal world, operators would constantly adjust energy and feedstock sources, product mix, equipment used, and other variables to **optimize the economic performance** of the plant.

In the real world, however, operators seldom get any real-time feedback on the economic effect of their actions. They could be unaware that they’re losing millions of dollars by running the plant at sub-optimal operating points.

Even if they have the information, they may not have the tools needed to evaluate complex interactions between variables, or to determine the best operating points before conditions change again.

**A limited view**

Predictive maintenance, abnormal situation prevention, economic optimization, and similar strategies offer clear productivity and cost benefits. But predicting potential problems and the effect of changing conditions requires a constant flow of **real-time information** – not just about the *process*, but also about the myriad pieces of *equipment* that make it work.

That’s something traditional automation architectures can’t easily provide. The control system can’t show you much more than the process variable and any associated trends or alarms. There’s no way to monitor equipment health, and thus no way to detect the early-warning signals of potential problems.

What’s needed is a way to predict such problems before they increase operational and maintenance costs, and the tools to leverage that information so you can do more with the resources you have – or with even less.
Emerson’s PlantWeb® digital plant architecture can meet these needs. The architecture’s **predictive intelligence** boosts productivity for both operations and maintenance by enabling you to

- see what’s happening in your process and your equipment,
- detect and identify conditions that could lead to problems, and
- deliver the right information to the right people at the right time … so they can take action to keep things running smoothly, efficiently, and profitably.

**A broader view.** PlantWeb’s digital technology makes it possible to access and use new types of information that go far beyond the process-variable signals available through traditional automation architectures.

This capability starts with intelligent **HART and FOUNDATION fieldbus instruments** – including transmitters, analyzers, digital valve controllers, and other devices – that use onboard microprocessors and diagnostic software to monitor their health and performance, as well as the process, and signal when there’s a potential problem or maintenance is needed.

PlantWeb’s valve diagnostics, for example, can tell you if wear, stiction, or other conditions call for maintenance during the next scheduled shutdown. Just as important, you’ll know which valves don’t need maintenance, so you won’t waste time servicing them.

PlantWeb also captures information on the condition of rotating equipment, such as motors and pumps. And it monitors the performance and efficiency of a broad range of plant equipment, from compressors and turbines to heat exchangers, distillation columns, and boilers.

**Information integration.** PlantWeb uses communication standards like HART, FOUNDATION fieldbus, and OPC, as well as our **AMS™ Suite** of integrated software, to make this information available in the control room, the maintenance shop, or wherever it’s needed.

With the remote monitoring and diagnostics of AMS Suite’s Intelligent Device Manager, for example, what might have been a 25-minute transmitter check in the field becomes a 2-minute task done online. Automatic documentation of the work also increases “wrench time.”

Equipment information is also integrated into PlantWeb’s **DeltaV™** and **Ovation®** automation systems, which combine it with process data to deliver accurate, reliable control and optimization, and to manage alarms and alerts intelligently.
You also get real-time optimization tools that analyze factors such as energy and feedstock costs, conversion efficiencies, and final product value to identify the best operating points for current conditions.

The power to predict – and improve. With the ability to see what’s actually happening – and about to happen – in your process and equipment, your team no longer has to spend as much of their time reacting to unexpected events, or trying to find problems that may not even exist.

Instead, they can focus on more productive tasks, like heading off problems they know are on the way, and finding new ways to reduce costs and improve performance – so you can meet the challenge of doing even more with even less.

Get the whole story

This executive summary provides only an introduction to PlantWeb’s capabilities for reducing operations and maintenance costs. To learn more about how the architecture delivers these benefits – and see what users say about the results -- download the complete white paper from www.PlantWeb.com/Putman-WP.

References


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