Integrating Asset Management and Maintenance

A goal of 80% planned maintenance is attainable when a plant asset management platform is integrated with maintenance strategy during engineering design.

Bill Broussard
Emerson Process Management

After speaking directly with more than 600 process industry maintenance supervisors, key personnel, and plant process engineers over the past three years, it's clear that most are engaged in a never-ending struggle to reduce reactive (unplanned) maintenance, which consumes as much as 80% of the maintenance man-hours in their plants. It's no wonder they can't achieve "best-cost producer" status—or even cut costs significantly. Their profits are eaten away by over-time labor costs and production losses due to unplanned maintenance activities.

The exceptions to this reactive maintenance cycle are people working in new facilities, where very little equipment breaks in the first two years. It is not until machinery begins to wear out after
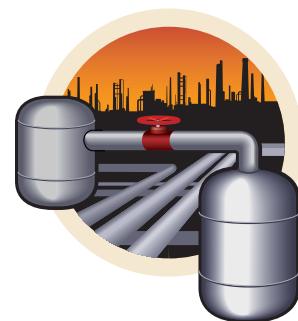
> **Many have become so comfortable solving problems in this reactive way that they have lost any sense of how much it is affecting the plant's profitability.**

some years of heavy operation that the high costs of unexpected downtime and maintenance really hit home.

The best way to prevent such losses is to attack the problem long before it occurs, during the front end engineering and design (FEED) stage of a capital project. The foundation for a functional maintenance strategy capable of reducing life-cycle costs should be laid before the plant is built. Plants without a viable maintenance strategy will not be able to sustain the high new-plant reliability they experience when they first go into operation.
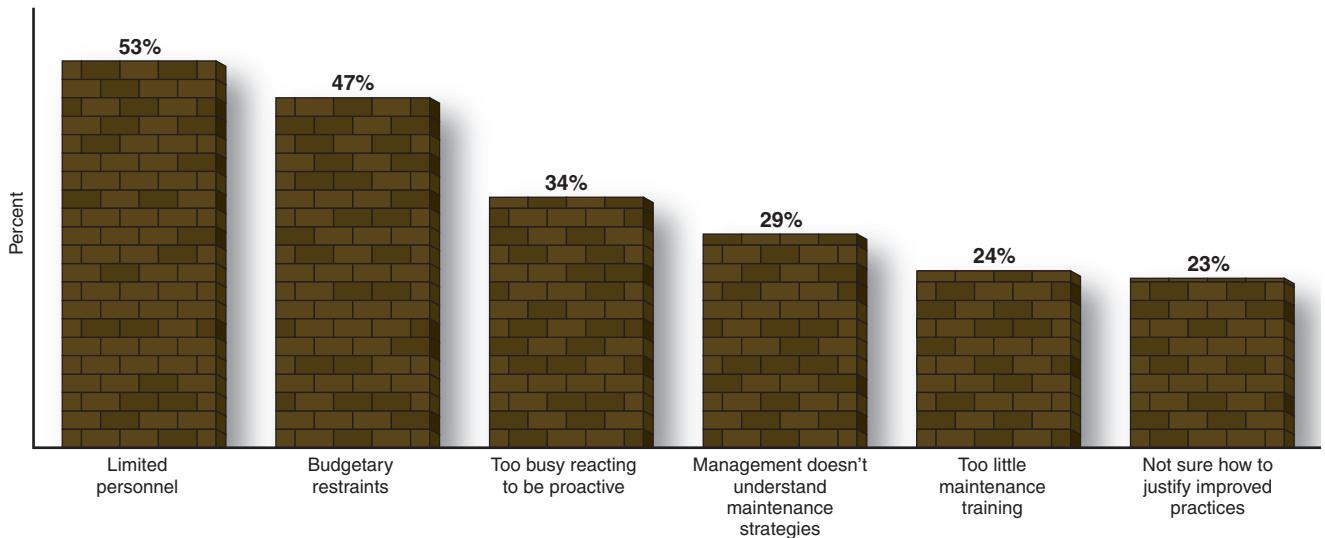
This idea of planning early for maintenance is quite radical since many of today's industry maintenance groups struggle with the ability to plan

Barriers to planned maintenance

Percent

53% Limited personnel
47% Budgetary restraints
34% Too busy reacting to be proactive
29% Management doesn't understand maintenance strategies
24% Too little maintenance training
23% Not sure how to justify improved practices

Source: Control Engineering *with data from Emerson Process Management.*

There is an irony when 'limited personnel' and 'too busy reacting' are cited as barriers to planned maintenance, since planned mainte- nance is one of the most effective ways to relieve those problems.

maintenance on any level. Instead, they live in a perpetual "fire-fighting" mode, and many have become so comfortable solving problems in this reactive way that they have lost any sense of how much it is affecting the plant's profitability.

Formal industry surveys have found that more than half of all maintenance is done reac- tively, which translates as unplanned and costly. Even more discouraging, these numbers have not changed over the last 20 years, despite the billions of dollars spent by process industry companies on computerized maintenance management systems (CMMS) and plant asset management (PAM).

ARC Advisory Group defines PAM as "technolo- gies intended to provide end-users with predictive intelligence." It has three main characteristics:

■ Potential problems are identified before they affect the process;

■ The health of plant assets is assessed using a combination of products and services; and,

■ Maintenance activity is driven by problem severity, potential causes, and operator options.

If properly implemented, PAM delivers informa- tion needed by maintenance to generate planned work in time to avoid costly and unnecessary breakdowns, or to keep process equipment running at target efficiency. In fact, companies that maxi- mize planned maintenance are likely to become best-cost producers, regardless of industry.

There is a real need for a structured approach to apply PAM technology to optimize assets over a plant's life. Including PAM specification during the FEED stage provides an opportunity to optimize predictive maintenance procedures before ever entering the cycle of reactive maintenance.

The graphic lists common barriers to planned maintenance, including the common claim that available personnel are too busy reacting to be proactive. The goal of 80% planned maintenance is attainable, but not while these barriers exist.

Bring in PAM early

Developing a PAM-oriented specification for a larger control system during the FEED stage establishes the importance of controlling long- term maintenance costs through operational equipment effectiveness. Upper management often realizes the importance of implementing predictive intelligence two years after startup when they must try to correct the increasing level of reactive maintenance. If predictive mainte- nance is held at a high level of importance from the beginning, it will create an environment that results in a best-cost producer.

As a major provider of PAM technology for both production and automation assets, Emerson has gained much experience while helping com- panies utilize predictive intelligence to improve operations, employ efficient maintenance prac- tices, and reduce unexpected downtime. Ensuring best results begins with specifying PAM during the design or FEED stage of capital programs and sup- porting its effective application after startup.

Once support for PAM is in place, plant design- ers must undertake several specific tasks to identify goals and strategies that will rationalize invest- ments in predictive intelligence. Through proper planning, they can implement the appropriate technology and use that technology effectively to maintain production and reliability of the plant.

Tasks to define the specs

Task 1: Objectives. Identify key business objectives for the facility and tie these back to operations and maintenance stakeholders. A key factor in developing a PAM specification is recognizing how reliability ties back to return on net assets (ROA). ROA is one of the factors measured by Wall Street in determining management effectiveness.

The prime objectives from management's perspective are performance and productivity targets related to availability, uptime, fuel costs, labor costs, and overall efficiency. Operations personnel are most interested in maintaining throughput, achieving daily production targets, avoiding unplanned issues, and keeping a safe working environment. Maintenance is principally interested in managing work order priorities, meeting the target for equipment availability, executing most work according to a plan and schedule, and staying within maintenance cost budgets.

Task 2: GAP and benchmarks. When considering a plant addition or process upgrade, it is important to assess existing strengths and weaknesses at the site. The process should include developing ratings for work planning and execution, management systems, goal making, accountability, diagnostics technologies in use, methods of improvement, training, and others. The result is a comprehensive benchmark of a plant's capabilities while identifying areas of improvement.

Task 3: Site goals/PAM specifications. Scrutinize your company's business objectives to identify goals that tie to operations and maintenance. Questions answered at this stage include: What maintenance strategy will enable us to achieve key objectives? Where should we invest in predictive intelligence? Can we make an investment in predictive intelligence? How do we spec this into the FEED? The answers drive the strategy and specification scope while often uncovering the need for predictive intelligence to overcome barriers.

This strategy relies on the availability of predictive intelligence to inform maintenance personnel of the condition of production equipment so they can identify when a failure is likely to occur. Maintenance can be planned according to the priority of that equipment. Critically important equipment can be repaired immediately, whereas less important equipment may be able to wait until the next scheduled shutdown. Well-managed plants exhibit a high degree of planned maintenance executed in time to avoid unplanned outages.

Tasks to document strategy

Task 4: Asset Information. Gather information on assets that make up your plant systems. That information becomes the backbone of a chart called an asset management blueprint. Individual devices are listed down the side and vertical columns include normal maintenance procedures. Boxes on the chart where the lines and columns intersect should indicate the maintenance tasks assigned to each asset and when the work needs to be performed. While gathering information and assessing maintenance requirements for every asset is a time-consuming task, it will allow the plant's operational and functional personnel to maintain the target availability and meet maintenance efficiency targets after startup.

The last column can show projected annual man-hours to accomplish the tasks for each asset. Adding up the hours in that column provides an early estimate of the annual man-hours required to maintain the plant using the prescribed strategy. This estimated total is beneficial, both for planning purposes and for comparison to previous performance or other plants' experiences with reactive maintenance. At the end of the year, a plant that uses more reactive than predictive maintenance will have a much higher annualized number of man-hours. The immediate reduction in maintenance-man hours quickly justifies and recovers the cost of adding predictive intelligence.

Task 5: Asset priority. Validate the priority of each asset to overall productivity by assigning a maintenance priority index (MPI). Every asset is evaluated for its importance to safety, the environment, production, cost, and product quality, and then receives a criticality ranking. Assets with a ranking in the top 20-30% justify predictive technology as part of the PAM strategy. Preventive maintenance can be selective on the lower 70-80%, and assets at the bottom of the list can be allowed to run-to-failure. In many plants, critical equipment still receives no preferential treatment, but when a key part of the process breaks down, production and profitability suffer.

Task 6: Task frequency. Establish appropriate maintenance schedules for each asset according to its priority and its failure methods. This is determined using MTBF/MTBM (mean time between failure/mean time between maintenance).

Task 7: Technology deployment. Determine PAM technologies needed for personnel to operate and maintain the plant following the maintenance strategy.

Tasks to outline functions

Task 8: Develop maintenance tasks. Create specific, written procedures that support necessary activities to avoid failure on the assets in the maintenance strategy blueprint. This approach is more efficient than a manufacturer's default recommended maintenance, where work is typically excessive to get equipment through the warranty period.

Task 9: Work flow. Define maintenance work flow, including problem discovery, work initiation, planning and scheduling, and closing a work order. It also identifies roles and responsibilities to support work flow as well as success metrics. Clearly-defined work flow is important to meet operational targets and prevent falling into the familiar reactionary mode where too many issues deteriorate into emergency situations.

Task 10: Map integration to business systems. Identify system integration issues and avoid investment in technologies that require too much manual interaction. This task ensures that critical integration between plant systems is in place and addressed formally during the FEED stage of a project.

Financial impact

A PAM strategy that aligns with the operational objectives of a facility that were established during the FEED stage of a project is a vast improvement over more typical haphazard practices. Too often plant managers are left to rely on experience to determine exactly how to integrate asset management technologies with most of the necessary maintenance activities.

When PAM is a consideration from the beginning of your capital project, the long-term benefits will include greater equipment availability, fewer emergencies, and lower maintenance costs over the life of the plant. As is often the case, effective planning at the beginning will lead to a positive and lasting financial impact. Whether you follow these steps on your own or use the expertise your control system provider, consider the value of adding a PAM specification to your next FEED project. The benefits, like your plant assets, will be long lasting.

Bill Broussard is global marketing manager, Plant-Web Services, for Emerson Process Management. Reach him at bill.broussard@emerson.com. ce

For more information, visit:
www.emersonprocess.com