Maintenance in the Power Industry: Ensuring Reliability

Dr. Ken Ferguson and Sandra DiMatteo, Contributors

Power providers are turning to work-identification methodologies and condition-monitoring to ensure they meet profitable reliability levels and to cut costs.

The approach to maintenance in the power industry has changed in recent years. To strengthen competitive position, many companies are focusing on equipment reliability. Elevated to strategic levels in the organization, maintenance goals are aligned with company goals to achieve higher returns on asset investments, to increase output and revenue, and to ensure safety and environmental integrity.
Now, power-industry maintenance teams are seeking innovative solutions to maximize equipment reliability while optimizing cost efficiencies. While budgets and resources shrink, stringent process guidelines such as the Institute of Nuclear Power Operations Equipment Reliability Process (INPO AP 913) and the Nuclear Regulatory Commission's Maintenance Rule (10 CFR 50.65) are still in effect. Power companies are finding they must move beyond conventional maintenance practices and many CMMS software programs.
Developing a reliability culture within maintenance is a new direction. Work-identification methodologies and condition monitoring are first steps in this effort. Leading companies are implementing reliability and maintenance practices, and using reliability technology to support proactive, condition-based maintenance. Achieving and sustaining improved levels of reliability will help manage maintenance costs.
Reliability software supports proactive, condition-based maintenance (Reliability Centered Maintenance, or RCM). This software directly links condition monitoring to CMMS and Plant Information Management systems. By doing so, power plants can leverage investments in SAP PM or any other CMMS. This is because reliability software addresses upfront strategic planning, monitoring asset health, identifying the right work to perform at the right time, and feeding that information to the CMMS (triggering the preventive or corrective work that needs to be done).
Reliability software addresses compliance for INPO AP 913 and the Mainte-nance Rule in a three-step process. First it automates collecting and analyzing condition data. Second, it sets regulatory limits. When asset health indicators fall outside established targets, alarms are automatically triggered. And third, in response to those alarms, appropriate maintenance work will be conducted to maximize equipment reliability.
Maximizing equipment reliability within manageable costs is not easy. Maintenance organizations in the power industry are faced with many challenges amidst restructuring and consolidation of electrical-generating power plants. Business models are changing. Where price was once determined by cost plus profit, today profit is determined by a set price, less costs. Therefore, cost management has a direct impact on profitability.
Power plants are now taking drastic cost-cutting measures, which often includes staff reductions. At the same time, many companies are struggling to capture the

enormous amount of knowledge lost as experienced maintenance workers retire.

The knowledge of the aging workforce

According to a recent Hudson Institute study of the workforce in North America, 30% to 40% of maintenance trades people will be retiring over the next five years. This problem is particularly acute in the power industry where estimates are as high as 50%. During their 20 to 40 years on the job, trades people collect a wealth of knowledge that is rarely documented or transferred to others. Well-seasoned maintenance veterans are intimate with their equipment and can quickly repair equipment to avoid downtime.
This knowledge includes asset-prioritization, asset-indicator targets, inspection knowledge and general know-how pertaining to the maintenance of the assets. This critical information is often just memorized by the employee or manually recorded in handbooks. As employees retire, this knowledge is lost in companies that do not systematically collect it as the employee performs his or her job. At the same time, fewer people are entering the trades.
The impact of the personnel shortage in the nuclear power industry has been significant. Soon it will be faced with the prospect of having insufficient personnel to support advanced reactors and the regulatory operations of existing reactors. The end result is that utilities may find themselves with few employees on hand to run plants just as they are seeking ways to extend their equipment lifespans. Many utilities are scrambling to find fresh talent just as the industry prepares to expand its operations.
Reliability software can capture years of asset-maintenance program experience, including:
&#149 The specific targets for normal and non-normal ranges of condition data, from simple numeric values to more complex rules-based engineering calculations as specified by the expert
&#149 Recommendations on the specific work that needs to be done to prevent failure and optimize asset performance.
The results of automated analysis and comparisons using reliability software draws attention to indicators that have fallen outside the normal condition. Alarm notices can be sent by e-mail or text pager as soon as an alarm range is reached. This notification is automatic, so there is no delay in responding to it. Also, charting of asset health indicators allows trends in asset condition to be easily noticed. Bands of color graphically show alarm severity ranges.

Doing more with less

With a limited work force, management's ability to choose the right tools facilitates equipment reliability. While CMMSs improve maintenance efficiency, they do not address the necessary upfront analysis of condition data required to identify the proper work to perform. Reliability software replaces the manual effort now used to collect and analyze condition data.
In addition, educating non-engineers to analyze condition data to reduce the reliance on licensed engineers is critical in the power industry where equipment failure can be catastrophic. Recall the Three-Mile Island reactor accident, the worst nuclear power plant accident in the U.S. The Nuclear Energy Institute said the cause

of this accident was a combination of equipment failure, inadequately designed instrumentation and the inability of the plant operators to understand the reactor's condition.

To comply with government regulations, today's power-industry engineers have been diligent in collecting and storing equipment condition data. But this activity requires the analysis of masses of data each day. Reliability software automates this process so the preventive or corrective work that needs to be done is executed in a timely manner. This process can do more with less: It manages failures and frees engineers to perform more mission-critical tasks.

In the nuclear power industry, the Maintenance Rule dictates that companies monitor its structures, systems and components (SSC) against established goals to provide assurance they are fulfilling their intended functions. Failure to comply with this regulation could result in loss of an operating license. Nuclear sites expend significant engineering resources to comply. Reliability software can manage this process as well. It monitors online predictive and visual inspection data, analyzes the data, and compares various data points to get a true picture of the operating health of the equipment. Engineers no longer need to remember manual calculations because software can perform them automatically, then present the results visually as flashing alarms.

Condition monitoring alone is diminished in value if the data is not analyzed and is not utilized to trigger the right work at the right time. Reliability software analyzes the data, then links the results to a CMMS. It adds value to a CMMS because it addresses the necessary upfront planning and optimization of the equipment maintenance program.

The business process

Like any business process, the reliability process requires a disciplined approach. When supported by reliability software and practices, a reliability- focused maintenance process will help to enhance and sustain a proactive work culture. The stages of plan, assess, improve and control can be applied to the maintenance process.

In the plan stage, maintenance goals are aligned with the business goals of the company. Since business units or areas within a company tend to exhibit differing stages of proactive maintenance, the plan leverages the tools and capabilities already in place, then moves it forward with formalized reliability practices. The plan identifies high-risk assets (those that matter most when they fail and are failing a lot), and establishes specific performance targets for those assets.

The assess stage measures and analyzes the actual performance of the asset and prioritizes gaps in performance. Performance gaps are functional failures or the inability to meet the performance requirements set for an asset. The fundamental requirement of measuring performance remains the key to achieving day-to-day business objectives. Manage-ment guru Peter Drucker once said: "It is not possible to manage what you cannot control, and you cannot control what you cannot measure." With visible performance metrics, awareness of current performance against company goals is maximized. It's the visibility of performance metrics that drives corrective actions, verifies gap closure and fosters a culture of continuous improvement.

The improve stage depends on proper work identification. Methodologies like RCM

guide the fundamental shift from conventional time-based maintenance to a reliability-driven approach. Because the opportunity to improve differs from asset to asset, the resulting maintenance program may include a mix of preventive maintenance, predictive maintenance and run-to-failure decisions.

Finally, the control stage plans, schedules, executes and follows up on work identified. This stage provides valuable information back to the assess stage in terms of the actual performance of assets, resulting in a continuous-improvement loop that maximizes reliability.

Over the next two to five years, emerging reliability software will further boost the move to greater efficiency. Because maintenance is typically the largest cost center in a utility, power providers are expected to take increasing advantage of it.

Dr. Ken Ferguson is a power generation consultant at Ivara Corp., Burling-ton, Ontario, Canada. Ferguson has more than 28 years experience in the nuclear industry and is a former divisional chairperson in the American Nuclear Society. Sandra DiMatteo is a product manager at Ivara Corp. with more than 15 years experience in the maintenance and reliability software industry. Ivara Corp. was founded in 1997 to help industrial customers achieve a proactive, reliability-driven approach to maintenance. It uses a company's existing strengths to create a measurable, effective program. For more information, visit www.ivara.com.

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