Maintenance Management & Technology - Program 69

Program Overview

Program Description

The Electric Power Research Institute’s (EPRI’s) Maintenance Management & Technology program (Program 69) helps plant owners and operators address common industry challenges related to maintenance program structure and functionality. EPRI works with top-performing organizations to collaboratively research and develop maintenance processes and technologies that help improve the safety, reliability, and performance of plant staff and equipment. Research projects include efforts to identify causes of potential equipment failures, effectively monitor and assess the condition of equipment, and proactively plan for equipment maintenance. A significant part of these research efforts involves the management and communication of data and information necessary for monitoring and maintaining power plant assets.

Research Value

EPRI’s Maintenance Management & Technology program helps its members transition to, and sustain, the most efficient and effective practices associated with plant maintenance. The key attributes of an optimized program are adoption of information management needed to support a condition-based approach to maintenance, and replacement of costly corrective maintenance with proactive preventive maintenance. The focus of this program is on providing an integrated solution that addresses the needs for processes, technologies, and skilled people, which enables condition-based maintenance. Using the results of this program, members can:

- Achieve operation and maintenance excellence through an integrated approach that includes process improvements, related technologies, and knowledge management;
- Address current issues associated with the need for flexible plant operations, asset retirement, and new reliability standards;
- Better standardize O&M programs, processes, and procedures; and
- Increase plant availability and reliability through improved maintenance management and staff performance.

Approach

The ongoing evolution of enhanced plant maintenance processes and technology is an inherently collaborative activity, involving member companies, industry experts, and EPRI staff. Involvement in the program as an advisor or participant in the various projects and user groups is the primary means by which value is received from EPRI. The project structure established to help facilitate this transfer of results includes:

- Users groups, meetings, and workshops that provide a structure for sharing peer information about, and experience with, plant maintenance. These venues include the Plant Reliability Interest Group (PRIG), Predictive Maintenance User Group (PdMUG), Vibration Technology Forum (VTF), Infrared Thermography User Group (IRUG), Lubrication and Bearing Workshop, and others.
- Plant maintenance processes that focus on development and improvement of both fundamental and new best practices experienced throughout the industry. Technical reports cover detailed aspects of the primary process elements such as condition-based maintenance, work management, maintenance basis, outage planning/execution, human factors, corrective action, and continuous improvement.
- Plant maintenance technology R&D that facilitates the deployment of advanced maintenance technologies, which are essential to achieving desired performance. This R&D includes technologies to support the identification and optimization of preventive maintenance (PM) tasks, the management of predictive maintenance (PdM), diagnostics, prognostics, and risk management. The software products in this project offer databases that members can use to apply component and system knowledge and perform effective equipment analysis.
Accomplishments

Maintenance engineers, planners, and system owners need resources related to processes and technologies, and to help achieve high performance in plant availability, reliability, and efficiency while effectively minimizing production costs. To help supply these resources, this program has developed products relating to:

- Development and application of plant reliability processes and standards at members’ facilities;
- More than 200 technical reports, technical updates, and software products that cover all aspects of preventive/predictive maintenance, work planning, work execution, outage management, and human performance;
- A software package to facilitate integrated equipment diagnostics (Asset Fault Signature Database and Diagnostic Advisor) and prognostics (Remaining Useful Life Database and Remaining Useful Life Advisor). These products include databases of known equipment fault indicators and failure models that are used to assist plant staff with both the diagnosis and prediction of plant equipment failures.

Current Year Activities

The program R&D for 2014 will maintain the focus on improvements in maintenance processes and related technologies. Specific research subject areas will include some of the following topics:

- Developing best practices work management in fossil power plants including both outage and non-outage work management
- Working with industry to identify, define, and apply performance metrics that are most suitable and most appropriately characterize maintenance effectiveness
- Developing software to facilitate the identification, prioritization, and implementation of preventive maintenance (PM) tasks
- Adding content to the Asset Fault Signature (AFS) Database and Remaining Useful Life (RUL) Database
- Exploring information management technology applications that enhance the ability of users to visualize and manage the configuration and layout of plants, units, systems, and equipment
- Identifying new advancements in maintenance technologies

Estimated 2014 Program Funding

$1.8M

Program Manager

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Summary of Projects

<table>
<thead>
<tr>
<th>Project Number</th>
<th>Project Title</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>P69.001</td>
<td>User Groups, Meetings, and Benchmarking</td>
<td>These projects provide a collaborative forum for exchange of information relating to implementation of advanced fossil plant maintenance strategies, processes, and related technologies.</td>
</tr>
<tr>
<td>P69.002</td>
<td>Fossil Plant Maintenance Processes</td>
<td>These projects assist members in achieving improved equipment reliability, reduced O&amp;M costs, and efficient workforce utilization through development and implementation of advanced maintenance processes.</td>
</tr>
<tr>
<td>P69.003</td>
<td>Fossil Plant Maintenance Technology</td>
<td>These projects conduct research to identify, develop, and apply emerging technologies that support improved fossil maintenance management processes needed to ensure viability of the existing fossil fleet.</td>
</tr>
</tbody>
</table>
P69.001 User Groups, Meetings, and Benchmarking (062022)

Description
Maintenance personnel need access to information about proven processes, organizational strategies, related technologies, and successful applications to help sustain high performance in plant availability, reliability, and production costs. Obtaining this information requires participation in workshops, conferences, technical webcasts, and user groups that enable peer information exchange and technology gap identification. This collection of information exchange activities gives maintenance managers, predictive maintenance (PdM) technicians, planners, system owners, maintenance engineers, and others the opportunity to collaborate and exchange best practices and lessons learned.

Approach
Technical workshops and conferences provide a structure for sharing peer information and experiences relating to plant maintenance. Webcasts are used to engage plant-level maintenance staff. Meetings include the Plant Reliability Interest Group (PRIG), Predictive Maintenance User Group (PdMUG), Vibration Technology Forum (VTF), Infrared Thermography User Group (IRUG), Lubrication and Bearing Workshop, and various workshops and training in new technologies.

Impact
- Addresses organizational and human performance barriers to sustained high performance in areas of cost and reliability
- Provides tools and information to plant management to address today's business challenges
- Provides access to industry-proven methods and practices through attendance at workshops, conferences, and webcasts
- Identifies implementation strategies pertaining to advanced maintenance processes and related technologies to improve plant reliability

How to Apply Results
Members receive value from this project by participating in the Plant Reliability Interest Group, Predictive Maintenance User Group (PdMUG), Vibration Technology Forum (VTF), Infrared Thermography User Group (IRUG), Lubrication and Bearing Workshop, topical webcasts, and training sessions. Members are encouraged to perform self-assessments and benchmark using best practices and metrics shared by participating peer companies, as well as EPRI staff and other industry experts.

P69.002 Fossil Plant Maintenance Processes (062023)

Description
Owners and operators of electric power generating units strive for effective and efficient maintenance processes to ensure optimum reliability and productivity of their fleet. To achieve this goal, these organizations need to sustain the optimum balance of corrective, preventive, predictive, and proactive maintenance activities in a streamlined, process-oriented program. Adoption of improved maintenance processes provides significant benefits to member organizations through improved quality of maintenance, reduced outage durations, avoided unplanned downtime, and enhanced safety. The need to sustain a high level of plant performance will increase in the future as aggressive dispatching strategies challenge equipment reliability, while at the same time reducing budget resources available for nonfuel operations and maintenance costs.

Advanced management practices are needed throughout the industry in areas such as outage planning/execution, preventive maintenance, backlog management, work closeout, inventory management, and human error reduction. Ongoing collaboration between member organizations and EPRI ensures that the processes and practices developed in this project can be adopted in today's fossil power industry business climate.
Approach
These projects focus on the development and continued improvement of maintenance processes. EPRI works with member companies to identify gaps and improvement opportunities relating to the specific needs of today’s electric power generation industry. Solutions and best practices are developed that optimize plant performance by balancing equipment reliability and maintenance costs. An emphasis is placed on condition-based maintenance processes used to facilitate risk-informed decisionmaking. Technical reports define desired characteristics of the primary process elements such as work management, predictive maintenance, maintenance basis, outage planning/execution, optimal capital resource allocation, and continuous improvement. These projects are increasingly focused on helping organizations transition to improved processes and then sustain high performance.

Impact
- Significant benefits in plant availability and production costs can be achieved through the implementation and sustained improvement of maintenance processes.
- Plant availability can be increased by reducing outage duration through better planning and reduced rework due to improved execution of maintenance tasks.
- Standard maintenance processes are more easily adopted across fleets of generating units, maximizing scarce technical resources and ensuring consistent criteria for use of capital and operations and maintenance budgets.
- Documentation of structured maintenance processes provides valuable references for new staff members in planning and executing maintenance activities.

How to Apply Results
Members who participate in EPRI as technical advisors in process development initiatives can more easily integrate findings and processes from this project in their plant maintenance programs. In addition, technical reports produced by this project are valuable reference guides and serve as instructional tools for new staff. This project continually explores new ways to assist members in implementing advanced process elements across member organizations—for example, through enterprise software tools and supporting databases.

P69.003 Fossil Plant Maintenance Technology (062024)

Description
The use of technology can greatly influence and improve plant maintenance. Technology has the potential to significantly improve efficiency and to standardize and facilitate processes. Technology primarily is used to support information management in areas such as predictive maintenance (PdM), work management, equipment diagnostics, equipment health, and risk assessment. Technology solutions must be cost-effective and easily integrated with existing enterprise systems. Technology gaps inhibit many maintenance organizations from maximizing their performance capabilities.

Advancements in maintenance technology will improve the ability of plant personnel to conduct condition assessments of plant equipment, diagnose equipment anomalies, and utilize risk management practices. This improvement will allow plants to optimize the use of scarce resources and maximize availability. The challenge to sustaining a high level of plant performance will increase as plants are cycled, new tighter regulatory restrictions are applied, and investors demand continued reductions in operating costs.

Approach
These projects seek opportunities to apply emerging technologies to address industry needs in plant maintenance processes. In some cases, process improvements developed under P69.002 (Plant Maintenance Processes) are considered as candidates for development of technology to assist implementation. The research and development includes:
• Development and demonstration of new databases for supporting maintenance decision-making. These databases include those that apply component and system knowledge to fault diagnostics, as well as databases that supply information related to prognostics and equipment remaining life.
• Other technology topics that support work execution, predictive maintenance, scheduling, and configuration management.

Impact
• Using information technology to integrate predictive maintenance with component and system health provides a basis for performing the right maintenance at the right time.
• Technology that facilitates the assembly and dissemination of key information on component health and risk of failure will enable more efficient use of maintenance resources and capital.
• The creation of shared industry databases that support fault diagnoses and remaining useful life assessment can effectively share knowledge and expertise from a broad segment of the fossil power industry.

How to Apply Results
Results of this project can be implemented as information databases that support advanced maintenance process elements such as diagnostics, prognostics, and risk-informed decisionmaking. In addition, technical reports or webcasts will assess emerging technology in related industries and strategies for successful implementation in fossil power generation. Peer collaboration at meetings such as the Plant Reliability Interest Group will enable sharing of best practices related to technology application. Opportunities also exist for members to pilot and demonstrate prototypes and first-of-a-kind maintenance technologies.
Supplemental Projects

Plant Reliability Interest Group (066929)

Background, Objectives, and New Learning

Organizations in the electric power industry are faced with the task of designing and implementing plant programs and processes that promote optimal equipment reliability while minimizing operating and maintenance costs. The objective of the Plant Reliability Interest Group (PRIG) is to provide an active forum for Electric Power Research Institute (EPRI) member companies to share successful strategies related to the design and implementation of these programs and processes. The challenges of implementation can be successfully addressed by peer-sharing, and the generation of strategies that result can benefit all members of the group.

EPRI’s Plant Reliability Interest Group (PRIG) will continually look for opportunities to broaden the scope to include emerging topics of generic interest to fossil plant maintenance such as Lean Maintenance and Human Error reduction.

Project Approach and Summary

The intent of the PRIG is to provide a forum for participants—including generating plant, power delivery, and corporate personnel—to address common issues, problems, and resolutions related to proactive maintenance strategies. The value of the interest group is in sharing information between those seeking solutions and those who either have successfully implemented process improvements, or have a common interest in developing a solution. A series of sessions within the annual meetings will cover different aspects of maintenance and reliability, such as predictive maintenance, maintenance basis, and continuous improvement.

Benefits

Members who participate in the PRIG will share information on practical approaches to achieving plant reliability as well as the effectiveness of enabling technologies. Benefits of this interest group include: improved equipment reliability, optimized maintenance costs, and improved decision-making.