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#### **Asset Reliability Coordinator**

**The maintenance planner might better be described as asset reliability coordinator. Here's why.**

**By Robert Wilson, Performance Consulting Associates**

The rush to reliability, fueled by rising global competition, high fixed costs, capital intensity, and the pressure for greater on-stream performance, is providing the planning and scheduling function with an opportunity to add further value to its business objectives. The maintenance planner might better be described as asset reliability coordinator.

Across the landscape of industrial plant maintenance, the asset performance picture is not all that good. Consider the following:

- Thirty percent of newly overhauled machines fail on startup
- An estimated one-third of the money spent on preventive maintenance is wasted
- Sixty percent of premature bearing failures are due to improper fitting, maintenance, and handling
- Maintenance and operation account for 70 percent of the money spent on pumps.

To rise above these shortcomings, plants have redundant systems and spared equipment to assure process availability. The average refinery runs at nearly 95 percent average availability, but studies have shown that downtime affects the bottom line by smaller profit margins, decreased yield and quality, reduced safety, additional environmental incidents, and missed delivery dates.

Additionally, plants have had to spend scarce capital to build more capacity to meet the fluctuations in their demand patterns and compensate for process unreliability.

Use of maintenance craft resources is even more alarming: average craft productivity, measured through "wrench time" studies, is typically in the 25 to 35 percent range. Productive work is held up by time spent waiting for materials, tools, instructions, and clearance and time spent traveling to the job.

Inefficiencies in craft utilization, many of which are beyond the individual craftperson's control, contribute to additional expense for outside contractors, rush charges for materials not planned to be on hand, excessive overtime, and work that had been identified but was not performed in a timely manner.

Perhaps the greatest cost for these inefficiencies is lost production resulting from process interruptions from unreliable equipment. Some examples illustrate the magnitude of benefits that flow from improved asset reliability:

- If an average size refinery were to increase its availability from 92 to 96 percent, with a \$3/barrel margin, it would generate an additional \$6 million/year.
- For an electric utility with a 1000 MW steam system, each 1 percent availability improvement might be worth over \$300,000/yr in power transaction capability.
- Each 100 Btu/kWh improvement in efficiency might be worth over \$400,000/yr.
- A 1 percent sustainable improvement in availability for a 1000 MW system means 10 MW of future power plant that does not have to be built. When construction prices are \$1200/kW, which is worth \$12 million in capital expenditures.

One of the best weapons for fighting these deficiencies in maintenance performance is the competent planning and scheduling of maintenance activities.

### **The benefits of good planning**

The benefits of good planning fall into several major categories:

1. **Productivity.** Planning affects productivity most in the reduction of delays. Implementing a fundamental planning and scheduling system should help improve productivity to about 45 percent. Then, as files become developed to prevent recurrence of problems of past jobs, productivity should increase to 50 percent. Finally, a good enterprise asset management (EAM) system should boost productivity to more than 55 percent. This increase in productivity alone, from 35 percent to 55 percent, boosts a 90 person maintenance workforce to the equivalent of 141 people.
2. **Quality.** Having the work scope, instructions, parts, tools, and crafts all correctly identified and ready before the job starts has a direct positive effect on quality. Quality is indirectly affected by the boost in productivity because the freed-up workforce can spend more time on difficult jobs and proactive work.
3. **Shift to proactive work.** Proactive work includes root cause failure analyses on repair jobs and corrective maintenance to fix small problems before they get out of hand. It also includes project work to improve less reliable equipment and increased attention to preventive and predictive maintenance. Greater productivity creates, in effect, greater resources. In a company with much reactive work, these additional resources are used to put out fires. A company with reactive work under control can leverage the additional resources to do more proactive maintenance work, dealing

efficiently with situations and preventing fires. World-class companies with preventive maintenance well in hand invest those resources in training to further increase labor skills and in projects to improve equipment or other work processes.

4. Increased availability. When more time is spent in proactive and preventive work, process interruptions become less frequent and less severe. With more time to plan ahead and anticipate equipment needs, planners can develop a more closely integrated schedule that accommodates both production and maintenance needs. A collateral effect is the reduction in on-hand maintenance, repair, and operating (MRO) inventories and total spending on spares.

5. Improved efficiency. Almost by definition, better-running equipment and processes provide improved quality in terms of both final product and conversion of raw materials into finished products.

6. Deferred capital investment. When the availability of existing equipment is increased, the need for additional new capacity can be postponed. Or in situations with relatively stable demand, the number of productive assets can simply be reduced. Either situation can have a considerable financial benefit to the company and its shareholders.

7. Reduced unit costs. When all of the potential benefits are consolidated, per-unit costs are reduced, providing a sustainable competitive advantage for the already efficient producer and a potential lifeline for the substandard producer. Thus, as process efficiencies level off, or as additional gains are no longer cost effective, asset performance and reliability become central to profitability. One of the key drivers for additional reliability is the ability to integrate production and maintenance activities into a single, comprehensive plan that maximizes output at lowest possible costs.

At this point, the asset reliability coordinator assumes a pivotal role.

### **Asset reliability coordinator**

Traditionally, the maintenance planner has been selected for personal knowledge of the technical side of maintenance (the whos and whats of equipment care), rather than the management side (the whys and whens). There is a need for personnel who understand the value of objective data on equipment condition, reasons for failure, and the protection of the economic value created by asset reliability.

Following are summary descriptions of the responsibilities of the recast asset reliability coordinator, using new tools and techniques to focus on asset reliability and availability, by making the crews not only more productive, but "smarter" by arming them with increased knowledge:

## **Job planner role**

Central to the coordinator's ability to add value is his or her primary work product: highly focused work packages that contain not only a listing of which craft skills are required for what periods of time, and the likely parts to be used, but more supporting documentation, for example:

- The location of the MRO parts that have been kitted or delivered to the jobsite
- Digital photographs of the asset and work area
- Safety procedures, including lockout-tagout requirements, zero-energy requirements, process safety requirements, confined entry permit forms, and environmental concerns
- Original manufacturer and internal documentation of wiring, layouts, dimensions, and tolerances
- A full bill of materials, with stores catalog numbers, in the event unanticipated damage is found
- Special equipment and tools that may be required
- A history of the most recent condition readings and work performed on the asset (repairs and replacements, preventive maintenance checks, predictive maintenance findings, instrumentation readings, operator logbook entries, etc.)
- Results of the coordinator's jobsite visit and comments on the work to be done
- A feedback form to record "found, fix, and fault" information by the crew.

The level of documentation should be commensurate with the requirements of the work. Routine repetitive work should require relatively little documentation, probably nothing more than a standard job template, which exists in a library of such plans.

## **Work scheduler role**

The second primary work product of the coordinator is the work schedule, actually a series of interlocking schedules with progressively more detail as the anticipated work time draws closer. In industries such as petrochemicals, with major turnarounds and long lead times, a long planning and scheduling horizon is critical to success.

The schedules are a joint product of operations, maintenance, and engineering and reflect all of the work to be accomplished. The coordinator generally chairs the scheduling meetings and comes prepared with a standard schedule incorporating production requirements (and windows of opportunity that normally arise), the condition of operating equipment and potential liabilities, and the manpower that will be available for the upcoming time period. Best practices call for detailed scheduling at least a week ahead, with less stringent requirements for the upcoming two weeks. Each functional group will have reviewed the work-order backlog to ensure that critical work has been identified, planned, and made ready for scheduling.

## **Analyst role**

A longer-range and potentially more critical function of the coordinator is to develop the ability to forecast future maintenance requirements. Today's EAM systems allow for a three-way view of asset performance: historical, looking backward to determine the most common root failure causes; real-time condition monitoring (typically through the plant's distributed control systems); and forward, analyzing each asset's mean time between failure and forecasting when the asset is most likely to affect the production process again. Failure information is critical to these views, and the coordinator must be zealous in gathering and recording that information.

The coordinator is also the database administrator for the records maintained in the EAM equipment history and condition files and the person in charge of the open backlog. This second function is extremely important in providing life-cycle management of all work requests and work orders. Timely and accurate knowledge of the current status of all open work orders allows maintenance and operations to take advantage of unforeseen opportunities and maximize the use of unscheduled downtime.

### **Facilitator role**

A key trait for success is the coordinator's ability to influence the actions of others. In most organizations, the planner, now coordinator, has no staff, no organizational authority, and no budget. But he or she is charged with coordinating the activities of a diverse group whose short-term goals may or may not be in alignment. Facilitation skills and a clear vision of the longer-term objectives will serve the coordinator, and his organization, well. Such skills can be learned and will improve with repeated practice.

### **Communicator role**

Finally, the coordinator must be able to clearly communicate the desired direction he or she is recommending, in terms that are relevant to the audience, whether it is operations (more throughput), maintenance (fewer breakdowns), or management (financial impact). Again, such skills can be learned.

### **Technology support**

None of the higher-level functional requirements of the coordinator can be achieved without enabling technologies. At a minimum, the support systems must include the following:

- A modern EAM system capable of capturing and analyzing both static and dynamic information on equipment condition and the likely time frame to the next critical production interruption. The system must contain critical equipment information, including performance parameters, bills of material, and component-level tracking, and be fully integrated with the human resources and financial systems. Additionally,

the system, or allied systems, must be able to display, manage, and distribute documents and perform higher-level analytical functions on data in the system. The coordinator must be trained to easily navigate the complexities of these systems and to interpret the details and convert them into usable information.

- Man-machine interface software connected to the EAM that monitors equipment parameters and downloads the information directly. Using previously established set points, the EAM system may generate a predictive or corrective maintenance work order before a costly and disruptive process interruption occurs.

- A decision-support system that integrates the information from multiple systems and promotes data-based decisions. The [information model](#) developed by the Machinery Information Management Open System Alliance (MIMOSA) provides an excellent definition of how an integrated system would function.

- Standards-based, distributed-component architecture that facilitates the adoption of enhancements as they become available. Considerable efforts have been devoted to removing the "islands of information" situations in which plants with multiple systems find themselves.

### **Best business practices**

No functional area exists in a vacuum. The relationships among various functions are described by business rules that specify roles and responsibilities, decision points, data flows, and evaluation criteria.

A starting point is the description of a vision of how the company's assets will be maintained:

To ensure that the assets of the company will be reliable. This goal will be achieved by anticipating deterioration and addressing its root cause by technical means and education of company personnel. The timing at which these actions will be initiated will be set through a mature financial appreciation that takes into account the optimum time at which items can be removed from service.

The next step is to define the relationship between operations and maintenance. The elements of such a definition might include the following:

1. Production owns downtime data and meticulously records failures, being particularly careful to log the reason for downtime.
2. Production attempts limited inspections, in keeping with their technical expertise, but raising their awareness of the condition of the assets they use.

3. Production moves to a greater sense of ownership of the assets, demanding more detailed information from maintenance regarding the condition of the equipment and the service provided and required by maintenance.

4. Maintenance reviews the history of their performance, particularly focusing on breakdowns. Where could work have been anticipated?

The two groups jointly review the inspection program in the light of information raised under items 2 and 4.

Additionally, the basics of asset care must be in place and rigorously practiced every day:

- Work is identified early and jointly approved by maintenance and operations
- Work packages are developed reflecting the nature, scope, and complexity of the work to be performed
- Work schedules are developed in accordance with the lowest-cost combination of maintenance, operations, and asset repair and replacement elements
- Asset care is based on historical information of performance and current condition monitoring
- Rigorous attention is given to understanding, capturing, and analyzing the root causes of asset failures.

The starting point for improving maintenance planning is the interface between operations and maintenance, to identify sources of uncertainty that would adversely affect planning and scheduling and the execution of maintenance tasks. In particular, the focus needs to be on the ability of the two groups to work together to reduce the total costs of operating.

The most critical skill required for improving reliability and availability is understanding the root causes of failure. This knowledge, in turn, leads to the development of an intelligent and cost-optimized plan for asset care and the prevention of production interruptions.

The asset reliability coordinator is in a pivotal role to use information available through a combined view of historical, current, and forecast asset performance.

*[Robert Wilson](#) is director of client assessments at [Performance Consulting Associates](#), Duluth, GA; (770) 717-2737*

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