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Asset management systems increase reliability and efficiency

Make use of technology to overcome barriers to better maintenance practices

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FAST FORWARD

- Asset management software improves work practices, reduces reactive maintenance, and lowers overtime labor.
- Asset diagnostics and other data can be integrated into one holistic reliability performance management system.
- Personnel in plants frequently have no good way of knowing if routine maintenance is being done too often or not often enough.

No matter how well you maintain production assets, including measurement instruments, control valves, and mechanical equipment, there is always room for improvement. In fact, the diagnostics and other data gathered from all those assets can now be integrated into one holistic reliability performance management system that will improve maintenance practices and result in higher reliability. Your plant should be more productive and deliver larger profits than you are reporting today.

We make that statement with a good deal of confidence, since maintenance can be improved in most plants. According to the ARC Advisory Group of Boston, plants in the process industries "typically operate 20 percent below full operational capacity," and equipment reliability issues have been identified as one of the principal reasons for that wasteful record.[1]

Furthermore, things are not getting better; overall plant maintenance has not improved much in the past 25 years. Despite heavy investments in automation, smart instrumentation, digitally operated control valves, and smart machinery (all under the umbrella of computerized maintenance management systems), reactive maintenance (the most expensive but least effective) has remained at about 55 percent.[2]

Limited manpower is most frequently cited as the greatest "barrier to progress," yet nothing saps manpower like having to respond to unplanned needs, especially emergencies when everyone is called away from assigned tasks to "fight the fire."

We believe the best way to overcome the manpower problem and other barriers is by making better use of technology, including systems that are probably already in your plant. The following summary, which is based on the actual experience of our customers over a 10-year period, shows just how much can be accomplished:

- Shift maintenance from reactive to predictive while improving uptime by as much as 15 percent
- Reduce overtime labor by up to 50 percent
- Lower turnaround costs by as much as 30 percent
- Increase plant availability by 10 percent or more
- Reduce spare parts consumption

What will it take to produce results like this in your plant? Integrate the diagnostics generated by your smart field devices and predictive data gathered from plant machinery with a reliability asset management system. Reliable information will be organized to generate work requests to be automatically delivered to an enterprise asset management (EAM) system. The degree of improvement will depend on the current state of your maintenance program and the amount of effort you put into the integration of these technologies.

Getting started

Personnel in plants with thousands of pieces of equipment frequently have no good way of knowing if routine maintenance is being done too often or not often enough. Nor can they easily identify which machines, valves, and instruments are causing the most problems. It is equally difficult to identify equipment on the verge of failure so that immediate repairs can be ordered to prevent sudden work stoppages.

An essential element for integrated asset performance management is predictive maintenance software. Predictive maintenance software, such as AMS Suite, facilitates the online retrieval of accurate, real-time diagnostics from across a broad scope of plant assets. For smart field devices, such as instruments and digital valve controllers, data is collected via the HART, WirelessHART, or FOUNDATION Fieldbus communications pro-

tocols. Field device information can also be gathered by technicians attaching a laptop or field communicator to one instrument at a time. A more progressive approach allows assets to be monitored continuously. Vibration data can also be obtained online or uploaded to the system from handheld analyzers or online monitoring systems connected to sensors mounted on rotating machinery. Data from oil analysis and other diagnostic methods are also available.

The information acquired is organized and displayed on easy-to-read graphical displays on the system. A single technician can monitor the health of hundreds of assets from the safety of a control room or other plant location. If the performance of an asset drifts beyond established limits, signals are raised to call attention to the event.

The *predictive maintenance system* generates alerts to make personnel aware of slight operating changes. Generally, minor repairs or adjustments can be made to address such issues, or the condition may simply be watched for further change.

Alarms indicate a need for corrective action to avoid unplanned downtime. There is generally time to determine if repairs can be delayed until a favorable time, such as a scheduled maintenance shutdown. But in severe cases, immediate action may be necessary to prevent an impending failure that could have costly consequences.

This predictive maintenance software has been instrumental in preventing countless failures and saving thousands of dollars in losses and manpower expenses. Figure 1 presents actual data collected by a U.S. chemical company after implementing a system. The application of diagnostic data greatly reduced the amount of manpower required to annually perform just five labor-intensive tasks. They simply did not need to be done as often.

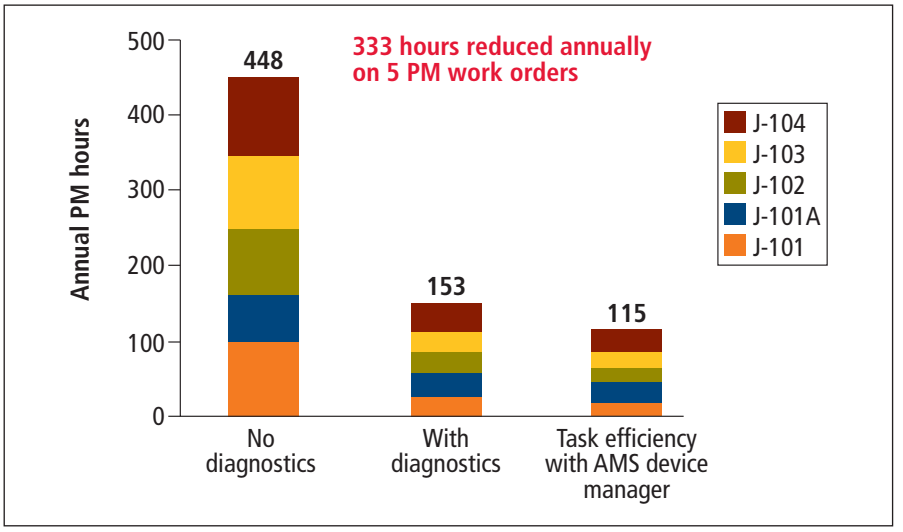

Figure 1. Actual data collected by a U.S. chemical company on savings

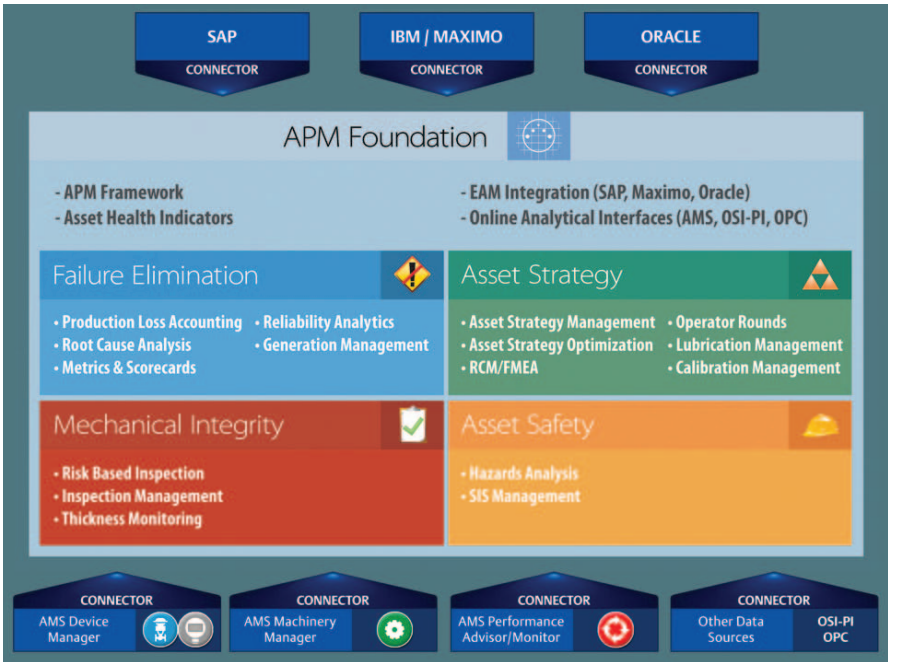

Figure 2. Not all functions need to be implemented simultaneously – you can start small and build a reliability program to fit your own needs and capabilities

Asset management

Each asset management software module contains a database that can be tailored according to the equipment in any specific plant. The asset names (or tag numbers) are entered along with the threshold information, i.e., the high and low limits that will trigger alerts and/or alarms. If this information is not entered correctly, the result can be a flood of erroneous alerts. Operators may become frustrated to the point that all warnings from the field assets are ignored, especially if the plant seems to be operating satisfactorily. This, of course, defeats the purpose of early warnings.

The users of this technology do not necessarily know where to set the thresholds for alerts and alarms. For example, where would you set the high and low vibration limits on rotating pumps, all of which may have different loads and run at different speeds? In addition, the criticality factors are different for each machine. Yet, if the limits are not correct, you may never learn about an imminent failure until it is too late.

Asset management requires a

substantial amount of experience with the assets and knowledge of the databases, which is why many users employ experienced industry firms that have subject-matter experts to configure systems for best results.

There are a number of asset performance management (APM) functions that should be present in a full implementation (Figure 2). Users can take a building block approach over time, since not all five APM modules shown need to be implemented simultaneously. You can start small and build a reliability program to fit your own needs and capabilities. Vendors provide assistance to guide you, especially in developing asset strategies, which are critical to the success of the APM process. These strategies are the culmination of the periodic maintenance tasks and diagnostic tests that must be accomplished in a well-planned reliability program.

We equate this to the daily tasks required to keep our bodies functioning well: eating properly, getting enough sleep, exercising regularly, etc. That is the strategy one ought to follow to maintain good personal health. Just as your doctor employs periodic tests to determine if you have any potential health problems, many diagnostic tests, such as control valve travel or a motor's vibration level, have been developed to help identify asset health issues that could have an adverse effect on productivity, including unexpected stoppages.

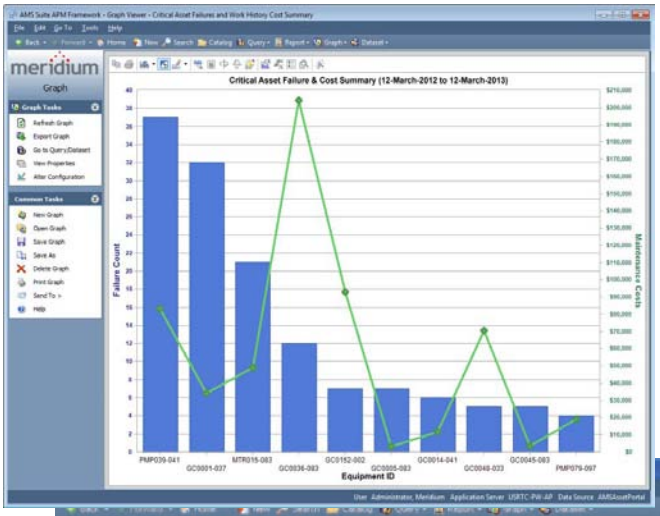

Figure 3. Dashboards provide users information

Figure 4. Critical asset failures and cost summary information

Once an asset strategy is created and placed in the software, it can be changed as the asset's role in the process becomes more (or less) important. Information flowing into the software may cast a light on certain tasks that should be performed more or less frequently – or possibly discontinued altogether if deemed unnecessary. Changing work strategies should reflect the operational tempo to which the asset is subjected.

Systems now are utilizing field-generated data and facilitating the timely preparation of work requests that are capable of managing high volumes of field-based intelligence and providing a single point of entry to existing EAM systems. This combines predictive intelligence with asset reliability, enabling real-time analysis of asset health and availability.

Dashboards can be customized for each user to provide an instant view of the current state of asset performance, availability, and maintenance (Figure 3). Also displayed are historical charts showing monthly results for overall equipment effectiveness (OEE), availability, and maintenance costs. Greater detail can be obtained on any asset simply by clicking on an item.

Critical asset failures – and how much they are costing your plant – can be determined (Figure 4). This enables users to quickly identify where maintenance time and money are being spent, pinpointing pieces of costly equipment by tag number. Failure information pulled from predictive diagnosis applications and cost information in EAM records is used to illuminate the "bad actors," or assets that require maintenance too often. The bars on this display indicate the number of time-consuming failures by each asset over the past year, and the green line shows the total maintenance cost of each piece of equipment. These reports can be updated frequently, so decisions can be made in real time.

All plant equipment is prioritized on the basis of failure modes and effects, its operational significance, and risk of failure. This provides more

focus on the assets that are critically important to overall production.

System customization allows specific objectives to be established and tracked. For example, you can quickly determine whether key established performance indicators are being hit or missed. If overall equipment effectiveness is declining, those assets contributing to the lackluster performance can be identified with a single click, so you know instantly where to focus attention to reverse the trend. The same is true of critical asset availability.

Automated work requests

EAM systems do a wonderful job of creating work orders for maintenance to be accomplished on specific pieces of equipment, scheduling the work, following up until the job is completed, and archiving a maintenance history on each asset. However, most work requests are created manually and may be based on faulty or incomplete information. The subsequent work order may be totally erroneous as a result.

APM systems automate the creation and submission of accurate and timely work requests to your EAM. Your maintenance program will change from being predominantly reactive to being much more proactive, with work scheduled according to well-established performance management benchmarks. That is a powerful, manpower-saving capability.

The diagnostics can also be used in a predictive manner. Depending on the criticality of the asset and the severity of its condition, the system may indicate whether to delay repairs until a scheduled shutdown. Or, if the condition is severe, corrective action may be ordered soon to avoid a failure that could be catastrophic.

Summary

If your plant is one that operates up to 20 percent below capacity, or if you spend too much time reactively "fighting fires," it is time to improve your maintenance practices. Even if your facility is full of smart instrumentation, and you are employing an up-to-date EAM, the only way to get the expected results is to make sure the field-generated diagnostics are utilized to automate the creation of work requests for your EAM.

Follow this program, and your maintenance practices will be less reactive and overtime labor will be substantially reduced. Turnaround costs will start to drop, and your spare parts will get more shelf time. Best of all, you will see availability and uptime increase by as much as 10 percent. We hope you get the recognition you deserve.

ABOUT THE AUTHORS

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[1]www.arcweb.com, "Emerson and Meridium Partner to Help Resolve the Asset Performance Management Puzzle," 11/1/2010

[2]Source: *Maintenance Technology* magazine