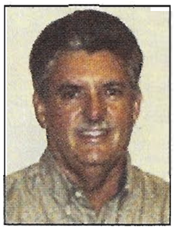
current issues BY JIM DAVIS



Davis

What is asset management and where do you start?

The concept of asset management has been around for a long time, but it has continually undergone name changes as well as changes to its overall definition. Simply put, asset management can be defined as: "A continuous process-improvement strategy for improving the availability, safety, reliability, and longevity of plant assets, i.e., systems, facilities, equipment, and processes."

For decades the industrial sector—particularly in the United States, Canada, and portions of the European community—has focused heavily on managing plant and equipment assets. Only recently have public utilities been interested or more formally involved in developing an asset management strategy (AMS). Preliminary program results migrating from Australia and New Zealand have somewhat fueled (or refueled) this effort.

A sound AMS must be viewed as belonging to and involving the entire organization, not just the maintenance department.

The primary purpose of an AMS and its accompanying components (programs, tasks, or activities) is to help you:

- know exactly what assets you have (i.e., those you are responsible for operating, monitoring, and/or maintaining),
- know precisely where your assets are located,
- know the condition of your assets at any given time,
- understand the design criteria of your assets and how they are properly operated and under what conditions,
- develop an asset care (maintenance) program that ensures that each asset performs reliably when it is needed, and
- perform all of these activities to optimize the costs of operating your assets and extend their useful life to what was called for by the initial design and installation (if not beyond).

AMS COMPONENTS

There are a number of basic factors and requirements that apply to each AMS component.

Know exactly what assets you have. This might sound simple, but knowing what assets your utility has may not always be easy. Some utilities have "inherited" certain assets that were annexed or may have been previously installed by developers or homeowners associations. In addition, some assets may have been added by the utility's own activities.

Breakdowns (or outages) occur, and when they do, organizations may not always be fully prepared with exactly the right equipment, parts, or in-house labor to make repairs. As a result, utilities may have to deviate from what were at one time somewhat standardized equipment and parts. Field modifications to processes and equipment (i.e., quick fixes, temporary fixes, bypasses) and other unplanned situations have the potential to change some equipment (or process) configurations and can also change their location.

Without proper and complete documentation, your records may not fully reflect these changes. This is why utilities should have in place a computerized maintenance work order system and all of the corresponding and documented procedures, roles and responsibilities, and feedback loops to ensure that every time anyone touches one of your assets there is a complete and easily retrieved record of the event.

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Know precisely where your assets are located. Again, this may sound simple, but how much time is still wasted digging out drawings, searching for documents, or tracking down the last person(s) who worked on an asset in order to locate it? Even worse, what used to be easily accessible may now be hidden under a new building, street, or sidewalk.

Many of the conditional elements mentioned with regard to "knowing what assets you have" apply here as well. However, with today's geographic information and global positioning system technologies, this is becoming less of a problem, especially with more recently installed assets. Part of a utility's overall AMS should include updating and modernizing previous asset information and data with these same technologies. Designing the installation of future assets so they are easily accessible is also a critical part of a well-functioning AMS.

Know the condition of your assets. Actually knowing the condition of each asset can present its own set of problems, especially when the asset is "hidden" (i.e., vaulted, underground, or remotely located). These situations dictate that a utility have a system (process or procedure) in place requiring it to do whatever inspections, preventive maintenance, and/or predictive tasks (e.g., running pigs) whenever the opportunity presents itself (sometimes the opportunity must be created) and that all related and pertinent information is completely and accurately captured, documented, and stored for easy access and review at a future time.

This information typically comes from operators, maintenance crews, contractors, and engineers—whoever touches the asset for any reason. This is one reason a good AMS is not just a maintenance department initiative. It must involve the entire organization.

Understand the design criteria of your assets: How are they to be operated and under what conditions? Increased customer demands, diversity, and modifications to equipment (not to mention environmental issues) may cause utilities to push assets far beyond their design capacity. If done for long, this may set the stage for a major catastrophe.

To avoid this situation, utilities need to know what their assets' design specifications are, document them, ensure that equipment is operating within those specifications, and maintain the equipment accordingly. Plant-distributed control systems and even computerized maintenance management systems/enterprise asset management systems (CMMS/EAMS) can be used to monitor these types of data and information.

Develop an asset care (maintenance) program that ensures each asset performs reliably (reliability) when it is needed (availability). Once you know what assets you have, where they are, and how to properly use or operate them, a basic maintenance program must be integrated to ensure they are ready, available, and, once turned on, will operate at or near the design specification parameters until you turn them off (reliability).

To do this, there must be a clear expectation about how your maintenance program (department or function) should be run. It is always better to operate in a proactive versus a reactive maintenance environment. It is a proven fact that operating in a reactive mode (typically meaning "fix things when or after they break") costs two to three times more in labor, parts and materials, and loss of service than does operating in a proactive environment. In this context, proactive means that through the use of regular inspections, effective preventive maintenance, and various predictive technologies, a utility is finding problems before they occur and fixing them before an actual failure.

A proactive asset-care environment includes all of the techniques outlined previously along with effective planning and scheduling and work-order feedback loops to provide equipment history that allows maintenance planners and/or reliability engineers to conduct data-mining, statistical process control, failure modes and effects analysis, and root-cause failure analyses in the event of unexpected failures.

In this day and age, it is all but impossible to keep these kinds of data current, accurate, and available without a good CMMS or EAMS. The latter is preferable because parts inventory and procurement (purchasing) functions can be integrated in the same software system.

Acknowledge and perform all recommended activities to optimize operating costs and extend an asset's useful life. This is the strategy component that primarily falls under the responsibility of supervision and management. There are two basic requirements:

- Establish proper key performance indicators for your asset-care processes in order to monitor and determine such things as percent scheduled versus unscheduled work, percent planned versus unplanned work, preventive maintenance compliance rates, average age of a backlogged work order, and average number of backlogged work orders.
- Collect the right kinds of data at the right time in a consistent format to enable you to make data-based decisions versus those based on a best guess. In addition, know where and how maintenance dollars are being spent so there is enough information in enough detail to determine whether to repair, refurbish, or replace an asset and the consequences of that choice.

The fundamentals of an effective asset management strategy may not be simple to enact, especially if any of the elements have not been diligently incorporated over the years. The services of former employees or a company that provides these services may be needed to assist with putting measures in place and bringing them on line so benefits can be realized as soon as possible.

PROPER CARE AND FEEDING OF YOUR ASSETS

There are six basic components of a sound maintenance AMS:

- work identification and control,
- job planning,
- work order scheduling,
- preventive and predictive optimization,
- materials coordination, and
- scheduled outage/shutdown coordination.

Each component merits a more detailed examination.

Work identification and control. The most important component of a sound AMS is work identification and control. Without this basic function, optimization of any of the others is virtually impossible. There are three cardinal rules that apply and that affect and involve all of the other components.

- No work order, no work.
- No work order, no parts.
- No parts, no work.

The first rule—no work order, no work—simply means that no work should be performed on any asset (by your employees or a contractor) without a properly generated and approved work order. Period. The only way to determine the true cost of operating and maintaining an asset is to record each instance in which labor and material resources are applied. The best way to capture this information is through a work order system that identifies the specific piece of equipment, who worked on it, for how long, what was done, and what parts and materials were used to complete the job.

Equipment history files (i.e., work orders) collected through a well-configured CMMS/EAMS system will become the primary source for accurate and relevant information with regard to the condition and cost of maintaining each asset and will be the best source for determining whether it should be repaired, refurbished, or replaced.

Additional useful indicators are also contained within a CMMS/EAMS as a result of the work identification and control process:

- how responsive your organization is with regard to acknowledging work orders and completing them in the time requested (This is a primary indicator of whether your maintenance department is proactive or reactive.);
- what your organization's past workload has been;
- what your organization's future workload looks like;
- problem areas, processes, or equipment within your organization;
- the number of maintenance people needed and their required skills.

Job planning. In order for planning to be effective, utilities must have maintenance planners well-trained in how to produce high-quality work order job packages. An effective job planning process provides

- quicker repairs on prescheduled work, projects, and other tasks;
- better-quality repairs and other work;
- more efficient "wrench time" from technicians and maintenance workers;

• improved parts and materials costs and usage;
• improved on-the-job safety; and
• less downtime.

Job planning also involves more than simply identifying parts. Other critical aspects of job planning are

• scoping and estimating the requirements for the job;
• determining the actual steps in performing the work (where needed);
• determining the labor required (amount of time and type);
• determining all preparatory work required;
• determining all parts, materials, and supplies needed;
• determining all equipment and tooling needs; and
• determining all job permits and other prework authorizations.

Good job planning (or the lack of it) will make or break a good maintenance program. It is an essential component of an effective AMS; it is also the beginning stage of establishing an effective reliability-centered maintenance (RCM) effort.

Work order scheduling. Once you have identified "what you need to do" (work identification) and "how you need to do it" (job planning), the next task is deciding "when to do the work" (work order/job scheduling).

Obviously, the more preplanning that can be done, the more easily the work can be scheduled. In reality, scheduling falls into three major groupings:

• jobs that need to be done right now—emergencies, unplanned outages, and environmental or safety hazards;
• jobs that need to be completed in the near future—some time within the next few hours or days;
• jobs that can be scheduled for the distant future—more than a week out.

True emergencies—situations that result in the loss of services, sudden outages, safety, or environmental conditions—need to be addressed as soon as someone can rectify the situation, either temporarily or more permanently. Unfortunately, these jobs "schedule themselves" and allow little if any time for effective planning. Certainly this is the type of work all utilities strive to spend the least amount of time doing. Effective preventive maintenance, predictive maintenance, RCM, and other related tools and systems (e.g., condition-based monitoring) can help minimize these reactive-type situations. Near-future jobs typically allow a little more time to properly plan and schedule the work needed but do not provide the effectiveness and efficiency afforded by more distant deadlines.

The most desirable scheduling situation is for the distant future because it provides time to effectively plan all aspects of the job and minimize time, materials, and downtime requirements necessary to get the right work done the right way at the right time. Again, the more effective the preventive maintenance, predictive maintenance, and other RCM-related tools in your tool kit, the better.

At a minimum, schedules for the following time frames need to be in place:

• 5–10 years
• 1–2 years
• 12 months
• 6–8 weeks
• 2 weeks
• Once a week/daily

Typically, fewer details will appear the farther out the schedule extends, but it would still show, for example, plans in 2010 to replace a major piping run; to add more monitoring equipment; or to refurbish or replace a pump, tank, or other vessel. At best, a particular month could be scheduled.

The closer you get in time to an event, the more details are needed, e.g., exact dates, tasks required, and resources required. These are all part of a good planning and scheduling program.

Preventive and predictive activities need to be balanced and optimized and must provide value for the time and effort they require.

Preventive/predictive optimization. Although preventive and predictive maintenance activities are appropriate to support the underlying focus of promoting more proactive (planned and scheduled) maintenance, too much of a good thing may not be effective.

Preventive and predictive activities need to be balanced and optimized and must provide value for the time and effort they require. This is not an easy task, and it often requires a large amount of resources to accomplish because most organizations have failed to perform such balancing and optimizing efforts for months or even years.

A good place to start is to apply the "6-to-1 rule," meaning that for every six preventive or predictive tasks performed, at least one corrective situation is found that needs to be addressed. Some would argue that predictive tasks should be higher, e.g., 4-to-1. However, there is no real "one-size-fits-all" indicator. If your preventive or predictive technicians never find any problems requiring corrective measures, they may be looking too often. On the other hand, if they find multiple things needing attention each time they perform their routine, they may not be looking often enough. This is especially the case if processes and equipment are breaking or failing faster than they can be detected.

Materials coordination. One of the greatest expenses for any job is the cost of necessary parts and materials. Even more costly, however, is inefficient materials coordination: maintaining items in inventory (in storerooms or warehouses) and paying associated storage and handling costs, carrying more than is needed, not carrying the critical items that are needed, spot buying, and overnight freight charges, to name a few.

There is a cost for carrying too much inventory as well as for downtime and, in some cases, lost revenues for carrying too little inventory or, more important, the wrong inventory.

In a reactive maintenance environment it is difficult to know what to keep in stock until something breaks or malfunctions and someone asks for it. In this type of reactive environment, storeroom or warehouse personnel and members of the purchasing department depend primarily on maintenance and engineering personnel to tell them what to carry. Identifying critical equipment as part of the CMMS/EAMS equipment/asset hierarchy setup can help determine what parts to carry as well as identify those items having a long lead time.

In a more proactive environment, it is often easier to predict what parts or materials are needed for a particular project when there is extra lead time resulting from effective planning and scheduling processes. To achieve this goal, operations, maintenance, and engineering personnel must work as partners with the warehouse and purchasing functions to optimize materials coordination.

Scheduled outage/shutdown coordination. Most utilities and organizations do a better job of planning and scheduling long-term, preplanned outages and shutdowns than they do day-to-day maintenance activities. But there are still ways to improve these events, and this requires that all of the five basic components of a sound maintenance asset management strategy discussed previously are in place and running efficiently. At a minimum, a successful planned outage or shutdown requires

- early identification of the work needed (not work that can effectively be done when the process or equipment is operational),
- thorough job planning and well executed job-planning packages with all the required information needed by crews or contractors,
- a well-thought-out schedule with multiple timelines for various tasks,
- a drop-dead date after which no new jobs will be added,
- pre-outage meetings with specific agendas and mandatory attendance,
- during-outage meetings to gauge progress and identify potential scheduling problems, and
- postoutage meetings to review what went right and why, as well as what went wrong and why, all of which should be documented.

The fundamentals of an effective asset management strategy may not be simple to enact, especially if any of the elements have not been diligently incorporated over the years.

SUMMARY

A sound AMS should be viewed as belonging to and involving the entire organization, not just the maintenance department. Developing this strategy helps your organization identify its assets, where they are located, what condition they are in, their design criteria and operating requirements, and how they should be cared for to maximize their useful life. Performing these activities will in turn optimize the costs of operating these assets, and extend their useful life to what the initial design and installation called for—if not beyond.

—Jim Davis is director of operations for Performance Consulting Associates in Duluth, Ga. He has more than 20 years of experience in the analysis, design, and implementation of preventive maintenance programs, systems to improve productivity, and cost control measures. Davis can be contacted at davis@pcaconsulting.com.