

Asset Management

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Safeguard Your Company's Future

Overcome high labor turnover and aging equipment issues through asset performance management

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“With fluctuating commodity prices and a competitive global market, one minute of downtime can translate into costly production losses.”

– Gerry Bleau, CEO, Ivara Corporation

Companies around the world face two looming issues that soon will have an even more dramatic impact on profitability and competitiveness than tough economic conditions: a drastically reduced skilled labor pool and aging equipment that requires more and more restoration-type maintenance.

Better-performing assets make better-performing companies, which means maintaining or improving asset performance levels is essential to financial health. Thus, tackling the twin challenges of declining work force skills and aging harder-to-replace assets with an asset performance management program is key to any successful management philosophy.

Within the next three to five years, most U.S. companies will lose more than 50% of their skilled work force.¹ The U.S. Department of Labor projects that by the year 2012 the demand for skilled maintenance workers will increase by almost 14% to 776,000. In addition, the demands on industry to replace retiring workers will put an even higher premium on skilled workers. A February 2007 *Plant Services* survey of more than 200 maintenance organizations found that these companies will soon lose more than 42% of their skilled workforce. More than 72% of these companies have no formal testing regimen for new hires, which calls into question whether those hired will have the appropriate skill sets for getting the job done.

¹ Ricky Smith, CMRP, CMPP, *Skilled Labor Losses on the Horizon*, *Plant Services*, n.d., n.pag.

According to the National Manufacturers Association, “More than 80% of manufacturers surveyed are experiencing an overall shortage of qualified workers that cuts across industry sectors. The pain is most acute on the front line, where 90% report a moderate to severe shortage of qualified skilled production employees, including machinists, operators, craft workers, distributors and technicians.”²

The outlook becomes even more alarming when considering the fact that more than 51 million adults, or nearly 23% of the adult U.S. population, have difficulty reading, and English is the second language for 31% of American adults.³ The impact of these factors becomes even more critical when considering that only 10 years ago a typical maintenance technician was expected to read and understand about 500 pages of technical information, written at the eighth-grade level, to maintain plant equipment. Today technicians must read and understand 5,000 pages written at the college undergraduate or higher level to do the same job. And this level of complexity is only expected to increase in the future.

Then there is the issue of aging equipment. According to *Industry Week's Manufacturing Performance Institute Census of Manufacturers*, in 2006 72.4% of U.S. manufacturing plants were over 20 years old and another 16.8% were between 11 and 20 years old. The majority of U.S. oil refineries are over 30 years old.⁴

The combination of aging equipment and higher costs for new capital purchases means more restoration-type maintenance attention will be required from an ever-smaller qualified workforce. The manifestation of this problem is reduced availability (longer downtime periods to restore equipment to optimal condition) and poor reliability (equipment not performing at designed or required specifications).

Everyone understands that improving the availability of equipment translates into increased utilization and, ultimately, throughput. However, the long-term concern for most organizations (if it is not already, it should or will be) is their ability to maintain availability *at current levels*, given aging equipment and a dwindling labor pool. To

operate at current levels of availability, maintenance labor is a key component of success, yet companies are having trouble finding and keeping skilled labor, and when they do find it, it is not necessarily a one-for-one skill set transfer. In other words, newly acquired skills do not match those lost to turnover and retirement.

In addition, managers are adding more and more responsibilities to their own task lists as regulatory requirements increase and subsequent quality issues demand more oversight. For example, even though companies want to increase such non-destructive equipment testing as vibration or radiation analysis and bring those skill sets in-house to reduce costs, increase testing frequency, and expand the scope of testing, in too many cases multiple ongoing improvement initiatives and large capital expansion efforts dilute leadership focus and attention.

These additional regulatory and process improvement initiatives consume valuable time of managers who once might have been able to work more closely with employees, particularly during the initial familiarization and job training phase of employment. Not so long ago, the ratio of employees to managers was 8:1. Now organizations are looking for a more self-directed work force, so they have moved to a 15:1 or higher ratio. This has resulted in a management capacity problem wherein managers have less time to spend training new employees and bringing them up to speed.

So, combine high labor turnover with aging equipment and overloaded management and it is easy to see why the asset crunch can quickly overwhelm companies unprepared to deal with these capacity erosion factors. But even in the face of this scary prospect, organizations have opportunities to ease their labor pains.

I. Back to Basics

To survive and be competitive, companies must improve on two basic dimensions of good business practice: standard operating procedures (SOPs) and data-driven decisions. The following sections will explain how to under-

²National Manufacturers Association, *2005 Skills Gap Report*, p.1

³U.S. Census Bureau 2004

⁴D. Sean Shurtleff and H. Sterling Burnett, *Increasing America's Domestic Fuel Supply by Building New Oil Refineries*, National Center for Policy Analysis, No. 603, November 15, 2007, p.1

stand the extent of your organization's problem; provide a means to extract the knowledge (known and hidden) from your existing work force; and show how completing the aforementioned tasks will enable your busy supervisory or management team to act more proactively. The goal is to increase asset reliability and availability to drive a higher return on invested capital.

a. Capturing Required Practices

Let's face it, there is only one best way to do anything. A good company recognizes this; a great company discovers "the best way," creates the SOPs, and requires absolute adherence to them in every facet of its operations. The benefit of standardizing work, as it relates to the issues discussed herein, is that it allows new employees to have the same knowledge, standards, and procedures former employees held.⁵ This means the organization has a better chance to get the one-for-one skill set exchange it needs to maintain or improve its effectiveness. As long as the replacement work force members have the fundamental skills (which essentially means they can read)⁶, they can follow established procedures and step right into those experienced shoes. Standardizing work helps ensure consistent performance.

When developing maintenance standards, every organization must analyze the requirements from a work content, labor, and equipment perspective.

b. The Labor Analysis

To get its asset reliability program off the ground, an organization must first estimate its projected work force losses over the next two to ten years. This will help management make logical decisions about how to handle the skill drain and determine how quickly the organization needs to move to counteract short- and long-term negative impacts.

Next, perform a job task analysis⁷ and develop a task-to-training⁸ matrix to determine the most critical, most fre-

quent, and most important tasks in the operations compared to the organization's current ability to perform them. These analyses will define what skill levels are required where and when, whether they are available in the existing labor pool, or whether training must be implemented to develop the skill levels necessary to get these jobs done. Most maintenance work, for example, does not require a top-level technician. In fact, 90% of maintenance work requires a person with only mid-level skills. These analyses will help prioritize where and when hiring and training are most needed.

When a major consumer packaged goods company completed an enterprise-wide flexibility analysis, it discovered that, in the short- to mid-term, it had the necessary skills available in-house, but needed to initiate cross training and convert staffers' knowledge into standard operating procedures which could be shared across the enterprise. Once the "house" knowledge was put into writing and shared across the company's 10 facilities, equipment uptime improved over 10% and mean time to repair was reduced 50%. To meet the long-term personnel goals defined by the analysis, the company established a hiring process that identified and responded to their specific corporate needs.

It is critical, when embarking on personnel acquisition, that this process includes testing new employees for the specific abilities, skills, attributes, mechanical aptitude, and literacy required to perform a job to standard. In addition, three other important changes should be implemented for the best chance for success.

- Train operators to assume basic maintenance tasks to reduce pressure on maintenance personnel and improve labor efficiency.
- Perform Maintenance Task Analysis (MTA) on equipment using experienced maintenance and operations personnel. (See next section.) This analysis will include details for preventive maintenance and corrective maintenance procedures that identify steps, specifications, tools, and materials required for each task.

⁵ Another benefit of standard work is both management and peers can observe deviation more easily.

⁶ Maintenance trades also require understanding of how/which tools to use, along with basic "aptitude."

⁷ A detailed review of the skills required to perform within a specific job description. It must be more detailed than simply "troubleshooting" or "work with 3 phase, 240 VAC."

⁸ Aka Flexibility Matrix, this is a listing of the skills required, by employee, with a rating of their capabilities, usually listed as "no training, familiar, capable with assistance, stand-alone, or trainer."

- Leverage technology for decision support.⁹ Enabling tools should aggregate and prioritize data so that it becomes *business intelligence*. Technology by itself will not provide the answer, but it should turn the data into the kind of information that allows intelligent human beings to make more timely decisions.

c. The Equipment Analysis

A company can improve the effectiveness of its maintenance work by improving the type of activities performed. For example, it is better to monitor the actual health of equipment than trying to prevent failure by replacing parts or the equipment itself on a time-based schedule. It is important to leverage knowledge to ensure consistent and best practices across multiple locations with similar equipment. Use condition-based techniques to capture failures earlier and involve more employees in reliability and asset management.

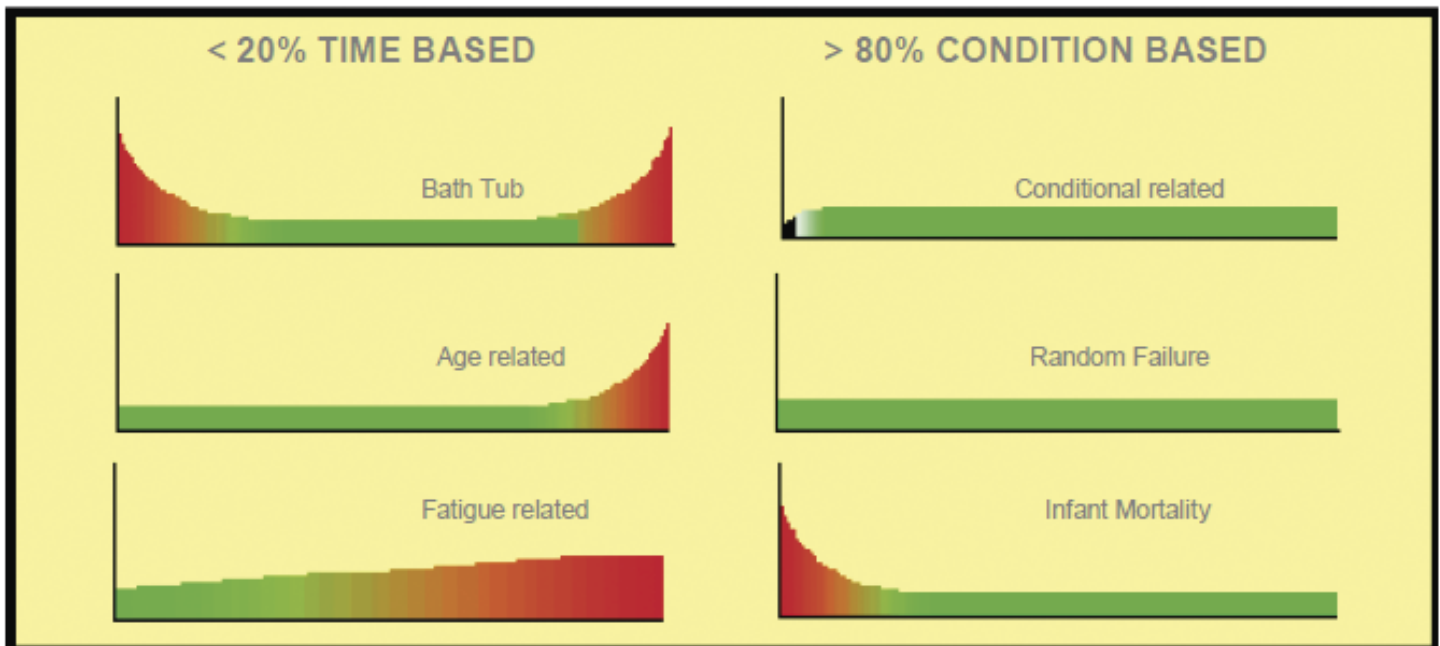
The first step in equipment analysis is determining *asset criticality* by using a ranking process to assess relative risk and impact to operations, safety, and cost, should functional failure occur.

Once the equipment is ranked by priority, the next step is to complete a required task analysis using a cross-functional

team of maintenance, operations, quality, and engineering personnel using RCM II¹⁰ (for critical equipment) or MTAs. An experienced reliability practitioner should facilitate this analysis so that the operational requirements, the potential means of failure, the methods to sustain operation, and the corrective actions once failure starts are clearly understood. It is important to note that any maintenance task analysis should include education and a solid understanding by the participants of the ways equipment can fail. Awareness of all the failure curves, not just the traditional view that equipment fails due to age, promotes the development of proactive, condition-based tasks and ensures that unnecessary work is not added to the workload or important tasks overlooked.

Once the equipment maintenance task analysis is complete, it is documented in the form of SOPs. Said another way, it becomes the work or job plans loaded into the CMMS/EAM.¹¹ At this stage, two parts of the improvement plan are in place. Schedule attainment to completing these tasks as planned can be tracked as a leading indicator and integrated into future planning; and documentation is in place to ensure the program survives both planned and unplanned personnel turnover by maintaining the “how” and “what” of successful asset management processes.

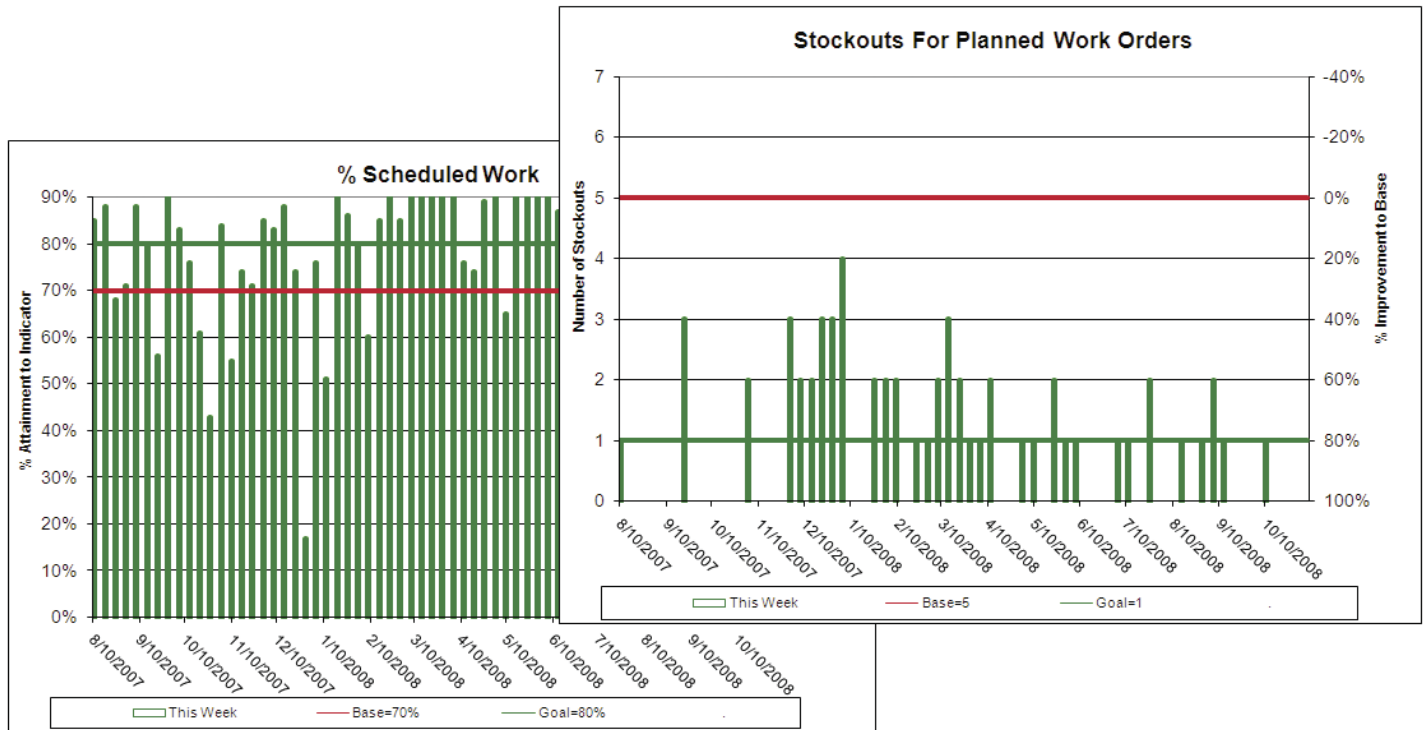
Time- versus Condition-based Failure Curves



⁹ See *Why Last Century Lean Transformation Fails in the New Millennium* by Margaret Wilson under White Papers at www.uscgcg.com

¹⁰ For more information on failure curves, see *RCM II*, by John Moubray or www.thealadonnetwork.com

Examples of Maintenance Leading Indicators



These new procedures will require the enhancement/review of the skills matrix described above to ensure those skills necessary to support the new maintenance tasks are added and evaluated. Additionally, to ensure the proper enabling tools are deployed, create a technology matrix to define what is needed to support the new/enhanced maintenance procedures, including:

- non-destructive test equipment (vibration, oil, infra-red, etc.);
- CMMS/EAM enhancements;
- special tools and associated training (torque, alignment, set-up tools); and
- asset performance management software.

II. Enabling Management Using Improved Asset Management Techniques

Implementing an asset reliability program, of which SOPs and data-driven decision making are part and parcel, can re-focus improvement efforts on the one area which can generate solid financial results, as evidenced by such companies as Dofasco, McCain Foods, and ConAgra.

ConAgra's Frozen Foods division experienced an average 20% improvement in units per labor hour within three months of starting a program of this nature. Using a cross-functional team, along with outside help, they were able to leverage the existing knowledge within their various plants to develop a solid maintenance program, which not only improved their operation, but also instituted the use of leading indicators and Pareto analysis to drive improvements before failure became catastrophic. In addition, the change dramatically improved supervisory and management quality of work because they relinquished their roles as "firefighters" and "back-up mechanics" and became managers and thinkers.

An asset reliability program can ease labor and management shortages, improve equipment efficiencies and longevity, advance safety, and improve production, product quality, and customer service, as well as reinvigorate worker motivation.

a. Measuring Maintenance

The goal of applying a reliability centered maintenance program is to improve the effectiveness of reliability programs,

¹¹ CMMS = Computerized Maintenance Management Software; EAM = Enterprise Asset Management Software

thereby improving the business' financial performance. When considering the cost per unit of output, the cost of maintenance can be broken down into three types:

1. Base work is defined as “the right work done at the right time” and is value-added. This is also known as proactive work. “Right work” either prevents failure or allows action to be taken to manage the consequences of failure, or deals with the failure effectively, once it has occurred. By defining and performing the “right base work,” we can reduce:

- the amount of emergency work,
- lost production time,
- excessive parts consumption, and
- secondary damage from failure.

2. Non-value added work is work performed with negligible impact on the asset's performance, or work that is done too early, e.g., unnecessary/early rebuilds.

3. Deviation work is the reactive, fire-fighting work done when the undesired failure has already occurred and the action is too late to have any real impact. This work is extremely expensive and is often mired with other unforeseen complications, failures, and downtimes.

Separating, prioritizing, and managing the three types of work is best done under an asset performance management system instead of a traditional “maintenance as a cost center” concept. Condition-based methodology and data-driven decisions, facilitated by technology, help overburdened managers understand which are the critical few indicators and assets they should be looking at on a daily, weekly, or monthly basis so they can make appropriate and timely management adjustments to avoid costly downtime.

For example, when a paper manufacturer stopped measuring its maintenance department solely on “downtime” by adding “schedule attainment,” “number of Pareto analyses completed,” “start-up attainment,” and OEE¹² to the scorecard, they saw an 18% improvement in maintenance cost per unit produced and a 50% reduction in production overtime. On top of that, they consistently achieved 98% customer service/on-time delivery for all product shipments.

Basing business decisions like these on an objective analysis of available data is not as difficult as it once was. Most companies have computer-based systems that store and report performance and financial data, but few use this information to make better business decisions. Instead, plant and corporate management make decisions based on perception or skewed data generated by selective use of the data contained in these systems. Without a basic change in the use of data to ensure decisions are based on fact, nothing will change.

Establishing an asset performance management system can help develop the management skills needed and create supporting infrastructure so that the responsible parties are not literally waiting for the next failure to occur, which is exactly what happens under the traditional approach to maintenance.

b. Enabling success

Just as the mechanic and the operator have certain conditions for which they are responsible, the management group has similar responsibilities at a higher level. Just as basically trained mechanics should be able to pick up in a new setting because good documentation and infrastructure have been put into place, so, too, should basically trained managers be able to do the same with the documentation and infrastructure that have been established for their level.

Although responsibility for asset performance management is shared by all levels in best-in-class organizations, administering a firm's assets – human, financial, and mechanical – is a job for C-level management for the simple reason that these are the components that keep a company alive and flourishing. This requires the kind of back-to-basics approach and strict adherence to standard operating procedures and data-driven decisions that only an asset performance management system can provide.

For example, a power company with over 60 plants across North America realized the necessity for, and value of, C-level involvement after it struggled for three years to improve standard reliability indicators. Once it decid-

¹² Overall Equipment Effectiveness

ed to make the issue a corporate initiative, the company instituted weekly steering team reviews at the executive VP level, resourced it short-term with outside project management, and measured progress using leading indicators. By taking these steps, the organization finally achieved the 8 – 15% improvement range they'd been seeking.

In Conclusion

By establishing defined SOPs that capture and pass on knowledge, companies can reduce turnover due to dissatisfaction, mitigate the loss of skills associated with retiring personnel, and hire literate resources that can meet the goal of maintaining or increasing asset performance levels. SOPs provide a base of instruction that releases the management team from training and supervisory activities so they can focus on more critical issues.

In addition, the management team has improved understanding of what work is required and what level of performance to expect, and has access to the information required to make iterative, timely, fact-based decisions.

The benefits are compelling:

- Less unplanned downtime and higher equipment availability;
- Improved planned downtime activities and higher availability;
- Improved quality, cost, and OEE through increased equipment reliability; and
- A substantially stronger bottom line.

Overcoming high labor turnover and aging equipment before they erode capacity, efficiency, and profits by implementing an asset performance management program can go a long way toward safeguarding a company's future.

About the Author



Margaret Wilson is USCCG's Operations Manager for Asset Performance Management. She joined the firm in 1999 as a senior project manager from Mervyn's California, where she was a facility engineer and process improvement manager.

Ms. Wilson earned a BS in civil engineering from the

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