TMG News
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"Sharing Information to Improve Reliability"

Measuring and Tracking Ownership

By: Winston P. Ledet

Since introducing our Dynamic Benchmark model in the June 2002 issue of TMG News, the concept of ownership has featured prominently in subsequent articles sharing lessons learned from the model. We have defined ownership as "people's willingness to initiate and participate in proactive improvements". Our continued work with the model has confirmed that ownership is the single most important leverage point. When we increase the level of ownership, the reliability of the facility improves dramatically and the production, profits, and cost improve to very impressive levels. Given its significance, we have continued to research this topic. In this article, information we've gathered will be shared to provide a more comprehensive definition of ownership and explore specific methods for measuring and tracking ownership.

Defining Ownership – Responsibility, Authority and Accountability

In previous articles, we have indicated that giving people a chance to have an impact on performance and letting them see their results supports the building of ownership. Further research has shown that ownership involves three elements: responsibility, authority, and accountability. To play a specific role in any organization, it is necessary for a person to have the responsibility, authority, and accountability for producing certain results. This means that a person must be responsible for seeing what needs to be done, have the authority to commit resources to meet those needs and be accountable to meet the demands of the total system.

Responsibility – Seeing What Needs to Be Done

In order to take responsibility for a piece of equipment, a worker must have knowledge of the functions that equipment must provide and also understand enough about how that equipment works to notice when the equipment is not functioning properly. Many organizations have established standard operating conditions to specify the limits for the proper functioning of equipment. Measuring the percent of time that the equipment is outside those limits is a measure of the needs of the equipment. A good measure of the level of responsibility of operating personnel is the percent of time they spend taking action to return the functioning of the equipment to be within the specified limits. In today's vastly automated process industries, a highly visible (and audible) sign of the needs of the equipment is the number of alarms ringing and flashing in the control room. Many of the standard operating conditions of the equipment are monitored by instrumentation that causes an alarm to sound and an alarm light to illuminate when a variable is out of limits. When visiting a refinery in Ohio in 2003, eight years after they had begun their defect elimination program, I was struck by the calm of their central control room. Not a single alarm was beeping, buzzing or flashing. What a difference the years of dramatically increased front line ownership of equipment reliability had made! It certainly wasn't the "Las Vegas strip" atmosphere that I had witnessed years before with lights flashing, bells ringing and horns blowing.

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The Grease Gun Team Fights Defects

During a Manufacturing Game® workshop at BP in Scotland, a cross functional Action Team was formed to tackle the problems they had been having with seized valves at the Dalmeny site. Team members Billy Bertram, Production Technician; Roy Cunningham, Shift Team Leader; and Andy Risk, Instrument and Electrical Technician, determined the problem was due to a general lack of greasing of equipment by operators. They discussed how these seizures were taking up valuable maintenance time to release and repair them and resolved to eliminate this simple but yet annoying defect.

The team discussed how greasing should become a part of everyday work and how it was currently being missed. It was noted that more seasoned operators were taking the time to grease the valves because it was how they were trained, but newer operators didn't automatically think of greasing as a part of their duties. Some operators even thought it was a job that was "beneath them" and not an important part of operating the plant.

The team decided that changing the attitudes of employees was the first order of business. They needed to create a more proactive culture towards eliminating defects as a whole. Operators needed to take more initiative, be more proactive, and realize the importantance of keeping the plant equipment adequately greased to keep the plant running smoothly.

First, they made employees aware of the problems by engaging the other shifts and vocalizing the need to improve the greasing of all equipment while doing rounds or performing various jobs in the plant. This was followed up with the creation of a Greasing Schedule, which coordinated

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Public Workshop Calendar

Throughout the year, The Manufacturing Game® holds workshops for the general public at various universities and/or professional organizations across the country.

TMG Public Workshops and Conferences of Interest

12th Annual SMRP Conference
October 3-6, 2004
Manufacturing Game Workshop
October 6, 2004
Norfolk, VA
To register or for more information visit:
www.smrp.org or call (800) 950-7354

9th Annual Lean Management and TPM Conference and Exposition
October 11-15, 2004
Manufacturing Game Workshop
October 12, 2004
Orlando, FL
To register or for more information visit:
www.productivityinc.com
or call (800) 394-6868

International Maintenance Conference (IMC)
December 5-7, 2004
Naples, FL
To register or for more information visit:
www.imc-2004.com/registration.htm or call (239) 985-0317

Additional workshops for 2004 may be announced at a later date. To register or for more information please visit our website at:
www.manufacturinggame.com

Authority – Allocating Resources

Of course, being responsible for detecting the needs of the equipment is only the first part of ownership. Detecting the needs and clearly identifying the nature of the defects is not enough. Defects that are causing malfunctions must be eliminated. To do this usually requires some amount of resources. Unless someone is authorized to provide these resources, the equipment will continue to malfunction and usually get worse. This can be broken down into at least two questions: "Are the resources available?" and " Who is authorized to use these resources?" In many organizations, there are distinct boundaries between different parts of the organization based on authority to use certain resources. One way to measure the authority aspect of ownership is to measure how long equipment is allowed to malfunction before it is restored to a proper functioning mode. Often, this can be measured in the maintenance management system by looking at how long it takes to close a work order once it has been initiated. This measure is accurate only when the organization is in a reactive mode and therefore waits for the malfunction to happen before it takes action. A proactive way to measure authority is to measure the rate at which the equipment actually malfunctions by calculating things like mean time between failures. An even better method of measuring actual malfunction rates is to perform a Weibull analysis of the failures over time or over a population of similar equipment to determine if the failures are due to normal wear out or are caused by improper care and use of the equipment.

Accountability – Meeting the Demands of the Total System

Finally, the accountability for the equipment must come as an evaluation of the effectiveness of the equipment to provide its expected value for the organization or business. This can best be measured by traditional business measurements such as profit, safety, and environmental effects. These measures can be compared to the performance of companies in a similar business such as direct competitors or against your company's own performance in the past.

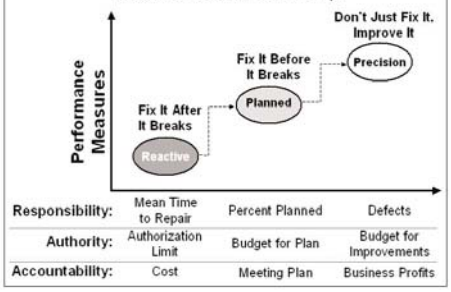
Ownership of the Whole Facility

For lasting change, ownership must go beyond the ownership of specific pieces of equipment as has been described thus far. Each person in the organization needs to exercise ownership over some portion of the entire facility in order to contribute to the organization's ownership of the facility as a whole. To accomplish this goal, each individual needs to understand the proper functioning of the equipment, processes and practices they use and understand how those functions add value to the entire enterprise.

Measuring Ownership of the Whole Facility

Appropriate measures of responsibility, authority and accountability, the 3 elements of ownership, should be established for ownership of the facility as a whole, in addition to establishing such measures for specific pieces of equipment. As the organization improves, what is measured will need to be changed to match the new organizational behaviors that brought about the improvement. We have found that organizations can be grouped into 3 categories based on their organizational behavior and the resulting performance. These 3 categories, depicted in Figure 1, are referred to as the Stable Domains. As an organization progresses through these Stable Domains, the measures for ownership will need to change in order to remain relevant. Examples of appropriate measures for each domain are provided at the bottom of Figure 1. In the Reactive Domain, constructive measures will include those that reveal the organization's ability to respond. The faster the equipment can be repaired, the higher the organization's performance within the Reactive Domain. The nature of behavior within organizations in the Planned Domain shifts from responding to planning. Proper meas-

Figure 1: The Stable Domains
Measurements of Ownership



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Action Team Improves Quality of Work Order Data

On May 14, 2003 an Action Team at BP in Azerbaijan addressed the problem of improper and incomplete entry of work order information into their MAXIMO CMMS (Computerized Maintenance Management System). The cross-functional team consisted of Ilham Asadov, Vladimir Krivtsun, Agil Yusifov, Mubariz Sadikhov, Tamerlan Aliyev and Rzaaga Kazimov.

The team members discussed how the incorrect/incomplete work order data was drastically decreasing the accuracy of the CMMS maintenance status reports. This problem was making it difficult to plan maintenance activities. The employees involved in entering the data were truly not aware of how these improperly completed work orders were affecting the accuracy of these reports and in turn, the ability to effectively plan maintenance activities. The Action Team discussed how to raise awareness by setting up a list of data requirements to distribute to all CMMS users for familiarization. They also determined that it was absolutely necessary to maintain weekly and monthly reports to provide feedback to the CMMS users about the quality of the information being entered.

Initially there were some arguments regarding the quality requirements but after the first few reports were issued, it was noticed that the quality of information was improving. The team arranged for weekly and monthly progress reports to be distributed. These reports were made available to all parties so that everyone could see the progress being made.

A key learning for the team was that many people became interested in participating in this effort once they understood the improvement in planning future maintenance activities that would result. To ensure that progress in work order data quality continues, the team is in the process of establishing training requirements so that all new employees will learn about proper entry of data into the work order system and maybe more importantly, will understand the benefits that quality information will provide to their site.

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ures in the Planned Domain are ones that focus on the quality of the plans generated and the consistency with which those plans are executed. Finally, in the Precision Domain where organizational discipline is required to successfully eliminate defects at their source, the measures will need to focus on the effectiveness of the organization in working across functions to achieve improvements.

Conclusion

Most discussions of improving reliability focus on the tools. And there are some wonderful tools out there – Reliability Centered Maintenance (RCM), Total Productive Maintenance (TPM), various planning and scheduling programs, vibration monitoring devices, Root Cause Failure Analysis (RCFA), and the list goes on. But these tools become nothing more than expensive toys if the front-line workers in the organization do not have the will to use these tools on a daily basis to improve the company's performance. Only when the front-line workers have true ownership of their work practices, in the form of responsibility, authority and accountability will the tools in the organization's "reliability toolbox" provide their full value.

THE ACTION TEAM STORIES FEATURED IN THIS ISSUE ARE EXCELLENT EXAMPLES OF OWNERSHIP.

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different shifts to cover all areas of the plant in a fair and efficient manner. Then, they recruited Chris Bennison, the Dalmeny Asset Manager, and engaged him in the effort. He instantly became a key supporter and made a note to start "noticing" which areas had been greased whenever he made his plant tours. This focus made all employees not only more aware of the issue of greasing equipment but also emphasized the need to step up and take the initiative to make the plant run more efficiently. Keith Niven and Mike Grant led the way and were among the first of the operators to get involved in getting out in the plant and greasing valves. Housekeeping Stations were also stocked with the correct equipment so that it would be easier for employees to pick up the grease gun and cartridges and grease the right equipment.

During this initial process, they ran into a few obstacles. They became aware of the fact that there were three different sizes of grease nipple fittings around the plant and they felt that this might be a barrier to greasing by the operators. They determined that they should unify all of the grease nipple fittings. They were surprised to find out that some work had already been done to standardize them. This energized the group and the standardization was completed. They also found another potential barrier to greasing by the operators. There were some points that were difficult to access. They created a plan to make access easier by running a flexible micro bore pipe from the original nipple to a more accessible point. This improvement plan will continue to happen on an ongoing basis as access becomes possible during various planned outages. Roy Cunningham and Ross Anderson were key in carrying out the grease nipple fitting standardization process.

The team is happy to report that the attempt to change the culture at the site has been successful and they were highly amused to hear about a particular incident that reinforced this impression. One operator on the night shift "took the huff" after a hot debate in the control room and spent his entire shift out in the plant greasing every valve he could find, rather than spending the shift with his colleagues. That's a lot of grease!

Not only has the culture changed, but the site has also experienced a £3,860 (approximatly US$4,700) per year reduction in related labor costs and 224 man-hours per year in savings. Go Team!

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BP Vietnam Continues Their Defect Elimination Effort

As part of the ongoing defect elimination effort at BP in Vietnam, Tu Anh Quan, Pablo Bartolome and Nguyen Ho Hoa met to discuss the problem with frequent air compressor tripping in the mezzanine deck utility area.

The team determined that the design of the compressor package had not taken into account the unfavorable strong winds on the platform. The winds were causing hot exhaust air to be re-circulated, increasing the cooling oil temperature to extremely high levels. The frequent trips were due to these high oil temperatures and in order to avoid these trips, they were using air blowers to help cool the compressors. This "quick fix" created its own problems. To run the blowers, the doors had to remain open, creating a lot of noise in the area. The blower used a lot of air and forced the compressors to work non-stop, increasing the wear. The hot compressors were creating a lot of water ingress in the plant air system. It was apparent that they could not continue to operate under these conditions.

The team was faced with a great deal of skepticism. Their goal was to eliminate the defect without having to make major modifications to the air intake, requiring the addition of ventilation ducts and fans. First they tried unsuccessfuly to baffle the air intake. Then, they tried reducing the pressure, but it was not enough. They then tried covering the intake, removing the door, and covering half the door but the remaining intake was too small causing low-pressure problems. All the testing without the blower was causing more frequent trips making communication with the CRT vital to make sure that backup compressors were ready.

Wind conditions, another obstacle the team faced, were drastically altering the temperature of the compressor from normal to trip, forcing them to take continuous measurements during the long testing periods.

Finally, the problem was resolved by modifying the compressor pressure point from 10 bar to 9.5, thereby reducing the heat generated in the compressor. They also covered the original air intake to prevent re-circulation and removed one of the acoustic cabinet doors to provide a new air intake.

The team realized four benefits from this eliminated defect. 1) The noise in the area was reduced by almost 10 decibels. 2) The compressors were now working on the design loading/unloading cycle, reducing compression wear and pipe corrosion. 3) Working temperatures were reduced from 65 – 67 C to an average of 62 C, also reducing wear. 4) The blower was eliminated, thereby reducing hot air circulation in the plant air system, which reduced serious water ingress/corrosion problems in the plant air network.

The team is in the process of fabricating more resilient; permanent covers for the air intake and counts this eliminated defect as a huge success. They credit their success to their drive and determination in getting the problem solved during the long testing periods coupled with the patience and support of the many persons involved due to the offshore rotation.