TMG News

The Manufacturing Game®

April 14, 2006

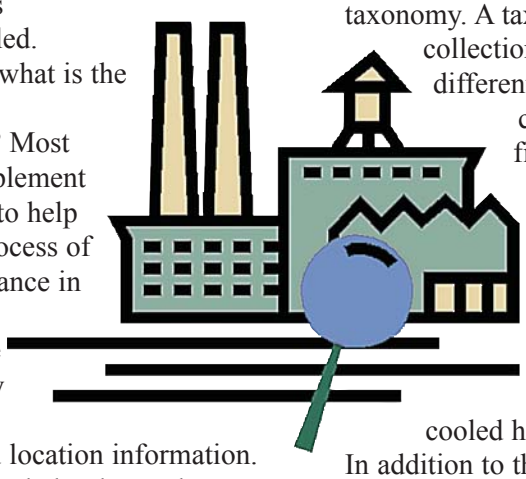
"Sharing Information to Improve Reliability"

Do You Know Where Your Bugs Are?

By Ken Latino, CMRP; Practical Reliability Group

As we all have learned, eliminating defects is the key to a safe and profitable plant. But how do we know where our "bugs" are hiding? There are certainly many ways to uncover where the bugs are, but one place in particular is your computerized maintenance management system (CMMS) or enterprise asset management system (EAM), as it is commonly called.

First of all, what is the purpose of a CMMS/EAM? Most companies implement these systems to help manage the process of doing maintenance in their plants. It is typically the central registry of all of their plant asset and location information. It offers tools to help plan and schedule maintenance work and allows for the purchasing of replacement parts. In addition to all of these functions, it is a terrific tool to document all of the events related to your plant assets. For example, when we go to a centrifugal pump to replace the mechanical seal we should come back to the CMMS/EAM to record that event. This extra step in the maintenance management process will allow us to "mine" the data to see where repeat problems (aka "bugs") are hiding.



Unfortunately, most plants do a poor job of documenting history in their CMMS/EAM. There are many reasons for this but below are some of the more common issues related to poor data collection.

- They lack a comprehensive hierarchy of their assets and locations. This is sometimes referred to as equipment taxonomy. A taxonomy is a collection of all the different equipment categories (e.g. fixed, rotating), equipment classes (e.g. pumps, heat exchangers) and equipment types (e.g. shell and tube heat exchangers, air cooled heat exchangers). In addition to the hierarchy, there are technical characteristics for each class of equipment as well as equipment specific codes associated with problems, detection methods, components, damage, causes and activities. Without a comprehensive taxonomy, it is very difficult to document maintenance history.

- There are insufficient definitions and training with regard to the collection of data. Users of the system end up using certain fields improperly or not at all.

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BP Gulf of Mexico Self Generates an Action Team to Tackle a Defect

In the summer of 2005, a group at BP Gulf of Mexico Offshore employees went above and beyond the call of duty and formed an Action Team to tackle a nagging problem. They had all had overwhelming success as members of Action Teams recently formed as part of The Operations Excellence Game™ workshops. Armed with the knowledge they had gained at those OEG workshops, they had the confidence to self generate their own Action Team to further investigate and determine the cause of frequent low speed shut-ins on the WC65JA Compressor indicating the #4 cylinder was not carrying load. They were able to determine that the burn sensor was bad and changed it out. Feeling the need to take it a step further, they decided to get with the manufacturer of the engine, Caterpillar, to do a RCFA and determine the life expectancy by getting a Caterpillar specialist out to troubleshoot and report the findings. When the specialist found other indicators of shut-in cause, they decided to leave it on for two weeks and monitor it. They made sure the Caterpillar specialist was available to be called out as needed to work with the maintenance group and maintenance scheduling was planned. Unfortunately, the two-week testing period was extended due to Hurricane Rita hitting the area. Once things were back to normal

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What's Inside?

SCHEDULE

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

SMRP 14th Annual Conference

October 25, 2006
Sheraton Birmingham
Birmingham, Alabama

To register or for more information please visit: **www.smrp.org**

Conferences of Interest

Offshore Technology Conference
May 1–4, 2006
Houston, Texas

To register or for more information please visit: **www.otcnet.org**

NPRA Maintenance Conference

May 23–26, 2006
San Antonio, TX

To register or for more information please visit: **www.npra.org**

Mark Your Calendars!

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For example, SAP-PM offers a field to determine if a maintenance event was a "breakdown". The problem, however, is that people have different ideas and definitions as to what signifies a breakdown. Therefore, the field is used inconsistently, and it is difficult to use it for reliability analysis. Simple definitions and explanations of these fields will be a big help in the consistency of the data collected.

- Work orders are written against the wrong equipment or even worse, no equipment. Many times the originator of a work request is not sure which piece of equipment is the problem (e.g. sometimes a motor problem might be wrongly diagnosed as a pump problem). If the work is written against the wrong piece of equipment or even worse, no equipment, there is little chance of getting the proper history recorded.

- There is no work process related to the closure of work orders. In many places, there is no process to verify work order history. For example, there is no review of the work order to make sure that all the work was properly documented and necessary codes were filled in. Complicating the issue is when work orders are automatically closed, not allowing for a technical review and editing of the work event.

Although these issues and many like them are very common, they are not insurmountable to resolve. In fact, with a few changes to the system configuration and a practical data collection work process, it is quite reasonable to expect good quality data coming from your CMMS/EAM.

I would recommend doing a review of your existing CMMS/EAM data to determine where the data gaps are. Are codes being filled in consistently? Are important dates updated and accurate? Is the proper piece of equipment specified? Etc. Once the gaps are identified, it is important to determine the root causes for the gaps. For instance, is it due to insufficient codes (e.g. taxonomy issues) in the system configuration, or is there a lack of work processes around the collection of this data? Once the issues are identified, a path forward can be formulated to resolve the issues. Many companies actually employ metrics to measure the quality of the data being collected. For example, they will track how many work orders had the codes filled out in a given time period.

So what can be done with this data? Well, for many it becomes a system for evaluating areas for improvement (aka "Defect Elimination"). It can provide the essential data for developing "Bad Actor" reports, metrics, and key performance indicators (KPI). Many companies track reliability metrics like Mean Time Between Failure (MTBF), Mean Time To Restore (MTTR), Reliability, Availability and many others. Most of these measures can be calculated with the data collected in your CMMS/EAM.

So to help identify the "bugs" within your facility, consider using your existing maintenance system. This data coupled with the knowledge and experience of your Action Teams can become a winning formula in your defect elimination efforts.

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after the hurricane, they were able to get the Cat representative out for more diagnostic checks and realized there was also a detonation problem. They also brought out a representative from LM Mechanic who began troubleshooting the unit. He went through the unit and worked on resetting and changing out many wiring harnesses and parts. After a week of getting nowhere, it was decided to get Glenn, a technical support specialist for the electrical/electronics end of the compressor to look at it. Both fought with the unit for the next week. At this point the unit was up and down with no set run time. Glenn started contacting Caterpillar on what problems were accruing. A Caterpillar representative recommended that a set of relays, relay bases and one of the wiring harnesses be changed out and advised that if that didn't fix the problem, he would personally fly down to assist with the problem first hand. After installing all the items, the unit was brought back online. While watching the unit run, Ryan, the Caterpillar mechanic, noticed that the choke air intake actuator closed. This gave the unit the same failure code they had been getting in past shutdowns. He then noticed that the actuator would open and close while the unit was running for no apparent reason. Ryan then held open the actuator with a wrench and avoided the shutdown. They were amazed to determine that the root cause of the major problem was the driver module on the choke air intake actuator. Basically, when the air intake was shut off from the unit, it would slow down and trip on low rpm speed sensor with no other failure code. After going out and restarting the compressor, the actuator would cool down and reset itself making it hard to determine what had really been happening. Luckily, Ryan was in the right place at the right time with his wrench.

As a result of this self generated Action Team, a lot of questions arose while trouble shooting this problem. Caterpillar stated that this was the first time worldwide this situation had ever happened.

The team is happy to report that as of January 18th, they have had only a couple of shutdowns on high detonation lasting only 20–30 minutes, and thus far the unit has been up and running without low rpm shutdowns. Kurt and Tracy are preparing a preventative maintenance schedule on critical parts that need to be checked on a time basis, while Caterpillar is still analyzing this problem to determine the expected life of the Driver Module on the choke air intake actuator. Since this failure had not happened before in the Caterpillar people's experience, they did not have any data on life expectancy of the Driver Module.

The Magic of Cross Functional Work

In early 2005, employees at Innovene in Alvin were facing a dilemma with repetitive pump overloads in Stratton Ridge. This problem was causing higher rates of equipment downtime, increased maintenance activities, and increased operational workload. These problems were making it difficult to keep the plant running at its maximum levels and highest reliability. The pumps were destroying themselves, and they would frequently need to be overhauled and rebuilt at a cost of approximately $35,000.00 per occurrence.

At a Manufacturing Game workshop, an Action Team was formed consisting of Oscar Nichols, James Witte, Mark Glasper, Clinton Douglas and Ricky Bond. After playing “The Game”, they were determined to squash the bugs causing the problems with the pump overloads. More specifically, the SG 5501 pump, a brine makeup pump that lifts brine from the ponds and transfers it to the brine de-gassing/0_2 removal section. In order to uphold the availability and reliability responsibilities to their customers and to the Olefins units, they needed to have sufficient brine to inject into the caverns to displace the product/olefins feedstock. The pumps, being a critical piece of equipment, were vital to the turnaround process that was about to begin. They knew that it was important that the pumps operate with no interruptions throughout the turnaround in order to continue to supply the customer while their production unit was down.

The TMG workshop provided the opportunity to step back and reflect on what was working, and what was not working, much like the 5-week reflections while playing "The Game." They realized that all functions were guilty of blaming each other for problems, and they were able to see how they were all responsible to some degree. Working as a cross-functional group, the Action Team was able to see a more complete picture of the situation than any one function could. The TMG workshop gave them the little spark that made the difference between talking about it and doing something about it.

What did they do? They improved seal flush operation by changing the process of starting pumps in order to

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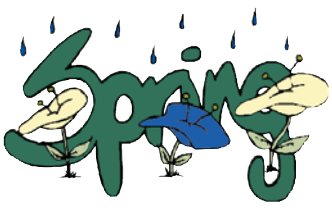
Persistence
is what makes the impossible possible, the possible likely, and the likely definite.

—Robert Half, personnel executive



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prevent damage to the pump on start up. They also decided to put level indicators in the sump to alert the operator of low suction levels, and finally, they changed the procedure to keep one pump running continuously in order to keep the discharge header pressured up. They decided that the cost of using a little electricity to run one pump continuously was a small price to pay to save pump overhauls and threat to unit operations. They were also able to increase operator patrol and observations and changed the start up procedure to pinch off discharge to reduce amp overload.

Although the root cause has still not been determined, the benefits of these changes are promising. The team is still hunting down the last bugs and believes that the bugs can run, but they can't hide. In the meantime, they are enjoying the benefits of smoother operations and fewer failures.