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Focus on Critical Assets Pays Off

Program avoids costly downtime and enhances planned shutdowns

By Joel Holmes, Monsanto

SINCE AN asset optimization program was initiated more than two years ago at the Monsanto herbicides plant in Muscatine, Iowa, it's prevented several potentially expensive process interruptions, saving the company tens of thousands of dollars.

For example, a pre-warn alarm of travel deviation in a distillate-receiver-level control valve led to discovery of leaking packing that was easily replaced without incident. Had this problem with a "Type A" or most critical control valve escalated without our knowledge, it could have caused an unplanned process shutdown costing as much as $100,000 per hour.

The pre-warn status alert was issued by our asset management software, which was acquired in 2005 for the Glyphosate Technicals (GT) Unit. The software was configured to issue an alert when output of a control valve and actual valve position (AVP) values differed by more than 5% for just five seconds, which we consider a sign of impending trouble requiring maintenance attention. In this case, electrical and instrumentation (E/I) technicians removed the valve assembly at the next scheduled production shutdown, replaced the packing, reinstalled the assembly and calibrated the valve. In addition, we performed diagnostic scans and tests to create a benchmark signature for archiving in an instrumentation database for future comparison.

FOSTERING PREDICTIVE MAINTENANCE

The asset management application makes predictive maintenance possible by providing access to a multitude of diagnostic data generated by smart field devices in our plant in addition to supplying alerts that enable us to avoid unwanted process interruptions that might lead to potentially extended downtime. The diagnostics indicate a device's operating condition as well as various performance characteristics, including control valve travel deviation, which helped us avoid a reactive maintenance scenario with the distillate-receiver-level control valve.

By tapping into device diagnostic information, we can predict with reasonable accuracy how long an instrument or valve will continue to satisfactorily perform before repairs or replacement is necessary. In some cases, we must take immediate action. However, often we can plan the job for the next scheduled maintenance shutdown — enabling us to ensure all necessary repair parts are staged (kitted) and technicians are equipped with the right tools and knowledge to safely, efficiently and correctly make the repair.

Of course, all equipment and instrumentation degrade with age; in a plant with myriad input/output (I/O) points,

it's impossible to respond to every performance issue. We approach that challenge in two ways. One is through asset prioritization based on criticality assessments to identify measurement devices and control valves that are essential in providing maximum production availability. The other method is by filtering device status alerts, so we can perform further analysis on conditions with potential to negatively impact production.

By prioritizing all our facility's assets we've been able to achieve a high level of process reliability. But first we needed to determine which components would cause all or part of a process to shut down if they were to become compromised or fail. By identifying critically important devices and valves we now know just where to focus our predictive maintenance (PdM) efforts. Those components deemed less critical receive lower priority preventive maintenance (PM) or are allowed to run to failure, if this won't result in harm to other equipment, unsafe conditions or compliance issues.

Asset prioritization enables us to focus our attention on Type A critical devices, especially when they trigger an alert. Just as a football team must protect its star quarterback to keep him in the game, we must provide special protection for our key assets to keep them productive and prevent costly process downtime.

With hundreds or thousands of devices in a unit continually reporting on their own health via numerous diagnostic status conditions, process operators can be overwhelmed by warnings and alarms. Which ones are most important and need to be investigated? In plants without a method of prioritizing this information, maintenance personnel are called upon to make a lot of fruitless trips to the field. We try to avoid wasting valuable technician time by filtering the status alerts to identify those coming from the most critical devices, leaving less significant issues to be investigated on a lower priority by our maintenance technicians.

We previously used an alert messenger application with Emerson's AMS Suite: Intelligent Device Manager predictive maintenance software for that purpose. But we are now examining use of AMS Alert Track Snap-On customizable software that filters status alerts and routes predefined critical items directly to a customizable list of recipients such as maintenance planners and schedulers. This tool efficiently removes the task of electrical personnel examining the list of numerous alerts and notifies appropriate decision makers immediately via e-mail and mobile devices.

GETTING STARTED

The GT Unit acquired its AMS Device Manager application from another Monsanto facility. One of the initial challenges was getting the E/I technicians to buy into the new system. I, too, was skeptical at first and had to prove to myself that the AMS Device Manager application could save money and maintenance time by preventing unexpected downtime.

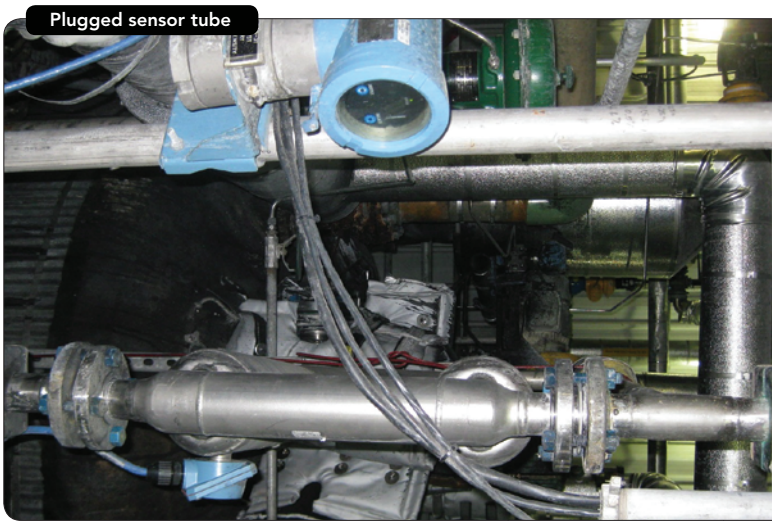

Figure 1. Software showed a flow meter problem that wasn't apparent otherwise and that could have led to costly downtime.

Many process engineers viewed it as another "toy" — until it revealed some critical control valve travel deviation issues and identified one severely bent valve stem. These are conditions that operators can't determine by simply looking at or listening to a control valve but that can lead to big trouble. That started to open some eyes.

Then, the alert monitor exposed a drive gain issue that indicated sensor tube pluggage on a Type A critical mass flow meter measuring catalyst slurry; at the time produc-

A RELIABILITY CULTURE TAKES SHAPE

The basis for Muscatine's reliability program is an asset prioritization (criticality assessment) process. We initiated it in 2006 to improve the accuracy of the SAP structure and determine the criticality of our process equipment. Accuracy improvement of the SAP structure enables better capture of failure data, detailed equipment costs and PM tracking so we can use Six Sigma tools to help identify improvement opportunities as well as measure the success of those improvements.

The criticality information allows Muscatine to align condition-based technologies (e.g., vibration, ultrasound, lubrication, infrared, motor testing and asset diagnostics) to determine the health of the most critical equipment without impacting operations. These data enable early detection of equipment degradation so repairs can be planned, scheduled and executed before catastrophic failure.

The Muscatine Electrical Reliability Program involves not only the electrical reliability engineers and technicians but the entire Muscatine Manufacturing Group. Ultimately, this program is intended to drive a best-in-class reliability attitude among Operations, Maintenance and Reliability Group personnel to create a sustainable culture of reliability.

This program has been recognized by Monsanto corporate management in St. Louis.

tion personnel were unaware of any potential blockage issues or inaccurate measurements. If this problem were to have gone unrecognized, the potential financial impact on the process could amount to as much as $25,000 per hour.

By accessing the flow meter's diagnostics, we quickly recognized the problem, which was corrected by backflushing sensor tubes to clear partial blockage and bring all diagnostic indications back into normal range. The process engineers and production personnel became "believers" after this type of alert was repeated several times on various mass flow meters within the process.

SPREADING THE NEWS

To gain plant-wide support for the predictive maintenance technology, we needed to inform site supervision and management personnel about what was happening in our unit. So we began issuing single-sheet "GT Success Stories" describing how diagnostic alerts had prevented costly production impacts and shutdowns. The news soon began spreading to other areas of the plant.

As more successes followed, "reliability" became more of an expectation than an aspiration. It took on considerably greater importance when a dedicated Reliability Group was established for the entire site (see sidebar). At present, two technicians focus on using predictive technology to continue improving overall electrical reliability. For example, before a recent scheduled outage at the GT Unit for catalyst replacement, they conducted diagnostic scans on about 40 Type A critical control valves to proactively determine which should be serviced. This marked the first time 100% of the unit's Type A critical control valves were evaluated prior to an outage. It caught some previously unrecognized deficiencies, resulting in work order entries to replace seats, rings, packing and even digital control valve positioners to maintain those valves in top operating condition.

In the past we routinely pulled many valves for overhaul — often unnecessarily — based solely on their time in service. By completing preliminary scans and tests, reliability technicians determined which assets really needed maintenance and excluded ones that didn't, saving a substantial amount of time and money during the outage and ensuring the plant could be restarted without delay. With maintenance head count at a premium, it's crucial to allocate man-hours wisely to complete all the highest priority shutdown activities.

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We test, plan and schedule accordingly to avoid reactive situations where plant personnel must "drop everything to put out the fire." Every avoided reactive maintenance "fire" is a success to our organization.

EXPANDING THE PROGRAM

Plant management wants the site to strive to become a world-class maintenance facility; establishing a reliability program based on asset prioritization was a major step in that direction. The recently formed Reliability Group now works closely with the Production and Maintenance Departments toward common plant goals and key performance indicators.

We currently are deploying AMS Device Manager software across the entire site. Soon 70% of the plant, encompassing approximately 1,200 I/O points, will be covered online. In the process, we're replacing many older field devices assessed as being critical with smart instrumentation, giving our asset management system more points to monitor for potential equipment failures.

Our ultimate goal is to prevent any unexpected outages due to instrumentation and equipment failures by continually enhancing manufacturing reliability. To date AMS Device Manager alerts have prompted generation of more than 100 deficiency work orders annually. This doesn't take into account the numerous auto-generated PM route work orders that make use of AMS Suite applications.

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