CONTROL

Smarter instruments add up to better maintenance for Mitsubishi Chemicals

The plant continues to find new ways to save thousands of man-hours while paring unplanned downtime

By Paul Studebaker, editor in chief

EMERSON GLOBAL USERS EXCHANGE

Control system health management is a game best played all-in. Control loop problems do not just occur in the sensors or the transmitters or the connections to the host—it's best to take an approach that will help anticipate, identify and diagnose trouble wherever it might occur.

Mitsubishi Chemical's Kashima plant processes naphtha into ethylene, propylene, cracked oil and downstream products. The plant's innovative use of HART communications, Rosemount 3051 transmitters with internal diagnostics, and Emerson Process Management's AMS Suite asset management software led to its selection in 2009 as HART Plant of the Year. The plant continues to find new ways to save thousands of man-hours while paring unplanned downtime.

"Our most common maintenance issues are control valves and transmitters. Our sticky resin causes valves to stick and transmitter signals to become non-linear," said Atsushi Kondo, instrumentation and maintenance group, Mitsubishi Chemical, presenting the session "Mitsubishi Chemical Uses Diagnostics and Smart Maintenance to Reduce Costs and Improve Uptime" with Takayuki Aoyama, instrumentation and maintenance group manager, Mitsubishi Chemical and Bill Zhou, Asia Pacific product manager, Rosemount, at this week's Emerson Global Users Exchange 2015 in Denver.

When issues with valves or signals occurred, the plant used to call the maintenance engineers, who would then check the DCS, loop and devices; analyze the gathered information; then find and then fix the abnormal value or status. This procedure is labor-intensive and time-consuming, often resulting in a shutdown. Instead,

"AMS monitors all of the devices. By the time the maintenance engineers arrive, they already know all the information." Mitsubishi Chemicals' Atsushi Kondo on the company's extensive use of smart instrumentation to save money and reduce downtime.

AMS can perform the same preliminaries as the maintenance engineers, saving labor and reducing lost production.

"AMS monitors all of the devices," Kondo said. "By the time the maintenance engineers arrive, they already know all the information." He walked attendees through examples of three common plant issues and described how the company applied automation to overcome them.

Monitor Instrument Health

At the Kashima plant, if piping temperatures fall, the product solidifies and the plant stops running, so steam tracing is critical. "The alarm sounds, and an engineer responds quickly," said Kondo. Often falling temperatures aren't the problem. Instead, they're in the transmitter wiring, where dust, humidity or water cause shorts or corrode connections. "The key parameter is transmitter terminal voltage, which is normally linear over the range of 4-20 mA. Dirt or water cause it to become non-linear." The solution is to monitor and alarm based on the loop resistance, which shows changes before the problem is severe enough to cause a shutdown.

The same approach is used to detect buildup on level probes and inside vortex flowmeters. "Signal strength should be uniform over time," Kondo said. "If it drops too low, we notify maintenance." AMS performs these notifications automatically by displaying system health parameters and highlighting serious problems in red, cautions in yellow. Maintenance engineers can quickly and easily identify developing problems before they cause a malfunction.

Diagnose Valve Friction

Many of the plant's solenoid-activated on/off ball valves are "unusually large, and difficult to remove for maintenance," said Kondo. The valves are serviced during shutdowns every two years, but in the meantime, they might seize due to the sticky powder. "We wanted to monitor the valves and predict problems," Kondo said.

When valve friction increases, the valve stroke speed will drop off. Adding Fisher DVC smart positioners and monitoring them through the AMS allows maintenance engineers to see when actuation force is rising. Due to the high speed and force requirements, the valves are still actuated by solenoid—the positioner simply reports how the valve responds. "We can see when the valve starts sticking due to buildup of polymer powder, and plan a repair," Kondo said. The plant has moved from time-based and reactive to predictive and proactive valve maintenance.

Improve Maintenance Efficiency

To support AMS, the plant added a DeltaV OPC Data Server alongside the operator system. AMS can automatically generate a set of signals and analyze the response for loop and valve checks. "This reduces the time for loop checks from three days to 12 hours," said Zhou. Checking the valves used to require two technicians, one on the panel and one in the field. "Now, we send specific positions to the valves, the DVC measures the actual position and reports back. It does the comparisons and gives pass/no pass indication," Zhou added. "It used to take five days, now it takes four hours."

During scheduled shutdowns, the plant tests the emergency shutdown system (ESD). "This used to require several people manipulating signals, viewing in the control room, and checking valves," Zhou said. "Now they use an Excel program to generate a positioning script that sends setpoints and checks responses in the test sequence." What used to take 10 days now can be done in one day.

"In Japan, people are expensive," Zhou concluded. "AMS allows Mitsubishi Chemical to have fewer people in the field while running like they have more engineers in the field all the time."

Paul Studebaker is chief editor of Control. He earned a master's degree in metallurgical engineering and gathered 12 years experience in manufacturing before becoming an award-winning writer and editor for publications including Control and Plant Services.