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PLANT OF THE YEAR 2009

MITSUBISHI CHEMICAL

Mitsubishi Chemical Corporation, Kashima, Japan
Plant of the Year 2009 Award Winner

Mitsubishi Chemical connects HART technology to the control room, saves up to $30,000 daily

PROJECT OBJECTIVES

- Detect abnormal situations in the process and protect field devices from malfunctions to improve plant availability.
- Reduce maintenance costs through the use of advanced diagnostics.

SOLUTION

- Applied HART Communication to more than 800 field devices to bring real-time visibility to continuous process variables and increase peak production performance.
- Replaced handheld devices with 800 direct HART communication connections to the control-room for real-time data access and proactive response.

RESULTS

- Increased peak production to a level of savings estimated at US $20,000 per day.
- Detected the onset of plugged impulse lines in a naphtha flow application to prevent a five-day, $3-million shutdown.
- Isolated an inefficient compressor pump problem early and perform necessary repairs before it caused damage to the rotor and possibly a plant shutdown.
- Reduced instrumentation maintenance costs 10 percent through advanced diagnostics at the pressure transmitter, accessed from the control room.

The Mitsubishi Chemical plant in Kashima, Japan, employed HART Communication technology to access real-time process variables, reduce maintenance costs 10% and averted issues to prevent a US $3 million shutdown.

Mitsubishi Chemical Corporation has improved its ability to diagnose abnormal process conditions and track equipment health 24 hours a day, thanks to an innovative instrumentation team at the company's 380,000 ton-a-year ethylene plant in Kashima, Japan.

"Our goal is to detect abnormal situations in the process and protect field devices from malfunctions," says Takayuki Aoyama, team leader of the instrumentation group, at Mitsubishi Chemical's 380,000 ton-a-year ethylene plant in Kashima. He notes HART communication's ability to collect online data from field devices without disturbing 4-20mA analog signal between them and the distributed control system (DCS).

That connection is critical to the plant's success, he says, because "diagnostic parameters that help detect signs of an abnormal situation or degrading performance are difficult to obtain with simple handheld devices," which require "a time-consuming, manual, step-by-step approach."

Instead, HART protocol-compliant devices are visible directly from the DCS and asset management applications in the control room, and require no manual intervention.

"HART technology made it possible to access these data without manual operation," Aoyama says. "This made it much easier for us to gather data and opened up many possibilities for us to detect abnormal situations from field devices." He cites valves, pressure transmitters, and analyzers as high-maintenance devices, while looking forward to additional work with the process intelligence of HART communication with vortex flowmeters, Coriolis flowmeters, and valve positioners.

"We estimate that cost savings is more than 10% due to utilizing HART features in the devices," adds Aoyama.

So far, the Mitsubishi plant has connected approximately 800 HART technology-enabled devices to the control room directly. (Ten of these are connected via multiplexer.) The control room features one vendor's distributed control system (DCS) and integrated asset management system; and a second vendor's asset management system, which is connected via multiplexer.

Because the HART Communication Protocol is ubiquitous -- all vendors in the control room as well as the field conform to it -- Mitsubishi was able to rapidly gain remote access to instrumentation. Differential pressure transmitter data in particular played a key role in the benefits achieved.

Advanced HART diagnostics from the pressure transmitter allowed Aoyama's team to quickly detect the onset of a plugged impulse line in a naphtha flow application as well as a plugged manifold during start-up. It also allowed the team to measure flow-loop variability, which helped identify an area of unstable flow due to inadequate pipe length. Furthermore, HART technology reduced the time and effort of root-cause analysis and a more rapid discovery of the problem.

After installing a conditioning orifice plate, flow signal stability was verified. This in turn provided an accurate measurement for improved plant availability and greater throughput.

Additionally, the use of advanced HART diagnostics from the pressure transmitter allowed the team to detect an inefficient compressor pump. The process data provided through HART communication helped personnel isolate and perform repairs to the compressor, preventing damage to the rotor.

If not identified and repaired in a timely manner, this problem could have led to a plant shutdown.

While direct operational cost savings haven't been released, the cost of an unscheduled plant shutdown is estimated to cost US $600,000 in lost production per day, and minimum production restart time of 5 days. Hence, preventing a shutdown/startup cycle saves a minimum of US $3 million.

So far, at least two device failures have been detected that could have caused a plant shutdown.

In addition to downtime-inducing situations and simultaneously reducing maintenance costs 10 percent, HART technology has provided process benefits. These include improved peak production performance, which if maintained, saves an estimated operational savings of $20,000-$30,000 USD per day.

HART communication has become a standard communication protocol for the plant. Plans call for gradual upgrades to the plant's remaining 2,200 analog-only devices with HART technology. Additionally, the company is testing *Wireless*HART protocol-compliant devices from Emerson Process Management.