Online Monitoring Avoids Costly Shutdowns

Todd Reeves

Even when a redundant pumping system is in place, it can be advisable to monitor the condition of the operating units in critical applications where maintaining production depends on motor-pump reliability.

A case in point is a large manufacturer in northern Europe that supplies plastic resins as feedstock to companies manufacturing consumer and industrial products, ranging from auto dashboards to beverage bottles to packaging. This manufacturer of high density polyethylene and polypropylene employs more than 450 workers. To maintain its standing as a preferred supplier in the highly competitive European industrial environment, the company must be a dependable source of high quality polymers, so management takes extra precautions to avoid unexpected shutdowns.

In one production unit, for example, two 65-kW multistage motor-pumps operating in a critical application in a hazardous ATEX Zone 2 are continuously monitored remotely for signs of trouble, even though a third motor-pump train is right there as a backup.

If one motor-pump train breaks down, it can be replaced by the backup with minimum downtime. However, the switchover procedure is complicated and an interruption of the continuous process is always a possibility. In addition, the production line is left in a precarious situation until the failed machine can be repaired and returned as the backup unit. Failure of either of the two pumps remaining in operation would then shut down that process unit, resulting in a significant productivity loss.

Two groups of workers rely on the steady operation of these pumps, each with a different perspective. The operators need the system to continue producing without interruption. At the same time, mechanical maintenance personnel want the pumps to operate long term at high efficiency and without danger of failure and a need for emergency repairs. No one wants to experience an unexpected failure in this critical pumping system.

Every time a maintenance crew has to enter that area, the members must wear protective equipment that restricts their movements and makes every procedure more difficult to do and longer to complete. The unit must remain shut down until a motor-pump has been removed or repaired, costing thousands of dollars in lost production.

The possibility of losing tons of high-demand plastics feedstock every hour, along with the cost of cleaning out and restarting the entire process, posed just too great a risk for plant management. Officials at this plant began seeking a way to mitigate the risk of losing unrecoverable revenue as a result of nothing more than a bearing failure.

Vibration monitoring and analysis of the data are effective ways to track the health of a wide range of rotating machinery in order to extend equipment longevity, avoid unplanned shutdowns, and lower maintenance costs. The main source of such data has been – and still is – route-based collection by technicians in the field. However, this is time consuming and provides only a "snapshot" of the condition of the equipment at the time measurements were taken. To gather such data in a hazardous production area, the techs have to don protective gear.

Technology now permits remote access to field-based information about the health and wellbeing of a whole range of rotating equipment without sending workers into the field at all. With this technology, key pumping systems can be automatically monitored for changing vibration patterns and rising temperatures – sure signs of impending trouble. When combined with information from other sources, such as lubricant analysis and infrared imaging, a true picture emerges of the operating condition of monitored assets and their potential for failure.

If properly interpreted, these signals can pinpoint the location, nature, and even the severity of developing problems. Data from automated monitoring systems enable plant personnel to predict when such a machine will need main-

tenance in order to prevent damage *and* avert lost production.

The European plastics manufacturer is employing a recently introduced online machinery health transmitter to *continually* measure parameters and alarm levels in the key motor-pump machine trains described above, assess signs of trouble automatically, and warn plant personnel whenever the possibility of a failure exists. The automated diagnostics package gives results directly to process operators in time for them to make adjustments to the process, which sometimes can correct a problem like pump cavitation.

Being able to see the vibration readings at each measurement location simultaneously is very beneficial. High vibration due to a bearing problem can typically be isolated to a specific bearing location, while vibration due to cavitation can be detected at every pump measurement location.

The knowledge provided by this monitoring system allows operators to request assistance by maintenance personnel only if a problem arises. Those individuals are freed from routine data collection and analysis, giving them more time for troubleshooting and program improvement.

This system turned out to be the right solution to keep those critical motor-pumps running efficiently. Shortly after it was installed, the monitoring system detected a problem in one of the operating motor-pumps, prompting the staff vibration analyst to check the readings with his own analyzer. After taking four additional readings on the motor, two on the geared coupling and two on the pump, he was able to identify a deteriorating bearing that was causing the motor to operate at 15 percent below its rated efficiency level. Restoring the motor to good operating condition resulted in a greater than 600 percent increase in equipment efficiency.

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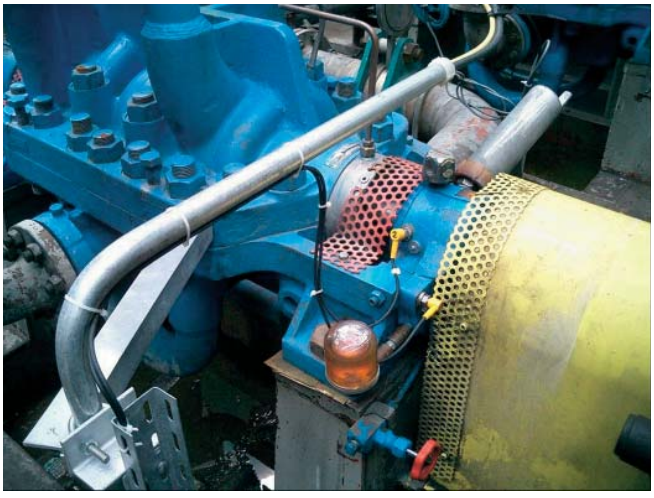

Sensors monitor changing vibration patterns and rising temperatures in critical pumping systems.

"I took vibration readings on the whole installation and then I took 8 system readings," the analyst said. "This confirmed the motor inboard bearing was generating high 'g' values, obviously higher than the outboard bearing on same motor. The presence of very dark grease was another sign of a failing element."

The motor-pump was taken out of service, removed from the site and sent to the shop while the backup was put on-line. Repair mechanics replaced the questionable bearing, and there was no loss of production and no emergency repair costs, both of which could have amounted to thousands of dollars.

The plant is now installing continuous machinery health transmitters on other critical machines in the plant and integrating them with the automated control system. Machinery health trends will now be recorded and tracked using the historian that is part of the advanced control system.

The very first online machinery health transmitter installed in this plant alerted the operations and maintenance departments to a potential problem that might have caused a major interruption in production along with expensive repair costs in a hazardous environment. As a result, the return on the investment in automated vibration monitoring was almost immediate.

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