Temposonics®

Magnetostrictive, Absolute, Non-contact
Linear-Position Sensors

MTS SENSORS

Dover Hydraulics Improves Steel Mill Operations with the use of Detached Electronics

Case Study

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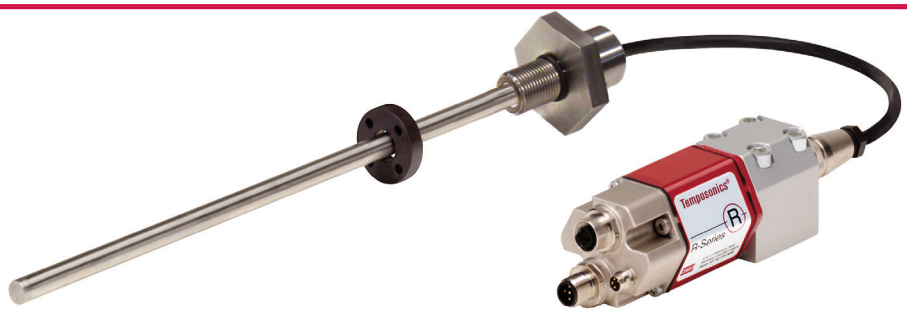

Model RD4 Detached Electronics position sensor

By Matt Hankinson, Ph.D, Technical Marketing Manager of MTS Sensors & J.C. Raies, Director of Sales & Marketing of Dover Hydraulics

SOLUTIONS FOR HIGH TEMPERATURE APPLICATIONS

Last year, J.C. Raies, (Director Sales & Marketing), with Dover Hydraulics, was visiting with a regular customer at large steel processing facility to help them identify ways to improve productivity. When he asked about the largest reasons for downtime, the customer illustrated his point by showing him a pile of several linear positioning sensors.

They were destroyed. While the sensor elements themselves were still intact and operational, the electronic heads used to interpret readings had been damaged by excessive heat. Used in continuous casting molds, extremely accurate linear positioning sensors are crucial to the day to day operations of the equipment.

Magnetostrictive linear positioning sensors have been used for decades in these applications to provide precise control of a mold. In high speed molds, a discrepancy of even a millimeter can quickly add up to tons of waste steel or, at worse, faulty products. To protect sensors from the elements, they are often embedded within the hydraulic cylinders used on the machine. The sensor head, however, has to reside outside of that enclosed environment.

"It is a problem that has plagued the industry for decades," Raies explained. "Steel mills, by nature, are among the most demanding environments in the industrial world."

The reason behind the catastrophic damage to the pile of sensors presented to Raies was clear to anyone who experienced firsthand the environments in which the sensors were used. Extreme heat and moisture, combined with continual vibration, electromagnetic interference and abrasive grit, will eventually ruin even the most durable equipment. With sensitive electronics, the problem is even more pronounced.

"This was not an easy problem to overcome," he said. "We tried multiple brands and designs. Each time, the result was the same – a pile of sensors destroyed by the everyday work conditions in these applications."

Just as the problem was evident, so was the eventual solution. There had to be a way to move the sensor further away from the actual machine. Unfortunately, here were issues with that approach as well. By "tethering" the electronics at a remote location, operators found that electrical interference amplified to an unacceptable degree.

Temposonics sensors work by inducing a sonic strain pulse in a specially designed magnetostrictive waveguide through the momentary interaction of two magnetic fields. One field comes from a movable permanent magnet which passes along the outside of the sensor tube; the other field comes from a current pulse or interrogation pulse applied along the waveguide. This interaction produces a strain pulse, which travels at sonic speed along the waveguide until the pulse is detected at the head of the sensor.

"Once we decided to move to a detached electronics model, we knew we were on the right track, but hadn't found a sensor that could overcome the electronic noise issues," Raies said. "That is when we approached a long time supplier of our own – MTS Sensors – and posed the problem to them."

In early 2012, MTS Sensors, the Sensor division of MTS Systems, introduced the RD4 Model Temposonics® magnetostrictive linear positioning sensors. Based on the R-Series Temposonics Sensor line, the RD4 incorporates a well shielded and reliable detached electronics setup.

In the Model RD4 Sensor, the sensing element is connected to the electronics via a cable and pipe. An RD4 interconnection cable exits the head of the sensor rod and connects to the electronics housing. Currently, the electronics housing, along with its mounting block, can be configured with either a side cable connection or a bottom cable connection. Side cable connections work with many different threaded rod styles, including M, T, C and D. This flexibility of design allows for easy sensor installation into standard threaded port opening on the top of the cylinder end cap. The bottom cable connection is for use with the pressure-fit rod style (S). Proper design and careful sensor installation is required to assure the correct fit and o-ring sealing., resulting in more resilient electronics that provide the benefits (i.e., precision and reliability) of traditional magnetostrictive systems with significantly lower risk of product damage.

“MTS Sensors explained that they could guarantee little to no interference in distances up to 39 inches,” Raies said. “Unfortunately, this wasn’t long enough to work with the installed equipment at our customer’s facility. Regardless, we decided to test it ourselves.”

These tests produced the results needed. While there was still minimal electronic noise, Dover was able to implement magnetostrictive sensors from MTS Sensor incorporating detached electronics as far as 6 feet away from the machine. This distance was more than enough to accommodate the equipment layout and provide the performance needed in these applications.

“Working with MTS, we were able to able find and implement a solution that will improve our customer’s productivity and significantly reduce downtime,” Raies explained. “We are currently exploring other applications and machines where the detached electronics model makes sense and provides value.”

ABOUT DOVER HYDRAULICS:

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ABOUT MTS SENSORS:

MTS Sensors, a division of MTS Systems Corp., is the global leader in the development and production of magnetostrictive linear-position and liquid-level sensors.

MTS Sensors Division is continually developing new ways to apply Temposonics® magnetostrictive sensing technology to solve critical applications in a variety of markets worldwide. With facilities in the U.S., Germany, Japan, and China, MTS Sensors Division is an ISO 9001 certified supplier committed to providing customers with innovative sensing products that deliver reliable position sensing solutions.

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