# Temposonics®

Magnetostrictive, Absolute, Non-contact
Linear-Position Sensors

MTS® SENSORS

## ThyssenKrupp Cuts Downtime and Improves Efficiency with MTS Sensors

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**Case Study**


**Model RP Profile-style position sensor**

**Model RH Rod-style position sensor**

*ThyssenKrupp cut downtime and improved the efficiency of their HGC equipment by using magnetostrictive linear sensors from MTS.*

**By Matt Hankinson, Ph.D, Technical Marketing Manager of MTS Sensors**

### THE LARGEST STEEL MILL FACILITY IN THE UNITED STATES

The ThyssenKrupp production facility in Calvert, Alabama doesn't resemble most manufacturing plants. The size of a small town, it boasts a production capacity of up to 5.3 metric tons of steel each year, including mild steels, high strength and advanced high strength steels, as well as high carbon and structural steels. Shipped products include miles of hot rolled bands and pickled coils, full finished cold rolled, galvanized, galvannealed, aluminized and galvalume products.

To meet customer demand, the equipment in the plant runs continuously, moving, shaping and cooling tons of metal every hour. It falls to a team of operators, and automation technicians like Rodney Willard, to ensure that each machine not only continues to operate, but that there is no deviation whatsoever. Banks of computers monitor every machine, alerting the team to deviations as small as a few microns.

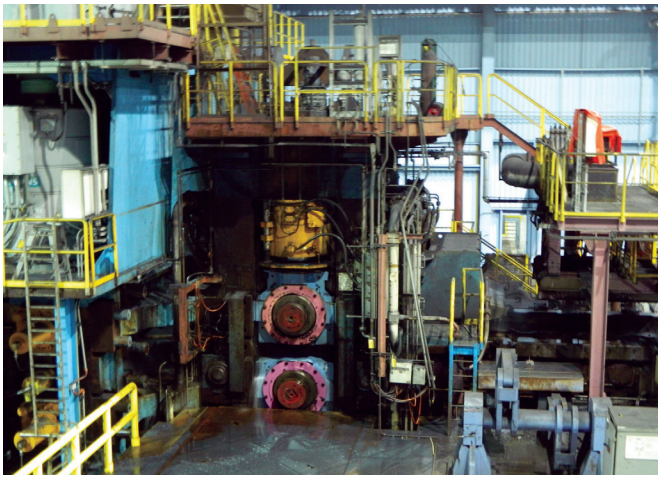
"Even a small discrepancy in the thickness of a slab on the line can quickly add up to thousands of pounds when you consider the speed at which our processing lines move," Willard explained. "Consistency and quality control are critical to ensuring that our customers get the exact product they are looking for in the most efficient method possible."

ThyssenKrupp utilizes advanced Hydraulic Gap Control (HGC) systems to keep steel traveling on the hot roll lines at the proper thickness. The key to these systems resides in four position indication sensors mounted on the sides of the HGC cylinders. The advanced sensors bolted onto the cylinders monitor any deviation, with resolution down to 1 micron, and communicate that data to the ThyssenKrupp control room. Any discrepancy will be immediately evident and allow workers to compensate in the most efficient method possible.

### EXPLORING NEW TECHNOLOGIES TO MEET THEIR NEEDS

The complete plant including electric and automation systems is supplied from the world leading company of rolling mills, SMS Siemag in Germany. The original supply was the proven advanced incremental linear encoders due to their precise measurement capabilities. The downside is these encoders are expensive and rely on delicate electronics to measure and communicate signals. They are susceptible to pressure and vibration and usually require maintenance and occasional replacements.

"These sensors operate in hostile environments where temperatures rarely drop and pressure, vibration and exposure to water are essentially constant," Willard said. "Maintaining and replacing failing linear encoders was one of our major sources of downtime on the hot roller



lines."In late 2010, Alec Glenn, the area manager of electrical maintenance for the hot strip mill, proposed switching to magnetostrictive sensors from MTS Sensors (Sensors Division of MTS Systems Corporation).ThyssenKrupp was already using MTS' R-Series linear position sensors on other equipment throughout the plant. Together with SMS Siemag support, the test project for the new position sensors was launched for a roughing mill stand.

As a test case, instead of replacing all of the encoder-style sensors, Glenn decided to only replace half of them. Since each stand utilized redundant sensors already, this meant he could evaluate both technologies side by side in real time to determine which technology best met the company's needs.

## TECHNOLOGY THAT WORKS

"Since we installed the MTS sensors in 2010, we haven't replaced any of them," Glenn explained. "In that same period, we have had numerous issues with the linear encoders and have had to replace five of them completely. The magnetostrictive sensors from MTS are just more robust and reliable. We will be switching all of the sensors on this equipment to the MTS R-Series."

Glenn also noted the precision and accuracy of the magnetostrictive sensor.

"One of our major concerns was if the MTS sensors could match the accuracy of the digital linear encoders," he said. "The difference between the two technologies was negligible after installation. The accuracy of the MTS R-Series exceeds our needs and, when combined with the improved reliability and lower price, makes them a much better fit for our operations."

R-Series sensors can report with a linearity as low as ± 20 microns with a fast update rate. They work with many different output protocols including SSI, DeviceNet, Profibus, DP, EtherCAT and EtherNet/IP. Recent advances in testing protocols have provided the data necessary to specify these sensors for even the most advanced and demanding rolling mill applications.

This was all information provided by MTS's study. In addition to better reliability and robustness in rougher environments, Willard noted ease of installation as another major advantage that they hadn't anticipated.

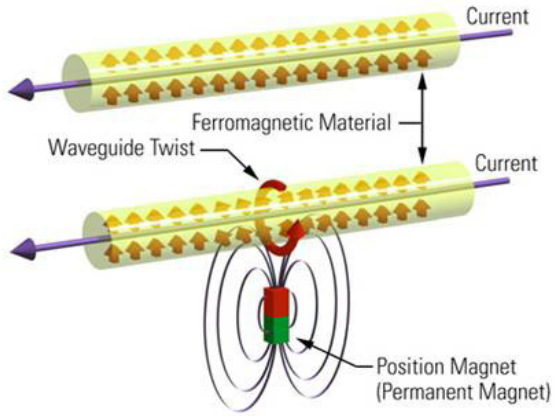
Additionally, the MTS R-Series sensors feature spare output channels not available on linear encoders. These channels provide additional redundancy and further reduce downtime associated with these applications.

"We have been very happy with the results since replacing linear encoders with the magnetostrictive sensors from MTS," Glenn said. "They have helped us improve our productivity and significantly reduce downtime and manpower associated with replacements and maintenance."

## HOW MAGNETOSTRICTION WORKS

Magnetostrictive-based sensors work by inducing a sonic strain pulse in a specially designed magnetostrictive waveguide by 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.

The magnet's position is determined with high precision by measuring the elapsed time between the application of the interrogation pulse and the arrival of the resulting strain pulse. Consequently, accurate non-contact position is achieved with absolutely no wear to the sensing components.




## 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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