

# LSV has Solved the Twist in the Tail



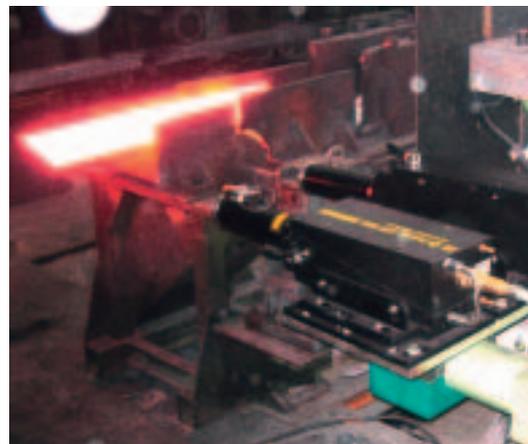
## Laser Surface Velocimeters (LSVs) Regulate Undesired Rotational Motion in Steel Rolling Mills

*Using two LSV Series 6000 Laser Surface Velocimeters to simultaneously measure the rotational and translational velocity of a rod at the exit of a planetary mill permits automatic control of rotational motion, thus minimizing (eliminating) tail swing exiting the mill.*

Boschgotthardshütte (BGH) produces specialty steels and alloys to meet the toughest demands. Effective process control is vital to efficient and profitable plant operation. At BGH's Edelstahl Freital facility, the existing control loop for the planetary mill introduced unwanted rotational motion into the end of the rod, causing the tail end to swing to the side upon exiting the mill. This created a significant problem when feeding the rod into the next process. Two Polytec LSV Series 6000 Laser Surface Velocimeters were selected to provide process feedback of the rod's true rotational and translational motion. Traditional tachometers on the drive rollers are prone to slippage and consequent inaccuracies. In Figure 1, the two water-cooled LSV-026 sensor heads are shown aligned to a moving hot steel rod.

Laser Surface Velocimeters (LSV) are non contact sensors that directly measure the velocity and length of a moving rod, tube/pipe, steel strip,

web or other moving material by detecting the Doppler frequency shift between two intersecting laser beams focused at the measurement surface. Polytec LSVs are mill-tough, high precision



**Figure 1: Two LSV-026 sensors heads simultaneously measure translational and rotational motion of the steel rod.**

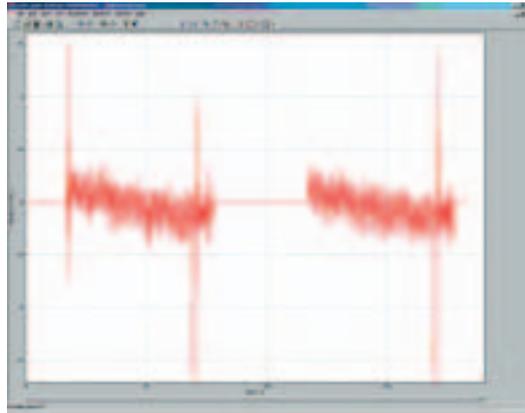
optical measurement systems with a proven history (record) of reliable service in continuous casters, rolling mills and other harsh industrial environments found in the process industries. The new LSV-6200 Velocimeter Controller uses a flexible interface concept that can easily integrate into existing process control systems for velocity control or cut-to-length applications (Figure 2).

In the outlet of the planetary mill, the rolled steel rods experience both a forward movement as well as a rotation, which causes undesirable effects in the next process. The second Laser Surface Velocimeter shown in Figure 1, measures the rotational velocity of the rod. This measurement is fed back into the drive system of the planetary mill to eliminate rotation of the rod before the next process.

The ability to regulate the process to zero rotational velocity is dependent on sensing both positive and negative velocities. The heterodyne detection technique used in the Polytec LSV is uniquely sensitive to the direction of motion. Heterodyne detection begins with a reference frequency shift between the two intersecting laser beams on a stationary part generating a zero velocity interference beat frequency of 40 MHz (the so-called carrier frequency). Now, motion in one direction increases the frequency to greater than 40 MHz, while motion in the opposite direction decreases the frequency to less than 40 MHz. This makes it possible for the LSV to recognize and directly output both the direction and magnitude of motion. With this information a control loop can be built to regulate the rotational motion to standstill ( $v = 0$ ).



**Figure 2: LSV-6200 Controllers for rotational and translational velocity in the switching cabinet**



**Figure 3: The measured rotational velocity during passage of two rods**

Other non-contact measurement methods sense the magnitude of the velocity or the speed of the surface but do not resolve the direction of the motion.

The closest LSV shown in Figure 1 is aligned to measure the translational velocity and, thus, the length of the steel rod. The length measurement is used to achieve precision cutoff control.

The PC LSV Monitor Software enables acquisition, trending and recording of all relevant data for process development, system setup and diagnosis. The saved data can then be recalled and displayed for basic analysis with the LSV Software or exported to third party software for more detailed analysis and evaluation (Figure 3).

After only a few hours of operation it was already apparent that the installed LSVs fulfilled all expectations. Pleased with the LSV success story, BGH has installed more LSV systems for cutoff control in their high-grade steel plant in Siegen.

#### **MORE INFO?**

For more information, please visit our LSV homepage [www.polytec.com/usa/lsv](http://www.polytec.com/usa/lsv)

#### **About the BGH Group**

The BGH Group includes plants in Freital, Siegen and Lungau. BGH Edelstahl Freital GmbH, with 650 employees the largest plant in the BGH Group, offers a complete selection of high-grade steel products, manufactured from unalloyed, light and high alloyed steel and special materials. These specialty alloys are used in many different products, such as cutlery, tools, implants or parts for machinery or vehicles.