Polytec

Non-contact measurement of strand length & speed

Continuous casting

Application note

Velocity and length measurements using laser surface velocimetry

Task

Optimize yield at the caster and rolling mills with tighter control of cut-length tolerance, accuracy and long term consistency.

Solution

LSV Laser Velocimeter's provide precise, reliable, non-contact measurement of strand length & speed, with little to no maintenance. The improved cut length accuracy and long term repeatability improves weight tolerances to the rolling mill, resulting in higher yield at the caster, as well as, the down-stream rolling process.

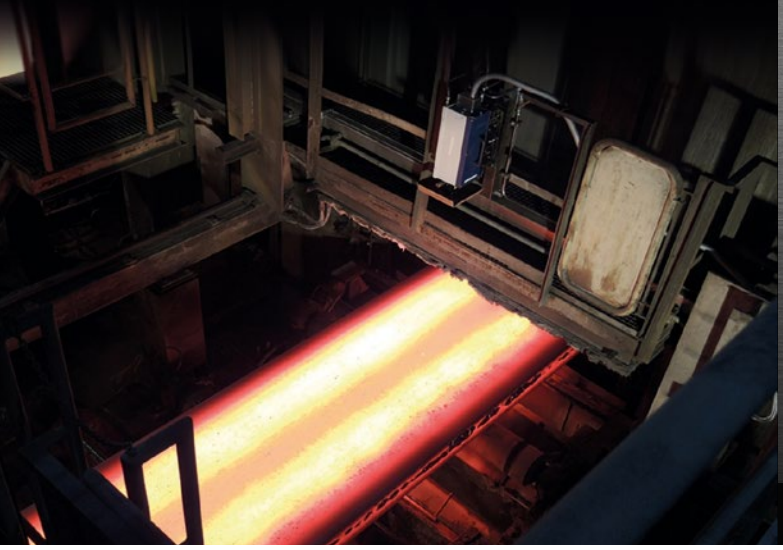
Background

Cut length control

The strand cut length at the caster is determined by the production requirements of the rolling mill. More precisely, the rolling mill specifies a weight or mass from the caster. Since the cross section of the strand is fixed at the mold, the only real time variable that can be controlled, in order to achieve the specified weight, is the cut length. The long term cut length repeatability and accuracy of slabs, billets, blooms and beam blanks is fundamental to optimizing yield at the caster. Hence the rolling mills and subsequent processes benefit from this process control, especially in mills producing finished products that are cut to length like plates, bars, pipes and others.

Quality control & safety

Cast speed and overall strand length serves as an important input for process and quality control. True cast speed can be integrated into the control loops as an additional parameter for enhancing mold level control, adjusting the cooling process and reducing the risk of break-outs, which lead to major downtimes and endanger operating personnel. Additionally, accurate speed & length measurements provide the ability to precisely locate and track changes in chemistry, ladle changes and other process events, enabling improved quality control.



Calculation:

- **Steel price:** 500 USD/ton
- **150 x 150 mm** billet
- **Billet:** 150 x 150 mm billet, 10 m length
- **Steel mill output:**
  500.000 billets / year (~900.000 t/year)
- **Assumption:** Potential length reduction per billet = 10mm (~1,8 kg steel)
- **Cost** of 1,8 kg steel = 500 USD / ton x 0,0018 t = ~ 1 USD
- **Savings:** at 500.000 billets / year = 500.000,- USD / year
  at 4-strand mill = USD 125.000 / strand annually

Return on Invest < 1 year

Current measurement techniques

The most common methods of measuring strand length are contact encoder wheels, which ride on the surface of the strand or a tachometer on a drive roll to measure shaft or motor speed. Both of these methods rely on contact with the strand in order to determine length and exhibit the typical challenges associated with contact measurement devices for achieving accurate length measurements. Encrustation of encoder wheels with dirt / scales and varying temperature causes the diameter and thus the circumference to change over time. In addition, slipping, skipping and mechanical issues also introduce unwanted errors in the length measurements. These issues are particularly problematic on a hot strand exiting a caster at temperatures in the range of 1000 °C to 1200 °C The result is unpredictable variability and drift in the length measurement, over time.

Furthermore, contact techniques require periodic process calibration and adjustments to correction factors to account for this unpredictable drift and errors. In practice, mill personnel invest significant time and money in mechanical maintenance of contact devices with typical costs approaching $50,000 per year.

The Polytec solution

The LSV Laser Velocimeter is uniquely designed to offer high precision, reliable, non-contact, length & speed measurements for continuous casting. Because it does not touch the surface or have any moving parts, it is not susceptible to the typical mechanical issues associated with contact devices, such as slippage, wear & tear or changing wheel diameter. Its mill duty construction, excellent repeatability and long term reliability make it an integral component for improving cut length tolerance, minimizing maintenance and increasing production efficiency. The result is reduced scrap and optimized yield at the caster, rolling mill and overall plant operations. A typical solution consists of a sensor head with 1500 mm stand-off distance, water-cooled housing, air wipe and various outputs, including a quadrature encoder output, for easy integration to existing control systems. The efficient water-cooled housing saves additional equipment. The rugged, mill duty construction, sophisticated optical configuration and advanced signal conditioning, offer unmatched reliability and performance, separating the LSV Laser Surface Velocimeter from other, so called, laser speed sensors.

Process: continuous casting
- Measurement of strand length & speed

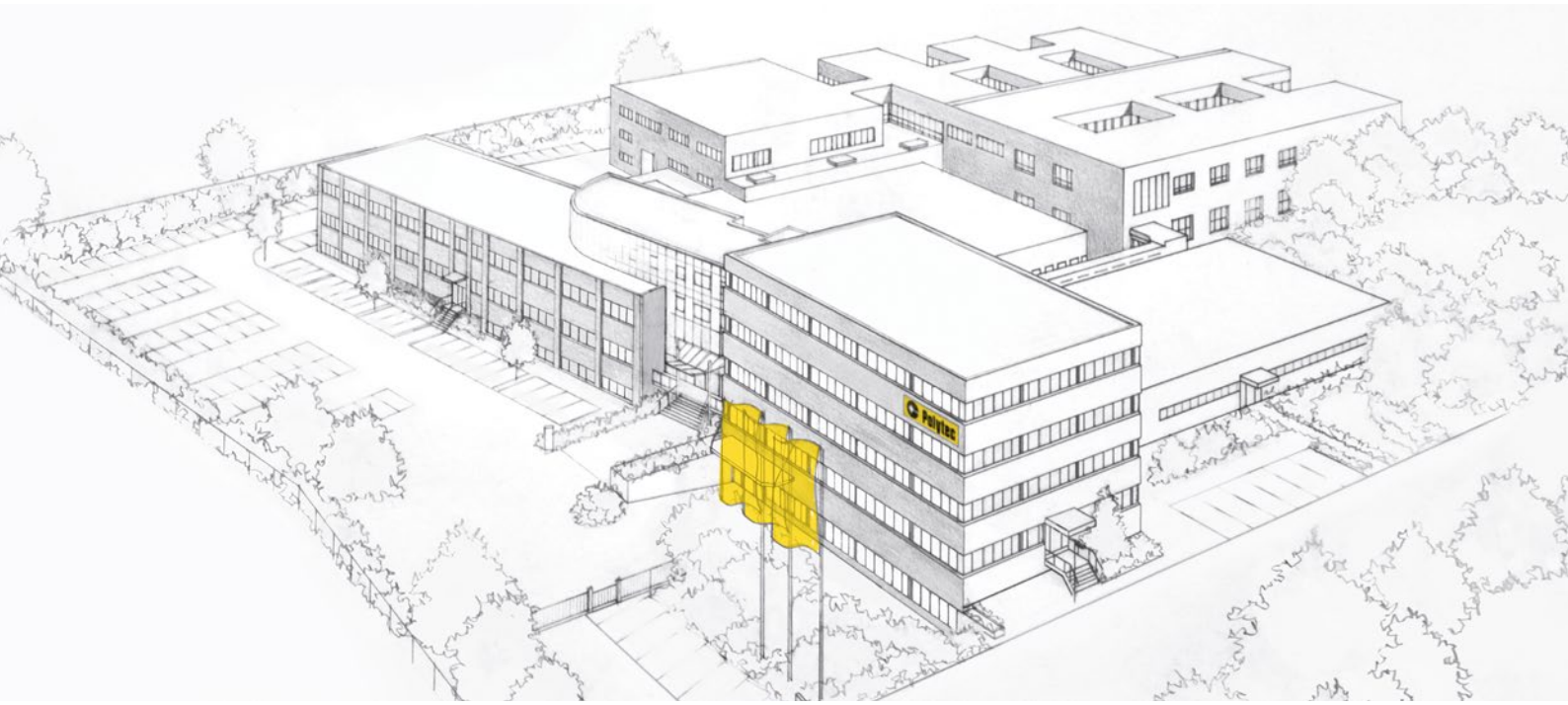
Problem: current measurement technique
- Contact wheel or tachometer on a drive roll
- Slippage, chatter, wear, insufficient accuracy

Solution: LSV Laser Velocity Sensor Systems
- Rugged, mill duty construction
- Advanced optical configuration
- Reliable performance
- Exceptional cooling performance of cooling housing

LSV-A-121 cooling housing
- Excellent cooling and sealing capabilities
- Field tested
- Long term operation without additional cooling equipment

Highlights: significant savings, increased yield
- Improve weight tolerance through better cut length accuracy and long-term repeatability
- Reduce scrap and optimize yield at the caster and rolling mills

For more information about Polytec Laser Surface Velocimeters please contact us or visit our web page **www.polytec.com/lsv**



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2019/03 - Technical specifications are subject to change without notice.