Steel Industry

The Worldwide Leader in Noncontact Temperature Measurement
Continuous Casters

Benefits: ■ Improved metallurgical properties ■ Increased productivity

At the continuous caster (illustration below), where molten steel begins its transformation into slabs, billets, or blooms, productivity problems can slow or shut down an entire plant.

Accurate real-time temperature monitoring coupled with the ability to adjust water nozzles and water flow rates allow for proper cooling, which helps maintain metallurgical properties. The results are better quality products, higher levels of productivity and longer equipment life.

The type and model of sensor is governed by the process and the sensor’s location. Infrared ratio thermometers, such as the Marathon FR fiber-optic sensors and Marathon MR integrated sensors, are the perfect choice for installation in harsh, dirty environments where the line of sight is obscured by dust, water spray, or steam. Use MP150 linescanners where edge-to-edge temperature profiles are needed to create a two-dimensional “thermal map” of the product.

Reheating Process

Benefits: ■ Reduced energy cost ■ Increased productivity

Reheating steel to a uniform temperature is critical so deformation does not occur. Uneven heating strains milling equipment and increases maintenance downtime.

Measuring the inside of a reheater with a series of temperature measurement devices (as shown in the Reheating Interior illustration) gives an operator the ability to check the reheater’s overall temperature and burner efficiency. The ability to correct the reheating process results in a more efficient use of fuel, which in turn produces a better quality product with less environmental waste.

Once the slab or billet exits the reheat furnace (Reheating Furnace illustration), Marathon infrared ratio thermometers or MP150 linescanners (for wide slabs) transmit temperature data immediately to an operator or controller allowing milling operations to be adjusted to their correct settings.

Raytek® noncontact infrared thermometers are designed for use in steel manufacturing processes where monitoring and controlling temperature is critical to productivity and product quality.

Temperature readings show whether processes are operating within their proper ranges, whether a reheater is too cold or too hot, whether a stand needs adjusting, or how much cooling should be applied. Each stage can be accurately monitored so the steel retains correct metallurgical properties as it travels through the milling process.

Every section of the steel manufacturing process can benefit from Raytek infrared thermometers. These benefits include:

■ Higher quality products
■ Increased productivity
■ Reduced energy costs
■ Enhanced worker safety
■ Reduced downtime
■ Easy data recording

Raytek infrared sensors take temperature measurement one step further. Simultaneous analog and digital output allows temperature data to be integrated into a closed loop control system and simultaneously output for remote temperature monitoring and analysis. Raytek sensors, with digital electronics and 2-way communications, can be configured remotely from the safety of the control room. The result: increased functionality and greater control.

A wide range of optics, including a remote-controlled, motorized variable focus, covers an enormous variety of applications. This is supported by integrated through-the-lens sighting, plus either laser or video sighting for correct target location.
Hot Rolling Mills

Benefits:  ■ Increased productivity  ■ Higher Quality  ■ Worker Safety  ■ Reduced Downtime

The diversity in the types of hot rolling mills and the number and types of stands in a process vary according to the type of product being manufactured (refer to the Hot Rolling Mill illustration above).

In all aspects of the steel manufacturing process, ongoing temperature measurements and stand adjustments ensure that quality and process line uptime is the norm and not the exception.

Scale Breaker
Marathon MR high performance ratio thermometers or a 1-micron MP150 linescanner (for wide slabs) placed before the scale breaker and before the roughing stands allows the operator to check that product temperatures are within rolling limits and to set the roughing mills accordingly.

Rolling Stands
Cooling continues as the steel makes its way to the rolling stands. If a process line stops for any length of time, the steel may cool more than usual before starting up again. Either way, the stands’ rolls must be set to compensate for the temperature change.

Rolls can be set manually by an operator, or Raytek infrared sensors mounted before each stand can automatically set the milling equipment. This makes sure the stands are configured properly for the steel’s temperature.

For controlled cooling areas, where steam and dust can block temperature readings, a Marathon MR ratio thermometer takes accurate measurements with up to 95% of the target obscured.

Down Coiler
At a hot rolling mill (similar to the illustration above) cooled steel is often rolled at the down coiler for transport to a cold mill or to another facility.

Accurate temperature measurements at the down coiler are needed to maintain proper cooling at the laminar-flow cooling section. Temperatures at this point are critical as incorrect cooling can change metallurgical properties, and the coil would have to be scraped.

Coil Box
Because the cooler steel at this point may be traveling 22 to 30 meters (75 to 100 feet) per second, a low-temperature infrared sensor with fast response time, such as the Marathon MM, is needed.

Another type of coiling is done at some mills where hot steel is coiled after the roughing stands for transport to another plant location. The hot rolls are then uncoiled and run through the finishing stands, cooled, then recoiled at the down coiler.

Cold Mills

Benefits:  ■ Increased productivity  ■ Higher Quality  ■ Reduced Downtime

Coiling is also often done at the end of the finishing stands after cooling, and the coiled steel is transported to cold mills in another area in the plant or shipped to other facilities.

Cold rolling makes a product thinner and smoother and is done while the steel is around 100°C (212°F).

Sensors mounted between each finishing stand allow the operator to detect temperature changes that require any adjustments.

Rod/Wire Mills

Benefits:  ■ Increased productivity  ■ Higher Quality  ■ Reduced Downtime

Other high-speed processes include rod and wire mills. In a typical rod or wire mill, billets are reheated and sent through a rolling mill to be reshaped as rods (refer to the Rod/Wire Mill illustration on the following page).

From here, the rods go through a series of intermediate stands that reduce the rods to different sizes. Finishing stands reduce and smooth the rods into a product that can be further processed into hundreds of different products.
Reheating a billet to a uniform temperature is critical to the entire process. Uneven heating strains milling equipment and increases maintenance downtime (see the Reheating section on page 2 for more information).

Knowing the temperature of the product at each stand allows the operator to adjust the rollers accordingly. When the product heads for the cooling area, cooling is rapid but carefully monitored to make sure the metallurgical properties are correct. If cooling is improperly controlled, the product would not meet specifications and could be downgraded or scrapped.

In some processes, the high speed and vibration of narrow rod or wire products make temperature measurement difficult. Marathon high-performance infrared ratio thermometers solve this problem. The target can drift in and out of the field-of-view or be partially obscured by dust, steam, and obstacles, and the Marathon sensor will still take accurate temperature measurements.

**Other Processes**

Raytek has temperature measurement solutions for every step in the steel making process, from coke ovens and blast furnaces to annealing mills and coating mills. Raytek also has temperature measurement solutions for forging mills and heat treating facilities.

Wherever temperature is a factor in production, from the raw material to the finished goods, Raytek is there to help answer your technical questions.

**Raytek Solutions For Steel Industries**

Marathon Series combines superior performance with state-of-the-art digital technology and is a family of unique infrared instruments designed for operating in harsh environments. These integrated units offer advanced electro-optics, smart digital electronics, and built-in user interface in a rugged, compact housing.

Included in the Series are the following:

- One and two color infrared thermometers
- Short wavelength/low temp thermometers
- Fiber-optic infrared thermometers
- ThermoJacket and accessories
- Field calibration and utilities software
- Configuration and monitoring software

**DataTemp® Multidrop Software**

Windows software for Marathon thermometers features trend plotting, data logging, sensor setup, process alarming and statistical process control.

**MP150 Linescanner**

This product offers a cost-effective way to measure edge-to-edge temperatures for control of product uniformity, providing data for a 90° field-of-view.

**DataTemp® DP Software**

Windows® software for the MP150 linescanner allows remote temperature monitoring, control and analysis. Thermal images can be viewed in real-time or saved and process irregularities corrected before they become problems.

---

Fluke Process Instruments

**Americas**

Santa Cruz, CA USA

Tel: +1 800 227 8074 (USA and Canada, only)

+1 831 458 3900

solutions@flukeprocessinstruments.com

**EMEA**

Berlin, Germany

Tel: +49 30 4 78 00 80

info@flukeprocessinstruments.de

**China**

Beijing, China

Tel: +86 10 6438 4691

info@flukeprocessinstruments.cn

**Japan**

Tokyo, Japan

Tel: +81 03 6714 3114

info@flukeprocessinstruments.jp

**Asia East and South**

India Tel: +91 22 2920 7691

Singapore Tel: +65 6799 5578

sales.asia@flukeprocessinstruments.com

**Worldwide Service**

Fluke Process Instruments offers services, including repair and calibration. For more information, contact your local office.

www.flukeprocessinstruments.com

© 2016 Fluke Process Instruments

Specifications subject to change without notice.

12/2016 3111680D