

Steel Hot Rolling Mill Application Overview

Temperature Control in the Hot Rolling Mill

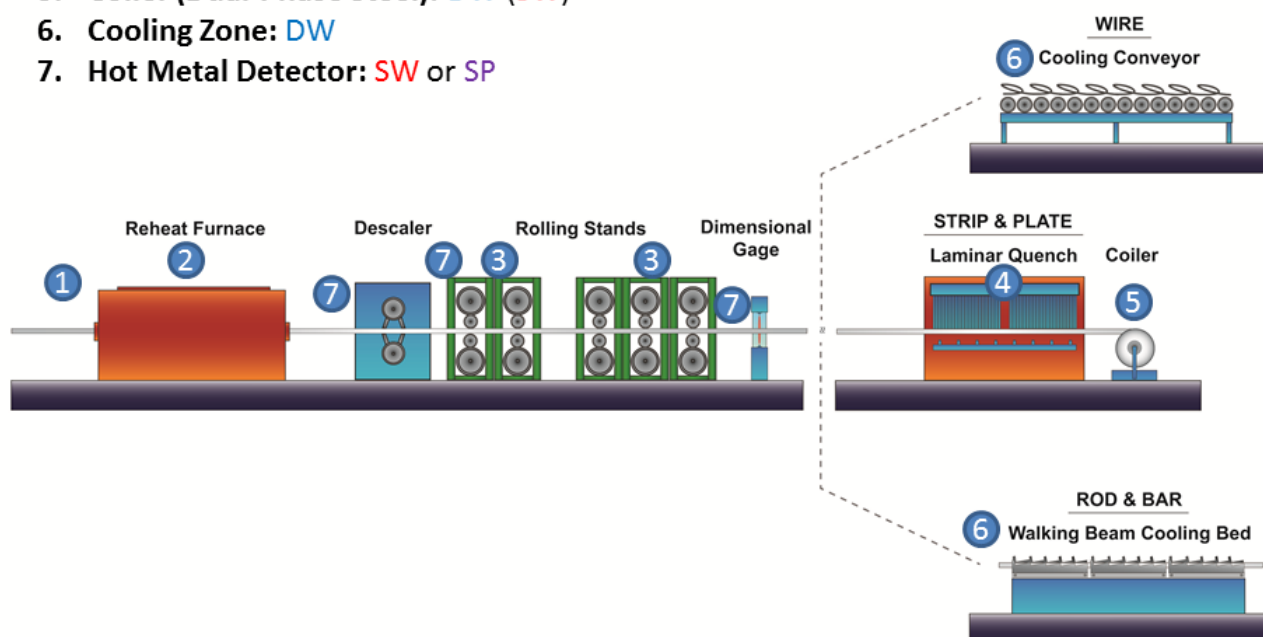
The Hot Rolling Mill is used to reheat shapes of steel to soften them enough so that they can be rolled thinner and longer through a series of rolling stands. The finished product can be either a strip, plate, rod, bar, wire, or shape (rails and H-beams). After the steel is formed to its desired shape, it is cooled so that the desired mechanical properties of the steel product are achieved.

Temperature control is critical throughout the Hot Rolling Mill to assure desired product properties, ensure quality product, improve line speed and process control. There are a number of interferences that can affect the pyrometer reading at every point along the hot rolling mill. These include water, steam, scale, misalignment, and emissivity variation. Wavelength selection is a critical choice in helping to minimize or eliminating the temperature errors due to these interferences.

Williamson Wavelength Technologies

With six unique Wavelength technologies, Williamson can make accurate and repeatable temperature measurements at every point along the hot rolling mill – compensating for common problems like 1) Water 2) Steam 3) Scale 4) Emissivity Variation and 5) Misalignment

1. Reheat Furnace – Entry: **SW**
2. Reheat Furnace – Heating and Soaking
Zones: **DW** or **SW**
3. Rolling Stands: **DW**
4. Laminar Quench: **SP**
5. Coiler (Dual-Phase Steel): **DW** (**SW**)
6. Cooling Zone: **DW**
7. Hot Metal Detector: **SW** or **SP**



Application Overview

The reheat furnace control system must adjust to the temperature, mass and distribution of the incoming steel. Over-heating the steel wastes energy, limits the rolling speed, and adversely affects the properties of the steel. Under-heating the steel also affects steel properties and risks damage to the rolls.

Williamson Wavelength Advantage

Long-Wavelength pyrometers are highly sensitive to misalignment, emissivity variation and scale. Short-Wavelength pyrometers are 4 times more accurate and offer temperature spans nearly as broad.

Pyrometer Benefits

- Conserve Energy
- Assure Desired Steel Properties
- Optimize Rolling Mill Speed

Wavelength Technology

- Short-Wavelength (SW) technology 4x less sensitive to misalignment, emissivity variation and scale.
- Williamson SW models offer broad temperature spans rivaling Long-Wavelength models.

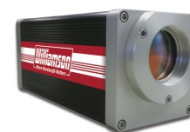
Suggested Models

Standard Configuration

- Pro SW-2A-32, 200-1000°F / 95-540°C

Alternative High Temp configuration

- Pro SW-22-37, 300°-2000°F / 150°-1100°C



Pro Series

Reheat Furnace – Heating and Soaking Zones



Application Overview

Computer models and atmosphere temperature values are not adequate for precise control of the reheat furnace. Without real-time feedback of the actual steel temperature, the accuracy and efficiency of the reheat furnace process is compromised. Challenging alloys such as high strength steels require tight temperature control to establish the desired properties. Traditional alloys tolerate a looser control of temperature, but benefit from energy savings and more consistent operating conditions.

Williamson Wavelength Advantage

Reheat furnaces are notorious for creating a challenging measurement condition for infrared pyrometers. With unique infrared technology and wavelength selection, Williamson offers the only pyrometers able to measure through combustion gasses and flames without interference.

Pyrometer Benefits

- Conserve Energy
- Improve Product Properties
- Improve Temperature Consistency and Uniformity
- Increase Rolling Speeds
- Reduce Wear and Tear on Rolling Equipment

Wavelength Technology

- Dual-Wavelength DW-08 technology views through CO gas and natural gas flames without interference in the soaking zone
- Short-Wavelength SW-16 technology views through coal and oil flames without interference



Suggested Models

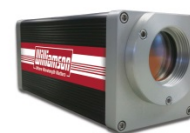
Coal and Oil Furnaces – Heating & Soaking Zones

- Pro SW-16-30, 700°-3200°F / 375°-1750°C

Natural Gas and CO Gas Furnaces – Soaking Zone Only

- Pro DW-08-50, 1300-2500°F / 700-1375°C

Install at the Heating Zone Exit and at the Soaking Zone Exit



Pro Series

Application Overview

Temperature readings at the rolling stands provide important feedback for the reheat furnace, and also maintain product quality. An accurate temperature reading is essential to optimally adjust line speed and assure desired steel properties. Temperature consistency between the top and bottom of the rolled steel also prevents derailment.

Williamson Wavelength Advantage

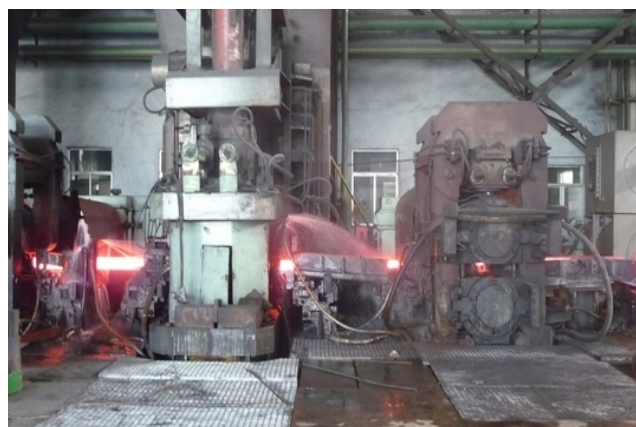
Water, steam, misalignment, emissivity variation and scale commonly interfere with pyrometer readings. Short wavelength and two-color pyrometers are unable to tolerate these common interference sources. Dual-wavelength pyrometers utilize unique narrowband wavelengths selected specifically to tolerate these common interferences.

Pyrometer Benefits

- Improve Product Properties
- Optimize Line Speeds
- Reduce Wear and Tear on Rolling Equipment

Wavelength Technology

- Dual-Wavelength (DW) technology automatically corrects for misalignment, emissivity variation and optical obstruction
- DW-08 wavelength set tolerates water and steam without interference
- DW technology is 20x less sensitive to scale compared with Two-Color technology.



Suggested Models

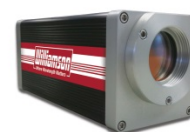
Traditional Configuration

- Pro DW-08-50, 1300-2500°F / 700-1375°C

Fiber-Optic Model for Underside Measurement

- Pro DWF-08-50, 1300-2500°F / 700°-1375°C

with ArmorGuard or Stainless Steel Braid protective Sheathing



Pro Series

Application Overview

The cooling rate through the laminar quench zone is a critical factor affecting the physical properties of the product, particularly for high tensile strength and dual phase steel alloys. Accurately monitoring the cooling rate assures the right crystal structure and hardness of the steel.

Williamson Wavelength Advantage

Heavy water flow and steam are common interferences at this location. Most Short-Wavelength models that are able to view through water and steam are not able to measure the low temperature range required for this application. Williamson offers a unique Specialty-Wavelength pyrometer that can view through water and steam without interference at a low temperature range.

Pyrometer Benefits

- Assure Desired Product Properties
- Reduce Energy Costs Due to Overcooling

Wavelength Technology

- Unique Specialty-Wavelength (SP) views clearly through 3 to 5mm of water and steam with little to no interference
- Tolerates modest emissivity variation with minimal error



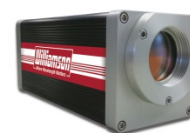
Suggested Models

Traditional Configuration

- Pro SP-WA-21, 700-2000°F / 375-1100°C

Fiber-Optic Model for Underside Measurement

- Pro SPF-WA-21, 800°-2000°F / 425°-1750°C



Pro Series

Application Overview

Steel temperature at the coiler has a significant impact on product properties. Coiler temperature is critical to confirm desired mechanical properties. By accurately monitoring temperature, you can also prevent over-cooling and conserve energy costs.

Williamson Wavelength Advantage

Emissivity variation, steam, water carry-over, dirty optics and misalignment prevent single-wavelength infrared pyrometers from providing an accurate reading, and Two-Color models do not measure the desired temperature span. Williamson Dual-Wavelength pyrometers resolve these important issues and provide a highly accurate measure of steel temperature.

Pyrometer Benefits

- Assure Desired Product Properties
- Conserve energy costs
- More efficient process

Wavelength Technology

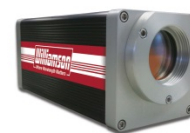
- Dual-Wavelength Technology automatically compensates for variable emissivity, optical obstruction and misalignment.
- The DW-24 model tolerates steam interference without error.



Suggested Models

Traditional Configuration

- The model DW-24-36 with the PCJ protective cooling jacket 600-1900°F / 315-1035°C



Pro Series

Application Overview

Dual-Phase Steel is cooled to an exceptionally low temperature (<400°F/200°C) in order to ensure the desired mechanical properties. The extra water spray needed to cool to such low temperatures typically produces steam at the coiler. Because of the broad range of measurement, it is not possible for one infrared pyrometer to produce a highly accurate measure of temperature at the coiler for both the standard steel mill products and also for the dual-phase products. As a result, a separate pyrometer is recommended to measure the low temperatures associated with the dual-phase product.

Williamson Wavelength Advantage

Short-wavelength pyrometers produce the most accurate temperature measurement for dual-phase steel at the low temperature values associated with the coiler. Williamson offers the only Short-Wavelength pyrometers able to tolerate steam without interference.

Pyrometer Benefits

- Assure Desired Product Properties
- Reduce Energy Costs
- More Efficient Process

Wavelength Technology

- Short-Wavelength (SW) technology for the most accurate temperature.
- SW-2A model tolerates heavy steam interference without error

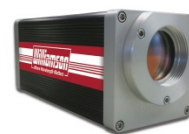


Suggested Models

Traditional Configuration

- Pro SW-2A-30, 150-800°F / 65-425°C

Views through heavy steam



Pro Series

Application Overview

Steel temperature at the cooling zone has a significant impact on product properties. The rate at which the steel is cooled and the final temperature at the exit of the cooling bed is critical to confirm desired mechanical properties. By accurately monitoring temperature, you can also prevent over-cooling and conserve energy costs.

Williamson Wavelength Advantage

Scale, emissivity variation, optical obstruction, misalignment, water and steam prevent single-wavelength infrared pyrometers from providing an accurate reading, and two-color models do not measure the desired temperature span. Williamson dual-wavelength pyrometers resolve these important issues and provide a highly accurate measure of steel temperature.

Pyrometer Benefits

- Assure Desired Product Properties
- Optimize Line Speed

Wavelength Technology

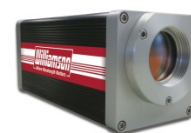
- Dual-Wavelength (DW) Technology automatically compensates for variable emissivity, optical obstruction and misalignment.
- The “24” wavelength set tolerates water spray and steam interference without error.



Suggested Models

Traditional Configuration

- The model DW-24-34 with the PCJ protective cooling 500-1700°F / 260-925°C



Pro Series

Application Overview

Infrared pyrometers are used as hot metal detectors to indicate the presence or absence of a leading or trailing edge of metal as it passes through the process. Hot metal detectors are often used to turn on/off quench or descaler systems.

Williamson Wavelength Advantage

Traditional hot metal detectors struggle with water and steam interference and are not appropriate for low-temperature or low-emissivity applications. Williamson offers three Hot Metal Detector configurations specifically designed to address these common application issues.

Pyrometer Benefits

- Reliable presence detection when water, steam, low-temperature metal or low-emissivity metal is an application issue.

Wavelength Technology

- SW-09 and SP-WA wavelengths view clearly through water.
- SW-16 and SW-22 view clearly through heavy steam.

Suggested Models

Steel Rolling Stands (water & steam)

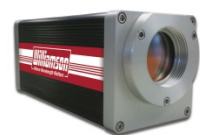
- Pro SW-09-50, 1000-2500°F / 540-1375°C

Steel Laminar Quench (water & steam)

- Pro SP-WA-21, 700-2000°F / 375-1100°C

Steel Coiler (low temperature & steam)

- Pro SW-22-37, 300-2000°F / 150-1100°C



Pro Series