Nordson
Measurement & Control

Industry: Metals

Application: MFAGC

Mass Flow for Automatic Gauge Control

Profile:

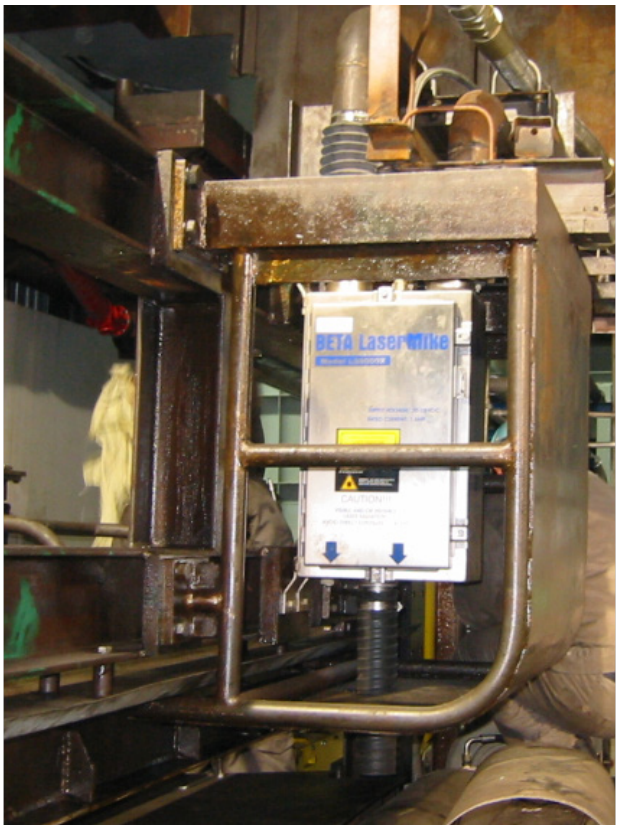
Cold rolling steel mill

Solution:

LaserSpeed® Pro 8500/9500

Results:

- Accurate measurements even during strip acceleration or deceleration
- Non-contact measurement eliminates measurement errors associated with contact measurement techniques
- Integrated system saves time and money previously spent on tweaking the mill control system to keep the product within specs



Using Mass Flow for Automatic Gauge Control to achieve better gauge control during the rolling process in Cold Rolling mills is intricate and can be tricky. This application note describes how you can complete this task with ease using the LaserSpeed Pro gauge.

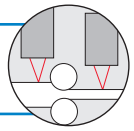
The Challenges:

Measuring Speed and Thickness

In Cold Rolling mills, manufacturers use Mass Flow for Automatic Gauge Control to achieve better gauge control during the rolling process, but this requires the speed and thickness of the strip to be measured at the entry and exit of each mill stand. The mass of the steel strip flowing into the rolling stand equals the mass of the strip exiting the stand.

The Solution:

LaserSpeed® Pro Gauge



For Mass Flow Automatic Gauge control, a LaserSpeed Pro gauge is used in conjunction with a thickness gauge to perform Mass Flow Automatic Gauge Control. The MFAGC is calculated by:

Mass Entry = Mass Exit

Mass = Thickness (T) x Width(W) x Density(D) x Length(L)

Length = Speed(S) x Time(T).

Width, Density, and Time are constant.

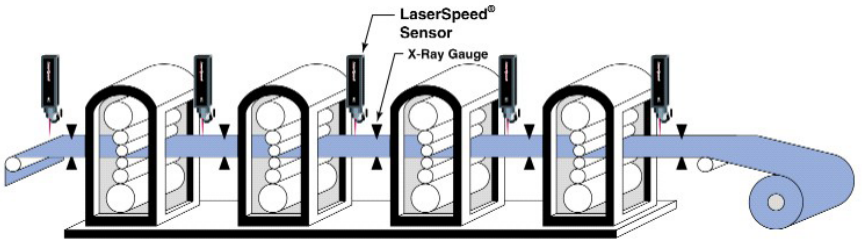
Therefore, substituting in the Mass formula;

$T_{Entry} \times S_{Entry} = T_{Exit} \times S_{Exit}$ **Or** $T_{Entry} \times (S_{Entry}/S_{Exit}) = T_{Exit}$

Graph 1

In summary, you can control the thickness out of a mill stand if you know the entry side thickness and speed and the exit speed.

LaserSpeed Pro can be used to greatly improve the gauge control of a rolling mill. Graph 1 shows the gauge of the strip at the entry of stand one and exit of each mill stand in a four-stand Tandem cold rolling mill without using the LaserSpeed Pro gauge to measure the speed. The speed reference is obtained from the drive rolls of the mill. Driven and non-driven rolls always have slippage between the strip and the roll. The strip always lags the driven roll and leads a non-driven roller due to slippage.



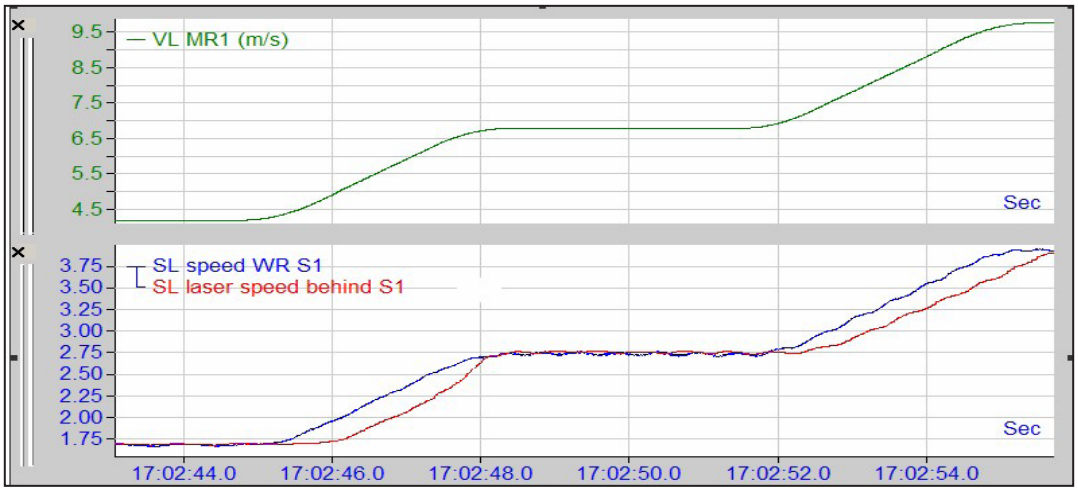
Graph 2 shows the same mill's performance when the manufacturer used the LaserSpeed Pro gauge to measure the speed of the Mass Flow control system. The LaserSpeed Pro gauge significantly improved gauge control as seen on following graph. In addition, more than 97% of the coil length is within gauge specification when using the LaserSpeed Pro gauge compared to only about 85 to 87% of the coil being within specification when LaserSpeed Pro is not used for MFAGC.

The LaserSpeed Pro gauge measures the speed of the strip directly, and the strip is not affected by slippage as opposed to using a driven roller that measures the speed of the roller. There is always slippage between the roller and the strip. The amount of slippage depends on many factors, such as pressure, amount of cooling solution, hardness of the steel, and the steel alloy.

Graph 3 shows the slippage between a driven roller and the strip in a cold rolling mill. The top graph shows the target speed for the control system. The bottom graph shows the speed measure by the driven roll (Blue line) matches the target speed of the control system but lags the actual strip speed by 150 milliseconds. The speed measured from the LaserSpeed Pro gauge (Red line) measures the true strip speed.

The biggest difference is seen during acceleration of the strip. Here, the driven roll speed leads the actual strip speed by 150 milliseconds. Whereas, the speed from the LaserSpeed Pro gauge follows the true strip speed exactly. This is why the LaserSpeed Pro gauge can significantly improve the performance of cold rolling mills.

Graph 2



Graph 3

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The Results:

The LaserSpeed Pro gauge delivers the following benefits:

- Accurate measurements even during strip acceleration or deceleration
- Non-contact measurement eliminates measurement errors associated with contact measurement techniques
- Integrated system saves time and money previously spent on tweaking the mill control system to keep the product within specs

The LaserSpeed Pro non-contact gauge is the most accurate, reliable, and cost-effective solution for measuring product speed and ensuring product quality.

For questions or support go to: https://ndc.custhelp.com/

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