Precision flatness control for SIROLL \textsuperscript{CIS} CM

Highly improved flatness in cold rolling

Metals Technologies
Learning means constantly getting better

The challenge:
In cold rolling, the first contact between material and machine determines the quality of the end product. If the roll gap profile has not been adapted exactly to the strip profile, a nonuniform pressure distribution across the strip width will be the result. This nonuniform pressure distribution leads to differences in elongation across the strip width, which we call flatness errors.

High strip tension during the rolling process may cover up this problem – at least until the strip is finished. That’s when flatness deviations become visible as wavy edges, wavy center, quarter buckles and camber. Flatness errors can also cause other problems like lateral shift of the strip, pinching, and strip breaks. These problems reduce strip speed and productivity – which ultimately impact your bottom line.

Our solution: Everything under neural network control
Our flatness control ensures the best possible roll gap at all times based on reliable measurement of the tension distribution in the strip. Using the actual flatness deviation and the effectiveness of the actuators, an intelligent algorithm generates commands for tilting, bending, roll shifting, cooling, and controlling all other functions of the rolling mill’s actuators. Precise knowledge of actuator effectiveness is essential for precise flatness control, and bending models or offline FEM calculations are insufficient for processes with the most demanding requirements. To achieve maximum knowledge of actuator effectiveness, Siemens has developed a neural network which adapts the effectiveness continuously during the entire rolling process. To achieve the best dynamic behavior, the control system monitors actuator priority as well as actuator speeds, resulting in a high-precision control system.
Quality data analysis makes quality visible
All data related to flatness are continuously recorded for analysis and displayed with a powerful quality data analyzer.

Perfect fit in any plant
Our flatness control solution is available on two hardware platforms:
- Integrated in the SIROLL® CIS automation and HMI system for new installations or large-scale revamps
- As a PC-based stand-alone solution with maximum flexibility and an integrated HMI system, to be installed in existing mills for use with any automation system

Both systems can easily be adapted to existing mill environments.

The perfect combination with SIROLL® CIS flatness measurement devices
We’ve developed SIROLL® CIS SIFLAT for greater precision and productivity in flatness control. This contactless system is based on the principle of periodically exciting the strip and measuring the excitation amplitudes across the strip width. In practice, this means:
- High resolution of measurement
- Independence from strip speed
- No special coating or surface treatment is necessary
- Maintenance can be carried out by customer’s maintenance staff
- No spare device is necessary

Siemens VAI shapemeters complete the range of applications for measurement. They include:
- Planicim® Flatness Roll – featuring modular design, continuously closed sleeve for good protection and highly sensitive measurement accuracy
- Air bearing shapemeter

Any existing suitable measurement device can be used as well.

Optimal display of measured values on high-resolution monitors. The operator has all relevant flatness control data for operation, calibration, and maintenance at hand and can take action via buttons, mouse, joystick, or touch screen.
A promising approach to better quality
We’ve designed our approach to flatness control with your needs in mind. Using our sophisticated, state-of-the-art automation technology, your rolling mill will soon be producing higher-quality, more marketable end products – for today’s demands and those of the future.

Our flatness control offers a number of technically superior features, including:

- Full integration of any existing measurement equipment, thereby safeguarding your previous investments
- A single control concept for all actuators
- Self-learning of mechanical actuator positioning effectiveness for optimum self-correction, thereby eliminating the need for manual reoptimization
- Operators can freely design, select, scale, and repeat setpoint curves, or take over the data from the process control
- Quality data analysis with comprehensive and configurable 3D displays of flatness distribution, cooling distribution, actuator positioning, and other strip and rolling data
- Improved identification of the causes of defects by providing on-demand display of information covering the previous 30 process seconds

Our experienced engineers also support you in commissioning to help you achieve the best possible configuration for flatness control.

Reference systems worldwide
Over 100 customers around the world already use our control system in their day-to-day operations. Whether used for steel, aluminum or nonferrous metal, our technology improves quality and increases productivity. And because it is openly designed to accommodate future developments, our technology is just as successful in retrofits of existing plants as it is in installations for new plants.

For steel and nonferrous metals, our flatness control system has proven a successful solution at:

- Tandem cold mills
- Reversing cold mills
- Skin pass mills
- Processing lines (in-line stands)
- Tension levelers
Good reasons for the precision flatness control

- **Fully integratable**
  Our flatness control can be fully integrated in any existing cold rolling mill.

- **Easily expandable**
  A wide range of options for flatness measuring devices is available.

- **Complete coverage**
  Siemens as full-line supplier offers a comprehensive solutions for measurement and control.

- **Uniformly controllable**
  A holistic control concept for all actuators guarantees maximum adaptivity.

- **High flexibility**
  Neural networks determine the actuator efficiencies and thus ensure a highly flexible operation.
For further information, please contact:

Siemens AG
Industry Sector
Industry Solutions
Metals Technologies
Schuhstr. 60
91052 Erlangen, Germany
E-mail: flatness.metals@siemens.com

Headquarters:
Siemens VAI
Metals Technologies GmbH & Co
P.O. Box 4, Turmstr. 44
A 4031 Linz, Austria
E-mail: contact.metals@siemens.com

The information provided in this brochure contains merely general descriptions or characteristics of performance which in actual case of use do not always apply as described or which may change as a result of further development of the products. An obligation to provide the respective characteristics shall only exist if expressly agreed in the terms of contract.