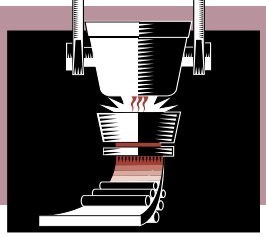
Technology Success Story

STEEL



Microstructure Engineering in Hot Strip Mills

Benefits

- Yields a more refined product, thus improving industrial competitiveness
- Decreases product variability
- Enhances off-line experimentation capability
- Optimizes hot rolling operations, particularly cooling and coiling
- Accurately predicts the thermal evolution, deformation behavior, roll forces, and resulting micro-structure of hot rolled steel to determine its mechanical properties

"We feel the Hot Strip Mill Model technology has world class potential."

—- Richard Shulkosky, Vice President, INTEG Process Group, Inc.

Properties of Hot Rolled Steel Can Now Be More Accurately Predicted and Controlled

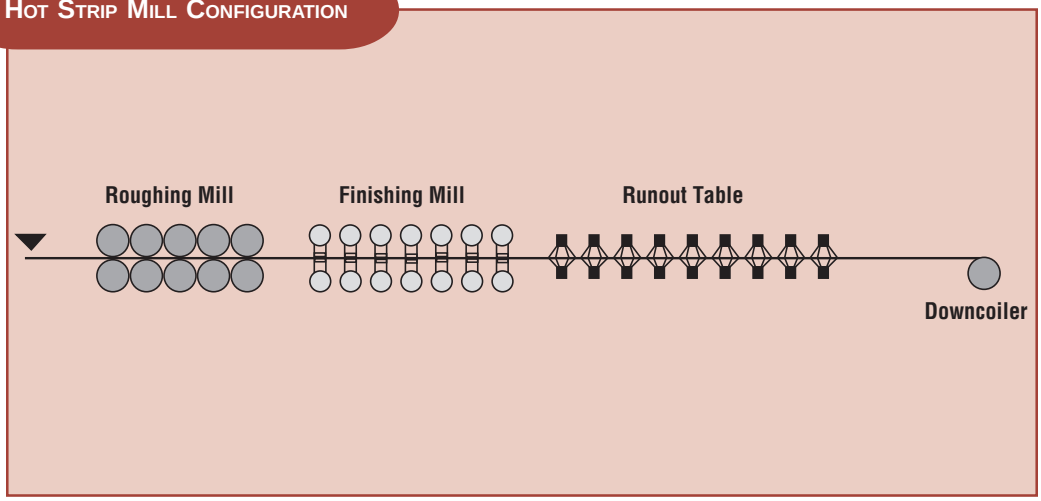
Hot strip mills play a key role in the finishing of continuous cast steel. Slabs from the continuous caster are reheated and sent to a series of rolls that converts them into hot-rolled sheets and coils. Hot-strip mills compress the slabs between horizontal rolls with a progressively smaller space between them, while vertical rolls regulate the slab's width. Coils processed by a hot strip mill are typically about a quarter-inch thick and a quarter-mile long. After cooling, hot rolled coils and sheets may undergo additional forming and finishing operations within the steel mill (e.g., cold rolling, pickling, heat treating), or may be sold as is.

Hot rolling is one of the most complicated process in the making and finishing of steel. Hot strip mills must:

- compress a wide range of slab thicknesses (anywhere from two to ten inches),
- process numerous grades of steel,
- simultaneously govern both width and thickness, and
- continuously operate for extended periods of time.

The ability to rapidly and reliably correlate the properties of hot rolled product to the operating parameters of hot strip mills would greatly benefit the steel industry, increasing both the efficiency and productivity of hot rolling operations.

Hot Strip Mill Configuration



The Hot Strip Mill Model (HSMM) is a predictive tool that quanitatively links the properties of hot rolled product to the operating parameters of a conventional hot strip mill. The simulation model is complete and is being commercialized by INTEG Process Group, Inc.

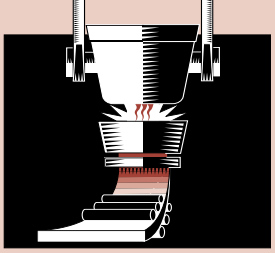
Solution

Researchers at the University of British Columbia and the National Institute of Standards and Technology (NIST) have developed a Hot Strip Mill Model (HSMM) that quantitatively links the mechanical properties of hot rolled steel to the operational characteristics of its mill. The model is capable of predicting the steel's thermal history, roll bite deformation, and resulting coil microstructure. Eight grades of steel are incorporated into the most recent version of the model, including: A36, DQSK, HSLA-50V, HSLA-50Nb, HSLA-50Nb/Ti, HSLA-80Nb/Ti, IF-Nb/Ti-rich, and IF-Nb/Ti-lean. However, the capability to add other steel grades will be added to the model in the near future.

The user-friendly model runs through the Microsoft Windows operating system, and can quickly be modified by its users to reflect site-specific hot mill characteristics. In addition to forecasting numerous criteria regarding current production runs, the HSMM enables technical personnel to perform off-line experimental scenarios with an exceedingly high number of steel grade-to-mill parameter combinations. The model can be used for streamlining coiling and cooling operations.

Results

The HSMM has achieved notable commercial success under AISI's collaboration with INTEG Process Group, Incorporated, the commercial licensee of the model. The original version of the model was released to 14 AISI members participating in the Advanced Process Control Program in July, 1998. INTEG continues to work with many of the original participants through the formation of an Enhancement Group. Continuous user feedback has shown the model is capable of predicting temperatures, forces, and mechanical properties off-line. INTEG plans to aggressively provide the HSMM to other commercial customers and to continue to provide future model upgrades.



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