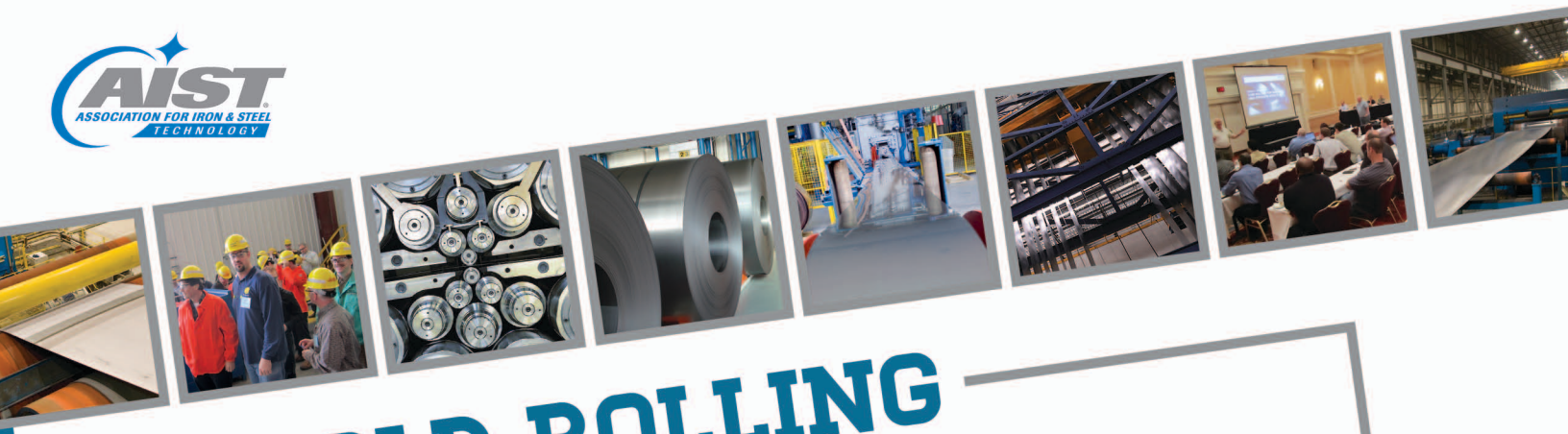


COLD ROLLING FUNDAMENTALS
— A PRACTICAL TRAINING SEMINAR

24–28 MARCH 2013 | MGM GRAND DETROIT, DETROIT, MICH., USA

SUNDAY
24 MARCH 2013

4 p.m.
Registration

5 p.m.
Reception

MONDAY
25 MARCH 2013

7 a.m.
Continental Breakfast

8 a.m.
Introductions and Opening Remarks
Mark Blankenau, Severstal Dearborn

8:15 a.m.
Overview
John Speer, Colorado School of Mines
General overview of products, metallurgy and processing from steelmaking to finishing, including product properties, end users and applications.

9 a.m.
Cold Rolling Fundamentals
John Speer, Colorado School of Mines
Deformation and metallurgical properties, iron-carbon phase diagram, grain size, stress-strain relationship, work hardening, effects of annealing, effect of percent reduction on R and N values, and effect of composition on properties.

10 a.m.
Break

10:15 a.m.
Rolling Mill Designs and Line Arrangements to Meet Process Requirements
Mike Peretic, SMS Siemag LLC
This presentation will begin with a brief history of the development of rolling technology, leading into a discussion of how material and process needs drove the development of various roll stack designs. Examples of 2-hi, 4-hi, 6-hi, MKW and cluster mill stack designs will be discussed with regard to their product applications. Various line configurations will also be presented to show relative production volumes for single-stand/single-pass mills, single- and 2-stand reversing mills, tandem mills, continuous tandem mills and coupled tandem mills.

Noon
Lunch

1 p.m.
Entry Mill Equipment
Frank Beddings, Danieli Corp.

2 p.m.
Hot Band Requirements
David Paton, ArcelorMittal Dofasco Inc.

2:45 p.m.
Break

3 p.m.
Exit Mill Equipment
Mark Landy, Siemens VAI

4 p.m.
Practical Applications
Mark Wellensiek, ArcelorMittal

TUESDAY
26 MARCH 2013

7 a.m.
Continental Breakfast

8 a.m.
Rolling Theory
Tom Richards and Venugopal Reddy, TMEIC Corp.
This presentation will cover cold rolling theory that can be used for: preliminary analysis of mill configurations, evaluating control requirements, on-line control for mills with broad product ranges or operating conditions, evaluating potential process enhancements, predicting expected quality goals and understanding the rolling process — off-line tools, on-line maintenance, what-if analysis.

10 a.m.
Break

10:15 a.m.
Rolling Theory (cont'd)
Tom Richards and Venugopal Reddy, TMEIC Corp.

Noon
Lunch

1 p.m.
An Introduction to Automatic Gauge Control
Chris Fryer, GE Energy Power Conversion
Automatic gauge control (AGC) is described for tandem cold mills of 4 and 5 stands, including feedforward and feedback controls. The control requirements for hydraulic and electric-screw stands are explained, as well as drive referencing for AC or older DC main drives. The established control methods for tension control (by speed or gap) are described in detail, along with the sequencing of control loops necessary for successful closed-gap threading and de-threading on batch rolling mills. Flying gauge change is described for continuously threaded mills with additional controls for reduction of tension, gauge and flatness variations on a product change.

2 p.m.
Flatness Measurement and Control
Paul Slater, GE Energy Power Conversion
Recap of shape theory, sensors, measurement principle, measurement rolls, measurement processing, decomposition into polynormal form, actuators and control loops, roll benching control, shifting, segmented sprays control and tilt control.

2:45 p.m.
Break

3 p.m.
Inspection Practices
Mark Blankenau, Severstal Dearborn
Inspection for cold rolled steel will be discussed. Sampling methods, frequencies, measurements, highlighting methods, lighting and response to observations will be presented.

4 p.m.
Practical Applications

5 p.m.
Reception

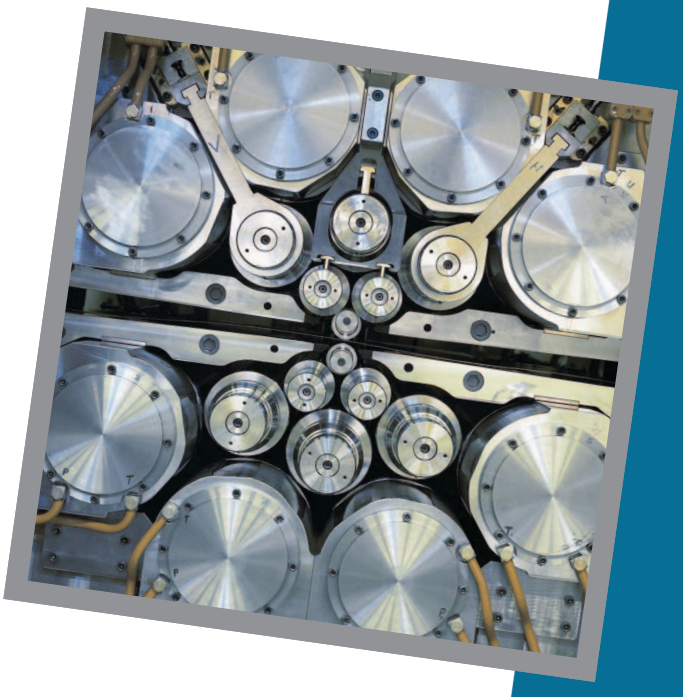
WEDNESDAY
27 MARCH 2013

7 a.m.
Continental Breakfast

8 a.m.
Lubricant Fundamentals in Cold Steel Rolling
Steve Schultz, MacDermid
This session will discuss the chemical and physical characteristics of rolling oils used for the production of cold rolled sheet. Specific topics will include the selection of base oils, emulsifiers and additives. There will be special emphasis on selecting these materials to provide a clean steel surface suitable for further processing. The role of synthetic lubricants will also be discussed.

9 a.m.
Hydraulic Systems
Lance Penick, Butech Bliss
This presentation will provide an overview of typical hydraulic systems for cold rolling mills. The discussion will cover a range of hydraulic topics, including: electrohydraulic system design, performance and maintenance requirements for cold rolling mill hydraulic systems with a focus on hydraulic automatic gauge control (HAGC) systems.

10 a.m.
Break



10:15 a.m.

Roll Cooling and Its Contribution to Cold Reduction Mill Productivity

Cliff Delmage, CLD Consulting

This discussion will cover the methods for determining the required roll coolant for different cold reduction operations. The methods for measuring the effectiveness of existing roll coolant systems will be covered. Modern roll coolant systems and the recommended equipment for an effective roll coolant system for a modern cold mill will be covered in detail. The proper design of a system will be covered in detail, including a discussion of piping sizes and material, and the proper design of application headers. Indicators for roll coolant volumes and application deficiencies will be discussed.

Noon

Lunch

1 p.m.

Roll Specifications and the Influence on Roll Performance

George Ott, Union Electric Steel Corp.

Roll performance is strongly influenced by the given roll specifications (hardness, depth of hardness, alloy selection). The manufacturing process also affects roll performance. Proper roll maintenance practices can further enhance roll performance.

2 p.m.

Roll Roughness, Hardness, Testing and Grinding Wheels

Jim Slawinski, Akers Roll

2:45 p.m.

Break

3 p.m.

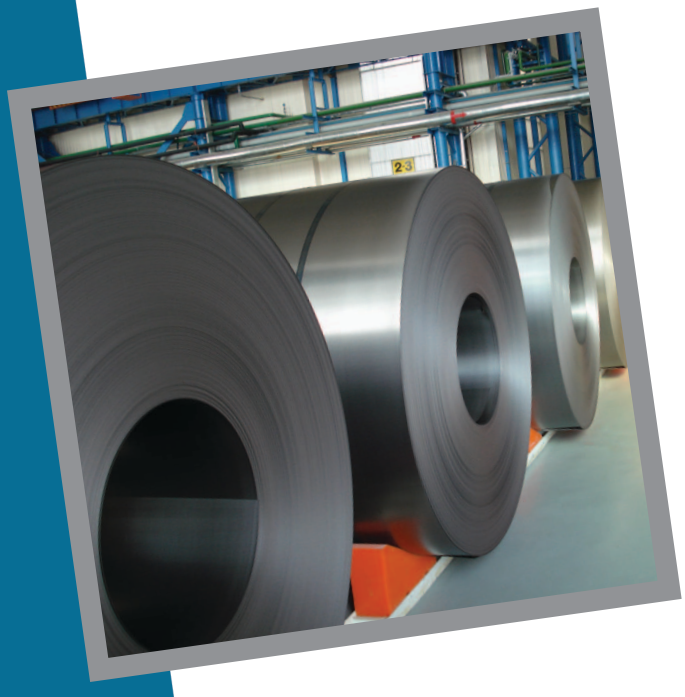
Roll Shop Best Practices

William Jennings, Rockport Roll Shop LLC

4 p.m.

Practical Applications

Larry Flowers, Severstal Dearborn



THURSDAY
28 MARCH 2013

7 a.m.

Continental Breakfast

8 a.m.

Cold Mill Safety

Jason Murphy, U. S. Steel – Mon Valley Works

This discussion will include how safety has to be part of the culture and implemented into everything that is done at the mill. Modifications that have been made at the cold mill in an effort to make the department safer will be covered, as well as some new devices that help make tasks safer.

9 a.m.

Operation Bottlenecks

Larry Flowers, Severstal Dearborn

Discussion will include an overview of operational bottlenecks for pickling line and tandem mill, theoretical bottlenecks due to design/layout, and practical bottlenecks due to product mix and production restriction.

10 a.m.

Break

10:15 a.m.

Rolling AHSS

Mark Wellensiek, ArcelorMittal

Discussion will focus on roll forces, tension practices, effects of width and gauge on roll forces, and modeling to determine mill limits.

11:15 a.m.

Practical Applications — Panel Discussion

Mark Wellensiek, ArcelorMittal Indiana Harbor; Mark Blankenau, and Larry Flowers, Severstal Dearborn

Noon

Lunch

1 p.m.

Plant Tour of Severstal Dearborn

5 p.m.

Return From Tour and Adjourn