



Cold Rolling Fundamentals

in conjunction with System Automation Fundamentals
— A Practical Training Seminar

9–13 September 2018

The Westin Huntsville
Huntsville, Ala., USA

*Featured Plant Tour:
Nucor Steel–Decatur LLC*



Registration Includes

Registration includes breakfasts and lunches Monday through Thursday; reception Sunday and Tuesday; plant tour with bus transportation; and a course workbook or flash drive including presentations.

Hotel Accommodations

A block of rooms has been reserved at The Westin Huntsville, Huntsville, Ala., USA. Please call the hotel at +1.256.428.2000 by 20 August 2018 to secure the AIST discount rate of US\$145 per night for single/double occupancy.

AIST Members	
US\$1,195	US\$1,295
by 30 July 2018	after 30 July 2018

Non-Members	
US\$1,410	US\$1,510
by 30 July 2018	after 30 July 2018



Featured Plant Tour
Nucor Steel-Decatur LLC

About the Program

This seminar provides a comprehensive overview of cold rolling. The course covers fundamentals, equipment, rolling theory, control, threading, rolls, lubrication, measurement, safety and new technology. Attendees will leave this course with a better understanding of the basic metallurgy involved, the different types of products and product attributes, the types of mills used and equipment involved with the mills, the theory of rolling, the latest technologies involved in cold rolling, safety aspects, rolling solutions, production measures, and much more. Panel discussions will provide an opportunity to discuss issues and engage in problem-solving.

Who Should Attend

Anyone who would like to expand his/her knowledge and understanding of cold mills and cold rolling should attend. This includes electrical, mechanical, lubrication and metallurgical engineers; maintenance personnel; operators; and those responsible for quality assurance. Equipment manufacturers and service suppliers will also benefit from this course.

Professional Development Hours

This course may qualify for up to 25 Professional Development Hour (PDH) credits. Each attendee will receive a certificate listing the quantity of PDH credits earned for the course. This course is not approved for PDH credit in New York, Florida, North Carolina and Oklahoma.

Organized By

AIST's Cold Sheet Rolling Technology Committee.



BRING YOUR OWN
YOUNG PROFESSIONAL

Visit AIST.org/byoyyp for more information





Schedule of Events

Sunday, 9 September 2018

4–6 p.m.
Registration

6 p.m.
Welcome Reception

Monday, 10 September 2018

7 a.m.
Registration and Breakfast

8 a.m.
Introductions and Opening Remarks

8:10 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.

9:55 a.m.
Break

10:15 a.m.
Rolling Mill Designs
Mike Peretic, SMS group Inc.
This presentation will open with a brief history of rolling technology, and a discussion of how material and process needs drove the development of roll stack designs and gap shape actuators. Examples of 2-hi, 4-hi, 6-hi and cluster mill stack designs will be discussed with regard to their product applications. Finally, various line arrangements — including reversing mills, batch tandem mills and continuous tandem mills — will be presented, showing the relative impact on production volume.

11:05 a.m.
Line Arrangements
Mike Peretic, SMS group Inc.

Noon
Lunch

1 p.m.
Entry Mill Equipment
Frank Beddings, Primetals Technologies
USA LLC

1:55 p.m.
Exit Mill Equipment Cold Rolling Mill
Christian Bartholdt, Andritz Sundwig GmbH, and Brian Smith, ANDRITZ Herr-Voss Stamco Inc.
This presentation focuses on creating a finish coil in perfect quality for the subsequent processes. Included in the discussion are exit mill table design; measurement and control instruments; creating a proper tension, high-speed coiling under attention of strip quality; coil handling and strip quality devices; and economic fume exhaust system.

2:50 p.m.
Break

3:10 p.m.
Cold Mill Upgrades Upgrades With S6-High Technology for HSS, AHSS and UHSS
Christian Bartholdt, Andritz Sundwig GmbH
This discussion focuses on revamping a used 4-high (6-high) to an advanced S6-high or combination 4/S6-high cold mill for cold rolling of advanced materials like HSS, AHSS and UHSS. Steps involve discussion with customer and see the product mix and future arguments; checking the old mill, dimensions, drawings, technical data, space, hydraulic and electrical equipment; production calculation; and design.

4 p.m.
Hot Band Characteristics That Influence Cold Rolling Performance
John Manko, Outokumpu Stainless USA LLC
The purpose of this presentation is to identify meltshop, hot strip mill and annealing technical parameters and defects that influence cold rolling performance.

4:40 p.m.
Roundtable Discussion

5 p.m.
Adjourn

Tuesday, 11 September 2018

7 a.m.
Breakfast

8 a.m.
Cold Mill Chatter
Stu Critchley, Salvis Group

Schedule of Events (cont'd)

A few familiar and elementary concepts used in simple vibration theory are reviewed at a basic level. The mechanisms and features of the most common forms of mill vibration are then introduced and illustrated in some detail. In this way, rolling mill chatter and vibration are introduced and explained with continuing reference to the basic mechanics of the main rolling mill components and the fundamental processes happening in the mill roll bite. The last portion of the session is a comprehensive review of causes and control strategies for the chatter or vibration. Explanations are built on the basic interactions between the main mill components and the strip that are analyzed in more mathematical detail in the cold rolling theory and modeling sessions presented by others later in the week.

9:50 a.m.
Break

10:05 a.m.
Roll Specifications and the Influence on Rolling Behavior
Ron Perhosky, Union Electric Steel Corp.

11:10 a.m.
Cold Mill Safety
George Stephenson, Nucor Steel–Decatur LLC
An overview of practices to safely grind and surface rolls to today's high quality standards in today's competitive market. This includes scheduled maintenance of grinder and lathes as well as roll bearings and scheduling of production with the mill changes.

Noon
Lunch

1 p.m.
Plant Tour of Nucor Steel–Decatur LLC 

5 p.m.
Return From Plant Tour

5–6 p.m.
Reception

Wednesday, 12 September 2018

7 a.m.
Breakfast

8 a.m.
Cold Mill Quality and Defects
Liz Hunter, Nucor Steel–Berkeley
An overview of the key elements associated with cold-rolled steel and quality, as well as an overview of common incoming and outgoing defects

9 a.m.
Roll Shop Practices: What Do Roll Shops Do for Your Mill?
Steve Wallace, Nucor Steel–Decatur LLC

9:50 a.m.
Break

10:10 a.m.
Cold Rolling Theory
Mark Zipf, Cold Rolling Technologies Inc.
This presentation will provide exposure to the next level of concepts and approaches, including non-circular arc rolling theories, advanced controls and multi-variable concepts/methods, a closer look at the subtle details of the overall shape/flatness control problem, envelope and control range depictions of mill capabilities, a study of 20-high cluster/Sendzimir Mills (AGC and shape), strategies for different materials and thickness ranges, multi-stage and multi-pass rolling operations, coordination of mill setup/roll crowns, pass scheduling, and shape target progression.

Noon
Lunch

1 p.m.
AFC Shape/Flatness
Mark Zipf, Cold Rolling Technologies Inc.
This presentation gives an introduction into the overall shape/flatness control problem, including specific definitions of profile, shape and flatness. An overview of the distortion phenomena and its sources/formation is given, including an analysis of the force-loaded transverse roll stack deflection characteristics, thermal reactions and available corrective shape actuators. Included is an examination of how to measure shape/flatness and the strategies used in contemporary systems. Discussion will also focus on the primary components, architecture, and theory of operation of automatic shape/flatness measurement and control systems. At the close will be an examination of shape/flatness control performance characterization and specification.

2 p.m.
Automatic Gauge Control
Mark Zipf, Cold Rolling Technologies Inc.
This presentation is an investigation of the thickness control problem, including available sensors, actuators, control dynamics, perturbation sensitivities and algorithms. Details of the basic automatic gauge control (AGC) modes (in an ideal, fully instrumented, single-stand configuration) are discussed, as well as their performance characteristics and when/where to use them, including their adaptations for variations in the rolling conditions. A study of critical couplings/interactions between AGC activities, strip tensions, roll bite friction/rolling speed and shape control activities is followed by an expansion to tandem mill configurations and constrained actuation/sensing arrangements. An examination of AGC performance characterization and specification will wrap up the session.

3 p.m.
Break

3:20 p.m.
Intermediate Concepts and Special Topics
Mark Zipf, Cold Rolling Technologies Inc.
This presentation will provide exposure to the next level of concepts and approaches, including non-circular arc rolling theories, advanced controls and multi-variable concepts/methods, a closer look at the subtle details

Schedule of Events (cont'd)

of the overall shape/flatness control problem, envelope and control range depictions of mill capabilities, a study of 20-high cluster/Sendzimir mills (AGC and shape), strategies for different materials and thickness ranges, multi-stage and multi-pass rolling operations, coordination of mill setup/roll crowns, pass scheduling, and shape target progression.

4:20 p.m.
Roundtable Discussion

5 p.m.
 Adjourn

Thursday, 13 September 2018

7 a.m.
 Breakfast

8 a.m.
Cold Rolling Lubrication Fundamentals
 William Hartley and Brad Wellensiek, Quaker Chemical Corp.
 This presentation will focus on cold rolling lubricant fundamentals. It will include information on key components of rolling oils and how lubrication is important in the cold rolling process.

9:30 a.m.
 Break

9:45 a.m.
Rolling Solution System and Maintenance
 William Hartley and Brad Wellensiek, Quaker Chemical Corp.

10:30 a.m.
Production Bottlenecks
 Robert Waldron, Nucor Steel-Berkeley
 The presentation will focus on identifying bottlenecks in the operation and mitigating them.

11 a.m.
Inspection for Cold Rolling
 Mark Blankenau, HyCAL Corp.
 Requirements, methods of work, equipment used, standards and lessons learned will be presented.

Noon
 Lunch

1 p.m.
Rolling AHSS
 Leland Robinson
 Primetals Technologies USA LLC

2 p.m.
Surface Texture Design
 Mark Blankenau, HyCAL Corp.

2:45 p.m.
 Break

3 p.m.
Motors and Drives
 Ronald Tessendorf, TMEIC
 Overview of motors and drives as applied to cold rolling.

3:40 p.m.
Air Blow-Off Systems
 Anthony Sobczak, Silvent Intech
 Air blow-off systems are the most effective way to completely clean the strip from the center all the way off the edges.

4:10 p.m.
Hydraulic Systems Troubleshooting
 Mark White, Ascension Hydraulics LLC

4:40 p.m.
Roundtable Discussion

5 p.m.
 Conference Adjourn

