

International Steel Academy

Fundamental Principles — Practical Knowledge

> 9–13 December 2013 > Jindal Steel & Power Ltd. > Raigarh, India

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TATA STEEL

Dr. T. Venugopalan, chief technology officer, Tata Steel Ltd.

“The breadth of knowledge displayed by the instructors of both these courses was remarkably inspiring. The course had a good balance of fundamental principles and practical knowledge sought after by industry professionals. The International Steel Academy can be heralded as a very good initiative of AIST to bridge the gap that exists between the industry and the educational institutions in the field of iron and steel technology.”



The International Steel Academy

Course Objectives

The AIST International Steel Academy has been developed to provide in-depth instruction focused on the fundamental elements of steelmaking (MSTS 201) and the fundamental elements of steel shaping and treating (MSTS 202). Each of these courses will be four days in length and will be held concurrently. The individual courses will be subdivided into the major processes (elements) required to produce quality steel products in today's economy.

The elements within each course will be presented in such a way that the steelmaking process will unfold as the course progresses. As an example, the Steelmaking curriculum (MSTS 201) will begin with the fundamental raw materials of steel, and progress through the processing of iron, melting of steel, refining, casting and solidification. The elements will contain information on the origin and history of the process, the latest technology used, the equipment needed and the steps necessary to produce a quality product for the next element. Also included in each element will be safety awareness, environmental considerations and common maintenance areas.

Target Audience

The curriculum for the AIST International Steel Academy provides a broad and deep understanding of the ironmaking and steelmaking process. Individuals who have experience in the industry and hold a basic understanding of the overall process would find the curriculum of the International Steel Academy beneficial. Process engineers, operations and maintenance personnel, plant management, sales and service engineers and others requiring an expanded knowledge of steel manufacturing fundamentals should attend.

Language

Course language is English.

Host Plant

JINDAL STEEL & POWER

Schedule at a Glance

MSTS 201: Steelmaking

Instructor: Dr. Ing. Jürgen Cappel > Room: JSPL Centre Auditorium

Monday, 9 December 2013

07:30–09:30	Registration
09:30–10:15	Opening Address/Welcome
10:15–10:30	Tea/Coffee
10:30–12:20	History and Fundamentals of Iron- and Steelmaking
12:20–14:10	Sustainability in Steelmaking
14:10–14:50	Lunch
14:50–16:40	Raw Materials
16:40–17:00	Tea/Coffee
17:00–19:00	Burden Preparation

Tuesday, 10 December 2013

09:00–10:50	Blast Furnace Process
10:50–11:10	Tea/Coffee
11:10–13:00	Alternative Ironmaking Processes
13:00–14:00	Lunch
14:00–15:50	Hot Metal Pretreatment
15:50–16:10	Tea/Coffee
16:10–18:00	BOF Steelmaking

Wednesday, 11 December 2013

09:00–10:50	EAF Steelmaking
10:50–11:10	Tea/Coffee
11:10–13:00	Alternative Steelmaking Processes
13:00–14:00	Lunch
14:00–15:50	Steel Refining Fundamentals
15:50–16:10	Tea/Coffee
16:10–18:00	Steel Refining Processes

Thursday, 12 December 2013

09:00–10:50	Casting Fundamentals
10:50–11:10	Tea/Coffee
11:10–13:00	Continuous Casting Process
13:00–14:00	Lunch
14:00–15:50	Steel Market Applications
15:50–16:10	Tea/Coffee
16:10–18:00	Production Planning
18:00–20:00	Reception and Dinner

Friday, 13 December 2013

09:00	Plant Tour of Jindal Steel & Power Ltd.



MSTS 202: Steel Shaping and Treating

Instructor: Prof. Dr. Ir. B.C. De Cooman > Room: JSPL Centre Multi-Purpose Hall

Monday, 9 December 2013

07:30–09:30	Registration
09:30–10:15	Opening Address/Welcome
10:15–10:30	Tea/Coffee
10:30–14:10	Introduction to Metallurgical Essentials
14:10–14:50	Lunch
14:50–16:40	Steel Standards
16:40–17:00	Tea/Coffee
17:00–19:00	Conventional Hot Strip Mills

Tuesday, 10 December 2013

09:00–10:50	Conventional Hot Strip Mills
10:50–11:10	Tea/Coffee
11:10–13:00	Conventional Hot Strip Mills
13:00–14:00	Lunch
14:00–15:50	Alternative Hot Strip Mills
15:50–16:10	Tea/Coffee
16:10–18:00	Hot Strip Mill Processing of Automotive Grades and Pickling Technology

Wednesday, 11 December 2013

09:00–10:50	Cold Strip Mill
10:50–11:10	Tea/Coffee
11:10–13:00	Coating Technology
13:00–14:00	Lunch
14:00–15:50	Strip Properties, Gauge, Shape, Flatness
15:50–16:10	Tea/Coffee
16:10–18:00	Strip Properties, Gauge, Shape, Flatness

Thursday, 12 December 2013

09:00–10:50	Tube and Plate Production
10:50–11:10	Tea/Coffee
11:10–13:00	Long Products: Bar and Wire Mills
13:00–14:00	Lunch
14:00–15:50	Long Products: Structural Steel and Rails
15:50–16:10	Tea/Coffee
16:10–18:00	Rolls for Rolling Mills
18:00–20:00	Reception and Dinner

Friday, 13 December 2013

09:00	Plant Tour of Jindal Steel & Power Ltd.

Developer: Dr. Ing. Jürgen Cappel

Dr. Cappel holds a doctoral degree in ferrous metallurgical engineering from RWTH Aachen in Aachen, Germany. Dr. Cappel has more than 20 years of experience working in iron- and steelmaking facilities. His responsibilities included management of the blast furnace process, the BOF and secondary treatment processes, raw material procurement, steelmaking research and development and overall steelmaking production. Throughout his career, he has been an active proponent for fundamental education of individuals in the steel industry. He has provided instruction to many of his employees while in steel production. Currently, as a consultant in the steel industry, one of the primary benefits to his customers is the education of their employees in producing steel efficiently in a safe, sustainable environment.

MSTS 201

Steelmaking

Course Description

The AIST International Steel Academy course MSTS 201: Steelmaking is intended as an introduction to the origin and sourcing of steelmaking raw materials and the fundamentals of melting, refining and solidification of steel. World-class manufacturing pursues excellence in quality, technology, efficiency, sustainability and innovation. An educated workforce knowledgeable in the fundamentals of raw materials, equipment, technology and operations is critical to achieving world-class steel production. This course, developed from experiences in academia, operations and research, also presents the dynamic state of steelmaking technology and the significance of steel production for economic growth.

Today's steel industry is teeming with innovation and advanced technology. Many of the breakthroughs are the result of experienced personnel who have merged hard work with efficiency and opportunity. Young professionals, devoid of the industry experience beneficial to developing new technologies, must rely on the steelmaking curriculum from academic institutions, which in recent years has waned. The MSTS 201: Steelmaking course merges practical industry experiences with advanced metallurgical concepts of smelting, refining and solidification. While many courses focus on steel as the material, the MSTS 201 curriculum broadens the scope to include the ancillary, supporting technologies critical to steelmaking, such as environmental aspects, equipment technology, production scheduling and control systems. The various subjects are presented in a manner that makes complex concepts understandable to non-experts.

Course Outline

1. History and Fundamentals of Iron- and Steelmaking

Through the last 6,000 years, the art of ironmaking has gradually turned into the science of steelmaking and continuous casting. The progress in technology over those years will be presented to create a foundation for the remaining MSTS 201: Steelmaking presentations. Included will be the histories of ironmaking, steelmaking and continuous casting, as well as how the steel industry created the industrialization of the modern world. The session concludes with a steel market review and a statistical overview of the host country steel industry situation.

2. Sustainability in Steelmaking

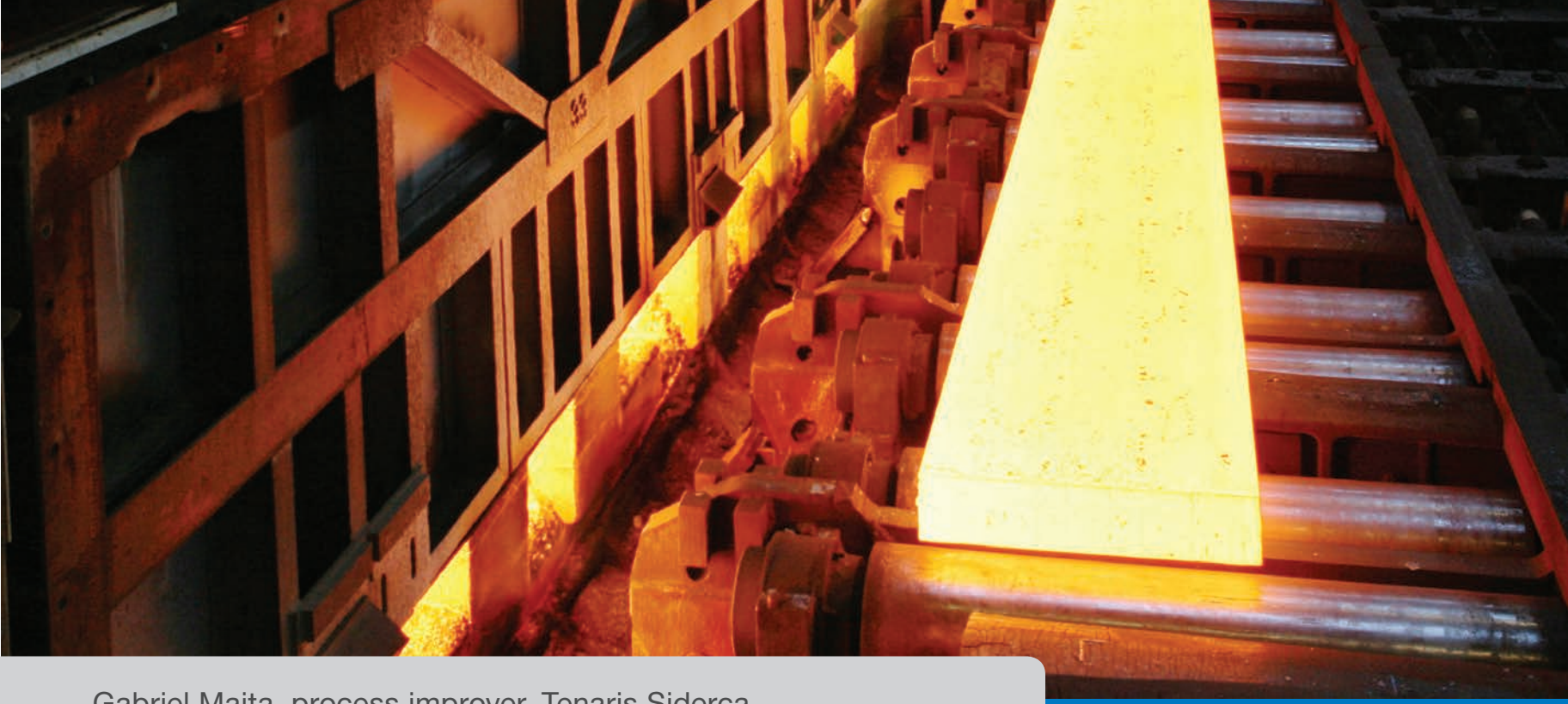
Eight sustainability indicators summarize the responsibility of the steel industry to their employees, their social role and their environmental behavior. Indicators will be presented to detail what it means for a steel company to be sustainable, including greenhouse gas emissions, energy and material efficiencies, environmental management systems, reduction in lost-time injuries, employee training, investment in new processes and technology, and providing a defined value to society.

3. Raw Materials

Steel production requires efficient sourcing and use of raw materials. Iron ore, coal, alloys, fuels, fluxes and recycled products will be described in terms of origin, availability, trade, chemical and physical properties, and logistics. Preparation and efficient use for cost-effective production will be discussed. The session concludes with an introduction of modern recycling technologies to reutilize mill waste according to the material efficiency indicators of the sustainability approach

4. Burden Preparation

Many raw materials cannot be utilized directly in iron- and steelmaking processes. Thermal preparation processes like sintering and pelletizing are introduced, as well as cold preparation technologies, including briquetting. Other alternatives are discussed. The importance of material quality testing and material behavior simulation in the melting process is pointed out. The session concludes with some remarks about lime and dololime production.



Gabriel Maita, process improver, Tenaris Siderca

"Dr. Cappel is a great instructor and good reference for the iron and steel industry. He touched on many points that metallurgists face and gave a comprehensive overview of the importance of steelmaking in the global market. I found answers to many of my questions, as well as the value in interacting with the participants. I realize that by sharing our experiences, solutions can be found. There are still opportunities to develop more in the future — more technology that fits the future demands of the market — and to deliver the latest quality requirements for environmental and economic requests."

5. Blast Furnace Process

The overall blast furnace design and process will be outlined. Discussion will cover the metallurgy of iron ore reduction and melting, hot metal quality and ways to influence it, as well as slag formation and processing to valuable byproducts. BF top gas composition and dust types and utilization are introduced. An overview of material and heat balances for the blast furnace will be discussed in detail. Maintenance considerations, production cost, plant utilities, recent advancements in instrumentation, modeling, automation and environmental aspects will also be described.

6. Alternative Ironmaking

In some regions of the world, non-coking coal or other primary energy sources are available for ironmaking. To develop a steel industry in these countries, direct reduced iron technologies came to industrial application. Current, viable technologies such as Midrex, Corex and Finex will be presented, including the metallurgy and final product characteristics and process byproducts. The session concludes with the introduction of the smelting reduction technology and the processes under development for industrial application.

7. Hot Metal Pretreatment

On its way from the blast furnace to the steel meltshop, liquid hot metal must be transported, intermediate stored and processed. The common technologies and metallurgies for hot metal pretreatment, are presented, detailing the methods used and the benefits of the processes to the final steel product. The role of hot metal solidified for scrap replacement in direct steel meltshops is explained. Environmental aspects are discussed.

8. BOF Steelmaking

The basic oxygen furnace (BOF) steelmaking process (also called the LD process) began in the 1950s in Europe. Since that time, the BOF process is the primary process to produce large quantities of high-purity steel from blast furnace iron. The history and current state of the process will be presented. The oxidation metallurgy of the BOF — including raw material considerations, material and heat balances, oxygen blowing and tap procedures — will also be detailed. The course will include information on BOF maintenance, production cost, plant utilities and the current technology available for instrumentation, modeling and automation. A description of environmental systems for BOF steelmaking will be included, as will the challenges facing steel produced via a BOF.

9. EAF Steelmaking

In the last 20 years, the electric arc furnace (EAF) process has spread rapidly across the globe as a viable alternative to the BOF for producing many steel products. This section of the course will detail the metallurgy of the EAF, including raw material considerations, material and heat balances, oxygen blowing and tap procedures, and the many variations in EAF designs. This section will also highlight maintenance requirements, plant utilities required and an overview of the current technology available for instrumentation, modeling and automation. An overview of the environmental systems and the future challenges for EAF steelmaking will conclude the section.

10. Alternative Steelmaking

This section will showcase recent, viable alternative steelmaking technologies: direct scrap melting with oxygen and coal (KMS) technology, energy optimized furnace (EOF) technology, induction furnace (IF) technology, and submerged arc furnace (SAF) technology. Micromill technology will also be introduced. Two general routes are available: an EAF/Consteel-based steelmaking route and a cupola furnace-based, hot metal to steel route.

11. Steel Refining

The chemical and temperature refinement of liquid steel is critical to the final cast product. The fundamentals of the metallurgical operations used to de-oxidize and refine steel will be presented, including the various treatment stations for reheating, degassing and alloying liquid steel. The different stations are necessary to produce the broad range of chemistries required for today's steel market. Interstitial-free steel grades are processed differently than sour gas service grades; likewise, a different process route is used to produce high-alloy steels for tools and roller bearings. The linking of these treatment stations to the overall process route will be presented, as well as the variety of process routes that can occur between the steel melting furnace and the final solidification process.

12. Casting Fundamentals and Casting Process

The casting section will begin with a history and overview of ingot casting and the current benefits of continuous casting steel via the ingot process. The history and evolution of continuous casting will then be described, focusing on the different cross-sectional shapes which can be cast and the markets served by each type. Machine elements will be discussed, along with physical and metallurgical models to understand the process, and an explanation of reoxidation prevention, flow control and slag carryover control. The benefits of technologies like electromagnetic stirrers are described, and mold powder technology is introduced. This part concludes with the technology developments of the last four decades.

Discussion of metallurgical phenomena will include surface and inner defects on CC products, their origin and countermeasures. Cleanliness of steel is discussed, as well as solidification effects and minimizing of negative quality effects caused by segregation. Various mold technologies, strand mechanics, the bending/unbending process, cooling processes and casting tensions are included.

As in the previous sessions, the material and heat balance of the process is introduced, along with maintenance issues, productivity aspects, production cost, plant utilities and the latest technological developments in modeling and instrumentation. The session concludes with casting/rolling applications like thin slab and direct strip casting.

13. Steel Markets and Applications

Steel grades can be classified into one of four categories: construction steel, ultralow-carbon steel, line pipe steel and engineering steel. Each category will be described in terms of its requirements in steel chemistry and applications. Innovations will be introduced.

14. Production Planning

Production planning requires an understanding of raw material availability, current operating conditions, current orders, and customer requirements and equipment availability, among other considerations. Continuous production processes are merged with batch processes to produce an efficient production sequence. An overview of how an order becomes a product will be given for different production systems.

Piya Chairat, department manager, Siam Yamato Steel Co. Ltd.

“It was beyond expectation and good to be there. I will take all I have learned to our team in the factory.”

Developer: Professor Dr. Ir. B.C. De Cooman

After 10 years in industrial materials research and research management, Dr. De Cooman started his academic career in ferrous metallurgy research as director of the Laboratory for Iron and Steelmaking at Ghent University in Belgium. His research interests include the solid-state physics of ferrous alloys, materials microanalysis and ferrous products development. In the Graduate Institute of Ferrous Technology (GIFT), he leads the Materials Design Laboratory (MDL) and is extensively involved with the development of advanced automotive, electrical, engineering and constructional steels. The MDL combines processing research expertise in the areas of casting, hot rolling, cold rolling, and continuous annealing and galvanizing with an in-depth analysis of materials performance to develop new steel concepts for industrial applications. Dr. De Cooman earned his Ph.D. from Cornell University.

MSTS 202

Steel Shaping and Treating

Course Description

The AIST International Steel Academy course MSTS 202: Steel Shaping and Treating is, first and foremost, intended as an introduction to the processing of steel products for industry professionals. Economic leadership requires constant attention to quality improvements, technological process innovations and breakthrough materials research. This has resulted in many new steel processing developments to meet the requirements related to steel applications, and a sustained industry-based effort in steel innovation. The course, which brings together decades of internationally recognized efforts acquired in the industry and at academic institutions, also reflects the vitality and the global nature of steel product and processing innovation.

At a time when considerable progress is being made to improve both steel production technologies and the understanding of basic materials science essential to the design of advanced ferrous materials, there is also a marked global trend in the lessening of interest in steel products and processing research at academic institutions. This evolution has had serious consequences for young professionals starting careers in the steel industry, as their general knowledge about steel and its processing is now less extensive than in the past. The course merges advanced steel metallurgy concepts and principles of state-of-the-art steel processing technologies. The course also focuses on important topics that play an essential role in current steel processing and product development. The various subjects are presented in a manner that makes complex concepts understandable to non-experts.

Course Outline

1. Introduction to Metallurgical Essentials

The fundamental concepts related to steel products metallurgy (composition, crystal structure, microstructure, strength, etc.) will be presented so that the attendee can gain an understanding of the relationship between microstructure and steel properties, as well as how the microstructure is controlled mainly by thermal cycles, which influences the decomposition of austenite. The attendee will also recognize the influence of fundamental steel metallurgy on the choice of industrial processing parameters to obtain specific material properties. An introduction to the metallurgy behind advanced and ultrahigh-strength steel grades will also be provided.

2. Steel Standards

Standards are classification methods to identify steel grades. The use of standards guarantees steel product quality, reliability and interchangeability. They are coherent, simple and convenient, and provide a specific name, symbol(s), number(s), letter(s) or a combination of these. Standards also include data such as composition, dimension and mechanical properties. An overview of the development of standards, the science behind them, and the influence of professional engineering societies, trade associations, government regulation agencies and official standardization institutes will be included.

3. Conventional Hot Strip Mill (HSM) Designs

Hot strip rolling refers to the process of rolling a steel slab while the steel is in a state of recrystallization due to its temperature. While above the recrystallization temperature, the steel is deformed via rolling to adjust the austenitic grain size required for downstream processing. The end product is a semi-finished steel coil. The principles of hot strip processing will be presented, as will HSM designs and the instrumentation and automation systems currently being used. Included in the section will be how cast slab quality impacts the final coil, slab reheating requirements, reheat furnace designs, roughing and finishing mill designs, and the purposes of each mill, descaling, strip and width control, coilbox technologies, roll configurations and roll changes during production, shears, runout tables and downcoilers. An overview of product classifications will also be presented.

Pamir Ozbay, sales application engineer, TMEIC North America

“The Making, Shaping and Treating of Steel 202 course in particular covers everything relevant to steel shaping and treating. It is useful both for beginners to learn new technology and for advanced individuals to refresh their industry knowledge. Dr. De Cooman was an excellent instructor and is an expert in this field.”

4. Alternative Hot Strip Mills

Alternative hot strip mills are fifth-generation HSMs that began in 1989 with the compact strip process (CSP) and have evolved into other designs such as in-line strip processing (ISP), endless strip processing (ESP) and the casting-pressing-rolling (CPR) process. Fifth-generation HSMs are compact, cost-effective facilities whose conversion costs are low due to the utilization of thin-slab casting machines (50–100 mm) directly linked to roller hearth furnaces and minimal or no roughing mill. The CPR process utilizes a 2- to 3-mm cast strip pressed between rolls prior to entering a reheat furnace, then a single-stand rolling mill prior to coiling. This section will present the designs and principles for alternative hot strip mills and the importance of these new technologies in terms of flexibility, productivity and cost-efficiency.

5. Hot Strip Mill Processing of Automotive Grades

Steel is a critical component in the production of automobiles. Sheet steel is required for the body, exhaust, wheels and other components. Each sheet-steel application in an automobile requires specific properties. For example, exterior panels on an automobile have a high degree of formability for material efficiency, as well as strength for passenger safety. The automotive industry has driven the efforts toward making new types of steel that are both stronger and more formable, which has led to the development of high-strength sheet steels and dual-phase steels. The presentation will show how properties required for a specific application are obtained through a combination of composition and thermomechanical processing.

6. Pickling Technology

Pickling of steel is essential in effectively removing surface oxides prior to cold rolling. The different pickling processes will be presented, as will the relationship of temperature and turbulence — the main processing parameters — to the rate of thermal oxide removal. Acid conditioning and regeneration and surface quality abnormalities, such as pitting, copper plating and burned-in scale, will also be discussed.

7. Cold Strip Mill

In the cold strip mill (CSM), a strip is obtained that has the target exit thickness with acceptable shape (flatness), without exceeding the mill limits. The work rolls must be free of marks, and the strip surface appearance must be defect-free. After the CSM, coils are annealed (batch or continuous), coated (electrogalvanized, hot-dip galvanized, etc.), temper rolled and surface treated, if required. Cold rolled strip may also be coil coated with a polymeric paint layer. The essentials of cold strip mill designs and operation, the strip annealing processes, and the function of skinpass or temper rolling will be presented. The influence

of processing on the microstructure and the subsequent properties of the cold rolled strip are included, as is the relation between the different process parameters in achieving the final in-service properties of cold rolled strip. Gauge controls and the engineered requirements of rolling lubrication will also be presented.

8. Coating Technology

Much of the success of coated sheet steel is due to a switch from uncoated to coated sheet in the automotive industry and its increased use in the building industry and household appliance manufacturing. By coating steel via galvanizing, Galvalume® or other coating technologies, the steel gains superior corrosion resistance at a low cost without impacting the availability or recyclability of the product, which has in turn led to its widespread use in manufacturing. This session will include cosmetic and perforation corrosion protection of sheet steel, the different types of metallic and organic coatings for hot and cold rolled strip products, and the essentials of the different coating technologies. Also included is the origin of the coating microstructure and the importance of metallic and organic coatings on hot and cold rolled strip products.

9. Strip Properties

In many applications, the required microstructure to obtain mechanical properties within a narrow tolerance is relatively easy to achieve. In addition, narrow tolerance must be achieved for thickness (gauge), strip profile (cross-sectional shape) and flatness. These strip properties are particularly critical in applications for which forming at the production site is limited. The attendee will learn about the essential types of strip defects, along with the relationship between processing and the formation of shape defects on the rolled strip. The importance of different defects in applications and the methods available to minimize them to improve product quality will also be presented.

10. Tube and Plate Production

The large variety of tubular steel products can be classified on the basis of size (diameter), production technology (welded or seamless) and in-service properties. The various types of steel tubes and their production processes will be reviewed, such as slitted strip, spiral pipe, electric resistance welded (ERW) pipe, seamless pipe and tube, etc. Additionally, the use of plate, produced in Steckel plate mills, in the production of large-diameter steel pipes will be discussed. The principles of thermomechanical controlled processing of plate steel will be included. The importance of the strength-toughness combinations for American Petroleum Institute (API) tube grades will be presented, as will the variety of plate applications and the physical/mechanical properties required for those applications.

11. Long Products: Bar and Wire Mills

Bar and wire mills provide semi-finished steels for many different applications. The end uses of the wire or rod are vast but can be classified into five product groups: tire cord, cold-heading quality steel, spring steel, bearing steel, and free-cutting or free-machining steel. Each product group and the processing necessary to achieve the required properties will be presented. The overall process of rolling as-cast billets into wire or rods will be explained, including the different designs of the mills used to roll wire and rod as specified by the customer. Attention will be given to the importance of the processing on the refinement of the microstructure and to the secondary processes in achieving the final in-service properties for the five product groups.

12. Long Products: Structural Steel and Rails

Production of structural beams and rails differs greatly from the production of wire and rod. The different mill designs for rolling beams and rails will be presented, as will the specialized equipment necessary for achieving the localized properties required in the final product. The principles of shape rolling and the processing by specially designed roll passes will be included. Additionally, the attendee will recognize the importance of strength in the case of structural steels and the importance of hardness in the case of rail steels.

13. Rolls for Rolling Mills

Quality manufactured rolls properly engineered for application in rod and bar mills, beam mills, rail mills and strip mills are critical for consistent and reliable production. Early-stand roughing and breakdown rolls, intermediate rolls and late-stand finishing rolls require different materials and manufacturing processes to provide the properties required in specific applications. Information on the processes used to produce the rolls and the properties inherent to the different types of rolls will be presented, including the metallurgical advantages gained by a particular production process and the different requirements and processes required to produce hot deformation rolls versus cold deformation rolls. Also presented will be specific defects seen in manufactured rolls, such as peeling, banding, firecracks and spalling, and inspection methods to determine such defects.

Trakune Arjkhumwongsa, staff, Siam Yamato Steel Co. Ltd.

“This was a good seminar. I learned a lot about ironmaking, and I am also more confident in steelmaking, which I can apply at my plant. [The instructors] have a lot of experience which [they] were able to transfer to us.”



Payments by credit card, checks and wire transfer will be accepted. All checks must be payable to AIST, in U.S. dollars and drawn from a U.S. bank. Contact AIST headquarters for wire transfer details.

Registration Fees

Register Today at AIST.org/ISA

AIST Member

India National

Rs. 42,000 (US$675)

By 30 November 2013, 12:00 EST

Rs. 56,000 (US$895)

After 30 November 2013, 12:00 EST

Overseas delegate

Rs. 71,000 (US$1,145)

By 30 November 2013, 12:00 EST

Rs. 87,000 (US$1,395)

After 30 November 2013, 12:00 EST

AIST Non-Member

India National

Rs. 49,000 (US$775)

By 30 November 2013, 12:00 EST

Rs. 63,000 (US$995)

After 30 November 2013, 12:00 EST

Overseas delegate

Rs. 78,000 (US$1,245)

By 30 November 2013, 12:00 EST

Rs. 94,000 (US$1,495)

After 30 November 2013, 12:00 EST

Registration Fees Include

Monday–Thursday lunch and tea/coffee, Thursday reception and dinner, plant tour and a course workbook.

Company Discount

Five (5) or more individuals attending from the same facility can receive a 10% discount per person. All registrations must be received together along with payment to qualify for the discount. Not applicable with any other discount.


Sponsorship Opportunities

Event Sponsor (exclusive) — SOLD

Sponsorship includes: Company logo on all event signage. Inclusion as conference event sponsor in e-blast promotions, electronic brochure and website for ISA. Company logo and recognition as sponsor on all food and beverage tables throughout dining area. One full-page, 4-color ad in *Iron & Steel Technology* magazine. Delegate exemption per event management.

Corporate Sponsor (non-exclusive) — Lac 5 (US$8,200)

Sponsorship includes: Company logo on defined event signage. Inclusion as a corporate sponsor in e-blast promotions, electronic brochure and website for ISA. Company logo and recognition as sponsor on lunch tables. One half-page, 4-color ad in *Iron & Steel Technology* magazine. Three delegate exemptions for ISA.

Associate Sponsor (non-exclusive) — Lac 3 (US$4,900)

Sponsorship includes: Company logo on defined event signage. Inclusion as an associate sponsor in e-blast promotions, electronic brochure and website for ISA (company name only). One quarter-page, 4-color ad in *Iron & Steel Technology* magazine. Two delegate exemptions for ISA.

Event Contributor (non-exclusive) — Lac 2 (US$3,300)

Sponsorship includes: Inclusion as an event contributor in e-blast promotions, electronic brochure and website for ISA (company name only). One delegate exemption for ISA.

Please email sales@aist.org for more information.



Housing

Hotel Shreshtha

Jindal Road, Bhagwanpur
Raigarh - 496001, CT, India
www.hotelshreshtha.in
Reservation phone number: +917762-228800 / +919827123101

Hotel Ans International

Jagatpur, Dhimrapur Road
Raigarh - 496001, CT, India
www.ansinternational.com
Reservation phone number: +917762235301 - 304 / +919826703604

Jindal Steel & Power Guest House

Individuals interested in staying at the Jindal Steel & Power Guest House should contact Mr. RK Ajmerla at +919827478071, rk.ajmeria@jspl.com, or Mr. B Lakshminarasimham at +918827478048, bln@jspl.com, for available accommodations. The tariff is INR 2500 per day.

Travel Information

Transportation by train

Raigarh is well connected by rail on the main route from Howrah to Mumbai via Nagpur. JSPL will arrange complimentary bus facility for pickup from Raigarh railway station to hotels/Guest House for all major trains stopping at Raigarh railway station; namely, Mumbai mail, Geetanjali Express and Azad Hind Express coming from Howrah, and Azad Hind Express and Howrah mail from Raipur.



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To advance the technical development, production, processing and application of iron and steel.



About AIST

The **Association for Iron & Steel Technology (AIST)** is a non-profit organization comprised of more than 16,000 individuals worldwide and includes iron and steel producers, suppliers, academics and students. In support of our mission, AIST's Technology Committees and Member Chapters work continuously to develop programs that foster networking, problem solving and the advancement of steel technology across a wide spectrum of disciplines.

Technology Committees

AIST has 29 volunteer-based Technology Committees which sponsor forums to facilitate discussion about the latest trends and technologies in iron- and steelmaking. AIST members with similar technical interests meet several times per year for plant tours, roundtable discussions, technical presentations, and the development of technical sessions for AIST conferences and symposia.

Each year, the AIST Technology Committees conduct numerous Specialty Training Conferences to serve the educational needs of the iron and steel community and to advance the knowledge about steel production processes. AIST offers the Making, Shaping and Treating of Steel® course and the AIST International Steel Academy to further supplement the regular training seminars.

Member Chapters

AIST has 22 volunteer-based Member Chapters in eight countries around the world which sponsor forums to facilitate industry programs at the local, regional or national level. Through active networking within a Member Chapter, AIST members benefit from the interchange of ideas and solutions and the strengthening of AIST's global network.

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