**PRIMETALS TECHNOLOGIES PROGRAM SCHEDULE**  
**AISTECH 2019 - BOOTH #1531**

**MONDAY, MAY 6**

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<td>9:30 am</td>
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<td>Digital Assistance Tools and Remote Service Solutions for Electric Arc Furnaces</td>
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<td>The Road to Digitalization is Paved with Intelligent Solutions</td>
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<td>Comparative Analysis of Arc Flash Solutions — A Case Study</td>
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<td>Building the First Prototype IIoT Solution for Your Power System</td>
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<td>Advanced Equipment Tracking in High-Temperature Production Environments at voestalpine and Dillinger</td>
<td>3:30 pm</td>
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<td>4:30 pm</td>
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<td>New Finishing Mill Technology for the Production of Thin Hot Band</td>
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### TUESDAY, MAY 7

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<td>10:00 am</td>
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<td>Substations for Industry 4.0 Steel Plants</td>
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<td>New Constructed Hot Strip Mill for Formosa Ha Tinh Steel Co. in Vietnam</td>
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<td>Comprehensive Condition Monitoring for the Metals Industry</td>
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<tr>
<td>Copper Stave Bending: Problems, Management and Solutions</td>
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<td>Revamping of existing RCM to “HYPER UC-MILL”</td>
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MONDAY, MAY 6

Session: Electrical Applications - Industry 4.0

The DIGITAL TWIN in Continuous Casting - A New Dimension in Automation Technology

A digital twin, which is an intelligent digital representation of a physical plant, product or process, allows metallurgists and process engineers to predict the behavior of the involved complex systems and optimize parameters before using them in real production. Digital twins offer numerous benefits by modelling, simulating and replaying of the casting process, which leads to a new dimension in product quality and reduced production costs. This paper describes the setup and simulation possibilities coming along with a digital twin of a continuous casting process. Success stories achieved with the digital twin at various steel producers complete this paper.

Time: 9:30 am
Location: 316
Speaker: Brannon Moore

Session: Computer Applications - Plant Systems

Digital Assistance Tools and Remote Service Solutions for Electric Arc Furnaces

Understanding electric arc furnace (EAF) plant digitalization includes the seamless interaction of equipment and smart automation with digital assistance tools like know-how databases and a rules engine. These tools assist EAF operators in the efficient production of established and new steel grades. New features from business intelligence systems allow deep insight and provide essential information for best decisions and life cycle measures. In addition, service contracts with a flexible validity period and secure cloud technology for remote support are a good value-add to get access to professional analyses. Adding predictive maintenance strategies can also be done without compromises for availability and reliability.

Time: 9:30 am
Location: 315
Speaker: Ramesh Khajjayam

Session: Electrical Applications - Industry 4.0

The Road to Digitalization is Paved with Intelligent Solutions

Today’s steel production is driven by process optimization and efficient productivity. For a reliable and sustainable solution, the answer is “digitalization.” This includes an overall view of plant and process know-how from bottom to top and all along the value chain by structural connectivity and modular modernization design. Digital twins are the new standard for optimizations and simulations before going to operation. Data-based approaches, through-process optimizations and business intelligence will contribute to the overall goal. New dimensions in predictive condition monitoring will gain more production-time. The vision will be a fully automated plant.

Time: 11:00 am
Location: 316
Speaker: Thomas Kuehas
Comparative Analysis of Arc Flash Solutions — A Case Study

This paper presents an evaluation of several active and passive arc flash reduction solutions based on NFPA 70E. A case study simulation is performed on an existing conventionally coordinated low-voltage switchgear system based on IEEE 1584-2018 standard, and the comparative results are presented. For each solution, the concept, the achievable energy levels and the associated cost of implementation are provided. A discussion of trade-offs and benefits of various solutions are presented to help the electrical safety supervisors make a sound judgment according to their own requirements.

Time: 11:00 am
Location: 413
Speaker: Ramesh Khajjayam

Building the First Prototype IIoT Solution for Your Power System

This paper presents a prototype Industrial Internet of Things (IIoT) solution using readily available hardware and software platforms. A data acquisition software platform was used to transfer edge computing data to the cloud. Cloud services were used to process and analyze data and generate operational insights. Pre-built machine-learning models were implemented. The process to build and train machine learning models in the cloud and to deploy them to the local environment was explored with the intention of integration into smart power monitoring systems for metals industry applications.

Time: 11:00 am
Location: 316
Speaker: Anil Kanagala

Advanced Equipment Tracking in High-Temperature Production Environments at voestalpine and Dillinger

Fully automatic detection of moving vessels such as ladles, slag pots, torpedoes, etc., is a common requirement in the steel industry. Extensive heat, dust, smoke and changing lighting conditions are common problems, which complicate this task. A new approach to overcome these problems is based on a three-dimensional measurement of the vessel surface. The recognition and evaluation of characteristics and unique features leads to the identification of the equipment. This method is described in detail using the experience gained at a pilot installation. Achieved results conclude the paper.

Time: 3:30 pm
Location: 409
Speaker: Andreas Rohrhofer
An Optimized Turnkey Solution for the Modernization of an Aging Power Quality Compensating System for an Electric Arc Furnace

STATCOM plays a key role in allowing a steel producer to maximize production, by providing a stable power supply, and to comply with power quality requirements for a meltshop. Incorporating a new STATCOM system into an existing plant installation has some challenges to overcome. This paper presents the methodology of planning and implementation of a new STATCOM in an existing meltshop along with the challenges encountered during the design and execution of such a system. The paper also presents an installation and commissioning plan that was successfully executed to start-up such a STATCOM installation.

**Time:** 4:30 pm  
**Location:** 316  
**Speaker:** Anil Kanagala and Ramesh Khajjayam

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New Finishing Mill Technology for the Production of Thin Hot Band

The demands related to the capabilities of a conventional hot strip mill have changed in the last several years. In addition to a high level of productivity, the demand for quality improvement and extension of product mix arises. In order to meet these trends, new mill stand technology allows producers to adapt the last finishing mill stand by efficiently switching from a 4-high mode to a 6-high mode with small work roll diameter based on production needs. A smaller work roll diameter allows for higher reductions, resulting in thinner hot-strip gauges with metallurgical benefits.

**Time:** 4:30 pm  
**Location:** 306  
**Speaker:** Konrad Krimpelstaetter

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TUESDAY, MAY 7

Arvedi ESP: Reaching Maturity in Endless Casting and Rolling Technology

Arvedi ESP is the first hot rolling process ever to produce cold-rolled substitutes in industrial scale, and a variety of final products are now produced directly from ESP hot band without implementing a cold rolling process. Energy consumption and related CO2 emissions are drastically reduced on the one hand by the compact layout of ESP lines, as well as by omitting subsequent cold rolling steps. Details of successful endless strip production, as well as new features under development for currently running projects, will be discussed in this paper.

**Time:** 10:00  
**Location:** 306  
**Speaker:** Andi Jungbauer

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Substations for Industry 4.0 Steel Plants

This paper compares the design and construction of a digital substation with a conventional substation. An executed conventional substation is redesigned with the digital concept and the comparative results are showcased. The digital substation design is then advanced into an I4.0 concept. Increased maintenance and operational efficiencies, utilization and reliability due to the integration with the plant’s digital platform are explored.

Time: 10:00 am
Location: 316
Speaker: Ramesh Khajjayam

New Constructed Hot Strip Mill for Formosa Ha Tinh Steel Co. in Vietnam

Commercial production started in the end of December, 2015 at hot strip mill line for Formosa Ha Tinh Steel (FHS) which is the first large integrated steel works in Vietnam. Nominal annual production is 5.3 million tons hot coils. The hot strip mill line consists of two roughing mill stands, 7 finishing mill stands, 3 down coilers and facilities for the mill workshop. This paper will introduce the outstanding technologies applied in the hot strip mill for FHS including the pair cross technology for optimal closed-loop control of the profile and flatness.

Time: 10:30 am
Location: 306
Speaker: Taroh Satoh

Advanced Profile Control: Model – Optimization – Contour

For profile and flatness control, on-line process models provide a detailed and validated description of roll stack deflection and material flow, i.e., pressure distribution in the roll gap. With a collection of process data included in the model-based profile setup, the on-line calculations can completely be reproduced off-line. Combining this feature with standard mathematical optimization allows for model parameter optimization. Here internal model parameters can be optimized along with externally supplied data such as roll properties. This minimizes the deviation between calculated and measured strip contour. Besides faster commissioning, optimized models allow simple profile control to highly sophisticated contour control.

Time: 10:30 am
Location: 315
Speaker: Matthias Kurz
Session: Electrical Applications - Powers & Drives

**Modernization of MG set and DC drives to AC drives based solutions - A power distribution and quality perspective.**

As the metals industry prepares to meet the projected increase in local demand, many mills are upgrading the existing MG set and DC drive based main stand and coiler installations to AC drive based solutions. This paper discusses the basics of MG sets, DC drives and AC drives from a power distribution and power quality perspective. Analysis is provided for evaluation of system capacity and limits along with solutions to comply with standards when replacing MG sets and DC drives with AC drive based solutions. A successful execution model is presented along with lessons learned and improvements achieved.

**Time:** 11:00 am  
**Location:** 316  
**Speaker:** Anil Kanagala

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Session: Ironmaking - Equipment & Maintenance I

**The Evolution of Blast Furnace Gas Cleaning Technologies**

Since the “Davy Cone” was developed in the 1980s, Primetals Technologies has had a 40-year period of development and application of its gas cleaning solutions. This paper will introduce the single-cone wet scrubber solutions originally designed for the British Steel Scunthorpe UK blast furnaces (the “four Queens”) and the modifications made to existing infrastructure to incorporate the Davy Cone scrubbers. The paper will then discuss the triple-cone solutions, the problems caused by acid gases, and the solutions trialed and implemented, as well as the development of the Tri-Ax cyclone and the MERIM dry cleaning solution.

**Time:** 11:00 am  
**Location:** 405  
**Speaker:** Robert Mawer

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Session: Hot Sheet Rolling - Emerging Technology & New Construction

**New Control Concept for ESP Thin Gauge Rolling Improves Thickness Quality**

Hot rolling thin gauges without cold rolling tremendously reduces production costs. With Arvedi ESP (Endless Strip Production) lines achieving exit thickness down to 0.6mm, the requirements for tension and thickness control of finishing mills have increased. A new control concept for hot rolling thin gauges with existing instrumentation is based on the cold rolling control concept successfully used many times in tandem cold rolling mills. The concept is based on fast roll gap change to control entry strip tension. Results from Arvedi ESP #4 line at Rizhao Iron and Steel Co. have shown excellent strip tension and thickness performance.

**Time:** 11:00 am  
**Location:** 306  
**Speaker:** Daniel Kotzian

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Session: Project & Construction Management - Strategies for Project Planning and Execution with Limited Resources

Panel Discussion: Strategies for Project Planning and Execution with Limited Resources

Panel members: Steve Bohm, JNE Consulting Ltd., Russell Sindrey, Hatch Ltd., Raymond Young, Primetals Technologies

**Time:** 2:00 pm  
**Location:** 318  
**Speaker:** Raymond Young

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Session: Long Products - Mill Technologies

Automated Coil Trimming System for Wire Rod Mills in the Digital Era

One requirement in wire rod production is head and tail coil trimming to remove rings with property variations. In-line shears prior to coiling at the laying head are available, but are difficult to operate and maintain. Most mills rely on manual trimming at a coil inspection station — a labor-intensive and potentially dangerous task. A new system has been developed for trimming within coil handling. A vision-assisted robot equipped with a ring separator and trimmer identifies, trims and removes unwanted rings. The new system’s capabilities are presented with results from a pilot facility and an operating wire rod mill.

**Time:** 2:00 pm  
**Location:** 308  
**Speaker:** Matthew Palfreman

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Session: Maintenance & Reliability - 4

Hear the Difference: Acoustic Plant Monitoring

Intuitively, living beings use sounds in the environment to gain information from it. This seldom-applied, but very bionic approach can be used for maintenance assistance and process monitoring in metals industries. By recording and analyzing the sounds produced by equipment, acoustic monitoring systems provide a new approach to condition-based maintenance and open up a wide field of applications for asset and process monitoring. Using several example installations, the method is described in detail. Achieved results are provided as well. An outlook about further applications concludes the paper.

**Time:** 2:30 pm  
**Location:** 317  
**Speaker:** Dieter Bettinger

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Feedback Control for Hook, Camber, Wedge and Strip Steering in a Hot Strip Mill

New strip steering technologies have been activated at hot strip mill no. 1 of thyssenkrupp in Duisburg, Germany. The system consists of two main components. In the finishing mill, camera signals are used to swivel mill stands in-bar at thread in and during rolling to minimize the lateral movements of the produced strip. In the roughing mill, a newly developed algorithm detects hook ends from the camera readings. The swivel values in the roughing mill are derived from a strip-to-strip feedback control, which considers the measured wedge behind the finishing mill and the detected hook ends on the transfer bar.

Time: 2:30 pm
Location: 306
Speaker: Matthias Kurz

Smart and Solid – the Digital Heart of Ironmaking

“Complex ironmaking processes require reliable automation with high performance and maintainability. Clearly structured systems, advanced programming tools, flexible communication, inclusion of smart sensors, digital twins for simulation (for training and development of software modifications), online documentation (supporting operation and maintenance) and virtualization are cornerstones of digitalization and offered by state-of-the-art automation systems. Individual and common features of current state of the art automation systems are illustrated by four recent projects:

- raw material handling and ore preparation at Thyssen Krupp/Germany
- blast furnace revamping at Dillingen/Germany
- new blast furnace at NTMK/Russia
- direct reduction plant of voestalpine/Texas”

Time: 2:30 pm
Location: 405
Speaker: Dieter Bettinger

High Quality Wire Rod and Bar Production at YongXing Special Stainless Steel

A new combination bar, bar in coil and wire rod mill has recently been commissioned at YongXing Special Stainless Steel Co. Ltd. in China, for production of numerous stainless grades, including austenitic, ferritic, dual phase and hardening steels. The new rolling mill has capabilities for rolling products from 4.5 – 130 mm, with quenching and heat treatment facilities to maximize in-line processing, plus new innovations such as stepless coil reforming for wire rod and optical bar counting. YongXing is now able to meet demands of customers seeking special grades for applications in industries such as aerospace and petrochemical.

Time: 3:00 pm
Location: 308
Speaker: TBD
**Sub-Arctic Toughness from API Coiled Plate on a Steckel Mill**

The production of API pipeline with sub-Arctic low temperature toughness from Steckel Mill coiled plate is a challenge for the steel producer. An appreciation of the characteristics of Steckel Mill rolling in conjunction with the key through process microstructure and operational parameters is required. This includes alloy design and development of an appropriate time temperature strain path. This paper reviews these metallurgical and process factors in combination with targeted equipment upgrades undertaken by Primetals Technologies Ltd. on a recent Steckel Mill project. The practical considerations in realizing these aims are also reported.

**Time:** 3:00 pm  
**Location:** 311  
**Speaker:** Joe Lee

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**Optimizing Production Efficiency and Quality with Digitalization**

With digitalization and sufficient know-how, steel producers can control and optimize production and product quality seamlessly across the entire process chain. This begins with a highly functional digitalization IT system that collects the right data from automation systems, measurement systems, smart sensors and operators. When these data are combined with digitized know-how from subject matter experts and artificial intelligence algorithms, the data can be transformed into valuable information such as KPIs, decisions, advice and actions. This paper explains one such system in detail, including its development, main elements and future outlook. Examples of successful implementation are also presented.

**Time:** 3:00 pm  
**Location:** 315  
**Speaker:** Thomas Pfatschbacher

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**A Recent Application of Advanced Cooling Technology to Improve High-Strength Plate Steel Production**

This paper describes a recent plate cooling modernization project. The MULPIC is designed to provide the high cooling rates and temperature accuracy needed to achieve the combination of high strength and toughness. Flatness accuracy is controlled using edge masking, crown valves and head tail masking. The control system incorporates flexible target cooling to achieve the desired time-temperature path. This paper also demonstrates the importance of the advanced model-based automation coupled with sophisticated adaptation. Insights are provided by predictions of the plate temperature and microstructural evolution during cooling. Typical performance results are given, which demonstrate the accuracy that was achieved.

**Time:** 3:30 pm  
**Location:** 311  
**Speaker:** Joe Lee
New Advancements in Condition Monitoring Technology to Enhance Steel Mill Productivity and Profitability
Co-Authored with Exxon Mobil

Steel mill operators have long used condition monitoring to deliver critical, real-time equipment performance insights that can help reduce unscheduled downtime and maximize productivity. However, as condition monitoring programs continue to incorporate newer technologies, operators can gain even deeper insights that further improve equipment operation and maintenance decisions. Leveraging field and laboratory data, this session will delve into some of these new technologies, including in-line oil sensors, and discuss how they can be integrated into a modern predictive maintenance program to deliver productivity and cost reduction benefits to steel mill operations.

Time: 3:30 pm
Location: 310
Speaker: Timothy Hurley, Primetals Technologies & Toby Hlade, ExxonMobil Fuels and Lubricants Co.

Innovation Cooling Model: The Future Starts Now

A revolutionary cooling model for hot strip mills computes — as a cyberphysical system — temperatures, enthalpies, phase fractions and microstructure from the roughing mill to the coiler in real time. It controls not only the coiling temperature, but the transfer bar temperature, the finishing mill exit temperature and the water management system in a comprehensive approach. The transfer bar cooling device, finishing mill speed, power cooling and laminar cooling valves, and pump speeds work as actuators. The pilot application was implemented at the thyssenkrupp Hot Strip Mill No. 1 in Bruckhausen, Germany, and results are presented here for the first time.

Time: 4:00 pm
Location: 306
Speaker: Klaus Weinzierl

Comprehensive Condition Monitoring for the Metals Industry

Excellence in maintenance has recently gained more attention since steel producers are facing challenges like lowering production costs and increasing output. In this context, condition monitoring helps avoid unplanned downtimes and saves associated costs, assisting in raising the overall plant availability or maintaining it at a high level. In this paper, monitoring functions for the upstream and downstream production processes in metallurgical plants are presented. It is illustrated that, in combination with customized services, a focused and holistic view of equipment and process condition can be realized.

Time: 4:30 pm
Location: 317
Speaker: Richard Stadlmayr
A Holistic Approach to Ironmaking Digitalization

The objective of holistic ironmaking technologies is to achieve the global optimum for all ironmaking processes rather than the individual optima for each plant. In one example, standardized rules-based decision-making optimizes the coordination of ironmaking plants. Another example offers plant performance supervision, monitoring the interactions and interdependencies of product quality parameters and process setpoints. The system provides KPI-dashboards, statistical process control, and quality/performance rules. And, it suggests optimized setpoints for all related automation systems. The interaction of these overall systems with local process optimization offers an increased degree of transparency and standardization - closer to the optimal operation of ironmaking.

Time: 4:00 pm
Location: 405
Speaker: Dieter Bettinger

Vacuum Degassing – Latest Design Concept and Metallurgical Results of a Vacuum Tank Degasser and RH

The vacuum process is the typical solution applied when it is time to upgrade the steel quality of an existing melt shop. The installation of a new 135t Vacuum Tank Degasser (VD) for the production of high pipe qualities in North America is a typical example. The new installation includes the latest design concepts for this kind of equipment: fully automated operations and lower environmental impact are key design aspects. The dry mechanical pump solution continues to be a perfect investment and operational cost approach for the vacuum technology. The main design aspects are described in this paper.

Time: 4:00 pm
Location: 410
Speaker: Hannes Beile

WEDNESDAY, MAY 8

Copper Stave Bending: Problems, Management and Solutions

Copper staves have now been used in blast furnaces for 40 years, and Primetals Technologies has had great success with this technology — in terms of the stave designs, the profiling of the blast furnace, and the operational strategies that can be used to support a 20-year campaign. However, a number of non-Primetals furnaces have suffered from challenges when implementing copper staves. This paper will reference some of the problems in bending and wear that customers have encountered, along with the solutions Primetals currently offers.

Time: 8:30 am
Location: 404
Speaker: Robert Horwood
Revamping of existing RCM to “HYPER UC-MILL”

Demands for electrical steel and high-strength steel products are growing rapidly worldwide by the increasing needs of vehicle electrification, energy efficient vehicles etc. “HYPER UC-MILL” is a well-suited solution to cold-roll such harder and thinner materials with high quality and high productivity by utilizing smaller work rolls driven by work roll drive system. The world’s first revamp of RCM to the HYPER UC-MILL was successfully completed with reliable technologies and scrupulous construction work. This paper introduces the effects of the revamping to the HYPER UC-MILL by comparing the actual rolling data before and after the revamping.

Time: 9:00 am
Location: 307
Speaker: Toru Nakayama

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