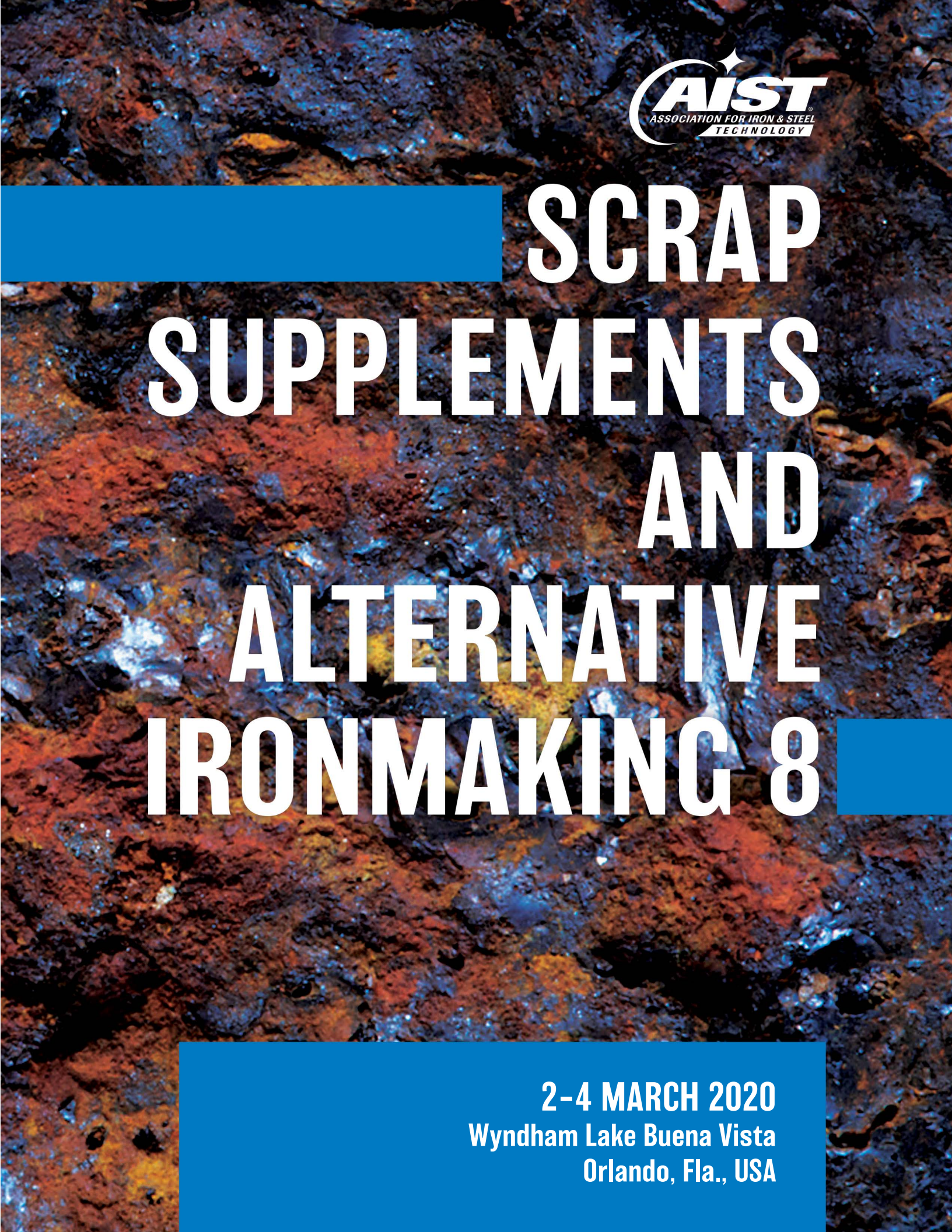

AIST
ASSOCIATION FOR IRON & STEEL TECHNOLOGY
SCRAP SUPPLEMENTS AND ALTERNATIVE IRONMAKING 8
2-4 MARCH 2020
Wyndham Lake Buena Vista
Orlando, Fla., USA

REGISTRATION INFORMATION

FOCUS

Development and application of alternative ironmaking processes to provide virgin iron units to the electric arc furnace (EAF) sector, hot metal to steelmaking vessels, or to process waste oxides in both blast furnace-based and EAF steel plants.

ABOUT THE PROGRAM

This is the eighth in a series of symposia covering scrap substitutes and alternative ironmaking, which originated with a highly successful meeting in Myrtle Beach, S.C., USA, in 1993. This meeting was initiated by the Advanced Technology Committee, which belonged to the Process Technology Division of the Iron & Steel Society (an AIST predecessor). This symposium, which is international in scope and participation, is associated with a high level of activity in research, process and project development, plant construction, and start-up of direct reduction and alternative ironmaking processes. This symposium will focus on the following areas: successful projects/processes, the challenges of struggling processes and those still under development including new approaches, and use of products.

WHO SHOULD ATTEND

Those engaged in the production, sale, and use of direct reduced iron, pig iron and scrap; managers and engineers from electric furnace and blast furnace–based steel companies; suppliers of iron ore, coal and natural gas; and steel company, engineering company, academic and research institute personnel engaged in ironmaking process development.

REGISTRATION

Registration includes a welcome reception on Monday evening, breakfast and lunch Tuesday and Wednesday, a reception on Tuesday evening, and a seminar workbook or flash drive.

AIST MEMBERS		NON-MEMBERS	
US$845	US$945	US$1,090	US$1,190
by 20 January 2020	after 20 January 2020	by 20 January 2020	after 20 January 2020

HOTEL ACCOMMODATIONS

A block of rooms has been reserved at the Wyndham Lake Buena Vista Disney Springs Resort Area. Please call the hotel at +1.800.624.4109 by 8 February 2020 to secure the AIST discount rate of US$159 per night for single/double occupancy plus US$10 resort fee.

PROFESSIONAL DEVELOPMENT HOURS

This course may qualify for up to 15 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 Direct Reduced Iron Technology Committee.

ORGANIZING COMMITTEE

Jan van der Stel, Tata Research IJmuiden; Joe Poveromo, RMI Global Consulting; Angelo Manenti, Metal Consulting LLC; Romain Frieden, Vulcanus Consulting; Thomas Battle, consultant; José Noldin, Lhoist/ABM; Frank Griscom, International Iron Metallics Association; Koji Saito, Nippon Steel & Sumitomo Metal Corp.; and Chris Ravenscroft, Berry Metal Co.

SCHEDULE OF EVENTS

Monday, 2 March 2020

2–4 p.m.
Registration

5–6 p.m.
Reception

Tuesday, 3 March 2020

7 a.m.
Registration and Breakfast

8 a.m.
Overview of Direct Reduction and Alternative Ironmaking Processes and Products
Joseph Poveromo, Raw Materials & Ironmaking Global Consulting
This symposium covers the development and application of alternative (to the blast furnace) ironmaking processes where the objectives include: hot metal processes to feed oxygen converters or electric arc furnaces; direct reduction processes to feed electric arc furnaces or to produce DRI/HBI to feed blast furnaces, oxygen converters, etc.; and direct reduction or hot metal processes to process waste oxides from either EAF mini-mills or fully integrated plants. Accordingly, this introductory lecture will present an overview of these direct reduction and alternative ironmaking processes and the products they produce.

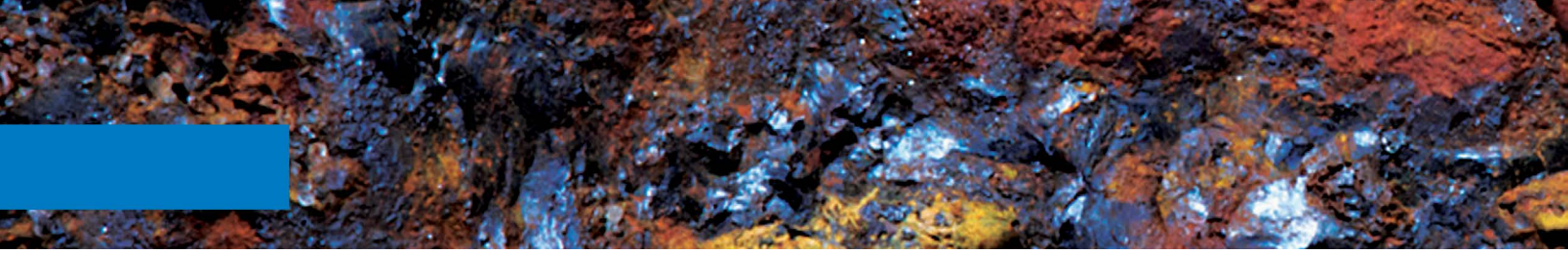
8:30 a.m.
Developing Metallics Strategies for the Future
Jeremy Jones, Continuous Improvement Experts (CIX Inc.)
In the past 20 years, steelmaking metallics have become global in nature. More recently, the trade of merchant hot briquetted iron (HBI) and even direct reduced iron (DRI) has also become global. However, the scrap landscape has been changing over the past 20 years as well. Gradually, residual quantities in steel scrap have been rising. Reuse of this scrap requires greater use of ore-based materials (OBMs) to dilute and offset the rising residual levels. This has led to increased demand for OBMs in the developed regions of the world. The steel scrap and OBM markets have become intertwined and careful analysis is required to develop an effective metallics strategy for the steel plant. Many parameters are dynamic, and it becomes very important to be able to conduct metallics market analysis in a timely manner so that the purchaser can derive the best value and take advantage of discontinuities in the market. The most effective method for evaluation of metallics is value-in-use (VIU), which determines the specific value that different metallics bring to a specific steelmaking operation. This paper will identify some of the factors that are currently impacting the market for steelmaking metallics.

9 a.m.
Not Only the Iron Content: How Scrap Cleaning and Ore Beneficiation Affect the Value of Scrap and DRI
Wenjing Wei, Kobolde & Partners AB
Today's focus on greenhouse gas abatement and efficient resource use has further increased the interest in the production of high-quality steel with minimum use of additives and energy. In this endeavor, the knowledge of raw material properties is of vital importance. For scrap, the presence of foreign material like wood, plastics, stones, sand, oxides, coatings, grease, dirt and an unknown percentage of tramp elements is important. For hot briquetted iron, the metallization degree and percentage of carbon and gangue elements are essential. For pig iron, the silicon content should be considered. Pricing of raw materials is often based on iron content and assumed yield. However, a more thorough analysis would consider various factors such as energy use, slag former use, refractory wear, tramp element control and capital costs. In the situation of a CO_2 tax, this should be included in the evaluation. Important factors are also the properties and quantities of dust and slag. Estimating the value-in-use of a material indicating the value of a material requires advanced models and calculation skills but helps the steelmaker to decide what materials to choose, how to improve the supply chain and make decisions about internal scrap cleaning and refining, as well as on-line scrap analysis. In this paper, the processes to upgrade raw materials with integrated on-line scrap analysis are described and the costs compared to the value of the upgraded products.

9:30 a.m.
Break

10 a.m.
Future Developments of the HIsmelt Technology
Neil Goodman, Smelt Tech Consulting
With the successful operation of the first commercial-scale HIsmelt plant in China and more than 1,000,000 metric tons of hot metal produced to date, Molong and other companies are planning to use the HIsmelt technology to monetize previously unusable resources such as steel plant wastes, contaminated ores, tailings and vanadium titanium magnetites.

10:30 a.m.
Energiron – Autoreducing Briquettes
Ashton Hertrich Giraldo, Danieli & C. SpA
The iron- and steelmaking industry involves numerous metallurgical steps such as lump ore pellets reduction, smelting, refining and others. Each one of these steps implies the generation of undesired wastes, such as iron oxides dust, slag and sludges. Therefore, the metallurgical waste is a common problem in direct reduction and steelmaking plants that affects



the economics and therefore needs to be addressed. Since its establishment, the Energiron direct reduction technology, jointly developed by Tenova and Danieli, characterized itself by setting new limits to the efficiency of its plants, thus allowing a sensible decrease in the iron ore and energy consumption for DRI production. Danieli has recently developed a way to further improve the overall yield of iron- and steelmaking plants, by reusing wastes — such as iron ore and DRI dust — to create a specific iron agglomerating product that can be directly fed into EAFs. The mechanical characteristics of this product allow for easy transportation and storage at the final users' premises.

11 a.m.

One Billion Tons of MIDREX® DRI and Counting

Vincent Chevrier, Midrex Technologies Inc.

Two significant achievements took place in 2018: the accumulated total production of DRI by the MIDREX® process surpassed 1 billion tons, and the annual production of DRI exceeded 100 million tons. Alternative iron units like DRI and HBI are manufactured products with well-defined, consistent chemical and physical characteristics. They are commonly used in an EAF to produce high-quality steel products that could not be made consistently with scrap alone. Blast furnaces can benefit from HBI to increase productivity and lower coke consumption, thus lowering CO_2 emissions. The demand for DRI/HBI is increasing as witnessed by the recent MIDREX plants commissioned in the last few years. This paper will highlight the MIDREX process and the advantages it offers in flexibility, reliability and innovations. As the world's need for metallics increases, DRI/HBI are well poised to reach new milestones.

11:30 a.m.

Finesmelt – New DRI Technology Highlights

Dmitry Solomin, Severstal IIBG

Finesmelt can be classified as a direct reduction process that converts iron ore fines and non-coking coal to metallic iron in the solid state, producing a DRI product without the need for agglomeration.

Noon

Lunch

1 p.m.

Computational Fluid Dynamics Modeling of Direct Reduced Iron Reforming Process

Rui Liu, ArcelorMittal Global R&D – East Chicago

This paper reports on recent progress of computational fluid dynamics (CFD) modeling of the DRI reforming process. An integrated computational model system, including a catalyst packing model, a two-dimensional axisymmetric single-tube model, and a three-dimensional burner-reactor coupled model, is developed to investigate random packing of catalyst particles, multi-component gas mixture flow, heat and mass transfer in tube reactors, as well as burner combustion in a DRI reformer. Upon successful validation of each model, a workflow is established combining all the modules to achieve accurate multi-physics and multi-scale simulations of DRI reforming. An excellent match is obtained in reformed gas temperature, compositions and tube pressure drop between predictions from the model system and plant measurements.

1:30 p.m.

NRRI's Fixed Bed Dynamic DRI Process Simulator

Brett Spigarelli, Natural Resources Research Institute

Shifts to higher-efficiency EAFs have increased demand for a new generation of taconite pellets suitable for making DRI, but much of Minnesota's taconite industry still produces pellets for older blast furnaces. Because bench-scale R&D efforts into upgrading Minnesota's taconite producers have limited applicability at the commercial scale, Natural Resources Research Institute (NRRI) has launched a project aimed at developing a new metallurgical test method called the Fixed-Bed Dynamic DRI Process Simulator that will help bridge this gap and enable the transition to modern pellet production. NRRI will present the final design selected for project execution and provide a project status report.

2 p.m.

Carbon in Direct Reduced Iron: Melting Behavior and Strength

Chris Pistorius, Carnegie Mellon University

DRI produced by gaseous reduction and carburization can have a high carbon content. This work deals with the effect of carbon concentration on the melting behavior and strength of DRI. Results show that the chemical state of the carbon — cementite, graphite or amorphous — has little effect on DRI melting behavior. Strength, however, is affected by carburization and DRI microstructure (phases and porosity). Data from industrial pellets shows that the same iron oxide pellets result in DRI with significantly different strengths. The DRI is weaker than the iron oxide pellets; much of the loss of strength occurs during the first reduction step — from hematite to magnetite. Faster reduction, such as in pure hydrogen, gives severe cracking and poor strength.

2:30 p.m.

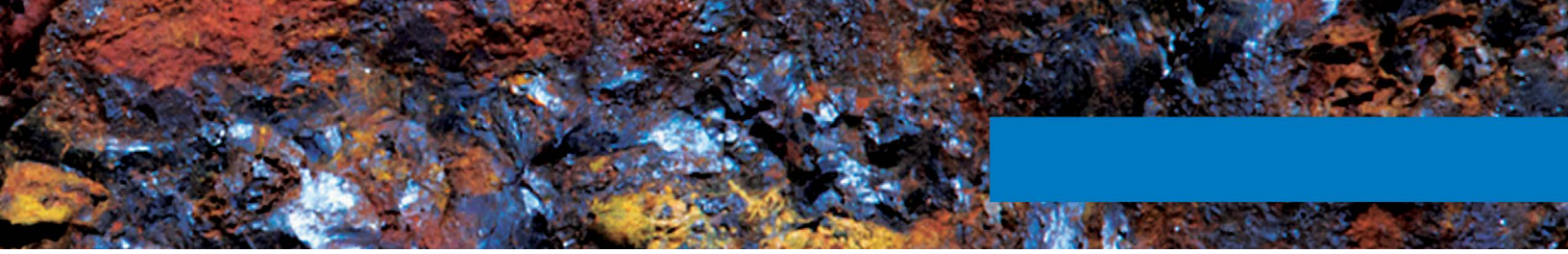
Break

3 p.m.

Enhancing the Use of DRI in Electric Steelmaking

Anup Sane, Air Products

As the use of DRI in electric steelmaking is increasing, some challenges with using this iron source are apparent, including lower yield, higher kWh and transport challenges. This paper



highlights new approaches to enhance the use of DRI in steelmaking. Pre-heating cold DRI during conveyance from the storage to the EAF can have advantages, namely decreased melt time and reduced kWh. A method for pre-heating DRI is discussed. Further, a method to convert DRI to pig/hot metal using combustion is presented that can enable the use of more DRI at the EAF or in the production of pig iron/hot metal at DRI production facilities.

3:30 p.m.

Simulation and Visualization for Electric Arc Furnace and Alternatives

Tyamo Okosun, Purdue University Northwest

Advanced simulation and visualization technologies are increasingly playing a key role for steel manufacturing. These technologies can provide intuitive understandings of complex phenomena and processes, and enable faster and better decision-making for process design, optimization, troubleshooting and training. A steel Manufacturing Simulation & Visualization Consortium (SMSVC) has been formed with the mission to develop and implement innovative technical solutions through the integration of advanced computer simulation and visualization technologies for the value chain of U.S. steel manufacturing. SMSVC research includes electric arc furnace and alternative ironmaking. This presentation will include an overview of SMSVC, the simulation and visualization technologies and methodologies, as well as project examples.

4 p.m.

Investigation on Carbothermic Reduction of Titanomagnetite Iron Ores in Terms of Thermogravimetry and Quadruple Mass Spectrometry

Sung-Mo Jung, Pohang University of Science and Technology

The carbothermic reduction of titanomagnetite (TTM) was investigated from a kinetic viewpoint in the temperature range of 1,000 to 1,150°C employing thermogravimetric analysis and quadruple mass spectrometry. The non-isothermal experiment showed that the reduction of titanomagnetite started at about 900°C and was completed after 1 hour of exposure at 1,150°C. The carbon gasification reaction was activated when the Fe_3O_4 in TTM, wüstite and Fe coexist at the fractional reduction of 0.21, indicating that the Fe-catalyzed nature of Fe was confirmed for the carbon gasification. The activation energy for the reduction in TTM to wüstite was evaluated to be 196.8 kJ/mol, and the reduction stage is believed to be limited by carbon gasification. The present investigation confirmed that the changeover in reaction mechanism might be carried out from carbon gasification to the reduction in wüstite to Fe by CO with increasing the fractional reduction.

5 p.m.

Reception

Wednesday, 4 March 2020

7 a.m.

Breakfast

8 a.m.

Commercialization of the E-Iron™ Nugget Process

John Simmons, Carbontec Energy Corp.

A new process has been developed to convert unpelletized iron ore concentrates or iron-bearing steel mill waste into pig iron–grade iron nuggets using clean, low-cost, renewable biomass as the reductant in the place of coal or coke. A successful pilot plant program produced high-quality iron nuggets utilizing three different iron ore concentrates and three types of biomass. Subsequent tests using steel mill waste as the feedstock also produced high-quality iron nuggets. This paper will present the results of a project that verified the technology, with an 85% reduction in carbon dioxide when compared to the blast furnace; and will detail a new 300,000-metric-tons-per-year production line to be built in Burns Harbor, Ind., USA, which will convert iron-bearing steel mill waste into pig iron–grade iron nuggets.

8:30 a.m.

Flash Ironmaking Technology – Scalable Direct Reduction of Iron-Oxide Using Hydrogen for North America

Chris Ravenscroft, Berry Metal Co.

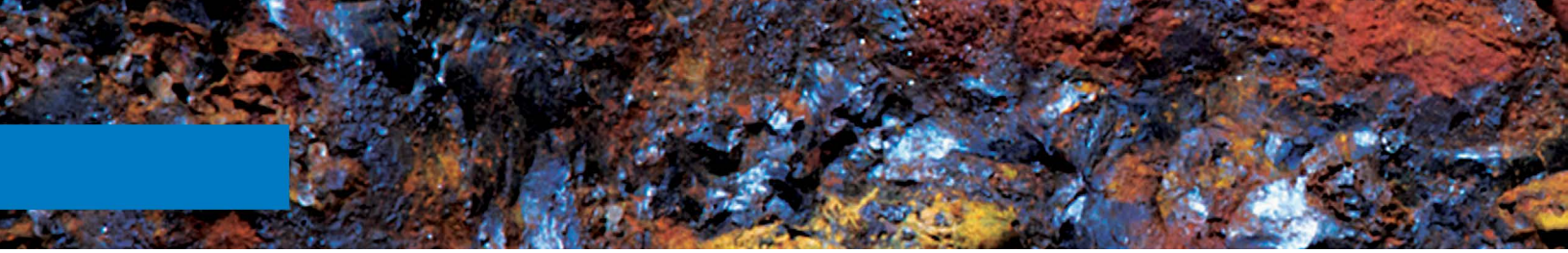
Flash Ironmaking is new direct reduction process that uses hydrogen to reduce iron oxide concentrates (or fines) into a highly metallized DRI product. The process consists of indirect induction heating of iron ore in a falling particle curtain, where the ore is heated to 1,325°C and reduced to metallic iron in 2–10 seconds. The process has been designed to promote increased energy productivity and reduce environmental emissions such as CO_2 emissions. As a scalable DRI process that does not require pelletizing, there are clear commercial advantages for EAF steelmakers, especially in North America.

9 a.m.

The Contribution of Metallics in Global Steel Production

Ludmila Nascimento, Tecnored

The steel industry has faced different challenges regarding environment concerns and quality. Metallics can contribute to overcoming the challenges that continue to face the industry. In this regard, this presentation will introduce Tecnored, a new technology to produce pig iron, which employs a variety of raw materials such as biomass, reducing the CO_2 emitted. Tecnored combines a new iron smelting process together with a low-cost source of sustainable biomass. Tecnored technology, developed at an industrial-scale plant since 2011, achieved the goal of operating with 100% briquettes. This, together with stable and trouble-free operation in a six-month campaign in 2018, provided the assurance that the technology is economically feasible to



move into commercial operation. Tecnored is a low-capital and low-operational-cost technology. Moreover, it can reach a net zero emission by using biomass, contributing to lowering CO_2 emissions within the steel industry.

9:30 a.m.
Break

10 a.m.
Stiff Extrusion – A Complement to Sinter
David Shippee, J.C. Steele & Sons Inc.
The sintering of high-value residuals has taken place for many years. This presentation looks at stuff extrusion as a complementary process to the sinter strands by analyzing material streams and determining which process is best.

10:30 p.m.
New Developments and Technological Trends for Gas-Based DRI Technology: Hydrogen Use and Pig Iron Production Using DRI
Angelo Manenti, Metal Consulting LLC
New developments and technological trends for gas-based DRI technology are flourishing in Europe and North America. This presentation will review European projects currently utilizing a hydrogen-based gas reactor to replace the blast furnace/cokemaking route, which dramatically reduces/eliminates CO_2 emissions for a more sustainable and environmentally friendly steel production process. Turning to trends in North America, discussion will focus on process routes and current plans to use the gas-based DRI module to produce pig iron.

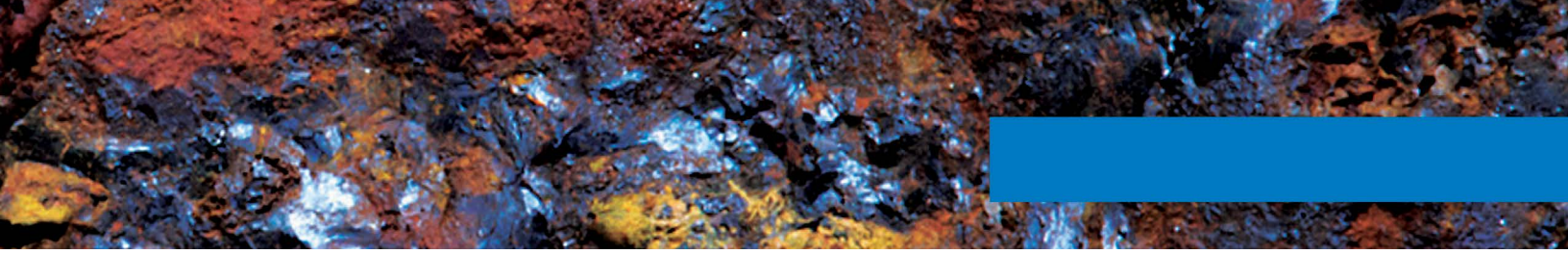
11 a.m.
From Waste Steel to Material: Agile Production Enabled by Additive Manufacturing
Jianyu Liang, Worcester Polytechnic Institute
This presentation will discuss a study conducted by the U.S. Army Research Laboratory and Natick Soldier Research from April 2014 to May 2015. The breakdown of metal waste recipe that simulates wastes generated from the force provider expeditionary 150- and 600-PAX camps is 60% ferrous, 36% aluminum and 4% other metals. The project aims to develop an agile manufacturing process that allows for the reuse of ferrous scrap to produce parts or repairs to ensure the warfighter's in-field readiness. This process integrates the following three manufacturing steps: (1) a scrap sorting and molten steel composition control system; (2) a stereolithography wax injection patterns created for investment casting of mission-critical parts; and (3) a post-process treatment protocol to control the quality of the final cast product. This effort will reduce the military's logistical tail by investigating the feasibility of a field-capable and on-demand manufacturing process, thereby potentially enabling the reuse of waste iron.

11:30 a.m.
Recovery of Iron From Waste Slag Using Carbon-Containing Waste
Samane Maroufi, University of New South Wales
This paper details the use of waste materials including waste plastic and toner as alternative carbon sources for the recovery of iron from industrial slag. Such waste materials consist dominantly of hydrogen and carbon, which are vital elements in the high-temperature metallurgical industries due to their role as reducing agents/carburizers. This paper will discuss the results of an experiment in which industrial waste EAF slag with 29 wt.% FeO content was mixed with plastic and toner in a specific ratio prior to reaction at 1,550°C, and their reduction behaviors were compared with coke.

Noon
Lunch

1 p.m.
HIsarna – A-Low Carbon Steelmaking Technology Development at Tata Steel: Various Roads to CO_2 Reduction
Jan van der Stel, Tata Steel Europe
The HIsarna process can produce hot metal directly from fine iron ore and coal in a single furnace and eliminates the need for coking and ore agglomeration. The process has been under development at Tata Steel in IJmuiden, the Netherlands, since 2009. In 2016, the decision was made to upgrade the HIsarna pilot plant to enable full continuous operation. After completion of the plant modifications in 2017, the focus of the development shifted from process research to the operational aspects like stability, availability and quality, and the development of an operating and maintenance strategy. In addition to the operational aspects, research with the objective to achieve a substantial CO_2 emission reduction continued. The coal used in the HIsarna process was partially replaced with renewable charcoal and the iron ore was partly replaced with recycled steel scrap. Both steps resulted in substantial CO_2 emission reductions. The experiments showed that more than 50% reduction of CO_2 emissions is possible without applying CC(U)S; however, CC(U)S is essential to achieve higher reduction levels such as 80–90%. The HIsarna process with its high CO_2 concentration in the offgas is ideally suited for cryogenic CO_2 separation. It is the intention to install such a plant at the HIsarna pilot plant in IJmuiden. The engineering study is in progress and preparations are made in the plant's offgas system.

1:30 p.m.
Re-Evaluation of Oxygenated Coal-Based Ironmaking Process Considering Environmental Challenges in the Steel Industry
SangHo Yi, POSCO
Coal-based ironmaking processes in integrated steel mills all around the world have been faced with a great challenge toward mitigating CO_2, SOx, NOx and dust emission. This study reviews the utilization of pure oxygen in the ironmaking process as a way to not only improve the process efficiency but also to



lead innovative reductions of harmful emissions. The FINEX® ironmaking process, which has been operated on a commercial scale for more than 10 years, has proved that using pure oxygen instead of air gives significant benefits in this perspective. Introducing less nitrogen in the offgas lowers NOx emission and enables FINEX tail gas after CO_2 removal to be injected to coke oven battery as CCU (carbon capture and utilization). Throughout long-term operation, pure oxygen is a necessity, not a luxury or cost escalator, in order to address environmental challenges in coal-based steel mills.

2 p.m.

COURSE50: Innovative Ironmaking Process Project Using Hydrogen

Yutaka Ujisawa, Nippon Steel Corp.

Since 2008, four Japanese blast furnace steelmakers and one engineering company have been working on an innovative ironmaking process project named COURSE50. The main research activities of the project consist of two parts. One is the development of hydrogen utilization technology for iron ore reduction using coke oven gas that contains a large amount of hydrogen. The other is the development of CO_2 capture technology from blast furnace gas by unused wasted heat within steel works. By using these major technologies, the project aims to cut CO_2 emissions from steel works by 30%. The project has successfully completed Step 1 (2008–2012), the development of basic technologies; and Step 2 (2013–2017), the development of comprehensive technologies. As a result, the carbon consumption in the blast furnace was reduced by 10% by the developed reaction-controlling technology. High-performance chemical absorption and physical adsorption methods were also developed to reduce 20% of CO_2 emitted from steel works.

2:30 p.m.

The Future of Primary Operations in Steelmaking in the Light of CO_2 Emission Reduction

David Rodriguez, Paul Wurth S.A.

The BF/BOF steelmaking route creates about 1,650 kg of CO_2 per ton of hot-rolled product. In Europe, the current benchmark for the Emission Certificates Trade Scheme is fixed at 1,328 kg/ton of steel product. Purely scrap-based EAF steel has huge potential to reduce CO_2 emissions; however, scrap availability and the need for virgin iron in quality steel products limits its share in overall steel production. Paul Wurth and partners see realistic opportunities for reaching nearly climate-neutral steelmaking within a few decades. The basis would be direct reduction of iron ore products by hydrogen that will be produced from steam by a highly efficient solid oxide electrolysis. The electric energy for the electrolytic process will come from non-fossil sources. This paper discusses scenarios of transforming integrated steel plants into near- to carbon-free production facilities. It also shows ideas and practical ways to reduce CO_2 emissions from BF ironmaking during the transition period.

3 p.m.

Break

3:30 p.m.

Hydrogen Plasma Smelting Reduction of Iron Ore – Are We on the Verge of Future Green Steel Production?

Michael Zarl, University of Leoben

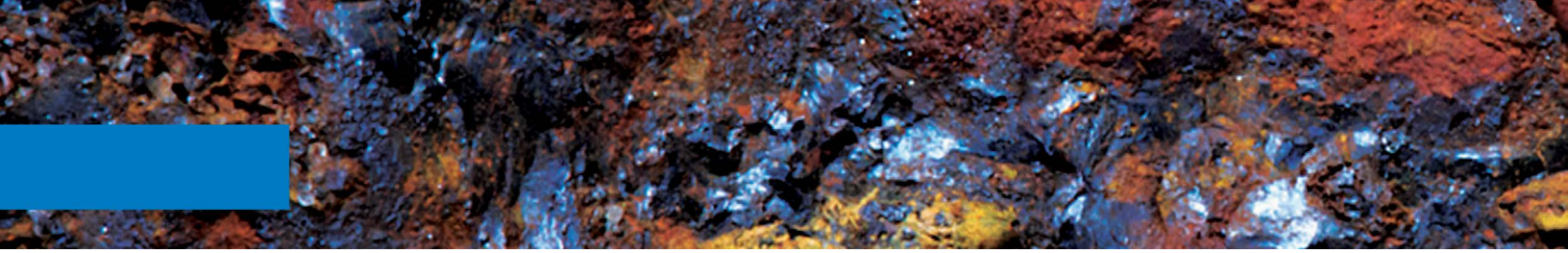
Since the discovery of fire, humankind steadily developed into a society that is burning things to gain energy. In former times, it was wood; nowadays the focus is on fossil fuels. This method of energy production has moved the industry a big step forward. Unfortunately, these steps in development also led to the crossroads the industry is facing now. The accompanying gas produced via the usage of fossil fuels is CO_2, which is linked to global warming and the connected climate change. The severe consequences of the increase of CO_2 in the atmosphere are already observable. The steel industry contributes around 6% of the worldwide anthropogenic emissions of CO_2. Therefore, it is clear that new methods of steel production need to be investigated. One promising technology is hydrogen plasma smelting reduction (HPSR), which not only produces steel without the usage of fossil fuels but also is a one-step process from iron ore toward steel. In this study, the current state of development of the HPSR process will be shown. Also the basic concept and the thermodynamics and kinetics will be briefly explained. Furthermore, some detailed information about the field of upscaling research in connection to the arc geometry of the plasma will be presented.

4:00 p.m.

VSB Charcoal-Based Blast Furnace Operation With High Productivity and Low Reducing Agent Ratio

Paulo Almeida, Vallourec Soluções Tubulares do Brasil S.A.

Vallourec Soluções Tubulares do Brasil S.A. (VSB) has a charcoal-based blast furnace that operates at a high level of performance. Since charcoal is a renewable energy source, its use reduces the environmental impact. The concentration of CO_2 in the atmosphere is balanced by the carbon cycle: from the removal of CO_2 from the atmosphere by eucalyptus trees to the emissions in hot metal production. Part of charcoal production is made by CARBOVAL, a continuous carbonization process that produces high-quality charcoal and can use part of the wood volatiles for electricity generation. This paper describes a general view of the charcoal ironmaking process and the practices applied to achieve high productivity and low reducing agent ratio in the blast furnace operation.



4:30 p.m.

Fluidized Bed-Based Direct Reduction With Hydrogen, Revisited

Tobias Stefan, Outotec (Canada) Ltd.

Almost 25 years ago, Lurgi, LTV Steel and Cleveland-Cliffs commenced the engineering and construction of the world's first hydrogen-based direct reduction plant applying fluidized bed technologies — the Circored Plant at Point Lisas, Trinidad. Given the recent increasing interest in hydrogen-based steelmaking, it is perhaps time to review the process fundamentals of hydrogen-based direct reduction. The presentation will also discuss the history and challenges of fluidized bed–based direct reduction, in particular "sticking" and how to avoid it. The features and performance of the Circored plant in Trinidad will also be introduced, and an outlook for the technology to assist decarbonizing steelmaking will be provided.

5 p.m.

Conference Adjourn