



# The Making, Shaping and Treating of Steel: 101

12-13 September 2018

The DoubleTree by Hilton Hotel & Suites  
Pittsburgh Downtown  
Pittsburgh, Pa., USA

*Featured Plant Tour: Ellwood Mill Products*



## About the Program

The modern production of steel has evolved over many centuries, with many technological improvements during the last 25 years. The making, shaping, and treating of steel are critical to product design, application, cost and performance. It is essential that employees involved in producing iron and steel, operating rolling mills, supplying equipment and materials to the steel industry, designing products, engineering, sales, and construction have an understanding of what steel is, how it is produced, and the effects of making, shaping and treatment on the final performance of steel products. This course provides essential knowledge to those who do not have a technical background in metallurgical engineering, rolling or quality-added downstream processing but have a need to understand more about the technical aspects of steel manufacturing, properties and applications.

## Who Should Attend

Iron and steel industry production workers and supervisors, equipment and materials suppliers to the steel industry, steel marketing and sales personnel, machine shop personnel, quality control technicians and supervisors, and component designers and engineers.

## Professional Development Hours

This course may qualify for up to 10.25 Professional Development Hour (PDH) credits. Each attendee will receive a certificate listing the quantity of PDH credits earned for the course. This course is not approved for PDH credits in New York, Florida, North Carolina and Oklahoma.



**Featured Plant Tour**  
Ellwood Mill Products

## Registration Includes

Registration includes Wednesday and Thursday breakfast, lunch and continuous breaks, Wednesday reception; plant tour with bus transportation; choice of *The Making, Shaping, and Treating of Steel*® CD-ROMs, which include the following volumes from the 11th edition: *Ironmaking, Steelmaking and Refining, Casting, Flat Products, and Long Products*; and a course workbook or flash drive including presentations.

## Hotel Accommodations

A block of rooms has been reserved at The DoubleTree by Hilton Hotel & Suites Pittsburgh Downtown. Please call the hotel at +1.800.222.8733 by 21 August 2018 to secure the AIST discount rate of US\$139 per night for single/double occupancy.

### AIST Members

**US\$845**

by 1 August 2018

**US\$945**

after 1 August 2018

### Non-Members

**US\$1,060**

by 1 August 2018

**US\$1,160**

after 1 August 2018



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# Schedule of Events

## Wednesday, 12 September 2018

7 a.m.  
Registration and Breakfast

8 a.m.  
**Overview of the Making, Shaping and Treating of Steel and History of the Industry**

The first session provides an overview of the technologies used to produce steel today and the evolution of world steel production. The general chemistry of steel is introduced to help illuminate the principles of iron- and steelmaking. This session ends with a brief history of metals production and an introduction to early iron- and steelmaking processes.

9 a.m.  
Break

9:15 a.m.  
**Ironmaking and Steelmaking**

This session explains the techniques used to produce iron and steel from raw materials, including ores and recycled materials. Processes reviewed include the blast furnace, direct reduction, ferrous scrap production, basic oxygen steelmaking and electric furnace steelmaking. The important gas, slag and metal reactions will be explained, as well as the important impacts of the processes on energy and the environment. The effects of the different processing techniques will be explained, and future iron- and steelmaking developments will be explored.

10:30 a.m.  
Break

10:45 a.m.  
**Ironmaking and Steelmaking**  
Basic, acid, and neutral slags and refractories will be introduced, along with reasons for using each. The interaction of refractories and slags with metal will be explored, including methods of reducing refractory wear and quality improvements. The use of ladle metallurgy treatment and furnaces will be explained. The principles behind other secondary steelmaking techniques will be explained, including degassers and argon oxygen decarburization steelmaking for the production of high-quality steels such as ultralow-carbon and stainless steels. Inclusion formation, modification and removal will be discussed.

Noon  
**Lunch and Depart for Plant Tour of Ellwood Mill Products** 🍌

5 p.m.  
Reception

## Thursday, 13 September 2018

7 a.m.  
Breakfast

8 a.m.  
**Solidification of Steel, Casting Defects and Prevention, and Continuous Casting of Steel**

The importance of solidification on final product quality will be discussed. The history and evolution of continuous casting processes from billets, blooms, and slabs to near-net-shape processes for thin slabs, strip, beam blanks and wire will be reviewed. The effects of tundish and mold metallurgy on product quality will be explained, along with casting defect causes and methods of prevention.

10 a.m.  
Break

10:15 a.m.  
**Introduction — Hot-Rolled As-Rolled Products and Product Applications**

The various end products of steel manufacturing will be introduced. The requirements and methods to produce these products will be reviewed.

Noon  
Lunch

1 p.m.  
**Hot Rolling — Reheat, Hot Rolling, Incoming and Hot Rolled Defects**

This section will provide an introduction to the theory of rolling and the effects of deformation processing on product quality and properties. The importance of the reheating process and how it affects subsequent rolling and quality will be discussed. Billets and blooms will also be reviewed.

3 p.m.  
Break

3:15 p.m.  
**Steel — Types, Mechanical Properties, Tests and Consistency**

Characteristics, applications and mechanical properties of steel alloys and grades will be explored. The effects of different alloying elements on steel manufacturing and final properties will be explained. An introduction of the methods of testing the properties of steel — including tensile, toughness and fatigue testing — will lead into discussions of the importance of melting, casting, rolling and forming on the final mechanical properties. The importance of selecting alloys and processing routes for specific engineering applications to achieve desired properties will be explained.

## Schedule of Events (cont'd)

4 p.m.

### Downstream Processing — Cold Rolling, Annealing and Coating

Steel finishing techniques, including heat treating and coating, will be reviewed. Basic steel heat treatment concepts of quenching, tempering, case hardening and in-process annealing will be introduced, along with the effects they have on steel microstructure and properties. Surface coating techniques, including galvanizing and other coatings, will be discussed.

5 p.m.

Conference Adjourn

## Instructors



### Frank Fonner

director of quality and metallurgical engineering, NLMK USA, Farrell, Pa., USA



### Bryan Webler

assistant professor, Materials Science and Engineering Department, Carnegie Mellon University, Pittsburgh, Pa., USA

Fonner began his career in the steel industry in July 1981, joining then Jones & Laughlin (J&L) Steel Corp. in Aliquippa, Pa., USA, after earning his B.S. degree in metallurgy from The Pennsylvania State University in May 1981. He worked for J&L Steel (subsequently LTV Steel) for 13 years, holding quality, maintenance and operating positions in the Tin Plate Department at the Aliquippa Works. In 1994, he joined the staff of the Association of Iron and Steel Engineers (AISE) in Pittsburgh, Pa., where he became the editor-in-chief of *Iron and Steel Engineer*, the monthly journal of AISE. In 2003, he joined Duferco Farrell Corp. as manager of process and product quality. In 2010, Duferco Farrell was acquired by NLMK of Lipetsk, Russia, and NLMK USA was formed by joining the Duferco Farrell plant in Farrell, Pa., with the Beta Steel plant in Portage, Ind., USA. In addition to holding a B.S. degree in metallurgy, he earned an M.B.A. from the Katz Graduate School of Business at the University of Pittsburgh in August 1987.

Webler is a faculty member in the Center for Iron and Steelmaking Research at Carnegie Mellon University (CMU). He received a B.S. degree in engineering physics from the University of Pittsburgh in 2005 and an M.S. degree (2007) and Ph.D. (2008) in materials science and engineering from CMU. From 2008 to 2013, he was a senior engineer in the Materials Technology Department of the Bettis Atomic Power Laboratory. Webler joined CMU in 2013. His research interests are primarily in the reactions between steels and their environments, both during processing and in service. Webler has projects studying inclusion evolution during steel processing, high-temperature oxidation of steels and other alloys, corrosion of stainless steels, and microstructure evolution during additive manufacturing of steels. He also teaches classes on computational thermodynamics and corrosion of metals. He was also awarded the Kent D. Peaslee Junior Faculty Award from the AIST Foundation in 2015.

