



# THE MAKING, SHAPING AND TREATING OF STEEL: 101

— A PRACTICAL TRAINING SEMINAR

9–12 SEPTEMBER 2013 | SHERATON STATION SQUARE HOTEL, PITTSBURGH, PA., USA

## MONDAY 9 SEPTEMBER 2013

4 p.m.  
Registration

## TUESDAY 10 SEPTEMBER 2013

Presented by

**JEREMY A.T. JONES**  
VP process services, Tenova Core

7 a.m.  
Continental Breakfast and Registration

8 a.m.  
**OVERVIEW OF THE MAKING, SHAPING AND  
TREATING OF STEEL AND HISTORY OF THE  
INDUSTRY**

The first session overviews 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.

10 a.m.  
Break

10:15 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.

Noon  
Lunch

1 p.m.  
**SECONDARY STEELMAKING, LADLE METALLURGY,  
SLAGS AND STEEL PLANT REFRACTORIES**

Basic, acid and neutral slags and refractories will be introduced, along with reasons for using each. The interaction of refractories and slags with the 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, including ultralow-carbon and stainless steels. Inclusion formation, modification and removal will be discussed.

3 p.m.  
Break

3:15 p.m.  
**SOLIDIFICATION OF STEEL — CONTINUOUS  
CASTING, DEFECTS AND PREVENTION**

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.

5 p.m.  
Reception

**WEDNESDAY**  
**11 SEPTEMBER 2013**

*Presented by*

**ROBERT E. GREUTER**

*director services, Long Product – Services USA, Danieli Corp.*

*7 a.m.*

Continental Breakfast

*8 a.m.*

**INTRODUCTION — END PRODUCTS**

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

*9 a.m.*

Break

*9:15 a.m.*

**ROLLING — STEEL DEFORMATION PROCESS**

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.

*Noon*

Lunch

*1 p.m.*

**STEEL — TYPES AND PROPERTIES**

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.

*2:30 p.m.*

**CLASSIFICATION OF DEFECTS**

A review of defects in hot and cold formed products will include their origin, how they adversely affect final products and how to prevent them.

*3:45 p.m.*

Break

*4 p.m.*

**DOWNSTREAM PROCESSING**

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 coating will be discussed.

**THURSDAY**  
**12 SEPTEMBER 2013**

*7 a.m.*

Continental Breakfast

*8 a.m.*

**PLANT TOUR OF TMK IPSCO KOPPEL TUBULARS CORP., KOPPEL AND AMBRIDGE PLANTS**

*Noon*

Return From Tour and Adjourn

