

# TMS 2009

138th Annual Meeting & Exhibition

February 15-19, 2009

Moscone West Convention Center  
San Francisco, California, USA

## Injection Phenomena in the PS Converter - The Teachings of J. Keith Brimacombe and His UBC Research Team

Short Course • Wednesday, February 18 • 8:30 a.m. to noon

*Free to TMS 2009 Annual Meeting Attendees*

### Scope

Topics to be covered include the fundamentals of fluid dynamics (applied to gas injection) including compressible flow; an overview of the teachings of Keith Brimacombe and his team on the injection phenomena in conventional single-pipe tuyere injection (bubbling and jetting flow regimes, gas penetration into the bath, slopping and splashing with mouth accretion, tuyere accretion growth with tuyere blockage and punching); the concept of "high pressure" or sonic injection including a review of the industrial trials from the '80s in North America; and a presentation on the concepts, trials and implementation of concentric injection (a.k.a. shrouded injection) in copper and nickel converters, a technique that was also promoted by Keith Brimacombe. A good number of theoretical notions will be covered and solutions to calculate flow conditions in tuyeres and injectors will be presented. All course notes will be made available to participants in an electronic format. *All at no charge!*

### Tentative Outline

1. Introduction to Fluid Dynamics
  - a. Definitions
  - b. Compressible Versus Incompressible Flows
  - c. Continuity and Momentum Equations
  - d. Sonic Flow
2. Single-Pipe Tuyere Injection
  - a. Background - Bubbling Versus Jetting Regime
  - b. Injection Under Bubbling Regime
  - c. Injection Under Jetting Regime
3. Shrouded Sonic Injection
  - a. Shrouded Injection Fundamentals
  - b. Trials and Implementation in Cu and Ni Converters
  - c. Shrouded Injector Design
  - d. Shrouded Injector Modes of Operation

### Instructors

**Joel Kapusta**, Air Liquide

**Greg Richards**, Teck Cominco Metals Ltd.

### For More Information

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Web: [www.tms.org/annualmeeting.html](http://www.tms.org/annualmeeting.html) (Click on Networking Events icon.)

### Other Peirce-Smith Converting Centennial Symposium Related Events

#### Peirce-Smith Converting Reception

Sunday from 6 - 8 p.m.

#### Program Session Listing

2/16 a.m. Historical Foundations/Refractory Practices

2/16 p.m. Operational Aspects

2/17 a.m. Injection Techniques, Modeling and Process Control

2/17 p.m. New Converting Technologies

#### Wednesday Program

Starting at 2 p.m., there will be 30-minute technico-commercial presentations by each company presenting their new converting technologies. Tentatively, the following companies will participate:

- Outotec (flash converting)
- Ausmelt (Top Submerged Lance (TSL) technologies)
- Xstrata Technologies (Top Submerged Lance (TSL) technologies)
- Others TBD - (more conventional type of converters)

The session will include presentations and an open discussion forum under the guidance of a neutral moderator. Delegates attending the forum will be able to ask questions to the representatives of the technology suppliers as well as bring forward their own views or experience with any other converting technologies.