9808 Magnetic Gate - System for Molten Metal Flow Control

Benefits

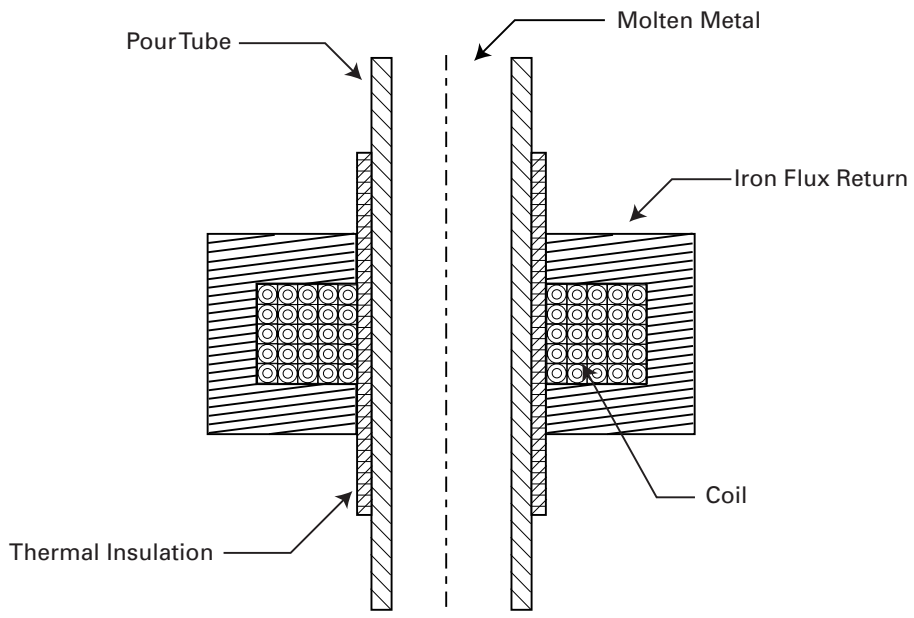
- Improved metal quality by reduced turbulence, reoxidation, and impurity entrapment
- Net energy savings of 2 x 1012 British thermal units (Btu) annually through improved yield
- Using an electromagnetic flow control device for continuous casting, the projected savings are several dollars per ton of steel produced

Applications

The largest area of opportunity for the MAG-GATE™ system is in continuous casting applications in steel production.

Electromagnetics offer many advantages for better control of the molten steel

Over 80 percent of all of the world's yearly steel production, or approximately 650 million tons, is produced by the continuous casting process. The American steel industry produces approximately 100 million tons of steel annually by this process. The maturing of continuous casting in the U.S., the emphasis on "clean steel," the rise of ladle and tundish metallurgy, the trend to higher production machines, and the need for precise control in innovative casting processes have all increased the importance of flow control in modern continuous casting. The Steel Manufacturers Association and the American Iron and Steel Institute have recognized this need for improved active flow control as part of their Steel Industry Technology Roadmap. Active flow control can increase productivity, and in a continuous casting machine the control of the flow from the tundish to the mold is the area of critical importance. Concept Engineering Group, Inc. is developing a magnetic gate (MAG-GATE™), and an electromagnetic system for active molten metal flow control.



The basic concept of the MAG-GATE™ system.

Project Description

Goal: To develop an electromagnetic flow control unit that improves quality and productivity of the continuous casting process.

The DC Axisymmetric Flow Control Device has the potential to overcome the disadvantages of high-frequency, high-power electric currents that have been tried previously. The device's configuration allows it to be used around conventional, ceramic pouring tubes.

Progress and Milestones

Phase I

- Project start date, June 1999.
- Design and construction of the prototype MAG-GATE™ is complete.
- Preliminary tests with Wood's metal are complete.
- Numerical modeling to optimize magnetofluidynamic processes is complete.
- Building and testing a beta unit in a first industrial application is underway.

Phase II

- Revise MAG-GATE™ system and conduct field trials.
- Bring unit to full commercialization.
- Estimated project completion date, September 2002.

Total Project Cost/Duration

$770,000/three years.

Research Organization

Concept Engineering Group, (CEG) Incorporated
Verona, PA

Industry Participants

Bethlehem Steel Corporation
Bethlehem, PA

SMS-DEMAG
Pittsburgh, PA

USX Corporation -
U.S. Steel Group
Pittsburgh, PA

For additional information,

Concept Engineering Group, (CEG) Incorporated
Rich Nathensen
ceg@air.spade.com

American Iron and Steel Institute
Joe Vehec
aisiap@aol.com