9925 Optimization of Post Combustion in Steelmaking

Benefits

- Potential savings to both the electric arc furnace (approximately $20 to $60 million) and the basic oxygen furnace (approximately $30 to $60 million) steel production
- Increased productivity as a result of reduced energy consumption and decreased melting time in the electric arc furnace

Applications

Successful completion of this project will result in the optimized use of post combustion in the electric arc furnace and in the basic oxygen furnace, thus increasing productivity and reducing production costs.

Improvements in the electric arc furnace and basic oxygen furnace will lead to increased efficiency of steelmaking furnaces employing post combustion

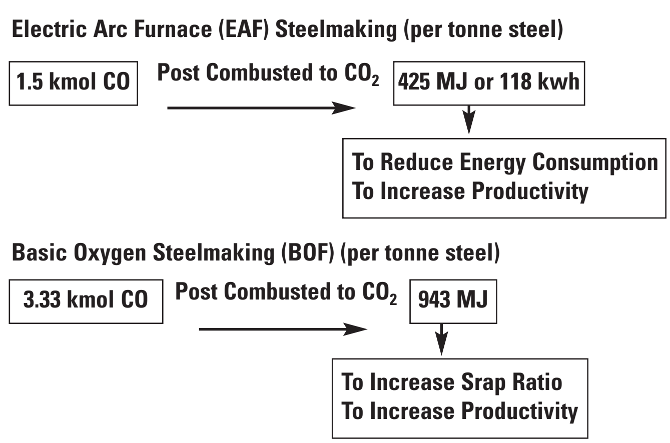
Currently, a majority of the furnaces used for molten steel production employ post combustion technology to transfer heat to the molten steel bath. For typical electric arc furnace and basic oxygen steelmaking furnace, a significant amount of carbon monoxide (CO) is available during the steelmaking process. Combustion of the available CO to carbon dioxide (CO_2) can release heat energy above the molten steel bath. Efficient transfer of the heat energy from the post combustion gases to the molten steel bath can reduce steel production costs and improve productivity.

Optimization of the post combustion process in its application to molten steel production furnaces is the major objective of this project being conducted by the American Iron and Steel Institute (AISI) Technology Research Program.

If post combustion practices can be made more efficient, there is a potential to reduce steelmaking costs in the range of $50 to $100 million annually. Additionally, furnace productivity would be improved.

Optimization for Post Combustion

Benefits of Post Combustion



Schematic depicting the benefits of post combustion.

Project Description

Goal: To combine the understanding of the chemical reactions with computational fluid dynamics (CFD) to optimize post combustion in electric arc and basic oxygen furnaces. The reaction of CO_2 with scrap will be measured and the reaction in a scrap pile will be modeled. This de-post combustion reaction and others will be combined with CFD to compute post combustion in an electric arc furnace or basic oxygen furnace.

Progress and Milestones

This three-year project was initiated in October 1999. Preliminary research in which the experimental technique for studying the de-post combustion reactions has been developed. CFD modeling has been done to show that CFD can give useful results.

- Complete university-based model development in cooperation with steel companies.
- Apply technology in steel mill(s) and quantify range of benefits.
- Completion of project: October 2002.

Total Project Cost/Duration

$558,000/three years

Research Organization

Carnegie Mellon University
Department of Materials Science
& Engineering
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Industry Participants

Center for Iron & Steelmaking
Research
Pittsburgh, PA

IPSCO Steel
Muscatine, IA

Ispat Inland Incorporated
East Chicago, IN

North Star Steel - Cargill,
Incorporated
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