# 9851 An Optical Sensor for Post-Combustion Control in Electric Arc Furnace Steelmaking

## Optical sensing of high temperature, high velocity, particle-laden gas streams facilitates real-time control

Real-time, off-gas composition information combined with other furnace parameters is key to optimizing Electric Arc Furnace (EAF) operations. Accurate and timely composition data integrated with EAF operations will reduce electricity and fuel consumption while increasing furnace throughput. The laser-based optical sensor being developed in this project provides a significant advance over current extractive probe technology, and will be integrated with a neural-net process control system to optimize furnace operation. A side benefit of the project will allow the EAF industry to reduce carbon monoxide emissions, a key environmental concern.

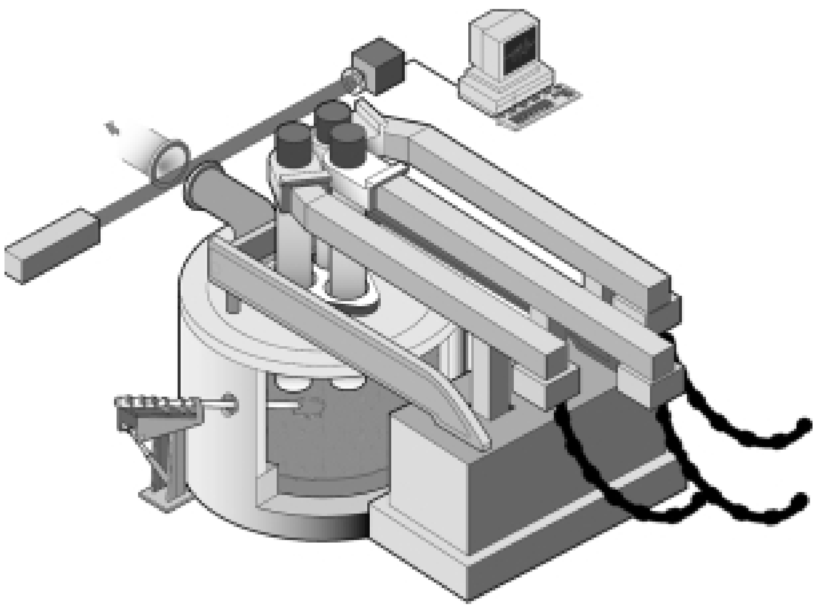

Illustration of a laser-based optical sensor with EAF and off-gas stream.

**Benefits**

Reducing the variability of the yield strength of HSLA steels will yield:

- Savings of $0.32 per ton of steel produced
- Reduced electricity consumption of 9 kilowatts per ton of steel
- Increased furnace throughput of 10%
- Reduced carbon monoxide emissions

**Applications**

The optical sensor technology could be applied to most EAFs in the U.S., and may be adapted to other high temperature industrial applications where carbon monoxide and carbon dioxide concentrations are key process variables. The electric arc furnace process accounts for nearly half of the annual steel production in the U.S.; this percentage is on the rise.

**Project Description**

**Goal:** To develop an optical sensor for EAF steelmaking based on an instrument providing real-time measurement of off-gas temperature, carbon monoxide, carbon dioxide, and water vapor concentrations in the furnace off-gas determined by absorption spectroscopy. The remote-sensing optical instrument will be based on tunable infrared-laser technology, and will provide input signals for control and optimization of oxygen usage and post-combustion. This new technology will also address needs for improved energy utilization and the development of automated process controls.

**Progress and Milestones**

- Project start date, January 2000.
- Complete initial optical sensor field trial, October 2000.
- Complete construction of optimized prototype sensor, April 2001.
- Complete long-term field trials of sensor system, August 2002.

**Total Project Cost/Duration**

$2,191,000/33 months.

**Research Organization**

Sandia National Laboratories
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**Industry Participants**

Georgetown Steel Corporation
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