Development/Demonstration of an Advanced Oxy-Fuel-Fired Front-End System

Oxy-gas-fired front-end technology promises significantly reduced energy usage

The glass industry is widely recognized as one of the most energy-intensive manufacturing industries in the United States. Of this energy use, natural gas accounts for approximately 80 percent. It is one of the largest costs in the manufacture of glass products, particularly considering the escalation of natural gas prices since the beginning of the decade. To reduce manufacturing costs, the glass industry has taken measures to improve its energy efficiency over the years. The implementation of oxy-fuel-fired furnaces and a host of new generation burners have yielded much improved furnace energy efficiency and productivity. However, with the improved efficiency at the back end of the furnace, the front end now, in many cases, uses the most energy in glass production, and few innovations have changed front-end technology in the last 50 years. To address this, two glass companies and two leading suppliers formed a consortium to develop and demonstrate a new technology for the front end of the furnace in multiple glass industry sectors.

Oxy-gas-fired front-end technology promises to significantly reduce natural gas consumption in the overall glass manufacturing process, lowering front-end energy usage by up to 65 percent. This technology will work with current production technology or can be systematically integrated into the development of advanced melting systems.

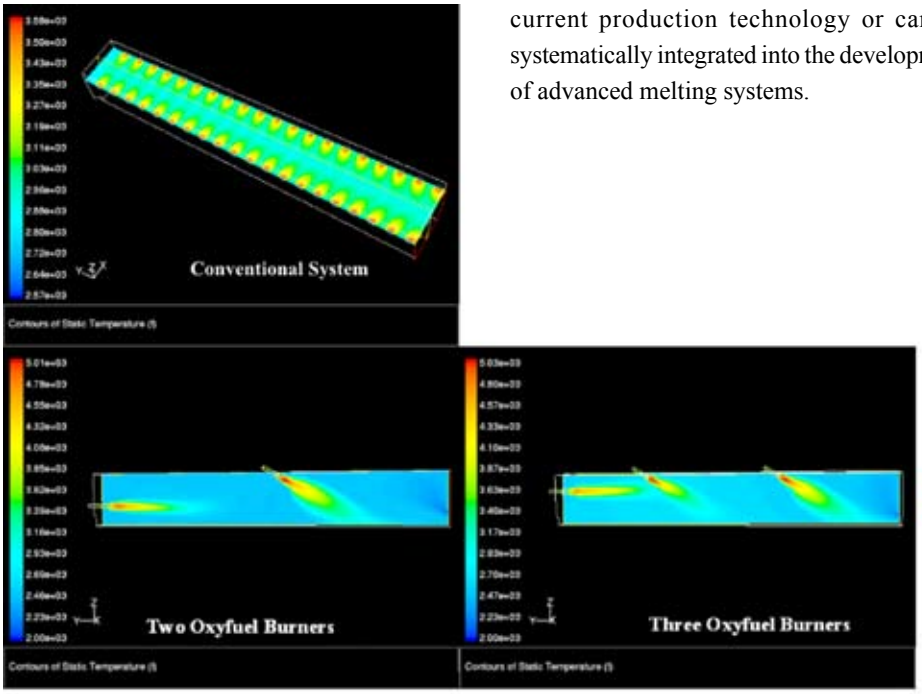
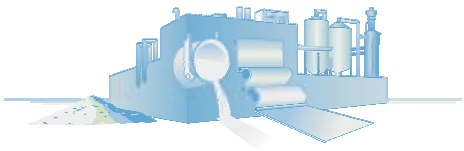


Figure 1 – Comparison of Conventional Technology Versus Oxy-Fuel Fired Front-End System



Benefits for Our Industry and Our Nation

- Up to 65 percent reduction in front-end energy usage
- Up to 65 percent reduction in CO_2 emissions

Applications in Our Nation's Industry

Multiple sectors of the glass industry would benefit from new front-end technology, in particular fiber, lighting, television, and container glass. Industrial adoption of this new technology has the potential for significantly reduced energy usage in the front-end of the furnace and significantly improved overall efficiency.

Project Description

Goal: To develop an oxygen combustion front-end technology that delivers high energy efficiency, improved glass quality, and robust environmental performance.

A conventional front-end system typically uses an air-gas firing system. The air and gas are mixed and then passed through a system of pipes to a large number of burners. These systems suffer from poor energy efficiency because safety concerns require that the air-gas mixture not be preheated. Additionally, the large number of burners requires a network of piping and control systems, which represents a significant capital investment.

This project intended to 1) develop burner systems that can be integrated into an operating front-end system; 2) develop and test a firing system that will reliably meet the needs for front-end system operations with minimum capital costs; 3) field test the firing system(s) to obtain information on controllability, durability, and other criteria; 4) demonstrate the technology on a production front-end system with over 20 firing zones to prove the various benefits; and 5) spread the technology to other sectors of the glass industry.

Progress and Milestones

The project started in September 2003.

Project partners designed and modeled an oxy-fuel front-end burner system, developed an oxy-fuel combustion system for integration into the front end, performed computer modeling on integration, and conducted multi-burner tests on a lab forehearth system.

Project partners conducted field tests of single- and multi-burner operations, then conducted a field evaluation of a production forehearth/channel.

Project partners designed and engineered a field demonstration system; modeled performance and glass quality; prepared a demonstration site; installed the system on a fiberglass front end; and demonstrated the technology. While minor technical issues have been encountered, the technology has been in operation for over 18 months in a commercial plant with significant energy savings.

Commercialization

The partners intend to adapt the technology for use in as much of the glass industry as possible. Limited modifications and field trials will prove the technology's production worthiness for each candidate sector of the industry.

The technology will be commercialized through licensing arrangements on a case-by-case basis. Each licensing agreement will specify the amount of technical support and consultation involved in the implementation and operation of the technology.

Project Partners

Owens Corning
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Osram-Sylvania, Inc.
Exeter, NH

BOC Gases
Maumee, OH

Combustion Tec/Eclipse
Rockford, IL

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A Strong Energy Portfolio for a Strong America

Energy efficiency and clean, renewable energy will mean a stronger economy, a cleaner environment, and greater energy independence for America. Working with a wide array of state, community, industry, and university partners, the U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy invests in a diverse portfolio of energy technologies.

U.S. Department of Energy
Energy Efficiency and Renewable Energy
Bringing you a prosperous future where energy is clean, abundant, reliable, and affordable

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