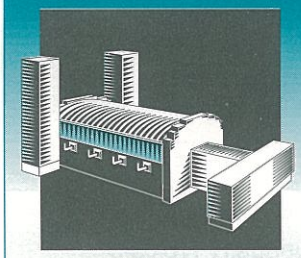


OEAS Technology for Sideport Furnaces

A GLASS INDUSTRY VISION:

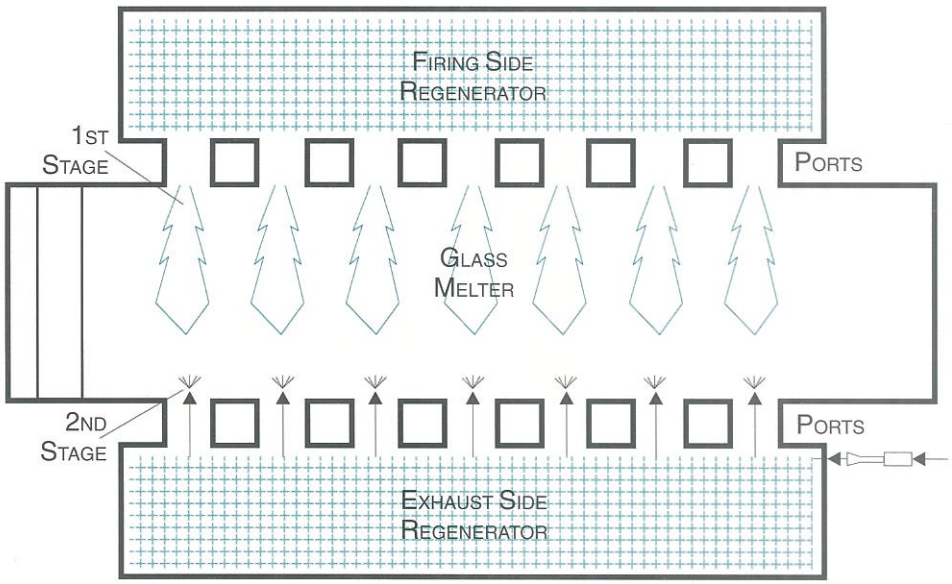
ONGOING RESEARCH PROJECT

Opportunity for Industry

Oxygen-Enriched Air Staging (OEAS) technology for sideport furnaces offers the glass industry important advantages in the face of increasingly restrictive regional emissions regulations. Currently, regenerative glass melters use very high air-preheat temperatures, which result in extremely high NO_x levels. While there are no federal regulations on NO_x at this time, these melters are increasingly being placed under strict regional regulations. To enable glass producers to meet these regulations, the OEAS project is working to reduce the NO_x emissions from regenerative sideport glass melting furnaces from 10 lbs. per ton of glass produced to below 3 lbs. per ton. Without such a cost-effective solution, companies may be forced to shut down additional facilities.

OEAS technology is beneficial to the glass industry because it will ensure:

- Reduced waste
- Energy savings
- Reduced emissions
- Reduced costs



Oxygen-Enriched Air Staging:
Technology that combines oxygen enrichment with air staged combustion for endport and sideport glass furnaces.

Project Partners

Office of Industrial Technologies
U.S. Department of Energy
Washington, D.C.

Institute of Gas Technology
Chicago, Illinois

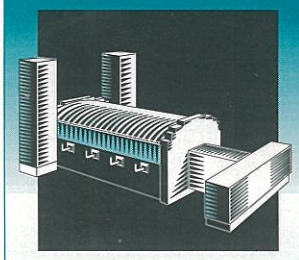
Air Products and Chemicals
Allentown, Pennsylvania

Combustion Tec, Incorporated
Apopka, Florida

Gas Research Institute
Chicago, Illinois

Owens-Brockway Glass Containers
Vernon, California

OEAS Technology for Sideport Furnaces



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Project Description

Oxygen and air staged combustion are two methods that the industry typically uses to reduce NO_x. While the use of oxygen eliminates nitrogen which can form NO_x, it is costly and can increase energy consumption. The air staging method costs less, but is less effective.

The Institute of Gas Technology (IGT) has developed OEAS technology, an advanced combustion modification technique which combines the two methods to control NO_x formation. By reducing the oxygen available in the flame's high-temperature zone and improving flame temperature uniformity, NO_x formation is controlled and heat transfer to the glass is improved, without interrupting furnace operation or adversely affecting product quality. By injecting oxygen near the exit port, complete combustion and heat release within the furnace are assured.

The OEAS technology has been successfully retrofitted to several endport furnaces in the U.S. and has achieved NO_x levels below 2 lbs. per ton (50-70 percent reduction). Efforts have now been initiated to apply the OEAS technology to sideport glass melting furnaces, which are used for 65 percent of U.S. glass production. The OEAS technology is being demonstrated on a six-port pair sideport furnace at Owens-Brockway's Vernon facility.

Benefits

The OEAS technology will benefit the glass industry by achieving:

- Reduced Waste — Total waste production is expected to be reduced by 10 thousand tons per year, a 31 percent reduction.
- Energy Savings — IGT estimates saving 28 percent of the energy used in conventional technology, representing 150 million Btus. per year.
- Reduced Emissions — NO_x levels will be reduced by 50-70 percent, thereby enabling glass producers to meet the most stringent environmental regulations through the year 2000.
- Reduced Costs — This is a highly cost effective means of meeting emission regulations without increasing fuel consumption. Capital and operating cost are moderate compared to competitive technologies. Additionally, the technology will reduce oxygen production costs.

Commercialization Plan

The OEAS technology has applications for regenerative glass melting furnaces in the container and float glass industries, as well as for other high-temperature processes such as metal melting.

Project Span: 3rd Quarter 1995 - 4th Quarter 1996

U.S. Department of Energy
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