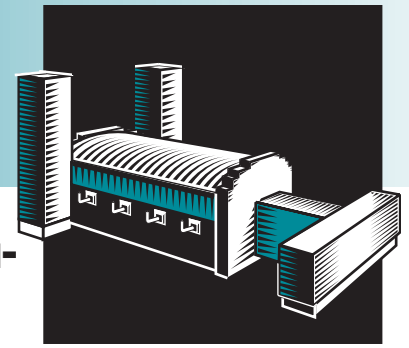


GLASS

Project Fact Sheet



CLEAN, EFFICIENT GLASS PRODUCTION USING HIGH-LUMINOSITY OXY-GAS BURNERS

HIGH-EFFICIENCY BURNER LOWERS COST AND EMISSIONS IN OXY-FUEL GLASS MELTERS

Benefits

- Offers savings of 0.4 trillion Btu by 2010
- Extends furnace life due to lower flame and exit temperatures
- Reduces NO_x emissions (up to 50%)

Applications

This novel burner can be used in all existing and new oxy-fuel glass melters. Although the largest demand currently exists in the flat, container, fiber, and specialty glass sectors of the glass industry, applications may also exist in other energy-intensive industries.

Project Partners

NICE³ Program
Washington, DC

Pennsylvania Department of
Environmental Protection
Harrisburg, PA

PPG Industries, Inc.
Harmarville, PA

Eclipse Combustion, Inc.
Orlando, FL

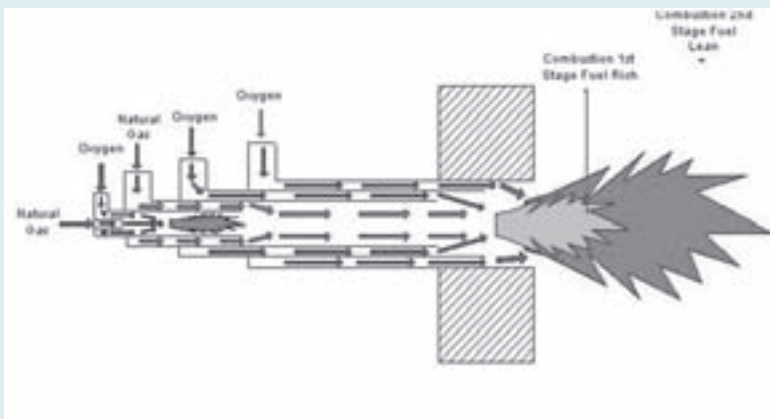
Gas Technology Institute
Des Plaines, IL

While significant progress has been made in developing oxy-fuel combustion systems, current technologies provide low flame luminosity which limits increases in production rates and thermal efficiency. These technologies also generate relatively high NO_x emissions in the presence of even small amounts of nitrogen (derived from air infiltration, N₂ in natural gas, oxygen, or feedstock).

PPG Industries, Inc. is working with Eclipse Combustion and the Gas Technology Institute to implement an advanced combustion system on an oxy-fuel furnace to demonstrate additional energy savings and environmental benefits that the high-luminosity burner will bring to the process. The high luminosity burners provide high heat transfer to the glass resulting in lower fuel consumption and lower CO and CO₂ emissions while providing large decreases in NO_x emissions. Lower flame temperatures and more uniform temperature distributions lead to longer furnace life. The integrated burner actuators and controllers allow each burner to be optimally tuned for peak performance at all firing conditions. These burners and burner actuators provide significantly lower fuel use and lower emissions than any burners in industrial use.

Pilot-scale test results show an increase in heat transfer of over 4%, corresponding to a decrease in needed fuel of at least 4%, and a decrease in NO_x emissions of 60% compared with the best commercially available oxy-gas burners.

SCHEMATIC OF THE HIGH-LUMINOSITY, LOW-NO_x BURNER



The unique preheating/combustion design of the high-luminosity, low-NO_x burner, being demonstrated by PPG Industries, will increase production rates and thermal efficiency.



Project Description

Goal: Convert an air-gas fired flat-glass furnace to an oxy-gas fired furnace with high-luminosity oxy-gas burners producing up to 600 tons of glass per day.

The high-luminosity, low-NO_x burner combines a preheating zone with two combustion zones. First, small fraction of the natural gas is burned. The products of this combustion are mixed with the main supply of natural gas, resulting in hydrocarbon soot then enters the first, fuel-rich combustion zone in which soot forms in the flame. The majority of the combustion, however, occurs in the second, fuel-lean combustion zone. The burning soot particles create a highly luminous flame that is more thermally efficient and cooler than a typical oxy-fuel flame. The lower flame temperature and the lower consumption of natural gas lead to less NO_x production.

Progress and Milestones

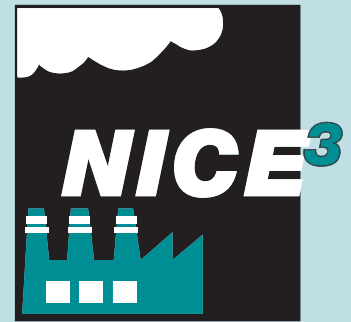
The following are the main tasks to be performed:

- Design, fabricate, and install a combustion system with 12 high-luminosity burners and their components.
- Conduct 9 months of testing on the furnace at full production.
- Analyze and compare the data collected with data from furnaces operating with other oxy-gas burners.
- Prepare a complete commercialization plan for selling the high-luminosity burner in the glass industry.

Economics and Commercial Potential

The glass industry has made concerted efforts to improve melting efficiency, lower fuel costs, and decrease gaseous emissions. Conversion of 20% of all U.S. glass production from air-gas melting in the last 12 years is strong evidence of this desire to lower operating costs and improve product quality in this highly competitive industry. The high-luminosity burner technology has been licensed to Combustion Tec, the glass division of Eclipse Combustion, by the Gas Technology Institute. This full-scale furnace demonstration will assure the glass industry of the operational, environmental, and economic benefits of the high-luminosity technology. No further development, except for scaling and engineering modifications for specific furnaces, will be needed. The product will be fully commercial after completion of this demonstration project.

Commercial introduction of the technology is expected by 2005. Annual energy savings by 2010 would be 0.4 trillion Btu. By 2020 the savings would grow to 0.8 trillion Btu.



NICE³ – National Industrial Competitiveness through Energy, Environment, and Economics: An innovative, cost-sharing program to promote energy efficiency, clean production, and economic competitiveness in industry. This grant program provides funding to state and industry partnerships for projects that demonstrate advances in energy efficiency and clean production technologies. Awardees receive a one-time grant of up to \$525,000. Grants fund up to 50% of total project cost for up to 3 years.

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