

Industrial Technologies Program



High-Intensity Plasma Glass Melter

Modular high-intensity plasma melter promises improved performance, reduced energy use, and lower emissions

The glass industry has used the same basic equipment for melting glass for the past 100 years. Manufacturers have generally employed refractory-lined furnaces of various sizes, fired with air or oxygen and with natural gas or oil as fuel. Over time, incremental changes have extended furnace life and improved energy efficiency. None of these improvements, however, has eliminated dependence on these large, costly melters, which burden the industry with high capital costs and fossil energy

requirements, and reduce competitiveness against growing competition from foreign producers and alternative materials. A few furnaces are currently powered electrically, usually for particular glass compositions, but they face technical challenges as well.

A modular, high-intensity plasma melter will benefit the U.S. glass industry by significantly reducing energy consumption and emissions while maximizing return on investment. Plasma melting yields a significantly lower cost per pound of glass than traditional technologies.

Benefits

- *Up to 40-percent reduction in energy use compared to existing technology*
- *Reduced levels of NO_x, CO₂, and particulate emissions*
- *Low capital costs*
- *Improved operability, including rapid product changes*
- *Reduced refractory usage*

Applications

This technology is applicable to all sectors within the glass industry, with fiber and specialty glass being the likeliest early adopters. The technology may enable the melting of new glass compositions and products. Adoption of this new technology promises to significantly improve energy efficiency in glass manufacturing.

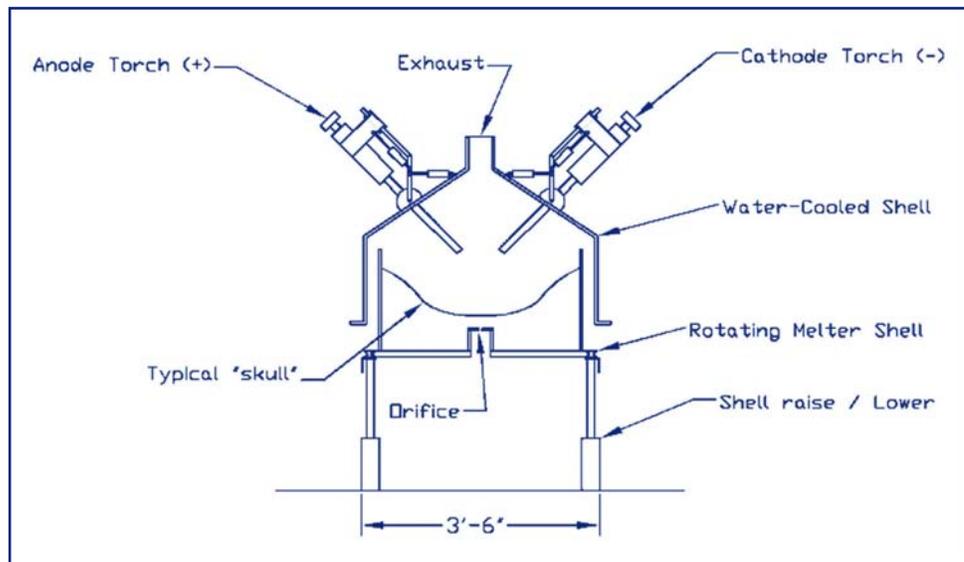


Figure 1 – Schematic of Plasma Melting Process

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Project Description

Goal: To design, build, install, and operate a full-scale modular high-intensity plasma melter capable of producing 500 to 1,500 pounds per hour of high-quality glass.

The focus of this project is to demonstrate the energy efficiency and reduced emissions that can be obtained through the use of a dual-torch plasma arc melting system. The concept is to rapidly melt high volumes of glass in a melter with a very small volume, improved energy efficiency, and reduced emissions. Typical square-foot-per-ton-per-day (SFTD) indices for commercial melters range from 4 to 15. Plasma melter systems have been demonstrated at throughput rates in excess of one ton per day with less than one square foot melt area (i.e., an index of less than 1 SFTD). To achieve this high throughput and high quality, very tight control of glass temperature and mass flow must be demonstrated. This is accomplished through key innovations such as dual-torch transferred arc-plasma technology, a rotating melt chamber to increase melt rate, skull melting to eliminate the need for a refractory lining and to reduce contamination of the glass from refractory and electrode components, and state-of-the-art control technology to provide stable conditions.

Progress & Milestones

- The project started in July 2003.
- In the first year of the project, Plasmelt will design, construct, and operate a 500-pound-per-hour high-quality glass melter in a laboratory environment.
- In the second year, Plasmelt will install and operate marble-making equipment, and produce fibers for glass-quality assessments. Plasmelt will then install the melter into an industrial environment at the first prototype location.
- In the third year, Plasmelt will commercialize and scale up the technology at partners' fiberglass facilities and in other U.S. glass industry segments. Plasmelt will also continue to operate the laboratory melter to support materials-melting trials for potential commercial clients identified by a marketing study, as well as broadly license and support the technology.

Commercialization

The project partners intend to make this technology available to a wide cross section of the industry at the earliest possible time. They intend to publish at least one white paper per year during the project and make additional presentations in the early stages of the project to increase awareness of the technology. Upon completion of the project, the partners will demonstrate, publicize, and work with companies to license and support installation and operation of the technology.

Project Partners

*Plasmelt Glass Technologies, LLC
Boulder, CO*

*Johns Manville
Littleton, CO*

*Advanced Glassfiber Yarns
Aiken, SC*

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