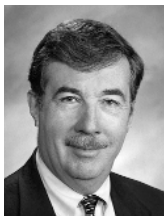
Michael Greenman, Contributing Editor



High-Intensity Plasma Glassmelter

The glass industry has used the same basic equipment for melting glass for the past 100 years. Generally, manufacturers have 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 currently are powered electrically—usually for particular glass compositions—but they face technical challenges as well.

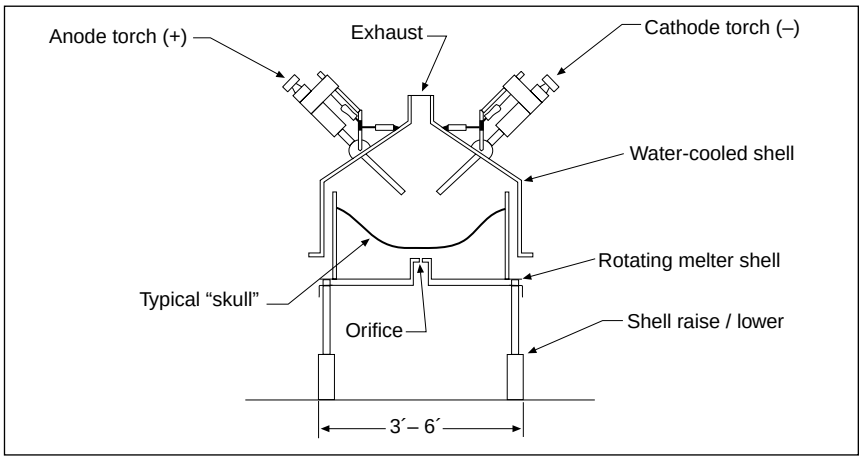
A modular, high-intensity plasma melter will benefit the U.S. glass industry. It will significantly reduce energy consumption and emissions while maximizing return on investment. Plasma melting yields a significantly lower cost per pound of glass than traditional technologies.

Project Description

The goal is to design, build, install and operate a full-scale, modular, high-intensity plasma melter capable of producing 500–1500 lb/h 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 <1 ft^2 melt area (i.e., an index of <1 SFTD). To achieve this high throughput and high quality, very tight control of glass temperature and mass flow must be demonstrated.



Schematic of plasma melting process.

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, Plasmelt Glass Technologies LLC (Boulder, Colo.) will design, construct and operate a 500-lb/h high-quality glassmelter 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 fiber-glass facilities of its project partners—Johns Manville (Littleton, Colo.) and Advanced Glassfiber Yarns (Aiken, S.C.)—and in other U.S. glass industry segments.

Plasmelt will 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.

Benefits

This technology is applicable to all sectors within the glass industry—with fiber and specialty glass being the likeliest early adopters—and may enable the melting of new glass compositions and products. The benefits include:

- Up to 40% reduction in energy use compared with existing technology;
- Reduced levels of NO_x, CO_2 and particulate emissions;
- Low capital costs;
- Improved operability, including rapid product changes;
- Reduced refractory usage.

Upon completion of the project, the partners will demonstrate, publicize and work with companies to license and support installation and operation of the technology.

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