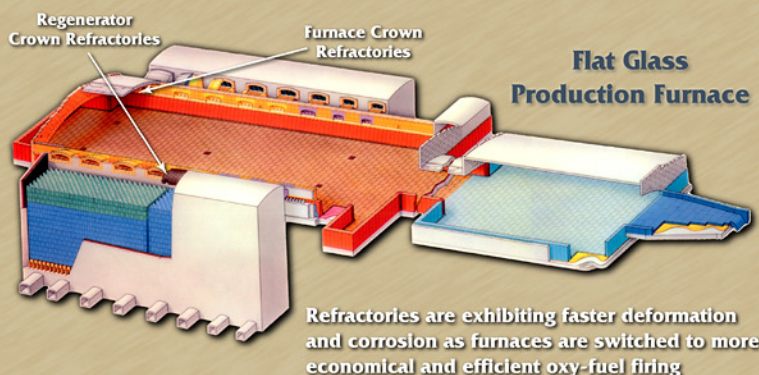


Development of Improved Refractories for the Glass Production Industry

Improved refractories will result in more efficient glass production furnaces



8 Refractory Categories Will Be Tested

- | | |
|------------------------|------------------|
| 1. Fusion-cast alumina | 5. Bonded AZS |
| 2. Conventional silica | 6. Andalusite |
| 3. Fusion-cast AZS | 7. Fused silica |
| 4. Fused-grain mullite | 8. Bonded zircon |

Glass Manufacturers Prioritized the Above Matrix

AFG Industries	Anchor Glass
Ball-FosterGlass	CardinalFG
Carr-Lowrey	CertainTeed
Corning	Corning Glass-RBMG
Ford	GalloGlass
General Electric Lighting	Glenshaw
Guardian Industries	Leone
Libbey	Osram Sylvania
Owens-Brockway	Owens-Corning
Phillips Lighting	Pilkington
Pittsburgh Corning	PPG
PQ Corporation	Schuller International
St George Crystal	Techneglas
Holophane	Thomson Consumer
Kimble Glass	Electronics
Knauf Fiber Glass	Lancaster Glass
Vetrotex	Wheaton

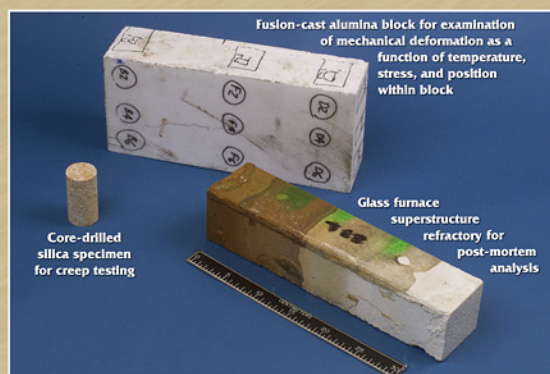
Creep and Corrosion Resistant Refractories in Furnaces and Regenerators (Crowns, etc.) are Imperative for Long Furnace Life

Goals/Benefits

- Characterize the high temperature mechanical deformation, corrosion resistance, and thermal conductivity of refractories
- Greater energy efficiency and economy

Participants

- University of Missouri, Rolla
- Glass Industry Advisory Committee
 - Glass manufacturers
 - Refractory suppliers
- Oak Ridge National Laboratory (ORNL)



Example of Refractory Characterization



Research and Development Sponsored by
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Office of Industrial Technologies,
Energy Efficiency and Renewable Energy, U.S. Department of Energy



Development of Improved Refractories for the Glass Production Industry

The objective of this task is to develop improved refractories and determine critical thermomechanical and thermophysical properties of refractories in various environments.

Valid engineering creep and high temperature Modulus of Elasticity (HT- MOE) data currently do not exist for almost all commercial refractories. Yet, refractory end-users such as glass-manufacturers require such data for the more efficient and economical design of their various glass production furnace structures (e.g., crowns). With the simultaneous imposition of mechanical and thermal stresses, creep deformation of the refractory material occurs as a consequence. Designers must ensure that the structural integrity is sufficiently maintained for maximum service life, so these high temperature deformations must be understood and considered for optimum glass furnace design.

Initially the project established dedicated refractory testing facilities which are capable of generating representative engineering creep and HT-MOE data to temperatures of greater than 1700°C in ambient air. The generated engineering creep and HT-MOE data will serve R&D requirements of refractories-manufacturers and its glass-manufacturer end-users and designers. The relevance of this effort to the refractory and glass-making industries would be ensured by coordinating research activities through [1] ORNL membership with Alfred University's Center for Glass Research (CGR) Satellite Center at the University of Missouri-Rolla (UMR), and [2] the active involvement of ORNL with the OIT Refractories Working Group.

The refractory testing facilities are equipped with necessary instrumentation to accurately control and monitor refractory creep and HT-MOE tests. Two test frames are being used for this project and both are capable of conducting either creep or HT-MOE tests. High temperature test conditions will be selected that mimic those of refractory service (determined through consultation with CGR-UMR members and the OIT Refractories Working Group).

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