The Opportunity

Improved monitoring of the glass temperature can help ensure product uniformity and improve efficiency by reducing cycle time by controlling the melting process.

Energy consumption represents approximately 21% of the total cost of float glass production. The glass melting tank is where the process starts with sand, limestone, soda ash, and cullet fed into a furnace for melting. Furnaces can use fossil fuels or electricity for the heating process which represents about 80% of the total energy usage. While fossil fuels still remain relatively economical, nowadays electrical boosters are often used to enhance capacity or temperature uniformity.

Protecting Critical Assets

With the high temperature required for glass processes, the refractory in the melting tank faces severe challenges and should be monitored carefully. Molten glass is very corrosive, so the refractory for the bottom of the melting tank is of special grade and quite expensive. The refractory used for the crown area always encounters the highest temperature in the melting tank, so its life can be shortened if temperature is not monitored and controlled well. Port arch temperature provides good information of the furnace condition and is important for combustion monitoring as well. Monitoring the bridge-wall temperature can provide a furnace temperature profile to avoid overheating.

All of these applications can be addressed with radiation pyrometers or thermal imagers. When electrical boosters are used, radiation pyrometers also offer an advantage that the measurement is immune to the electrical current.

Temperature Concerns

In glass production, viscosity is the most important parameter, and is directly related to the glass temperature. Bulk glass temperatures can be measured with radiation pyrometers more accurately and economically than traditional thermocouples. Choosing the proper pyrometer wavelength allows one to penetrate deep into glass and measure the bulk temperature accurately. Improved monitoring of the glass temperature can help ensure product uniformity, as well as reduce cycle time by controlling the melting process, thereby improving efficiency.
LumaSense Technologies has developed a complete solution for monitoring the glass melt furnace. This rugged, industrial design incorporates field proven components and is easy to retrofit into existing thermocouple wells such as on the crown refractory. The system can help optimize the furnace operation by measuring the bulk glass temperature, monitor or controlling burner output, and monitor the health of the refractory components. This will enable the user to maximize production efficiency. The system includes the following components and features:

- **IS 50-LO & LO/GL pyrometers**: Short wavelength infrared pyrometers that can be mounted in existing thermocouple wells, or through viewports, for internal refractory monitoring. The IS 50-LO/GL pyrometer is specially tuned to measure the bulk glass temperature. Both pyrometers are provided in industrial housing with flexible fiber-optics and lensing withstanding 250 °C for ease of installation.

- **LumaSpection for Furnaces Thermal Imagers**: Revolutionary design to continuously monitor through natural gas flames the internal furnace refractory and glass temperatures. A wide-angle, water-cooled, and air-purged boroscope lens penetrates through a port in the furnace side to provide an accurate high resolution thermal image of the interior. The solution includes a fail-safe auto retraction system.

- **LumaSpection for Refractory Thermal Imagers**: Refractory lined critical vessels in glass production plants operate at high temperatures and are at risk of failure as joints and refractory degrade. The LumaSpection for Refractory system is mounted external to the melt tank to provide real-time, non-contact thermal imaging for automated fault detection and monitoring for your more critical assets such furnaces and float tanks. An environmental housing is provided, and optional pan and tilt hardware.

- **LumaSpec Software**: Windows-Based Thermal Imaging Software that Offers High-Speed Real-Time Data Acquisition and Image Analysis Capabilities. Users can quickly validate theory, isolate areas of specific interest, or identify uses for monitoring and alerts.
  - User defined regions of interest allow continuous trending and alarm generation for critical areas.
  - Full image data analysis including profiles, histograms, 3-D rendering and image overlay.
  - Integrate into plant control system via OPC or analog output options.
  - Full image archiving capabilities
  - Allows secure remote monitoring through multiple terminals.
  - Integrate multiple thermal imagers, pyrometers and other plant sensor data.
Direct, accurate measurement of the glass bulk temperature for improved control of the melting process

Full thermal image profiles of the glass furnace to monitor & control firing profiles, and visualize furnace uniformity

Improved monitoring of critical crown, bottom and side refractory components

Increased lifetime, with minimal installation and maintenance required

Contact your LumaSense applications engineering representative for more details on integrated solutions.
Harnessing the Power of Your 6th Sense

Six Simple Steps to the 6th Sense


LumaSense illuminates our customers’ core generation, materials, and manufacturing processes with an invaluable 6th Sense to help detect, reduce, and ultimately prevent inefficiencies and unnecessary waste of energy, materials, and human capital. Utilizing this 6th Sense, resource-intensive global companies can hone their competitive edge at massive scale and directly improve their bottom line.

The 6th Sense is the power of perception beyond the five senses. Some refer to it as intuition, others say it is the ability to understand the subtle cause and effect relationship behind many events. LumaSense Technologies provides the sensors and solutions that awaken this 6th Sense in customers to allow them to efficiently optimize their processes.

OUR UNIQUE 6TH SENSE METHODOLOGY

01 UNDERSTAND
We listen to understand what you need and want, then document the scope of work required.

02 ANALYZE
We review your industrial process, analyze what needs to be done, and implement our Six Factor Formula for Efficiency.

03 DESIGN
We design the optimal and most cost-efficient process for you, employing a combination of sensors and software/automation.

04 VALIDATE
We validate that our solution meets your needs and that you can actually cost-effectively use this design.

05 IMPLEMENT
We provide you with a turnkey implementation, including training.

06 SUSTAIN
We verify our solution performs as specified now and for the long term and that you are satisfied with the results.

Upon completion, LumaSense customers gain an inexorable “6th Sense” that delivers immediate gains and progressive performance.

LumaSense Technologies

<table>
<thead>
<tr>
<th>Americas and Australia Sales &amp; Service</th>
<th>Europe, Middle East, Africa Sales &amp; Service</th>
<th>India Sales &amp; Support Center</th>
<th>China Sales &amp; Support Center</th>
</tr>
</thead>
<tbody>
<tr>
<td>Santa Clara, CA Ph: +1 800 631 0176 Fax: +1 408 727 1677</td>
<td>Frankfurt, Germany Ph: +49 69 97373 0 Fax: +49 69 97373 167</td>
<td>Mumbai, India Ph: +91 22 67419203 Fax: +91 22 67419201</td>
<td>Shanghai, China Ph: +86 133 1182 7766 Fax: +86 21 5039 8096</td>
</tr>
</tbody>
</table>

info@lumasenseinc.com
LumaSense Technologies, Inc., reserves the right to change the information in this publication at any time.

www.lumasenseinc.com
©2015 LumaSense Technologies. All rights reserved.
App Note - Flat Glass Melting Tank - Rev. 04/13/15