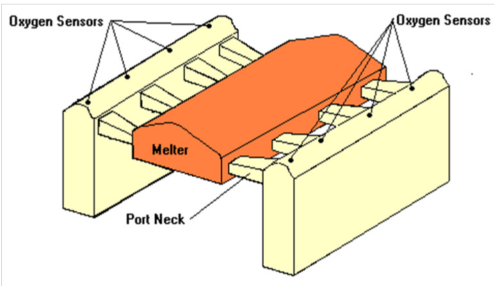
COMBUSTION CONTROL

Proven technologies for: Container Glass Float Glass Fiberglass Silicates ..And More

Energy & Environmental Solutions for Glass Manufacturers

Where Does the Real Problem Lie?

In any combustion reaction, oxygen and fuel are mixed to give off heat and combustion products. Typically, a fuel such as natural gas or oil is combined with air. Air contains only 20.9% oxygen with the remaining 79.1% consisting of nitrogen and other gases that are not required for combustion. These other components detract from the combustion process by absorbing heat, causing lower efficiency, and creating emissions.



Regenerative Furnace w/ 4 Ports - Cross Fired

A combustion process may run with high levels of excess air (oxidizing) and still melt glass. However, this wasted fuel contributes to pollution and causes quality defects. On the other hand, running at too low a level of excess air (reducing) creates problems at the other end of the spectrum. Insufficient oxygen causes raw fuel to flow up the stack. This situation creates waste and air pollution, damages the refractory and platinum tank parts, and contributes to quality defects. In most combustion processes, it is safest running with excess oxygen. The level of waste is about twice as high on the fuel rich side of stoichiometric combustion as it is on the fuel lean side. Therefore, it is best to run with slightly excess oxygen to ensure against the possibility of the more wasteful, reducing conditions.

Do the Math

1% Drop in Excess O_2
Equals
1.5-3% Savings in Fuel
20% Reduction in NOx

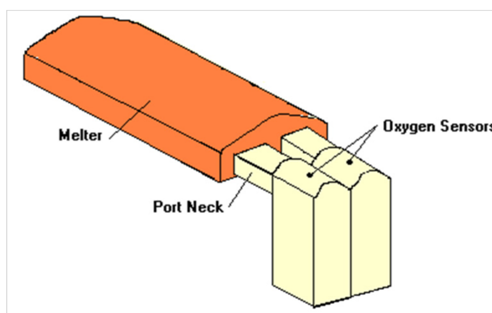
The Solution "Measure where it matters!"

There are two major types of oxygen analyzers found in the glass industry: low temperature sampling types (extractive) and low/high temperature in-situ sensors. Both types work in glass melting furnaces, but excessive maintenance limits the usefulness and reliability of the extractive units. Heaters, pumps, sample lines and cells require continuous attention. Regular calibration services are a must. The filter system of the pumps must be cleaned periodically due to moisture in the hot gases.

Using high temperature in-situ sensor solves these problems. High temperature in-situ oxygen sensors do not require pumps, heaters, filter systems, calibration, etc. The sensors are located in the furnace where the combustion is complete and the optimal location varies by furnace type. In flat glass tanks, the regenerator crown and high on target walls are best. Direct fired tanks with recuperators such as those found in fiberglass plants use installations in the crown of the melter, back wall of the melter or in the recuperator stack (preferred). Proper installation of the sensor will ensure its performance. Continuous oxygen monitoring improves the consistency of product quality and reduces maintenance costs by highlighting faults and burner imbalance. While monitoring has its benefits, the true Return on Investment is realized when oxygen is controlled for optimized combustion.

Results: Cost Savings + Eco-Efficiency

The recurring cost of sensors is low compared to the operating expense of the glass tank. Fuel savings and emissions reduction are established using a well-accepted rule of thumb from burner manufacturers. Above 1400ºC (2552ºF), fuel savings is 1.5-3% for every 1% reduction in excess O_2. Each 1% reduction in excess O_2 leads to 20% reduction in NOx emissions. Continuous excess oxygen measurement provides a tighter, more responsive air/fuel ratio resulting in more consistent quality, reduced operating costs (preserves refractory and platinum tank parts), and reduced emissions.



Regenerator Tank w/End Port

Air/Fuel systems benefit from oxygen trim control systems, but the use of oxygen/fuel systems (Oxyfuel) makes the use of sensors imperative. Air is free. In oxygen/fuel systems, both the fuel and the oxygen are major expenses. In-situ sensors provide control for Oxyfuel systems as well as Air/fuel systems.

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