United PROCESS CONTROLS

COMBUSTION SYSTEM OPTIMIZES GLASS MANUFACTURING, IMPROVING PRODUCT QUALITY AND GLASS COLOR, AND MAXIMIZING FURNACE EFFICIENCY WITH FEWER EMISSIONS.

TECHGLASS | United PROCESS CONTROLS

The real time, in-situ measurement of excess oxygen and temperature in the radiant heat zone of a boiler or furnace provides a window for viewing combustion conditions closest to the source. Excess oxygen and temperature measurements, taken at strategic sample points around the firebox, provide timely information for optimal trim control of the combustion process. With a focus on fuel costs and NOx emissions, it is essential that the excess oxygen measurement be fast and accurate.

Combustion is the rapid combination of oxygen with a fuel resulting in the release of heat. In most combustion processes the oxygen comes from air. Unfortunately, only 20.9% of air is oxygen. Nitrogen and other non-combustible gases make up the other 79.1%. These gases are detrimental to the combustion process because they must be heated, thus creating thermal loss.

Ideal combustion minimizes the thermal loss and the amount of NOx produced. However, the reality is that most combustion processes use excess oxygen. A combustion may run with high levels of excess air (oxidizing) and still heat the billets. The excess air contributes to pollution (NOx) and causes quality defects: metallurgical and high scaling. 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 contributes to quality defects. In most combustion processes, it is safest to operate with excess oxygen, and additionally the total amount of wasted fuel is reduced.

Combustion efficiency plays a major role in the overall performance of the process, when energy is a significant operation cost. Fuel savings and NOx reduction can be estimated using general rules of thumb. Burner manufacturers estimate a fuel savings of 1% for every 1% reduction in excess oxygen at a flue temperature of 1200°F (649°C). At higher temperatures even greater fuel savings are possible. The North American Manufacturing Handbook supplement provides the information necessary to calculate exact savings. It has been documented that a 1% reduction in excess oxygen equates to a 20% reduction in NOx output. This is a linear function, thus a 2.5% excess oxygen reduction would result in a 50% reduction in NOx.

COMBUSTION OPTIMIZATION CASE STUDY

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The financial justification for using oxygen sensors to minimize excess oxygen is presented next in a case study. Cost savings owing to fuel reduction can be quantitated. Total Cost of Ownership calculations along with the cost savings calculation results in potential payback and Return On Investment (ROI) predictions. Empirical data is used to correlate the expected NOx reduction associated with excess oxygen reduction.

Commercially available in-situ, high temperature oxygen sensors have the potential to solve combustion control and burner management problems with short payback and high annual ROI in steel, glass, power, petrochemical and refining applications.

CASE STUDY

For over four decades United Process Controls, through its acquired affiliates, has worked with clients throughout the world to achieve their upgrade goals in combustion and heat treatment.

Since the early 90s, TECHGLASS Sp. z o.o., a Polish glass plant engineering company has been supplying glass furnaces, forehearths, batch plants and all related services. In 2013 the National Factory for Glass Industries "Zoujaj" in Saudi Arabia, started construction of a € 40 million glass plant in Riyadh, and also made one of its largest capital investments, a new glass furnace worth € 12 million from Techglass.

Oxyfire™ In-Situ Zirconia Oxygen Sensor is designed to measure excess oxygen in combustion processes

Techglass supplied a new furnace complete with automation and control systems as part of a turn-key solution, including design, materials delivery, construction and start-up. Techglass President Andrzej Skowiniak, who oversaw the construction and installation, said:

"Around 3.000 tons of materials and machinery in 200 containers were transported to Riyadh by sea from Poland and other European countries. At its peak, almost 80 specialists from Poland worked on the project at the same time. Commissioning, which took place in May 2014, was completed ahead of the schedule, 6 months earlier than contracted. The site team optimised the working parameters by integrating a UPC OxyFire™ excess oxygen system, and since then, **we've achieved excellent glass quality, environment load and energy consumption**. Following the successful execution of this contract, Techglass has been awarded two additional contracts in Dammam, Saudi Arabia and Cairo, Egypt. While the glass bottles market is relatively small in these countries because of alcohol laws, low energy prices and access to readily available raw materials have encouraged the production and export of low-cost glass containers. Our cooperation with United Process Controls has resulted **in significant advantages in quality, environment issues and costs savings for customers like Owens Illinois, Vetropack, Stoelzle, Philips Lighting, Saint-Gobain and others**. The UPC OxyFire™ excess oxygen system enables effective stabilisation of the melting parameters, allowing our clients to realise real financial and operational benefits."

Andrzej Skowiniak
President of Techglass

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