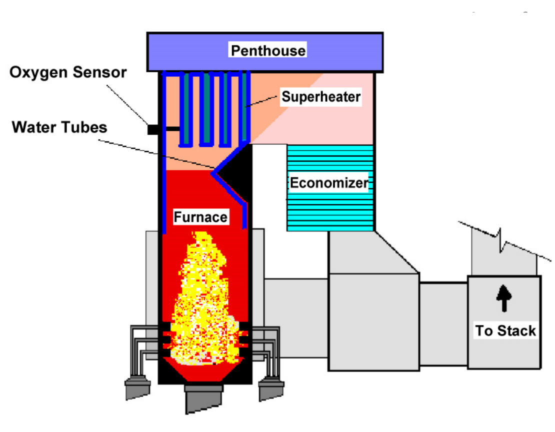
COMBUSTION CONTROL

Proven technologies for: Thermal Oxidizers Package Boilers Cracking Furnaces ...And More

Energy & Environmental Solutions for Power Producers

Where Does the Real Problem Lie?

In any combustion reaction, theoretically there is a required volume of oxygen to react with a given amount of fuel. Typical combustion systems mix a fuel, such as natural gas or oil, with air. Unfortunately air contains only 20.9% oxygen. The remaining 79.1% consists of nitrogen and other gases that are not required for combustion. These detract from the combustion process by having to be heated and causing lower efficiency.
A combustion process may run with high levels of excess air in the boiler and still produce steam. However, this wasted fuel contributes to pollution and causes lower efficiency. On the other hand, running at too low a level of excess air will create problems at the other end of the spectrum. Insufficient oxygen causes raw fuel to flow up the stack and higher LOI. This situation creates wasted fuel and air pollution, damages



BOILER UNIT SECTION

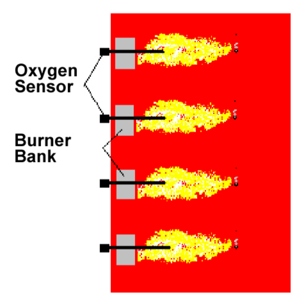
›ry, and contributes to unsafe
In most combustion processes, it is
›ing with excess oxygen. The level of
bout twice as high on the fuel rich side
›metric combustion as it is on the fuel
›. Therefore, it is best to run with
excess oxygen to ensure against the
›ossibility of unsafe and wasteful,
reducing conditions.

The Solution **"Measure where it matters!"**

There are two major types of oxygen analyzers found in the power industry: low temperature, sampling types (extractive) and low/high temperature in-situ sensors. Both types work in utility boilers 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 and ash in the hot gases.

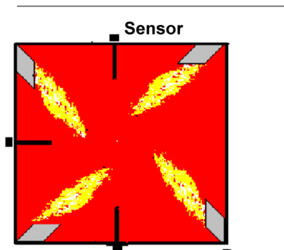
The low temperature in-situ unit is a direct reading sensor without pumps and sample lines. Temperature limitations of the sensor require that it be installed in an area downstream from the combustion zones. The measurements include the combustion excess oxygen plus all air in leakage in the ductwork. This does not allow the accuracy required for very efficient tight control. Maintenance is also required because of heaters and regular calibration services.

The introduction of the high temperature in-situ sensor has virtually eliminated these problems. High temperature in-situ oxygen sensors do not require pumps, heaters, filter systems, calibration, etc. The sensor must be located in the furnace where the combustion is complete. The locations preferred are in the superheater section of the boiler. Proper installation of the sensor will insure its performance. By using multiple sensors in the combustion zone, operations will be able to divide the boiler in to zones for burner balancing and tuning. This will pinpoint problem areas in the furnace and help to eliminate hot spots that cause tube failures. This system works well in wall-fired boilers because of the combustion gas streamlining. Another big advantage in T-fired units is the ability to center the fireball. Each sensor will provide an oxygen measurement as well as a temperature measurement. Continuous oxygen monitoring will improve efficiency and reduce maintenance costs by highlighting faults and burner imbalance.



WALL FIRED FURNACE PLAN VIEW

The Result: **"Become a low-cost, highly-efficient power producer"**



T-Fired Furnace Plan View

The cost of sensors is generally very low compared to the operating expense of the unit. Fuel savings are established by using a well-accepted rule of thumb from burner manufacturers. Above 1500º F, approximately 1.0-2.0% in fuel will be saved for every 1% reduction in excess oxygen. Generally, savings of 1-3% in fuel costs can be expected. Continuous excess oxygen measurement will provide a tighter, more responsive air/fuel ratio to be maintained. The result is a more efficient operation.

Reducing conditions are controlled to preserve the furnace refractory and the metal tubing. Air pollution is another big advantage of using sensors. NOx formation is influenced by exhaust temperature, fuel level, and excess oxygen. Lowering excess oxygen will lead to lower emissions. The high temperature oxygen sensor has been established as dependable and simple to use. It is considered a good choice to insure consistent excess oxygen in the boiler unit. It is essential to control the air/fuel ratio to minimize emissions, maximize fuel efficiency, and lower LOI. Plant efficiency improvements equal cost savings and a better power producer.

USA	+1 414 462 8200	FRANCE	+33 3 81 48 37 37
CANADA	+1 514 335 7191	GERMANY	+49 7161 94888 0
CHINA	+86 21 3463 0376	POLAND	+48 32 296 66 00

sales.na@group-upc.com
www.group-upc.com