Combustion control for boilers in power plants, co-incineration plants and waste incinerators

Components to be measured
– O₂, CO, CO₂, CH₄

ABB Solutions
– AZ20
– LS25
– LS4000
– ACX

Measurement made easy

Introduction
With burning coal, petroleum products, natural gas as well as domestic and hazardous waste optimum combustion plays an essential role. Hence, the flow of combustion air delivering the required oxygen to the process needs to be controlled.

• AZ20 – economic point in-situ oxygen ZrO₂ probe
• LS25, LS4000 – fastest cross-stack oxygen, carbon monoxide and carbon dioxide laser measurement
• ACX – complete pre-engineered analyzer cabinet with multi-component measurement (CO, CO₂, O₂) and with optional stream switching and multi-point sampling
Combustion control for boilers in power plants, co-incineration plants and waste incinerators

Motivation
Optimization of the combustion process is achieved with a certain excess of oxygen compared to what is necessary for a stoichiometric conversion of the available fuel. At the same time the excess air volume is limited in order to minimize the energy loss through the hot flue gas emission to the atmosphere. Most effective excess air level has, besides reduction of emission levels, the objective of saving fuel costs. Operating the combustion process near the optimum air to fuel ratio (Lambda = 1) improves the efficiency significantly.

Task: Combustion control
Optimal combustion control means continuously monitoring of either O₂ or O₂ together with CO or even CO₂ concentration directly in or after the combustion chamber in order to control air volume flow and fuel injection.

Typical measuring ranges
- CO: 0 to 400 / 1000 mg/m³
- O₂: 0 to 10 / 25 Vol%
- CO₂: 0 to 20 Vol%

ABB alternative solutions
ACX is a complete system for extractive continuous gas analysis. The system can be fully operated from the outside. Inside, the well-established reliable analyzers of the Advance Optima series work with the proven components for sample conditioning. The ACX system is particularly easy to maintain as a result of the standardized design. Comprehensive digital communication allows global remote maintenance and control with Analyze³ Explorer.
ACX can be equipped with a back-purge option to prevent clogging of the sample probe due to the dust load. Other options
- Dual sampling for simultaneous measurement at two different sampling locations
- Dual switching for measurement at two sampling locations or for uninterrupted measurement at one sample location during the back-purge phases
Several configurations are available to best fit the application.
- ACX (CO)
- ACX (CO, O₂)
- ACX (CO, CO₂, O₂)
- ACX (CO; stream switching)
- ACX (CO; dual sampling)
This solution is preferable if
• high dust loads can be expected
• multi-component measurements are required
• the customer prefers a consistent extractive technology in his plant
• Remote maintenance via AnalyzeIT Explorer is required

**LS4000** is an in-situ laser analyzer which selectively measures the oxygen (O₂), and LS25 is for measuring carbon monoxide (CO) and carbon dioxide (CO₂) concentration. The laser operates according to the principle of single-line spectroscopy. For measurement purposes a single absorption line is selected from the gas to be measured in the near infrared spectral range, at which no cross-sensitivity from other gases occurs. The absorption line is scanned and the receiver located opposite detects the absorption caused by the sample gas and calculates the gas concentration from this.

LS4000 is a stand-alone analyzer, whereas LS25 is a module of the AO2000 series. Up to four LS25 analyzers can be integrated into an AO2000 based or ACX system using an Ethernet connection. Hence, all options for connectivity and powerful software solutions of AO2000 can be used.

LS4000 and LS25’s cross-stack installation ensures more representative measurement than single point measurement. Local concentration spots in the duct can be detected.

Due to the in-situ installation at the process, in-situ analyzer achieves T90 times within few seconds. As a result, the reaction time after changes in process conditions can be reduced significantly.

Moreover, sample gas is not extracted from the process. With no sample handling components required, number of moving parts and therefore lifetime costs are reduced.

In addition to the oxygen measurement, the LS25 can optionally be used for temperature measurement as well.

This solution is preferable if
• maximum dust loads do not prevent cross-stack measurement
• ABB offers special technical solutions such as insertion tubes in order to reduce the impact of high dust loads
• please contact for a detailed feasibility check and advice.
• the customer prefers a cross-stack averaged concentration
• response time within few seconds (T90) is required
• minimum maintenance due to missing sample handling components
• remote maintenance via AnalyzeIT Explorer is required

**AZ20** is an Endura combustion gas oxygen analyzer and the latest combustion gas analyzers from ABB in a long line of high-quality. The sensor, based on a zirconium oxide cell, is mounted at the tip of the probe that is inserted in the flue duct. The resulting direct, in situ measurement provides accurate and rapid oxygen reading for combustion control optimization and emissions monitoring.

**Customer benefits**
• save fuel costs
• simultaneously reduce pollutants