Introduction
During the combustion of fossil fuels, the mineral matter (inorganic impurities) converts to ash and partly leaves the boiler as fly ash along with the flue-gas. Fly ash constitutes the primary particle matter entering the particulate control device. The characteristics and the amount of the fly ash depend on the used fuel for example on the mineral composition of coal and combustion type. Different technologies such as electrostatic precipitators (ESP), fabric filters and wet scrubbers are commonly used to remove particulate matter from the flue-gas.

Components to be measured
– CO (electrostatic precipitator, ESP)
– Delta CO (fabric filter)
– O₂

ABB Solutions
– LS25
– LS4000
– ACX

Measurement made easy

- LS25 – fast in-situ, cross stack laser (TDL) measurement for oxygen, carbon monoxide and carbon dioxide
- LS4000 – fast in-situ laser (TDL) measurement for oxygen
- ACX – complete pre-engineered analyzer cabinet to monitor CO back-purge and stream switching multi-point sampling
Safety measurements

for dust filter or power plants and cement plants

Motivation

ESP uses the action of force on charged particles in an electric field for dust removal. The dust particles, which are charged through the collection of negative ions, are guided to a receiving electrode in an electric field where they are collected. ESP generally represents an explosion hazard by the explosive gas mixture entering the electric field. The ESP acts as a source of ignition at high CO levels. Explosions may occur when CO is between 8 to 12 % and O₂ > 6 %.

Fabric filter units consist of one or more isolated compartments containing rows of fabric filter bags or tubes. Particle-laden gas passes up along the surface of the bags then radially through the fabric. Particles are retained on the upstream face of the bags while the now cleaned gas stream is vented to the atmosphere. The filter is operated cyclically, alternating between relatively long periods of filtering and short periods of cleaning. Fabric filters pose a fire hazard by the ignition of hot fly ash. With increasing liability insurance premiums and a growing need to increase productivity, it is essential to employ preventive, rather than reactive measures.

By minimizing the risk of fire in fabric filters or CO explosions in an ESP, companies can see an increase in personnel safety as well as a decrease in downtime and loss of resources. In short, they can save money.

Task: Prevent CO explosions in an ESP

Monitor CO and O₂ concentrations before the ESP.

Typical measuring ranges

- CO: 0 to 100 / 500 mg/m³ (power plants)
- CO: 0 to 3 Vol% (cement)
- O₂: 0 to 10 / 25 %

ABB alternative solutions: ACX, LS25, LS4000

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 AnalyzeIT 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
- in cases where very rapid CO changes and high process gas velocity (around 12 m/s) can be expected (e.g. in cement plants) a short CO-system-response time (T90) needs to be employed
- ACX Fast is designed with a fast sampling system which allows a T90-CO-system time < 10 s

Several configuration are available to best fit the application.

- ACX (CO; standard probe)
- ACX (CO, O₂; standard probe)
- ACX (CO; Ex probe)
- ACX (CO; stream switching)
- ACX Fast (CO; T90 ≤ 10 s)

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

**LS25** is an in-situ laser analyzer which selectively measures the oxygen O₂ and carbon monoxide CO concentration.

**LS4000** is an in-situ analyzer which measures oxygen (O₂)

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 family. Up to four LS25 analyzers can be integrated into an AO2000 based or ACX system. Hence, all options for connectivity and powerful software solutions of AO2000 can be used. LS25’s cross-stack installation ensures more representative measurement than single point measurement. Local concentration spots in the duct can be detected.

With being installed in-situ directly at the process, the LS4000 / LS25 achieves T90 times within few seconds. As a result, critical situations can be detected faster and the security of the facility is increased significantly. In addition to the augmented security, sample gas is not extracted from the process. With no sample handling components required, number of moving parts and therefore lifetime costs are reduced and optimized to a minimum.

When high dust loads might make the cross-duct measurement difficult, due to attenuated scattering light effects. ABB offers special technical solutions: Insertion tubes, for example, are used in order to reduce the impact of high dust loads. Please contact for a detailed feasibility check and advice.

This solution is preferable if

- maximum dust load does not prevent cross-stack measurement
- the customer prefers a cross-stack averaged concentration
- response time within few seconds (T90) is required
- minimum maintenance due to nonexistence sample handling components
- remote maintenance via AnalyzeIT Explorer is required

**Customer benefits**

- improve insurances premiums
- decrease downtimes
- avoid loss of resources