Yokogawa's CO Monitoring Solution

TDLS200 TruePeak

The TruePeak TDLS measures gas concentrations inside the process, using a tunable diode laser. As the laser travels through the process, the amount of light absorbed by the process gas is measured to determine the gas concentration. The TDLS200 is designed for the most demanding applications.

TDLS measures CO in the firebox.

- No lag time in detecting CO breakthrough.
- No false low reading due to CO quenching.
- Active compensation for ambient background radiation changes
- Capable of measuring across large ducts

TDLS measures CO in-situ.

- No sample system to maintain or get plugged.
- No sample system induced lag time.

TDLS is a path measurement.

- Provides coverage across the firebox (not point).
- Ensures isolated areas of breakthrough are detected.
- Typical analyzers (2-8) for large ducts.

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The clear path to operational excellence

VigilantPlant is Yokogawa's automation concept for safe, reliable, and profitable plant operations. VigilantPlant aims to enable an ongoing state of Operational Excellence where plant personnel are watchful and attentive, well-informed, and ready to take actions that optimize plant and business performance.

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Represented by:

YOKOGAWA

Practical Carbon Monoxide (CO) Measurement

Coal Fired Plant Solutions

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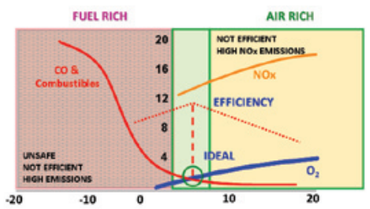
CO Monitoring for Coal Fired Plants

Introduction

There are currently 1470 generators at 617 facilities in the United States alone that use coal as the major source of energy to generate electricity. Of these facilities, 141 are considered industrial, institutional or commercial sites that consume most of the electricity produced on-site. The remaining 476 sites are identified as "power plants" owned by electric utilities and independent power producers that generate and sell electricity as their primary business. The primary goals that drive these power plants are increasing efficiency and throughput, reducing emissions of pollutants, and maintaining a high level of safety.

Obtaining these goals ensures that:

- Power plants generate the highest profits
- Comply with environmental regulations
- Assure workplace and community safety

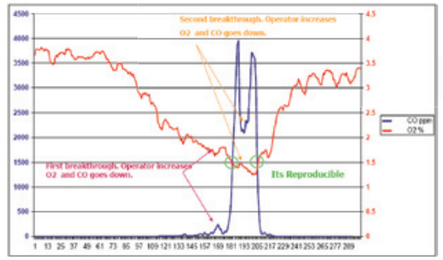


Purpose

An accurate measurement of the carbon monoxide (CO) concentration in the boiler flue gas can be used to achieve the goals of combustion efficiency, pollutant emissions reduction, and safe operation. By measuring the concentration of CO, power plants are able to fine tune the air to fuel ratio used on the burners to obtain the highest combustion efficiency. Measuring the CO concentration allows the power plants to reduce the amount of combustion air used while ensuring complete combustion, reducing the production of the pollutant NOx. The concentration of CO in the flue gas is also the most sensitive indicator of unburned combustibles in the process and can indicate the emergence of an unsafe situation.

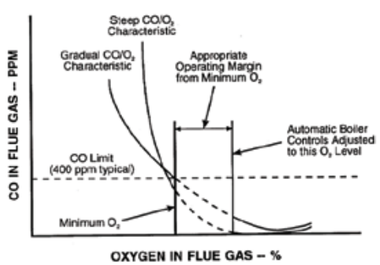
The amount of excess air in the flue gas is determined by measuring the concentration of oxygen (O2). The ideal excess O2 level (the lowest possible that allows complete combustion) depends on several factors:

- Fuel type
- Burner type
- Humidity changes in the air
- Moisture content changes in the fuel
- Varying boiler loads
- Fouling of the burner system
- Mechanical wear of combustion equipment



Operator Test: Adjust O2 downward to cause CO breakthroughs

CO is the most sensitive indicator of unburned combustibles. As the amount of excess O2 is reduced, the emergence of CO will occur before other combustibles appear (unburnt fuel). When the concentration of CO reaches the desired setpoint, the excess O2 concentration is at the desired level and becomes the new excess O2 setpoint. As the concentration of CO increases or decreases, the excess O2 setpoint can be trimmed accordingly. CO trim control of excess O2 concentration assures minimal energy loss, maximum efficiency, and reduced NOx emissions independent of boiler load, fuel type, humidity, moisture content of fuel and other variables that make excess O2 control difficult.



Obstacles

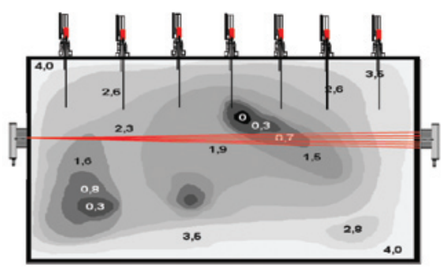
Measuring CO accurately and reliably in coal fired applications has traditionally been extremely challenging. Some of the obstacles that must be overcome:

- Flue gas laden with fly ash particulate
- High temperature in the optimal measuring location
- Stratification of gas concentrations
- Presence of SO2 in the flue gas
- Speed of response in non-insitu installations

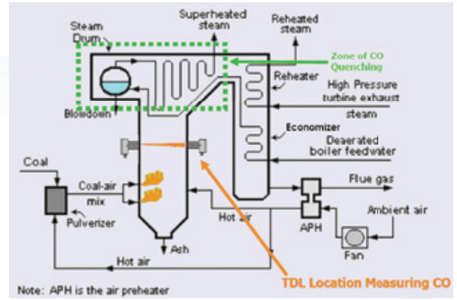
Current measuring technologies that are employed to measure CO (or combustibles in general) are Catalytic Bead sensors, Thick/Thin Film thermistors, and IR spectroscopy.

These measuring technologies are prone to the following problems:

- The catalytic sensors require sample extraction (not insitu) installations. These sample extraction systems are prone to plugging and fouling with fly ash in coal fired applications. They require frequent preventative maintenance and the filters they require cause slow response times.
- The catalytic sensors are discreet or point measurements. They do not provide a path or average measurement across the firebox. They are subject to stratification errors, may not detect isolated areas of CO breakthrough, and require multiple points of installation to provide adequate coverage.



Flue Gas Stratification/Point vs.Path Measurement



Solution

Tunable Diode Laser Spectroscopy (TDLS) manufactured by Yokogawa Corporation of America has been proven in the field to be a solution for this difficult measurement. The TruePeak Analyzer utilizes powerful lasers that are highly sensitive and selective for CO. The TruePeak Analyzer measures CO directly in the fire box. This means no lag time in detecting CO breakthrough and no false low reading due to CO quenching after the fire box. The TruePeak Analyzer measures CO insitu. There is no extractive sample system induced maintenance or lag time. The TruePeak Analyzer is a path (across the fire box) measurement. This provides an average reading that ensures isolated areas of CO breakthrough are detected. Minimal installations are required.