

FEATURES SHEET

TEOM[®] SERIES 4200 COMBUSTION EFFICIENCY MONITOR

The TEOM Series 4200 Combustion Efficiency Monitor is designed for use at coal-burning facilities to generate fly ash carbon concentration results automatically. The monitor provides near real time feedback to plant operators for maximizing combustion efficiency and/or fly ash sales.

The monitor draws a sample from a flue isokinetically every 12 minutes by default, and uses an accurate, direct analysis technique to determine the percentage of the fly ash mass made up of carbon.

The monitor can be configured to sample from a single point, or optionally from two closely-located sites for sequential sampling and analysis.

Both sample collection and analysis take place at the single-piece collection filter, which is an integral part of the unit's mass sensor. The chief components of the analysis system are an industrial-grade microbalance and a non-dispersive infrared (NDIR) CO₂ sensor to determine the CO₂ released by oxidizing the sample.

Instrument Cycle

The monitor's instrument cycle consists of the following major steps:

- Collection of a fly ash sample isokinetically onto the high-temperature collection filter.
- Weighing of the fly ash sample collected on the filter by the TEOM mass sensor.
- Heating of the fly ash sample to 800 °C to oxidize the carbon contained in the collected material.
- Measurement of the CO₂ generated during the sample oxidation process. This takes place in an open-loop CO₂ measurement system that scrubs the sample oxidation/carrier gas stream of CO₂.
- Automatic computation of the percent carbon contained in the fly ash sample, based upon the CO₂ released during oxidation and the original mass of the collected material. The monitor

stores the carbon-in-ash information internally, and makes it available to plant systems in a number of different formats.

- The device cleans the collection filter and blows back the pitot tubes and sample probe to prepare for the next instrument cycle.

System Configuration

The Series 4200 monitor consists of the following main components:

- A single enclosure containing sample collection and analysis hardware, as well as electronic controls and user interface, mounted on a stand. The upper section of the stand can be raised and lowered approximately 20 inches (50 cm) to facilitate installation.
- A sample probe and umbilical line transport the sample from the flue to the monitor, and provide flue temperature and differential pressure information to determine the flue velocity. Each sample probe/umbilical line is heated, and contains both an instrument and manual sample line. The instrument can support a second optional sample probe/umbilical line, providing the ability to sample from two locations sequentially.
- Within the instrument, the collection and analysis bench moves the mass sensor and integral collection filter to different locations during the different phases of the instrument cycle. These locations include the *sample station*, where sample collection and weighing takes place, the *furnace station*, where sample oxidation and the CO₂ determination occurs, and the *cleaning station*, where the unit cleans the collection filter before beginning the next instrument cycle.
- A field-proven microprocessor system with keypad/display controls the operation of the monitor, and makes results available to plant operators in a number of formats. Using PC-based software for Windows[®] operating systems, users can easily compile reports in tabular and/or graphical form.

General Features

The Series 4200 monitor contains the following general features:

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- Direct measurement technique generates carbon-in-ash results independent of coal type and boiler additives.
 - System components and design chosen to maximize reliability and provide low, predictable maintenance requirements.
 - The system performs a measurement of the percent carbon concentration found in fly ash using a test patterned after the loss-on-ignition method (ASTM C311).
 - Flow control is maintained using the Streamline™ system, a patented orifice-based flow measurement device designed to withstand industrial environments.
 - Open-loop measurement of CO₂ provides for reliable carbon determination (open loop design minimizes potential cross-interferences).
 - Dried, flow-controlled air stream is stripped of CO₂ prior to entering the furnace where sample oxidation takes place.
 - Durable, quick-heating furnace reaches 800 °C in less than 15 seconds.
 - The monitor does not contain any pumps, motors or belts to generate vacuum, provide cooling to the system electronics, or move the mass sensor on the collection and analysis bench. Rather, these capabilities are provided through the use of plant air supplied to the instrument.
 - The mass sensor and integral filter are maintained at an elevated temperature of 180 °C, or higher during sample oxidation, to maintain consistent operation.
 - The collection filter contained in the mass sensor is cleaned and its weight tared at the beginning of each instrument cycle.
 - Sample probe fits on standard 3 or 4 inch ports.
 - Collection and analysis process produces very little waste.
 - Heated umbilical line is flexible to facilitate installation.
 - The instrument is mounted on a stand with wheels to allow for convenient transport among sampling locations.
 - Remote operation possible under the direction of plant control system, and automatic shutdown under predetermined conditions. Advanced internal diagnostics warn of instrument status conditions.
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- U.S. and international patents granted and pending.
 - TEOM is a registered trademark of Thermo.