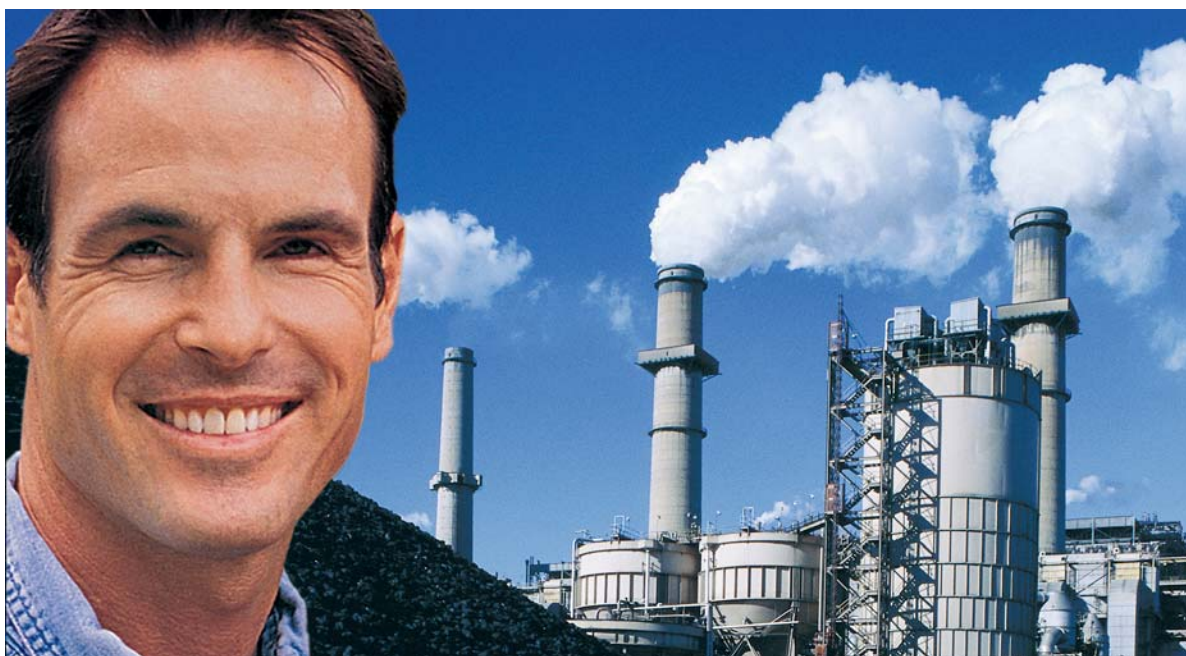


Coal Flow, Monitoring and Control

for Combustion Management



ABB

Coal Flow, Monitoring and Control for Combustion Management

ABB developed the PfMaster system for closed loop Combustion Optimization of boilers fired with pulverized coal. The ABB PfMaster system is for use on pulverized-coal feeds into boilers. A single system with one signal processing unit can measure up to 24 pulverized-fuel (pf) burner feeds. Poor distribution of pf causes combustion inefficiency and also environmental issues.

This continuous online measurement enables performance monitoring and the possible application of a closed loop control system to maintain optimum furnace performance.

The integration of such instrument into boiler control allows to influence two critical factors of combustion performance: excess air and mill dynamics. Conventional strategies control excess air based on the O₂ content after the boiler. This, however, neglect the behavior of each individual burner and might considerably increase combustion air. Furthermore, the mill dynamics traditionally are determined once, at initial commissioning. At this stage, load changes or storage behavior can only be modeled very limited.

New control strategies take advantage of the precise knowledge of coal flow and allow to optimize air distribution and coal feed very efficiently.

Sensor

The sensor, consists of 2-3 rings in the pipework providing highest performance even in the presence of roping and mal-distribution of pf. Therefore, the greatest flexibility of options are available when choosing a location to site the meter. Each sensor features a completely smooth internal bore which enables the longest possible interval between inspections and results in a long life span expectation.

All three measurements, velocity, coal-concentration and temperature (option), are made within the sensor.

Sensor connection to the signal-processing computer is by a single low-voltage multicore cable, the design of which has been optimized to provide the highest rejection of possible interference signals generated on the plant.

Another feature of the sensor electronics is the incorporation, as standard, of barrier circuits to prevent any possibility, under fault conditions, of hazardous voltages igniting the explosive atmosphere present in the pipe-bore.

No energy is transmitted into the pipe. Signal-sensing utilizes the detection of electrostatic energy, which is naturally present on the pf particles. This passive sensing therefore eliminates any dangers which might be present with systems based on ionizing radiation, such as microwave techniques.

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Signal processing unit and Display

The signals of up to 24 sensors connect into one Personal Computer for signal processing. A number of user-facilities are available which offer flexible I/O configuration.

The VDU display presents, graphically, the status of all meters and provides additional functionality for alarm handling etc.

If all signals are transmitted to the control system, the VDU is not needed permanently just for commissioning times.

The processed measurement signals may also be transmitted to the DCS and used for advanced control strategies.

Return on investment

Key issue for a highest possible benefit is the individual integration of the measurement into existing closed loop control structures. However, the goals are reduction in excess air by optimized air distribution, enhancement of mill dynamics by an online measurement of the mill output, and reduction of Ammonia consumption due to decreased NOx creation. These measures can considerably reduce operating cost and may permit a return on investment between 1-2 years.



Highlights

- On-line measurement of pulverized-fuel (pf) distribution (pf split), velocity and mass flowrate
- Realization of specific control strategies
- Measurement across total cross-section
- Non-intrusive, passive system
- Virtually unaffected by pf roping
- Inherent precision and calibration at manufacture
- Very low maintenance
- Safe, nonhazardous operation
- Short times for return on investment

Industrial^{IT} for Power Generation

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ABB Utilities GmbH

Postfach 10 03 51
D-68128 Mannheim
Kallstadter Straße 1
D-68309 Mannheim
Phone: +49 (0) 6 21 381-30 00
Fax: +49 (0) 6 21 381-26 45
E-mail: powertech@de.abb.com

Internet: www.abb.com

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