PfMaster  

Pulverised Fuel Flowmeter

Specification DataFile

- On-line measurement of pulverized-fuel (pf) distribution (pf split), velocity and mass flowrate
  - improved burner and boiler stoichiometry
- Measurement across total cross-section
- Non-intrusive, passive system
  - extremely low wear rate
- Virtually unaffected by pf roping or 'practical' pf distributions
  - superior to probe devices
- Inherent precision and calibration at manufacture
  - unaffected by changes in coal type and moisture content
- Simpler commissioning with no on-site calibration required
  - factory calibrated from traceable standards
- Very low maintenance
  - visual inspection required only during major outage
- Safe, nonhazardous operation
- Modular scaleable system
  - facilitates expansion

Pulverised Fuel Meter for coal-fired power stations and blast furnaces improves combustion efficiency and reduces emissions

ABB Instrumentation
General
The ABB PfMaster system is for use on pulverised-coal feeds into boilers. A single system can measure up to eight pulverized-fuel (pf) burner feeds from a single mill. Poor distribution of pf causes combustion inefficiency and also environmental issues.

For the first time a continuous on-line measurement enables performance monitoring and the possible application of a control system to maintain optimum furnace performance.

ABB Instrumentation offers Total Boiler Management solutions.

Introduction
Coal-flow transport behaviour and distribution to boiler burners has, up until now, proved difficult to meter. The dynamics of the coal flow are very dependent on factors such as particle size, roping and the physical plant layout.

The common way of checking the condition of the fuel distribution has been to use probe sampling devices. Whilst these do provide a reasonable indication of the flow in a given pipe at a given moment, the time taken to sample up to eight pf feeds across one mill can take several hours, during which the mill conditions have changed and hence the volume of fuel in previously sampled pipes has varied.

The ABB PfMaster is capable of making continuous measurements of pf flow in all the burner pf feed pipes simultaneously. Any instabilities in the Mill performance and pf pipework are instantly evident. Measurements are continuously updated and hence the output signals respond accordingly. The PfMaster is ideal for use within pf flow-control systems.

Development
The production of this innovative measurement system has been the result of practical experience and knowledge gained over many years in the process control and flow metering industries. The patented principles on which PfMaster operates culminate from a clear understanding of the technical and application requirements and through intensive instrument development.

Long term field trial activities, in the most demanding installations, have verified the durability of PfMaster. It meets the requirements of a low-maintenance product, an essential quality for modern practices in power generation.

PfMaster – Sensor
The sensor, being a spool-piece, provides the highest performance 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. An expected life in excess of ten years is typical. All three measurements, velocity, concentration and temperature, 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 ionising radiation, such as microwave techniques.

PfMaster – Signal Processor and Display
At the heart of the system is the signal processor which can handle up to eight sensors, sufficient to meet the requirements of a complete Mill. A number of user-facilities are available which offer flexible I/O configuration.

The VDU display presents, graphically, the status of all eight meters. Any measurement which is in an alarm condition changes color to indicate the fault and can also be programmed to trigger an electrical output from an I/O module.

A number of ‘Function’ keys at the foot of the display allow the user to switch between other facilities which include:

- **Setup** in which the ranging and output control is set
- **Trend** shows the system’s measured value over the past 60 minutes
- **Log** sets the file and logging interval for the internal data-logging facility
- **Cal** contains system calibration parameters which are accessible only through password controlled entry

In the event of power failure all the remote current outputs are frozen. The Processor system automatically restarts on power resumption.

If the measurements are all transmitted back to the control room there is no requirement to continuously connect the VDU. However, it is required during commissioning.
Specification

Sensor

Size range
DN 25 to DN600

Spool piece
Stainless steel, compact design

Mounting
CS Flanges, ISO7005 PN 16, ANSI 150
Flangeless, (VJ mounting)
Victaulic coupling

Process Temperature
–20°C to 180°C (–4°F to 356°F)

Pressure Rating
16 bar

Environmental
IP65 / NEMA 4X

Measurements
Absolute pf Velocity
Burner pf Split
Relative pf Loading (Concentration)
Mass Flowrate – computed for each pf line from split and external total mass input (mill feed-rate or similar)

Sensor Electronics

Supply
5V, powered from Signal Processor

Ambient
–20°C to 70°C (–4°F to 158°F)

Environmental
IP65 / NEMA 4X

Cabling
Single multicore screened cable
Sensor distance up to 200m

Approvals
Designed to EEx ia e (CENELEC & FM)
Zone 0 inside pipe
Zone 1 outside pipe
(Approval pending)

Signal Processor

Display (Optional)
VDU – required for commissioning
Processor – 19 in. rack-mounting

Sensor Input Channels
1 to 8 per processor system

Velocity Range
0.3 to 60m/s

Analog Outputs
Isolated 4 to 20mA
Fully programmable for Velocity, Split & Concentration
Modular – DIN rack-mounted

Alarms
Programmable high/low points for Velocity & Split
Modular – DIN rack-mounted

System response time
<1.5s – suitable for continuous on-line pf flow control

Logging
Velocity, Split, Concentration & Temperature.
File format – Comma delimited (*.csv)

Temperature
10°C to 60°C (50°F to 140°F)

Environmental
IP54

Dimensions
19 in. rack-mounting
Excludes VDU, keyboard & mouse (all optional)

Power
< 200VA
110/230V a.c. 47 to 63Hz