Data Sheet
SS/PFMAS_2

Pulverised Fuel Flowmeter

PfMaster

- **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
- **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
- **Digital Buses**
  – variety of buses for simple cable interfacing
  – single cable interfacing
- **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

General

The ABB PfMaster system is for use on pulverised-coal feeds into boilers. A single system can measure up to 24 or 32 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 Limited 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. The two measurements, velocity and concentration, 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 24 sensors, sufficient to meet the requirements of a number of Mills. Many user-facilities are available which offer flexible I/O configuration.

The VDU display presents, graphically, the status of all 24 or 32 meters. Any measurement which is in an alarm condition changes color to indicate the fault.

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

Mass Enables relative or absolute mass details to be configured and displayed

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

Specification

Sensor

Size range

DN 25 to DN600

Spool piece

Stainless steel, compact design

Epoxy coated carbon steel body

Stainless steel electrodes

Mounting (vertical mounting recommended)

Wafer Type

Victaulic coupling

Velocity Type – R4 or DN100 PN16

Ideally, sensors should be located at the same distance from any hydraulic disturbances such as bends, trifurcators and so on.

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

Incorporates zener barrier to prevent hazardous voltages on the electrodes. **Note**. Not hazardous certification approved.

Signal Processor

15 in. Display

Local TFT flat color screen

Sensor Input Channels

1 – 24 or 25 – 32 per processor system

Velocity Range

0.3 to 60m/s

Inputs/Outputs

Isolated 4 to 20mA

Fully programmable for Velocity or Mass Flowrate

Inputs (optional)

Mass (feeder input) via 4-20mA or digital OPC Client, Modbus or DH+

Bus Outputs (optional)

OPC Server Client using either Ethernet or RS485 or RS232

Modbus via RS485 or RS232 DH+

Alarms

Programmable high/low points for Velocity & Split (on screen only)

ISystem response time

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

Logging

Velocity, Split concentration, Mass flowrate with programmable logging interval

File format – Comma delimited (*.csv)

Temperature

10°C to 60°C (50°F to 140°F)

Environmental

IP65

Power

< 200VA

110/230V a.c. 47 to 63Hz

Remote Display (Option)

Wireless LAN with IEEE 802.11 interface enables a remote PC with ABB supplied software to control, display and read logged data via a wireless connection

Remote Support

Modem supplied. Requires a direct-dial external telephone connection for remote support

Dimensions

Enclosure – 24 Channel Unit

1203mm x 803mm x 297mm (47.4 in. x 31.6 in. x 11.7 in.) (excluding optional canopy and wall-mounting brackets).

Keyboard and USB drive are also supplied

Enclosure – 32 Channel Unit

1805mm x 803mm x 297mm (71 in. x 31.6 in. x 11.7 in.) (excluding optional canopy and wall-mounting brackets).

Keyboard and USB drive are also supplied

Ordering Information – Sensors

PF/M	PF/M	/XXXX	X	X	X	X	X
Sensor Size							
25		0025					
40		0040					
50		0050					
100		0100					
200		0200					
250		0250					
330		0330					
356		0356					
358		0358					
362		0362					
370		0370					
381		0381					
387		0387					
438		0438					
483		0483					
533		0533					
584		0584					
600		0600					
Special		9999					
Sensor Style							
Full Bore			1				
Velocity Meter			2				
Sensor Couplings							
Wafer				1			
Victaulic Grooved				2			
DN100 PN16 Insert (Velocity Sensor only)				3			
R4 Insert (Velocity Sensor only)				4			
Special				9			
Sensor Amplifier							
Integral					1		
Remote (1m [39.4 in.] cable)					2		
Cable Glands							
M20 (glands supplied)						1	
½ in. NPT (blanking plugs supplied)						2	
Build Standard							
Standard							1
PED approved							2

Ordering Information – Signal Processor

PF/E	PF/E	/XX	X	X	X	X	X	X	X	X	X
Input Modules											
1 17		01 17									
2 18		02 18									
3 19		03 19									
4 20		04 20									
5 21		05 21									
6 22		06 22									
7 23		07 23									
8 24		08 24									
9 25		09 25									
10 26		10 26									
11 27		11 27									
12 28		12 28									
13 29		13 29									
14 30		14 30									
15 31		15 31									
16 32		16 32									
Output Modules											
None Required			0								
1 output per sensor			1								
2 outputs per sensor			2								
Signal Processor Enclosure											
Standard IP65 (up to 24 inputs)				1							
Standard IP65 (25 to 32 inputs)				2							
Custom				9							
Customer Interface – OPC											
Not Required					0						
OPC Client					1						
OPC Client + RS232/485 Interface Converter					2						
Customer Interface – WLAN											
Not Required						0					
WLAN						1					
Glanding											
No glands fitted, gland plate undrilled							0				
M20 (glands supplied)							1				
½ in. NPT (glands not supplied)							2				
Accessories											
None								0			
Wall mounting brackets fitted								1			
Enclosure Canopy fitted								2			
Wall mounting brackets & Enclosure Canopy fitted								3			
Accessories*											
None									0		
Mill input via 4 to 20mA									1		
Customer Interface –Setup OPC											
OPC Initial setup for configuration										9	
Repeat order with the same setup										0	
Display Mimic											
Mimic Initial setup											9
Repeat order with the same setup											0

* Select the combination of enclosure and mill input required.

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