

The Greenbank Group UK

Enhancing the performance of our customers plant and equipment



Enhancing Performance

PfMaster Coal Flow Monitoring System



Greenbank Terotech Ltd is the official partner and sole distributor of the ABB PfMaster coal flow balancing and measurement monitoring system. The PfMaster system is designed for use on pulverised-coal feeds into boilers. A single cabinet can connect up to 32 sensors to measure coal distribution and velocity in pulverised-fuel (Pf) burner feeds. Poor fuel distribution causes combustion inefficiency. Coal-flow transport behaviour and distribution to boiler burners has, up until now, proved difficult to meter. The dynamics of the coal flow are dependent on factors such as particle size, roping and the physical plant configuration, in particular the layout of the Pf pipe-work from individual mills to the burners.

The common way of checking the condition of the fuel distribution has been to use probe-sampling devices. Whilst these do provide an indication of the flow in a given pipe at a given moment, the accuracy is a function of the probe type and procedure used. In addition, the time taken to sample up to eight Pf burner feeds across one mill can take several hours using the most accurate single point sampling techniques. This makes controlled changes and the checking of distribution after improvements over a range of mill throughputs a very labour intensive task.

The PfMaster enables continuous 'on-line' measurement, balancing and monitoring of performance of the flow of Pf.

The benefits of the ABB PfMaster include:

- Low-maintenance, an essential quality for modern practices in power generation.
- Factory calibrated. There is no need for expensive and time consuming manual sampling techniques.
- ATEX and CE approval for safety. The device is passive and is designed so that no energy can enter the fuel pipes.

- The real time use of velocity information for trimming of Primary Mill Air! The application data shows that reducing the Primary Mill Air for a given load can improve both classification & distribution.
- Mills that have multiple coal pipes exiting the classifier can use control valves to balance the fuel distribution
- Used in conjunction with other Greenbank Group technology, such as the GAIM HVARB anti rope breaking and trim control device, the PfMaster allows real time feedback to allow fine tuning of coal flow distribution.
- An alternative combustion improvement option is to use the PfMaster to give real time feedback to plant control of secondary air at the burners to balance the combustion at individual burners.



INVESTOR IN PEOPLE



PfMaster Coal Flow Monitoring System

PfMaster Sensor

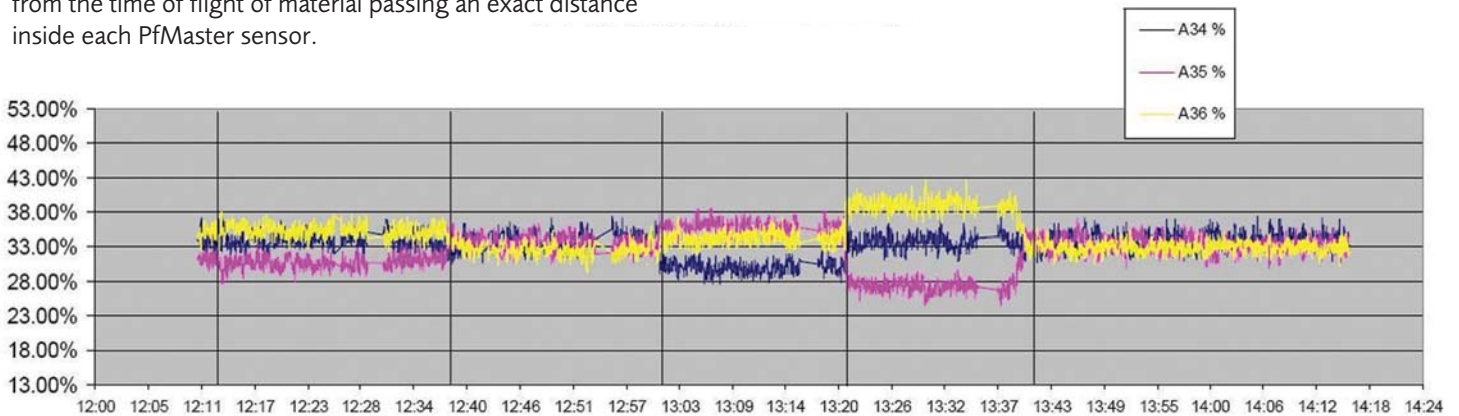
The PfMaster Sensor monitors for poor distribution of coal to the burners. Electrostatic sensor rings around the whole internal circumference of the pipe identify coal roping and twisting of the Pf travelling through the pipe. Signal-sensing utilises the detection of electrostatic energy, which is naturally present on the pf particles.

Each sensor features a completely smooth internal bore, making the design relatively immune to wear due to coal impact, and it is unaffected by high pressure excursions from the mill (Pressure Equipment Directive certificates on request). This ensures the longest possible interval between service inspections.

PfMaster Sensor electronics attached to the sensor act as an amplifier to send the measurements to the control cabinet where coal velocity and concentration are derived. The central cabinet calculates the coal distribution and flow from all the sensors of a particular mill. Then it determines individual pipe coal velocities from the time of flight of material passing an exact distance inside each PfMaster sensor.

PfMaster Sensor connection to the central signal-processing cabinet is by a single low-voltage multi-core cable. The PfMaster sensor electronics design and input modules at the central cabinet have been optimised to provide the highest rejection of possible interference signals generated on the plant.

The PfMaster sensor electronics incorporate, as standard, 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. As such the PfMaster Sensor has appropriate CE and ATEX approvals. This passive sensing therefore eliminates any dangers which might be present with systems based on active measurement techniques, such as microwave and other electromagnetic radiation techniques



Monitoring HVARB percentage splits at a UK Coal Fired Power Plant with PfMaster as the measuring device.

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PfMaster Coal Flow Monitoring System

PfMaster - Signal Processor & Display

At the heart of the system is the signal processor which can handle up to 24 or 32 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 colour to indicate the fault. A number of 'Function' keys at the foot of the display allow the user to switch between other facilities.

These include:

- Setup in which the ranging and output control is set.
- Trend shows the systems 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.

Greenbank On-Line Velocity Meters

Many low NOx burner designs have been designed for very low Pf velocities, some as low as 16 m/s for optimum combustion. It is also well understood that mill classification is improved both on Dynamic and Static classifiers with reduced Pf velocity through the mill. The Greenbank On-Line Velocity Meter works on the same principle as the PfMaster i.e. non-intrusive with the same quality sensor electronics & cabinet.

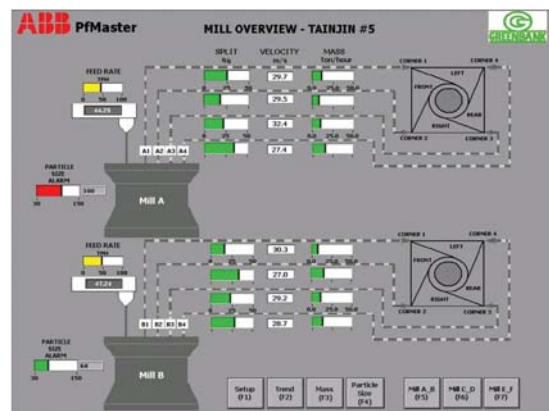
For coal velocity measurement only, it is not necessary to utilise

the whole pipe circumference as with the PfMaster sensor. As such, the design screws into the pipe via a 4 inch BSP fitting as it determines velocity from the time of flight of material past its two sensors in the same way as the PfMaster sensor.

Clients can use the on-line velocity meter to minimise primary air through the mill for optimum classification, improved distribution and burner combustion.

The PfMaster 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 working in the process of delivering Pf to the boiler.

Intensive instrument development and long term field trial activities, in the most demanding installations, have verified the durability of the PfMaster. Wear of any intrusion into the pipe is a function of the coal type and its velocity. The PfMaster is non-intrusive. Greenbank can guarantee a minimum life of sensor spool pieces. All sensors are factory calibrated before shipping with a certificate of conformity. To date no PfMaster system has ever failed or suffered down-time and required maintenance.



PfMaster Velocity & Distribution



PfMaster Coal Flow Monitoring System

General Specification

Sensor Size Range:	DN25 to DN660	Signal Processor Display:	Local flat colour 15" screen
Spool Piece:	Stainless steel, compact design Epoxy coated carbon steel body Stainless steel electrodes	Sensor Input Channels:	1 - 24 or 25 - 32 per processor system
Mounting:	Wafer Type-between flanges Victaulic Joints Velocity Type-R4 or DN100 PN16	Velocity range:	0.3 to 60 m/s
Note:	Vertical mounting recommended at the same distance from any pneumatic disturbance, bend, splitter, etc.	Inputs/Outputs:	Isolated 4 to 20mA
Process Temperature:	-20°C to 180°C (-4°F to 356°F)	Inputs (optional):	Mass (feeder input) via 4-20mA or Digital OPC client, Modbus or DH+
Pressure Rating:	16 bar	Bus Outputs (optional):	OPC Server Client using either Ethernet, RS485 or RS232 Modbus via RS485 or RS232 DH+
Environmental:	IP65 / NEMA 4X	Alarms:	Programmable high/low points for velocity (on screen only).
Measurements:	Absolute Pf velocity Burner Pf split Relative Pf loading (concentration) Mass flowrate - computed for each line from split and external total mass input (mill feed rate or similar)	System Response Time:	<1.5s - suitable for continuous on-line Pf flow control
Sensor Electronics Supply:	5V, powered from signal processor	Logging:	Velocity, split, concentrations with programmable logging intervals. File format - Comma delimited (*.csv)
Ambient:	-20°C to 70°C (-4°F to 158°F)	Temperature:	10°C to 60°C (50°F to 140°F)
Environmental:	IP65 / NEMA 4X	Environmental:	Panel IP65 rated
Cabling:	Single core multi-screen cable Sensor distance <200m	Power:	<200VA 110/230V a.c. 47 to 63Hz
Approvals:	Incorporates zener barrier to prevent hazardous voltages on the electrodes.	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.
Note:	Not hazardous certification approved	Remote Support:	Modem supplied as standard. Requires an external direct dial telephone connection.
		Dimensions:	24 channel unit - panel 1203x803x297mm 32 channel unit - Panel 1805x803x297mm Keyboard and USB drive supplied as standard

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