



# Particulate & Emission Monitoring Systems

particulate emission

mass emission

stack velocity



Technological innovation in continuous particulate monitoring for environmental and process applications in manufacturing industry

US-EPA



Particulate  
0-30mg/m<sup>3</sup>  
0-150mg/m<sup>3</sup>



BImSchV 17 0-15mg/m<sup>3</sup>  
BImSchV 13 0-150mg/m<sup>3</sup>  
BImSchV 27 0-30mg/m<sup>3</sup>



Certificate No: 9389

# the company

PCME is a worldwide organisation dedicated to the innovation, design, development, manufacture and supply of continuous particulate emission monitors for industrial processes. With instruments monitoring over 10,000 emission sources in over 40 countries, PCME provide a comprehensive range of products, using a choice of technologies, for bagfilter performance optimisation and regulatory emission measurement. The company continues to strengthen its position in the market by meeting the needs of customers in three core areas:

## Regulatory Compliance:

Industrial processes installing and operating continuous monitoring instrumentation to meet and/or exceed national and international requirements including US EPA, UK MCERTS and German TÜV standards

- Measurement in  $\text{mg}/\text{m}^3$
- Monitoring the performance of filter plant systems
- Qualitative/indicative monitoring

## Corporate Responsibility:

Industrial processes monitoring emissions to provide data for their own internally driven environmental programs and quality control procedures

- Improved environmental performance through corporate governance or environmental programs (eg ISO 14000)
- Instruments meet the demand for high quality measurement similar to any process instrument where data is of value to the organisation

## Process Improvement:

Industrial processes installing monitoring instruments to improve their process with a financial return

- Instrument output is directly used to control the process
- Typical uses include improved powder production, reduction of product loss from process particle collection device and reduced running costs of fabric filters (eg extending life of bags)

PCME is a committed investor in regulatory approval processes, and it's accreditation achievements include German TA-LUFT approvals, BImSchV 17,13 and 27 and the UK Environment Agency's MCERTS accreditation for both Electrodynamic (charge induction) and Dynamic Opacity (light variation) technologies. On-going investment programmes in certification processes and product development coupled with ISO-9001 certification, reflects the Company's firm commitment to quality, validated performance, reliability and long-term repeatability.



# monitoring range



## Dust Emission Monitoring

**Electrodynamic** instruments with inherent robustness provide effective monitoring even in the most aggressive environments including those with variable velocity. Insulated probe options are available for high humidity gas streams and applications with high conductive dust loadings. Particularly suitable for baghouse management, these instruments offer single point mounting for ease of installation.

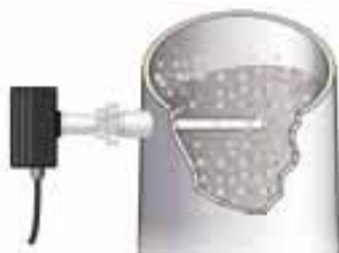
The capability of differentiating particulate

from water vapour also provides unique solutions in dryer applications. ATEX approved options are available. (see next page)

**Dynamic Opacity** systems offer contamination tolerant optical technology for larger stacks, Electrostatic Precipitator applications and boiler monitoring. Instrument air is typically utilised rather than blower systems for reduced maintenance and lower running costs.

# technologies

PCME have a comprehensive range of particulate monitoring technologies to ensure that only the right technique is used in a particular application. Interference and cross-sensitivities are minimised by selection of the most appropriate technology. Electrodynamic techniques are used in bagfilter applications, insulated sensors in drier (humid) applications and optical techniques after Electrostatic Precipitators.



## Electrodynamic Particulate Emission Monitoring

### Principle of Operation

Proprietary technique based on a charge induction principle derived from particle interaction with probe inserted into a stack or duct. The instrument output is an analysis of this frequency response and in appropriate applications is a function of the concentration of particulate.

### Applicability

- Bagfilters, Cyclones, Humid air streams\*
- \* using patented insulated sensor

### Dust Concentration

- 0.01 mg/m<sup>3</sup> to 10,000 mg/m<sup>3</sup>  
(product specific)

### Approval Range

- 0 – 30 mg/m<sup>3</sup> (MCERTS/TUV)

### Unique Features

- Unaffected by contamination of probe
- Unique solution for dryers & humid gas streams
- Optimised to tolerate change in velocity of 8-18 m/s (unlike Triboelectric systems)
- Zero and Span Checks
- Patented Insulated Sensor for humid applications
- Patented Probe Contamination check



## Electrodynamic Cross-Correlation Velocity & Mass Monitoring

### Principle of Operation

Measures transit time of particles between two rods by cross-correlating Electrodynamic signature

### Velocity Range

- 1 – 40 m/s (other velocities on request)

### Unique Features

- Contamination on sensor causes no error
- Operates in humid and aggressive environments
- Dust measurement available for mass monitoring as upgrade option (application specific)
- Operates in stacks up to 400°C



## Dynamic Opacity Particulate Emission Monitoring

### Principle of Operation

Ratiometric measurement based on light variation

### Applicability

- Bagfilters, Electrostatic Precipitators, Cyclones, Boiler Stacks

### Dust Concentration

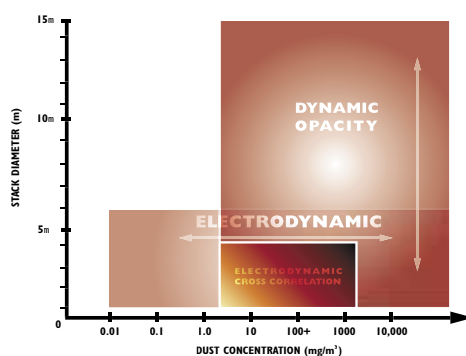
- 2.5 mg/m<sup>3</sup> to 20,000 mg/m<sup>3</sup>  
(minimum detection limit is application specific)

### Approval Range

- 0 – 150mg/m<sup>3</sup> (MCERTS/TUV)

### Unique Features

- Ratiometric measurement permits accurate measurement when lens contaminated up to 90%
- Zero and span checks on compliance instruments
- Selectable dust concentration and/or **opacity** outputs
- Light intensity, upscale checks
- Optional audit unit (model specific)
- Blower systems not required since air purge is sufficient

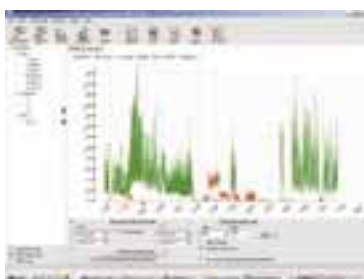


## Environmental and Process Reporting

PCME provide a full suite of PC software for emissions reporting, instrument configuration and process optimisation. Software for the downloading, displaying, analysis and report generation of emissions data from a PCME emission control unit provides instantaneous and historical access to emissions data for both process and legislative reporting purposes.

- Real time mode and short term log for process control
- Long-term log for emission reporting
- Powerful trend views with zoom and pan facilities

- Instrument overview, alarms, maintenance and failure condition reports
- Environmental reporting with data backup and system redundancy



Graphical Report/Analysis from DustReporter 2



DustView System Overview

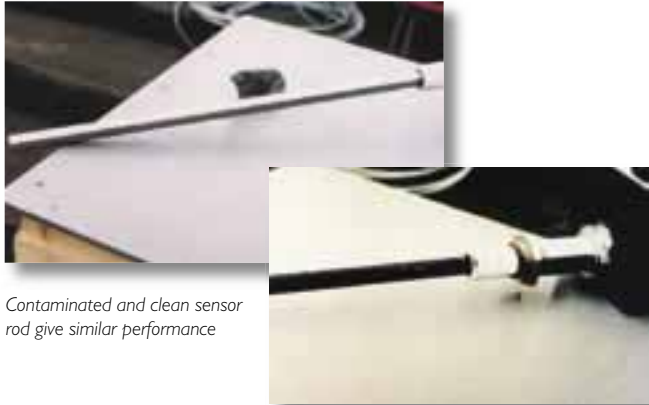


# added value designs

## Tolerance to Contamination

Electrodynamic instruments are tolerant to rod contamination since the charge induction does not principally involve direct contact between particulate and measurement surface.

Dynamic Opacity instruments operate with no reduced accuracy even with the transmitter and receiver optics 90% contaminated. They provide opacity outputs (colour) in addition to concentration ( $\text{mg}/\text{m}^3$ ) output (model specific)



## Humid Monitoring Conditions

Unique performance in humid stacks after drying processes.

**Patented** Insulated sensor technology (option) permits instruments to operate reliably in high humidity stacks after spray driers and fluid driers. Electrodynamic measurement technology discriminates effectively between particulate and water vapour.



## Powerful User interface

Instrument interface is optimised for the parallel use by maintenance, process and environmental personnel. Powerful single and multi-sensor control units permit secure configuration and availability to data. Graphic trend and review screens provide Bagfilter pulse and average emissions concurrently and local or PC configuration and reporting is fully supported by open data architecture.

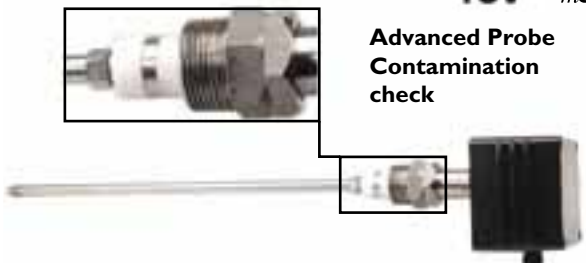


## Approved, Accurate and Repeatable Measurement

Instruments are certified by TÜV, Germany for the more demanding requirement to measure emissions in  $\text{mg}/\text{m}^3$  within defined tolerances (BlmSchV 17 and 13). Instruments approved according to the UK Environment Agency's MCERTS approvals process are also provided. Automatic zero and span checks self-validate instrument and **patented** sensor contamination checks provide additional assurance of measurement accuracy.



**Advanced Probe Contamination check**



## Optimised Performance for Filter Plant

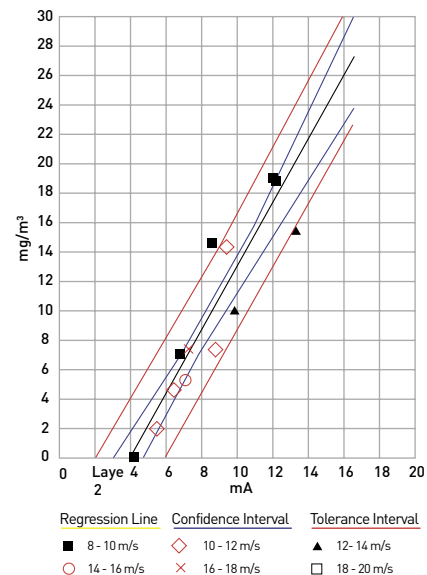
Electrodynamic technology is ideal for use after bagfilters and cyclones due to its low minimum detection level ( $<0.01\text{mg}/\text{m}^3$ ), rugged performance and repeatability even in applications with highly contaminating dusts and single stack access installation requirements. Dynamic Opacity instruments provide very reliable operation in large stack and Electrostatic Precipitators applications. World-class designs provide maintenance personnel with the tools to maintain optimum operational efficiency and to diagnose and locate filter problems.



Dynamics of dust levels during bag cleaning shown with graphics screen

## Velocity Insensitivity

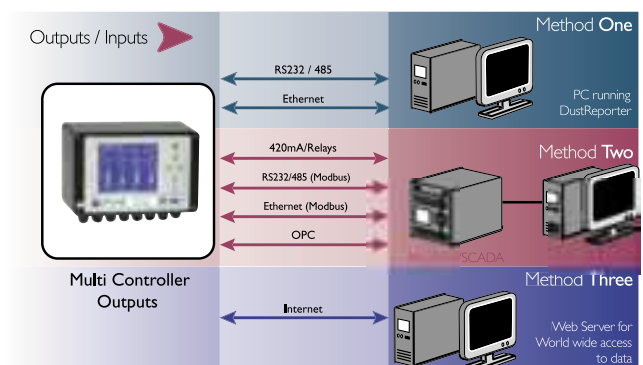
Electrodynamic instruments maintain calibration under changing velocity conditions of 8 – 18 m/s. (Independently verified by German TÜV)



Calibration remains stable with changing velocity

## Industrial Connectivity

Hardware and software protocols are supported for connecting instruments to LAN, PC, PLC, DCS and SCADA systems as well as the internet for off-site data access. Modbus, TCP/IP (Ethernet), OPC and/or 4-20 mA connections permit emissions data accessibility throughout the industrial plant.



# monitoring range (cont)



## Compliance (Regulatory) Monitoring with Approvals

Compliance instruments incorporate automatic self-checks (zero and span) and sensor contamination checks for enhanced repeatability and reliability.

Certified to German TÜV (BlmSchV 17, 13 and 27) and UK MCERTS standards, PCME's range of approved instruments have been assessed by independent third parties to satisfy rigorous standards for continuous validated

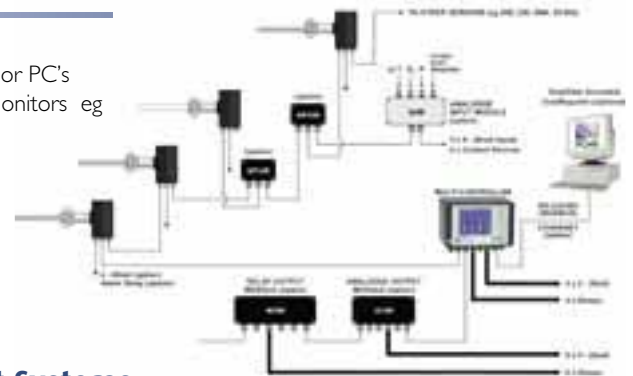
performance. PCME also provide solutions to specific national and international regulatory requirements. eg PS-I, PS-II CAM and MACT (US), EN-14181 and Qual 2 (Europe) and Qualitative/Quantitative monitoring (UK and Germany).

## Integrated Multi-stack Emission Systems

Multi-emission point monitoring systems utilising a flexible and advanced network of sensors are available for regulatory, compliance and filter performance monitoring. The instrument design permits up to 32 sensors to be connected to a single control unit from which industry standard outputs (4-20 mA, RS232/485 Modbus) are provided for easy connection to plant control systems.

Optional components include:

- Ethernet connections to LAN or PC's
- Analogue inputs from other monitors eg  $O_2$ , Gas and Temperature
- Remote access via Internet



## Bagfilter Management Systems

Leaking bags and broken bags can be detected in single or multi-compartment filter systems providing maintained operation at optimum levels. Identification of specific row or compartment failure reduces downtime and replacement costs of faulty bags.

Predictive maintenance capability assists in maintenance re-work scheduling, budgeting for replacement parts and provides accurate records for regulatory purposes.

- verification of effective operation of complete filter system
- early anticipation of filter problems
- variations in performance between bag rows are clearly indicated for rapid problem location

## Flow Rate and Mass Monitoring

Stack particle velocity (m/sec), dust concentration ( $mg/m^3$ ) and mass emissions (Kg/hr) are simultaneously monitored, recorded and reported to satisfy both process and new regulatory requirements which focus on the total mass discharge of particulate from a plant.

Ease of installation from single point flange mounting and through simple set-up and

configuration, this network compatible sensor provides invaluable environmental impact protocol data for environmental audits. In addition, the sensor, with in-built self-checks, can be combined with gas analysers to provide gas mass emission data.



## Hazardous Dust and Gas Zones

Intrinsically safe instruments (certified as categories 1, 2, 3 compliant devices according to ATEX) provide dust monitoring capability in applications where hazardous area (EX) certification is required.

Certified for:

- ATEX dust zones 20, 21, 22 typically found in the food and powdered metal and chemical industries
- ATEX gas zones 0, 1, 2 typically found in the chemical, petrochemical, blast furnace and refinery industries



## COMBUSTION & INCINERATION

- POWER PLANTS
- INCINERATORS
- REFINERIES
- PULP & PAPER



### Monitoring Issues:

- Approved and certified systems for dust concentration, not simply colour
- Tolerance to flyash which contaminates monitoring systems
- Low maintenance needs due to limited man-power to maintain analysers and instruments
- Highly abated emissions after incineration processes and therefore minimum detection level constraints
- EN-14181, incineration and combustion specific standards, WID (Waste Incineration Directive) & LCPD (Large Combustion Plant Directive)
- Tolerance to vibration and high temperatures and suitability for large stacks
- Dust analysers are integral but specialist part of emission CEM system

### Emission Sources:

- Coal Fired Boilers
- Recovery Boilers
- Oil and Gas fired boilers
- Biomass boilers
- Limestone dry scrubber
- Activated carbon dry scrubber
- Municipal waste incineration
- Chemical waste treatment



## MINERAL

- LIME
- CEMENT
- ROADSTONE
- GYPSUM



### Monitoring Issues:

- Humid emissions from mineral drying and calcining plant
- Extensive use of ESP, Cyclone and bagfilter dust arrestment plant, all which can fail causing visible emissions
- Environmentally sensitive emissions from main kiln stack as well as multiple emission sources from mills, coolers and silos (IPPC, WID, LCPD)
- Tolerance to abrasive and contaminating dust
- Fugitive dust emissions from storage and handling
- Potential to emit large amounts of emissions due to large size of filter systems
- Approvals and regulatory compliance issue, US, European regulations under US EPA and IPPC

### Emission Sources:

- Kilns
- Calciners
- Raw mills
- Clinker coolers
- Cement mills
- Silos/Materials Handling
- Rotary ore dryers
- Kettles
- Board drying kilns
- Mixing conveyors
- Screening



## TOBACCO

### Monitoring Issues:

- Multiple emission sources from primary and secondary processes

### Emission Sources:

- Cutters & Dryers
- Conveying Systems
- Blenders and Mixers
- Cigarette Making Machines

## TIMBER

### Monitoring Issues:

- Re-circulating air from arrestment plant in timber and wood working industries while meeting Health and Safety dust exposure levels

### Emission Sources:

- Boiler Plant
- Extraction Systems on Saws, Planes, Machining & Sanding Processes

## ASBESTOS

### Monitoring Issues:

- Very low levels of particulate
- High environmental concerns

### Emission Sources:

- High Efficiency filters (HEPA)



trial companies across a broad range of manufacturing  
 improve environmental performance and control.

## METALS

- STEEL
- FOUNDRY
- BATTERY
- NON-FERROUS
- ALUMINUM



### Monitoring Issues:

- Tolerance to contaminating particulate with high carbon, moisture and metal content
- Emission control is critical due to toxic nature of some particulates
- EX requirements from Blast Furnaces
- High levels of particulate and large arrestment plant from smelting, sinter and furnace applications
- Low level abated emissions (typically  $<0.2 \text{ mg/m}^3$ ) in non-ferrous and battery industries
- Elevated temperatures and abrasive dusts create increased maintenance challenges
- Efficient control and operation of multi-compartment bagfilters and ESP

### Emission Sources:

- Furnaces
- Shotblasting process
- Sand plant
- Smelting furnaces
- Converters
- Lead refineries
- Anode baking ovens
- Coke plant
- Calciners
- Electrolytic reduction
- Reverberatory furnaces
- Steel casting
- Blast furnaces
- Sinter plant

## CHEMICAL AND FOOD

- CARBON BLACK
- PLASTICS
- $\text{TiO}_2$
- PIGMENTS
- SUGAR
- STARCH
- MILK POWDER



### Monitoring Issues:

- Discriminating between steam and particulate in spray dryer stacks in food, detergent and chemical industry
- Tolerance to contamination due to inherent physical properties of carbon black and other chemical powders
- Explosive gas zones in refineries, paint operations and chemical processing
- ATEX dust zones due to potentially explosive areas in starch, sugar and flour processes (problematic for optical systems)
- Extensive use of bagfilters and cyclones with measurement, process optimisation and failure detection requirements
- Digital and analogue interface to existing instrumentation, plant control systems and LAN connections

### Emission Sources:

- Spray dryers
- Agglomerators
- Silos
- Mills
- Classifiers
- Pelletizers
- Fluid bed and rotary dryers
- Dryers
- Coolers
- Materials handling
- Blenders
- Process Reactors

## PHARMACEUTICAL

### Monitoring Issues:

- Humid emissions from drying plant
- Product loss

### Emission Sources:

- High Efficiency Filters (HEPA)
- Spray Dryers
- Materials Handling & Blending
- Vacuum Transfer systems & Silos

## AUTOMOTIVE

### Monitoring Issues:

- Oil aerosols after engine compartment machining operation
- Preventative Maintenance on filters

### Emission Sources:

- Coalescent filters
- Paint Spray Extraction
- Casting and Shotblasting

## GALVANISING

### Monitoring Issues:

- Typically short-term batch processes

### Emission Sources:

- Galvanising Bath

# technical services worldwide

PCME recognises that service support is a critical issue for industrial operators who may depend on the results from instruments as part of regulatory permits or to provide critical process details. PCME offers a complete range of technical services which include taking 'turnkey' responsibility for installing and commissioning monitoring systems. Robust scheduled maintenance and calibration contracts are available in support of installed systems, providing on-site and factory service training and of course providing responsive emergency breakdown service. Importantly, PCME's instruments are designed for optimised performance and minimal routine maintenance.

## Worldwide on-site support



PCME's service capability extends throughout the world and has proven to provide robust, responsive services to our global customer base. We know the importance to our customers of having instruments serviced at their sites to reduce downtime and increase instrument availability. World-wide service partners have teams of service engineers who are trained by PCME to provide on-site support. In the UK, a network of field service engineers provides on-site national coverage.

## Service Contracts

Preventative maintenance, extended warranty, rapid breakdown response and calibration services are all covered by a range of service contracts to meet regulatory and process specific support requirements. In the UK, a range of contracts help operators achieve a high OMA (Operator Monitoring Assessment) score for their monitoring systems and worldwide PCME supports its distribution partners to provide similar high level field and factory services.

## Breakdown Service

Many of PCME's instruments include automatic self-checks to provide warning of the need for any instrument repair or service. In the case of instrument breakdown our network of field service engineers are fully trained to carry out instrument fault analysis and repair on site. Factory repair services are available from the UK headquarters in St Ives, Cambs.

## Calibration Services

PCME understands that a calibration is not simply an Iso-kinetic test. Documented and traceable calibration procedures capture instrument performance and configuration. Calibrations are provided using a range of National and International sampling standards (eg. EN 13284-1 and BS ISO9096) via a subcontracted network of approved sampling personnel. In the UK, sampling personnel are MCERTS approved.



## Training

PCME provides regular on-site and factory service training for plant personnel to support their monitoring systems. In addition, PCME organises Training Courses to improve knowledge and understanding of instrument service requirements, legislative issues, the features and performance of monitoring systems and the optimised use of emissions analysis and reporting software.



[www.pcme.co.uk](http://www.pcme.co.uk)



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