

Categories of Particulate Emission Monitoring used by Industrial Processes for Regulatory Compliance and Arrestment Plant Control

Requirements for different types of particulate emission monitoring has evolved over the past 20 years to satisfy three important trends:

- 1) The increasing importance and variety of type approvals and certification schemes such as MCERTS and TUV.
- 2) The application of BAT (best available technology) to monitoring approaches which means that feedback on particulate filter condition is required in certain processes while absolute measurement is required in others.
- 3) The wide adoption of bagfilter type arrestment plant whose operation can be optimised by new types of performance monitoring.



Typical industrial process which uses continuous particulate monitoring

The most important categories of continuous particulate monitoring arising from these requirements are as follows:

1) Particulate Measurement Systems

These are instruments which for a defined range of application conditions have the accuracy and consistency of response to be reliably calibrated in mg/m³ by comparison to a standard reference Method (SRM) (Isokinetic test). There are three sub-categories of instruments within this category divided by the level and sophistication of approval from MCERTS (UK), TUV (Germany) and satisfaction of US EPA standards (US).

1.1 QAL1 approved instruments/PS-11

These instruments have the Quality Assurance features such as reference materials and Zero and Span functions to ensure uncertainty in measurement is always below a defined uncertainty, as required by EN 14181 in Europe and PS-11 in the US. They are approved according to the EN 15267-3 standard which is reflected in the latest version of MCERTS (Version 3) and BImSchV 17 and 13 in Germany according to the TUV approval scheme.

1.2 MCERTS and TUV approved CEMS

These instruments are approved as measurement systems under older approvals requirements (MCERTS Version 2/older versions of BImSchV 17/TUV or reflect the new European standard for filter dust monitors (MCERTS Version 3, Class 2). Such instruments are approved as measurement systems and while still having Quality Assurance features to ensure practical reliable measurement, do not necessarily have reference materials and span features which enable total uncertainty to be assessed. These types of instruments are often used for measurement in processes where regulators are not applying EN 14181 (eg metals minerals and chemical processes regulated by the IPPC directive) but still requiring an independent approval meeting specific performance criteria.



Dynamics of dust levels during filter cleaning and monitored to diagnose location of leaking bags



Approval schemes test instrument reliability as well as performance and functionality

1.3 CEMS without approvals

These instruments have the features required for reliable measurement, (accuracy and reliable long term operation, calibration screens, internal quality assurance checks) but have not been subjected to the independent verification of an approvals scheme. Such instruments are used in parts of the world where regulators do not require an approval or measurements are being done for non-regulatory purposes.

2) Filter Leak Monitors

These instruments are used for monitoring changes in emissions from particulate arrestment plant (eg Electrofilters or bagfilters) and provide a tool to minimise emissions from processes and monitor for arrestment plant malfunction (eg leaking bags, failed bags).

Regulators in Europe sometimes require Filter Leak Monitors to support legislative requirements 'to minimise emissions from processes' falling under the IPPC directive.

Two sub-categories of these types of instruments are:

- 2.1) Approved instruments (eg to MCERTS Class 3 requirements or TA Luft) where quality assurance features are required in addition to reliable measurement. The performance standard is similar to the ASTM standard D 7392-07 for bag leak detectors which has relevance for MACT monitoring in the US.
- 2.2) Filter Leak Monitors which are not certified to any performance standard but still provide a variety of quality assurance and functionality options.

3) Filter Performance Monitors

In addition to providing leak monitoring capability for bag filtration arrestment plant, these more advanced instruments allow the plant operator to monitor the dynamic operation of the filters cleaning system and diagnose the location of faulty bag rows and compartments. This provides valuable information to maintenance teams in solving leakage problems, and reduces bag replacement costs.

This functionality is often combined with particulate measurement systems or may be added via a separate control unit to filter leak sensors hence permitting approved versions of these instruments.

In large multi-compartment bag compartments, multi-sensor systems are used to monitor emissions from each compartment to diagnose the location of failed compartments.

Selecting the Right Level of Instruments

To help plant operators ensure they have the right level of particulate instrument for their specific requirement and select the right product, PCME has given its latest product range product names which reflect their monitoring capability (eg PCME QAL 181 is a measurement product with QAL1 approval. It is therefore much easier for a plant operator or regulator to see which product category a specific instrument is intended to serve.

In addition, greater visibility has been given to the measurement principle of each instrument, reflecting that each category may be served by a choice of different measurement technologies (eg QAL1 measurement systems are available as ProScatterTM, Forward Scatter technology or ElectroDynamicTM Probe Electrification technology based instruments). The terms 'ElectroDynamicTM inside', 'Dynamic OpacityTM inside' or ProScatterTM inside' have been adopted to provide strong differentiation between instruments using different measurement principles.

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Particulate Measurement Systems

Filter Performance Monitors

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