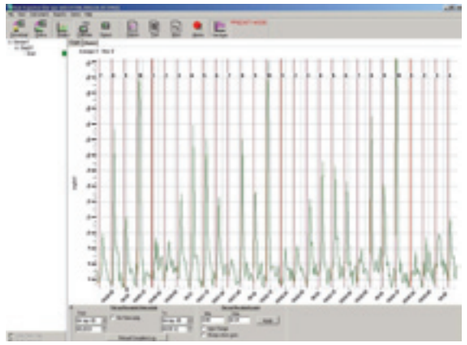
cost and environmental nuisance reduction using filter failure prediction

Although particulate monitoring systems are generally purchased to monitor environmental emissions to atmosphere, many users also utilize these instruments as preventative maintenance tools. The ability to predict when a filter is likely to fail and to be able to identify which row or chamber is at fault has provided users with a proven method to not only reduce the environmental impact and clean-up costs associated with large-scale emission events but also to make significant savings in spares, maintenance times and lost production.
To achieve this the selected monitoring technique must be able to accurately track the very dynamic dust emissions created during a bag filter cleaning cycle. To these ends we recommend Electrodynamic units in preference to Optical or Triboelectric systems.

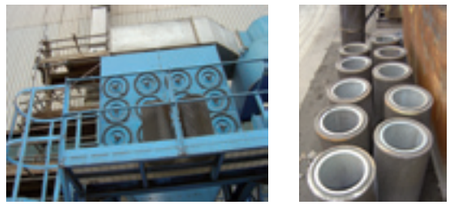
As a filter is reverse jet cleaned, any defects in the filter membranes are exposed resulting in relatively high dust peaks. By monitoring these peaks in real time using the Predict software package, it is possible to identify potential problems within the filter before they result in breaches of environmental limits.

The cleaning signature of the bag house is made easily identifiable by the input to the monitor of the filters cleaning pulses via Auxiliary Input Modules. Additionally further outputs maybe taken from pressure sensors within the bag house to assess the caking of the filter elements, thereby allowing the operator to reduce bag wear and compressed air usage and allowing the optimisation of the filter system.

Predict provides the possibility to observe filter problems remotely and check maintenance work to ensure correct performance of the filter. The use of Predict has proven the ability of a monitor not only to be used for environmental compliance but also to be used as a significant aid to plant maintenance and to also enable users to greatly reduce the instances of catastrophic filter failure.



Predict data identifying damaged bag rows (row10)



Predict offers the possibility of shorter maintenance times and the replacement of fewer filter elements

The use of Predict allows:-
Scheduled maintenance Reduced maintenance times Lower labour costs Reduction of spare filter inventories
Longer bag life Increased production time Reduced environmental emissions due to better filter control

electro-filter efficiency monitoring

To optimise the performance of electro-filters it important to fully understand how much particulate the filter is actually removing from the gas stream. PCME's unique capability to provide a single monitoring system incorporating two separate sensors utilising Optical technology for use post filter for use post filter and Electrodynamic Technology pre filter allows users to successfully measure Electro-filter efficiency.
These two complimentary monitoring techniques are used as they offer the best monitoring solutions in the widely different conditions found in these two locations. Electrodynamic sensors have a proven capability to monitor the extremely high dust loads found Pre-filter, providing a reliable, rugged monitoring solution whereas Optical sensors are chosen for chosen for use Post filter as a result of their capability to measure extremely low dust levels (0.1 mg/m^3 utilising pro-scatter techniques) and their low maintenance requirements.

The ability to observe in real time the performance of the filter allows the operator to adjust operating parameters to optimise not only filter efficiency but also reduce operating costs, extend the filters operating life and decrease the environmental impact of the process.

Effective electro-filter monitoring utilising PCME's Optical and Electrodynamic technologies

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Issue 01/06

filter management

PCME

Emission Monitoring in the Aluminium Industry

particulate emission monitoring

US-EPA

mCERTS
Particulate
0-15mg/m^3
0-30mg/m^3
0-150mg/m^3

TÜV
BImSchV 17 0-15mg/m^3
BImSchV 13 0-150mg/m^3
BImSchV 27 0-30mg/m^3

Certificate No: 9389

PCME and the Aluminium Industry

PCME's involvement with the Aluminium Industry over the last fifteen years has lead to the development of a unique range of particulate monitoring systems. Working in conjunction with some of the industry's key players, PCME provides an unparalleled range of instrumentation to work in the challenging monitoring conditions associated with modern high efficiency filters. These instruments not only protect our environment by aiding legislative compliance but also decrease operator costs by helping to reduce filter maintenance costs and production downtime.

Monitoring solutions for bauxite crushing, calcining, anode baking, electrolytic reduction, smelting, casting

Electrodynamic DT system after bauxite crushing plant

The production of Aluminium from the crushing of bauxite ore to the melting of aluminium facilitates the use of many high efficiency filters to prevent the emission of particulate to the atmosphere. To overcome the challenges associated with the successful monitoring of these filtration systems, PCME provides a number of instruments utilising Electrodynamic technology for use with bag filter systems and Dynamic Opacity solutions for electro-filters. These measurement technologies are featured in a range of accredited systems (MACT, TUV, MCERTS) to provide both indicative and calibrateable devices.

Bagfilter Monitoring

The most common type of filter found on Aluminium plants today is the bag house. These units can be found on most parts of a modern plant in applications ranging from the initial bauxite ore crushing, right through the process including calcining, anode baking and electrolytic reduction, to melting and casting. These filters all have a number of commonalities; the stacks are usually of a comparatively small diameter, less than 2m and the emissions are low, typically single figure mg/m^3. To provide the most cost-effective and technically appropriate monitoring solution, PCME has developed a range of patented, probe-based Electrodynamic monitoring systems incorporating a non-contact, charge transfer technique to accurately measure the particulate emissions from these types of filter. These systems are easy to install, requiring only single point mounting and no ancillary services such as purge air. They are frequently used in conjunction with our Predict software package to allow plant operators to predict catastrophic filter failure before it occurs, thereby preventing potential high emissions to atmosphere and reducing lost production time and maintenance costs. To provide the utmost confidence in the quality of the measurement, our advanced monitoring systems incorporate not only zero and span checks, but also a unique patented secondary contamination ring which monitors any leakage currents or signals across the probe's insulator, thereby proving the measurement integrity of the sensor.

Anode baking plant monitored by a TUV approved Electrodynamic system

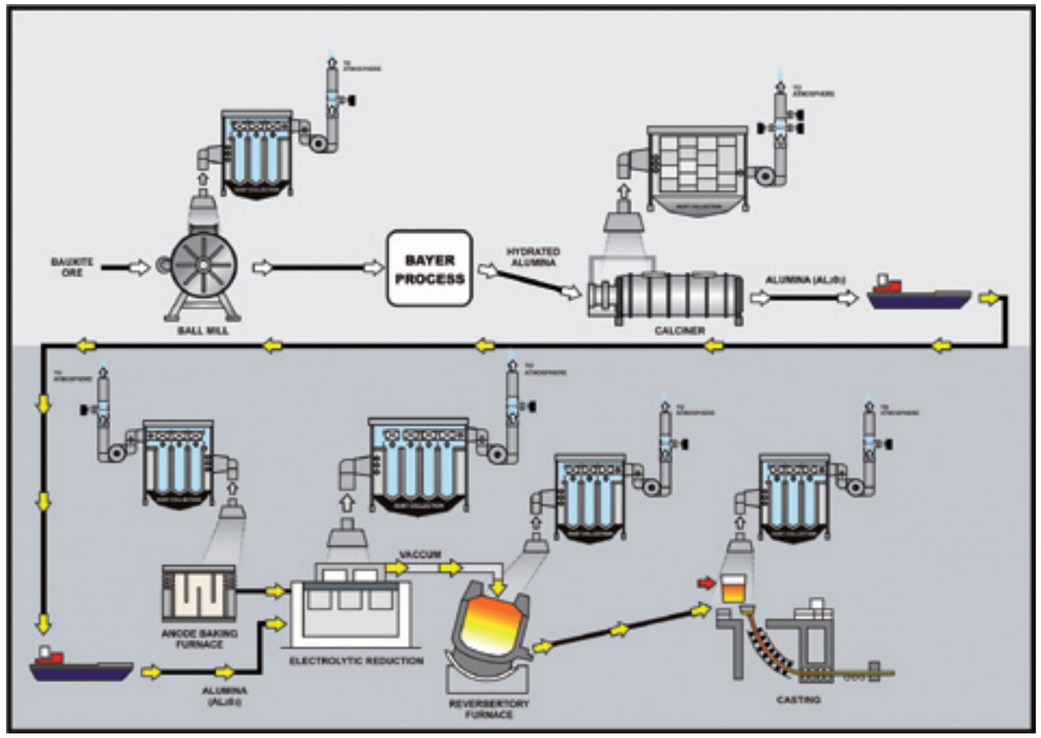
Bag filters found on Electrolytic reduction and smelting processes utilise networked DT990 systems

Simple single point mounting

Bag filter performance monitoring of casting bag filter

Sensor element unaffected by contamination

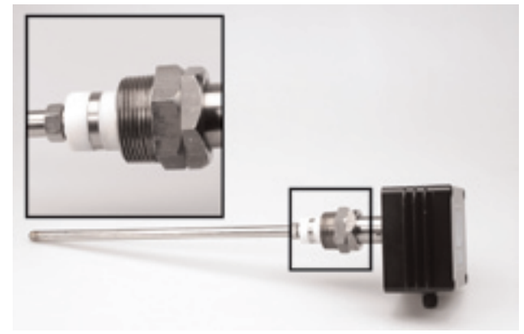
Aluminia Production//Aluminium Smelting



Electro-filter Monitoring

Although bag filters predominate in Aluminium facilities, Electro-filters are also commonly found on certain applications, such as calciners.

These filters require special consideration when selecting a monitor as their action alters the charge characteristics of the particulate and, therefore, will affect the response of both traditional Triboelectric and Electrodynamic monitors. To overcome this issue, PCME supply Dynamic Opacity systems. These units are a factor of ten times more sensitive than traditional Opacity instruments and are less affected by particulate build-up on the optics, requiring simple air purging rather than the blower motors associated with Opacity systems. This accredited technique provides a reliable and accurate monitoring system which requires substantially less maintenance than a traditional Opacity system with the added benefit of low costs of ownership.



Advanced patented probe contamination check

Dynamic Opacity monitor used to monitor electro-filter after calciner

Dynamic Opacity monitor approved to TÜV / MCERTS fitted to an electro-filter stack