Aluminum Producer Maintains Emissions Below 1 mg/m³ from a 2.8M CFM Process

DynaCHARGE™ Outperforms Forward Scatter PM CEMS

Challenge

At Iceland's largest aluminum smelter, located in a pristine glacial fjord, air flow through the stack is 2.8M CFM after being treated by two Gas Treatment Centers (GTC), each consisting of a 12-compartment baghouse with a total of 23,020 individual filters. The challenge for this plant was to keep particulate emissions as low as possible while minimizing downtime and expenses to maintain the baghouses.

"[Aluminum producer] employs best practices to always be a good corporate citizen and neighbor."
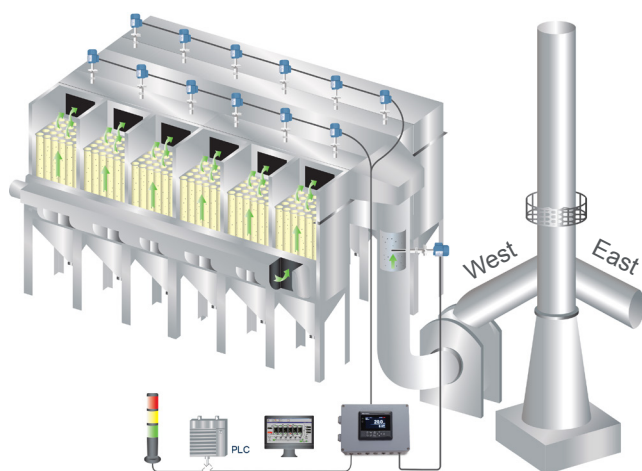
Aluminum producer maintains emissions below 1 mg/m³ (1/5 the design performance of 5 mg/m³) on 2 filtration systems (East & West); each has 12 compartments containing 11,510 individual filters.

Solution

This aluminum producer's approach to this challenge was to employ Best Available Technology (BAT) for all aspects of the process.

This began with selecting Fives Solios, a leader in aluminum plant emissions control, for the engineering and supply of two high efficiency GTC's.

Management then applied BAT for monitoring and optimizing baghouse performance by choosing Auburn FilterSense's DynaCHARGE™ particulate monitoring technology employing charge induction sensing. This advanced technology in each compartment is enabling the plant to maintain the GTC filters in optimum condition yielding emission below 1 mg/m³ (1/5 of the design guarantee of 5 mg/m³). Integrated filter-cleaning control enables locating developing leaks by row, which is key to replacing filters quickly, as needed, before emissions increase. This saves countless man hours manually searching for leaks, minimizing downtime and employee exposure to hazardous PM and confined spaces. The process engineer stated that manual leak searches are "*down to a single row of 20 filters instead of 960 for each compartment.*"
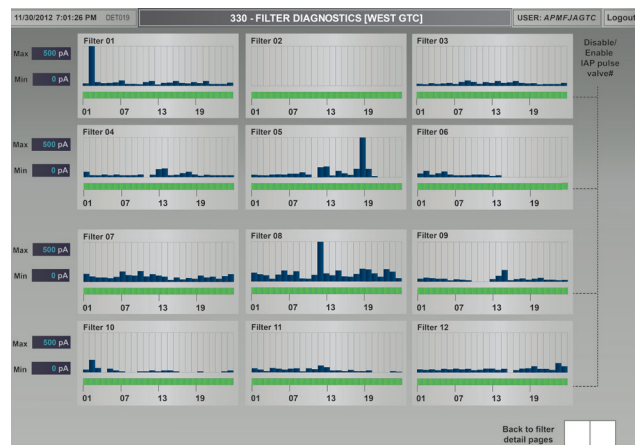
Particulate Measurement and Control Solutions

Auburn FilterSense

DynaCHARGE™ vs. Optical Forward Scatter

Maintaining emissions at such a level below the design value is only achievable because of the unique performance of DynaCHARGE and the proactive maintenance commitment of this plant.

Their commitment to best practices didn't end there. An Auburn FilterSense DynaCHARGE PM CEMS (Particulate Matter Continuous Emission Monitoring System) was installed alongside an optical forward scatter PM CEMS in the common outlet of each baghouse to monitor total particulate for regulatory compliance. Forward scatter technology is known for low-level detection and is widely used for compliance. After onsite commissioning by Auburn FilterSense, the process engineer stated, "*The PM 100 is working excellent; it shows us small changes better than forward scatter and we don't have to worry about signal strength (decreasing with dust buildup). It is and will be our main filter analyzer.*"

Comparison tests proved DynaCHARGE provided superior leak detection below 1 mg/m³ (Chart 1), similar mass linearity (Chart 2), and superior baseline measurement (Chart 3). DynaCHARGE is simpler to install without the need for calibration or lens alignment and operates with at least a 6 times longer maintenance interval. Operators commented, "*The forward scatter needs calibration at least once a year and lens cleaning once or twice per month.*" Auburn FilterSense has a 6–12 month simple inspection where there has been no need to perform sensor maintenance. "*The on-site support from both suppliers has been excellent.*"

"Auburn FilterSense is our main filter analyzer; it would not be possible to detect small leaks without it." – Process Engineer

Control Room view of DynaCHARGE leak detection by row.

1. Leak Detection

Peaks represent a single small leak in one row

- ■ DynaCHARGE™ (in compartment)
- ■ DynaCHARGE™ (in common outlet)
- ■ Optical Forward Scatter (in common oulet)

2. Mass Linearity

$R^2 = .99$

$R^2 = .9831$

Concentration of Material Injected (mg/m³)

- ■ DynaCHARGE™ (in common oulet)
- ■ Optical Forward Scatter (in common oulet)

3. Baseline Measurement

Erroneously High Value (Forward Scatter)

Accurate Baselines (DynaCHARGE)

Loss of Detection (Forward Scatter)

- ■ DynaCHARGE™ (in compartment)
- ■ DynaCHARGE™ (in common outlet)
- ■ Optical Forward Scatter (in common oulet)