Hot Gas Filtration

Hot Topic Hour
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Overview

- Hot Gas Filter Decision Guides for suppliers and end users are being expanded and updated continuously.
- Alerts, insights and newsletters are providing the latest updates.
- These guides are free to owner/operators in the power, cement, steel, and waste-to-energy industries.
- The coal-fired power related Decision Guides are available to suppliers in *Power Plant Air Quality Decisions.*
- The Gas Turbine Inlet Filter Decision Guide is available to suppliers in the *Gas Turbine Combined Cycle Supplier Program.*
- The other Decision Guides are available to suppliers in *Industrial Air Plants and Projects.*
- All the Decision Guides are also included in **Detailed Forecasting of Markets, Prospects and Projects.**
- A broader initiative is to create a vehicle to allow end users to easily select the product or system with the lowest total cost of ownership.

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Lowest Total Cost of Ownership

- Owner/operators in any country, but particularly in developing countries, have few resources to choose the hot gas filter product with the lowest cost of ownership.
- As a result the lowest priced local product is often selected over the better international choice.
- The Mcilvaine Decision Guides and related services are focused on determining the ownership costs of various hot gas filtration options.
- Large multi national end users are recognizing the value of the global sourcing/total cost of ownership analysis to reduce operating costs in all their plants.
- Arcelor Mittal has made substantial cost reductions with this combination.
- Through Global Sourcing they just placed an order with Hamon for sinter plant filters for plants in Poland, Belgium and Brazil.
- A large percentage of filter purchases are being made by the largest steel, cement and power companies. They make investments large enough to participate in total cost of ownership analyses.
- For those owner/operators who are emphasizing total cost of ownership the Mcilvaine services are an invaluable free resource.
- For suppliers with the best products there is a whole new route to market promising not only higher revenues but higher margins.

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Hot Gas Filter Options are Growing and Changing

The hot gas filter options are growing and changing. The drivers are:

- More stringent air emission limits on particulate
- Desirability to integrate filtration with DeNO$_x$ and acid gas capture
- Development of new systems to remove dust at high temperature
- Development of systems to remove multiple pollutants
- Opportunities to improve efficiency of processes and reduce greenhouse gases

There are a number of ways to remove dust from air. Dry precipitators presently remove more dust than all the other technologies combined. On the other hand, the market share for dry precipitators has dropped from 90 percent decades ago to closer to 50 percent now. In the future, the dry precipitator share will drop even farther as power plants switch to fabric filters.

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Options to Remove Dust from Hot Gas

Industry	<450°F Filters	850°F Filters	Catalytic Filters	Dry Precipitators	Scrubbers	Wet Precipitators
Coal-fired Power	P	P	P	P	S	S P
Waste-to-Energy	P	P	P	P	S P	S P
Cement	P	P	P	P		
Steel	P	P			S P	
Sewage Sludge Incineration					P	S
Coal Gasification		P			P	P
Natural Gas Processing	P					
Biomass Firing	P	P	P	P	S P	S P
Glass Furnaces	P	P	P	P	S	
Gas Turbine Intake	P					

P = primary, S = supplementary
yellow = most used, blue = most promising

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New Technologies - New Choices

The industry has responded to these drivers with a range of new technologies. It is, therefore, going to be a challenge for the operator to select the best option for his specific situation. Here are some of the new choices:

- Membranes and laminates with microfibers to achieve higher efficiency at equivalent pressure drop.
- Filter media to best deal with the large load increases caused by direct sorbent injection of activated carbon or lime.
- Filter media to cope with sulfuric acid condensate as coal-fired boilers burning high sulfur coal are utilizing filters.
- Compact pleated filters to fit inside the shell of a precipitator.
- Filters to remove organics as well as dust.
- Filters to reduce NO_x as well as capture dust.
- Filters to operate at 850^{o}F.
- Filters to operate at 500^{o}F.
- New flow schematics such as CKD loop for mercury removal in cement kilns and ZLD using spray drying of sludge in FGD.
- Technology improvements in one industry can be very useful in other industries.
- Mcilvaine is creating a vehicle for cross pollination of new technology among disparate industries.

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Developments in Specific Industries

- Coal-fired power: DSI, catalytic filters, removal of dust prior to air preheater, insertion of filter bags in existing precipitators, membranes for higher efficiency, consideration of a venturi scrubber/wet precipitator option instead of DSI fabric filter; SBS injection and lowering air heater temperature to where a bag with 250^{o}F limits could be used.
- Waste-to-Energy: Mercury and acid gas capture along with dust, elimination of the first-stage filter with a system to produce salable hydrochloric acid and valuable metals.
- Cement: Coping with hazardous waste and sewage sludge as well as kiln dust, separate loop for mercury removal and capture, options to extract phosphorous from clinker kiln dust.
- Steel: Capturing fugitive dust, replacing precipitators with fabric filters, dealing with sinter plant variables.
- Sewage Sludge: Improving scrubber dust removal and final capture in WESP.
- Coal Gasification: Ceramic filter with improved performance, venturi scrubber and production of rare earths and 30 percent hydrochloric acid.
- Natural gas processing: Coalescing filters for droplet removal, ionic liquid impregnated pellets for mercury removal, filters to remove fines leaving carbon bed filters.
- Biomass firing: Filters to deal with sticky contaminants released by combustion.
- Glass Furnaces: Use of the catalytic filter with DSI injection using high reactivity lime.
- Gas turbine intake: Filters to resist the salts and moisture of offshore turbine locations, HEPA efficiency to reduce turbine maintenance, membranes vs. nanofiber laminates, static vs. pulsed.

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Industry Decision Guide Tours

Brief tours of a number of Decision Guides will be conducted.

Please do not hesitate to question, dispute, or contribute.

- Cement
- Steel
- Coal-fired Power
- Gas Turbine inlet filters
- Dry scrubbing of glass furnaces, WTE, and solid fuel boilers

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