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Pulsed ceramic filter-PCF

Product data scheet

Appointment of FCI

It is used to clean the air flow from CO, NO_x, SO_x, HCL, HF, VOC, dioxin, polydisperse dust particles with temperatures up to 1000°C, and gases with solid particle concentrations up to 20 g/m³.

Application industry :

- Mining and processing industry
- Black and non-ferrous metal metallurgy
- Atomic Industry
- Housing and utilities
- Food industry
- Production of mineral fertilizers
- Construction industry
- Thermoelectric engineering
- Chemical and petrochemical industry

Application

Gas purification system for precious metal smelting furnaces, wet catalytic units, solid fuel boilers, incinerators, glass and basalt furnaces, and catalyst regeneration units. Incinerators for hazardous waste and radioactive waste, solid household and liquid waste, etc.

Main advantages

- Achieve existing and future atmospheric emission standards,
- Possibility of deep heat recovery using heat purification gas,
- The amount of flue gas after purification and heat recovery is reduced by 3-6 times,
- Reduce clean capital and operating costs,
- The filter occupies a smaller area,
- Reduce aerodynamic resistance,
- Less maintenance,

- Reduce overall operating costs: energy saving.

Efficiency

Perform complex gas purification from solid particles and harmful gas components.

Residual concentration of solid particles-less than 2 mg/m³

An integrated system for purifying gases from CO, NO_x, SO_x, HCL, HF, VOC, and dioxin is achieved by using the following methods :

- Catalytic activation of ceramic filters ;
- The system in which the adsorbent is fed into the air flow before the filter.

Cleaning efficiency

PM ≤ 2mg/m³

CO – 95%

NO_x – 95%

SO_x – 90%

HF – 95%

HCL – 95%

VOC – 98%

Dioxins – 99%

The purification process includes processing gases at temperatures up to 600°C (in higher temperature applications, shell lining is required) and passing them through ceramic catalytically active filter elements (additional option). Pollutants (dust, acid, NO_x, heavy metals, and PCDD /PCDF) in the exhaust gas are removed in a device where the following processes occur :

- Filter through a ceramic filter to remove dust ;
- Pneumatic pulse system for cleaning ceramic components ;
- Heavy metals are adsorbed on the filter.

The PCF filter is a patented device used for complex purification of high-temperature gases (up to 1000°C) from solid particles and harmful chemical components because of the use of catalytically active ceramic filter elements and the system-dust flow that feeds the adsorbent into the gas.

The design of ceramic high temperature filters is similar to the design and working principle of bag filters. The fundamental difference lies in the filter material. Used in ceramic filter PCF“- granular ceramic filter element based on silicon carbide or alumina.

Technical characteristics of granular ceramic filter element.

PCF ceramic pulse filter adopts granular ceramic filter element, which is used to purify high-temperature gases. The granular ceramic filter element is made of coarse silicon carbide or aluminum oxide (substrate) with a thin selection layer-membrane on the outer surface.

The pore size of the substrate and membrane is selected according to specific tasks, based on data on the dispersion composition of the separated particles, the required aerodynamic resistance, and the gas purification efficiency. The overall view of the filter element is shown in Drowing 2.



Drowing 2. Ceramic filter element

Chemical resistance of EKOFILTER "Z": resistant to acids, salt solutions and organic solvents. Not resistant to hydrofluoric acid.

Parameter	Unit measure	Meaning
Filter level	microns	≤ 0,3
Porosity of the substrate	%	38
Material density	g/cm ²	1,85
Bending strength (ring compression)	MPa	≥ 20
Highest temperature resistance	°C	1000
Filter hot air in an oxidizing environment	°C	750
Filter hot air in a reducing environment	°C	600
Coefficient of thermal expansion (25-1000 0 °C)	K	5,6 10 ⁻⁶
Thermal conductivity (200 0C)	W/m K	2,5
Filter area	m ²	0,175
Outer diameter	mm	60
Inner diameter	mm	40
length	mm	1000
weight	kg	3

Working principle of PCF ceramic pulse filter

With the increase of pressure drop during gas cleaning, the regeneration of ceramic filter elements is carried out using pulse regeneration. Pulse regeneration can be carried out using compressed air or inert gas. The pulse regeneration system includes: a receiver with a cleaning and dewatering device for the cleaning flow, a solenoid valve, a cleaning tube with a nozzle, and a control system. When the typical specific gas load is 100 m³/m²* hour and the temperature of the purified gas is 350-500°C, the aerodynamic resistance of PCF is 2000-2500Pa. When the solenoid valve is opened, the air flow with a pressure of 4-6 bar enters the purge tube, flows out through a nozzle with a diameter of 7 mm, and flows directly to the open flange of the ceramic filter element, resulting in an air flow velocity of 100-120 m/s and a pressure of about 12000 Pa. This pressure is enough to clean the pores of the ceramic filter element and destroy the filter cake from the outside. In addition, the particles settle in the collection hopper.

The integrated system for purifying gases from CO, NO_x, SO_x, HCL, HF, and VOC is realized by using the following methods :

- Catalytic activation of ceramic filters;
- The system in which the adsorbent is fed into the air flow before the filter.

The pulse regeneration system ensures timely dust removal and maintains the nominal breathability of the filter element. The control unit of the regeneration system is located in a separate control cabinet on the filter housing. The regeneration system includes: a valve block, a pressure guide tube, a Venturi nozzle, a control controller, a differential pressure gauge connected to the dirty and clean rooms, and a set of accessories for supplying compressed air to the valve block.

When filtering gas, a layer of dust will accumulate on the surface of the filter bag, thereby increasing the hydraulic resistance of the filter, that is, the pressure drop between the clean chamber and the sleeve chamber (the pressure drop is used as a controlling factor to participate in the regeneration system). The differential pressure gauge continuously measures the differential pressure; when the set value is reached (according to the set position of the set point on the dial), a signal is sent to the controller, who initiates the operation of the pulse valve according to its program. When the pulse valve is triggered, the compressed air from the valve block enters the Venturi nozzle through the pulse tube with a pipe, and then enters the hose. The presence of pulsed nozzles and Venturi nozzles improves the efficiency of compressed air pulses and improves the cleaning of dust in the filter element.

The system uses 1-2" valves. When triggered, the valve emits a certain amount of compressed air per pulse; the pulse duration is 100-150 milliseconds; the minimum time

between adjacent pulses is 6 seconds. Adjust the pulse duration and the time between pulses when debugging the bag filter.

At present, the components of the regeneration system have been optimized to ensure that the system operates efficiently at a compressed air pressure of 0.5 MPa.

PCF specifications

No.	Parameter	Meaning	Unit measure
1	Purified gas consumption, up to	5800	m ³ /hour
2	Total installed filtration area	45	m ²
3	The filtration area of a ceramic filter element	0,175	m ²
4	The geometry of the ceramic filter element : Outer diameter/inner diameter, length mm	60/40/1000	mm
5	Number of filter elements in the module	256	pc.
6	The gas temperature at the inlet of the filter is as high as	600	°C
8	The mass concentration of solid particles at the entrance is no longer	20	g/m ³
9	The mass concentration of solid particles at the outlet of the filter, not more	2	mg/m ³
10	Service life of ceramic filter element	2-5	years

Provide complete measuring equipment for circulating filters :

1. Differential pressure sensor on the filter.
2. Air flow temperature sensor at the inlet and outlet of the filter.
3. Dust level sensor in the filter funnel.
4. Particle concentration meter (optional)
5. Gas analyzer (optional)
6. Dust removal system (optional)

Documentation

The equipment provided includes :

- Paper passport of the product-1 copy.
- Operating instructions on paper-1 copy.
- Installation instructions on paper-1 copy.
- Accounting documents-1 set.

Software

The software has been licensed to the customer.

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