

AIR POLLUTION CONTROL SYSTEMS

FLUE GAS FILTRATION AND DEDUSTING.

Ventilex and the Environment.

Ventilex started building air pollution control systems for industry 50 years ago to cooperate with the fast growing needs of the environmental market and the severe legislation in Holland. Very soon the experience and success of Ventilex in building air pollution control systems expanded all over Europe, especially in the field of the industrial process related applications of flue gas filtration and dedusting.

The air pollution control systems engineered and supplied by Ventilex are always using in house designed filtration equipment, most of the time constructed in our own workshops in Holland. In this way, Ventilex is controlling the high quality level of the equipment.

Although all the Ventilex air pollution control equipment is constructed according to the international standards, most of the systems will be tailor made in order to optimize the performance in function of the application.

Summary of Ventilex air pollution control equipment;

- Jetbag fabric filters, with automatic pulse-jet cleaning (on-line and off-line).
- Gas filtration at high temperature, using stainless steel sintered fibers filter elements.
- High efficiency cyclones.
- Venturi scrubbers.
- Packed bed wet scrubbing towers.
- Dry gas scrubbing reactors.
- Dry scrubbing products storage, dosing and injection systems.
- Gas coolers.



JETBAG Filter

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Applications air pollution control systems.

- Most of the air pollution control systems use "dry" gas filtration with a Ventilex Jetbag pulse-jet fabric filter. Using dry filtration gives important advantages compared to other systems, such as wet systems. The advantages of dry filtration systems are: very high filtration efficiency (solids emission levels $< 1 \text{ mg/Nm}^3$), dry handling and storage of the collected solid dust particles and eventual validating of the collected dust (no waste water), smaller energy consumption, and less maintenance. For these reasons Ventilex shall only use wet filtration to solve special problems related to gas or dust properties and with the eventual possibility of recycling the waste water into a wet production process.
- Industrial process related dedusting systems for more severe applications, such as: corrosive process conditions or environment, high humidity conditions combined with hygroscopic products, very fine dust particles (sub-micron), abrasive dust, high temperature, or a combination of different of these process parameters.
 - Exhaust and filtration of corrosive or/and humid gas: for these applications the systems has to be designed to avoid any risk of condensation of water or acid vapors. To tackle these problems Ventilex will combine different techniques such as: electrical heat tracing, pre-heating of the system, stand by heating during shut down, special engineering to avoid cold spots, etc..



JETBAG - Electrical heat tracing of filter hopper

- Process gas filtration for hygroscopic products: for these applications special attention is paid to the behavior of the inlet of the filter collecting hygroscopic dust, related to the gas properties such as humidity and temperature. In all circumstances the operating conditions in the filter will be controlled so that clogging risk of the filter fabric and bridging of the dust in the filter hopper will not disturb the functioning of the system.

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- Abrasive dust filtration: the major operating parameters which will determine the life time of the filter elements and the risk of abrasion on the steel parts of the system are gas velocity and gas distribution in the system (wear by abrasion is related to gas velocity in an exponential way). In addition to the special design for gas velocity and distribution, some parts of the system will have a special design by using wear plates and abrasion resistant steel for construction (baffle plates, dedusting piping bends, etc..)



JETBAG - Filter on abrasive dust from sand dryer.

- Filtration of very fine dust: the most difficult gas filtration applications are these where the system will have to separate very fine sub-microscopic dust particles. In a lot of cases these fine dust particles are also very dangerous for the environment and for people's health (such as heavy metal dust particles) and need the highest possible filtration efficiency. Because of the properties of the sub-microscopic particles the filter installation has to be specially designed at very low air/cloth ratios, using filter fabrics made of micro-fibers or using a microscopic filter membrane. To avoid filter puffing (decreasing the efficiency of the filter) and dust re-entrainment after cleaning, in a lot of cases off-line cleaning is necessary.

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- Dry gas scrubbing and filtration to eliminate gaseous (HCl, HF, SO_x, dioxins and furans, etc.) and solid pollutants

Certain applications of gas filtration, mostly related to thermal process systems (waste incineration, melting furnaces, etc..) contain also gaseous pollutants such as HCl, HF, SO_x, dioxins, furans, etc..) which can be very dangerous for the environment.

These hazardous gaseous pollutants have to be eliminated, together with the dust particles. To solve these problems, Ventilex uses a "Dry Gas Scrubbing and Filtration" process, based on the dry absorption of the gaseous components by a special selected absorbing agent (dry scrubbing product) which is injected in the gas stream in a special designed reactor, followed by a Je-tbag fabric filter.

Typical dry scrubbing absorbing products are: active coal, lime, sodium carbonate (Bicar), zeolithe or a combination of different of these products;



FLUE GAS DRY SCRUBBING AND FILTRATION

- Hot gas cooling and filtration.

When hot gas filtration is needed, the most economic and performing solution consists in first cooling down of the hot gas until a temperature which is compatible with standard filter fabrics and then filter the gas in a Jet-bag fabric filter. This method offers different advantages compared to straight "hot" gas filtration, such as: smaller air volume after cooling (smaller system), standard economic filter fabrics can be used, smaller energy consumption and eventual energy recovery on gas cooler.

The gas cooler has to be designed considering possible operating problems, such as dust settlement in the heat exchanger (automatic cleaning can be installed), abrasion by the dust, corrosion risk by condensation of acid gas components.

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- Hot process gas filtration (up to temperatures of 800°C).
For some industrial processes it is necessary to filtrate the hot process gas, without cooling, for example to allow recycling of the gas in the process or energy saving reasons. For these special applications Ventilex uses a special Jet-bag filter design with heat resistant filter elements, made in stainless steel micro fibers (max. design temperature 800°C).



JETBAG FILTER with stainless steel fibres filter elements



JETBAG FILTER with automatic cleaned gas cooler

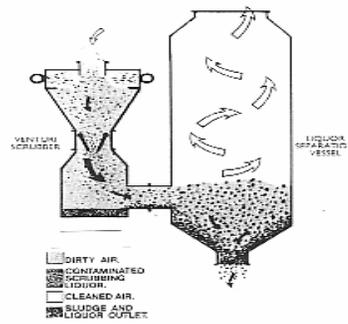
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▫ Wet scrubbing.

Although in most of gas filtration applications, dry filtration by mean of a fabric filter is the best technology, in some cases gas filtration by wet scrubbing can be advisable for different reasons such as: hot gas which is difficult to cool before filtration, or, the possibility of waste water recycling into the process.

In the Ventilex program we use three types of wet scrubbers:

- Dynamic scrubbers, composed of a centrifugal turbine (fan) with water injection at the turbine inlet, followed by a wet cyclonic separator or demister.
- Venturi scrubbers, where the solid dust particles are cached in the Venturi throat by mixing with the injected scrubbing liquid in the turbulent gas stream, followed by a cyclonic separator or demister.



VENTURI SCRUBBER WITH WET CYCLONIC SEPARATOR

- Packed bed scrubbing towers - low pressure drop scrubbing system, where the gas stream is filtered by the scrubbing liquid in a packed bed composed of floating plastic balls, followed by a demister.



PACKED BED SCRUBBER