

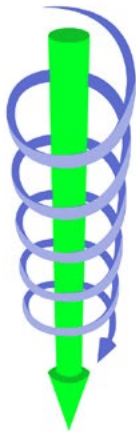
# techNaero

Filtration – it's all about technology





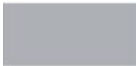
Down flow



Gravity



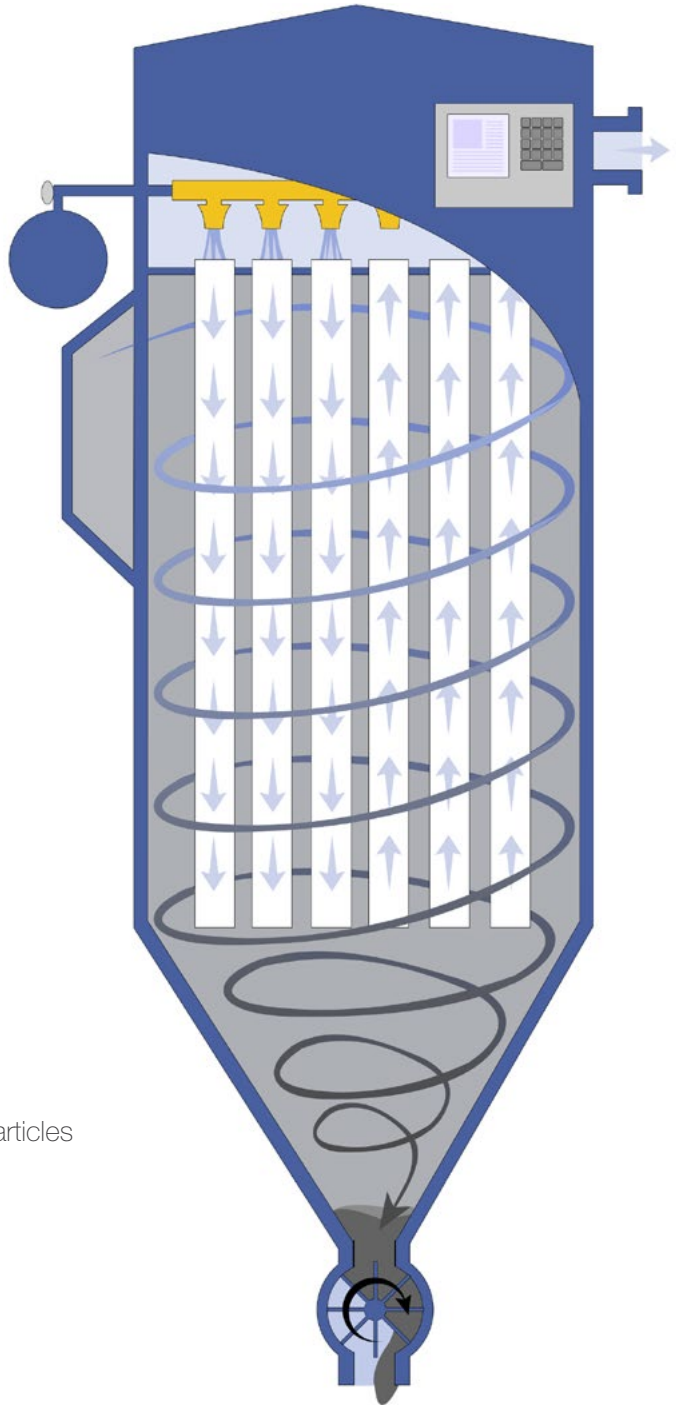
Clean air



Polluted air



Secreted particles



## Why choose a techNaero filter?

techNaero's filter system includes a large number of unique features, which separately increase efficiency, lifetime and energy savings.

### HIGHER AIR FLOW PER M<sup>2</sup> WITH DOWN FLOW

techNaero's filters use the down flow technique, enabling a much higher air flow per m<sup>2</sup> filter than conventional filter systems and makes filtration of very fine submicron particles possible, since the air flow takes place in gravity direction.

### GENTLE REGENERATION – EXTENDED OPERATION

techNaero's filters operate 24/7 and are self-cleaning during operation by means of a very gentle regeneration, using a large amount of compressed air at low pressure – making the bags last longer.

### CONTROL SYSTEM WITH LESS THAN A 3 YEAR PAYBACK PERIOD

techNaero's control system uses an advanced SingleBoardComputer that is also applicable with most other filter systems and it is energy saving at the same time – so even after retrofitting, payback times of less than 3 years are possible.

### ROBUST CONSTRUCTION – ATEX APPROVED

A solid round filter construction in 3 and 4mm steel and standard explosion membranes make techNaero in compliance with the requirements of the ATEX directive for explosive dust. The robust construction makes it highly resistant to abrasive types of dust.

### CLEAN AIR FAN - 30% SAVING

The filters are able to operate at very low pressure, due to the round shape; thus, the fans are suitable as effective fans for clean air, with up to 30% energy savings, compared to ordinary fans.

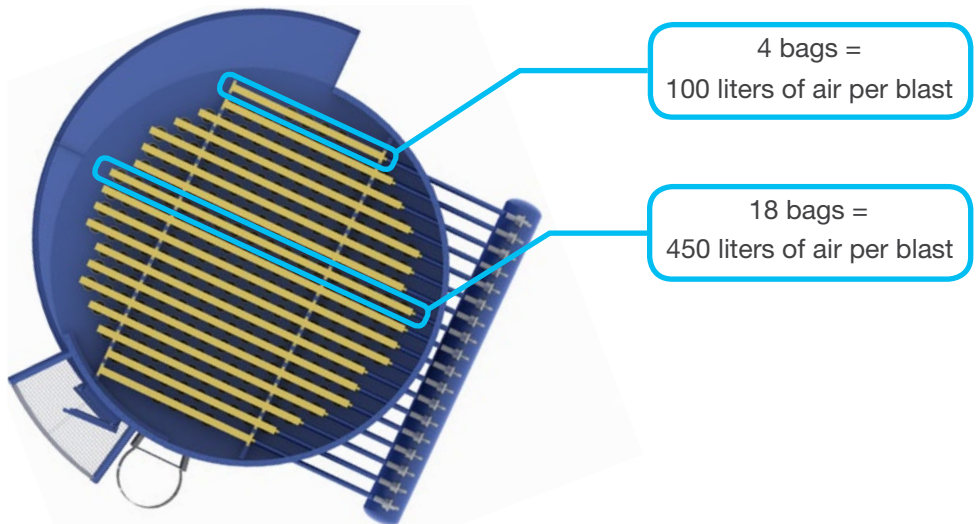


## Energy savings – control system

At techNaero, we constantly work on energy optimisation of our filters, so they altogether work with the lowest energy consumption. Energy optimisation of a filter process requires constant calculation of the cleaning energy and the fan energy. Our system is able to identify the lowest energy consumption possible.

Conventional controllers have a fixed opening time for all target valves. We take a more direct route and administer instead the desired air volume for each bag in the filter and then let the control system constantly calculate the opening hours and check the airflow using a PID control which is constantly seeking just the right amount of air to be purified.

If it wasn't for the control calculated differential opening of the valves then each valve in this example would consume 450 litres of compressed air. With differentiated hours therefore very large air volumes can be saved and both experience and calculations show that you can save up to 23 % of compressed air consumption alone on this feature.



When the optimized hours have stabilized, the control system begins by calculating the new air quantity per bag, in order to optimize the air consumption in relation to the cleaning efficiency. So no matter what value was entered from the beginning the control system will regulate itself and adapt so that every litre compressed air will be utilized optimally.

## Energy savings - preventive maintenance

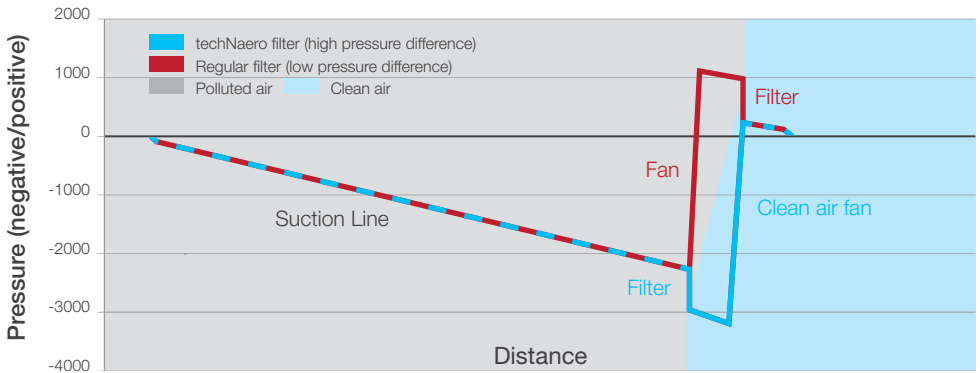
If dust composition changes or when the filter bags get older the controller will automatically attempt to keep the filter cleaned as before, but the incorporated air volume will also change.

All key data on filter operation is stored over time and therefore the control system can follow the development of the filter system. The trend thereby calculated can provide a safe indication of when it would be economically optimal to switch bags.

It may be long before the controller reaches the preset alarm value for a blocked filter and it will be possible to predict whether this moment will come in time between two normal maintenance intervals for the entire system.

## Energy efficient fans - 30 % savings

If the fan is placed after the filter - instead of before the filter - you can use a clean air fan, which with an identical performance will save 30% electricity consumption on every future operating hour.



A typical diagram of pressure in an exhaust system.

As the filter in this way is placed "in the middle of the process" it is exposed to a higher differential pressure on the filter wall. It is therefore essential that the filter can handle an increased pressure differential on the filter wall from approx. 1000Pa. to about 3000 Pa (300 kg/m<sup>2</sup>). Especially square filters have problems with such pressure differences, whereas with techNaero's filters you can seamlessly install energy saving fans.

Chalk  
Graphite  
Sugar  
Iron ore  
Wood fibres  
Soda ash  
Cardboard dust  
Bauxite  
Activated carbon  
Coke  
Granite  
Cupola furn., slag  
Metal sinter  
Ferrosilicon  
Silica  
Coffee powder  
Detergent  
Coal  
Lime, burnt  
Cocoa  
Ash  
Iron dust  
Dolomite  
Potato starch  
Fertilizer  
Gypsum  
Husk, cleaning dust  
Copper oxide  
Ferromanganese  
Phosphate  
Kaolin  
Ferrosilicon  
Cement  
Cast iron  
Alumina  
Ammonium nitrate  
Carbon black

## Module structure ensures effective mounting

techNaero's filters are made as modules to be mounted on site. The module system makes production easier and faster, and above all, makes it possible to transport the filters in ordinary standard containers, regardless of the size.

The modules are not removed from the containers before they arrive on site; then they are installed. The modules of indoor filters can each be transported to the mounting site through ordinary gates, in order to avoid building changes.

On site, the filter can be assembled completely, and then be installed – the filter can alternatively be assembled in rings, and then stacked on or under each other, depending on the available lifting capacity.



Assembly at Severstal, Russia

## How does a techNaero control work?

A techNaero control is able to control a filter in the two common modes used everywhere, as well as three other special developed modes that optimise the energy consumption in different ways.

The heart of the control is a processor that incessantly calculates the parameters by means of advanced algorithms, differentials and PID adjustments, in order to optimise the energy consumption, as well as ensuring sufficient cleaning power.

$$u(t) = MV(t) = K_p e(t) + K_i \int_0^t e(\tau) d\tau + K_d \frac{d}{dt} e(t)$$

Equation for PID-regulation

## How do you communicate with a techNaero control?

The filter can be started and stopped by means of ordinary switches, placed on the control box, but is preferably monitored and controlled via the internet/intranet on a regular computer or smartphone and by means of the supplied software.

If other corporate units are controlled via a regular industrial communication line such as RS-485 and SCADA software, the control can be connected directly and will receive and send commands and information, using the most common protocols (MODBUS ASCI, MODBUS RTU, OMRON).



Operational monitoring through the included software

techNaero selected references



Avedøreværket Blok II, Copenhagen  
The largest supplier of energy in Denmark  
1 filter - pneumatic transport



Cherepovets, Rusland  
The largest manufacturer of steel in Russia  
2 filters - ferrosilicon



Krivoy Rog, Ukraine  
The largest manufacturer of iron ore in the Ukraine  
2 filters - iron ore



Pavlograd Coal Mine, Ukraine  
The largest coal mine and electricity manufacturer  
in the Ukraine - 1 filter - flue gas

Burshtynskaya Coal Power Plant  
2300 MW coal power plant in Ukraine  
6 large filters - fine coal dust

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techNaero is composed of the English word "technical" and the Greek word for "air": "technical" "and" and "aero" result in **tech N' aero**. The company was founded in 2005 by engineer Anders Larsen, who has more than 18 years of experience in the field of filters and air technique.