Dust Collection & Gas Scrubbing
TEMA Process B.V. offers Dust Collection & Gas Scrubbing equipment and systems for emission control, gas cleaning and product recovery.

TEMA Process designs the Dust Collection & Gas Scrubbing equipment and systems in accordance to the latest standards, local conditions and product specifications.

Tema Process Dust Collection & Gas Scrubbing Line include:
- Jet bag Filters
- Cyclones
- Venturi Scrubbers
- Packed Tower Scrubbers
- Dry Scrubbers
- Cyclones in combination with Jet bag Filters
- Cyclones in combination with Packed Tower Scrubbers

Figure 1.0 shows the Efficiency / Particle size relationship of above mentioned line of equipment.
Jet bag Filters

Design of Jet bag Filters (Process Technical)

TEMA Process design for continuous Jet bag Filters is based on the process data and local conditions and can be offered “Taylor-made” suitable for the application.

Important criteria for the design are:

- Gas volume in Nm³/h
- Chemical composition of the gases
- Moisture content of the gases
- Temperature of the gases
- Dust in kg/h
- Characteristics of the dust, like corrosive, abrasive etc.
- Particle size range of the dust
- Local emission standards
- Explosion resistant (ATEX)
- Hygienic design
- On line or off line systems
- Materials of construction
Design of Jet bag Filters (Construction & Layout)

Based on process technical data the filter area is determined and the construction of the Jet bag Filter, suitable for the project, can be designed in detail supported by special parametric software as partly shown below:

### Filter 3-3-16 Parameters

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
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<tbody>
<tr>
<td>Filter 3-3-16 Parameters</td>
<td>Sizes</td>
<td>Format</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Covers Left</td>
<td>2 ul</td>
<td>possibly: 1+2+3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 Covers Right</td>
<td>2 ul</td>
<td>possibly: 1+2+3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 Rows</td>
<td>9 ul</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 Exhaust Front Left</td>
<td>1 ul</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7 Exhaust Front Right</td>
<td>1 ul</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8 Exhaust Back Left</td>
<td>0 ul</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9 Exhaust Back Right</td>
<td>0 ul</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 Dust Outlet out of CL</td>
<td>0 mm</td>
<td>Outlet out of center of middle hatch, neg.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11 Lenght Filter Bags</td>
<td>3500 mm</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12 Height Part I</td>
<td>1800 mm</td>
<td>possibly: 1600+1800</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13 Height Part II</td>
<td>1800 mm</td>
<td>possibly: 1800</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14 Height Part III</td>
<td>1300 mm</td>
<td>possibly: 500+1000+1300+1800</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15 U_Conveyor</td>
<td>0 ul</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16 V_Conveyor</td>
<td>1 ul</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17 Filter Lenght</td>
<td>6330 mm</td>
<td>Inside dimension</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The filter top part can be designed based on following variables:

- Number of covers
- Layout of the covers
- The covers can be located on one side or 2 sides of the air buffer tanks
- Under each cover there are 4 rows in width and 8 – 16 filter bags in depth
- Materials of construction can be selected in accordance to the table of “construction materials” (page nr. 8)
The bags are protected by standard wear protection shields. (see page 6)
The maximum number of covers on one side of the buffer tanks are 4 (maximum 4 covers on each side!)

The top part is standard made of stainless steel and is isolated.
The top part can be provided with double covers (see construction detail on page 6).
Length of filter bags are available from 2000 mm – 5000 mm.
Bag support cages can be split in length in several parts for one filter bag with easy connection to reduce space for replacement of the filter material (see page nr. 8).
The textile bags can be supplied in different qualities according to table figure 2.0 (page nr. 7).
The filter housing is designed in several “modules”.

- The dust is collected in a tapered chute with an integrated spiral screw for dust discharge.
- The location of the screw discharge also can be chosen to meet local dust collection or transport.
- The 3D design drawing is the base for laser cutting- and production drawings.
- An enormous number of construction variations are possible considering the variables in number of covers, number of bags in the length rows and filter bags length.
Filter bag for most demanding solutions like:
- High temperatures
- Micro dust particles
- Chemical unfriendly environment
- Electrostatic dust particles

### Properties of Textile Fibers for Dry Filtration

<table>
<thead>
<tr>
<th></th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>PP</td>
<td>94° C 200° F</td>
<td>94° C 200° F</td>
<td>107° C 225° F</td>
<td>Yes</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>3</td>
<td>5</td>
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<tr>
<td>PES</td>
<td>132° C 270° F</td>
<td>94° C 200° F</td>
<td>150° C 300° F</td>
<td>Yes</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>3</td>
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<tr>
<td>PAN</td>
<td>125° C 260° F</td>
<td>125° C 260° F</td>
<td>150° C 300° F</td>
<td>Yes</td>
<td>2</td>
<td>4</td>
<td>5</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>ARAMID NOMEX®</td>
<td>204° C 400° F</td>
<td>177° C 350° F</td>
<td>240° C 465° F</td>
<td>No</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>PTFE</td>
<td>260° C 500° F</td>
<td>260° C 500° F</td>
<td>290° C 550° F</td>
<td>No</td>
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<td>5</td>
<td>5</td>
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<tr>
<td>PPS</td>
<td>190° C 375° F</td>
<td>190° C 375° F</td>
<td>232° C 450° F</td>
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<td>5</td>
<td>5</td>
<td>5</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>POLYIMIDE P84®</td>
<td>260° C 500° F</td>
<td>195° C 383° F</td>
<td>300° C 580° F</td>
<td>No</td>
<td>2</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>FIBER GLASS</td>
<td>260° C 500° F</td>
<td>260° C 500° F</td>
<td>290° C 550° F</td>
<td>No</td>
<td>2</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>4</td>
</tr>
</tbody>
</table>

Legend: 1 - Poor; 2 - Fair; 3 - Good; 4 - Very Good; 5 - Excellent

NOMEX® is registered Trademark of E.I. DU PONT DE NEMOURS
P84® is registered Trademark of LENZING A.G.
Design of Jet bag Filters (Details of construction)

Support cage in filter bag

How to install a filter bag

1/1 steel wire support cage

½ steel wire support cage

Top of support cage
Design of Jet bag Filters (Details of construction)

Materials of construction

Mild steel
Heat resistant steel 16Mo 3
Heat resistant stainless steel
153 MA, AISI 321, 1.4878

Duplex steel
Stainless steel AISI 304(L),
316(L), 904L, 254 SMO
Titanium

Assembly of Filter Top part

Dust discharge spiral screw
A Cyclone is a relatively simple device that uses centrifugal force to separate larger particles from air streams.

It is a high capacity / high efficiency separator (figure 3.0) that also can be used in combination with fluid bed Dryers / Coolers, Jet bag Filters, Packed Tower Scrubbers and other process equipment.

Diameters from 400 to 2000 mm.

Materials of construction

- Mild steel
- Heat resistant steel 16Mo 3
- Heat resistant stainless steel 153 MA, AISI 321, 1.4878
- Duplex steel
- Stainless steel AISI 304(L), 316(L), 904L, 254 SMO
- Titanium
- Wear resistant design

Figure 3.0
High capacity Cyclones

High efficiency Cyclones
Venturi scrubbers are used to remove particulate matter from a gas stream. A „Venturi Scrubber“ consists of a contact section called a venturi section in combination with a droplet separator section.

Exhaust gas with dust is fed into the venturi section where it passes through a water mist at the venturi throat at high velocity. This results in thorough mixing of water droplets and dust particles which agglomerate to form larger particles which are subsequently removed from the gas in the separator section.

The water supply units and spraying systems allow recirculation of water with high dust contents. These systems are used for cleaning particulate matter from exhaust gas with stringent emission level, soluble dust mainly in the mineral and chemical industry.
Packed Tower Scrubber

Packed tower scrubbers are used to remove particulate and/or vapor contaminants from an exhaust gas stream by way of dilution or absorption.

A packed tower is an efficient method of carrying out mass transfer between gas and liquid phases. Packed tower scrubbers incorporate packing media to facilitate intimate contact between a scrubbing liquid and gas to be scrubbed. Applications are: reduction of dust or gaseous emission levels, product recovery, air pollution and odor control.

In countercurrent scrubber operation, the gas flows upward through the packing material, while the liquid flows downward by gravity through the packing material. The liquid wets the surfaces of the packing material, providing a large amount of surface area for diffusion of one or more components of the gas stream into the liquid stream, thereby cleaning the gas.
Adsorption of acidic gases and organic compounds occurs in the reaction ducting and in the dust cake on the fabric filter bags.

The unused and recycled adsorbent (\(\text{Ca(OH)}_2\), sodium bicarbonate, activated carbon) are injected into a “reacting” duct and then dispersed over the complete filter area.

The final emission levels on HF, HCL, SOx and organics is depending on the used adsorbent, stoichiometric value and operating temperatures.

For smaller systems the adsorbent is premilled and supplied in Big-Bags on larger systems on site milling and silo-storage can be used.
Special Applications

Double Jet bag Filter

Fluid bed Deduster