**Filter system® for gas turbines**

*What gives this systems?*

- Reducing the dimensions of the new design of the filter houses;
- Reduce the presser drop of existing systems;
- Increase the efficiency of gas turbines;
- Longer service life of air filter systems;
- Reduced operating costs.

**Standard System of 2-Steps Filtration**

292+292=584mm

Q = 3400-4200 m³/h

**Standard System of 3-Steps Filtration**

**Standard System of 2-Steps Filtration**

**Standard System of 3-Steps Filtration**

<table>
<thead>
<tr>
<th>Pressure drop, Pa</th>
<th>Air flow, m³/h</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>1000</td>
</tr>
<tr>
<td>2</td>
<td>2000</td>
</tr>
<tr>
<td>3</td>
<td>3000</td>
</tr>
<tr>
<td>4</td>
<td>4000</td>
</tr>
<tr>
<td>5</td>
<td>5000</td>
</tr>
</tbody>
</table>

Air flow, m³/h

1 - PF (G4) + FF (F8)
2 - PF (G4) + FF (F9)

Air flow, m³/h

1 - CF (G2) + PF (G4) + FF (F8)
2 - CF (G2) + PF (G4) + FF (F9)
High Flow Filter System of 2-Steps Filtration

Increase airflow PF+FF on 20%
Filtration system 400+400=800mm
Live time is up to 1.5 - 2 times
Q= 4200-4500 m³/h

System in the operating mode

High Flow Filter System of 3-Steps Filtration

Coalescer filter (CF) class G2
Reverse minipleat pre filter (PF), class G4
Fine filter (FF), class F8-F9

System in the operating mode

High Flow Filter System of 2-Steps Filtration

Air flow, m³/h
1 - PF (G4) + FF (F8)
2 - PF (G4) + FF (F9)

High Flow Filter System of 3-Steps Filtration

Air flow, m³/h
1 - CF (G2) + PF (G4) + FF (F8)
2 - CF (G2) + PF (G4) + FF (F9)
Super Flow Filter System of 2-Steps Filtration

Increase airflow
PF+FF on 30%
Filtration system 600+600=1200mm
Live time is up to 2-3 times
Q = 5000-5200 m³/h

Reverse minipleat pre filter PF, class G4

System in the operating mode

Super Flow Filter System of 3-Steps Filtration

Coalescer filter (CF), class G2
Reverse minipleat pre filter (PF), class G4
Fine filter (FF), class F8-F9

System in the operating mode

Super Flow Filter System of 2-Steps Filtration

Super Flow Filter System of 3-Steps Filtration

Air flow, m³/h
1 - PF (G4) + FF (F8)
2 - PF (G4) + FF (F9)

Air flow, m³/h
1 - CF (G2) + PF (G4) + FF (F8)
2 - CF (G2) + PF (G4) + FF (F9)
Air Intake Filtration System® for gas turbines

Existing types of air intake systems

Variant # 1

II Step
Pre filter (Z line), class G4
Filter area is 2-2.5 sqm

III Step
Fine filter, class F8-F9

Variant # 2

Pre filter of pocket type
Filter house for pre filter
Fine filter, class F8-F9
System in the operating mode

Filter area of pre filter class G4 is 2.5 sqm.
System of 2-Steps Filtration (the fine cleaning)

At the 1st step of filtration is used standard coalescer filters are using, and at the 2nd and 3rd steps is used pre filters and fine-filters as shown on the scheme below are using.

Why $1 + 1 \neq 2$?

Thus, the pressure drop for both of the filter could be calculated as:

$$\Delta PF = \Delta Pl + \Delta PPack$$

where are:

$\Delta PF$ – the pressure drop of the filter;

$\Delta Pl$ – the pressure drop of the airflow at the intake of Air Filter;

$\Delta PPack$ – the pressure drop of the airflow is flowing through the minipleat filter package.

As shown on the picture below, both the reverse pre filter and fine filter are mounted to each other so, that the output channels of pre filter are the continuation of the input channels of fine filter. Thus, it eliminates the input pressure drop at the input of the filter, which is 40 Pa at the airflow of 3400 m$^3$/h.

The pressure drop for both filters are mounted separately is equal the pressure drop to each of them, but new filtration system eliminates the pressure drop at the intake of the fine filter. Thus, the pressure drop for both filters are mounted accordance with the new scheme is less than the pressure drop for two filters are mounted separately.

Scheme of 2-Step Filtration.

1 – the minipleat filter packages of reverse pre filter, class G4; 2 – the output channels of reverse pre filter; 3 – the minipleat filter packages of fine filter, class F7-F9; 4 – the input channels of fine filter.
New System of 4-Steps Filtration
(the finish cleaning, class E10-H14)

At the 1st Step of filtration is used standard coalescer filters, and pre-filters of class G4 at the next step. The scheme of 3rd and 4th Steps is shown below.

**III Step**
Reverse minipleat fine filter, class F6-F9

**IV Step**
Minipleat EPA-HEPA filter, class E10-H14

Reduction the pressure drop at 40-80 Pa

1 + 1 ≠ 2

Scheme of 4-Stage Filtration

1 – the minipleat filter packages of reverse fine filter, class F6-F9; 2 – the output channels of reverse fine filter; 3 – the minipleat filter packages of EPA-HEPA filter, class E10-H14; 4 – the input channels of EPA-HEPA filter.
3-steps Compact Air Intake Filtration System for gas turbines

Scheme of Compact Filtration System
1 – the supporting wall of the filter chamber of the Air Intake System; 2 – the fine filter; 3 – the reverse minipleat pre filter; 4 – the coalescer filter; 5 – the gasket

Coalescer filter class G2
Reverse minipleat pre filter, class G4
FF-class F8-F9
Comparison of two filter systems

140 - 160 Pa as a gift!

The benefits of filtration system

- increase the area of filtration of coalescer and pre filters;
- reduced pressure drop at 160ПА;
- increase the efficiency of a gas turbine;
- reduction of gas consumption of gas turbines.

**Standard system**
coalescer filter (G2) + pre filter(G4) + fine filter (F8)

**New system**
coalescer filter (G2) + pre filter(G4) + fine filter (F8)

<table>
<thead>
<tr>
<th></th>
<th>Dimensions, mm</th>
<th>Filtration area, m²</th>
<th>Pressure drop, Pa</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Entrance area</td>
<td>Length</td>
<td>Pre filter PF G4</td>
</tr>
<tr>
<td>Standard system</td>
<td>596x596</td>
<td>692</td>
<td>2,5</td>
</tr>
<tr>
<td>New standard system</td>
<td>592x592</td>
<td>609</td>
<td>4,8</td>
</tr>
<tr>
<td>New high flow system</td>
<td>592x592</td>
<td>825</td>
<td>10,0</td>
</tr>
</tbody>
</table>
Different types placement of filters in air inlet filter housing of gas turbines

3-Steps Filtration

Variant # 1

Intake air
Coalescer filter G2
Pre filter G4
Fine filter F7-F9

Variant # 2

Intake air
Coalescer filter G2-G4
Pre filter G4
Fine filter F7-F9

4-Steps Filtration

Variant # 1

Intake the air
Coalescer filter G2
Pre filter G4
Fine filter F6-F9
Filter EPA E10-E12

Variant # 2

Intake the air
Pre-filter G4
Fine filter F6-F9
Filter EPA E10-E12
Air filters for gas turbines

1st stage of air filtration

Coalescers

Flat polyurethane foam
Strainer
Z-line polyurethane foam

2nd stage of air filtration

Pre filters

Pre filter Z-line class G4
Reversible filter class G4
Pocket filter type class G4
Cartridge Filters for Gas Turbines

Self-cleaning filter cartridges
3rd stage of air filtration

Fine Filters

Pocket filter
Class F6-F9

Filter Class F6-F9

Compact filter (depth of 292mm)
class F7-F9

Compartment filter (depth of 400mm)
class F7-F9

Compact filter (depth of 600mm)
class F7-F9

4th stage of air filtration
Effective and High Effective filters

Minipleat filter
class E10-H14

Compact filter (depth of 400mm)
class E10-H14

Compact filter (depth of 600mm)
class E10-H14