

REFERENCE

viledon®

2-STAGE AIR INTAKE RETROFIT AT FOUR GAS TURBINE UNITS OF A COGENERATION POWER PLANT IN TEXAS

A large power producer, located in Houston, Texas, invested in a retrofit for the air intake filter houses at four gas turbine units. Our Viledon® team realized this project in collaboration with a leading provider of services in the energy sector. High humidity coupled with high dust loads of an industrial zone is the main challenge of the site. The existing 2-stage filter setup could not handle the amount of dust and moisture which resulted in short filter lifetime, requiring unplanned downtime and high maintenance effort. The purpose of the retrofit was to increase pre- and final filter lifetime, avoid dust bypass and thus provide maximum protection for the turbine blades to ensure a high system availability.

The situation

The combined cycle power plant runs four Siemens W501F units at an operation base load of 150+ MW per unit. Houston, Texas has a humid subtropical climate with short, heavy rains in the summer. In addition, the plant is located in an industrial area so that filters have to cope simultaneously with high levels of humidity and urban dust.

The inlet air filtration of the existing filter house was carried out by a single filter wall with a 2-stage filter system consisting of pleated filters with cardboard frame (filter class MERV 8) as prefilters and compact V-style filters (filter class MERV 14) as final filters.

Poor filter lifetime with the filters used so far including less than 6 months for prefilters and approx. 8–10 months for the fine filters required a completely new air intake concept. Further malfunctions could be noted in a first analysis:

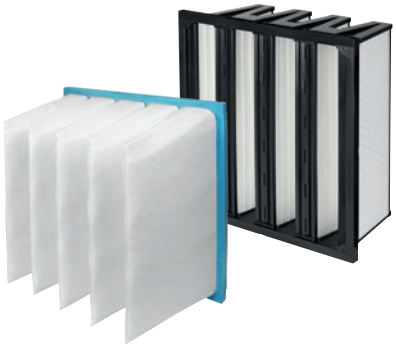
- fast pressure drop increase.
- deformed cardboard prefilter frames which led to dust bypass and dirt in front of the 2nd filter stage.
- dust bypass shortened the lifetime of the final filters.
- inadequate filter efficiencies.
- water accumulation behind the 2nd filter stage.

As a result, each turbine suffered serious power output losses and increased maintenance costs.

The Viledon® solution

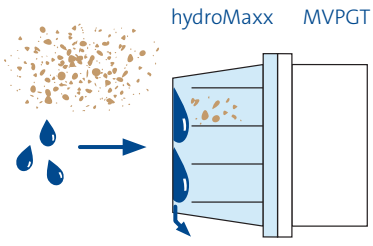
Freudenberg optimized the filtration system by installing the hydroMaxx reverse pocket filters (filter class MERV 8, ISO T5) as a prefilter (1st stage). The second filter stage is equipped with MVPGT B 95 cassette filters (filter class T7, MERV 14).

- First results of the new filtration concept indicated a filter lifetime of > 18–24 months with a significantly lower pressure differential increase and reduced shutdowns due to filter change and maintenance.
- The customer is very satisfied with the excellent results of the filter upgrade.



Viledon® hydroMaxx coalescer for prefiltration and MVPGT B 95 cassette filter for final filtration

- The new 2-in-1 configuration, whereby the hydroMaxx filters are clipped onto the MVPGT B 95 filters, is very quick to install. It also saves considerable space. There was no need for capital-intensive conversion of filter walls.
- Online prefilter change is possible because of Freudenberg's unique clip-on system.



No water ingress from 1st filter stage to 2nd stage

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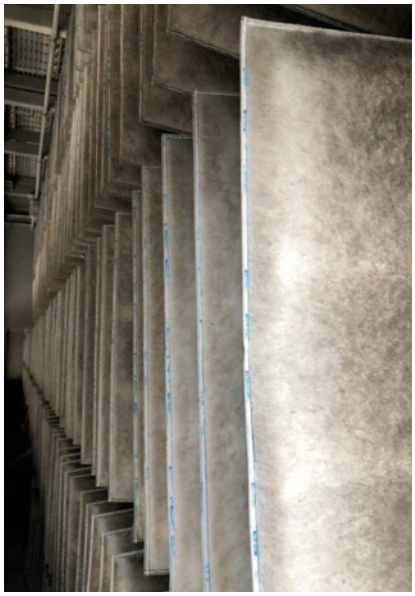
One of four air Intake filter houses



Cogeneration plant with four gas turbine units

Customer benefits

- Extended lifetime of pre- and final filters. Whereas with the old set-up it was only 6 months, operators now achieve a runtime of more than 18 months, thanks to the 2-stage high-efficiency intake air filter concept. This enables the operator to reliably comply with planned maintenance intervals.
- Reduction of initial and overall pressure drop values despite dusty and humid conditions.
- Higher output and improved heat rate resulting in sales revenue especially in the peak summer months due to significantly reduced fouling and associated lower power degradation.
- The selected Viledon® filters are perfectly suited for the local conditions related to temperature fluctuations and humidity.
- Operators gain an extended filter lifetime with more power output.



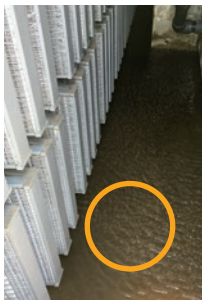


Situation after: tight seal between hydroMaxx coalescer prefilter and MVPGT final filter. Dimensionally stable filter construction with rigid filter frames. No dust bypass nor wetness behind the 2nd filter wall.

KEY DATA	
Location	Houston, Texas
Gas turbine	Four units of Siemens W501F, 180 MW each
Intake air flow rate per unit	1,370,252.22 m³/h (806,500 CFM)
Intake air system / filters fitted	2-stage filter system 1st stage: 374 pcs each of hydroMaxx coalescer filters of filter class ISO T5, ISO ePM10 50%, G4 rated; MERV 8 2nd stage: 374 pcs each of MVPGT B 95 cassette filters of filter class ISO T7, ISO ePM1 95%, MERV 14

ISO T-class acc. to ISO 29461-1. ISO ePM_x filter class acc. to ISO 16890. MERV filter class acc. to ASHRAE 52.2:2017





Situation before with 4-inch (96 mm) cardboard prefilters. Problem: Deformed prefilters and no airtight seal between the two filter stages which lead to dust bypass on the 2nd filter stage. Water accumulation behind the 2nd stage.

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