Envibat WESP
Next Generation Wet Electrostatic Precipitator

Envibat WESPs are used for industrial process gases and operate at or near the dew point. Pollutants such as condensable oils, tars, sticky particles, aerosols and sub-micron size particles (PM2.5) will be captured. In a wet scrubber it would take a tremendous amount of energy, in other words a high pressure drop, to remove sub-micron particles. Envibat WESPs provide substantial improvements in high collection efficiency, reduced maintenance costs and low power consumption compared to similar technology.

Though based on a modular design, all Envibat WESPs are customized to meet client requirements and emission requirements – thus improving profitability and ensuring a clean environment.

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Wet Electostatic Precipitator Technology

Wet electrostatic precipitators (WESPs) are used in applications where scrubbers, dry ESPs or other pollution control technologies are not able to reach the emission requirements. Installations can be as a replacement of existing ESPs or scrubbers, or as a tail-end cleaning after a dry ESP.

WESPs are the only alternative when low emissions are required, collection of sub-micron particles such as PM2.5 particulate is necessary, the material is either sticky, wet, flammable, explosive or has a high resistivity.

WESP technology is the only option when emission requirements below 1 mg/Nm3 are required along with low operating and maintenance costs.

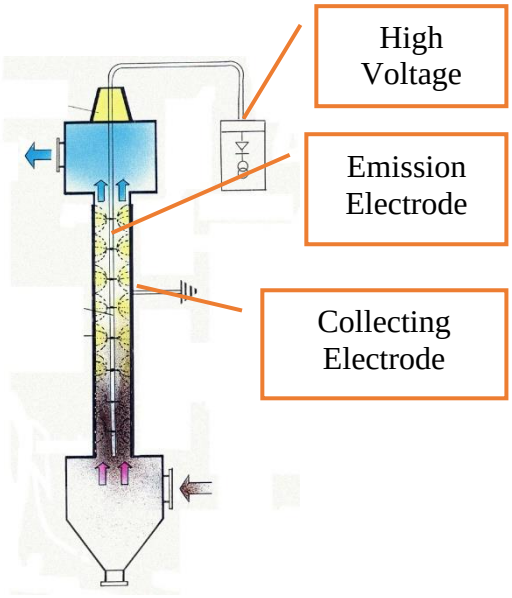
	Scrubber	Baghouse	Dry ESP	Wet ESP
PM 2.5 Abatement		✓		✓
Aerosol removal	✓			✓
Heavy metal removal				✓
Dioxin and furan removal		✓		✓
Eliminates opacity		✓		✓
Low gas temp./high dew point	✓			✓
Sticky particulate	✓			✓
Handles particles with high resistivity	✓	✓		✓
Low energy consumption			✓	✓
Low maintenance costs	✓			✓

Advantages of WESP technology

- Low emissions achievable: < 1 mg/Nm3
- Highly efficient for sub-micron particles
- Captures both aerosols and solids
- No fire risk
- No moving parts
- Dust resistivity not a limiting factor
- No rappers required, no re-entrainment
- Reduction of mercury and heavy metals

How our Wet Electrostatic Precipitators operate

The gas flows into the WESP from either the top or the bottom. Our highly efficient gas distribution system ensures an equal distribution across all of the vertical tubes. The walls of the tubes are electrically grounded and act as collector electrodes. An emission electrode is positioned in the centre of each tube, to which a high voltage is applied. The gas closest to the emission electrode is ionised by a corona discharge, in turn giving aerosols and particles a negative charge and driving these towards the collection electrode. Particles adhere to the collector electrode, until they are washed off when the system is flushed.



Applications

Wet electrostatic precipitators are commonly used for:

- Smelters
- Coke ovens
- Coal power plants
- Textile industry
- Pulp and paper facilities
- Steel industry
- Fire laboratories
- Municipal waste incinerators
- Sulphuric acid plants
- Particle board production (blue haze problems)
- Biofuel plants
- Sugar industry

Envibat Wet Electrostatic Precipitators

Envibat WESPs are modular and developed for maximal performance, easy installation and stable production over a long time. The efficiency and the performance are generally very high.

The modular technology allows scaling the design from small installations up to large installations with flows around 3 million m3/h.

High Performing Gas Distribution (HPGD) system

The gas flow distribution arrangement allows efficient and equal distribution of gas flow across all collection tubes. The HPGD system is fabricated in PE-polymer – the result is a highly effective gas flow distribution system that requires minimal maintenance.

High voltage insulation system

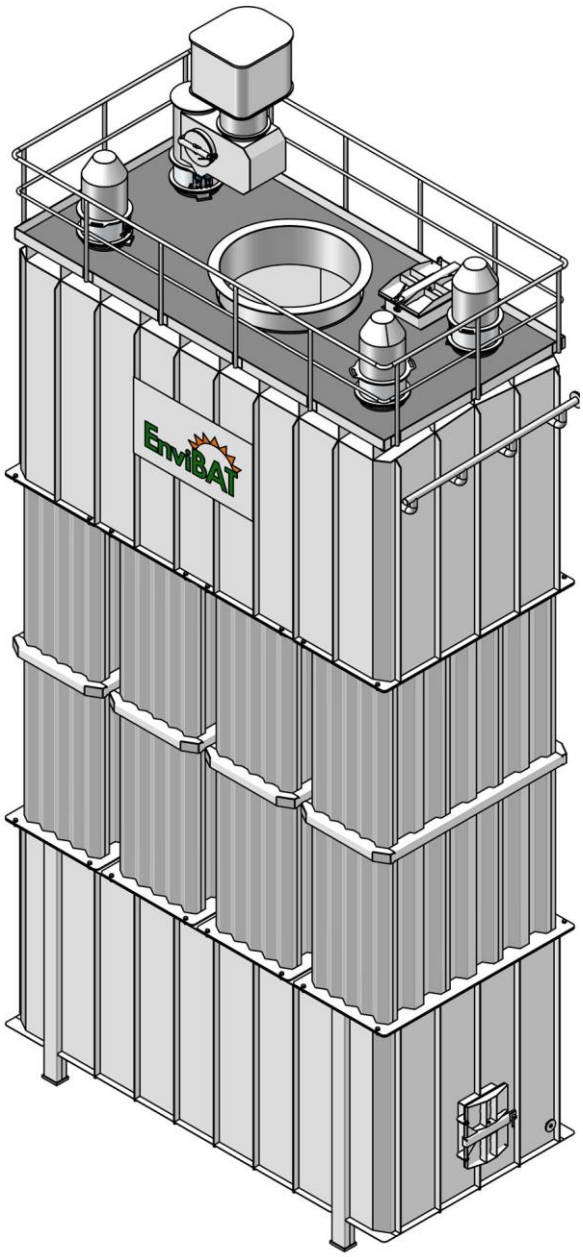
This system consists of a rigid high voltage frame suspended at four points by rugged and durable ceramic insulators. The insulator compartments are designed with large inspection/maintenance caps to provide more than adequate space for insulator inspection and/or removal. The insulators are not located in the flue gas stream thus avoiding contamination due to wetting and particle deposition.

Hexagonal tube collection bundles

A common wall tube design provides high structural strength and small footprint. This design provides a high collection area per m2 cross section. Overall weight and footprint size are low.

Electrode alignment system

The electrodes are suspended from the high voltage frame with an adjustable suspension system that allows for easy alignment of the electrodes in the collector tubes.



Flushing system

The high voltage plenum and gas flow distribution system is equipped with a flushing header that provides an intermittent flushing spray to prevent problematic buildup of particulate on the high voltage frame or collection tubes. The duration and frequency of the spray depends on the severity of the application but is typically set at 60 seconds every 4-12 hours.

Interlock system

To ensure safety during process stops and maintenance, all Envibat WESPs are designed with interlock systems which make it impossible to access the inside of the filter unless the high voltage system is turned off.

Patented electrodes: BACT-o-ROD

The BACT-o-ROD discharge electrodes consist of 21.3 mm diameter rigid tubes with needle tips distributed along the rod. It allows superior performance due to the sharpness of the tips and to the uniform and high current along the entire electrodes.

Insulator compartment purge system

The insulator compartments are purged with heated air to keep the insulators clean and dry. The purge air is heated within the insulator units by air heaters controlled by thermostats. The purge system is designed to keep the purge air flow required to a minimum.

Power consumption

WESPs require high voltage rectifiers, with different models being used depending on the number of electrodes in the system. Envibat WESPs are compatible with high voltage rectifiers from different brands.

Besides the high voltage rectifiers, the insulator chambers require heating for the purge air. Here, the Envibat design offers huge advantages over competitor designs, as the system has been designed for low air flow and thus low energy requirements. The purge air is indirectly heated with heating foils having a nominal rating of 0.75 kW. The operational power need is normally around 0.3 kW. Each WESP has four insulator chambers, making the total requirement around 1.2 kW.

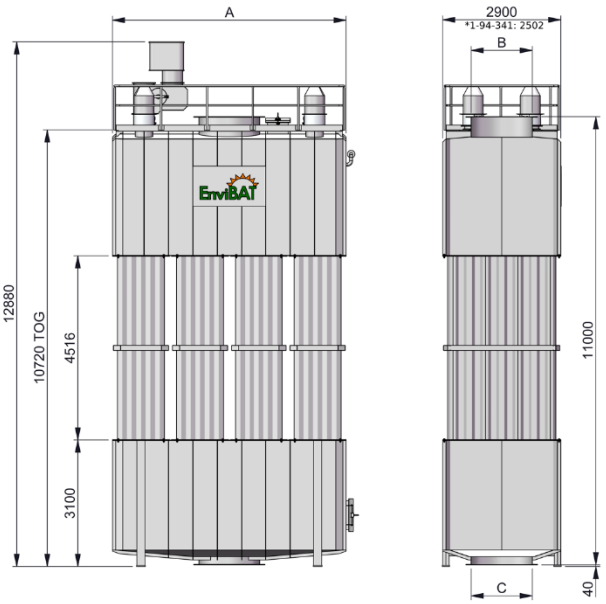
The table below gives a comparison between an Envibat WESP and a competitor's design. On top of this, extra purge air leads to higher power consumption in fans and other equipment, and sometimes to lower quality products, eg. in sulfuric acid plants.

	Envibat WESP	Competitor WESP
Air flow / insulator	~ 1.5 m3/h	~ 300 m3/h
Total purge air flow (4 insulators)	6 m3/h	1200 m3/h
Power required for heating (20°C – 110°C)	1.2 kW	240 kW
Energy required per year (8250 h/year)	~10 MWh	~ 2000 MWh
Energy costs (€0.05/kWh)	500 € / year	100 000 € / year
Cost factor	1	200

WESP Geometry

Below, an overview of the standard sizes of Envibat filters is given. Other configurations are possible on request. For help with sizing, please contact us!

Emission electrodes	BACT-o-ROD rigid discharge electrode
Collecting electrode	Hexagonal tubes Diameter 235 mm Length 450 mm
Requirements for insulators	Purge air appr. 1.5 m3/h; heating appr. 0.3 kW As standard, all models have 4 insulators.



Model number	Geometry				Gas flow capacity (m3/h) at: Velocity V (m/s) Residence time t (s) Specific collecting area SCA (s/m)				
	Length A (m)	Electrodes	Cross-section (m2)	Collecting area (m2)	V 1.0 m/s t 4.5 s SCA 75 s/m	V 1.5 m/s t 3 s SCA 50 s/m	V 2.0 m/s T 2.25 s SCA 38 s/m	V 2.5 m/s t 1.8 s SCA 30 s/m	V 3.0 m/s t 1.5 s SCA 25 s/m
1-94-332	2.3	94	4.5	332	16 060	24 089	32 119	40 149	48 179
1-111-392	2.3	111	5.3	392	18 964	28 446	37 928	47 410	56 892
3-59-625	4.3	177	8.4	625	30 240	45 360	60 480	75 600	90 720
2-111-784	4.7	222	10.5	784	37 928	56 892	75 856	94 820	113 784
4-59-834	5.75	236	11.2	834	40 320	60 480	80 640	100 800	120 960
3-111-1176	7.1	333	15.8	1176	56 892	85 338	113 784	142 231	170 677