Wet ElectroStatic Precipitator
WESP – WET Electrostatic Precipitator

Wet Electrostatic Precipitators (WESP) offer efficient emissions control for sub-micron particulate, heavy metals, acid mist, oil mist. The WESP is recommended because of its proven performance, compactness, robust design, automatic operation, and low operating costs.

Operation principles and basic design

Scrubber section

Hot contaminated gas from the production lines are cooled to full saturation and pre-cleaned from all particles larger than 2 microns in a special un-clogging scrubber. The scrubber creates a turbulent layer of fine mist which accomplishes the mass transfer of toxic gases and the capture of large particles onto the mist bubbles. The turbulent layer provides good mass transfer and offers efficient gas cooling below adiabatic saturation together with good absorption of soluble compounds.

Field of application

- Textile processing
- Veneer and particle board dryers
- Phosphorous furnace emission
- Silicon manufacturing
- Hazardous waste incinerator
- Plastics and gasket manufacturing
- Biomass drying
- Sulphuric acid plants
- Food drying

Pollutants removal

- HCl, HBr, HF, H₂S, NH₃
- SO₂, SO₃, SiO₂
- Oil mist, sub-micron particulate, VOCs
- Aldehyds, phenol
**Collector section**

In the vertical design, the evenly distributed saturated gas flows upward through the electrostatic section of the WESP.

An ionizing electrode runs down the centre of each tube. A strong electrical field is generated between the central discharge electrode and the collecting tube.

**Sizing**

The velocity component at which the particles move in the gas stream towards the collecting electrodes is called “migration velocity”. It is the most important empirical factor for the WESP sizing; it is correlated to the particle efficiency removal with the Deutsch-Anderson formula:

\[
\eta = 1 - e^{-\frac{AWc}{V}}
\]

Where:
- \( \eta \) = collection efficiency
- \( A \) = collection area
- \( Wc \) = particle terminal electrostatic velocity
- \( V \) = gas flow rate

Equation indicates that the electrostatic precipitator should have the following characteristics:

- high collector surface area (A)
- optimum gas velocity to allow enough time for particles to deposit (Q/A)
- high migration velocity (Vt)

AWS is able to optimize all these parameters in order to reach the best performance needed by the process.

**Technical features**

AWS engineers industrial grade, heavy-duty, low-maintenance design WESP’s.

**High voltage frame**

The high voltage discharge system consists of a rigid frame suspended with ceramic insulators located outside the flue gas stream in order to avoid contamination caused by condensation and particle deposits.
High voltage and current control

Automatic high voltage power generation. Solid state microprocessor control with variable inductance system.
New models with high frequency mono-phase high voltage system.

WESP Model

Depending on the application AWS, can choose the most efficient and cost-effective WESP model.

We can choose from different technology:
A) Condensing tubular WESP
B) Tubular WESP
C) Honeycomb WESP
D) Horizontal plate WESP

A) Condensing tubular WESP

In the Condensing WESP, which is the best available technology, the walls of the collecting tubes are cooled on the outside surface by a water jacket, causing a film of condensed moisture from the saturated gas to gather on the inner surface of the tubes. The water film created on the walls of the tubes flushes the collected particles down and out of the tubes. No further cleaning is necessary.

It also reduces clean water usage, minimizing flushing requirements.

Ionizing electrodes

Heavy duty, rigid electrodes provide long life and no maintenance or adjustments. Sharp point design provides high intensity charging fields.
Rigidly supported for greater reliability with no maintenance.

Air purge system

The insulators compartments are purged with filtered, heated air to keep the insulators clean and dry.

Safety interlocks

To ensure personal safety, the WESP is provided with mechanical interlocks that require the complete shut down of the plant before entering the system.

Liquid effluent treatment (oil separators, chemical-physical treatments, filtration technologies, ...) can be integrated into the design to achieve liquid discharge close to zero.
**B) Tubular WESP**

In those applications where the particulate to be captured is not so sticky, the Condensing WESP model can be replaced by a simple tubular WESP where the walls of the collecting tubes are not cooled on the outside by water jacket. This solution allows costs reduction ensuring a good gas purification at the same time.

**C) Honeycomb WESP**

For larger applications or where it is necessary to minimize the plant space it is possible to design a WESP with hexagonal honeycomb clusters. This solution offers the largest precipitation surface in the smallest space.

**D) Plate WESP**

In many applications it is preferred to save space in elevation and to design a gas treatment directly in line with the process.

In other cases it is necessary to combine the gas treatment with a heat recovery.

In all these applications the solution with horizontal plate WESP is preferred.

AWS can satisfy all client’s requests choosing the most cost-effective solution.
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