AWS Corporation offers a full range of air pollution control technologies, waste and primary water treatments and industrial fluids purification systems.

The "air pollution control division" is specialized in the design of scrubbers, catalytic deNOx systems, regenerative and catalytic combustors, dry absorption, brownian filtration, wet and dry electrostatic precipitators.

Wet Electrostatic Precipitators (WESP) offer efficient emissions control for sub-micron particulate, heavy metals, acid mist, oil mist.

Our Electroclean™ is recommended because of its proven performance, compactness, robust design, automatic operation, and low operating costs.

**Fields of application**

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

**Pollutants removal**

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

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**Operation principles and basic design**

**Scrubber section**

Hot contaminated gas 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 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 efficient gas cooling below adiabatic saturation together with good absorption of soluble compounds.
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.

Operation principle

Electrons are emitted from the discharge electrodes which are charged with a rectified negative high voltage. Due to the high voltage difference, these electrons migrate towards the collecting electrodes: as particles pass through the gap between the discharge electrodes and the tube walls, they are intercepted by negatively charged gas molecules. These molecules or negative ions accumulate on the particles surface and become fully saturated with negative charge.

As the gas with charged particles passes up the tube, it enters the collection section where there are strong repelling forces. The strong electrical field causes the charged particles and entrained droplets to migrate to the inner surfaces of the tube and consequently to be removed from the gas flow.

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
- $Wc$ = particle terminal electrostatic velocity
- $A$ = collection area
- $V$ = 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 ($V_t$)

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

Technical features

AWS engineers industrial grade, heavy-duty, low-maintenance design of the WESP.

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.

Ceramic insulator and insulator frame
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.

Electroclean™ Model

Depending on the application AWS selects 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 Electroclean™
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.

D) Plate Electroclean™
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.

C) Honeycomb Electroclean™
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.

Example of application in the chemical sector