

Wet Electrostatic Precipitators



Air Pollution Control Systems
THE ULTIMATE CHOICE™



AirPol
WET ELECTROSTATIC PRECIPITATOR

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The AirPol Wet Electrostatic Precipitator (WESP) was piloted and employed by AirPol in the late 1970's for a specific need in the petroleum industry. The requirements for a high collection efficiency control device for sub-micron particles were, however, at that time few and far in between. The emphasis was mainly on mass efficiencies on larger than micron size particles. There seemed to be no market for the WESP since the efficiency requirements could be met by conventional and less expensive devices.

AirPol did over time refine and improve the WESP to what today is a remarkably efficient device for sub-micron particles with low water consumption and low pressure drop.

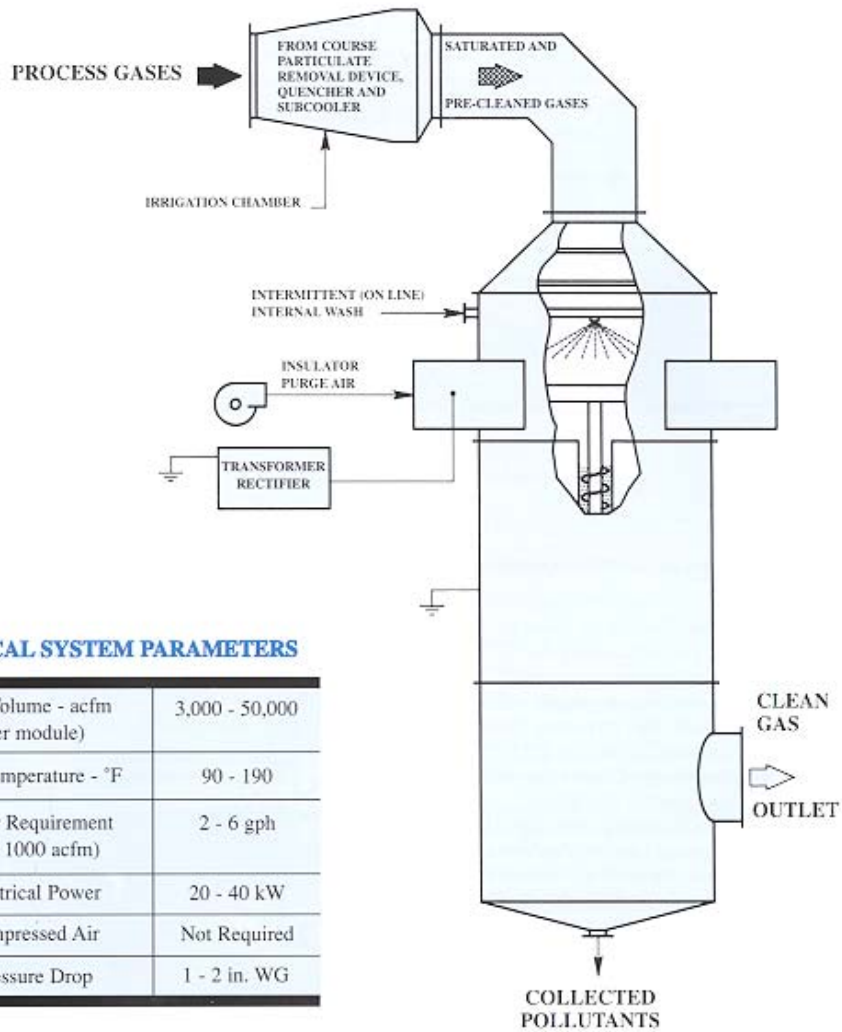
In addition to the type precipitator described in this brochure we also have over 100 WESP units of different configuration in operation for many diverse industrial applications.

WHY A WESP?

The present emphasis on air toxics and heavy metals has reintroduced the WESP in industries such as incineration, wood drying, manufacturing of particle and strand board, and many other processes. These industries are now considering the WESP as the "Most Achievable Control Technology" for particulate control. The list of applications is increasing every day. Being the ultimate device capable of achieving high collection efficiency on "blue smoke" and other ultrafine particles, the WESP has an important roll in today's air pollution control market.



TYPICAL PROCESS DIAGRAM



HOW IT WORKS

Sub-micron particles are often generated in a combustion process, such as incineration. The heavy metal elements are vaporized in the high temperature combustion zone, and will not change its state of phase until they have reached much lower temperatures, in some cases as low as 110-120°F. The WESP

is a particulate and liquid mist collection device, and the process gas must therefore be cooled to the point where most of the contaminants in gas form have solidified or converted into liquid droplets.

The process gas is therefore pre-treated in a quencher or conditioner before it enters the WESP to lower the temperature and completely saturate the gas. The gas enters the upper plenum and travels down through a number of cylindrical collecting tubes. In the center of each tube is a high voltage discharge electrode, that when energized emits an electric corona field. The particles passing through this field attain a negative charge and migrate over to the collecting tube wall, which is grounded. The fine water droplets generated in the pre-conditioner will also be charged and migrate to the wall. This water creates a thin film of liquid that runs down the collecting tube, providing continuous cleaning and self irrigation of the tube wall.

With the WESP on line, a wash down system is activated at certain adjustable time intervals. A spray header with nozzles strategically located above the collecting tubes provides a thorough rinse, which will effectively remove deposits of particulate matter on the tubes. In this way the maximum voltage (optimum collection efficiency) can be maintained with the AirPol WESP. There is no need for off-line manual cleaning as often is the case for other types of WESPs.

DOWNFLOW VS. UPFLOW

There are two basic types of tubular Wet Electrostatic Precipitators, one where the gas is flowing vertically downward, and the other vertically upwards. AirPol has selected the superior downflow principle for the following reasons:

- Gravity works in favor on the downflow unit. The irrigation water running down the tubes washes the particulates with it.
- The downflow makes it possible to keep the internals cleaner, and eliminates down time caused by solids build-up on the collecting tubes.
- The flow of water required to maintain clean internals is less with a downflow unit
- Higher secondary voltage can be applied in the downflow WESP resulting in fewer collecting tubes.

ROUND TUBES VS. SQUARE OR HEXAGONAL.

The AirPol discharge electrode is located concentrically in the collecting tube. This gives a symmetrical electric field strength in the space between the electrode and the tube wall. The square or hex configuration has its highest field strength at the wall closest to the electrode (flat side) and lower field strength in the corners.

The round tube has the following additional advantages over the square and hex tube:

- Larger tube diameter allows higher voltage. AirPol WESP operates above 20 kV per inch, smaller square tube units typically 10-13 kV per inch.
- An AirPol WESP with 47 tubes of 10 inch diameter has higher efficiency than a competitive unit with 360 tubes 5 inch square. The AirPol unit at the same time is infinitely less sensitive to dust build up and has therefore better ability to maintain higher voltage (efficiency).
- Less number of collecting tubes means less electrodes to be aligned simultaneously during installation.
- Less number of internals means less maintenance.



SUPERIOR DISCHARGE ELECTRODES

The AirPol WESP utilizes rigid discharge electrodes consisting of large diameter tubes as opposed to wires or rods. The attachment hardware is very rugged and ensures accurate alignment in the center of the tube. The electrodes have high intensity corona generating zones spaced at precise distances in order to give maximum electric field strength at the operating voltage level.

SPECIAL GAS OUTLET DE-WATERING SECTION

The outlet de-watering device in the bottom plenum has proven to give a droplet free gas discharge. It eliminates the need for chevron type mist eliminators and mesh pads, which are prone to solids build up and plugging, and will require frequent maintenance.

AirPol WESP ADVANTAGES:

- Superior Down Flow Design
- Highest Intensity Corona
- Higher Collection Efficiency
- Lower System Energy Requirements
- Lower Water Requirement
- Rigid Electrodes with Precise Alignment
- Fewer Electrodes than Upflow Design
- Self Irrigation Configuration
- On Line Intermittent Wash Down
- No Chevron or Mesh Pad Mist Eliminators
- Low Maintenance - Close to 100% Up Time

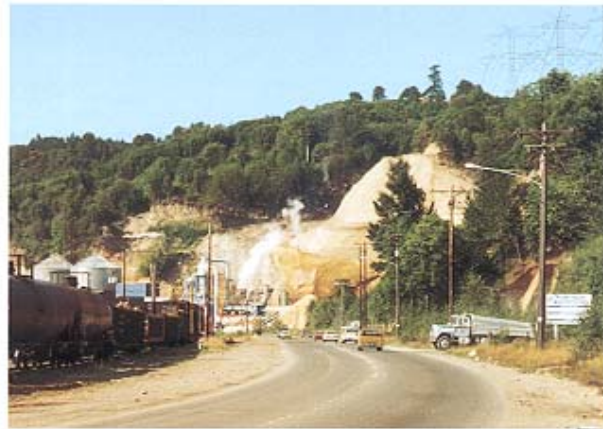


BEFORE

A rotary saw dust dryer using wood chips and bark as fuel (hog fuel). This fuel produces a dust loading of 0.072 gr/dscf and includes a high proportion of condensible (back half) particulate. This installation had a significant visual "blue haze" stack plume.

AFTER

Retrofit of an AirPol Wet ESP system, enables the facility to eliminate the use of natural gas as fuel and continue to use the by-product fuel of wood chips and hog fuel. The "blue haze" is eliminated and the stack emission is 20% below the design requirements of local regulatory agencies.



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