

HAMON RESEARCH-COTTRELL, INC.



Two Tubular WESPs



Tubular WESP on top of FCC Scrubber



A Modular Horizontal Plate WESP Section



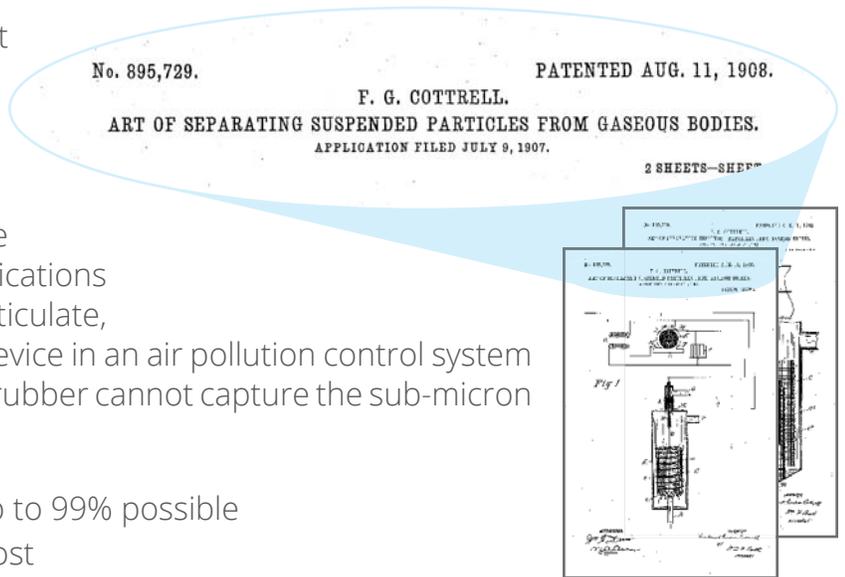
Horizontal Plate WESP

WESP
Wet Electrostatic Precipitator



WET ELECTROSTATIC PRECIPITATOR

Dr. Frederick Cottrell developed the first Wet Electrostatic Precipitator (WESP) in 1907 to control sulfuric acid mist from a copper smelting process in Pinole, California. (*patent at right*)



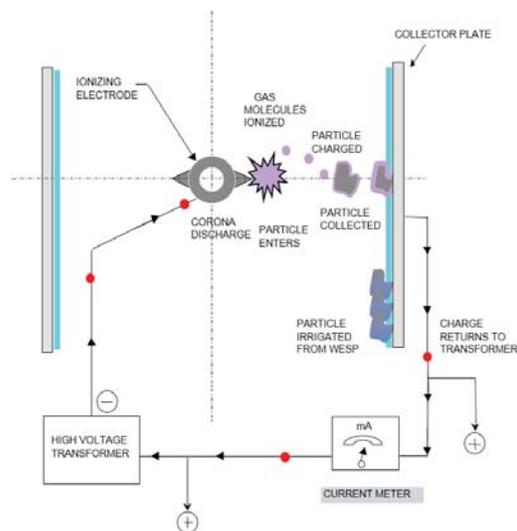
Since that time WESP technology has become well-established in both industrial and utility applications around the world to remove sub-micron particulate, condensables and acid mist as a final polishing device in an air pollution control system where an upstream dry ESP, fabric filter or wet scrubber cannot capture the sub-micron particulate due to its small size.

- **Performance** - over 90% typical and up to 99% possible
- **Compact Size** - minimizes space and cost
- **Opacity** - less than 10% possible
- **Reliability** - well-established technology in hundreds of applications
- **Fuel Flexibility** - allows for use of various fuels to reduce fuel cost
- **Multi-Pollutant Control** - sub-micron solid particulate, condensables, and sulfuric acid mist
- **Modular Design** - allows for scale up to any size air-flow
- **Maintenance** - no moving mechanical parts; continuous self-cleaning
- **Pressure Drop** - typically less than 1" w.c. through the WESP

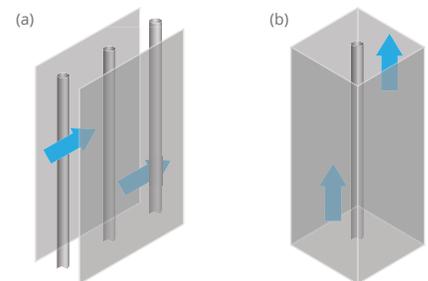
OPERATION

A Wet Electrostatic Precipitator (WESP) operates in the same three-step process as a dry ESP:

1. Charging of incoming particulate with negative ions from corona generation through the use of a high voltage system
2. Collection of the negatively charged particulate on a positively charged collection electrode surface
3. Cleaning of the captured particulate on the collecting electrode surface via use of water sprays, irrigation or condensation versus rapping or sonic horns. This is the primary difference between a dry and wet ESP.



CONFIGURATION



A WESP can be configured with flat plate collecting electrodes handling a horizontal gas flow similar to a dry ESP. (a)

Alternatively, a WESP can be configured in an up-flow tubular configuration on top of the wet scrubber to minimize foot-print. (b)

The collecting tubes can be either round, square, rectangular or hexagonal. Hamon Research-Cottrell offers both plate and tubular WESP designs.

MODULAR

Hamon Research-Cottrell can supply WESPs in modules fully assembled in the shop and trucked to site ready for installation. For larger installations either multiple modules or field erection can be offered depending upon schedule and field costs.



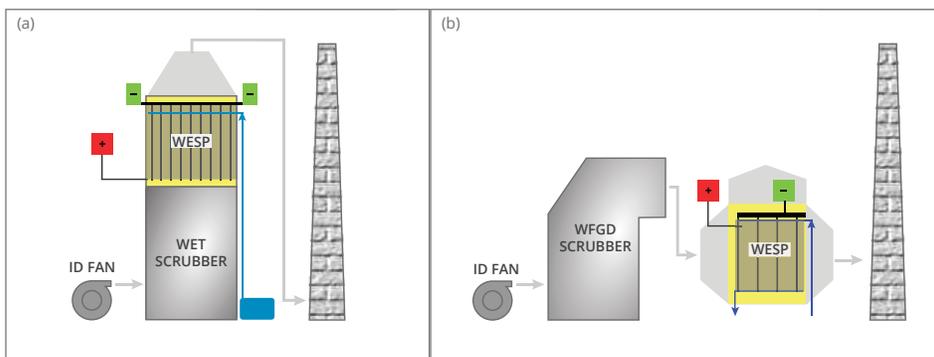
Modular collecting section for a Tubular Up-Flow WESP

PERFORMANCE

WESP removal efficiency is dependent upon several parameters – gas velocity, collection surface area, corona power, and electrical sectionalization. The Hamon Research-Cottrell WESP can achieve very high removal efficiencies, in excess of 90% on sub-micron particulate and acid mist. Increasing treatment time while minimizing size is critical to designing a cost-effective wet ESP that can meet required emission guarantees.

LOCATION

A WESP is typically installed after a wet flue gas desulfurization (WFGD) system in the utility industry or after a wet scrubber in an industrial application where the flue/process gas has been cooled to moisture saturation. Once cooled, gaseous pollutants condense to form sub-micron aerosols that can be captured within the WESP. The WESP can be integrated into the scrubber unit ^(a), or it can be located after the scrubber unit ^(b).



MATERIALS OF CONSTRUCTION

Due to the saturated condition of the process gas WESPs are susceptible to corrosion. Proper selection of the materials of construction depends upon analysis of the process gas, expected pH and chloride levels in the water. Material of construction can range from carbon steel, stainless steel, FRP to high end alloys such as Hastelloy®. Each industry and plant site is unique. Hamon Research-Cottrell will select an appropriate material of construction that provides long life, resistance to corrosion and reliability.

EXPERIENCE

Hamon Research-Cottrell has installed hundreds of WESPs in a variety of industries since the 1930's



Tubular Up-Flow WESP with round casing at a biomass plant



Horizontal Flow Plate WESP at a chemical manufacturer



WESP on top of wet scrubber on a refinery FCCU



WESP installed at a coal-fired power plant after a wet FGD system

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Hamon Research-Cottrell is part of the worldwide Hamon Group and is a major provider of air pollution control technology. HR-C serves the North American market from its main office in Somerville, NJ.

Hamon Research-Cottrell provides innovative clean air technologies to a wide array of industries including power generation, pulp & paper, petrochemical, chemical, glass, cement, steel, food, and pharmaceuticals. Hamon Research-Cottrell is a worldwide leading supplier of:

- Electrostatic Precipitators
- Fabric Filters
- ReACT™ multi-pollutant control technology
- Dry and Wet Flue Gas Desulfurization Systems
- DeNOx Systems (Selective Non-Catalytic Reduction - SNCR)
- Urea to Ammonia (U2A®) Systems
- ExxonMobil Wet Gas Scrubbers

Hamon Research-Cottrell provides solutions and project services that include new and retrofit equipment, engineering and fabrication, parts and aftermarket support, field services, trouble-shooting, fluid dynamics and specialty consulting.

INTEGRATED SOLUTIONS FOR A CLEAN ENVIRONMENT

The Hamon Group is a global source for engineering and contracting.

Its activities include the design, the manufacturing of critical components, the installation and the after-sale services of cooling systems, process heat exchangers, air pollution control (APC) systems, HRSG's and chimneys.

