

The Proven Alternative to Wet ESP

Cloud Chamber Scrubber (CCS) technology is sometimes confused with electrostatic precipitation (ESP) because both use electric charge. Aside from this superficial similarity, the technologies are strikingly different. Only the CCS uses charged droplets.

Wet ESP works by charging the particles in a gas stream, causing them to migrate through an electrostatic gradient to metal collectors where they are washed into a sump. The collectors are up to 8 centimeters away, an enormous “drift” distance for a particle that is less than a micron in size. Dry ESP in general is not suitable for submicron particle applications. Wet ESP is required, usually multiple stages. Typically, only light pollutant loading is practical; even so, satisfactory removal is not possible on many pollutants.

CCS in Contrast with Wet ESP

In contrast, CCS technology removes submicron particles simply and effectively. The CCS charges only the collector (that is, the water droplets) and moves the collectors to the particles.

When a particle passes within 20 microns, the droplet charge induces a dipole force on the particle, which causes the particle to move the short distance to the droplet for capture and collection. The charged droplet “cloud” is able to handle even heavy particle loading with high efficiency. The CCS does not have the very high voltage plus high amp draw demanded by corona charging, or the associated arcing, sparking, and current suppression (space charge) limitations.

Additional Advantages of the CCS Compared to W-ESP

- Power consumption is significantly less
- Removes coarse, fine, submicron, ultrafine, and condensable particulate
- Greater flexibility – particles larger than a few microns interfere with W-ESP function
- Simultaneously removes acid gases with efficiencies equal to a packed bed scrubber

Wet ESP: Charging Particles

- Charges each sub-micron particle with a charge of a few dozen electrons
- Long particle drift distance, several centimeters average to collection plates
- Charging: 1000-3000 watts per 1000 cfm. Voltage is 50kV - 100 kV. Sparking and current suppression. Corona charging of particles is difficult.
- Low pressure drop, less than 1.0” w.g., higher if combined with gas scrubber
- Recirculation pumping less than CCS but charging power dramatically higher
- Total system energy usage much higher compared to the CCS
- Ultra-low water usage to remove pollutants from the W-ESP system
- Light loading only, relatively sensitive to changes in loading
- Poor turn-down for process air flow changes or real-time variations
- Corrosion by acids accelerated by high electrical currents, thin water films leave dry spots and build-up
- High maintenance – dozens of tubes to cake and complicated electrical system, downtime

CCS: Charging Water Droplets

- Charges each sub-millimeter droplet with a charge of millions of positive or negative charges
- Short particle drift distance, approximately 20 microns average before capture by droplets
- Charging: 10 watts per 1000 cfm. Voltage is 10kv - 15kV. No corona charging. Water readily accepts a high charge using patented method.
- Low pressure drop, less than 1.2” w.g. including gas scrubber.
- Recirculation pumping more than W-ESP but charging power a small fraction
- Total system energy usage much lower compared to the W-ESP
- Ultra-low water usage to remove pollutants from the CCS system
- Heavy or light loading, relatively insensitive to changes in loading
- Excellent turn-down for process air flow changes and real-time variations
- Corrosion virtually non-existent, no high currents, cascade washed surfaces, build-up eliminated
- Low maintenance - simple open vessel design, routine preventative inspection, uptime

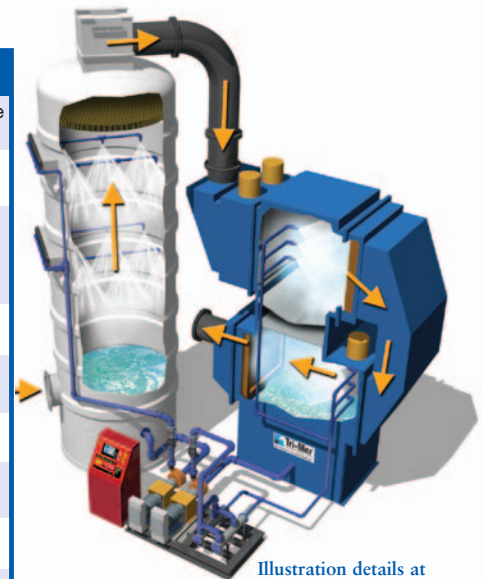


Illustration details at tri-mer.com/wet_scrubber.html

To remove gases or coarse particulate, Wet ESP often requires a second device. CCS does not. For more information, see www.tri-mer.com/wet-ESP.html

