

## **8. Theory of Operation:**

- A venturi scrubber accelerates the waste gas stream to atomize the scrubbing liquid and to improve gas-liquid contact.
- In a venturi scrubber, a “throat” section is built into the duct that forces the gas stream to accelerate as the duct narrows and then expands.
- As the gas enters the venturi throat, both gas velocity and turbulence increase.
- Depending upon the scrubber design, the scrubbing liquid is sprayed into the gas stream before the gas encounters the venturi throat, or in the throat, or upwards against the gas flow in the throat.
- The scrubbing liquid is then atomized into small droplets by the turbulence in the throat and droplet-particle interaction is increased.
- Some designs use supplemental hydraulically or pneumatically atomized sprays to augment droplet creation.
- After the throat section, the mixture decelerates, and further impacts occur causing the droplets to agglomerate.
- Once the particles have been captured by the liquid, the wetted PM and excess liquid droplets are separated from the gas stream by an entrainment section which usually consists of a cyclonic separator.
- For venturi scrubbers generally use the vertical down flow of gas through the venturi throat and incorporate three features:
  - A “wet-approach” or “flooded-wall” entry section to avoid a dust build-up at a wet-dry junction;
  - An adjustable throat for the venturi throat to provide for adjustment of the gas velocity and the pressure drop; and
  - A “flooded” elbow located below the venturi and ahead of the entrainment separator, to reduce wear by abrasive particles. The venturi throat is sometimes fitted with a refractory lining to resist abrasion by dust particles

## **10. Advantages/Pros:**

### **Advantages of venturi scrubbers include:**

- Can handle flammable and explosive dusts with little risk;
- Can handle mists;
- Relatively low maintenance;
- Simple in design and easy to install;
- Collection efficiency can be varied;
- Provides cooling for hot gases; and Corrosive gases and dusts can be neutralized.

## **11. Other Considerations:**

For PM applications, wet scrubbers generate waste in the form of a slurry or wet sludge. This creates the need for both wastewater treatment and solid waste disposal. Initially, the slurry is treated to separate the solid waste from the water. The treated water can then be reused or discharged. Once the water is removed, the remaining waste will be in the form of a solid or sludge. If the solid waste is inert and non-toxic, it can generally be land filled. Hazardous wastes will have more stringent procedures for disposal. In some cases, the solid waste may have value and can be sold or recycled.