

VENTURI SCRUBBER DUST COLLECTOR

Design Features

- High efficiency Wet Scrubber for particulate removal in sub-micron range.
- Wet inlet section wall eliminates build-up and wear.
- Modulating throat would maintain a constant throat pressure drop for varying gas loads.
- Gas capacities of 1 000 to 550 000 Am³/hr.

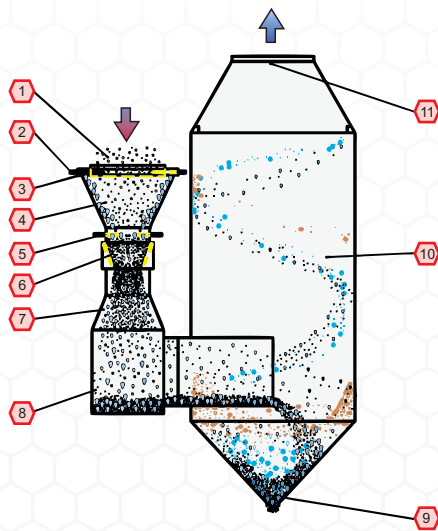


Figure 1. Venturi Scrubber Operation

Legend

1. Top Inlet Section
2. Water Inlet top of cone section
3. Flooded shelf
4. Cone Inlet Section
5. Throat Water Inlet
6. Throat Damper (Double Blade Modulating)
7. Divergent section
8. Wet Elbow
9. Slurry Outlet
10. Cyclonic Separator
11. Clean Gas Outlet

Operation

- Dusty gas enters the Venturi Scrubber Inlet connection via ductwork from the process/emission source.
- Tangential Feed Pipes introduce scrubbing liquid. (straight open pipes)
- The scrubbing liquid that is introduced swirls down through the Venturi Converging Section, providing the liquid for atomization and protecting the surfaces from both abrasion and build-up.
- Gas stream is accelerated due to the reduced cross-sectional area.
- Additional Radial Liquid Pipes introduce more scrubbing liquid to ensure complete coverage of the round cross-section Venturi Throat.
- The Mixing/Collision zone particulate is captured in the scrubbing liquid droplets created by the exhaust gas stream accelerated in the Throat Section.

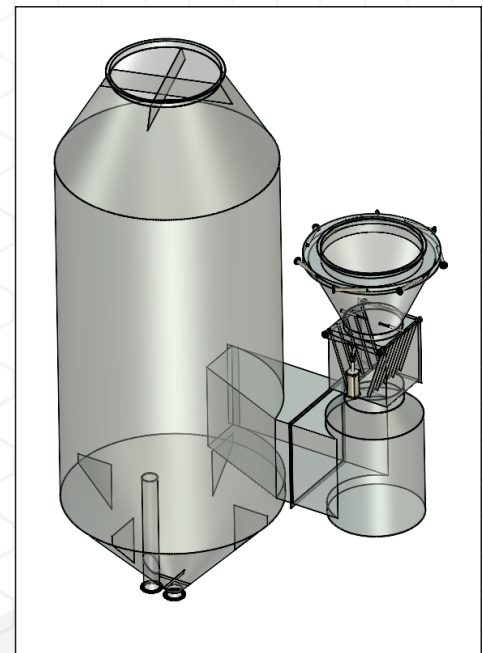


Figure 2. Venturi Scrubber Exploded view

- Pressure drop across the Venturi Throat determines the collection efficiency achievable. Higher pressure drops allow greater collection efficiency.
- To accommodate fluctuating exhaust gas volumes, a damper is used to adjust the throat cross-sectional area to maintain operating pressure drop for a constant efficiency
- A diverging Section below the Venturi Throat promotes extended contact time for the particulate and scrubbing liquid and assisting with pressure drop regain.
- The gas/liquid mixture turns and enters the Cyclonic Separator Inlet where it is accelerated into the cyclonic zone.
- The entrained scrubbing liquid with captured particulate is removed via centrifugal force.
- Slurry then drains to the bottom cone of the Separator vessel.
- The liquid in the bottom of the wet elbow serves to cushion impact and prevent abrasion of metal surfaces.
- The scrubbing liquid with captured particulate drains to the Recycle Pump for recirculation back to the Venturi feed pipes while a small portion ("bleed") is removed for disposal or treatment.
- Anti-Spin Baffles stop the gas spin and straighten the flow before the cleaned exhaust gas exits the Separator to an Exhaust Stack or ductwork.
- Cleaned exhaust gas exits the flanged Separator Outlet connection.

Benefits

- The collector has minimal moving parts.
- Specifically designed to suit all range of volumes.
- Adjustable pressure-drop over the throat section would give constant efficiency.
- Fixed throat or variable throat (Manual or modulating throat design available) design available.
- Liquor inlet is via open pipe design and with no use of any spray nozzles that could plug and erode.
- Scrubber outlet dust laden liquor portion can be recycled with clean water make-up.
- Inlet section, throat and wet elbow sections are all wet areas and minimal erosion takes place.
- Low maintenance due to open pipe liquor inlet and throat designs.
- Material of Construction to suit specific client's needs.

CASE STUDY 1 – VENTURI SCRUBBER

Table 1. Specifications & Performance: Eswatini Plant Venturi Scrubber.

Boiler MCR Capacity	105 tph – Bagasse and 85 tph - Coal
Boiler fuel	Bagasse and Coal fired
Gas Volume – Bagasse (MCR)	166 891 Nm ³ /hr
Gas Volume – Coal (MCR)	115 713 Nm ³ /hr
Inlet Dust Load - Bagasse	20.0 g/Nm ³
Inlet Dust Load - Coal	6.7 g/Nm ³
Outlet emission - Bagasse	100 mg/Nm ³
Outlet emission - Coal	150 mg/Nm ³
Collector	Venturi Scrubber
Collector size	Ø5 200 mm
Scrubber water requirement	410 m ³ /hr
Pressure drop – Bagasse (MCR)	2 000 Pa
Pressure drop – Coal (MCR)	2 750 Pa
Emission – Bagasse (Tested)	15 mg/Nm ³
Emission – Coal (Tested)	107 mg/Nm ³



CASE STUDY 2 – VENTURI SCRUBBER

Table 2. Specifications & Performance: Zambia Plant Venturi Scrubber.

Boiler MCR Capacity	163.38 tph – Bagasse
Boiler fuel	Bagasse
Gas Volume – Bagasse (MCR)	302 422 Nm ³ /hr
Inlet Dust Load - Bagasse	12.0 g/Nm ³
Outlet emission - Bagasse	150 mg/Nm ³
Collector	Venturi Scrubber
Collector size	Ø7 500 mm
Scrubber water requirement	630 m ³ /hr
Pressure drop – Bagasse (MCR)	1 900 Pa
Emission – Bagasse (Tested)	34 mg/Nm ³

