

August, 1986

STANDARD EDUCTOR VENTURI SCRUBBERS (EVS SERIES)

Ceilcote standard eductor venturi scrubbers (EVS) have been engineered for use in removal of particulate matter and noxious gases from ventilation and process gas streams. They are especially useful in applications involving hydrolysis or those requiring condensation of steam vapors. Properly sized, the EVS can achieve high collection efficiencies. They are particularly adaptable to gas cleaning applications where gas flow is small and where space is limited. In addition, no fan is required. This feature saves both space and cost. Typically, an EVS is supplied with a separator sump tank and a recirculation pump and piping set. In some cases, available line water pressure can be used, thus eliminating the need for a pump.

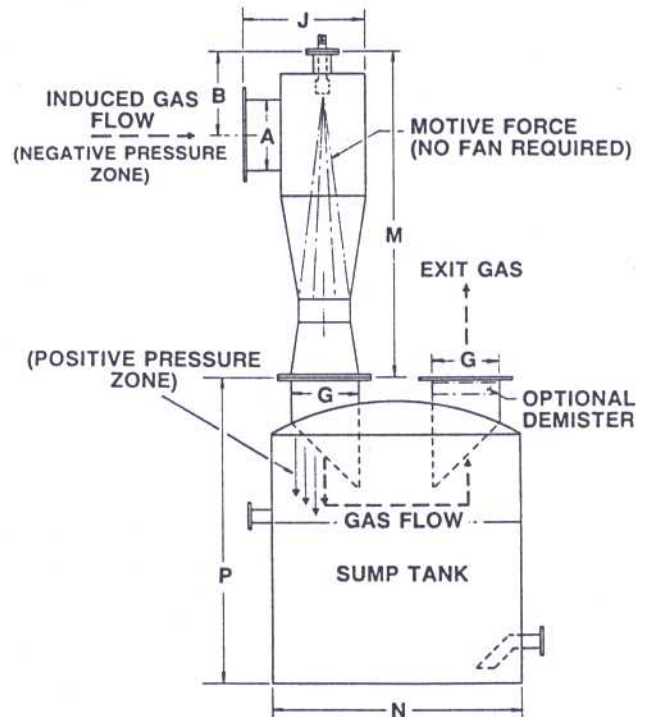
Applications

EVS scrubbers are used in the following applications:

- Pulp mill digesters
- Cl₂ and phosgene emergency vents
- Storage tank vents
- Reactor vents
- Kettle exhausts
- Low gas flow applications (down to 5 ACFM)
- Presence of high heat of reaction
- High solids loading
- Fluctuating gas flow
- Hydrolysis, i.e. reaction with SiF₄

Principle of Operation

Scrubbing liquid under pressure enters the EVS through a spray nozzle which provides both motive force and gives a spray pattern and droplet size distribution most suitable for maximum entrainment and scrubbing efficiency. The passage of the water spray through the venturi throat creates a suction at the inlet of the EVS. This causes the dirty gases and/or vapors to be drawn into the venturi throat where violent turbulent contact between the scrubbing liquid and gases or vapor creates the desired scrubbing action. The combined gas and liquid stream then passes into a tank or separator chamber where the non-condensable cleaned gases are separated from the liquid and vented to the atmosphere.

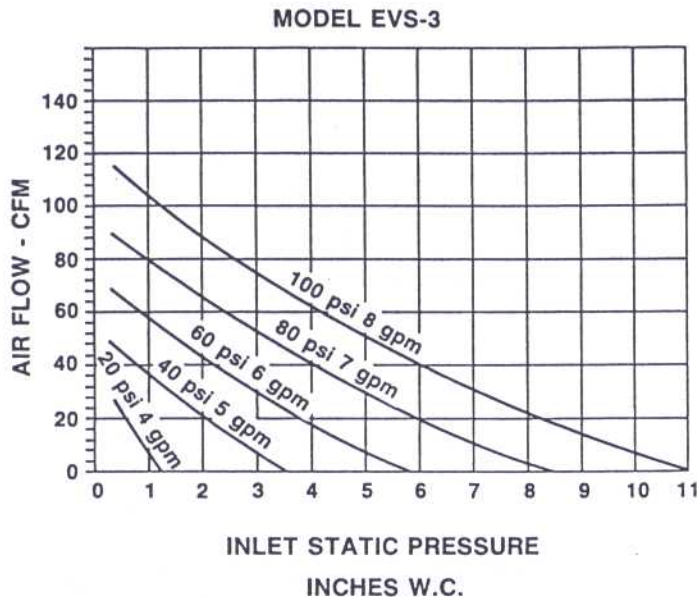


Model No.	Typical* CFM at -1" W.G.	Gas Inlet A	B	J	Height of EVS M	Gas Outlet G	Tank Dia. N	Tank Height P
EVS 3	100	3"	8"	9"	2'-3"	3"	2'-0"	2'-6"
EVS 6	450	6"	10"	12"	3'-3"	6"	2'-6"	3'-6"
EVS 8	1,100	8"	12"	16"	4'-2"	8"	3'-6"	4'-0"
EVS 10	1,750	10"	14"	18"	5'-0"	10"	4'-0"	4'-6"
EVS 16	4,000	16"	20"	26"	7'-7"	16"	5'-0"	6'-2"
EVS 20	7,000	20"	24"	34"	9'-2"	20"	7'-0"	7'-6"
EVS 24	11,000	24"	27"	42"	10'-10"	24"	8'-0"	8'-8"
EVS 30	16,000	30"	30"	48"	13'-1"	30"	9'-0"	9'-11"
EVS 42	28,000	42"	36"	60"	17'-8"	42"	10'-0"	12'-1"
EVS 54	45,000	54"	42"	72"	22'-8"	54"	11'-0"	14'-3"
EVS 60	65,000	60"	48"	84"	25'-0"	60"	12'-0"	14'-6"

*CFM varies with pressure.

Gas Flow Capacity and Draft

The EVS can be used where gas flows are as low as 5 ACFM and as high as 100,000 ACFM. Inlet static pressures up to -10 inches W.C. can be achieved although most applications call for -1.0 to -2.5 inches W.C. of draft. Draft (inlet static pressure) can be adjusted by changing the pumping rate. See typical curve below for Model EVS-3. Similar curves for all models are available from Ceilcote.



Particulate Collection Efficiency

Removal of solid or liquid particles is primarily accomplished by inertial impaction on the scrubbing liquid droplets. Collection efficiency is dependent on the velocity of the scrubbing liquid stream through the Venturi throat section. Generally the higher the velocity the greater the collection efficiency on a given particle size. If particles below 3 micron in diameter are to be removed, extremely high throat velocities are necessary to give violent turbulence between the particles and the scrubbing liquid. This requires high pump and spray nozzle pressures and therefore greater energy consumption. The EVS will give 98% to 99% removal on particles down to 3.0 microns in size.

CEILCOTE AIR POLLUTION CONTROL
14955 Sprague Rd. Suite 250
Strongsville, OH 44136
(440) 243-0700

Gas Absorption Efficiency

For noxious gases removal efficiency is dependent upon the type of gas, type of scrubbing liquid, the rate of scrubbing liquid and its pressure at the spray nozzle. Where the gas is highly soluble or reactive with the scrubbing liquid efficiencies of 80% to 90% can be obtained. Multiple stage EVS units can be used to increase absorption efficiency. Each stage may include a completely separate liquid recirculation system. One example used in control of odoriferous gases is a water pre-wash stage to remove particulate matter followed by an acid stage followed by a caustic stage.

Spray Nozzles

Special spray nozzles with the appropriate spray angle for each application are used. In most applications, either polypropylene or Teflon nozzles are provided to give maximum resistance to abrasives. Other materials, such as rubber and various metals, are also used.

Separator Sump Tank

Normally, the EVS is mounted on a separator sump tank which serves to separate the scrubbing liquid from the gas stream and vent the gas stream to the atmosphere. The separator sump tank also serves as a reservoir for the scrubbing liquid which is recycled to the spray nozzle. Separator sump tanks are available in standard sizes for the different EVS models. An entrainment separator of either chevron blade or mesh pad design may be placed in the gas outlet if necessary.

Recycle Pump and Piping

In most applications, Ceilcote provides a recirculation pump and related piping to recycle the scrubbing liquid from the separator sump tank to the spray nozzle. The standard EVS system is normally supplied with a centrifugal pump selected to provide both correct liquid flow rate and nozzle pressure. Recycle piping is fabricated for convenient field assembly and normally includes a ball valve for throttling and a pressure gauge. In all cases, suitable materials of construction are selected for system components.

Where available plant water, line pressure and volume are adequate, no pump or recycle are needed. This approach is particularly appropriate for gas volumes less than 500 ACFM.

Materials of Construction

Where corrosive duty is severe, the EVS and the companion separator sump tank are constructed of fiberglass reinforced polyester resin (FRP) or 316 stainless steel. Other materials used are plain carbon steel, 304 stainless steel, and the higher alloys such as Hastelloy C or Inconel 625.