



SPECIFICATIONS

FIBERGLASS PACKED TOWER SCRUBBERS HORIZONTAL AND VERTICAL SERIES ECH & ECV

HEE ENVIRONMENTAL ENGINEERING, LLC

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SPECIFICATION FOR FIBERGLASS HORIZONTAL CROSS FLOW AND VERTICAL COUNTER CURRENT FLOW SCRUBBERS

1.0 SCOPE

The specification covers requirements for Fiberglass Packed Tower Scrubbers intended for use in industrial application where corrosion control, as well as cleaning efficiencies are of prime importance and where the process service temperature does not exceed 180 F (250 F for special construction).

2.0 MATERIAL OF CONSTRUCTION

2.1 SCRUBBER HOUSING

- 2.1.1 Resin – The interior shall be a high quality vinyl ester resin such as Ashland Chemical's Hetron 922L or equal. The exterior shall be a high quality fire retardant vinyl ester resin such as Reichold Chemical, Inc. DION FR 9300 or equal with 1.5% Antimony Trioxide. The selection resin for the chemical environment shall be based on comprehensible evaluation of actual field service performance and experience and laboratory testing in accordance with ASTM C 581, or determined by actual testing by the customer utilizing a test coupon supplied by Harrington.
- 2.1.2 Resin Filler – The selected resin shall not contain any fillers except as required for viscosity control or fire retardancy, and in no case shall the amount of filler material exceed five percent by weight of the total weight of the resin. Antimony Trioxide may be added, up to the five percent limit, in compliance with the resin manufacturer's recommendations to create a finished product with a Class I flame spread rating of 25 or less when tested per ASTM-E84 Steiner tunnel test.
- 2.1.3 Exterior Gel Coat – The exterior of the scrubber housing shall be coated with a commercially available materials consisting of a polyester resin for corrosion control, a pigment ultraviolet light degradation. The material shall be such as teat manufactured by Lilly Industries, Incorporated or equal.
- 2.1.4 Fiberglass Reinforcement – The reinforcing material shall be an industrial commercial grade of glass fibers, such as manufactured by Owens-Corning or equal and shall have a coupling agent to provide a suitable bond between glass reinforcement and resin.
- 2.1.5 Interior Surface – The scrubber housing shall have a resin rich interior surface to comply with the recommended by the resin manufacturer. The surface shall also utilize a synthetic material, such as Nexus Veil to provide an additional barrier as required by the chemical service that the scrubber body will be subjected to.
- 2.1.6 Housing Design – The scrubber housing and the inlet or outlet transitions shall be suitably designed for the intended vacuum or pressure condition without excessive deflection. Fiberglass ribs shall be incorporates as required to avoid excessive deflection.
- 2.1.7 Hold Down Lugs – The scrubber shall be equipped with seismic rated anchor hold down lugs using type A or type B lugs and be bonded to the scrubber housing exterior using the correct laminate sequence.

2.2 RECIRCULATION SYSTEM

- 2.2.1 Piping – Pipe fitting for services up to 140F shall be Schedule 80, type 1, Grade I, polyvinyl chloride (PVC). For service temperatures of up to 180F, the piping material shall be Schedule 80, chlorinated polyvinyl chloride (CPVC). The material shall be manufactured by Spears Manufacturing, R & G Sloane Manufacturing or equal.
- 2.2.2 Valves – Adjustable flow control valves, such as true union end type ball valves shall be used to control solution flows to the spray piping. Valves for services up to 180F, the adjustable flow control valve body shall be chlorinated polyvinyl chloride (CPVC).
- 2.2.3 Nozzles – Spray nozzles shall be of polypropylene (PPL) material for service temperatures to 180F. The type and pattern of the nozzles is dictated by the application requirements. Nozzles shall be as manufactured by Bete or Spraying systems.

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- 2.2.4 Pumps – Sump Pumps shall be used when the scrubber is supplied with a self-contained recirculation system. The pumps shall be manufactured by Filter Pump Industries, Gusher Pump Company or approved equal and shall be mounted directly on the scrubber body to an integral sump box. The material of construction for the sump pumps shall be chlorinated polyvinyl chloride (CPVC) or 316 stainless steel. Pumps for scrubbers requiring external pumps not mounted directly to the scrubber body shall be centrifugal type pump and shall be manufactured from polyvinyl chloride (PVC), chlorinated polyvinyl chloride (CPVC) or 316 stainless steel.
- 2.2.5 Pump Inlet Filters – All scrubbers supplied with self-contained recirculation systems shall incorporate a pump inlet filter to prevent foreign materials from entering the pump and causing damage to the impeller. The filter shall be capable of being serviced and maintained through a pump box access door. The material of construction shall be polyethylene (PE) for service temperatures to 140F. For services temperatures above 140F, the pump inlet filters shall be Halar.
- 2.2.6 Assembly – The components of the recirculation system shall be installed in such a manner as to allow easy accessibility for maintenance purpose. The spray nozzles and piping system shall be serviceable from the exterior of the unit. If more than one recirculation pump is supplied with the unit, each pump shall be easily removed, independent of the other, and the unit plumbed in such a way as to allow the remaining pump to continue to function.

2.3 PACKING MATERIAL

- 2.3.1 Construction – The material shall be a design which induces highly turbulent mixing between the scrubbing liquor and the process air stream, thus creating mass transfer. The design provides self-distribution of the liquid and process air stream across the many channels within the packing material. The material shall be LANPAC as manufactured by Lantec Products Inc. or Tri-Packs as manufactured by Jeager Tri-Packs Inc. The packing materials shall be manufactured from polypropylene (PPL) for temperatures up to 180F, or other material suitable for the chemical environment.
- 2.3.2 Pressure Drop – The pressure drop shall not exceed .35 inches water gauge per foot of packing depth at a gas loading of 2,250 pounds per hour per square foot and a liquid flow rate of 2,000 pounds per hour per square foot.
- 2.3.3 Assembly – The packing shall be supported by fiberglass shapes such as angles, eye beams, wide flange beams or grating. The packing shall be removable through a bolted top or optional access door located near the packing.

2.4 MIST ELIMINATORS FOR VERTICAL PACKED TOWER SCRUBBERS

- 2.4.1 Construction – The unit shall be a Euroform Model T-125 as manufactured by Munters Corporation. The material of construction shall be polypropylene (PPL).
- 2.4.2 Design – The T-271 Mist Eliminator shall be composed of the series of multi-angular shaped separating walls arranged to provide a channel for the gas flow.
- 2.4.3 Performance – The mist T-271 mist eliminator shall be capable of removing 99 percent of all mist particles larger than 45 microns in diameter. The pressure drop shall not exceed .15 inches of water column at the design velocity.
- 2.4.4 Assembly – The mist eliminator shall be supported by fiberglass shapes such as angles, wide flange beams, eye beams or grating.

2.5 MIST ELIMINATORS FOR CROSS-FLOW HORIZONTAL SCRUBBERS

- 2.5.1 Construction – The unit shall be a Euroform Model T-125 as manufactured by Munters Corporation. The material of construction shall be polypropylene (PPL).
- 2.5.2 Design – The T-125 Mist Eliminator shall be composed of sine-shaped flow contours with phase separating chambers.
- 2.5.3 Performance – The mist T-125 mist eliminator shall be capable of removing 99 percent of all mist particles larger than 25 microns in diameter. The pressure drop shall not exceed .25 inches water column at the design velocity.
- 2.5.4 Assembly - The mist eliminator shall be supported by fiberglass or polyvinyl chloride (PVC) shapes such as angles, wide flange beams, eye beams or gating.

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2.6 MOUNTING HARDWARE AND GASKETS

- 2.6.1 All nuts, bolts and washers used to mount the access doors, pumps, valves and any other equipment to the fume scrubber shall be stainless steel of a type compatible with the surrounding environment.

3.0 SCRUBBER DESIGN

3.1 VELOCITY

The scrubber shall incorporate an inlet transition to reduce the inlet velocity of the process air stream to the desired through put velocity of the scrubber, as dictated by the service requirements. The velocity shall be between 140 and 900 feet per minute, to allow adequate interface between the process gas stream and the scrubbing liquor.

3.2 SCRUBBER EFFICIENCY

The efficiency of the scrubber shall be as required, based on the inlet concentration of the gas stream, and the outlet concentration necessary to comply with the local air pollution control laws in the area where the unite is being installed. In instance where local codes are not known, or when the law is not clear, the outlet concentration of the cleaned air process stream shall meet the requirement of the air pollution control laws of the South Coast Air Quality Management District of Southern California.

3.3 RECIRCULATION SYSTEM

The piping, pumps, valves and nozzles shall be capable of recirculation the required gallon age of solution required per square foot of packing surface, dictated by the process conditions and monetary considerations. Where two pumps are required to supply the necessary gallonage, each pump will be plumbed in such a manner as to allow removal of the pump from service without the necessity of discontinuing service of the balance of the system.

3.4 SUMP

The scrubber sump shall be capable of retaining a minimum of one and one half times the gallonage of solution required by the recirculation system. An overflow fitting shall maximize the liquid level in the sump box.

4.0 PRODUCT WARRENTY

Refer to HEE STANDARD PRODUCT WARRANTY for details and information on the warranty.

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EXAMPLE OF SCRUBBER EQUIPMENT TABLE

Name	Acid Scrubber
Quantity	3
Tag	SC-1, SC-2, SC-3
Air Flow Conditions (Per scrubber)	24,000 SCFM Present 30,000 SCFM Future
Contaminants/Expected Removal Efficiencies	
Acetic Acid CH ₃ COCH ₃	95 percent
Chlorine Cl ₂	99 percent
Hydrofluoric acid HF	95 percent
Hydrochloric acid HCl	95 percent
Scrubber Inlet Temperatures	65 – 85 F
Scrubber Type (wet packed bed scrubber)	Horizontal cross flow or Vertical counter current
Manufacturer	Harrington Environmental Engineering
Model	ECH 78-4 LB
Duct size	32 Inch Diameter
Electrical Pump HP	5 HP (Qty:2)
Power	480/3/60
Motor Enclosure	TEFC
Control Panel Enclosure	Nema 4
UL Listed	Required
Total External Static Pressure	4.8 inches water column
Maximum Scrubber Static Pressure	1.9 inches water column
Scrubber Dimension	185x121x119 Inches (LWH)

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ACCESSORIES, ENHANCEMENTS AND OPTIONS AVAILABLE

Access Panels
Chemical Feed System
Conductivity Controller and Probe
Double Containment Sump
Drain with Ball Valve
Flanged Inlet and Outlet
Flexible Connectors
Float Valve
Inlet Water Solenoid, Gate Valve, Flow Meter
Inline Flow Meter
Instrumentation/Control Panel
Lifting Lugs
Liquid Flow Indicator
Magnahelic Gauge and Switch
Mist Eliminator Side Access
ORP Controller and Probe
Positive Pressure Construction
Pressure Gauge with Guard and Valve
Pump Motor Disconnect
Rain Shields for Double Containment
Removable Transition
Sample Tap
Space for Future Packing
Special Resin Systems
Standby Pump
Sump Heater and Controller

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