

## **SPECIAL SPECIFICATION**

### **SECTION 15861S**

#### **FUME SCRUBBERS**

#### **PART 1 - GENERAL**

##### **1.01 SUMMARY**

- A. Section includes packaged, skid-mounted scrubber systems for corrosive exhaust systems.
- B. Related Sections
  - 1. Drawings and general provisions of contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to work of this section.
  - 2. Division 13, Seismic Protection and Controls sections, apply to the work of this section.
  - 3. Division 15, Basic Mechanical Materials and Methods, Insulation, and Mechanical systems demonstration Sections, apply to the work of this section.

##### **1.02 SUBMITTALS**

- A. Product Data:
  - 1. Manufacturer's technical product data and installation instructions for Fume Scrubbers, including performance curves and rated capacities, sequences of operation, control programs, Piping & Instrumentation Diagrams and wiring diagrams.
  - 2. Furnished accessories such as packing material, circulating pumps, demisters, overflow weirs, control panels, and control devices and sensors.
  - 3. Shipping and operating weights, ..
- B. Shop Drawings:
  - 1. Fully dimensioned and to scale layout drawings of Fume Scrubbers including connections sizes and plan and elevation locations for, but not limited to, scrubbers, containment pan, duct, piping, structural supports (anchor bolts), and wiring.

2. Show interface and spatial relationships between Fume Scrubbers and adjacent equipment.
  3. Show hole alignment of duct flanges. Show all test and instrumentation locations and sizes.
  4. Detail any and all special structural attachment points required for seismic restraint.
  5. Detail wiring diagrams for power, signal and control systems and differentiate between manufacturer .
- C. Maintenance Data: For fume scrubbers and furnished accessories, including maintenance manuals specified in Division 1.

### 1.03 QUALITY ASSURANCE

#### A. Qualifications

##### 1. Manufacturer's Qualifications

- a. Manufacturer shall perform his own fabrication, controls, and testing processes.
- b. The owner and/or his representatives shall have the right to tour the manufacturer's plant anytime that fabrication is being performed on Fume Scrubbers intended for his project..

##### 2. Installer Qualifications

- a. Installation contractors shall have at least 3 years of successful experience on hazardous exhaust projects.

##### 3. Codes and Standards

- a. The latest edition of all applicable state, national and Sandia ES&H codes and or directives.
- b. NFPA Compliance: Comply with NFPA 90A "Standards for the Installation of Air Conditioning and Ventilating Systems", and NFPA 91 "Standard for the Installation of Blower and Exhaust Systems."
- c. Fume Scrubbers shall be listed for use without the necessity for internal fire protection sprinklers or any devices relied on to cut off air flow in the event of fire by Factory Mutual Research Standard 4922.

- d. Fume Scrubbers shall have a flame spread of less than 25.

#### 1.04 DELIVERY, STORAGE AND HANDLING

- A. Protect Fume Scrubbers from damage due to normal handling during shipment and storage. Protection shall be applied to open ends to prevent dirt and moisture from entering.
- B. Consignee must inspect shipment upon delivery and note any and all damages and discrepancies on bill of lading and notify manufacturer within 24 hours.
- C. Fume Scrubbers shall not be stored in an area where they will have a chance to be damaged from traffic or debris.

### PART 2 - PRODUCTS

#### 2.01 MANUFACTURER

- A. Fume Scrubber
  - 1. Harrington Environmental Engineering  
720 East Carnegie Drive, Suite 100  
San Bernadino, CA 92408

#### 2.02 EQUIPMENT

- A. Provide complete skid mounted, vertical draw through, wet type Fume Scrubbers with spherical packing, demisters, secondary drain pans, water recirculation system of over flow weir design and integral, stand alone controls, and accessories, as scheduled in full accordance with the specifications below and Mechanical Equipment Schedule, all material shall be compatible with dosing chemicals; 98% H<sub>2</sub>SO<sub>4</sub> for acid and 50% NAOH for ammonia scrubbers:
  - 1. Scrubber housings:
    - a. Premium quality industrial grade vinyl ester resin such as Ashland Chemical Hetron 922L or equal; surfaces exposed to the surrounding atmosphere shall require a polyester resin of high quality fire retardant industrial grade selected for the environment in which it will operate.
    - b. Resin shall not contain any fillers except for viscosity or fire control; but shall in no case exceed five percent by weight of the total resin weight.

- c. Exterior gel coat: industrial grade, free from imperfections, consisting of a polyester resin for corrosion control, color pigment, and a UV inhibitor, such as diatomaceous earth. Fiberglass reinforcement shall be of industrial commercial grade of glass fibers and shall have a coupling agent suitable for bonding of the glass reinforcement and the resin.
  - d. Interior surface: Resin rich to comply with resin manufacturer's recommendation, flow coated with same resin as used in manufacture of the fan housing. Interior housing shall contain a resin rich veil interior when required for the service application.
  - e. The Scrubber housing and the inlet and outlet transitions shall be designed for negative 15 in. w.g. without excessive deflection.
  - f. Hold down lugs: the scrubber shall be equipped with seismic rated anchor hold down lugs, bonded to the exterior housing.
  - g. The scrubber housing shall have an integral sump large enough to contain all the recirculation water, without over flowing, once the pumps have been shut off. The sump shall be provided with level, fill, caustic, biocide, drain, and overflow drain connections.
2. Recirculation system:
- a. The distribution system for each scrubber shall be arranged to distribute uniformly over the fill material and shall consist of a centrally located header with junction boxes, and side laterals with weirs. Materials shall be polypropylene or vinyl ester FRP. The distribution troughs shall be equipped with "V" type weirs which shall be field adjustable for leveling and servicing.
  - b. Pipe and fittings shall be Sch 80 CPVC with true union type ball valves. Provide valving to isolate each pump and lateral, in such a way as to allow the removal of one pump while the system stays operational.
  - c. Gaskets shall be EPDM or Teflon.
  - d. Dual, vertical, seal-less, centrifugal pumps shall be provided for the recirculation system. Pumps shall be injection molded FRP, mounted on the sump. Pump seal water, if required, shall be internal to the pump. Each pump shall be capable of supplying the required GPM for the entire scrubber, one pump shall function as back-up. Pump motors shall be TEFC, premium efficiency, furnished by the specified manufacturer. Each pump shall be furnished with an inlet filter.

- e. The manufacturer shall identify all piping that requires freeze protection on the shop drawings.
  - f. Basin water level shall be maintained by a float type make-up water valve, accessible through a bolted access cover.
  - g. Blowdown/overflow shall be set to 4 GPM for the ammonia scrubber and 6 GPM for the acid scrubber.
  - h. Pressure gages shall be provided in the recirculation piping as indicated on the drawings. Differential gages shall be provided across the packing and demisters. Isolation diaphragms shall be provided if the gage materials are not compatible with the process.
3. Secondary containment basin:
- a. Provide and install an FRP secondary containment basin sized to hold the entire liquid content of the scrubber plus 50% when the pumps are off. Provide water tight penetrations to accommodate the scrubber basin drain and overflow drain piping.
4. Mist eliminators:
- a. Mist eliminators shall be composed of a series of, multi-angular shaped, separating walls arranged to provide a channel for the gas flow, constructed of polypropylene, and be capable of removing 99 percent of all mist particles larger than 45 microns in diameter, with a pressure drop not to exceed .15 in. w.g. The mist eliminator shall be Eurofoam style, model T-271 as manufactured by Munters Corporation.
5. Packing material:
- a. The packing shall be manufactured from polypropylene. The packing shall be LANPAC as manufactured by Lantec Products Inc, or Tri-Packs as manufactured by Jeager Tri-Packs Inc. The packing depth shall be a minimum of 5 feet. The packing material shall be designed to ensure self-distribution and turbulent mixing between the scrubbing liquor and the process air stream. The packing shall be accessible through a side access panel.

## 2.03 CONTROLS

- A. Provide a complete and operating, factory tested, control system for each scrubber which will operate independent of the FCS. Connections to FCS shall be for status, and

alarming only. Refer to contract drawings for instrumentation required, locations, and sequence of operation.

1. Provide a loose, NEMA class 3r control panel for field mounting inside existing, adjacent fan room and a single NEMA class 3r junction box mounted on scrubber. Pre-mount, if protected from shipping damage, and wire all control devices to scrubber mounted junction box. Clearly mark all terminal strips for, Control contractor provided and installed interconnect conduit and wiring between control panel and junction box. Provide 120V rated, normally open, contacts in each panel for start stop operation of each scrubber pump. Electrical contractor shall supply and install, interconnect wiring and conduit to pump motor starters.
2. Control devices.
  - a. Signet pH probe/transmitter/reader capable of sending a 4-20 milliamp signal to FCS, mounted to sample side stream pump water pH as indicated on contract drawings and orient for visual reading from eye level. Signet # 3-8750-1 in-line pH electronics with readout, # 3-2714 flat pH sensor, # 3-8050 mounting adapter and # P31542 mounting cap for pH sensor.
  - b. Signet acid flow transmitter #3-8550-1, flow sensor #P51530-T1, 6-inch fiberglass saddle # FPS060 and universal transmitter on pipe mounting #3-8050.
  - c. Signet caustic flow transmitter #3-8550-1, flow sensor #P51530-H0 with Hastelloy pins, 3-inch fiberglass saddle # FPS030, 4-inch fiberglass saddle # FPS040 and universal transmitter on pipe mounting #3-8050.
  - d. Signet Ultrasonic Point Level # 3-2212-SR (316ss with relay for caustic) and # 3-2212-TR (TEFZEL with relay for acid).

#### 2.04 ACCESSORIES

- A. Provide a clear access panel for observation and access to the packing, and the demisters.
- B. Provide adequate lifting lugs.

### PART 3 - EXECUTION

#### 3.01 ERECTION & INSTALLATION

- A. Examine areas and conditions under which the scrubbers are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to installer and owner.

- B. Assemble and install scrubbers, secondary containment basin, and controls according to the manufacturers instructions, at the locations shown on the contract drawings. Ensure the weight of piping and ductwork is not transferred to the scrubber.

**END OF SECTION**