

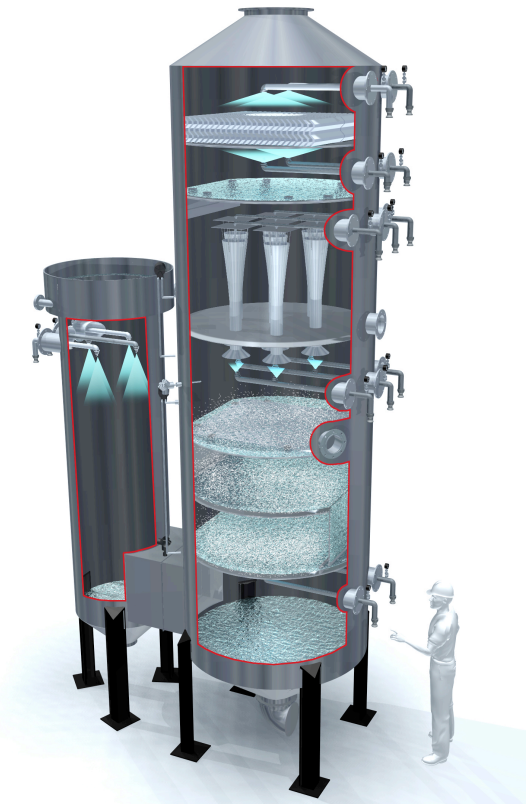
EnviroCare International

Wet Scrubbing Emission Control System Proposal

**To:
City of Greensboro**

**For:
TZ Osborne WWTP**

**EnviroCare VenturiPak™ Scrubber
Proposal Number 4083P75 Rev.1
Submitted December 20th, 2018**



EnviroCare International, Inc, 507 Green Island Road American Canyon, CA 94503 USA
(707) 638.6800 * Fax (707) 638.6898

Customer:
Plant:
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PROPOSAL SCOPE

This proposal offers a VenturiPak™ wet scrubber system by EnviroCare International, Inc. for installation by a customer selected contractor who will be referred to as the **Contractor** for the remainder of this document. The proposed scrubber is complete with equipment necessary to retrofit the existing tray scrubber.

The equipment required for a new VenturiPak™ scrubber includes:

- New VenturiPak™ Scrubber. A new VenturiPak™ vessel will be fabricated and will contain a subcooling stage, a MicroMist™ Venturi stage, a separator stage, and SPC mercury module stage. All spray lances, instrument fittings and manways required for the VenturiPak™ Scrubber vessel will be included or reused from the existing tray scrubber as needed.
- One complete factory assembled booster pump skid. The booster pump skid will feature an inlet duplex basket strainer, ball valves, water booster pumps, flow meters, and water pressure indicators. Motor starters and VFD will be supplied loose for customer installation into the MCC.
- Field instrumentation and equipment as stated
- Budget for field services.

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DESIGN CONDITIONS

Application: FBI Biosolids Incineration System
Plant Elevation: 100 ft above MSL
Power Required: 460 V / 3 phase / 60 hertz and 110 V / 1 phase / 60 hertz
Effluent Flushing Water: EFW 75° F @ 40 psig
Service Water: SW 75° F @ 40 psig

SYSTEM REQUIREMENTS

Scrubber Inlet Conditions:

Flue gas Volume (Wet): 21,750 acfm, 19,285 scfm (w)
Temperature: 180° F
Dust Loading: ≈2.6 lb/min

System Flow Requirements:

Tray Irrigator Spray Water: 12 GPM @ 40 psig * (EFW)
Impingement/Condenser Tray Water: 550 GPM @ 10 psig * (SPW)
Venturi Stage Water, max vol.: 64 GPM @ 240 – 280 ** psig
Venturi Throat Spray: 22-50 @ 40-180 ** psig
Mist Eliminator Irrigator water: 12 GPM @ 50 psig* (potable)

Scrubber Outlet Conditions:

Volume: 11,417 ACFM
Temperature: 91° F
Venturi Stage Pressure Drop: ~ 24.0 In WC
Total Pressure Drop Across Scrubber: ~ 40.0 In WC

* Pressure required at lance elevation ** 40 PSI required at booster pump skid elevation

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PROPOSED EQUIPMENT DESCRIPTION

EnviroCare will furnish the following equipment for one VenturiPak™ Wet Scrubber system, including all engineering drawings necessary to install and implement the EnviroCare equipment by the selected **Contractor**.

ITEM 1. VENTURIPAK™ SCRUBBER

The new VenturiPak™ Scrubber vessel will be installed by the **Contractor** and supplied by EnviroCare as follows:

1. **90" ID Sub-cooling Stage:** Three (3) levels of proprietary dual orifice impingement trays installed on internal diaphragms. Additional equipment supplied by EnviroCare for this stage includes:
 - a. Tray irrigator spray lance assembly. Spray lance assemblies include pressure gauges, flex hoses, isolating ball valves, cam lock fittings, and Y-strainer. Existing tray scrubber components to be reused as appropriate.
2. **74" ID MicroMist™ Venturi (MMV) Stage:** MMV tubes will be diaphragm mounted and located above the sub cooler trays in an EnviroCare supplied scrubber module. Included for this stage are:
 - a. Eight (8) 4.5" nominal size, 316L SS MMV tubes (7 installed, 1 spare). There will be nine total Venturi tube locations for future use.
 - b. Three (3) parallel spray lance assemblies with one HydroMist nozzle positioned below the inlet of each MMV tube. Spray lance assemblies come complete with pressure gauges, flex hoses, ball valves, and Y-strainers.
 - c. Each MMV tube will contain an internal SpiralMist throat nozzle and water delivery pipe for turndown during low gas conditions.
 - d. Two (2) throat spray manifolds for supplying water to the internal throat nozzles and comes complete with pressure gauges, flex hoses and hex head plugs where required. Isolation ball valves and Y-strainers are also included.
 - e. Two (2) headers to provide a single field connection to both the Venturi inlet spray lances and the Venturi throat manifolds.
3. **74" ID Separator Stage:** The separator stage will be supplied as part of the EnviroCare supplied scrubber and will consist of the following:
 - a. One (1) separator tray level of Dual Orifice impingement trays
 - b. One level of mesh style mist eliminator pads reused from existing scrubber.
 - c. Mist Eliminator irrigator spray lances will be re-used from the existing tray scrubber.
 - d. Blind flanged nozzle for separate SO₂ scrubbing water capability and caustic injection if needed/required.

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4. **74" SPC Mercury Stage:** The mercury stage will be supplied as part of the EnviroCare supplied scrubber module and will consist of the following:
 - a. One (1) mercury module diaphragm to mount the existing SPC modules on.
 - b. The mercury module wash spray lance assemblies will be re-used.
 - c. A port will be blind flanged for later use with heated air system. Heated air is recommended for all SPC mercury systems for maximum performance. The heated air components will be purchased separately and are not part of this equipment supply as discussed with the TZO.

Materials:

Plate: 3/16" minimum, 316L SS

Pipe & Fittings (flue gas contact): 316L SS

Pipe & Fittings (ambient conditions, process water only): 304L SS or better

EnviroCare supplied scrubber vessel will be a **3/16" T316L SS 7'-6"** diameter (necked down to 74") by ~30'-0" high. The new VenturiPak™ Scrubber vessel will include all necessary spray lance mounting ports, 1/4" pressure taps, 1/2" temperature taps, and manways to provide access to each scrubber stage. The new scrubber section will be sandblasted to commercial sandblasting specification **SSPC-SP6** for a uniform finish.

ITEM 2. BOOSTER PUMP SKID

The EnviroCare supplied booster pump skid will be factory assembled and pre-piped. Booster pumps will be vertical mounted, centrifugal, multistage with **premium efficiency** motors. The booster pump skid will include all the necessary equipment and instrumentation to monitor the scrubber system and to control flow to the MicroMist™ Venturi tube stage. Piping and fittings shall be **304L SS** and sandblasted to commercial specification **SSPC-SP6** for a uniform finish. Structural steel will be **A36 CS** and painted with grey **PPG Pithane** paint. The booster pump skid will include the following:

- a. (1) VFD and (2) Motor Starters Supplied Loose (Install in MCC)
 - I. Powerflex 400 VFD w/ HMI
 - II. Motor Starters: Square D – Size as Required (model 8536SDO1V02S or similar).
- b. (2) 20 HP CRN15-10 **Grundfos** Pumps (one operating, one standby)
- c. (1) 15 HP CRN 15-6 **Grundfos** Pump (for use with VFD)
- d. (2) Mag Flowtubes with integral mounted transmitters
- e. (3) pressure gauges
- f. Isolation ball valves as required
- g. Duplex Basket strainer

*Instrumentation will be consistent with manufacturers supplied with the existing tray scrubber by EnviroCare.

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ITEM 3. FIELD EQUIPMENT (SUPPLIED LOOSE)

The following field equipment will be supplied by EnviroCare and is required to correctly monitor and operate the VenturiPak™ Scrubber system. Additional instrumentation is necessary and being re-used from the existing tray scrubber.

- a. (1) Temperature transmitters w/ Type K Thermocouple
 - I. Subcooling Stage Outlet

- b. (1) Differential pressure transmitters
 - I. Venturi Stage

*Instrumentation will be consistent with manufacturers supplied with the existing tray scrubber by EnviroCare. Client should consider adding a separate pH analyzer on the Venturi stage drain. This will optimize caustic usage.

ITEM 4. FIELD SERVICES

EnviroCare will provide field services for the following:

- a. Start-up
- b. Stack Testing & Training
- c. Contingency

We anticipate one ECI engineer making three trips to site to complete the above. Each trip will include 3 days on site. We will invoice per the actual rates identified on the next page. For budget purposes, we've separated out the field service anticipated costs.

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EQUIPMENT AND SERVICES TO BE SUPPLIED BY OTHERS

- Installation of new VenturiPak™ scrubber system module
- Installation of new Booster Pump Skid
- Installation of VFD and Starters in the MCC
- Supply and Installation of Local Start/Stop Enclosure
- Removal and replacement of equipment and instruments to be reused
- Plant water supply to all spray lance locations and sub-cooling trays
- Plant water supply to inlet of scrubber booster pump skid. Supply pressure to be constant over range of operation
- Design, supply and installation of interconnecting piping and supports including drains
- Field piping insulation and heat tracing as required
- Supply and installation of field instruments except as described herein
- Access ladders and platforms
- Implementation of EnviroCare functional specification
- All items required, but not specifically mentioned in this proposal

FIELD SERVICE DAILY RATES (For Item 4 and additional trips as needed)

Travel time and work performed: ...:\$1,200.00 plus expenses

Saturday and Sunday work::\$1,600.00 plus expenses

Holiday work:.....:\$2,000.00 plus expenses

NOTES:

- Terms of payment on all field service invoices are net cash.
- One day (8 hours) minimum charge.
- Partial work days will be invoiced at full day rates.
- All rates are portal to portal.
- All travel expenses such as airfare, car rental, hotels, meals, etc. will be invoiced at full cost plus 10%.
- The above rates do not include any taxes, licenses, or other fees. Rates are on a Net basis.

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DELIVERY SCHEDULE

SUBMITTAL OF DRAWINGS FOR APPROVAL:	4 WEEKS AFTER RECEIPT OF ORDER FOR DRAWINGS
SHIPMENT:	16-20 WEEKS FOR EQUIPMENT AFTER RECEIPT OF APPROVED DRAWINGS.

EQUIPMENT PRICE

The price for the proposed equipment shown below is for equipment manufactured and/or services stated, but exclusive of options, local, state or federal taxes.

The price is valid for ninety (90) days from date of this proposal and is firm through shipment provided fabrication and shipment can be made within the delivery schedule listed herein.

EQUIPMENT PRICE, FOB Jobsite:
VenturiPak Vessel (with 90" ID subcooling stage)
Items 1, 2, and 3:..... **US\$ 358,950.00**

Field Services (Budget)
Item 4:..... **US\$ 22,000.00**

PAYMENT SCHEDULE

- 20% Net 30 days after submittal of drawings for approval
- 20% Net 30 days after submittal of certified drawings
- 50% Net 30 days after notification of readiness of equipment or partial shipment.
- 10% Net 30 days after commissioning and successful startup, not to exceed 180 days from delivery.

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Standard Terms and Conditions of Sale

The following Terms and Conditions form part of each proposal submitted by EnviroCare International, Inc. (hereinafter called "Supplier") for the sale of equipment, construction, start-up, maintenance services and materials to a Client/Customer, (hereinafter called "Purchaser") and any contract by and between the parties, includes as a part thereof,

1. Duration of Proposal – The proposal is valid for 90 days from the issue date (or as stated in the proposal.)
2. Terms of Payment - Payment terms shall be net 30 days from date of shipment or declaration of readiness (or as stated in the proposal).
3. Liability – Supplier's liability shall be limited to the amount of the contract price. Supplier shall indemnify and hold harmless Purchaser against all losses, liabilities, claims or demands arising out of bodily injury or damage to property arising out of the performance of this contract, but only to the extent that the aforementioned is attributable to the negligence of the Supplier. Supplier shall only be liable for those activities under our direct control.
4. Consequential Damages -In no event shall the Supplier be liable for Incidental or Consequential Damages, however caused.
5. Differing Conditions– In the event activities or operations at the site by parties other than the Supplier interfere with the execution of the work; an equitable adjustment shall be made to the Contract Price and schedule.
6. Force Majeure - In the event of delays or damages due to conditions beyond the Supplier's reasonable control, including, but not limited to, Acts of God, Acts of the Purchaser or Purchaser's customer, etc., including fire, strikes, floods, war and civil uprising and delays in transportation and Supplier's inability to obtain necessary labor, materials or manufacturing facilities. In the event of such delays, the Contract dates shall be extended by an equitable period of time and the Supplier shall be entitled to an equitable adjustment in the Contract price.
7. Warranty – Supplier warrants to Purchaser that the work provided under this Contract is free from defects in material, workmanship and design, under normal use and service for a period of eighteen (18) months after shipment or twelve (12) months after initial operation or use, whichever occurs first. Supplier's warranty obligations are, at Supplier's sole option, to repair or replace any work which is shown to Supplier's satisfaction to have been defective as to material, workmanship or design, provided that: written notice of such defect is given to Supplier within thirty calendar days of discovery, and the equipment/work has been used and operated in accordance with the Supplier's operating and maintenance instructions. In any event, Supplier's warranty obligation is limited to 25 (twenty-five) percent of the total contract value.
8. Cancellation – Purchaser's cancellation of the contract is subject to a cancellation charge of 10% of the total price of the contract, plus Supplier's actual expenses and expenses to which the Supplier has committed for fulfillment of the contract before notice of cancellation is received.
9. Contract Interpretation – If any of the provisions of these Standard Conditions of Sale (including statements made in the proposal) conflict with any provisions in the Purchaser's documents, the former shall govern unless Supplier expressly agrees to the contrary in writing. Any contract resulting from this proposal shall be construed, and the legal regulations of Supplier and Purchaser shall be determined, in accordance with the laws of the State of California, USA.
10. Acceptance – This Proposal is subject to acceptance by Purchaser within ninety (90) days and shall constitute a binding agreement with the Supplier only when thereafter approved by Supplier and signed by an authorized officer.
11. Delivery – Title to all materials shall pass to the Purchaser at point of Manufacture per EXW or FCA (per ICC Incoterms) and risk of loss will thereafter be borne by Purchaser.
12. Escalation – Pricing may be adjusted to reflect changes in material cost per the United States Bureau of Labor Statistics, Producer Price Indexes.
13. Service and Maintenance Manuals – Price includes one (1) paper and one (1) electronic Service and Maintenance Manuals.

End of Proposal