

Date: October 16, 2019**PO:** 67128**Subject:** TZ Osborne WRF FBI #1 Scrubber Upgrade FA#2 Cover Letter with
EnviroCare Scrubber design clarifications and comments

Thank you for the valued purchase order. This document is to serve as EnviroCare's submittal cover letter for EnviroCare FA#2 Submittal "For Customer Approval" dated October 15, 2019. It contains comments and design considerations regarding the submittal. It is organized according to relevant scrubber stages. Reference EnviroCare submittal drawings C101 and C102-1172 while reviewing this document.

General Comments

1. The scrubber system is designed to accommodate the off gasses produced by FBI#1 for the gas flow range corresponding to an incinerator feed rate from 3000-6000 dry lbs/hr.
2. The scrubber system will accommodate plant effluent water temperatures of 100 °F. This will result in an increased outlet temperature, increased scrubber exhaust gas moisture content, increased tray water flow and increased differential pressure across the scrubber as compared to using 75°F effluent water. Reference PID documents.
3. The gas stream velocity at the inlet of the scrubber is approximately 7450 feet/minute. This is approximately 2.5 times the industry standard of 3000 feet/minute. The increased velocity will increase fan pressure requirements and potentially lead to unforeseen problems. Similarly, the outlet duct velocity is approximately 35% above recommended duct velocity.

Scrubber Bottom Cone Stage

Per Hazen & Sawyer FA#1 Submittal Review Comments dated September 17, 2019 EnviroCare has included provisions and an equipment request for change order for the following Equipment:

- a. One (1) continuous level sensor for level for sump level control.
- b. One (1) high level switch.
- c. One (1) pH sensor assembly to be installed in the 8" scrubber main drain piping.

Scrubber Dual Orifice Impingement Tray Stage

Per Hazen & Sawyer FA#1 Submittal Review Comments dated September 17, 2019 EnviroCare has included provisions and an equipment request for change order for the following Equipment:

- a. One (1) tray plant effluent water flow meter/transmitter.
- b. One (1) tray plant effluent electrically actuated flow control valve.

Scrubber Venturi Stage

Per Hazen & Sawyer FA#1 Submittal Review Comments dated September 17, 2019
EnviroCare has included provisions and an equipment request for change order for the following Equipment:

- a. One (1) pH sensor assembly to be installed in the 4" Venturi stage drain piping.

Separator Tray Stage

Per Hazen & Sawyer FA#1 Submittal Review Comments dated September 17, 2019
EnviroCare has included provisions and an equipment request for change order for the following Equipment:

- a. One (1) differential pressure indicating transmitter.

Mist Eliminator Stage

Per Hazen & Sawyer FA#1 Submittal Review Comments dated September 17, 2019
EnviroCare has included provisions and an equipment request for change order for the following Equipment:

- a. Two (2) mesh mist eliminator irrigator spray lances with flex hose assemblies and appurtanances (Tag# C118-1172) and one (1) associated header (Tag# C148-1172).
- b. One (1) six (6) section mesh mist eliminator array.

SPC Stage

- a. Two (2) SPC backwash spray lances with flex hose assemblies and appurtanances (Tag# C119-1172) and one (1) associated header (Tag# C149-1172).
- b. One (1) Potable water flow meter/transmitter.
- c. One (1) Potable water wash water block valve.
- d. One (1) SPC backwash pressure reducing valve.
- e. Twelve (12) SPC modules.

Scrubber Outlet Stage

- a. One (1) scrubber outlet temperature transmitter.

Prepared by:

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EnviroCare International, Inc.

EnviroCare VenturiPak Scrubber, TZ Osborne, Greensboro, NC
EnviroCare Contract Change Order Request Bill of Materials For Equipment not in Original Bid
Per Hazen & Sawyer, Aaron Babson PE, Submittal Review Comments Dated September 17, 2019

Revision 0: October 16, 2019

ITEM	MFR P/N	DESCRIPTION	COST	COMMENTS
1	Endress & Hauser FMD78-ABC7F41AFAAU4	Cost to supply one (1) Scrubber Sump Continuous Level Sensor with Transmitter Isolation Valve	\$ 5,975.00	Continuous level sensor Per H&S comments 9.17.19
2	Endress & Hauser CM42-NAA101EAE00	Cost to supply two (2) Scrubber Sump Drain & Venturi Drain pH Probes with Cables, Retractable Assemblies, Isolation Valves and Transmitters	\$ 14,740.00	For pH monitoring of Scrubber Effluent Steam Per H&S comments 9.17.19
3	Rosemount 8711SSA040M1Q4/8732EMT1A1M4	Cost to supply one (1) Condenser Tray Supply Water Magnetic Flow Meter Transmitter	\$4,200.00	To Monitor and Regulate Scrubber Tray Water Per H&S comments 9.17.19
4	Rosemount 8711SSA015M1Q4/8732EMT1A1M4	Cost to supply one (1) Potable Supply Water Magnetic Flow Meter Transmitter	\$3,550.00	To Monitor and Regulate Scrubber Potable Water Per H&S comments 9.17.19
5	Endress & Hauser PMD75-RBC7FE1DAUA+N3	Cost to supply one (1) Separator Stage Differential Pressure Transmitter with 3-Way Manifold Valve (Owner to supply scrubber overall differential pressure transmitter)	\$ 3,225.00	Required to Replace Instrument not Scavenged from Tray Scrubber Per H&S comments 9.17.19
6	Endress & Hauser TMT82-AA42BD1TKAAA1	Cost to supply one (1) Scrubber Outlet Thermocouple with Temperature Transmitter	\$ 690.00	Per H&S comments 9.17.19
7	SOR 1510C-G5A-C-W9-ES	Cost to supply one (1) Scrubber Sump High Level Switch	\$ 500.00	Optional Scrubber Sump Level Switch Per H&S comments 9.17.19
8	Valtek/Rotork MaxFlo4 4"-150#-IQT-125	Cost to supply one (1) Condenser Tray Supply Water Flow Control Valve with Electric Actuator	\$ 15,700.00	Required to Regulate Scrubber Tray Water Per H&S comments 9.17.19
9	Jamesbury/Rotork 4D-3600-XTB2/IQT-125	Cost to supply one (1) SPC Module Backwash Water Block Valve with Electric Actuator	\$ 10,500.00	Required to Replace Valve not Scavenged from Tray Scrubber Per H&S comments 9.17.19
10	Cashco 2B6-1B27-11000000C	Cost to supply one (1) SPC Module Backwash Pressure Reducing Valve	\$ 600.00	Required to Replace Valve not Scavenged from Tray Scrubber Per H&S comments 9.17.19
11	1172-118-1	Cost to supply two (2) Mesh Mist Eliminator Irrigator Spray Lances	\$ 3,920.00	Required to Replace Spray Lances not Scavenged from Tray Scrubber Per H&S comments 9.17.19
12	1172-148-1	Cost to supply one (1) Mesh Mist Eliminator Irrigator Spray Lance Header	\$ 640.00	Required to Replace Header not Scavenged from Tray Scrubber Per H&S comments 9.17.19
13	1172-119-1	Cost to supply two (2) SPC Module Backwash Spray Lances	\$ 4,615.00	Required to Replace Spray Lances not Scavenged from Tray Scrubber Per H&S comments 9.17.19
14	1172-149-1	Cost to supply one (1) SPC Module Backwash Spray Lance Header	\$ 640.00	Required to Replace Header not Scavenged from Tray Scrubber Per H&S comments 9.17.19
15	1172-560-1	Cost to supply and install one (1) 90"Ø Mesh Mist Eliminator	\$ 6,000.00	Required to Replace ME Array not Scavenged from Tray Scrubber Per H&S comments 9.17.19
16	1172-570-1	Cost to supply twelve (12) SPC Modules, Note- Orders fewer than twelve (12) pieces will result in price increase	\$ 141,120.00	Required to Replace Modules not Scavenged from Tray Scrubber Per H&S comments 9.17.19
Total Change Order (USD):			\$ 216,615.00	
* The above proposal is valid for thirty (30) days. All prices are quoted FOB Jobsite.				
**Procurement & fabrication for this project will not commence before a formal change order is executed.				

