

## SPECIAL SPECIFICATION

### SECTION 15482S

#### PH ADJUST CHEMICAL METERING SYSTEM

#### PART 1 - GENERAL

##### 1.01 SECTION INCLUDES

- A. Chemical distribution system: pH adjust chemical metering systems including boxes with metering pumps, chemical distribution piping including insulation and heat tracing, hookup of utility piping and control cable to equipment in chemical dispense rooms and **scrubber** control panels.

##### 1.02 REFERENCES/PROJECT REQUIREMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Requirements of the following Project Specification Sections apply to this section:
1. Flow rate:

Chemical	
98% H2SO4 for Scrubber	2.5 GPH max at 100 psi with 13 feet lift
50% NaOH for Scrubber	2.5 GPH max at 100 psi with 13 feet lift

- B. Requirements of the following Project Specification Sections and Code apply to this section:
1. Section 13085-S – Seismic Protection
  2. Section 15050-S – General Material & Work Requirement – Mechanical
  3. Section 15070-S - Vibration Isolation.
  4. Section 15072-S – Operation and Maintenance Manuals (MEP)
  5. Section 15090-S - Polymer Process Piping Systems.
  6. Section 15170-S - Motors.
  7. Section 15250-S - Insulation Mechanical Systems.
  8. Section 16001-S – Electrical Work.
  9. Section 16920-S - Motor Control Center.

C. Additional project requirements:

1. Verify **with SNL for the drum type**, connection on chemical drums supplied by SNL before manufacturing of metering pump systems.
2. Provide reference to demonstrate the trade experience for installation and testing of chemical piping and dispense unit.
3. Provide reference to demonstrate the trade experience for manufacturing chemical dispense unit.

1.03 DEFINITIONS

A. Not used

1.04 DESIGN REQUIREMENT

- A. **Provide** process chemical supply pipelines **with 1/2" minimum size** for scrubbers .
- B. Double contain polymeric distribution system chemical pipelines (Acids, Caustics) via transparent, liquid tight coaxial **PFA** tubing, to acid and ammonia **scrubber** .
- C. **Provide foot valve for each chemical intake line .**
- D. **Provide a multifunction valve for each chemical line to avoid siphon effect.**
- E. **Coordinate with life safety for leak detection**

1.05 SUBMITTALS

- A. Submit the following in accordance with Conditions of Contract and Shop Drawings:
  1. Product Data for metering pump boxes
  2. Coordination shop drawings
- B. Submit designs to Owner for review.
- C. Explain technologies employed to dispense and distribute chemicals.
- D. The supplier shall provide at the time of purchase order (PO) two (2) complete sets of the following documentation for the chemical dispense and controls system.
  1. Complete operational procedures.
  2. List of all materials that will contact the process chemical, including the vent and purge lines.
  3. Mechanical, electrical, and pneumatic system schematics.

4. Mechanical and electrical drawings.
5. Complete parts list.
6. Recommended spare parts list.
  
7. All test data reports on performance requirements.

**1.06 QUALITY ASSURANCE**

- A. Base Bid:
1. Provide full time quality control expert on site to witness procedures and ensure they are being properly followed. Expert to possess demonstrated experience in high purity systems QA/QC, both installation and certification.

**1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Not Used

**1.08 PROJECT/SITE CONDITIONS OR SPECIAL CONDITION**

- A. Warranty: special agreement of warranty starts after the certification of chemical dispense system.

**1.09-1.13**

- A. Not Used

**1.14 COMMISSIONING**

- A. The startup includes:
1. Pressure test according Leak Integrity Performance - Polymer Systems.

Criteria	Design Validation	Factory Certification	On-Site Performance
Static Pressure Test (w/ Air Nitrogen)	+/- 1% in 2 hours temp compensated	+/- 1% in 2 hours temp compensated	+/- 1% in 2 hours temp compensated
Across Seat Leak Rate (w/ Air Nitrogen)	+/- 1% in 2 hours temp compensated	+/- 1% in 2 hours temp compensated	N/A
Hydrostatic Pressure Test (w/ NPW)	+/- 1% in 24 hours temp compensated	+/- 1% in 24 hours temp compensated	+/- 1% in 24 hours temp compensated

Across Seat Leak Rate (w/ NPW)	+/- 1% in 24 hours temp compensated	+/- 1% in 24 hours temp compensated	N/A
Hydrodynamic Pressure Test (w/ UPW)	No detectable leak in 24 hour period	No detectable leak in 2 hour period	No detectable leak in 60 minute period

Notes on Leak Integrity Performance Requirements:

- a) Static Pressure Test for Polymer systems shall be conducted at 10 psig.
- b) Hydrostatic Pressure Tests with NPW shall be conducted at 1.5 x Working Design Pressure (**50 psig**).

- 2. Check out of safety, control and electrical system
- 3. Testing of metering pump by using non potable water
- 4. Drain non potable water
- 5. Purging and dry out of chemical piping
- 6. Introducing chemical to the piping

## 1.15 MAINTENANCE

- A. Not Used

## PART 2 – PRODUCTS

### 2.01-2.02

- A. Metering Pump:
  - 1. Prominent

### 2.03 MATERIALS

- A. Wetted Corrosive Liquid Streams - Tubing, Components, and Fittings in metering pump box:
  - 1. Tubing, cast and extruded components: Perfluororoalkoxy (PFA) - High Purity Grade Resin; DuPont 440/450 or approved alternative.
  - 2. Machined components: Polytetrafluorethylene (PTFE) - High Purity Grade Resin; DuPont or equivalent.

3. Diaphragms: PTFE - High Purity Grade Resin; DuPont 7A, 7B, or approved alternative.
4. Gaskets: Chemically compatible/inert with process liquid.
5. Valves: PFA or PTFE (DuPont 7C), packless, inverted bellows type, packless, diaphragm type.
6. Minimum automatic valve cycle life:  
 Automatic valves:  $\geq$  50,000 cycles (Pneumatic only)  
 Manual valves:  $\geq$  25,000 cycles
7. Polymer Fittings:

mechanical fittings shall be **Entegris** Flaretek or equivalent,. "Flaretek" PFA for hot chemical applications. Utilize CPFA nuts for all PFA tubing connections throughout the distribution piping network

- B. Wetted Corrosive Liquid Streams - Tubing, Components, and Fittings to exhaust :
  1. Tubing, cast and extruded components: Perfluoroalkoxy (PFA) - High Purity Grade Resin; DuPont 440/450 or approved alternative.
- C. Chemical Polymer Distribution Tubing External to Cabinetry: Watertight, double contained using clear plastic containment materials, **double contained PFA.**
- E. Polymer Check Valves shall be springless disk type (no O-ring).

## 2.04 MANUFACTURED UNITS

### A. **Metering Pump Box: Microbar**

## 2.05 EQUIPMENT

### A. GENERAL

#### 1. Valves:

a. Manual valve handles: Directional, or utilize visual indicators to indicate open and closed positions.

b. Color code manual valve handles as per Owner's instruction.

### B. PH ADJUST CHEMICAL METERING BOX

#### 1. Electrical

a. All electrical enclosures shall be heavy-duty water tight, and compatible with the environment (e.g. corrosion resistant for acid system applications). All

electrical wiring and components will be designed to resist a direct spray of water.

- b. **Cover or door** shall be provided for all cabinets/compartments.
- c. All cabinetry and components shall be grounded.

## 2. Labeling

- a. A label clearly displaying the chemical formula, common name, and concentration of the chemical shall be attached to the enclosure exterior surface. All utility input and output connections shall be clearly labeled.
- b. All utilities, equipment, and piping installed by the supplier shall be labeled in accordance with local regulation. Minimum acceptance per ANSI A13.1 - Scheme for Identification of Piping Systems.
- c. All electrical/electronic circuits and sub-panels shall be labeled.
- d. All valves shall be tagged with destination and function information.

## 3. Construction

- a. **Metering pump box shall be constructed by using 1/2" inch polypropylene plate for NaOH and 1/2" polyvinylidene plate for H2SO4.**
- b. **The bottom of metering pump box shall be sloped to provide a low point for leak detection.**
- c. **The metering pump boxes shall have a gasketed leak tight panel for observation and maintenance of pumps inside boxes.**
- d. **The metering pump boxes shall have a minimum 4" depth of containment to collect chemical spill.**

## C. CHEMICAL DISTRIBUTION BOX

- 1. Provide chemical distribution box to meet project requirements.
- 2. **Stainless steel boxes with teflon coating** to have a **gasketed** leak tight window for observation of fitting inside box. Pressure test (20 in WC above box) box to ensure leak integrity.

## D. CHEMICAL DISTRIBUTION

- 1. The chemical distribution system shall utilize chemical metering pumps , chemical distribution boxes, and pipeline interconnection between the dispense systems and boxes, and to the point of delivery (termination point).
- 2. Submit distribution pipeline component and materials information, including manufacturers part and model numbers.
  - a. Include vendor information, data sheets, test data, and other information where applicable.
  - b. Provide material delivery lead times.
  - c. List primary and secondary supplier alternatives
  - d. **Include isolation anti-siphone valves at POINT-OF-USE Valve Box**

E. Controls and Monitoring

1. Chemical dispense system controls shall be microprocessor .
2. Each **metering pump** system shall have independent control and monitoring systems.
3. The system shall be capable of archiving its current sequence during a power interruption.
4. Each dispense unit shall include a screen display for viewing current status, operating parameters and set points, alarms, etc.
5. All signals to or within the system shall be fail safe. Fail-safe is defined as if power or pneumatic supply is lost, or if the microprocessor/PLC malfunctions. In such a state, all valves fail closed, the process chemical flow stops, and the system sounds an alarm. Manual system reset is required.
6. The controls and monitoring system shall control basic system monitoring/shutdown functions, and any automatic sequencing. Control routines shall be provided which are user software configurable within safety parameters.
7. The controls and monitoring systems shall provide for local and remote shutdown capability. The following conditions shall initiate a system shutdown:
  - a) System failures as defined through safety analysis.
  - b) Manual local .
8. The controls and monitoring system shall provide **relays to report pump status and empty drum to the scrubber control panels.**
9. All system electronics/electrical shall be uninterrupted by electrical micro-interruptions within the following ranges, i.e. the system shall remain on-line:
  - a. Voltage - +10 / -15 Volts
  - b. Frequency - + / - 0.5 Hz.
  - c. Rate of Change - 1.0 Hz/sec
10. All system electronics shall include the following characteristics:
  - a. Functionally unaffected by Radio Frequency Interference (RFI) and Electromagnetic Interference (EMI) in frequency ranges up to 350 MHz. at a distance of 2 feet.
  - b. Protected against electrostatic discharge.
  - c. Non-volatile memory.
  - d. 16 bit analog I/O resolution.
  - e. Capable of operation over a temperature range of 0 - 50 deg C.
  - f. Capable of operation over a relative humidity range of 0-95% (non-condensing)

2.06-2.11

A. Not Used

PART 3 – EXECUTION

3.01-3.04

A. Not Used

**3.05** INSTALLATION

A. Vent lines shall be stop at damp of exhaust.

**B.** Label enclosures and manifolds with process chemical, source supply, and destination information. Labels shall be “Brady” or equal corrosion resistance.

**C.** Provide **continuous** piping support and seismic support for **PFA** piping

3.06-3.15

A. Not Used

END OF SECTION