

**SECTION 44 4310**

**PACKAGED FLOTATION TREATMENT SYSTEM**

**PART 1 - GENERAL**

**1.01 SUMMARY**

- A. Description of Work: District shall furnish the pre-engineered packaged flotation treatment system, including wastewater flow meter, conditioning tank, chemical metering systems, polymer dilution system, micro-bubble generators, flotation tank, dewatering conveyor, solids transfer pump, control panels, and all appurtenances necessary to provide a complete, operating system. District shall also furnish additional products and services to complete the factory integration of the flotation treatment system with the compressible media filtration units and chlorine induction mixer. All submittals and shop drawings required for the manufacture and factory integration shall be furnished by the Manufacturer directly to the Engineer.
- B. Description of Work: Contractor shall install as furnished by the District the pre-engineered packaged flotation treatment system as described preceding. Contractor shall furnish additional products and services to complete the field installation as indicated on the drawings and described herein. All submittals and shop drawings required for the field installation integration shall be furnished by the Contractor to the Engineer.
- C. Related Documents: The General and Supplementary Conditions and applicable sections of Division 1 form a part of this section.

**1.02 RELATED SECTIONS:**

- A. 40 9610.10 Process Control Narrative
- B. 05 5000 Metal Fabrications (Catwalks) are excluded from Section 44 4310.

**1.03 REFERE NCES**

- A. The Purple Book - California Health Laws Related to Recycled Water - Health and Safety Code, Water Code, and Titles 22 and 17 of the California Code of Regulations

**1.04 PERFORMANCE REQUIREMENTS**

- A. Design Flow Capacity: 250 gallons per minute (350 gallons per minute maximum)
- B. Influent pH: 7.5 - 9.0
- C. Influent total suspended solids concentration: < 100 mg/L
- D. Effluent total suspended solids concentration at above influent conditions: < 10 mg/L.

**1.05 SUBMITT ALS**

- A. Shop Drawings: Submit Shop Drawings for complete system. Shop Drawings shall include the information listed below. Submit all items in one package.
  - 1. Model designations, descriptions, and specifications for all equipment supplied with the system.
  - 2. General assembly drawing showing utility requirements and points of connection for influent, effluent, and utilities.
- B. All submittals and shop drawings required for the manufacture and factory integration shall be furnished by the Manufacturer directly to the Engineer.
- C. All submittals and shop drawings required for the field installation integration shall be furnished by the Contractor to the Engineer.

- D. Detailed Software and Hardware Design documents for control system.
- E. Control panel elementary and layout drawings.
- F. Process flow sheet.
- G. Manuals: Furnish manufacturer's installation, lubrication, operation and maintenance manuals, bulletins, drawings, and parts lists for the complete system and for individual equipment items. Manual will include a text description of system operation, troubleshooting, and normal maintenance.

#### **1.06 QUALITY ASSURANCE**

- A. Manufacturer: Flotation system furnished under this Section shall be supplied by a single manufacturer who has been regularly engaged in the design and manufacture of the equipment. The manufacturer shall have supplied complete systems that have been in successful operation at similar installations for at least 5 years.

#### **1.07 INSTRUCTION OF OWNER'S PERSONNEL**

- A. Obtain the services of a qualified representative of the manufacturer to start up the system and instruct the Owner's operation and maintenance personnel in the proper procedures for operation, troubleshooting, and preventive / corrective maintenance of the system. Provide five (5) days of startup and instruction services.

### **PART 2 - PRODUCTS**

#### **2.01 GENERAL**

- A. Provide a complete wastewater influent conditioning, solids separation, and solids dewatering system as specified herein. Wastewater influent pumped into a partitioned, covered coagulation / flocculation tank shall be mixed with two turbine agitators where a coagulant chemical and flocculating polymer are added in series. Solids separation shall be by flotation by micro-bubbles of air having a surfactant film and emulsified in water generated by one of two (2) parallel microbubble generators. Flotation separation shall occur in a rectangular flotation tank with agitated influent flocculation section and chain-and-flight float skimmer. Solids dewatering shall be by gravity drainage on a moving perforated belt. Dewatered solids shall either be deposited into a roll-off bin or be pumped to drying beds by a peristaltic pump.
- B. System shall be Suspended Air™ Flotation (SAF™) Model H50\_250 as furnished by Heron Innovators, Inc. No like, equivalent, or "or equal" item or no substitution is permitted.

#### **2.02 WASTEWATER TRANSFER PUMP VFD'S AND FLOW METER**

- A. Pump drives: Provide two variable frequency drives for each of Pumps P10A and P10B (see Section 40 2310, para. 2.02 B), Lenze AC Tech SMVector or equal, sized and configured for the pump. Drives shall be capable of speed control proportional to a 4 - 20 mA input signal. Controller is by others.
- B. Flow Meter: Provide one 8" wafer style magnetic flow meter, Sparling Tigermag FM626 or equal. Meter shall have local indicator and both 4 - 20 mA and scaled pulse outputs.

#### **2.03 CONDITIONING TANK AND MIXERS**

- A. Tank: Provide one vertical cylindrical 3,500 gallon capacity tank, nominal 8 ft. diameter and 13 ft. high, with cover and underflow baffle plate providing a clear slot opening of approximately 1 ft. Baffle shall divide the tank volume approximately 2/3 and 1/3. Tank and cover shall be fabricated of Type 304 stainless steel.
- B. Mixers: Provide one turbine agitator per compartment, Mixtec or equal, electric gearmotor driven, with speeds, propeller type, size, and number per shaft designed by the mixer supplier

to promote coagulation in the larger tank section and flocculation in the smaller tank section. Mixers shall be mounted on stainless steel structural supports attached to the tank, of sufficient stiffness to prevent excessive movement of the mixer during operation.

- C. Access walkway: Provide walkway with removable grating above the mixers, aluminum frame, grating, and guardrail, connecting to the flotation tank catwalk by a stairway. Walkway shall be shop fabricated in sections for field assembly.
- D. Interconnecting piping: Provide pre-fitted flanged Sch. 80 PVC piping from the conditioning tank outlet box to the flotation tank wastewater inlet connection, sized to match wastewater inlet connection.

#### **2.04 MICROBUBBLE GENERATOR ASSEMBLIES**

- A. Provide two (2) Heron Innovators Model F-50 SAF™ Generators, each rated to continuously deliver a minimum of 13.2 gpm of micro-bubble emulsion with a surfactant bubble film, containing approximately 30 - 40% air by volume, at a discharge pressure of at least 5 psig. Each generator assembly shall include a Sealed Generator Module, recirculation pump, and control panel mounted, pre-piped, and pre-wired on an ASTM A36 carbon steel frame. Frame shall be coated with a primer and machinery enamel. Recirculation pump shall be 3 Hp, 480v, 3 ph, Gorman-Rupp GHS series gear pump with gear reducer and Lenze AC Tech SMVector or equal VFD. Pump and gear reducer are bolted to the structural steel frame. No vibration isolators are provided. Assembly shall include automatic water level control, a frothing agent metering pump (see Para. 2.06 A) powered from the control panel, and a solenoid valve and flow meter on the froth discharge line. Flow meter shall control frothing agent metering pump rate proportional to froth flow rate via scaled pulse output. Water requirement shall be 7 gpm of potable or reclaimed tertiary treated (filtered) water at 40 psig. Discharge flow rate of micro-bubble emulsion shall be manually adjustable down to 10% of maximum rated flow.
- B. The Microbubble generator tank, base, and instrument plates are fabricated from Type 304 Stainless Steel. All wetted parts are seal welds and leak tested prior to shipment.
- C. Instrumentation, Piping, and Hoses are per Heron Innovators Inc. Pipe, fittings and spooling shall be schedule minimum schedule 20 seamless 304L SST pipe and 16 ga. 304L SST tubing. Flanges shall be 150 lb. ANSI rated, raised face or conforming ANSI plate flanges.
- D. Provide a pre-wired control panel mounted as part of each generator assembly, with wiring installed to the generator components. Control panel enclosure shall be fiberglass hinged NEMA 4X.

#### **2.05 FLOTATION CELL**

- A. Provide one (1) Heron Innovators Model CF250 Cross Flow Flotation Cell rated to treat a nominal 250 gpm, maximum 350 gpm, of flocculated wastewater. Total effective flotation surface area per cell shall be 35 sq. ft. minimum. Connection points shall be provided for wastewater inlet, treated water outlet, polymer, micro-bubble emulsion, and tank drain.
- B. The flotation cell shall be rectangular, with a full width chain and flight skimmer and an inclined dewatering beach at the float collection end, and an integral baffle and adjustable overflow weir at the discharge. The inlet chamber shall include a paddle flocculator powered by a gearmotor with VFD. The chain and flight skimmer blades shall be fabricated of light gauge stainless steel sheet metal with elastomer wiper blade, the chain shall be either polymeric pintle type or nickel plated mild steel, and the skimmer shall be driven by a gearmotor with VFD.
- C. The tank shell, along with the welded internals, will be fabricated from 304 stainless steel sheet or plate. All sheet or plate will be minimum 10 gauge unless otherwise noted. All external weld joints will be seal welds and leak tested prior to shipment to insure liquid tight tankage. Loose internal fastened tank parts will be type 304 stainless steel sheet.

- D. All structural members will be ASTM A36 Carbon Steel and/or 304 stainless steel. All welded pipe members will be minimum schedule 20 seamless stainless steel pipe and/or fittings, and all flanges will be 150 lb. ANSI, slip on, raised face conforming to ASTM A106 & A105, or ANSI plate flanges. Interconnecting piping, fittings, and flanges will be minimum 10 gauge stainless steel.
- E. Provide a catwalk with ladder and guardrails for access to the top of the flotation tank. Provide access to the skimmer gearmotor and effluent weir from the catwalk. Catwalk construction to be aluminum frame, grating, and guardrail, shop fabricated in sections for field assembly.

## **2.06 SOLIDS DEWATERING CONVEYOR AND SOLIDS TRANSFER PUMP**

- A. Provide one (1) plastic chain conveyor belt, Heron Innovators Model DWC2410, tank nominal 2'-10" wide x 14' long, belt nominal 2 ft. wide x 10 ft. long, driven by a gearmotor with VFD, mounted so as to receive the solids from the flotation cell and deposit dewatered solids into a hopper. Chain belt shall be polypropylene, nominal 40 mil slot opening, Intralox or equal. Belt shall be supported on a stainless steel frame allowing for adjustment of the drive and idler shafts and providing continuous support rails for either side of the belt. The assembly shall include a water spray bar mounted beneath the belt.
- B. P12A: Provide one (1) peristaltic pump, 1-1/2" nominal hose diameter, electric gearmotor driven, Vector 2006 by Wanner Engineering, or equal.

## **2.07 CHEMICAL METERING SYSTEMS**

- A. Provide two (2) Coagulant metering pumps, one (1) polymer metering pump, and two (2) frothing agent metering pumps. Pumps shall be ProMinent Gamma/I or equal, manual stroke length adjustment, and stroke frequency automatically adjusted via scaled pulse input, 110v 1 ph. power, sized to provide the correct amount of chemical for the process requirement. The polymer metering pump shall be provided with a high-viscosity pump head.
- B. Provide a polymer dilution system, Polymixer by Hoffland Environmental, or equal, including water inlet solenoid valve, water rotameter, and mixing chamber with 1-Hp 120v 1 ph. mixer. Provide a distribution manifold with two (2) points of discharge and flow indicators on each discharge.

## **2.08 SYSTEM CONTROL PANEL**

- A. Provide a control panel with starters, Variable Frequency Drives for P10A, P10B, P14A, P14B, ClearFloater gearmotors, dewatering conveyor gearmotor, and sequencing / timing controls for the wastewater transfer pumps, conditioning tank mixers, flotation cell flocculation mixer and skimmer drive, coagulation metering pump, polymer dilution system, SAF™ Generators, and dewatering conveyor. Total power requirement shall be 480v, 3 ph, 25 Hp connected load. Electrical panels shall include a control power transformers for 110v and 24v controls.
- B. NEMA 4X fiberglass hinged enclosure typical, minimum 36W" x 48H" x 12" deep, with backplane; Hoffman, Vinckier, or equal.

## **2.09 ASSOCIATED CONTROLS EQUIPMENT**

- A. The operation of the SAF equipment, and all equipment and systems not controlled by others, will be controlled by an Allen-Bradley SLC 5/05 equipped with an Ethernet data highway.
- B. The SAF PLC will interface via an Ethernet link to the Fuzzy Filter PLC. The SAF PLC will have ladder logic for the overall control of the Graton tertiary system.
- C. The SAF PLC will control the operation and speed of pumps P10A and P10B, and when necessary control valve FCV 10, to maintain a constant level in the surge tank. It will also control the speed of the surge tank pumps P14 A and P14B, receiving a speed signal from the FF PLC control algorithm.

- D. The SAF PLC will control the chlorination process, including but not limited to, starting and stopping the induction mixer, setting a gaseous chlorine flow rate, and monitoring the chlorine residual at the CCB induction mixer outflow and the CCB effluent trough.
- E. The SAF PLC will coordinate the tertiary system operation with the Fuzzy Filter PLC. It will signal when to start and stop filtration and emergency shutdown operations. It will monitor when the FF PLC is starting backwash, and coordinate P10 pumps with P14 pumps.
- F. A Windows XP or later personal computer will be configured with a compatible SCADA (Supervisory Control, Data Acquisition, Alarm) software, such as Intellution iFix, Wonderware, Outlook, or RSView. It will communicate on the Ethernet data highway.
- G. The following additional control hardware, as shown on the mechanical drawings, shall be specified and furnished:

Item Description	P&ID Name
Chem Mix Tank Influent Control Valve	FCV 10
Surge Tank Level Sensor	LE 10
Magnetic Flow Meter, Fuzzy Filter Influent	FE 14
Pressure Transmitter, Fuzzy Filter Influent	PE 14
Magnetic Flow Meter, Fuzzy Filter Effluent	FE 15
Level switch for chlorine induction mixer chamber	LS 16
Thermocouple and Heat Trace Tape, Heat Traced Chemicals Conduit to Chem Mix Tank	TE 10
Thermocouple and Heat Trace Tape, Heat Traced Chemicals Conduit to Flotation Cell	TE 12
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**2.10 SPARE PARTS AS REQUIRED BY TITLE 22**

- A. Title 22 recycled water regulations require a high degree of reliability for tertiary wastewater processing systems. To meet these requirements, furnish these spare parts:
  - 1. Chemical Tank Mixers:
    - a. Shaft Seals, Output Shaft Bearings, NILOSprings, Pinion Shaft Bearings, Seals etc.
    - b. Coagulant Mixer
    - c. Flocculant Mixer
  - 2. Flotation Cell:
    - a. Flocc/skimmer motor and gearbox
    - b. VFD
    - c. Packing
    - d. Paddle mixer with fins, bearings
    - e. Fins
    - f. Bearings
  - 3. Skimmer:
    - a. Chain
    - b. Scraper blade w/neoprene
    - c. Neoprene replacement
    - d. Scraper mounting assembly
    - e. Skimmer bearings "drive shaft"
    - f. Skimmer take up bearing assembly
  - 4. De-watering Belt:
    - a. Belt replacement panel
    - b. Upper take-up bearing
    - c. Lower sleeve bearing
    - d. Upper shaft

- e. Lower drum shaft
- f. Nozzles
- g. Motor and gear box
- 5. Sludge Pump:
  - a. Motor and Gear Box
  - b. Flex Hose
- 6. Miscellaneous
  - a. Magnetic flow meter
  - b. Polymer dilution system

### **PART 3 - EXECUTION**

#### **3.01 DESIGN AND IMPLEMENTATION OF CONTROL SYSTEM**

- A. Heron will subcontract a qualified and experienced water-wastewater Controls Engineering firm for the final design, specification, and implementation of the SAF controls system. Candidate firms are:
  - 1. Westin Engineering, Rancho Cordova
  - 2. MCC Control Systems, Vacaville
  - 3. EDCCO Group, San Carlos
  - 4. Others with similar experience and qualifications
- B. The Engineer and Heron Innovators will jointly select the Controls Engineer primarily on experience and qualifications.
- C. The Engineer and Controls Engineer will hold two coordination meetings with Revere Control Systems of Birmingham, AL, the Fuzzy Filter controls firm: pre-design and post-design.

#### **3.02 INSTALLATION**

- A. Install system components in accordance with the supplier's recommendations.

#### **3.03 FIELD QUALITY CONTROL**

- A. Contractor shall arrange for an authorized factory-trained representative of the supplier to check the installation perform electrical and functional testing of the controls and confirm correct operation, and adjust the equipment for optimum performance.

**END OF SECTION**