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October 9, 2018

Theresa Enright
SRF Coordinator
Iowa Department of Natural Resources
502 E. 9th Street
Des Moines, IA 50319

Re: Sioux City Dewatering & Odor Control Project
AIS Waiver Request for Ball Valves

Dear Ms. Enright:

The Dewatering and Odor Control Procurement project at the Sioux City Wastewater Treatment Plant is funded by a loan through the Clean Water State Revolving Loan Fund. The Consolidated Appropriations Act of 2014 includes an "American Iron and Steel" (AIS) provision that requires SRF recipients to use iron and steel products produced domestically. Valves are included in the list being subject to this requirement.

The Dewatering and Odor Control Procurement project includes the procurement of a dewatered solids cake pump system for installation by an installation contractor. As part of the dewatered solids cake pump system, high pressure ball valves have been included in the design for installation on the dewatered solids discharge line. The design includes two 10-inch valves and one 8-inch valve. The design team has not been successful at finding a domestic manufacturer of the high pressure ball valves needed to complete this project, and therefore requesting a waiver be issued for the high pressure ball valves specified in this project. In accordance with the guidelines for AIS waiver request, specific information is required to be submitted with waiver requests. The required information is present below and in attached documents.

General information

Description of the foreign and domestic construction materials:

The specified biosolids high pressure ball valves selected for this project are constructed of materials sourced from China. Partial valve assembly occurs in Oklahoma, USA.

Unit of measures:

The unit of measure for this product is one valve (each).



Quantity:

There are a total of three high pressure ball valves in this project. One 8-inch and two 10-inch valves.

Price:

The quoted unit price for the 8-inch valve is \$ _____ and \$ _____ for the 10-inch valves. The total price for all three valves is \$ _____. Prices provided are complete assemblies as delivered by Schwing Bioset, Inc.

Time of Delivery or Availability:

The estimated delivery time for the valves in this project is 20 weeks after issuance of the Notice to Proceed.

Location of the Construction Project:

The project is located at:

Sioux City WWTP

3100 South Lewis Boulevard

Sioux City, IA 51106

Name and address of the proposed supplier:

The name and address of the valve supplier is:

KF Valves

1500 SE 89th Street

Oklahoma City, Oklahoma 73149

Detailed justification for the use of foreign construction materials:

The high pressure, full port, trunnion mounted style ball valve is specified because it can provide reliable service on the dewatered solids discharge line. The maximum design working pressure of the discharge line is 1,440 psi. Trunnion style valves, by nature of its design, can provide reliable service in the high-pressure application. Other style ball valves are more prone to leaking at the size and design pressure of this application. The design team has not been able to find a manufacturer with an AIS compliant trunnion style ball valve.

Supporting documentation necessary to demonstrate the availability, quantity, and/or quality of the materials for which the waiver is requested

Supplier information or pricing information from a reasonable number of domestic suppliers indicating availability/delivery date for construction materials:

The design team has been in communication with the following manufacturers:

1. Cameron Grove: Manufacturers 8 and 10-inch trunnion style ball valves. Valves are constructed of materials sourced from China and assembled in China.
2. WKM: Manufacturers 8 and 10-inch trunnion style ball valves. Valves are constructed of materials sourced from China and assembled in China.
3. SCV: Manufacturers 8 and 10-inch trunnion style ball valves. Valves are constructed of materials sourced from China and assembled in China.



4. GWC: Manufacturers 8 and 10-inch trunnion style ball valves. Valves are constructed of materials sourced from China and assembled in China.
5. Quadrosphere: Manufacturers 8 and 10-inch trunnion style ball valves. Valves are constructed of materials sourced from China and assembled in China.
6. Apollo: Manufacturer with domestic sources, able to meet AIS requirements in the 8-inch size. However, the 8-inch valve Apollo manufacturers is not trunnion style design and they do not produce a 10-inch valve meeting AIS requirements.
7. KF: Manufacturers 8 and 10-inch trunnion style ball valves. Valves are constructed of non-domestic materials with partial assembly in the Oklahoma, USA.
8. PBV: Manufacturers 8 and 10-inch trunnion style ball valves. Valves are constructed of materials sourced from China. All assembly and machining are completed in Texas, USA.

Documentation of the assistance recipient's efforts to find available domestic sources, such as a description of the process for identifying suppliers and a list of contacted suppliers:

The list of contacted suppliers has been provided above. The list was generated using a vendor that is familiar with trunnion style ball valve manufacturers.

Project Schedule:

- Construction/Installation Bid Opening: November 6, 2018
- Notice to Proceed for Construction: December 2018
- Installation of Valves: March 2019
- Project Completion: September 2019

Relevant excerpts from the project plans, specifications, and permits indicating the required quantity and quality of construction materials:

The following information is attached:

- Technical specifications for the valves.
- Select process drawings from the project showing the three high pressure ball valves.

Waiver request includes a statement from the prime contractor and/or supplier confirming the non-availability of the domestic construction materials for which the waiver is sought:

Schwing Bioset, Inc. has been working through our local vendor who works with all of the above-mentioned ball valve manufactures. To date the vendor has not been able to find a manufacturer of trunnion style ball valves that meets the American Iron and Steel requirements.

Please contact us with any questions regarding this request.

Sincerely,



Michael Shoup, P.E.



**SECTION 411210
DEWATERED SOLIDS CAKE PUMP**

PART 1 - GENERAL

1.01 SCOPE OF EQUIPMENT SUPPLY

- A. The equipment to be supplied under this Contract shall consist of a positive displacement cake pump, to pump dewatered biosolids cake and furnishing factory authorized startup services for said equipment by a single equipment supplier.
- B. The equipment supply also includes modifications to the Buyer's existing cake pump model KSP25. Equipment shall include:
 - 1. Provision of new stainless steel hopper as indicated on drawings.
 - a. Hopper shall be of vertical sidewall construction with an enclosed top fitted with a mating flange to match chute connection from the horizontal cake conveyor as indicated on drawings. Hopper shall be fabricated of 3/16" thick SS.
- C. The WORK includes the design, layout and provision of cake pump discharge piping from existing and new cake pump to the solids storage silo. Design shall be inclusive of pipe support design, pipe support provision, and location of pipe supports.
- D. The Installation Contractor shall move existing cake pump control panel from electrical room in the headworks building to the existing hydraulic power pack. Seller shall provide installation Contractor control wiring diagrams for existing KSP25 cake pump.
- E. Reference Specifications
 - 1. Section 260510 Common Motor Requirements
 - 2. Section 260519 Low-Voltage Electrical Power Cables
 - 3. Section 260523 Control-Voltage Electrical Power Cables
 - 4. Section 260526 Grounding and Bonding for Electrical Systems
 - 5. Section 260533 Raceway and Boxes for Electrical Systems
 - 6. Section 262816 Enclosed Switches and Circuit Breakers
 - 7. Section 262913 Enclosed Controllers
 - 8. Section 409513 Network Systems
 - 9. Section 409550 Programmable Logic Controllers
 - 10. Section 409600 Instrumentation and Control System
 - 11. Section 409635 Process Control Strategy
 - 12. Section 409513 Control Panels and Hardware

1.02 EQUIPMENT AND SERVICES

- A. Equipment furnished under this section shall be fabricated and supplied , in full conformity with the Procurement Drawings, specifications, engineering data, instructions and equipment Seller's recommendation, unless otherwise noted by the Buyer.
- B. Furnished equipment shall include, but not be limited to, the following:
 - 1. One (1) piston pump
 - 2. One (1) twin screw auger feeder
 - 3. One (1) hydraulic power unit for pump and twin auger screw feeder
 - 4. One (1) piston pump control panel
 - 5. Replacement cake pump hopper for existing cake pump, of vertical construction
 - 6. Cake pump discharge piping design, layout, and support from the cake pumps to the solids storage silo and truck loading bay as indicated on Procurement Drawings.
- C. All pumping units shall be designed and built for 24-hour continuous service at any and all points within the specified range of operation, without overheating, without excessive vibration and strain, and requiring only that degree of maintenance generally accepted as peculiar to the specific type of pump required. All parts shall be capable of being installed without any additional fitting or machining.
- D. Services furnished under this section shall be provided by certified factory trained personnel.

E. O & M MANUALS

1. O & M Manuals shall be included with the equipment at the time of shipment. Six(6) sets of manuals shall be included, bound in 3-ring binders and labeled with the equipment name. Manuals shall include the following minimum requirements:
 - a. Company name and phone number of Seller.
 - b. Name and phone number for ordering parts.
 - c. As-built drawings.
 - d. Detailed assembly drawings with member sizes and dimensions, hole patterns and material types.
 - e. Complete bill of materials and partslist.
 - f. Operating instructions and schedule of routine maintenance.
2. O&M manuals shall be submitted to the Engineer for review and approval.

F. PAINTING

1. The following equipment systems shall be protective coated according to the following schedule. Finish colors to be selected by the buyer.
2. Piston pumps, valves, power units and twin screw augers shall be painted as follows:
 - a. Surface preparation - Sandblast SSPC-SP6
 - b. Primer - One (1) coat Red oxide primer, 2-3 mils DFT
 - c. Intermediate - One (1) coat of Tnemec 135 Chembuild, 3-5 mils DFT
 - d. Finish - One (1) coat of Tnemec N69 Hi-Build Epoxoline II, 3-5 mils DFT
3. Total dry film thickness for primer, intermediate and finish coat system shall be a minimum of 8 mils DFT.
4. Stainless steel surfaces shall remain unpainted.

G. SPARE PARTS

1. The following spare parts shall be supplied in addition to any mentioned above for the biosolids handling equipment specified herein.
 - a. Sludge piston pumps
 - 1) Two (2) sets of suction discs
 - 2) Two (2) sets of discharge discs
 - 3) Two (2) sets of suction seats
 - 4) Two (2) sets of discharge seats
 - 5) Two (2) sets of replacement O-rings for discs
 - 6) Two (2) sets of replacement O-rings for seats
 - 7) Two (2) sets of material rams
 - 8) Two (2) sets of hydraulic oil filters
2. Spare parts shall be suitably packaged for long term storage with waterproof labels indicating contents of each package.

1.3 SINGLE EQUIPMENT SUPPLIER

- A. All equipment specified within this section shall be designed and furnished by a single equipment supplier.
1. Single equipment supplier shall have total system responsibility.
 2. Single equipment supplier shall be responsible for all equipment and services described herein.
 3. The single equipment supplier shall provide all training and submittals described herein and as stated in Section 013300.
 4. Unloading and installing equipment shall be performed by the Installation Contractor.
 5. SUPPLIER: Schwing Bioiset, Inc., or equal.

1.4 SUBMITTALS

- A. Four (4) sets of submittal manuals shall be furnished, bound in 3-ring binders and labeled with the equipment name. Manuals shall include the following minimum requirements:
1. Company names and phone numbers of Sellers.
 2. Name and phone number of vendor for ordering parts.

3. Complete set of mechanical, electrical, control wiring diagrams, and hydraulic drawings for all equipment.
4. Electrical and control wiring diagram for existing cake pump (CKP-101).
5. Complete set of catalog cuts, bills of material, and parts lists for all equipment.
6. Detailed assembly drawings with member sizes and dimensions, hole patterns and material types.
7. All submittal drawings shall be 17" x 11".
8. Operating instructions and schedule of routine maintenance.

B. Submittal manuals shall be submitted to the Buyer for review and approval.

1.05 DESIGN DRAWINGS

A. The design basis of the equipment layout, piping layout, pipe support design shall be as indicated on drawings and is based on equipment furnished by Schwing Bioset, Inc.

1.06 REFERENCES

- A. AGMA: American Gear Manufacturer's Association
- B. AISC: American Institute of Steel Construction
- C. ANSI: American National Standards Institute
- D. ASTM: American Society for Testing and Materials
- E. ASCE: American Society of Civil Engineers
- F. AFBMA: American Friction Bearing Manufacturer's Association
- G. AWS: American Welding Society
- H. ASME: American Society of Mechanical Engineers
- I. CSA: Canadian Standards Association
- J. IBC: International Building Code

PART 2 - PRODUCTS

2.01 PISTON PUMP

- A. Seller: Schwing Bioset, Inc.
- B. Design and construct sludge pumps and ancillary equipment as shown on the procurement drawings and specified herein.
- C. Provide self-priming twin cylinder, reciprocating piston pump, suitable for pumping dewatered sludge cake with near continuous delivery rate.
- D. The pump shall be designed to start and stop from a loaded or unloaded condition. A loaded condition is where a column of sludge is sitting in the vertical chute above the screw feeder and the pump discharge pipe is full of sludge cake.
- E. Biosolids Pump Design Criteria: Pump must be a standard model manufactured by vendor. Custom designed pumps will not be accepted.
 1. Quantity of pumps - One (1)
 2. Minimum Solids Concentration Design Flowrate - (14.2 - 75 GPM) assuming 16% solids
 3. Maximum Solids Concentration Design Flowrate - (7 - 48 GPM) assuming 25% solids
 4. Total dry solids - 16 - 25 %
 5. Design pumping pressure - 500 PSIG
 6. Minimum diameter of hydraulic cylinders - 5.9 in
 7. Maximum cylinder ratio - 2.35
 8. Minimum diameter of product pumping cylinder - 9 in
 9. Minimum suction valve opening diameter - 8 in
 10. Minimum pressure poppet valve opening - 5.9 in
 11. Minimum number of discharges - One (1)
 12. Minimum diameter of discharge - 7 in
 13. Minimum cylinder stroke length - 39 in

14. Service Duty - Continuous, 24 hour service
- F. Equip each pump with the following minimum components:
1. Two (2) material delivery cylinders
 2. One (1) water box
 3. Two (2) differential cylinders
 4. Two (2) material rams
 5. Two (2) suction poppet valves
 6. Two (2) discharge poppet valves
 7. One (1) control block
 8. One (1) 3-position (forward/neutral/reverse) control valve.
- G. Material Delivery Cylinder
1. Provide steel material delivery cylinders with inner hard-chrome plated surface and honed for low friction losses.
 2. The material delivery and differential cylinders are to be separated by a water box through which water can be flushed to clean and cool the delivery cylinders.
 3. Provide easily replaceable piston heads made of BUNA-N or other suitable material for this application.
- H. Poppet Valve Assembly
1. A poppet valve assembly achieves transfer of the pumped product from the suction side via the material cylinder to the conveying line.
 2. The poppet valve assembly shall consist of two (2) valve discs and seats housed in either a suction valve chamber or a pressure valve chamber.
 3. Each valve shall be opened and closed by means of a hydraulic cylinder.
 4. Poppet valve discs and seats shall have a minimum Rockwell hardness of 55. On the suction material cylinder, the suction valve is open and the pressure valve is closed. At the end of a pumping stroke, reversal of the valves takes place in such a manner that the formerly open valve is closed and the closed valve is allowed to reopen. This opening cannot occur until there is a greater pressure on the upstream side of the poppet valve. The sequence of valve operation shall ensure that no back flow of pumped material from the pressurized discharge side to the low pressure suction side.
 5. The poppet valve must be designed to have sacrificial poppet valve discs and seats that are easily replaceable and available from US manufacturers. Designs where the entire poppet valve must be replaced after wear are not acceptable.
- I. Water Box
1. A water-filled isolation box shall separate the delivery cylinders from the drive cylinders. It shall provide cooling water for the piston rod and lubrication of the piston head while it is reciprocating.
 2. Provide water box with removable cover and safety screen with quick connections for easy maintenance.
 3. Equip isolation box with 1-inch diameter NPT fittings for external water supply and 1½-inch connection for overflow and drain.
- J. Control Block:
1. The main control block shall control material piston and poppet valve position. The main control block shall consist of three (3) control valves:
 - a. S-1: A three position forward, neutral, reverse hydraulically operated.
 - b. S-2: A two position directional spool to direct oil flow to the hydraulic pistons, pilot pressure operated.
 - c. S-3: A two position directional spool to direct oil flow to the poppet valves, pilot pressure operated.
 2. Hydraulically activated switching of all moving components shall be required assuring positive shifting at all times and eliminating the need for stroke adjustment.
 3. A separate forward/reverse valve shall be provided to control S-1 spool operation. The forward/reverse valve shall be pilot-pressure, solenoid activated with maintenance mode

electrical panel. In normal operation, solenoid must be energized for pump to operate in forward mode. In maintenance mode, ram operation is controlled by a spring return switch, plus a pump jog button which must be pressed to insure two-hand operation.

4. The design of the hydraulic controls shall make three connection lines between the power unit and pump necessary. Positioning of differential cylinders and poppet valves with the use of solenoids, magnetic position sensors, or limit switches is not acceptable.

K. Base

1. The pump shall be mounted on a welded frame adequately sized to support the pump and designed to be fixed on a foundation.
2. Anchor bolts, nuts and washers shall be as recommended by supplier.
3. Emergency Stop pushbutton and Maintenance Controls shall be mounted at the sludge pump to enhance operator safety. The two-hand control system simplifies routine ram changing service and prevents service personnel from putting their hands in the water box when ram motion is possible.
 - a. Controls furnished at the maintenance panel are as follows:
 - b. E-STOP pushbutton
 - c. PUMP JOG pushbutton
 - d. MAINTENANCE MODE ON / OFF switch
 - e. FORWARD / OFF / REVERSE switch
 - f. With the MAINTENANCE MODE switch in the ON position, the pump cannot be operated using the Pump Control Panel. The pump is operated manually using the FORWARD / OFF / REVERSE switch and pressing the PUMP JOG pushbutton.

L. Pump Discharge and Connection Piece

1. Each pump shall include a quick connect coupling with 8-inch - Victaulic Type HP70ES heavy duty grooved coupling for the discharge port.
2. Spool piece shall include a 2-inch fully ported bleed valve supplied by Schwing Bioset.

2.02 TWIN-SCREW

- A. The Twin-Screw shall receive sludge cake and feed that mixture into the Piston Pump.
- B. The Twin-Screw shall be counter rotating intermeshing twin-screw type as manufactured by Schwing Bioset, Inc.
- C. Twin-Screw Design Criteria:
 1. Quantity: One (1)
 2. Screw Diameter: 13 inches
 3. Inlet Opening Length: 60 inches
 4. Inlet Opening Width: 24 inches
- D. Twin-Screw shall be supplied complete with hydraulic motor, gearbox, and bearings. Gearbox shall include initial fill of gear oil. The trough weldment shall be fabricated from minimum ¼ inch thick A36 carbon steel.
 1. Motor: Hydraulic drive shall be powered by Hydraulic Power Unit as detailed below.
- E. The twin screw augers shall be intermeshing and counter-rotating to be self-cleaning. Each screw shall be a combination of paddle flights and full flights. A minimum of one and one-half pitch lengths of the twin screws must be completely contour shrouded in the suction housing to the Piston Pump.
- F. Each screw shall be supported at the drive end by oil lubricated bearings in the Screw Feeder gear box and at the tail end by grease lubricated hanger bearings. The entire rotating assembly shall be designed to provide continuous duty under all anticipated load conditions. Seals with Teflon impregnated rope packing shall be provided at the drive end of each screw shaft to minimize sludge leakage.
- G. The Twin-Screw shall be equipped with hydraulic drive motor and necessary control equipment. Gear box shall be heavy duty design, capable of developing up to 9000 nm of torque. Three hydraulic lines shall be provided between twin screw and power unit for supply, return, and case drain.

- H. The Twin-Screw outlet connection shall be bolted to the Piston Pump inlet connection. The faces of the Twin-Screw and the Piston Pump at the point of connection shall be machined and furnished with O-rings.
- I. The transition housing of the Twin-Screw shall be equipped with a pressure sensor.
 - 1. A 4-20mA signal shall be sent to the Control Panel to indicate pressure at the transition.
 - 2. Field wiring to the Control Panel shall be completed by the CONTRACTOR.
 - 3. When the Twin-Screw is operated in Automatic Mode, screw auger speed shall be automatically adjusted to maintain optimal material pressure at the transition. This maximizes material cylinder filling efficiency for the Piston Pump and reduces the total number of pumping strokes required.
- J. A Sludge Feed Hopper shall be furnished with the Twin-Screw.
 - 1. The Sludge Feed Hopper shall be bolted to the flanged inlet opening of the Twin-Screw. The mating flanges of the hopper and Twin-Screw shall be factory drilled. Hardware and gasket shall be furnished by the Schwing Bioset, Inc.
 - 2. The hopper shall be constructed of 3/16" minimum thickness 304 stainless steel with appropriate stiffeners to prevent excessive deflection from occurring under full load conditions.
 - 3. Sealed inlet openings for sludge feed shall be provided at the top of the hopper. An inspection door shall also be included.
 - 4. Flanges of the hopper and Twin-Screw Mixer shall bolt together.
 - 5. The hopper shall be fully enclosed to limit splashing and the release of odors.
- K. A "radar" type level sensor, as manufactured by Endress+Hauser or ENGINEER approved equal, shall be mounted in the hopper, positioned over the Twin-Screw Mixer inlet opening.
 - 1. A 4-20mA signal shall be sent to the Control Panel to indicate the sludge level in the hopper.
 - 2. Field wiring to the Control Panel shall be completed by the CONTRACTOR.
- L. An automatic greaser shall be provided to lubricate the hanger bearings and stuffing box of the twin screws. Greaser shall have 24VDC power from the power unit, and shall have 1 liter reservoir. Greaser shall be Linclon Quicklube, or equal.
- M. A mating flange shall be provided on the top of the hopper to match chute connection and location as indicated on drawings.

2.03 HYDRAULIC POWER UNIT

- A. The hydraulic power unit for driving each piston pump, valve actuation and twin screw auger feeder shall be a completely self contained, factory assembled unit as manufactured by Schwing Bioset.
- B. The frame shall be made of welded steel construction adequate to support all components and designed to be anchored to a suitable base and include, but not be limited to the following:
 - 1. Hydraulic oil reservoir mounted above or adjacent to the drive and hydraulic pump. The oil reservoir shall be baffled in two sections and the minimum reservoir volume shall be 200 gallons.
 - 2. Hydraulic oil (Exxon/Mobil Univis or as per Seller's recommendation for duty and service specified herein)
 - 3. Power unit shall use one electric motor to drive the piston pump and screw feeder circuits. Electric motor shall be 100 HP, TEFC, 480VAC, 60 Hz, 3 phase; 40°C ambient rated; 1.15 service factor; Class F insulation; and shall be premium efficiency.
 - 4. One (1) clean out cover
 - 5. One (1) sight level indicator
 - 6. One (1) return line filter (10 micron absolute) with flow bypass and filter contamination switch
 - 7. Two (2) oil pressure switches - piston pump and screw feeder
 - 8. One (1) high oil temperature switch
 - 9. One (1) low oil level switch

10. One (1) 3/4-inch reservoir drain with shut off valve
11. One (1) filter-breather assembly
12. An axial piston type hydraulic oil pump providing infinitely variable displacement volume, as manufactured by Rexroth shall be provided. This hydraulic oil pump shall control the cake pump operation speed and limit pressure to prevent over pressurization of the cake discharge line. A redundant factory preset pressure relief valve shall limit the peak discharge pressure at slightly higher pressure to avoid excessive heating of oil.
13. An auxiliary hydraulic oil pump, also axial piston type with adjustable axis design and providing infinitely variable displacement volume, as manufactured by Rexroth shall power the screw feeder. The axis position shall be adjustable to control the output of the auxiliary hydraulic pump. The axis positioning shall be via a proportional solenoid. In Auto mode, the speed of the screws shall be controlled off a signal from the pressure sensor mounted at the screw feeder transition housing.
14. The power unit shall also incorporate an integral conditioning circuit for cooling and filtering the hydraulic oil.
 - a. A constant volume gear pump driven on a common shaft with the pump and screw feeder hydraulic pumps shall continuously filter hydraulic oil through a 6 micron (absolute) filter and water-cooled heat exchanger on the power unit.

2.04 FIELD HYDRAULIC TUBING

- A. Rigid hydraulic tubing shall be provided to connect the Hydraulic Power Unit to the Sludge Pump and Twin-Auger Screw Feeder, including:
 1. Hydraulic tubing and fittings required for installation.
 2. Carbon steel seamless hydraulic tubing shall be supplied in nominal 20 feet lengths. Installation Contractor shall field cut and install.
 3. Flexible hose connections 4 feet long shall be provided at equipment to isolate vibration.
 4. Hydraulic tubing and fittings shall be installed and painted by the Installation Contractor.
 5. All supports for the hydraulic lines shall be supplied by others.

2.05 PISTON PUMP CONTROLS

- A. PLC based logic panels shall interface with all existing power-unit mounted and field mounted instruments and devices. Controls shall include, but not be limited to:
 1. A LOCAL/OFF/REMOTE switch shall be provided for control of the pumping units.
 - a. In the "REMOTE" mode of operation, the pump and screwfeeder will be turned on and off from a remote signal generated from the Control Room. In addition, the main hydraulic oil pump speed can be increased or decreased with pushbuttons from this Control Room.
 - b. In the "local" mode, the pump and auger feeder will be started stopped, and controlled at the local control panel.
 2. All control logic shall be accomplished by means of a programmable logic controller (PLC). The PLC shall be Compactlogix as manufactured by Allen Bradley. All PLCs provided shall include provisions for network connection via Ethernet protocol via Ethernet switch as manufactured by Phoenix.
 3. All operator controls specified hereafter shall be implemented on a color touch-screen operator interface, Panelview Plus as manufactured by Allen Bradley. Minimum screen size shall be 10" diagonal. Emergency stop push button and alarm light shall not be implemented on the operator interface.
 4. Provide an AUTO/MANUAL selector switch for control of the screw feeder speed.
 - a. In AUTO position, the speed of the screw feeder shall be controlled from a signal generated from the pressure sensor located in the transition section.
 - b. In MANUAL position, the pump and screw feeder can be increased and decreased independently from separate pushbuttons.
 5. Provide a HAND/OFF/AUTO selector switch for control of the twin screw.
 - a. In the HAND mode, the twin screwfeeder speed shall be controlled locally.
 - b. In the AUTO mode, the twin screwfeeder speed shall run at a speed to maintain a constant level in the hopper.

6. Radar level transducer, shall be positioned over each twin screw feeder, and monitored by the PLC.
7. Power to panel shall be 480V / 3 phase / 60 hz, and a front panel mounted circuit breaker disconnect switch shall be provided.
8. Provide terminal strips to receive wires from external devices with a minimum of 10 percent spare terminals.
9. In manual mode, the speed control for the biosolids pump and the screw feeder shall be done through increase/decrease buttons.
10. Provide a selector switch for bypass hydraulic circuit labeled LOAD-BYPASS. This switch controls an electrically operated hydraulic solenoid (24 volt) valve used to direct oil from the hydraulic pump directly back to the reservoir. The purpose of this valve shall be to start the hydraulic system under no load to minimize in-rush current.
11. Provide a HIGH OIL TEMPERATURE amber indicator light. This shall be connected to high oil temperature switch on the hydraulic power unit. This switch shall energize the light at 65°C (150°F). Automatic piston pump shutdown shall also occur at this setting.
12. Provide an emergency stop (E-STOP) pushbutton.
13. Provide a HIGH OIL PRESSURE amber indicator light. This shall be connected to the high oil pressure switch on the hydraulic power unit (Note: for the piston pump and screw feeder hydraulic pump). The switch shall be set to energize the light at a pressure (hydraulic/material) just below the relief valve setting. Automatic piston pump system shutdown shall occur at maximum setting. There shall be an adjustable 0-60 second time delay set at 30 seconds so that the indicator light shall not energize during momentary hydraulic pressure spikes.
14. Provide a LOW OIL LEVEL amber indicator light. This shall be connected to the low oil sensor on the hydraulic power unit. This sensor shall be set to energize the light when the oil level falls below the low level on the sight gauge and an automatic piston pump system shutdown shall occur on this condition.
15. Provide a DIRTY OIL amber indicator light. This shall be connected to the dirty oil sensor on the hydraulic power unit. The sensor shall be set to energize the light when the oil has become so dirty that the oil is bypassed around the filter.
16. Provide an elapsed time meter to indicate the total running time of the piston pump in hours.
17. Provide a RESET pushbutton. This shall be provided to reset control relays and de-energize lights after the system has been corrected for failure due to high oil pressure, high oil temperature, low-low biosolids level and low oil level.
18. Provide an audible alarm to signal piston pump shutdown.
19. For all alarm conditions, provide alarm indicator light and audible alarm at the local control panel with horn silencer and reset pushbutton.
20. Provide status indicator lights of Red (RUNNING) and Green (OFF).
21. Provide an additional amber alarm light(s) for electric motor OVER-CURRENT shut down.
22. Provide 0-100% LED speed indicator display for each piston pump and screw feeder.
23. The screw feed transition pressure indication readout shall be displayed on the transmitter sensor.
24. Control Enclosures shall be NEMA 4X, with 316 SS construction. Enclosures shall include UL/CSA approval.

2.06 MOTOR STARTER

- A. Full voltage motor starter shall be provided by the Installation Contractor and shall be located in an existing MCC, "HW-MCC-IL/IR".

2.07 NEW SOLIDS HOPPER FOR EXISTING CAKE PUMP (CKP-101)

- A. Supplier shall provide a new vertical wall solids hopper for the existing cake pump.
 1. Supplier to coordinate bolt pattern and provide hardware and gasket for installation of the new hopper onto the existing twin-screw auger body by the contractor.
 - a. Gasket shall be of material, thickness and dimensions as recommended by supplier.

- B. Hopper shall be complete with top cover and shall include a mating flange for the horizontal conveyor discharge, an inspection hatch and provisions to mount existing hopper radar type level indicator.

2.08 DEWATERED CAKE PUMP DISCHARGE PIPING AND VALVES

A. Dewatered Cake Pipeline

1. High pressure steel piping shall be furnished from the solids pump discharge connections to the silo as shown on the drawings. Pipe shall be furnished complete with all fittings, coupling and flanges. Pipe hangers and supports, anchors, and other necessary appurtenances to be supplied by installing contractor.
2. Piping furnished hereunder shall be complete with all joint gaskets, bolts, and nuts required for installation of valves and equipment furnished for the dewatered solids pumps. Supports shall be supplied by contractor.
3. The Contractor shall coordinate design, installation, and testing of the piping system with the solids pump supplier.
4. Pipe, fittings, and accessories shall be handled in a manner that will ensure installation in sound, undamaged condition. Equipment, tools, and methods used in handling and installing pipe and fittings shall not damage the pipe and fittings. Hooks inserted in ends of pipe shall have broad, well-padded contact surfaces.
5. Pipe shall be carbon steel, A53 Grade B seamless with schedule XS wall thickness.
6. Piping shall have a minimum working pressure of 1,000 psi and minimum burst pressure of 4,000 psi (4:1 Safety Factor).
7. Bends shall have a radius of 3D or greater unless specifically noted on the drawings.
8. Couplings shall be Schwing Bioset SX bolted couplings for high pressure dewatered cake service.
9. Flange joints shall be permitted where piping is connected to equipment or valves. Flange faces shall and perpendicular to the pipe center line. Flanges for ball valves shall be raised face.
 - a. When bolting flanged joints, care shall be taken to avoid restraint on the opposite end of the pipe or fittings, which would prevent uniform gasket compression or which would cause unnecessary stress in the flanges. One flange shall be free to move in any direction while the flange bolts are being tightened. Bolts shall be tightened gradually and at a uniform rate, to ensure uniform compression of the gasket.
10. Special care shall be taken when connecting to pumping equipment to ensure that pipe stresses are not transmitted to the pump flanges. All such piping shall be permanently supported so that accurate matching of bolt holes and uniform contact over the entire surface of abutting pump and piping flanges are obtained before installation of any bolts in those flanges. In addition, pump connection piping shall be free to move parallel to its longitudinal center line while the flange bolts are being tightened.
11. Each pump will be leveled and aligned into position to fit the connecting piping, but will not be grouted until the initial fitting and alignment of the pipe is completed so that the pump may be shifted on its foundation as necessary. Each pump will be grouted before final bolting of the connecting piping.
12. END JOINTS. Couplings shall be heavy duty castings with split design consisting of a two piece ductile or malleable iron casting, nitrile based rubber cavity gasket and quad-ring. The joints shall be Schwing Bioset SX couplings with Male/Female interlocking raised ends. Raised ends shall have a chamfered shoulder which will increase joint strength as coupling bolts are tightened. Grooved end type coupling systems shall not be permitted.
13. Where indicated on the drawings, reducers shall be concentric pattern.
14. Dewatered solids piping supports shall be designed by the pipe supplier and shall include stamped calculations by a Professional Engineer licensed in Iowa. Support shall be furnished and installed by the Contractor and shall include hangers, brackets, supports, anchors, inserts, bolts, nuts, rods, washers, and other accessories.
15. All piping shall be rigidly supported and anchored so that there is no movement, visible sagging, or undue stress between supports.

16. Unless otherwise specified, all pipe supports shall comply with ANSI/MSS SP-58 and MSS SP-69 and fabricated of carbon steel or malleable iron with the Seller's standard finish.
17. Pipe supports shall be manufactured for the size and type of pipe to which they are applied. Strap hangers will not be acceptable. Threaded rods shall have sufficient threading to permit the maximum adjustment available in the support item.
18. Anchorage shall be provided to resist thrust due to pulsation, vibration, temperature changes, changes in diameter or direction, or dead ending.
19. The exterior surfaces of all pipe and fittings shall be shop primed. Interior pipe surfaces shall remain uncoated. Final coating shall be applied by contractor in the field.
20. The interior of all pipe and fittings shall be thoroughly cleaned of all foreign matter prior to installation and shall be kept clean until the work has been accepted. Before jointing, all joint contact surfaces shall be wire brushed if necessary, wiped clean, and kept clean until jointing is completed.
21. Precautions shall be taken to prevent foreign material from entering the pipe during installation. Debris, tools, clothing, or other materials shall not be placed in or allowed to enter the pipe.
22. Pipe and fittings shall be carefully examined for cracks and other defects immediately before installation. Debris, tools, clothing, or other materials shall not be placed in or allowed to enter the pipe.
23. All joints shall be watertight and free from leaks. Each leak which is discovered within the correction period stipulated in the General Conditions shall be repaired by and at the expense of the Contractor.
24. The dewatered sludge pump piping shall be subject to a pressure test of 1000 psi. The Contractor shall provide all necessary pumping equipment, piping connections, pressure gauges, and other equipment, materials, and facilities necessary for the tests. The tests shall be conducted by the Construction Contractor.
25. All pipe, fittings, valves, pipe joints, and other materials which are found to be defective shall be removed and replaced with new and acceptable material, and the affected portion of the piping retested by and at the expense of the Contractor if leakage is due to an installation problem and at the expense of the Seller if leakage is due to defective materials.

B. Biosolids High Pressure Ball Valve:

1. The ball valves in the sludge cake service shall be full port ball valve trunnion mounted designed for high pressure pulsating service. The valves shall be class 600 with a maximum working pressure of 1440 psi.
2. The valves shall be API monogrammed. The valves shall be designed, manufactured and tested in strict accordance with API 6D and applicable ASTM and ANSI standards.
3. The valve shall consist of a 316 solid stainless steel through conduit full port ball that rotates on a fixed axis with an upper stem and lower trunnion. The valve shall be a non-lubricated bi-directional flow valve with independent sealing capability on each side of the ball.
4. The valves provided shall be the standard product in regular production by manufacturers who have furnished these valves of similar size and service capabilities to the equipment described herein. The valve shall be manufactured by KF Industries, or PBV.
5. The valve components shall consist of the following:
 - a. Stem shall be 17-4 PH stainless steel in sizes 6" and greater. The stem shall be blow-out proof, using a "T-shaped" configuration for positive retention. The valves shall incorporate an anti-static feature ensuring electrical continuity between the stem and body. Provisions shall be made for emergency sealing for the stem.
 - b. Trunnion stem shall be 17-4 PH stainless steel in sizes 6"-12".
 - c. Ball shall be full port and solid 316 stainless steel. Hollow or sleeved balls are not acceptable. Nickel plated ball valves are not acceptable.
 - d. Valve body shall be split body, end entry design. Material shall be carbon steel. Single multi-purpose stem and interchangeable top plates shall permit changing from

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wrench to gear operator or power actuator without disturbing any pressure containing parts.

- e. Seat shall be of the cartridge seat design consisting of a seat ring with a reinforced TFE or nylon seat insert and body seal. The seats are spring loaded to assure ball/seat contact at low pressure.
Energizing springs shall be individually cupped to minimize sludge deposits from impending spring action.
- f. Valve shall be capable of double block and bleed service as standard. Positive independent sealing permits pressure from either side of a closed valve to be stopped by seat seal permitting the ball cavity to be vented to verify both upstream and downstream seat seal integrity.
- g. Manual gear operators shall be self locking in all positions. Adjustable screws shall stop travel at open and closed positions and position indicator shall be standard. Gearing shall be permanently lubricated. Gear operator shall be fully weather resistant for outdoor service. The gear casing shall enclose a high strength ductile iron gear with hardened steel worm supported by roller bearings.
Gear operator shall be capable of being fitted with chain wheels for raised height operation.
- h. All valves in the horizontal position shall be supported on either end. Supports shall be designed, supplied, and installed by the contractor. Valves in the vertical position shall be supported within the pipeline from the piping supports.

C. Valve Actuators:

- 1. Where indicated, valve for solids piping shall have an electric actuator capable of closing and opening the valve at maximum shutoff pressure.
 - a. Rotation: the direction of rotation of the wheel or wrench nut to open each valve shall be to the left (counterclockwise). Each valve body or actuator shall have cast thereon the word "Open" and an arrow indicating the direction to open.
 - b. Electric Actuators: Electric actuators for ball valves shall be multiturn type with worm gear operator for quarter-turn operation. Actuators shall be EIM "Series M/MG", or equal by Rotork or Limitorque.
 - 1) Each electric actuator shall be furnished complete with a motor, gearing, handwheel, limit and torque switches, lubricants, heating elements, wiring, and terminals. Each actuator shall be constructed as a self-contained unit with housing and shall be integrally assembled on the applicable valve.
 - 2) Actuator motors may be mounted horizontally adjacent or vertically above the reduction gearing. All gearing shall be either oil bath or grease lubricated. If grease lubrication is used, in no case shall motors be mounted vertically below the gearing.
 - c. Motors: Motors shall be capable of operating the valve under full differential pressure for a complete open-close and reverse cycle of travel at least twice in immediate succession without overheating. Motors shall be designed in accordance with NEMA standards and shall operate successfully at any voltage within 10 percent above or below rated voltage. Motor bearings shall be permanently lubricated.
 - d. Power Gearing: Power gearing shall consist of hardened steel spur or helical gears and alloy bronze or hardened steel worm gear, all suitably lubricated, designed for 100 percent overload, and effectively sealed against entrance of foreign matter. Steel gears shall be hardened to not less than 350 Brinnell. Gearing shall be designed to be self-locking so that actuation of a torque switch by torque overload will not allow the actuator to restart until the torque overload has been eliminated. Planetary or cycloidal gearing or aluminum, mild steel, or nonmetallic gears will not be acceptable. Actuators shall be designed to open or close the valve within 60 seconds under full line pressure.
 - e. Terminal Facilities: Terminal facilities for connection to motor leads, switches, position transmitter, and heating elements shall be provided in readily accessible terminal compartment. Each terminal compartment shall have at least two openings

for external electrical conduits, one sized at least ¾ inch and the other at least 1 ¼ inches. Each terminal compartment shall be large enough to allow easy routing and termination of fifteen 12 AWG conductors.

- f. Controller: Electrical service to the actuator shall be 480V/ 3 phase / 60 Hz. Each electrically actuated valve shall be furnished with a reversing controller located inside the actuator housing. The controller shall be equipped with:
 - 1) A motor overload protective device in each phase.
 - 2) A space heater element, rated 120 volts ac, sized to be continuously energized for prevention of condensation within the controller enclosure.
 - 3) A control power transformer with fused secondary, if power supply is greater than 120 volts ac, with volt-ampere capacity suitable for started control plus continuous service to space heater elements in motor housing, limit switch compartment, and controller enclosure.
 - 4) Reversing controllers shall be both mechanically and electrically interlocked and shall be provided with direct-operated auxiliary contacts required for interlocking and control.
 - 5) "Open-Close" push buttons and a "Local-Off-Remote" selector switch and red and green indicating lights shall be furnished as a part of the enclosure.

PART 3 - START-UP PHASE SERVICES

3.01 INSTALLATION CHECK/TRAINING

- A. Installation Check (Shall be provided at completion of Phase 1 and Phase 2 construction.)
 - 1. An experienced, competent, and authorized representative of the Supplier shall visit the site of the Work and inspect, check, adjust if necessary, and approve the equipment installation. The representative shall be present when equipment is placed in operation shall revisit the jobsite as often as necessary until all trouble is corrected and the equipment installation and operation are satisfactory in the opinion of Engineer.
 - 2. The Suppliers representative shall furnish a written report certifying that the equipment has been properly installed; that piping has been properly cleaned; is in accurate alignment; is free from undue stress imposed by connecting piping or anchor bolts; and has been operated at full load conditions and that it operated satisfactorily.
 - 3. All costs for these services shall be included in the contract price for the number of days and round trips to the site as required.
- B. Training
 - 1. The Supplier shall provide a qualified representative at the jobsite for one day to train the Buyer's personnel in operating and maintaining the equipment.

3.02 O & M MANUALS

- A. O & M Manuals shall be included with the equipment at the time of shipment. Six (6) sets of manuals shall be included, bound in 3-ring binders and labeled with the equipment name. Manuals shall include the following minimum requirements:
 - 1. Company name and phone number of manufacturer.
 - 2. Name and phone number for ordering parts.
 - 3. As-built drawings.
 - 4. Detailed assembly drawings with member sizes and dimensions, hole patterns and material types.
 - 5. Complete bill of materials and parts list.
 - 6. Operating instructions and schedule of routine maintenance.
- B. O&M manuals shall be submitted to the Engineer for review and approval.

3.03 PAINTING

- A. The following equipment systems shall be protective coated according to the following schedule. Finish colors to be selected by the Buyer.
- B. Piston pumps, valves, power units and twin screw augers shall be painted as follows:
 - 1. Surface preparation - Sandblast SSPC-SP6

2. Primer - One (1) coat Red oxide primer, 2-3 mils DFT
 3. Intermediate - One (1) coat of Tnemec 135 Chembuild, 3-5 mils DFT
 4. Finish - One (1) coat of Tnemec N69 Hi-Build Epoxoline II, 3-5 mils DFT
- C. Total dry film thickness for primer, intermediate and finish coat system shall be a minimum of 8 mils DFT.
- D. Stainless steel surfaces shall remain unpainted.

3.04 SPARE PARTS

- A. The following spare parts shall be supplied in addition to any mentioned above for the biosolids handling equipment specified herein.
1. Sludge piston pumps
 - a. Two (2) sets of suction discs
 - b. Two (2) sets of discharge discs
 - c. Two (2) sets of suction seats
 - d. Two (2) sets of discharge seats
 - e. Two (2) sets of replacement O-rings for discs
 - f. Two (2) sets of replacement O-rings for seats
 - g. Two (2) sets of material rams
 - h. Two (2) sets of hydraulic oil filters
- B. Spare parts shall be suitably packaged for long term storage with waterproof labels indicating contents of each package.

3.05 DELIVERY, STORAGE, AND HANDLING

- A. Seller shall be responsible for delivery of the equipment to site.
- B. Installation Contractor shall be responsible for unloading and storing equipment based on Seller's recommendations.

END OF SECTION