SECTION 11325

progressive cavity pumps

# GENERAL

## DESCRIPTION

### **Scope:** This section specifies positive displacement progressing cavity pumps, complete with electric motors, and all specified appurtenances, as shown on the plans and specified herein.

### **Type:** The pumping units shall be of the self-priming, positive displacement, progressing cavity type specifically designed for pumping the specified waste water sludge.

## references

### This section contains references to the following documents. They are part of this section as specified and modified. In case of conflict between the requirements of the section and those of the listed documents, the requirements of this section shall prevail.

|  |  |
| --- | --- |
| **Reference** | **Title** |
| AGMA 6010-E-88 | Spur, Helical, Herringbone, and Bevel Enclosed Drive |
| AGMA 6019-E-89 | Gear Motors Using Spur, Helical, Herringbone, Straight Bevel, or Spiral Bevel Gears |
| AGMA 6023-A88 | Design Manual for Enclosed Epicyclic Gear Drives |

## Design

### **Equipment List:**

|  |  |
| --- | --- |
| **Item:** | **Equipment Number:** |
|  |  |
|  |  |

### **Performance and Design Requirements:**

#### Sludge handling pumps shall be specifically designed and selected for continuous duty pumping of liquids with the following properties:

|  |  |
| --- | --- |
| Percent Solids | Up to 8% |
| pH | 5.5-7 |
| Temperature | 70°F |

#### The pumps shall be of the compact, close-coupled design. The gear reducer shall be sized for a minimum service factor of 1.5 and designed with a thrust load capability of 150 percent of the actual thrust load.

#### The pumps, along with associated drive appurtenances, shall be mounted on common fabricated steel baseplates.

#### Manufacturers must currently have installations for the same liquids and of the same size pump unit, in service for a minimum of three years. Manufacturers not named in this specification must also provide a pre-submittal package to the engineer no less than three weeks prior to the bid date for approval. The pre-submittal package must include, at minimum, the following: dimensional drawing, performance curve, O&M manual, electrical/drive details, installation list (for the same liquids as specified) with minimum three contacts and phone numbers.

### **Transfer Pumps Operating Conditions:** The progressing cavity pumps shall have the following operating characteristics:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Equipment Service** | **Rated Capacity, gpm** | **Differential Pressure psi** | **Maximum/ minimum pump speed, rpm** | **Suction and discharge port size,  in** | **Minimum motor  hp** | **Drive** |
|  |  |  |  |  |  |  |

### **Feed Pumps Operating Conditions:** The progressing cavity pumps shall have the following operating characteristics:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Equipment Service** | **Rated Capacity, gpm** | **Differential Pressure  psi** | **Maximum/ minimum pump speed, rpm** | **Suction and discharge port size,  in** | **Minimum motor  hp** | **Drive** |
|  |  |  |  |  |  |  |

## ENVIRONMaNTAL CONDITIONS

[Engineer to specify]

## SUBMITTALS

### The following information shall be provided.

#### Manufacturer's data including materials of construction and equipment weight.

#### Predicted performance curves.

#### Motor data.

#### Universal joint warranty.

#### A copy of this specification section with addenda updates, and all referenced sections with addenda updates, with each paragraph check marked to show specification compliance or marked to show deviations.

# PRODUCTS

## MATERIALS

| **Component** | **Material** |
| --- | --- |
| Rotor |  |
| Stator |  |
| Pump Body |  |
| Shaft Sealing |  |

[Engineer to specify requirements above]

## EQUIPMENT

### **Rotor and Stator:** Each pump shall be a one stage design employing a convoluted rotor operating in a similarly convoluted stator. The convolutions shall be configured to form a cavity between the rotor and stator, which shall progress from the pump's inlet to discharge port with the operation of the rotor. The fit between the rotor and stator at the point of contact shall compress the stator material sufficiently to form a seal and to prevent leakage from the discharge back to the inlet end of the pumping chamber. Stators for sludge pumps shall have Buna elastomer. The sludge pump rotors shall be constructed of hardened tool steel. Additionally, the sludge pump rotors shall have a chromium nitride coating (Duktil process) or hard chrome platingwith a minimum thickness of (.0108").

#### Stators shall be replaceable without dismantling the pump suction or discharge flanges or any associated piping. Pumps that require additional space for axial/horizontal removal of the stator shall not be allowed.

#### Rotors shall be replaceable without dismantling the pump suction or discharge flanges or associated piping. Pumps that require additional space for axial/horizontal removal of the rotor shall not be allowed. The rotor design shall include provisions so that rotor replacement does not require the disassembly of either universal joint.

#### The pump’s stator shall be formed from a single piece Buna-n rubber sleeve inside a two piece extruded aluminum shell.

#### The stator shall be affixed to the suction casing by the use of four (4) thru-bolts for easy removal and replacement. Stators shall not be affixed to the suction casing by threaded connections or by snap rings. The suction edge of the stator shall be chamfered to allow for unrestricted flow into the pumping elements.

#### Stator designs that limit nominal pump pressure capability to less than 90 PSI per stage hall not be acceptable. Split stators are not acceptable as they can leak.

### **Drive Train:** The drive train shall be warranted for one (1) year from acceptance and shall consist of the following:

#### Each pump rotor shall be driven through a positively sealed and lubricated pin joint. The pin joint shall have replaceable bushings, constructed of air-hardened tool steel of 57-60 HRc, in the rotor head and coupling rod. The pin shall be constructed of high speed steel, air hardened to 60-65 HRc. The joint shall be oil or grease lubricated with a high temperature (450° F), PTFE filled synthetic grease,

#### To optimize seal and pin joint life, the connecting rod shall be of sufficient length to maintain its operating angle within 1 degree.

### **Casings:** A 125-pound (ANSI B16.5 RF) flanged connection shall be provided at both the inlet and discharge ports. The suction casing shall employ two opposed cleanout openings to facilitate removal of debris without dismantling the pump or pipework.

#### The casing shall have multiple ¾” NPT connection for vents, drains, and gauges. The connections shall be at the highest and lowest point of the housing regardless of suction orientation.

### **Bearings:** Each pump shall be provided with oil lubricated thrust and radial bearings, located in the gearmotor, designed for all loads imposed by the specified service. Minimum bearing L-10 shall be 50,000 hrs.

### **Shaft Sealing:** Shaft shall be sealed using a single internal mechanical seal as specified in Section 2.02. The shaft shall be solid through the sealing area, but of a two part design which allows the rotating unit to be removed from the pump without disassembly of the gearmotor bearings. Seal materials shall be solid silicon carbide faces with 316 stainless steel metal parts and viton elastomers.

### **Motor and Drive Unit:**

#### Gear motors or gear reducers shall be designed in accordance with AGMA 6019-E (Class II). Unless otherwise noted, motors shall be energy-efficient, TEFC motors.

#### Pumps that require variable frequency drives (VFDs) are noted in paragraph 1.01 E. VFDs shall be constant torque type. For VFD-driven units, the pump supplier shall be responsible for the provision of the fixed reduction between the motor and pump. The reduction ratio shall be that required to operate the pump at its maximum operating speed when the motor is operating at its nominal rated full speed in accordance with the schedule in paragraph 1.01 E. VFD-driven units may be operated at up to 85 Hz at the maximum speed.

## ACCESSORIES:

### **Run Dry Protection:** The stator shall be fitted with a sensor sleeve and thermistor sensor. A controller shall also be provided and shall be installed by the contractor in the motor control center. The controller shall monitor the stator temperature and activate a shutdown and alarm sequence if the stator temperature reaches the adjustable limit on the controller. The controller shall include a manual local and remote reset function. Input to the controller shall be 1x115VAC/60 Hz.

## STANDBY COMPONENTS

### One set of special tools shall be provided to service the pumps.

# eXECUTION

## INSTALLATION

### The pumps shall be installed as specified and in accordance with manufacturer's written recommendations. The installation and initial operation of all components shall be certified by an authorized representative of the pump manufacturer.

## TESTING

### After completion of installation, the pumps shall be completely tested to demonstrate compliance with operating requirements as specified.

end of section