Neptune Chemical Pump Co.
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Polymer Dilution Blend and Feed Specifications For General Use

Electronic Diaphragm Metering Pump

1.0 GENERAL

The contractor shall furnish and install polymer dilution blending and feeding units together with all drives, motors, valves, piping, supports, controls, and accessories necessary for a complete and operable system in accordance with the requirements of the contract documents. Each system shall be completely piped, wired and tested before shipment.

2.0 PRODUCTS

2.01 General

The polymer dilution blending and feeding units shall be integrated equipment packages to automatically meter, dilute, activate, and feed (emulsion, solution or dispersion) polymers. Concentrated polymer and water shall be blended. The process shall begin with a motor driven, high energy, injection head which shall spread the polymer into thin layers for introduction to the water without the formation of fisheyes or gels. The injection head shall have a multiple vaned, close tolerance rotor. All of the dilution water shall go through the high energy zone for machines with capacities of 1200 gpm or less. Units handling water flows in excess of 1200 gpm shall utilize secondary dilution. Machines which feature secondary dilution shall cause flow in excess of 1200 gpm to be diverted to the secondary dilution stage. When flows reduce, the secondary dilution stage shall be shut down for flow rates below 1200 gpm to allow all of the dilution water to, again, pass through the high energy injection head.

After the initial high energy mixing, the solution shall be introduced into a low energy static mixer. Static mixer shall contain a series of 316SS mixing elements housed in clear PVC housing for viewing the final mixed solution. Static mixing elements shall produce a high degree of back mixing. Systems that do not have a motor-driven polymer mixing chamber shall not be considered equal. System shall be designed for wash down duty. System shall have an electronic diaphragm polymer feed pump.

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2.02 Frame

Each polymer unit shall have a 304 stainless steel open frame that will house and support all components.

All components in contact with polymer or water shall be of stainless steel, brass or inert plastic.

2.03 Pump

The pumps shall be an electronic solenoid-driven diaphragm type that have a manual stroke length adjusting knob and electronic push button control of the strokes per minute or hour.

Diaphragm pump shall be capable of receiving an external 4-20 mA pacing signal from a remote monitoring devices (supplied by others) to automatically adjust the neat polymer feed rate.

Diaphragm pump shall be capable of pumping liquid polymers with an apparent viscosity of 50,000 cps. Pump shall have a water proof microprocessor type control panel with a LCD digital display of strokes per minute. Stroke rate shall be 0 — 100 strokes per minute. (Units used to prepare dilute solutions to be stored in a central tank for distribution to multiple points by other pumps, shall be manually controlled by the on/off sequence of high and low level switches; the 4-20 mA pacing signal is not required.)

Pump output shall be: _____ gph minimum. _____ gph maximum. A wye strainer shall be supplied installed in the suction line for the pump.

2.04 Rotameters

Each unit shall have an integral rotameter type flow indicator to meter and control the dilution water flow rate. The rotameter shall have a guided float type with acrylic metering tube scaled in 0 to ____gpm and with a 316 stainless steel and brass control valve. If more than 1200 gph of dilution water is required, a secondary flow indicator shall provide an additional 0 – 1800 gph. The secondary dilution water flow shall combine with the primary flow circuit and pass through a second static mixer prior to exiting the unit.

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2.05 Pressure Sensor

Each unit shall have an integral flow sensor to automatically place the system in standby in the event of insufficient dilution water pressure/flow. When in "stand-by", the polymer feed pump is shut off, preventing the feeding of polymer in the absence of sufficient dilution water. The polymer feed pump is shut off making it impossible to feed polymer in the absence of sufficient dilution water. This condition will generate an alarm contact output when low pressure is detected. System will restart automatically when water pressure is restored

2.06 Solenoid Valve

Each unit shall have an integral solenoid valve for on/off control of the dilution water. The solenoid valve and polymer feed pump are interlocked to an HOA selector switch enabling the unit to be started or stopped from a remote signal.

2.07 Check Valves

Each unit shall have a check valve located on the polymer and water discharge lines mounted immediately adjacent to the point of initial contact between the water and polymer. The valve shall be chemically compatible with the polymer and water.

2.08 Dilution Water

Each unit shall be supplied with a wye strainer for dilution water inlet. Each unit shall have a pressure gauge to monitor water pressure throughout the system and withstand 100 psi operating pressure.

2.09 High Energy Mixing Unit

The polymer and water shall mix and activate initially in a motor-driven, thin-film injection head called the "Gatlin". The high energy mixing unit shall consist of a sixteen groove fluted rotor that allows water to flow through its flutes while rotating at a constant 1550 rpm. Neat polymer shall be injected through a check valve, through the side of the housing and perpendicular to the rotating flutes and dilution water. The tolerance between the sixteen rotor tips and housing shall not exceed 0.020 inch. Injection head shall be designed to produce a minimum of 400 ultra thin polymer sheets per second. To prevent shear rate damage to the polymer, high energy contacting time of the polymer and dilution water shall not exceed 0.5 seconds. Mixing systems without high energy mixing zones or with contacting times greater than 0.5 seconds shall not be considered equal. Systems that rely solely on hydraulic impingement contacting and static mixing chambers shall not be acceptable.

The high energy mixing device will have a minimum speed of 1550 RPM and shall not be a pump. The mixing chamber shall have a mechanical seal and a 316 stainless steel shaft and housing.

2.10 Static Mixing

Each unit shall have a secondary mixing unit constructed of clear plastic to allow viewing of the mixed polymer and water solution. The mixing unit shall contain 316 stainless steel triple action static mixing elements that complete the polymer blending process.

2.11 Materials

The wetted elements of the unit which contact neat or dilute polymer shall be constructed of materials that are non-corrosive, such as the following:

- PVC
- Acrylic
- Polyethylene
- 316 stainless steel

2.20 Controls

Each unit shall be equipped with all necessary controls, pre-wired, to provide the following minimum functions:

- Dilution water flow control with rate adjusting valve and flowmeter.
- Hand-Off-Auto* switch to control power to the solenoid valve, Gatlin mixing unit and metering pump.
- Stroke frequency and stroke length adjustments for diaphragm pumps.
- Local or remote control of pump feed rate. *
- The remote control shall be in response to a 4 to 20 mA control signal. *
- Flushing mode switch that shuts off the feed pump and allows water to flush the system.

* *In the **hand position**, the unit is started and stopped manually, however, the flow sensor described in paragraph 2.05 remains active and polymer will not feed in the absence of sufficient dilution water. In the **auto position**, the unit will run only when an external contact permits the unit to run. This could be a flow signal from a waste stream, a level switch signaling the need to refill a storage tank with dilute polymer to be fed by multiple pumps to multiple points of use or any other external condition that is desired to cause the polymer blending to begin or end.*

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All motors shall be TEFC or TENV construction. All electrical controls and wiring shall be of NEMA 4 construction.

2.21 The control system shall accept a 4 to 20 mA control signal to pace the polymer feed pumps in response to external control. (Except for manual units used to refill a central feed tank as described in paragraph 2.03.)

2.22 Each unit shall be provided with the following output contacts:

- § Run status (dry contact)
- § Fail status (dry contact)

2.30 Power Requirements

Each unit shall have a 120 volt, 60 hertz at less than 5 amps or 220 volt, 50 hertz, single phase at less the 3 amps power requirement.

2.40 Accessories

Unless otherwise shown, all polymer dilution and feeding units shall be mounted on pedestals or 304 stainless steel supports. They may be equipped with the following optional accessories:

- § Dilution water pressure regulator.
- § Polymer calibration column.
- § Drum suction pipe with thread for drum bung and strainer on end of suction pipe.
- § 1/3 HP drum mixing unit with three pair of mixing blades. Unit is designed to be inserted through a 2” bung hole and threaded into bung connection.
- § Desiccant dryer for excluding moisture from polymer drum.

2.50 Spare Parts

All polymer diaphragm feed pumps shall have a spare parts kit which includes a spare diaphragm, spare check valves, and spare seals. One spare set of bearings shall be provided for all bearing housings and one spare mechanical seal for each seal used.

2.60 Manufacturers

Neptune Polymaster (formerly Komax Polymaster) or Stranco M Series Polyblend modified as necessary to conform to these specifications.

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3.0 Installation

3.01 General

The polymer dilution and feeding units shall be installed in accordance with approved procedures submitted with the shop drawings and as shown, unless otherwise approved.