Liquid Polymer Preparation Equipment

Notes:

Careful review of this specification is required to modify the sections in accordance with the requirements of the project. Notes should be removed prior to final printing.

For industrial and municipal applications in excess of 600 gallons per hour of liquid polymer solution.

This specification is based on best practices as carried out in municipal waste water, mining and pulp and paper industries where liquid polymer preparation and polymer dosing is mission critical for proper process performance. The practices assure consistent makeup concentration, correct ageing time, and high equipment reliability.

Three pieces of equipment are required, the liquid polymer blending system, a polymer solution storage tank, and solution dosing equipment. When properly installed this configuration of equipment assures high quality fully activated solution. A tank of solution to provide uninterrupted supply if there is a need to take the blending system off line. A metering system that meters and further dilutes polymer for use at multiple process points.

The concept of polymer preparation plant meets current needs for chemical and allows for future process improvements with significantly lower costs. For example, a typical in line system dedicated to the current plant will not allow for expansion from 12 to 24 MGD, whereas a properly sized polymer plant will only require the addition of metering pumps for the new processes being added

Part 1 General

Polymer Blending System
Polymer Solution Storage Tank
Solution Metering System – Duplex

1. Submittals:
   1.1. Shop Drawings
      1.1.1. Make, model, weight, and electrical data of each equipment assembly
      1.1.2. Catalog information, descriptive literature, specifications, and material of construction list
      1.1.3. General assembly drawing showing the equipment dimensions, locations of connections and weights associated.
      1.1.4. electrical schematic, showing power and control wiring, inclusive of terminal strip

1.1.5. Motor schedule inclusive of rating, manufacturer and any modifications.

1.2. Operation Manuals

1.2.1. One page easy start-up with electrical schematic. Laminated

1.2.2. Full instruction manual inclusive of installation, start up, operation, lay up, and maintenance.

1.3. Quality Assurance

1.3.1. Factory Test Reports

1.4. Special shipping, storage protection, and handling instructions

1.5. Suggested spare parts list

1.6. List of special tools

Part 2 - Products

Polymer Blending System Specification

1. Design and Material
   1.1. Stainless steel piping and all stainless components on polymer side. Brass or bronze valves may be used on the water side only.

   1.2. Polymer Pumps: Stainless steel internal gear pump or progressive cavity, stainless steel external relief valve with pressure gauge on discharge. Moyno, Netzsch, Seepex, Liquiflo, Eco or equal.

   1.3. Polymer pumps shall be piped in a duty stand by configuration. The stand-by pump shall be protected with non return valves so that the second pump will start automatically without a user needing to open or close valves.

   1.4. The system shall automatically switch to the second polymer pump if the system is unable to dose the correct amount of neat polymer. A contact closure and local alarm light will show Polymer Alert. The system will shut down and initiate a polymer alarm (contact closure and local light indication) if the stand by pump can not provide proper flow within ten seconds of starting up.

   1.5. The operator shall set the polymer concentration between 0.25 and 2.0% at a password protected interface. The system will then determine the

flow rate for polymer based on the current water flow and control the polymer addition to keep the correct polymer concentration. The equation for polymer addition shall be based on volume and allow the variable for bulk density to be changed.

1.6. System uses non mechanical mixing to achieve polymer activation. This can be achieved through the use of a high turbulence injection nozzle with continued low turbulence for polymer solution ageing and homogeneity. Accepted practices are Hydrokinetic Tees, Mixing Tees, Injectors and eductors.

1.7. The system shall be designed so that after the completion of a blending cycle the polymer injection point just after the polymer check valve is flushed no less than three times. This flushing shall occur without the polymer pump starting.

1.8. Water flow is to be monitored by a magnetic flow meter that is of a design to not reduce the water line. The system shall alarm in a no or low water situation and stop operation.

1.9. The system shall be designed so that water flow fluctuations do not cause the system to default to a low water flow alarm. The system shall be designed so as to allow water flow fluctuations up to thirty percent less than the highest system flow rate. The system shall continue to control the correct polymer concentration throughout these fluctuations.

1.10. Frame shall be open design of all stainless steel construction.

1.11. The system shall provide polymer pump run time totalization.

2. Electrical

2.1. The system will be operated be either Relay logic or a commercially available programmable logic controller, capable of programming. No systems with proprietary controls shall be used.

2.2. If a PLC is supplied. A PLC override switch is to be provided. If the PLC override is engaged the system will still be capable of batch make down from level controls in a tank. Polymer no flow and water no flow must continue to operate.

2.3. Electrical and control enclosures shall be NEMA 4X Stainless Steel

2.4. Power connection: 110VAC single phase all power distribution, control circuitry and control to be included in the system.

2.5. All motors to be totally enclosed fan cooled, rated wash down duty with a 1.5 service factor.

2.6. The system shall us variable frequency drives and AC motors for the metering pump.

2.7. The system shall provide a motor starter and overload for a neat polymer tank mixer. A manual-off-Auto switch and indicator light shall be provided. In auto mode the mixer will turn on and off based on settings in the PLC. Operator will be able to set hours off and minutes on.

2.8. The system shall provide a solution tank mixer starter and overload. A manual-off-Auto switch and indicator light shall be provided. In auto mode the mixer will turn on when the feed system is preparing solution and will continue to operate for a period of 0 to 60 minutes based on user defined settings

2.9. System shall be designed to accept conductivity level probes or an analog tank level sensor.

2.10. System shall have a contact closure than stops the system if a high high level condition is reached in the solution tank. This signal will stop the system in manual or auto mode.

2.11. The system shall be supplied with the ability to easily add a biocide pump for the addition of biocide into the dilution water. This function shall be selectable through screens that have a different password that standard user access. The access will allow for the selection of when biocide is to added. The number of batches of polymer being the variable, and for how long that the biocide shall be added, second being the variable. The 110 vac power to operate the pump shall be accessed via a waterproof plug on the side or underneath the control enclosure. The addition of a biocide pump at a later date shall not require any piping changes or additions to be made in the field. This biocide is to control biological growth in the solution storage tank when environmental conditions promote biological growth in the tank media.

3. Manufacturers or Equal
   3.1. Chem-Flow, Model

Solution Storage Tank Specification

1. Design and Material
   1.1. 300 gallon HDPE rotationally molded tank, Covered with cone bottom, raised off the ground to provide flooded suction. Outlet piping shall be a minimum of 1 ½ inches ID with a drain valve and suction isolation valve.

   1.2. Mild steel frame supporting the solution tank. Primed and epoxy coated.

   1.3. A solution tank mixer operating at 440 VAC three phase 60 Hz. Mixer speed shall be less than 450 RPM. One horse power TEFC wash down duty motor is to be used.

   1.4. A low-low level switch separate from any system level control is to be fitted to the tank. The switch shall be set so that the tank will have a minimum level of no less than fifty gallons. The switch is to be used to stop the solution metering pumps from running dry.

   1.5. The tank will be fitted with a high-high level switch. This switch shall be used to stop the Polymer Preparation System in the event of failure of the

   1.6. Stainless steel level probes for stating and stopping the preparation system in batch operation shall be fitted to the tank. The electrodes shall be shielded from splashing polymer.

   1.7. The polymer inlet to the tank shall be piped so that incoming solution does not splash on to the level probes and enters the tank now lower than one third below the top of the tank.

2. Electrical
   2.1. The tank shall have a NEMA 4 electrical enclosure. All electrical and switching is to be terminated in this box.

   2.2. Conductive low voltage level probes are fitted to the tank for connection to a level switching module in the Polymer preparation System.

3. Manufacturers or Equal
   3.1.1. Chem-Flow, Model

Solution Metering System – Duplex

1.0 Design and Material

1.1 System shall be able to accurately meter solution with viscosities up to 10,000 cps. Between a rate of XXX gallons per minute at a pressure of 40 PSI.

1.2 The system shall be of open frame stainless steel construction with stainless steel piping.

1.3 The system shall have two external gear metering pumps piped in a duty standby configuration. Ball valves shall be placed so that a pump can be removed for service while another pump is in operation.

1.4 Relief valves shall be piped from the discharge side of the pump back to the suction inlet. A pressure gauge shall be supplied on the discharge of the pump

1.5 A Koflo calibration column equal to one minutes maximum pump (up to a maximum of four liters shall be supplied. Valves to allow for the filling and isolation of the column to perform a draw down shall be supplied.

2.0 Electrical and Control

2.1 The electrical enclosure will be fitted to the system and will be NEMA 4X. The box will include a lockable isolator, power on light, and pump on lights.

2.2 Each pump shall be controlled by an AC Variable Speed Controller capable of a 10:1 turndown. TEFC wash down duty AC motors will be used to drive the pumps. ACTECH Drives or equal, Leeson, Baldor or equal for motors.

2.3 A manual off auto switch will be provided for each pump. In auto the drive will be remote started and follow a 4-20 mA signal.

2.4 The system shall be supplied with a pump selector switch and a relay to stop the pumps if a tank dry condition is sensed.