Technologic PPS Parallel Pump Controller

GENERAL DESCRIPTON

1. **Mechanical and Electrical Details**

   a. The parallel pumping system pump logic controller shall be the Bell & Gossett Technologic PPS parallel pump controller. The PPS controller shall be specifically designed for the control of multiple pump HVAC hydronic and/or chilled/heated water systems that involves up to 8 variable speed pumps in parallel, staged, sequenced, and standby configurations. The PPS controller can be used with either sensored or sensorless closed-loop hydronic systems.

   b. The Technologic PPS controller shall include a 5.7" TFT touch-screen for all necessary user interface functions. Keypad based interfaces, LCD readouts, and LED displays will not be accepted. The PPS controller shall perform online self-diagnostic testing of the CPU(s), RAM, and flash memory. No data shall be lost during power supply interruptions.

   c. The Technologic PPS controller shall have a NEMA 12 rated cabinet. The PPS controller shall have three levels of password security: one level for user monitoring parameters; a second for supervisor monitor and adjust setup parameters; and a third level to allow technician adjust all the parameters.

   d. The Technologic PPS controller shall be listed by and bear the label of Intertek (ETL) and certified per Underwriter's Laboratory, Inc. (UL) and the CSA safety standards.

   e. The Technologic PPS controller should be able to connect up to 8 pumps and up to 16 analog inputs from VFD

   f. The Technologic PPS controller shall be capable of accepting and processing appropriate signals (DP, Temperature, or Flow) for the following connection in parallel pumping and VFD terminal blocks:

      1. Up to 16 analog inputs (AI; connection is in the VFD) for zone DP or analog input signals 4-20 mA
      2. AI for flow sensor for end of curve protection,
      3. Up to 7 digital inputs (DI), to connect to DP switch for pump protection for the standard configuration
      4. 1 DI for remote connection for start/stop
      5. General system alarm
      6. 1 serial port for communication with the BMS
      7. 1 serial port for communication with the VFDs
      8. 2 USB ports
      9. 1 Ethernet ports
      10. 1 Powerlink Interface
      11. 1 X2X Link Interface
      12. 1 terminal block for 24VDC power supply

13. Input voltage options available 208/230, 460, or 575VAC 60/50Hz

g. Technologic PPS Controller should display the following parameters status:
    1. Total sensorless flow
    2. Sensorless pump head
    3. Total power
    4. Speed of individual pumps
    5. Alarm status
    6. Wire to water efficiency (calculated)
    7. Number of pumps running (max eight)
    8. Lead pump number

h. Technologic PPS Controller should display individual pump and VFD status
    1. Speed Ref (% and Hz)
    2. Run time (hrs)
    3. Pump/VFD fault
    4. Run status (running/stopped in graphic animation)
    5. Current (Amps)
    6. Volts (VAC)
    7. Power (kW)
    8. Pump head (Graphic in real time)
    9. System flow (Graphic in real time)
    10. System curve/pump (Graphic in real time)
    11. Control curve (Graphic in real time)
    12. Pump speed curve (Graphic in real time)
    13. Pump efficiency and power curve

i. The Technologic PPS controller shall allow field adjustments of control parameters as described below.

2. Sequence of Operation for Technologic PPS Controller

a. The system shall consist of a Technologic PPS Controller, multiple pump/VFD sets with manual and automatic alternation and pump staging.

b. When the PPS controller Mode of Operation selector switch is in the REMOTE position, the parallel pumping system shall start upon the closure of customer's contact.

c. When the selector switch is in the LOCAL position, the pumping system shall operate automatically.

d. The Technologic PPS controller shall compare each process variable to the independent, engineer/user determined set-points when the PPS controller runs in sensor operation mode.

e. When all set-points are satisfied by the process variable, the pump speed shall remain constant at the optimum energy consumption level. If the pump feedback from the pumps indicates that the

operating pumps are approaching the end of curve point, the PPS controller shall automatically stage on lag-pumps as required to bring all pumps back to an acceptable operating point.

f. The PPS controller shall continuously update and compare each process variable to its individual set-point.

g. If the set-point cannot be satisfied by the designated lead pump, the PPS controller shall initiate a sequence of operation to stage a lag pump.

h. The lag pump shall accelerate until lead pump(s) and lag pump equalize in speed.

i. Further change in process variable shall cause the pumps to change speed together.

j. When the set-point criteria can be safely satisfied with fewer pumps, the PPS controller shall initiate a destage sequence and continue variable speed operation.

k. As the worst case zone deviates from set-point, the Technologic PPS controller shall send the appropriate speed signal to the VFD to speed up or slow down the pump/motor.

l. In the event of a system feedback failure due to a pump or VFD fault, the PPS controller shall automatically start the next variable speed pump/VFD set in sequence and continue variable speed operation.

m. In the event there is no feedback signal from a pump, its process variable signal shall be removed from the scan/compare program. Alternative pump feedback, if available, shall remain in the scan/compare program for control.

n. The pump number corresponding to the failed feedback signal shall be displayed on the operator interface of the PPS controller.

o. In the event of failure to receive all feedback signals, all VFDs shall maintain a pre-determined speed and per-determined of pumps. Reset shall be automatic upon correction of the zone failure.

p. PUMP or VFD fault shall be continuously scrolled through the display on the operator interface of until the fault has been corrected and the controller has been manually reset.

q. The Technologic PPS controller shall be capable of serial communications with BACnet, Modbus, and Metasys protocols. The PPS controller shall offer the option of gateways for both LonWork and TCP/IP protocol connection for communication over the internet.

3. Alarms

a. General alarm

b. Pumps running fault alarms

c. Drive fault alarms

d. Zone/sensor alarm

e. Drive communication alarm

2. QUALITY ASSURANCE

a. All equipment or components of this specification section shall meet or exceed the requirements and quality of the items herein specified, or as denoted on the drawings.

b. Ensure pump operation, at specified system fluid temperatures without vapor binding and cavitation, is non-overloading in parallel or individual operation, and operates to ANSI/HI 9.6.3.1 standard for Preferred Operating Region (POR) unless otherwise approved by the engineer.

c. Ensure pump pressure ratings are at least equal to system’s maximum operating pressure at point where installed but not less than specified.

d. Equipment manufacturer shall be a company specializing in manufacture, assembly, and field performance of provided equipment with a minimum of 20 years of experience.

e. Equipment provider shall be responsible for providing certified equipment start-up and, when noted, an in the field certified training session. New pump start-up shall be for the purpose of determining pump alignment, lubrication, voltage, and amperage readings. All proper electrical connections, pump's balance, discharge and suction gauge readings, and adjustment of head, if required. A copy of the start-up report shall be made and sent to both the contractor and to the engineer.