ITT

Technologic® 502 Variable Speed Pump Controller

Integrated pump controller and adjustable frequency drive controls up to four pumps in parallel

- Qualify for Green Building Incentive Programs and Rebates
- Achieve LEED Certification
- Sustainable Water Conservation and Energy Efficiency
- Reduced Environmental Impact
- Lower Electric and Water Utility Costs
- Long-Term Economic Returns

Technologic 502 Pump Controller

- **Assures Energy savings**
- **Equipment Payback in 1-3 years**
- **Easy to set up**
- **Reduces equipment wear**
- **Contributes to building LEED certification**

The real world benefits of Energy and Operating cost savings achieved by applying variable speed drives to hydronic pumping systems have been realized for many years. Such benefits include less wear and tear on pumps and control valves, leading to longer equipment lifetime; improved occupant comfort, stemming from equipment operation to meet building load; and cost savings from energy rebates and lower operating cost. The standard variable speed pumping system consists of four basic components:

1.) Pump and motor set
2.) Adjustable frequency drive
3.) PID pump controller with loop diagnostics
4.) Pressure sensor/transmitter

Bell & Gossett, the industry leader, has once again combined two of these key elements into one with the development and introduction of the Technologic 502. A combination pump controller and high quality variable speed drive in one single enclosure. It is the most economical, versatile, and reliable pump control system ever!

Existing constant speed pumping systems can easily be retrofitted by simply replacing the existing starter panel with a pump controller, drives and a remote sensor.

Economical

A single Technologic 502 controls up to four parallel pumps with the addition of three follower drives. Fewer panels also means less interconnecting field wiring for the installer. A unique common panel further reduces field wiring and improves ease of installation.

The system is expandable; the second, third, or fourth drive of equal size can be added at a later date as the system requirements grow by simply changing the program parameters of the Technologic 502 at the time revisions are required.

Versatile

The Technologic 502 is packed with unique features including local and remote start, along with a plain English diagnostic display with soft touch keypad switches. The user has quick access to the multi-fault memory and is able to recall the last 10 faults and related operational data.

This pump controller can accept a combination of four analog inputs for zone sensors, an optional flow sensor to provide flow readout and end of curve protection, or smaller pressure sensor for supply monitoring. In multiple pump systems the Technologic 502 will initiate auto start of lag pumps upon lead pump failure and alternation is both manual and automatic.

Special functions such as no flow shutdown, high system and low suction pressure cutout are available for pressure boosting applications.

The Technologic 502 comes fully equipped for communications with building automation systems. Both through hardwire and an RS-485 interface that utilizes the Johnson Controls N2, Modbus RTU, and Siemens P1 protocol.

Reliable

The pump controller is both UL & cUL listed.

The Bell & Gossett Technologic 502 is designed with customized algorithms to handle the entire range of pumping applications including secondary, tertiary, hot water, chilled water, and pressure boosting.

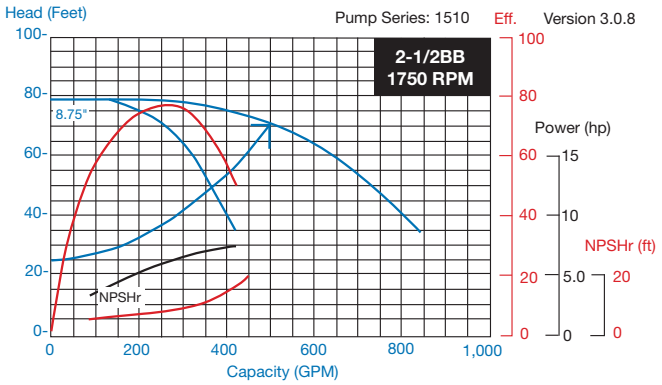
Its proven program safeguards against damaging hydraulic conditions such as pump flow surges, hunting, and system over pressurization.

The logic is held in EEPROM memory storage to prevent accidental loss of data due to voltage surge or spike. In the event of a complete power outage all field values remain stored and can be recalled by the operator.

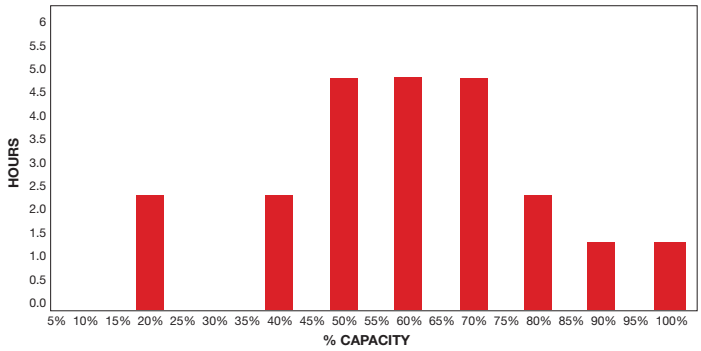
Optional manual or automatic across the line bypass configurations are also available.

Why Variable Speed?

Consider the following example:



System Parameters	
Pump Series: 1510	Impeller Diameter: 8.75 in.
Pump Model: 2-1/2BB	Pump Flow: 500 GPM
Motor Size: 7.5	Pump Head: 70 Feet
Pump Speed: 1750	Number of Pumps: 2



Constant Speed System Analysis

Load	Hours	Flow (GPM)	Head (FT)	Cost/Day	Wire/Water
20%	2.40	100.0	78.54	$0.68	52.17%
40%	2.40	200.0	74.99	$0.99	68.45%
50%	4.80	250.0	70.58	$2.27	70.30%
60%	4.80	300.0	63.98	$2.49	69.58%
70%	4.80	350.0	53.77	$2.68	63.52%
Two Pump Operating in Parallel					
80%	2.40	200.0 200.0	74.99 74.99	$1.98 $1.98	68.45% 68.45%
90%	1.20	225.0 225.0	72.99 72.99	$1.06 $1.06	69.77% 69.77%
100%	1.20	250.0 250.0	70.58 70.58	$1.13 $1.13	70.30% 70.30%

Constant Speed Operating Cost	
Total KW Hours = 48,507	Cost per kwhr = $0.10
Total Hours/Years = 8,760	Annual Operating Cost = $4,851

Variable Speed System Analysis

Load	Hours	Flow (GPM)	Head (FT)	Cost/Day	Wire/Water
20%	2.40	100.0	26.8	$0.20	60.2%
40%	2.40	200.0	32.1	$0.45	64.3%
50%	4.80	250.0	36.1	$1.32	61.7%
Two Pump Operating in Parallel					
60%	4.80	150.0 150.0	41.0 41.0	$1.77	62.9%
70%	4.80	175.0 175.0	46.8 46.8	$2.33	63.5%
80%	2.40	200.0 200.0	53.4 53.4	$1.52	63.6%
90%	1.20	225.0 225.0	61.0 61.0	$0.97	63.6%
100%	1.20	250.0 250.0	69.4 69.4	$1.24	63.5%

Variable Speed Operating Cost	
Total KW Hours = 35,775.3	Cost per kwhr = $0.10
Total Hours/Years = 8,760	Annual Operating Cost = $3,577

Payback Method

Initial Cost of Variable Speed System	$10,000
Initial Cost of Constant Speed System	$ 8,000
Amount to be recovered	$ 2,000
First Year Cost Savings = $4,851-$3,577	$ 1,274
Annual Depreciation Difference	$ 286

Year	Annual Return	Cumulative Return
Year #1	$936	$936
Year #2	$906	$1,842
Year #3	$878	$2,720

True Variable Speed Payback	2.2 Years

Cost savings year after year. Payback in less than three years.

Calculations based on: Annual Discount Rate 8%, Customer Tax Rate 31, Straight Line Depreciation over 7 years, Estimated Energy Cost Excalation Rate 5%

Diagnostic Display
Pump status and alarms

End of Curve Protection
To Protect pumps from operating outside of published/efficient range

Motor Overload Protection
Turns motors off prior to point of damaging electrical conditions

Communication
Hardwire or Serial Communication to BAS

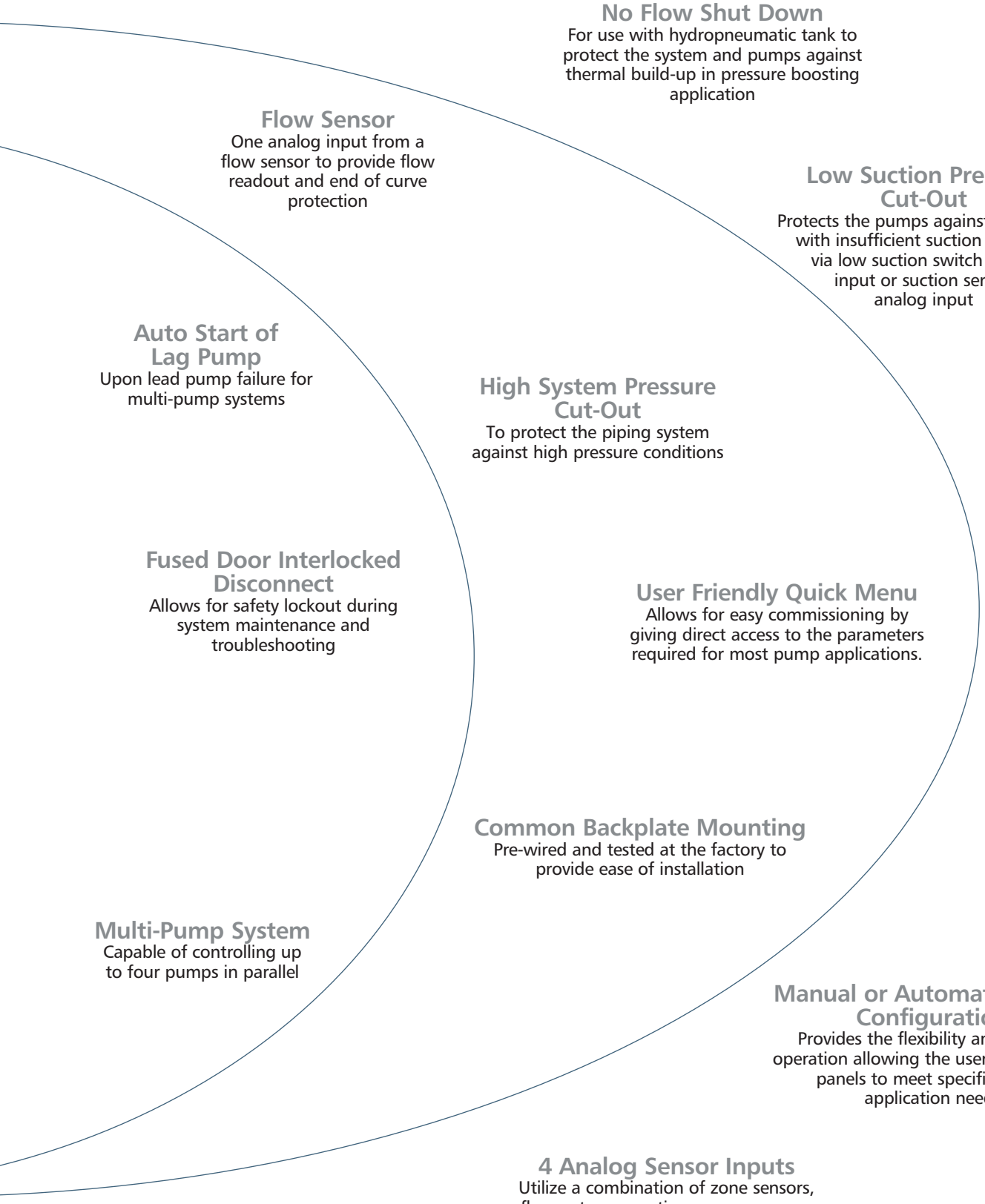
Manual and Automatic Alternation
To provide even pump wear

NEMA 1 Enclosure
Optional NEMA12 or NEMA 3R also available

Duty/Standby Application
Build in redundancy for critical installations

Local-Off-Remote Control
Allows for local control or operation via building operation interface

UL and CUL Listed
Ensures quality products



No Flow Shut Down
For use with hydropneumatic tank to protect the system and pumps against thermal build-up in pressure boosting application

Flow Sensor
One analog input from a flow sensor to provide flow readout and end of curve protection

Low Suction Pressure Cut-Out
Protects the pumps against operating with insufficient suction pressure via low suction switch digital input or suction sensor analog input

Auto Start of Lag Pump
Upon lead pump failure for multi-pump systems

High System Pressure Cut-Out
To protect the piping system against high pressure conditions

Fused Door Interlocked Disconnect
Allows for safety lockout during system maintenance and troubleshooting

User Friendly Quick Menu
Allows for easy commissioning by giving direct access to the parameters required for most pump applications.

Common Backplate Mounting
Pre-wired and tested at the factory to provide ease of installation

Multi-Pump System
Capable of controlling up to four pumps in parallel

Manual or Automatic Bypass Configuration
Provides the flexibility and back up operation allowing the user to customize panels to meet specific critical application needs

4 Analog Sensor Inputs
Utilize a combination of zone sensors, flowmeter, or suction pressure sensor

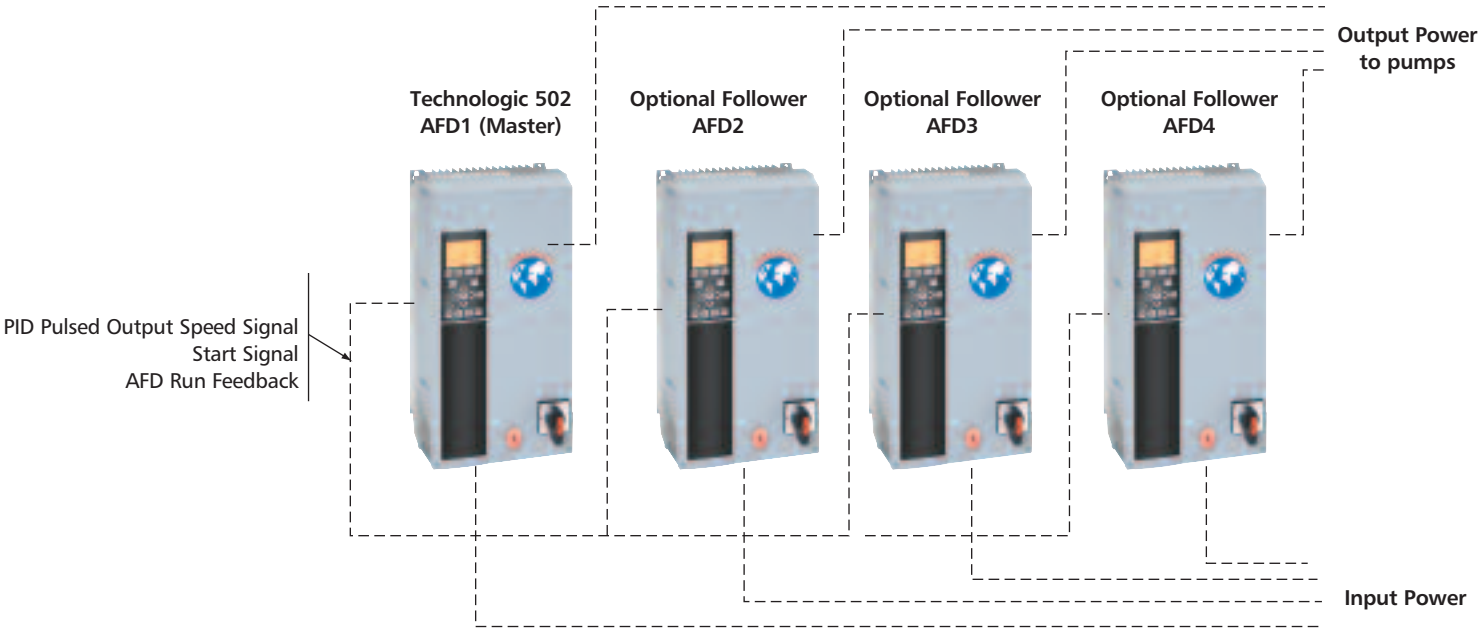
Installation

Ease of Installation

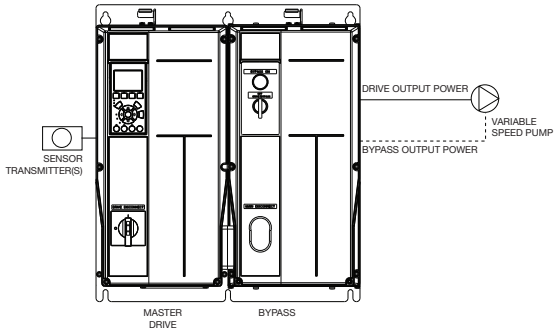
The Technologic 502 Pump Controller and up to three variable speed drives are available on a common backplate with single point power connection. It is ideal for:

- retrofits, utilizing existing pumps
- new installations that do not require a skid mounted unit
- conversion of constant speed units to variable speed

Technologic 502 controller and drives are also available in components for situations where a common backplate is impractical.



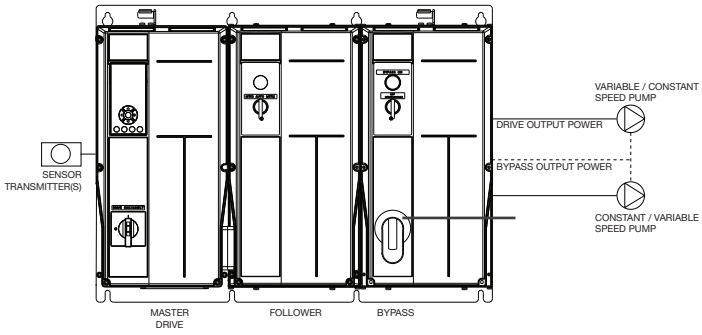
Automatic Bypass (Optional)



TYPE A-1 BYPASS

One pump and one Technologic 502 with Type A-1 Bypass

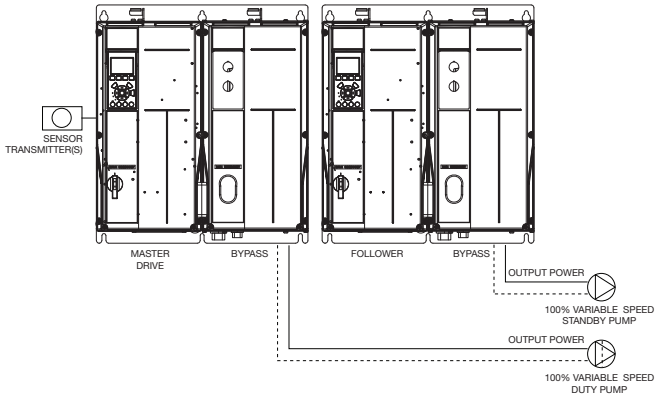
Sequence of operation:
In the "AUTOMATIC" mode, the pump shall operate through the AFD. In the event of a system differential pressure failure due to an AFD fault, the pump controller shall automatically initiate a timed sequence of events to start the pump across the line. The pump shall run at constant speed with motor overload and ground fault connection.



TYPE B-3 BYPASS

Two pumps and a Technologic 502 with Type B-3 Bypass for duty-standby application

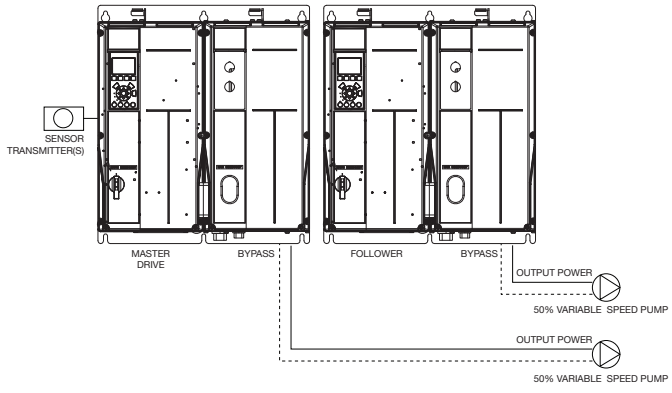
Sequence of operation:
In the "AUTOMATIC" mode, the duty pump shall operate through the AFD. In the event of a system differential pressure failure due to a pump or overload fault, the pump controller will automatically initiate a timed sequence of operation to start the standby pump in variable speed mode. In the event of a system differential pressure failure due to AFD fault, the pump controller shall automatically initiate a timed sequence of operation to start the standby pump across the line.



TYPE C-4 BYPASS

Two pumps, one Technologic 502, one follower AFD, and Type C-4 Bypass for duty standby application.

Sequence of operation:
In the "AUTOMATIC" mode, the duty pump shall operate through the AFD. In the event of a system differential pressure failure due to pump, AFD, or overload fault, the pump controller shall automatically initiate a timed sequence of events to start the remaining pump/AFD set in the variable speed mode. Upon subsequent failures, a timed sequence of events shall bring on a pump in the across the line mode with motor overload and ground fault protection.



TYPE D-4 BYPASS

Two pumps, one Technologic 502, one follower AFD, and Type D-4 Bypass for parallel pumping application.

Sequence of operation:
In the "AUTOMATIC" mode, the pump shall operate through the AFD. The Technologic 502 shall continuously scan and compare each process variable to its individual setpoint and control to the least satisfied zone. If the setpoint cannot be satisfied by the lead pump, the pump logic controller shall initiate a timed sequence of events to stage a lag pump. When the set point criteria can be safely satisfied with one pump, the pump controller shall initiate a destaging sequence and continue variable speed operation. In the event of a system differential pressure failure due to a pump, AFD, or overload fault, the pump logic controller shall automatically start the remaining pump/AFD set in the variable speed mode. In the event of AFD faults, the pumps shall be automatically started sequentially across the line.

Pump Logic Controller

The Technologic 502 pump logic controller assembly shall be listed by and bear the label of Underwriter's Laboratory, Inc. (UL) and Canadian Underwriter's Laboratory (CUL). The controller shall be specifically designed for variable speed pumping applications.

The controller shall function to a proven program that safeguards against damaging hydraulic conditions including:

a. Pump flow surges
b. Hunting
c. End of curve (flow sensor required)
d. System over pressure

The pump logic controller shall be capable of receiving up to four analog inputs from zone sensor / transmitters indicated on the plans. It will then select the analog signal that has deviated the greatest amount from its setpoint. This selected signal will be used as the command feedback input for a hydraulic stabilization function to minimize hunting. Each input signal shall be capable of maintaining a different set point value. Controller shall be capable of controlling up to four pumps in parallel.

The pump logic controller shall have a configurable analog input for a flow sensor. This input shall serve as the criteria for the end of curve protection algorithm.

The hydraulic stabilization program shall utilize a proportional-integral-derivative control function. The proportional, integral and derivative values shall be user adjustable over an infinite range.

The pump logic controller shall be self prompting. All messages shall be displayed in plain English. The operator interface shall have the following features:

a. Multi-fault memory and recall last 10 faults and related operational data.
b. Red fault light, Yellow warning light, and Green power on light.
c. Soft-touch membrane keypad switches.

The display shall have four lines, with 20 characters on three lines and eight large characters on one line. Actual pump information shall be displayed indicating pump status.

Controller shall be capable of performing the following pressure booster functions:

a. Low suction pressure cut-out to protect the pumps against operating with insufficient suction pressure.
b. High system pressure cut-out to protect the piping system against high pressure conditions.
c. No Flow Shut down to turn the pumps off automatically when system demand is low enough to be supplied by the hydropneumatic tank. No Flow Shutdown shall not require any external flow meters, flow switches, nor pressure switches to determine when a No Flow condition exists.

The following hardwire communication features shall be provided to the BAS:

a. Remote system start / stop non-powered digital input
b. Failure of any system component. Output closes to indicate alarm condition.
c. One 4-20 mA output with selectable output of:
    1. Frequency
    2. Process Variable
    3. Output Current
    4. Output Power

The following communication features shall be provided to the Building Automation System via an RS-485 port utilizing Johnson Controls Metasys N2, Moudbus RTU, or Siemens P1 protocol:

1. Individual Analog inputs
2. Individual zone setpoints
3. Individual Pump/AFD on/off status
4. System Percent speed
5. System Start/ Stop command
6. System Operation mode
7. Individual Kw signals
8. System flow, when optional flow sensor is provided

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