

Part 2 – Products

2.01 Lift Station Controller

- A. The Lift Station Controller shall be an off-the-shelf, preprogrammed, dedicated to the application, microprocessor based controller capable of monitoring process variable inputs and automatically control one to three constant speed or variable speed pumps or can be configured for monitoring only purposes. Systems using a one of a kind, non-standardized, custom programming generic controllers represent additional complexity and unproven operation and thus are not in conformance to the intent of the these specifications and will not be acceptable.
- B. The operator interface shall display the current level in feet and represent the level in bar graph form, which dynamically updates based on the level in the wet well. An active/dynamic graphical representation of each pump and its status shall be displayed on the same screen along with flow in gallons per minute. Pump graphic shall change state to indicate – “Off”, “Called”, “Running”, and “Failed/Out of Service”. A trend screen showing, a minimum of, the last 2 hours of wet well level fluctuations shall also be available. The operator interface shall have a display area not less than 3.5” with 160 x 128 pixel resolution, Transflex touch screen graphic display viewable in direct sunlight. The operator interface shall be suitable for Type 12, 4 & 4X environment. Additionally, the front panel shall be manufactured from a UV resistant polyester substrate.
- C. The controller shall be provided with a battery back-up system allowing operation of controller and any loop powered sensors to continue to operate for a minimum of 4 hours during a 120 Volt service power interruption. To prevent the loss of data during an extended power outage, longer than 4 hours, the controller shall have a built in replaceable battery system to keep volatile memory active for approximately 10 years.
- D. The controller shall come standard with herein specified predefined inputs and outputs having a total I/O compliment of 24 discrete inputs, 16 discrete outputs and 2 analog inputs.
 1. As a minimum, in its base configuration, the controller shall be capable of accepting the following input status signals:
 1. Pump 1, 2 & 3 Running
 2. Pump 1, 2 & 3 HOA In Auto
 3. Pump 1, 2 & 3 Seal Failure
 4. Pump 1, 2 & 3 Overtemp
 5. Pump 1, 2 & 3 Overload/VFD Fault
 6. Backup Active
 7. High Level Float
 8. Low Level Float
 9. Control Power Failure
 10. Generator Running
 11. Phase Failure
 12. Station Intrusion
 13. Flow Pulse
 14. Temp Alarm High/Low
 2. As a minimum, in its base configuration, the controller shall be capable of providing the following output status signals:
 1. Pump 1, 2 & 3 Call
 2. Pump 1, 2 & 3 Failure
 3. Pump 1, 2 & 3 VFD Fault Reset
 4. Common Alarm

- 5. Alarm Horn
- 6. Alarm Horn Silence
- 7. Backup Reset

3. As a minimum, in its base configuration, the controller shall be capable of monitoring the following (4-20 mA) process signals:

- 1. Wet Well Level
- 2. Station Flow

E. In addition to the previously specified required monitoring and control signals, the controller shall accommodate, without additional programming, expanded Optional Inputs and Outputs. The following I/O points shall be provided for applications requiring VFD control and or analog temperature measurement:

1. Inputs

- Pump 1, 2 & 3 VFD Speed
- Station Temperature
- Pump 1, 2 & 3 Motor Current

2. Outputs

- Pump 1, 2 & 3 VFD Speed

F. A three level security system shall be provided for authorized operators (OPER) and supervisors (SUPER). The security system code shall be field configurable using 1, 2, 3, 4, or 5 characters. A successful log on or log off shall be recorded as an event on the removable memory module.

1. 1st Level – System will default to non-logged in mode operation. Without being logged in, screens are view only. No adjustments or alarm acknowledgments shall be possible.

2. 2nd Level shall be an authorized OPER – Operator Access

- After successful OPER authorization code has been interceded the operator shall have rights to edit set points and acknowledge alarms

3. 3rd Level shall be an authorized SUPER – Supervisor Access

- All privileges as the OPER
- Right to change the passwords of both SUPER and OPER users
- Right to set lifetime pump runtime and start totals
- Right to toggle communication ports between telemetry communications or local programming modes
- Right to set the controller time and date
- Right to access removable media system screen

4. Shall be provided with factory default passwords

5. To prevent unauthorized controller adjustments, an adjustable 0-999 second delay shall be provided to automatically logoff the current user after the adjustable time period, and no operator screen navigation has been detected.

G. The controller shall be capable of operating pumps in an automatic or manual mode. In automatic mode, a built in alternator shall be available to equalize motor starts, stops and run time. The alternator shall have the capability of being put into fixed sequence mode at any time. Alternation shall also have the capability to alternate cyclically or following an adjustable period of time.

H. As a minimum, the following system setpoints shall be provided:

- | | |
|---|----------|
| • Wet Well Level High and Low Level Alarm * | xx.x ft. |
| • Start Lead*, Lag 1*, Lag 2 * | xx.x ft. |
| • Stop Lead*, Lag 1*, Lag 2 * | xx.x ft. |
| • Pump 1, 2 & 3 Failure To Start Delay | xxx sec |
| • Pump 1, 2 & 3 Seal Failure Delay | xxx sec |

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- Pump 1, 2 & 3 Over Temp Delay xxx sec

Systems requiring monitoring of Temperature, Motor Current or the control of VFDs, will be provided with optional off-the-shelf, I/O expansion cards as necessary to accommodate the additional setpoints:

- High and Low Temp Alarm * xxx deg. F.
- Pump 1, 2 & 3 Motor Current High* and Low Alarm* xxx amps
- VFD 1, 2 & 3 Speed Ramp (High/Low) Setpoints xxx %

* indicates an associated, user adjustable (0-999) seconds time delay shall also be provided to prevent momentary process fluctuations from impacting alarm or control.

I. The controller shall monitor, display and log the following alarms:

1. High or Low Wet Well Level Alarm (Transducer)
2. Pump 1, 2, or 3 Seal Failure
3. Pump 1, 2, or 3 Over Temp
4. Pump 1, 2, or 3 Overload
5. VFD 1, 2, or 3 Failure (if applicable)
6. Pump 1, 2, or 3 Failure (internal to controller, Call No Run)
7. Float Backup Active
8. Low Level Cutout (from floats)
9. High Level Alarm (from floats)
10. Control Power Failure
11. Generator Running
12. Phase Failure
13. Station Intrusion
14. Temp Alarm

J. The controller shall be provided with Pump Status screens that provide the following information and control options:

1. Pump 1, 2, 3 Status (Off, Called, Running, & Failed)
2. Pump 1, 2, & 3 Hard and Soft H-O-A Status
3. Pump 1, 2 & 3 Seal Failure Status
4. Pump 1, 2, & 3 Over Temp Status
5. Pump 1, 2, & 3 Overload Status
6. Today: Pump 1, 2, & 3 Runtime xx.x Hours
7. Today: Pump 1, 2, & 3 Starts xxx
8. Yesterday: Pump 1, 2, & 3 Runtime xx.x Hours
9. Yesterday: Pump 1, 2, & 3 Starts xxx
10. Current (CRNT) Month (MNTH): Pump 1, 2 & 3 Runtime xxxx.x Hours
11. Current (CRNT) Month (MNTH): Pump 1, 2, & 3 Starts xxx
12. Last Month (MNTH): Pump 1, 2, & 3 Runtime xxxx.x Hours
13. Last Month (MNTH): Pump 1, 2, & 3 Starts xxx
14. Total: Pump 1, 2, & 3 Runtime 999999.9 Hours
15. Total: Pump 1, 2, & 3 Starts 999999

K. Navigation

1. A menu system shall be provided for the user with proper access to change setpoints, setup pump starts, stops, alarms, alarm delays and setup pump alternation. The following parameters shall be provided:
 1. Level and Level Delay Setpoints
 2. Alternation – Auto or Fixed mode; Timed or Cyclical
 - a. The operator shall have a choice of selecting automatic or a fixed sequence.
 3. Pump Failure – call, no run

- a. The user shall be able to enter pump failure time for each pump that is enabled. A failed pump will be replaced with the next available pump.
4. Seal Failure and Over Temp
 - a. The user shall be able to enter seal failure and over temp time delays for each respective pump that is enabled.
5. Miscellaneous Alarms
 - a. The user shall be able to enter delays for communications failure, intrusion and high or low temperature.
6. Transducer Range (wet well level)
 - a. A field shall be provided to scale the transducer in feet to setup the vertical scale on the Home screen and an adjustable offset in feet, shall be provided to compensate for the transducer to be raised off the bottom.
7. Volumetric Flow Calculation
 - a. The controller shall provide station flow information based on external flow transmitter or based on high accuracy volumetric process calculations using wet well level excursions as sensed by wet well level transmitter in conjunction with verified pump operations. Systems that do not monitor/use actual pump run feedback in the calculation are deemed unreliable and will not be acceptable.
 - b. The controller shall provide the following flow related information as a minimum:
 - i. Station incoming flow rate (Average).
 - ii. Station Effluent Todays flow total.
 - iii. Station Effluent Yesterdays flow total
 - iv. Station Effluent Previous Month Flow Total
 - v. Station Effluent Current Month Flow Total
8. A controller shall log the pump run time data, alarms and analog data to the removable memory card.

L. Back Up Control

1. The controller shall have a built in back up monitoring system. The backup system shall be configured to allow external operation of pumps in the event of primary sensor failure. In this mode, the float switch inputs shall be monitored to detect high or low level. Upon detection of a float switch high or low level, the controller shall indicate an alarm. Upon detection of Float Backup Active input, the controller shall disable the primary sensor from operating the pumps. Pumps will operate on the high and low level float inputs via backup controller. The controller will stay in this mode until backup system is reset.

M. Unauthorized Intrusion Detection System

1. The controller shall have a built in intrusion detection system to provide premises security. The controller shall monitor an external door switch, proximity sensor, limit switch, etc. to detect door open or closed. When the intrusion system is engaged, the intrusion system shall detect the change of state of the door switch and allow a user adjustable time for an authorized operator to input a security code into the controller operator interface. Successful log in will disable the intrusion system. If unsuccessful, an alarm will be generated. When rearming the system, a user adjustable time delay will start counting and provide time for the operator to vacate the premise and shut any open doors. Once the timer has completed its count, the system shall re-arm itself.

N. Alarms and Historical Events

1. When an alarm is activated it shall be logged with a time and date stamp and displayed in the alarms summary screen until the operator acknowledges it.
2. A historical screen shall provide a historical log for the most recent 64 events

3. An additional screen shall be provided to indicate todays, yesterdays, previous month and current month flow through the pump station.

O. Removable Memory

1. A removable memory storage device shall be provided to store a backup of the program and historical data. Memory module can be used to copy and install configurations including graphics to like controllers in the system or inserted to like replacement controllers. Removable memory shall be sized to allow a minimum of 5 years of data storage or 78 million time and date stamped process data readings. Data storage rates shall provide sufficient resolution of monitored process signals to provide an accurate historical representation of the process. Data shall be formatted in .CSV format and easily read and importable to Windows based applications including Excel or Access for manipulation or longer-term storage of historical data. The memory card shall be easily accessible, without having to remove or disconnect panels, wires or other equipment, allowing for quick removal and replacement.

P. Controller Communications

1. The controller shall include a minimum of two RS-232/RS-485 serial ports (Operating at up to 115 Kbs) and 1 CAN network port.
2. Communications protocol shall be configured based on MODBUS RTU open standard protocol.
3. When enabled, this communication feature shall allow the controller to communicate over optional telemetry equipment including: Phone Line, VHF/UHF/900/Spread Spectrum, Satellite Radio, Fiber Optic and Cellular communication mediums.
4. A CAN port shall be provided to interface with optional CAN-based remote I/O.

Q. Power and Environmental

1. The controller shall operate on 10 to 30 VDC power source. Controller shall be able to operate in an environment with 5 – 95% humidity noncondensing and have a temperature operating range of 14 to 140 Deg. F. or better.

R. Diagnostics

1. The controller shall have built-in diagnostics allowing for on-site troubleshooting of equipment without the need for a Laptop, special programs or specialized training. Diagnostics shall be viewable from the front of the display. The following minimum set of diagnostics shall be available via a self-test command:
 - a. Run and OK status
 - b. Network Status and Usage
 - c. Average Logic Scan rate
 - d. Application Memory Usage
 - e. Loaded Firmware Versions
 - f. Loaded Protocols
 - g. Removable media access

S. Certifications

1. The controller shall be compliant with CE, UL, UL-C and for use in applications requiring Class 1, Division 1 - A, B, C & D classifications.

T. The Lift Station Controller shall be an LSC Controller as manufactured by ICS Healy-Ruff.