SCC Inc.

Specifications

Document No. TS-3010

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Deaerator and Surge Tank Control

Product Description

The deaerator (DA), surge tank (ST), and condensate tank shall have a control system equal to a series TS control system. The system shall have the ability to control up to six (6) pumps with either motor starters or Variable Speed Drives (VSD). Flexible communication interface options to the building management system (BMS) provide streamlined data collection, monitoring, and control.

Sample Specification

1. The major components of the DA/ST control system shall consist of:
   - Mitsubishi FX3U programmable logic controller (PLC)
   - Schneider HMISTU855, 5.7 inch or HMIDT542, 10.4 inch touchscreen operator interface
   - Protocol translator shall translate Modbus TCP/IP to BACnet MS/TP, Ethernet/IP, LonWorks, Johnson Metasys N2, Profinet, or Profibus
   - 24 VDC power supply
   - Individual pump current switches
   - 7MF series pressure sensors, 7MF series differential pressure transducers, and Pt1000 ohm RTD temperature sensors
   - RWF55 single loop PID controllers for water level, Backup water level, and/or pressure control
2. The DA/ST control system shall have the following functionality:
   - The control system shall manage the lead/lag operation, sequencing, and rotation of the feedwater and/or transfer water pumps, and/or condensate transfer pumps via motor starters or Variable Frequency Drives
   - The system shall maintain an adjustable water level setpoint in the DA, ST, and/or Condensate tanks
   - The system shall maintain an adjustable DA tank pressure setpoint
   - The system shall maintain a backup emergency adjustable water level
   - The system shall start and stop the feedwater or transfer water pumps based on the following:
     - An adjustable ON/OFF pressure setpoint, sensed via a transducer in the common feedwater header
     - Feedwater or transfer water pressure setpoint, sensed via a transducer in the common discharge header
     - Feedwater control based on the main steam header pressure, and a setpoint offset between the main steam header pressure and feedwater header pressure
     - Boiler start/stop command to feedwater pumps, one pump start per boiler
   - The system shall provide appropriate information on functionality and status of all pumps by monitoring the following:
     - Current transformer switches
     - Tank pressure
     - Temperature
     - Feedwater or transfer water pump common header pressure

3. The DA/ST control system shall have the following features:
   - Ability to maintain feedwater and transfer water manifold pressures, based on an adjustable setpoint
   - Ability to maintain two feedwater pressure setpoints for two separate headers
   - Ability to maintain DA and ST water level, based on an adjustable setpoint
   - Ability to transfer water from condensate tank to DA/ST, based on condensate tank water level
   - Ability to monitor high, low, and low/low water switch status
   - Ability to monitor pump status via current switches or differential pressure switches
   - Ability to monitor the system and actuate alarms
   - Feedwater and transfer pumps lead/lag rotation based on run time hours
   - Ability to monitor and/or control DA steam pressure
   - Ability to monitor DA and ST water levels, and perform full PID water level control
   - Ability to control pumps via motor starters or VSDs
   - Ability to run the pumps in manual mode via the HAND/OFF/AUTO selector switch in hand, even if the PLC and the touchscreen are corrupted, or damaged
   - Ability to maintain accurate water levels with the RWF55 load controller, even if the PLC and the touchscreen are corrupted, or damaged
   - 5.7 inch or 10.4 inch touchscreen human machine interface (HMI)
   - The standard building automation system interface shall be Modbus TCP/IP
   - BACnet IP, BACnet MS/TP, Ethernet/IP, Profibus, Profinet, LonWorks, Johnson Metasys N2, or Ethernet/IP (Allan Bradley) shall be optional protocols
   - Field configurable RTD and analog inputs, 4 Pt1000 RTD's and up to 8 analog inputs
   - Ability to externally add redundant DA or ST water level control
   - Display graphics representing job specific pump configurations
   - Display graphics representing tray or spray type DA
   - Ability to display low and high water level alarms off of the water level controller when low/high floats are not available
   - Ability to remote monitor via smartphone, tablet, or PC
4. The DA/ST control system shall have the following lead/lag features with motor starters:
   - Each pump motor shall have a status monitoring current switch
   - Pump status and run mode shall be displayed on the HMI, indicating pump availability and position (lead/lag)
   - High pressure, minimum pressure, and time delay shall be entered on the HMI when the desired feedwater header pressure is met and/or the transfer water pump is operating
   - Each pump shall have an HAND/OFF/AUTO selector switch
   - The pump selector switch shall be placed in AUTO position to follow the lead/lag sequence, and to allow the DA/ST control system to monitor the feedwater or transfer header pressure
   - The pump selector switch shall be placed in HAND position to allow continuous run, unless there is an alarm present or low water level is detected
5. Motor starter sequence of operations shall consist of the following: (This sequence also applies to differential pressure setpoint between the main steam header and feedwater manifold pressure)
   - The lead pump shall be activated and run continuously

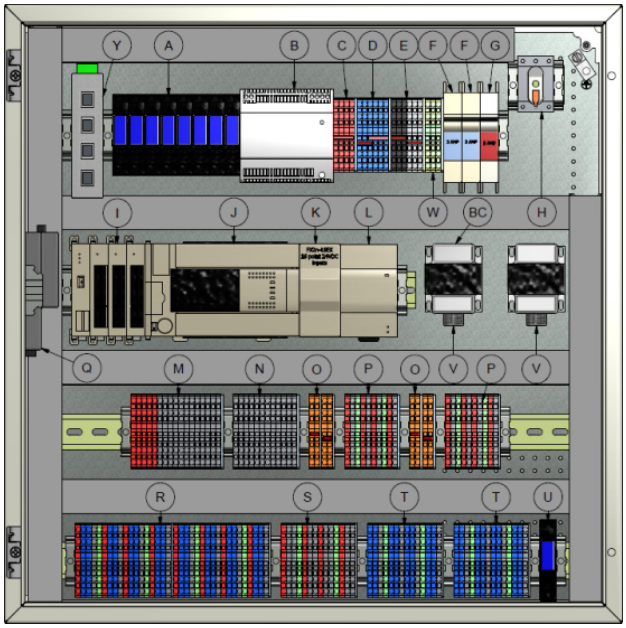
- Lag 1 pump shall start if the feedwater header pressure or transfer pump header pressure drops below the minimum pressure setpoint for an adjustable time delay between 0 and 30 minutes
- With Lead and Lag 1 running, Lag 2 pump shall start if the feedwater header pressure drops below the minimum water pressure setpoint for a time exceeding the adjustable start delay
- The system shall keep adding lag pumps whenever the feedwater or transfer header pressure drops below the minimum allowable pressure setpoint
- The last lag pump shall be dropped offline when the combination of lead and lag pumps raise the feedwater or transfer header pressure above an adjustable pressure setpoint for an adjustable period of time
- The second to last lag pump shall be dropped offline if the pressure rises above the high pressure setpoint for a time exceeding the adjustable stop delay
- The system shall continue to shut down lag pumps whenever the feedwater or transfer header pressure rises above high pressure setpoint for a time exceeding the adjustable stop delay
- The RWF55 water level control shall modulate the DA or ST makeup water valve to maintain the desired water level
- The RWF55 water level control shall modulate the steam balancing valve to maintain DA steam pressure setpoint, if applicable
- The lead pump shall be rotated back to the last pump in the lag sequence, based on lead pump operating time
- The lead pump rotation sequence shall be: 1,2,3,4,5,6 – 2,3,4,5,6,1 – 3,4,5,6,1,2 etc..
- If the online lead or lag pump fails, the next pump in the sequence shall be activated

6. Lead/lag sequence of operation with a VSD shall consist of the following:
    - If the feedwater or transfer header pressure is below setpoint, the system shall activate the lead pump VSD, and execute a PID algorithm based upon the programmed header pressure setpoint
    - The lead pump VSD shall activate after it receives the modulating 4-20mA signal from the PID control output
    - The lead pump shall modulate to maintain feedwater or transfer header pressure setpoint
    - If the PID output approaches the lag pump start setpoint for an adjustable start delay, Lag 1 pump VSD shall be activated and receive the same modulating signal as the lead pump
    - The lead and lag pumps shall run and modulate in unison to maintain the setpoint
    - Lag 2 pump VSD shall activate and receive the same modulating signal if the system PID output approaches lag pump start setpoint for a time exceeding the adjustable start delay
    - The system shall keep adding and modulating pumps when the PID output reaches the lag pump start setpoint
    - The last lag pump shall be dropped offline if the PID output drops to the drop pump output setpoint for a time exceeding the adjustable stop delay
    - The second to last lag pump shall be dropped offline if the PID output drops again to the pump drop output setpoint for a time exceeding the adjustable stop delay
    - The system shall continue to shut down the lag pumps when the PID output drops below the pump drop setpoint for a time exceeding the adjustable stop delay
    - The lead pump shall be rotated back to the last pump in the lag sequence, based on lead pump operating time
    - The lead pump rotation sequence shall be: 1,2,3,4,5,6 – 2,3,4,5,6,1 – 3,4,5,6,1,2 etc.. If the online lead or lag pump fails, the next pump in the sequence shall be activated

Dimensions

For dimensions, reference TS-3000 data sheet.

Parts Description



A	Pump and DA/ST low water relays	N	Pump start/stop terminals
B	24 VDC power supply	O	24 VAC feedwater actuator power terminals
C	24 VDC (+) terminals	P	4-20 mA feedwater modulating output terminals, and 4-20 mA level DP terminals
D	24 VDC (-) terminals	Q	BMS interface for communications other than Modbus
E	120 VAC terminals	R	Analog input terminals
F	Water level circuit breaker	S	RTD input terminals
G	System power circuit breaker	T	VFD analog output terminals
H	System 120 VAC disconnect	U	Alarm relay output terminals
I	Analog and RTD input modules	V	Feedwater valve, 24 VAC transformer
J	Programmable logic controller (PLC)	W	Ground terminals (PE)
K	Digital input module	Y	5-port Ethernet switch
L	Analog input module	BC	2nd feedwater valve, 24 VAC transformer
M	Digital input terminals		