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1. INTRODUCTION

The following Process Control Narrative describes in detail the operation of the orthophosphate dosing system and associated equipment and controls. The operating conditions and scenarios described below include but are not limited to most conditions and scenarios which will be encountered.

1.1 Process Overview

The orthophosphate dosing system will have a main dosing stream; chemical would be dosed upstream of the UV (disinfection system). Dosing would help in controlling the corrosion in reticulation system. The dosing streams will consist of variable speed metering pumps (duty/standby) located in the UV Disinfection Building.

2. CONTROLS

2.1 Vendor Supplied PLC

N/A.

2.2 Remote-Auto

Pre-UV Orthophosphate Metering Pump Operation

The orthophosphate dosing upstream of the UV disinfection facility will be used to control corrosion within the distribution system. During normal operation, orthophosphate will be dosed prior to the UV header during the low demand season. Orthophosphate dosing will flow pace based on the Total Treated Water Flowrate. The Orthophosphate system will have one duty variable speed drive pump and one standby pump to dose orthophosphate.

The metering pumps P-861, P-862, will have VFDs to control the orthophosphate pumping rate to treated water going to the UV reactors. The pumps' speed will be flow paced based on an operator target dose and the Total Treated Water Flowrate to the UV Disinfection Facility.

The number of Duty Metering Pumps will be determined based on the following criteria:

- Flow of Orthophosphate less than or equal to 20L/hr = 1 Duty Metering Pump
- If the flow of orthophosphate exceeds the capacity of the duty dosing pump, then an alarm will be sent to SCADA and the standby pump will be run to meet the required orthophosphate flow.

The orthophosphate dose is flow paced with the flow to the UV system. The operator would set the target dose in mg/L of orthophosphate. The process control system (PCS) would calculate the flowrate of the chemical in L/hr for the dosing pump using the pump calibration input (mL/revolution), target dose (mg/L), specific gravity of chemical (SG), and the treated water flowrate. The operator will manually input the values of mL/revolution via calibration of the pumps weekly and PCS will calculate the pump speed and send a signal to the pump (to increase or decrease the flow). If the operating duty or pump becomes unavailable, then the standby pump will be started and an alarm would be raised on the SCADA.



Whenever a duty pump fails, the standby pump will run at the same speed that the unavailable pump was running. The operator will be able to adjust the speed of the pump manually through the SCADA/HMI system if required.

During normal operation, the duty pump selection will be done manually on the HMI by the operator.

Leak detection will be carried out by each pump equipped with a leak sensor within the pump casing. In the event of a detected leak, the pump will be shutdown and standby pump will start. An alarm will be generated to SCADA.

2.3 Remote – Manual

2.4 Local Control

3. START-UP AND SHUT DOWN SEQUENCES

3.1 Commissioning and First Start-Up

3.2 Start-Up Following a Planned Shut Down

3.3 Planned Shut Down

3.4 Emergency Shut Down and Power Failure

4. CONTROL SYSTEM DETAILS

4.1 Interlocks

The table below identifies how the control system responds to key failure and process interlock conditions.

Tag No.	Event	Type	Control System Action
P-861/P-862	Duty, and standby pumps fail	Alarm	Alarm on SCADA and immediately change the pumps.
P-861/P-862	Leak detection	Alarm	Alarm on SCADA.



4.2 System Set Points, Status and Alarms

Legend:

1. D – Display on a screen
2. S – Display and operator input on a screen
3. I – Physical I/O
4. R- Internal Register
5. Alarm Level Priority 1 – High Priority Dial Out
6. Alarm Level Priority 2 – High Priority – Immediate Action - No Dial Out
7. Alarm Level Priority 3 – Low Priority
8. L – Logged to database
9. T – Display on trend

The following list may not contain all required plant control system tags and signals. The contractor is to do a detailed take-off from all drawings and specifications and determine all required tags and signals.

TAG	Signal/Tag Description	Display and Register Type	Alarm Level	Trend/Logging	Notes or Range
Signal/Tag Description SCADA/HMI Engineer adjustable set points					
Description SCADA/HMI Operator adjustable set points					
Orthophosphate Dosing Setpoint					
SC-861/862	Dose rate setpoint				1-5 mg/L
SI-726	Speed Control				0-100%
Orthophosphate Feed Pump 1					
YI/YIR -861	Dosing Pump Start/Stop Command				0-1
SI-861	Speed Control				0-20 L/hr
UC 862	Calibration setpoint				mL/revolution
Orthophosphate Feed Pump 2					
YI/YIR -862	Dosing Pump Start/Stop Command				
SI-862	Speed control				0-20 L/hr
UC 862	Calibration setpoint				mL/revolution
Description SCADA/HMI status signals					
Orthophosphate Feed Pump 1					
YIR-861	Running status				0-1
YA 861	Auto/Remote status				0-1
SI-861	Speed Indication				0-20 L/hr
Orthophosphate Feed Pump 2					
YIR-862	Running status				0-1
YA-862	Auto/Remote status				0-1
SI-862	Speed Indication				0-20 L/hr
Description SCADA/HMI alarm signals					
Orthophosphate Feed Pump 1					
YA-861	Pump Fault				0-1



TAG	Signal/Tag Description	Display and Register Type	Alarm Level	Trend/Logging	Notes or Range
Orthophosphate Feed Pump 2					
YA-862	Pump Fault				0-1