Appendix H

Process Control Narrative

1. OPERATING DESCRIPTION OF PLANT

1.1 General

.1 Provide control system programming and configuration services to achieve the operational functionality generally as described in the control descriptions provided in this section and in compliance with Contract Documents.

.2 This Section outlines the proposed operation and control strategies for the Scum Dewatering System and Scum Collection System.

.3 It should be noted that these control descriptions are provided as a guide to the intent of the main control strategies for the Scum Dewatering System and do not purport to describe every detail and nuance of the completed programs. The control system integrator and Contractor must study contract documents and take into consideration the NEWPCC standard practices for PLC program design, graphics objects characteristics, screen layouts, and operator interface features.

.4 All aspects of the new control sequences, operator interface, and remote monitoring must be thoroughly tested in cooperation with the City and the Engineer to demonstrate correct functioning of all control system features and to verify that all interlocks and alarms are functioning properly.

.5 All process equipment shall be equipped with at least one (1) local control panel.

.6 All package equipment status points will be monitored by the SCADA, recorded by the historian or recorded in short term storage, and available to be trended. Important operating measurements will be visible directly on the process's Human Machine Interface (HMI) screen. All package equipment available control inputs will be integrated with the main plant Process Control System (PCS).

.7 All equipment will be able to be run remote manual by the operators from the SCADA. All equipment not in automatic mode from a physical Hand/Off/Auto switch will raise the alarm "Not in Auto".

.8 When under PCS control (Auto/Manual Mode), all equipment (pumps, fans, valves, etc.) will have fail to start/open/close alarms if the status feedback does not meet the control demand within the expected time. The alarm will be latched and require Operator reset. PCS will deem the equipment fails.

.9 All tanks with level monitoring will have a high level alarm, and a low level alarm.

.10 All equipment will raise alarms when a fault is generated, or abnormal operating conditions are detected. See equipment specifications and manufacturer's ratings for operating condition limits.

.11 The vendor package control systems will interface with the PCS PLCs via hardwired commands and statuses as shown on the P&IDs. Vendor package control systems which include local HMI the data shall be available in the plant HMI.

.12 Refer to Appendix H for a proposed list of Alarms and Setpoints. The list is to be finalized during commissioning.

2. SCUM COLLECTION SYSTEM

2.1 General

.1 Primary scum is currently collected and pumped to the existing digesters. Scum collection from primary clarifiers no. 1, 2 and 3 is not automated; their scum troughs are manually controlled to rotate ninety degrees to collect scum from the surface of the circular tanks. Scum Tank 1, which is dedicated to the circular clarifiers, is not in use; the scum is conveyed directly to the scum pump suction piping. Scum collection from primary clarifiers no. 4 and 5 is automated and the scum is conveyed to Scum Tank 2.

.2 As part of this project, scum collection will be automated for primary clarifiers no. 1, 2 and 3 to Scum Tank 1. To automate scum collection, the scum trough will be controlled to automatically rotate (XV-P11110, XV-P11210, XV-P11310) to collect scum when the clarifier surface skimmer passes by the collection trough. The scum withdrawn from clarifiers no. 1, 2 and 3 will be re-routed to Scum Tank 1 located in the scum room, while the scum from clarifiers no. 4 and 5 will continue to be discharged to Scum Tank 2 between primary clarifiers no. 4 and 5.

.3 The Primary Clarifier Mechanisms (P104-1PM1, P204-2PM2, P304-1PM3) can be operated in Remote Automatic, Remote Manual, and Local Manual mode.

.1 In Remote Automatic mode:

.1 The Primary Clarifier Mechanisms will rotate continuously. The mechanism will stop if a High High Torque alarm is active (OSHH-P11100, OSHH-P11200, OSHH-P11300).

.2 In Remote Manual mode:

.1 The Primary Clarifier Mechanisms can be turned on and off through the pop up faceplate on the PCS HMI.

.3 In Local Manual mode:

.1 The Primary Clarifier Mechanisms can be started and stopped at the local control station (HS-11100, HS-11200, HS-11300).

.4 The PCS will display a High Torque alarm as triggered by torque switches OSH-P11100, OSH-P11200, OSH-P11300.

.4 The Scum Trough (XV-P11110, XV-P11210, XV-P11310) can be operated in Remote Automatic, Remote Manual, and Local Manual Control.

.1 In Remote Automatic mode:

.1 The skimmer triggers the limit switch (ZS-P11111, ZS-P11211, ZS-P11311) every time it passes by the Scum collection trough to count the rotations.

.2 When the skimmer triggers the limit switch, operator adjustable time setting on PCS HMI will be provided (Minimum Value: 1s, Maximum Value: 3600s) to delay the opening the trough until skimmer reaches desired location for the trough to collect the scum. Then the trough to open.

.3 Based on a user adjustable number of rotations on the PCS HMI(Initial Value: 1, Minimum Value: 1, Maximum Value: 100) the Scum trough will open for another user adjustable time (Initial Value: 30s, Minimum Value: 0s, Maximum Value: 300s) to collect scum.

.1 If a fault is detected on the Scum Troughs (XV-P11110, XV-P11210, XV-P11310) valve XV P31101 will automatically close to prevent filling the Scum Tank 1A/B with wastewater.

.2 The operator can isolate the faulted Primary Clarifier by manually closing valves HV-P3110-D, HV-P3110-B or HV-P3110-C.

.3 The operator can then reopen XV P31101 to so that Scum Tank 1A/B can continue collecting scum from the unaffected Primary Clarifiers.

.2 In Remote Manual mode:

.1 The operator can open and close the scum trough through the pop up faceplate on the PCS HMI.

.3 In Local Manual mode:

.1 The scum trough can be controlled locally by the use of the Open/Close hand switch.

2.2 Start-up and Shut-down Sequences

.1 The following describes the start-up sequence for this area of the plant and the other upstream or downstream process units that are affected by the start-up sequence.

.1 Commissioning and First Start-Up:

.1 The following procedure shall be used for putting the Primary Clarifiers into service for the first time or after a major repair:

.1 Conduct pre-commissioning checks and tests and take any necessary remedial measures.

.2 Calibrate instrumentation.

.3 While the Primary Clarifiers and influent and effluent pipes are empty, start and verify the rotation, movement and alignment of each piece of equipment.

.4 Remove all debris from pipes, channels or equipment.

.5 Power up equipment as per Manufacturer’s instructions.

.6 Complete all SAT, SIFT,SIT checks per Specification Section 40 96 01 and 40 96 02.

.7 Ensure that the valves at the inlet and outlet of the Primary Clarifier have been set to the proper position.

.8 When all checks have been completed, place LOR switch in Remote and start equipment using the Plant PCS.

.9 Check Remote-Auto sequence functions properly.

.2 Start-up Following a Planned Shut-Down:

.1 The following procedure can be used to start-up the Primary Clarifier mechanism system:

.1 While a Primary Clarifier is not in service, start and verify the correct performance of each piece of equipment in that train.

.2 While the Primary Clarifier, and influent and effluent pipes are empty, start and verify the rotation, movement and alignment of each piece of equipment.

.3 Power up equipment as per Manufacturer's instructions.

.4 Ensure that the gate valves at the inlet and outlet of the Primary Clarifier have been set to the proper position.

.5 Introduce screened raw sewage into the Primary Clarifiers' influent pipe and verify the operation of the valves. The clarifier mechanism shall be running while influent is introduced into the Primary Clarifiers to prevent over torquing the mechanism if it is started after the clarifier is full.

.6 Start the equipment from the HMI using the PCS system (the selector switch on the LOR is in Remote).

.7 Check Remote-Auto sequence functions properly.

.3 Emergency Shut Down and Power Failure:

.1 Emergency Shut Down:

.1 Emergency shut down can be initiated by pushing the E-stop button on the Local Control Panel for the following equipment:

.1 Primary Clarifier mechanisms.

.2 Hardwired Interlocks:

.1 Torque High-High Switch.

.2 E-Stop push button.

.3 Primary Clarifier mechanisms to retain last state after restore power after a power failure.

3. SCUM TANKS RECIRCULATION PUMPS

3.1 General

.1 Scum Tank 1A/1B will collect the scum from Primary Clarifiers 1-3. Scum recirculation pump P-P3211 will recirculate scum through the tank to keep the solids in suspension.

.2 Scum Tank 2 will collect the scum from Primary Clarifiers 4 and 5. Scum recirculation pump P-P3221 will recirculate scum through the tank to keep the solids in suspension.

.3 The Plant Control System (PCS) controls the operation of the scum pumps.

3.2 Controls

.1 Scum recirculation pumps can be operated in Remote Automatic, Remote Manual, or Local Manual mode:

.1 In Remote Automatic mode:

.1 The Scum pumps will run continuously at pre-set speed when the level (LIT-P31111, LIT-P31121, LIT-P32111) in the respective scum tank is above the minimum tank level operator adjustable set point (set at commissioning).

.2 The scum pumps have software interlocks in the PCS to prevent the pump from starting if the suction valve is not open (XV-P31113 OR XV-31123 for P-P3211, XV-32212 for P-P3221) and alarm will be generated.

.2 In Remote Manual mode:

.1 The Scum pumps are manually started and stopped by the operator from the pop up faceplate on the PCS HMI. The pump speed in manually set.

.2 The scum pumps have software interlocks in the PCS to prevent the pump from starting if the suction valve is not open (XV-P31113 OR XV-31123 for P-P3211, XV-32212 for P-P3221).

.3 In Local Manual mode:

.1 The Scum recirculation pumps can be started and stopped at the local control panel (HS-P32110, HS-P32210). The speed of the pumps can be adjusted at the associated VFD Human Machine Interface (HMI).

3.3 Start-up and Shut down Sequences

.1 The following describes the start sequences for this area of the plant and the other upstream or downstream process units that are affected by the start-up.

.1 Start-up Following a Planned Shut Down:

.1 For a major shutdown where maintenance work is carried out, it may be necessary to complete the 'first start-up' procedure. If the pumps (P-P3211 & P-P3221) are simply starting up after a planned shutdown, start-up can be controlled by the PCS and operator, as described in 3.2. It can also occur in manual mode at the PCS, or be done locally at the field controls for the pumps.

.2 The following procedure can be used to start-up the Scum pumping system:

.1 While the pumping system is not in service, start and verify the correct performance of each piece of equipment in that train.

.2 Prior to start-up, the pipes shall be checked for debris or sludge accumulation and cleaned if necessary.

.3 Ensure that the isolation valves are in the correct position.

.4 Power up equipment as per Manufacturer's instructions.

.5 Ensure that the dewatering system is in operation.

.6 Once flow has been established, start the equipment from the main control panel using PCS system (the selector switch on the remote operator station is in Auto).

.7 Check Remote-Auto sequence functions properly.

.8 The operator will have an option to set FSW valves XV P32112 and XV P32212 to on the recirculation pumps to open automatically for an operator adjustable period when the pumps start to flush the pipes.

.2 Planned Shut Down:

.1 To shut down the equipment, the operator undertakes the following steps:

.1 Stop the Scum pumps (P-P3211 & P-P3221), switch pump control to remote manual on PCS HMI and stop the pumps to be taken out of service, as per manufacturer's instructions.

.2 Turn LOR selector switch to off position to lock out the Scum pumps (P-P3211 & P-P3221) at the MCC.

.3 Flush the pipes upstream and downstream of the pumps.

.4 Close the isolation valves upstream and downstream the pumps (HV-P3211-A & HV-P3211-B and HV-P3221-A& HV-P3221-B) to be taken out of service.

.3 Emergency Shut Down:

.1 Emergency shut down for the pumps (P-P3211 & P-P3221) can be achieved by placing the LOR switch in the off position.

.2 Emergency shut down can be activated by Emergency shut down for each pump can be activated by placing the LOR switch in the off position Control System Details.

.4 Controls and Interlocks:

.1 PCS Interlocks:

.1 Low tank level below operating set point provided by (LIT-P31111, LIT-P31121 and LIT-P31131) for tanks 1A/1B and 2 respectively.

.2 Suction valves XV-P31113 and XV-P31123 closed for pump P-P3211.

.3 High pressure from PIT-P32111 for pump P-P3211.

.4 High pressure from PIT-P32211 for pump P-P3221.

4. SCUM TRANSFER PUMPS AND SCUM RECIRCULATION LOOP

4.1 General

.1 Scum Tank 1A/1B will collect the scum from primary clarifiers 1, 2 and 3: During normal operation scum will be transferred via scum transfer pumps P-P3212 and P-P3213 (duty/standby) to the Scum Dewatering Building and flow in a recirculation loop between the Dewatering Building and Tank 1.

.2 Scum Tank 1A and 1B will be interconnected with valve HV-P3113-A to maintain a balance between the two compartments.

.3 During normal operation Scum Tank 1A will also receive scum from Scum Tank 2 from pumps P-P3222 and P-P3223.

.4 During normal operation Scum Tank 1B will receive scum from scum recirculation loop from the Dewatering Building.

.5 Scum Tank 2 will collect the scum from Primary Clarifiers 4 and 5. During normal operation scum will be transferred via scum transfer pumps P-P3222 and P-P3223 (duty/standby) to the Scum Tank 1A.

.6 Actuated valves XV P32222, XV P32232, XV P33111, XV P33121, FV 33112, FV 33122 and XV P33131, FV P33121, FV P33131 are set by the operator to control the path of the scum flow and recirculation.

.7 Actuated valves FV P33112 and FV P33122 are automatically modulated to control the flow of scum to the dewatering presses by the rotary press PLC.

.8 The Plant Control System (PCS) controls the operation of the scum pumps.

.9 Valves required for setting which Tank transfers scum to which rotary press are shown in the following table. The table indicates the valve states required for desired scum flow path.

Table 4-1: Valve States

Transfer From	Transfer To	Valve State (X = Closed; O=Open)												
		XV- P32222	XV- P32232	FV- P33131	XV- P33111	XV- P33121	HV-P3313-A	HV-P3313-B	FV- P33112	FV- P33122	XV-P31101	HV-P3110-E	HV-P3111-A	HV-P3112-B
Tank 1	Rotary Press 1	O	X	X	O	X	O	X	O	X	O	X	O	O
Tank 1	Rotary Press 2	O	X	X	X	O	O	X	X	O	O	X	O	O
Scum from PC1-3	Tank 2										O	O	X	X
Tank 2	Tank 1	O	X											
Tank 2	Rotary Press 1	X	O	X	O	X	X	O	O	X	O	O	X	X
Tank 2	Rotary Press 2	X	O	X	X	O	X	O	X	O	O	O	X	X
Tank 1	Digesters	O	X	O	X	X					O	X	O	O
Tank 2	Digesters	X	O	O	X	X					O	O	X	X

.10 Scum is returned through the recirculation loop back to the Scum Tank 1B.

.11 Alternative scum flow paths:

.1 In case of Tank 1A/1B shutdown all scum from Primary Clarifiers 1-3 can be directed by gravity to Tank 2 via manual valve HV-P3110-E.

.2 There will also be an option to transfer the scum from Tank 2 to the Dewatering Building. Refer to **Table 4-1**.

.3 In emergency operators will have an option to transfer the scum to the Digesters via the scum transfer pumps by opening mechanized valves XV P33131 and closing XV P33111 and XV P33121. The scum transfer pumps speed when the valve XV P33131 is open will be on operator adjustable setpoint to control the flowrate to the Digesters. Refer to **Table 4-1**.

.4 In emergency operators will have an option to transfer the filtrate to either the Control Chamber Inner Ring or Outer Ring via existing connections and manual valves.

.12 Scum Recirculation Loop:

.1 Scum will be pumped in a recirculation loop between the scum tanks and the dewatering building to provide adequate velocity in the scum line to prevent deposition.

.2 Valves FV P33121 and FV P33131 can be closed to close the loop. Valves FV P33121 and FV P33131 will be interlocked with valves FV P33112 and FV P33122 to control the valves in reverse relationship.

.3 Valves HV-P3313-A and HV-P3313-B can be used to control the flow of scum return to either Scum Tank 1A or Scum Tank 2.

4.2 Controls

.1 The Scum Transfer Pumps P-P3212 and P-P3213 service Scum Tank 1 in a duty standby configuration. Scum Transfer Pumps P-P3222 and P-P3223 service Scum Tank 2 in a duty standby configuration.

.2 Each pump can be operated in Remote Automatic, Remote Manual, or Local Manual mode.

.1 In Remote Automatic mode:

.1 The pump will be controlled based on the Section 4.4 describing the normal pump operation.

.2 In Remote Manual mode:

.1 The transfer pump can be started and stopped via the pop up faceplate from the PCS HMI. The pump will run at the manual speed set point operator adjustable on PCS HMI screen.

.3 In Local Manual mode:

.1 The pump can be started and stopped by the hand switch (HS-P-32220, HS-P32230, HS-P32120, HS-P32130) at the local control panel.

.2 The pump speed can be adjusted at the VFD keypad.

.3 The Scum Transfer Pumps P-P3212 and P-P3213 will be initially set to 100% speed (operator adjustable speed) to run the loop.

.4 The Scum Transfer Pumps P-P3222 and P-P3223 will be initially set to 60% speed (operator adjustable) to transfer scum to Tank 1.

4.3 Start-up and Shut Down Sequences

.1 The following describes the start sequences for this area of the plant and the other upstream or downstream process units that are affected by the start-up.

.1 Start-up Following a Planned Shut Down:

.1 For a major shutdown where maintenance work is carried out, it may be necessary to complete the ‘first start-up’ procedure – Section 2.2.1. If the pumps (P-P321&P-P3213 and P-P3222&P-P3223) are simply starting up after a planned shutdown, start-up can be controlled by the PCS and operator, as previously described in 4.2. It can also occur in manual mode at the PCS, or be done locally at the field controls for the pumps.

.2 The Operator is required to restart the Scum pumps (P-P3212&P-P3213 and P-P3222&P-P3223) after a fault.

.3 The following procedure can be used to start-up the Scum pumping system:

.1 While the pumping system is not in service, start and verify the correct performance of each piece of equipment in that train.

.2 Prior to start-up, the pipes shall be checked for debris or sludge accumulation and cleaned if necessary.

.3 Ensure that the isolation valves are in the correction position.

.4 Complete all SAT, SIFT, SIT checks per specification Section 40 96 01 and Section 40 96 02.

.5 Power up equipment as per Manufacturer's instructions.

.6 Ensure that the dewatering system is in operation.

.7 Once flow has been established, start the equipment from the main control panel using PCS system (the selector switch on the remote operator station is in Auto).

.8 Check Remote-Auto sequence functions properly.

.2 Planned Shut Down:

.1 To shut down the equipment, the operator undertakes the following steps:

.1 Stop the Scum pumps (P-P3212&P-P3213 and P-P3222&P-P3223) to be taken out of service, as per manufacturer's instructions.

.2 Flush the pipes upstream and downstream of the pumps.

.3 Close the isolation valves upstream and downstream the pumps () to be taken out of service.

.4 Lock out the Scum pumps (P-P321&P-P3213 and P-P3222&P-P3223).

.3 Emergency Shut Down:

.1 Emergency shut down for the pumps (P-P321&P-P3213 and P-P3222&P-P3223) can be activated by placing the LOR switch in the off position.

.4 Controls and Interlocks:

.1 PCS Interlocks:

.1 Scum pumps (P-P321&P-P3213 and P-P3222&P-P3223) are disabled by a Scum Tank 1 and Scum Tank 2 low level alarm.

.2 Flow Control Valves FV P3311 and FV P3312 are automatically closed by a dewatering system failure.

.3 Scum pumps (P-P321&P-P3213 and P-P3222&P-P3223) are disabled by High Pressure from PIT.

.4 Scum troughs are automatically disabled by high high level alarm on Scum Tank 1 and Scum Tank 2.

4.4 Normal Mode of Operation

.1 Tank 1A/1B:

.1 Tank 1A/1B has a level transmitter (LIT/LE-31111 and LIT/LE-31121) that provides the tank level to the controller for the automatic control sequence and both high level and low level alarming.

.2 Tank 2:

.1 Tank 2 has a level transmitter (LIT/LE-P32111) that provides the tank level to the controller for the automatic control sequence and both high level and low level alarming.

.2 The transfer pumps will operate on a duty/standby control configuration.

.3 Tank 2 transfer pump P-P3222 and P-P3223 will transfer scum to Tank 1A:

.1 To even out wear, pumps will rotate duty each pumping cycle or after a set runtime (operator adjustable) on pumps PCS HMI popups within a group.

.1 During the continuous duty change, the next duty pump will ramp up to the minimum pump speed. The previous duty pump will begin slowing ramping down smoothly at a rate of 3% per second (operator adjustable) until it hits its minimum pump speed and it will turn off.

.2 The next duty pump will ramp up while the previous duty pump is slowing down.

.4 Tank 1 pumps P-P3212 and P-P3213 will turn on and off based on request from the Dewatering Rotary Presses. When the request for scum transfer is requested for a tank, the assigned duty pump for the tank will be started. The pump will run at the preset speed set point.

.1 To even out wear, pumps will rotate duty each dewatering cycle or after a set runtime (operator adjustable) on pumps PCS HMI popups within a group.

.1 During the continuous duty change, the next duty pump will ramp up to the minimum pump speed. The previous duty pump will begin slowing ramping down smoothly at a rate of 3% per second (operator adjustable) until it hits its minimum pump speed and it will turn off.

.2 The next duty pump will ramp up while the previous duty pump is slowing down.

.5 If the duty pump faults, the duty assignment will rotate if the standby pump is in Remote Automatic Operation and is ready.

.6 If level transmitter (LIT/LE-31111 or LIT/LE-31121) indicates a low Tank 1 level:

.1 A LOW Tank 1 LEVEL alarm will be raised.

.2 The P-P3212 and P-P3213 pumps will stop.

.7 If level transmitter (LIT/LE-P32111) indicates a low Tank 2 level:

.1 A LOW Tank 2 LEVEL alarm will be raised.

.2 The P-P3222 and P-P3223 pumps will stop.

.8 If level transmitter (LIT/LE-31111 or LIT/LE-31121) indicates a high Tank 1 level:

.1 A high Tank 1 LEVEL alarm will be raised.

.2 The assigned duty pump for Tank 1 will start.

.9 If transmitter (LIT/LE-P32111) indicates a high Tank 2 level:

.1 The assigned duty pump for Tank 2 will start.

.10 If transmitter (LIT/LE-P32111) indicates a high-high Tank 2 level:

.1 A high Tank 2 High Level alarm will be raised.

.11 Discharge Flow:

.1 The scum flow to dewatering press is monitored by flowmeters FIT/FE P33113 and FIT/FE P33123.

.2 The scum flow bypassed to digester is monitored by flowmeter FIT/FE P33132.

.3 The scum flow on the loop back to the Scum Tank is monitored by flowmeter FIT/FE P33133.

5. DEWATERING ROTARY PRESS

5.1 General

.1 The rotary presses and flocculation tanks are vendor packages with their own dedicated controllers. These packages will be fully integrated with the PCS, which will allow for monitoring and control. The vendor controllers shall be of City standard equipment with the same programming requirements.

.2 There will be two (2) Rotary Presses (RP-P3312 and RP-P3322) (duty/standby) in the new Dewatering Building.

.3 Each of the packaged rotary press machines (RP-P3312 and RP-P3322) will have an inline-dedicated flocculation tank (TK-P3311 and TK-P3322) with a variable speed mixer. Prior to the Scum entering the flocculation tank, polymer will be injected to the Scum pipe.

.4 The rotary press operation will be local automatic or manual.

.5 In local automatic mode the starting and stopping of each rotary press will be initiated if the level in Scum Tank 1A/1B (LIT/LE-31111 or LIT/LE-31121) is above the operator adjustable start level set point, if Scum is pumped from Tank 1 to dewatering. Set during commissioning.

.6 In local automatic mode the starting and stopping of each rotary press will be initiated if the level in Scum Tank 2 (LIT/LE-32111) is above the operator adjustable start level set point if Scum is pumped from Tank 2 to dewatering. Set during commissioning.

.1 The rotary presses will only start and operate during the available period as defined by an operator adjustable availability schedule. The operator will be able to adjust the available time for the rotary presses for each day, adjustable to 10-minute increments. Initially the rotary press availability will be set to 7:30 to 15:30 on Mondays to Fridays.

.2 If the High-High-level alarm on the scum tank pumping to dewatering is raised and no dewatering press is available, an emergency bypass to the digester will open (XV-P33131) and additional alarm will be raised. This is to prevent the overflow of Scum tanks.

.7 The feed rate to the rotary press will be automatically controlled by motorized flow valves FV P33112 and FV P3312) and flowmeters (FIT/FE P33113 and FIT/FE P33122) which will be automatically controlled by the vendor PLC. Solenoid valves and flow switches (XV P3312, XV P33123, XV P33125, XV P3322, XV P3322, XV P33225) controlling and monitoring plant water (W3) to the rotary press will be automatically controlled by the vendor PLC to provide wash-down during the automatic cleaning process. If the associated flocculation tank, or conveyor for a rotary press is not in automatic mode, or the associated dewatered scum bin is full, the rotary press will not be able to start and will shut down and raise an alarm if the rotary press is currently running.

.1 A standby dewatering press will automatically start if a flocculation tank, or conveyor for a duty rotary press is not in automatic mode, or the associated dewatered scum bin is full.

.8 During normal operation scum will be pumped from the Scum Tank 1 to Rotary Presses. While Scum is flowing to the Rotary Press (RP-P3312 and RP-P332), a signal will be provided to start the polymer feed pumps (P-P341 and P-P3412) for the polymer system by the Scum pump flowmeters (FE P33122 and FE P33113).

.9 The flow to the Rotary Press will be controlled by the Flow Control Valve (FV P33112 and FV P3312) and flowmeters (FE P33113 and FE P33122). The Rotary Press will send a signal to the Flow Control Valves (P33112 and P3312) to modulate the flow based on the pressure sensor readings on the Press.

.10 The operator will be able to input a desired chemical ratio, in parts per million (ppm) – operator adjustable. This setting will look at the current flow rate and maximum feed pump settings and send the desired speed signal to the PCS. If changes in the flow rate or set points occur, the PCS will compensate the pump signal.

.11 Two density meters (DIT/DE P33130 and DIT/DE P32230) will be installed on the scum pipe before the Rotary Presses. The density meters will provide low % solids and high % solids alarms. Based on the alarms the operators can manually adjust the scum trough opening frequency to control the thickness of the scum and adjust the polymer dose.

.12 Filtrate from rotary presses will be collected and directed to process drain lift station.

.13 Dewatered scum from rotary presses will fall by gravity to screw conveyors (CNV-P341 and CNV-P342), which are part of the bins covers and then to bins below. Both conveyors will be interlocked to start automatically if any upstream rotary presses are running. Two bin covers will automatically distribute the cake over the bin area. Foul air will be drawn from the headspace of each bin and will be directed to the odor control system.

.14 The cameras (XE P34133 and XE P34233) will be for visual monitoring of the room. These cameras will be integrated into the PCS.

.15 A bridge crane will be for equipment maintenance. The travel path will be limited to operator definable protected areas using smart controls.

.16 Two (2) scales (WE P3423 and WE P34132) will measure the weight of the bins. The scales will automatically trigger alarm when the bins are full and notify the pickup company. The scales will be interlocked with the dewatering system.

6. POLYMER SYSTEM

6.1 General

.1 To enhance dewatering, polymer is injected into the Scum feed line using metering polymer feed pumps (P-P3411 and P-P3412). The polymer pumps operate in a duty/standby arrangement.

.2 The polymer package consists of dilution system, 2 peristaltic pumps and associated valves.

.3 The pumps are peristaltic type equipped with remote speed control.

.4 The polymer skid will pump the diluted polymer only to the duty rotary press. The flow of polymer to the rotary press on duty is controlled by the automatic valves XV-P34112 and XV-P34122. XV-P34112 will open when RP-P3312 is on duty. XV-P34122 will open when RP-3322 is on duty.

6.2 Controls

.1 The polymer pumps can be operated in Remote Automatic, Remote Manual, and Local Manual.

.2 The polymer feed pumps are equipped with built-in Hand/Auto selector, digital display and indicator lights for monitoring the equipment.

.3 The following sub-sections describe each mode of operation.

.1 Remote- Auto:

.1 Under normal operating conditions, the polymer system run in Remote Mode controlled by the PCS.

.2 Diluted polymer solution is pumped from the polymer tote by polymer feed pumps (P-P3411 and P-P3412).

.3 The polymer dosage is controlled in the PCS based on operator adjustable dosing rate of 1.5 kg of dry polymer per dry tonne of Scum. Based on the dosage rate input, the PCS flow paces the polymer solution feed based on the measured Scum flow to Rotary Press, the solids concentration (input by Operations Staff) and the operating polymer solution concentration.

.4 The normal operating sequence for the polymer system is as follows:

.1 Dilution will be kept constant (at 0.5% operator adjustable) but the dilution water flow will vary based on the required polymer dose.

.1 A pressure gauge shall be supplied to measure actual water pressure at the make-down unit.

.2 A flow control valve (XV P3413) shall be provided to ensure a constant repeatable flow for the Primary dilution.

.2 Remote – Manual:

.1 In Remote-Manual mode, the polymer pumps (P-P3411 and P-P3412) can be started and stopped by the operators from the pop up faceplates. The pump speed can be controlled via the pop up faceplates.

.3 Local Control:

.1 In Local Control mode, the polymer pumps (P-P3411 and P-P3412) can be started and stopped to run at the local speed setpoint from the local HMI.

6.3 Start-up and Shut down Sequences

.1 The following describes the start sequences for this area of the plant and the other upstream or downstream process units that are affected by the start-up.

.1 Commissioning and First Start-Up:

.1 The following procedure shall be used for putting the equipment into service for the first time or after a major repair:

.1 PCS continuously monitors the influent flow rate as detected by FE P33113 and FE P33123.

.2 PCS calculates the polymer pumps (P-P3411 and P-P3412) feed rate according to the influent flow rate and a setpoint for dose.

.3 PCS sends a 4-20 mA signal to control start/stop and speed of the polymer pumps (P-P3411 and P-P3412).

.2 Start-up Following a Planned Shut Down:

.1 When the polymer system needs to be started following a planned shut-down, the operator shall start the polymer system from the PCS.

.3 Planned Shut Down:

.1 When the polymer system needs to be taken out of service, the operator shall shut-down the polymer system from the PCS and isolate the lines.

.4 Emergency Shut Down:

.1 Emergency shutdown of the polymer system can be initiated by:

.1 Failure of a normal start-up sequence.

.2 Failure of a normal shut-down sequence.

.5 PCS Interlocks:

.1 Polymer feed pumps (P-P3411 and P-P3412) are interlocked to the operation of the duty Rotary Press (RP-P3312 and RP-P3322). Polymer feed pumps (P-P3411 and P-P3412) require run status of duty Rotary Press (RP-P3312 and RP-P3322) in order to run.

7. PROCESS DRAIN LIFT STATION

7.1 General

.1 All process drain and produced filtrate inside the dewatering building is transferred to a process drain lift station housing two fixed-speed submersible pumps (P-P350 & P-P350) to return drain to Control Chamber Outer Ring.

.2 The two pumps can discharge into two separate headers which transfer to the Control Chamber Outer Ring. Both lines have pressure indicator-transmitters (PG P35011 and PG P35021). During normal operation only one header is used.

.3 Pump duty will rotate between the two (2) pumps so that all are subjected to the same degree of wear and tear. That is, no one pump shall be dedicated to permanent standby and remain idle for extended periods.

.4 An ultrasonic level indicator (LIT-P35012 monitor the level in the sump, and protect the pumps from running dry.

.5 Discharge Flow:

.1 The filtrate discharge flow is monitored by flowmeters FIT/FE P35012 and FIT/FE P35022.

.2 The filtrate can be either directed to the inner ring via valves XV-P35012 and XV-P35022 or to outer ring via valves XV-P35011 and XV-P35021.

7.2 Controls

.1 The drain pumps can be controlled in Local Automatic or Local Manual mode.

.1 In Local Automatic mode:

.1 The pumps are in lead/lag configuration.

.2 If the level (LIT/LE-P35012) in the lift station is above the operator set point transfer level the assigned lead pump for will start.

.3 The lag pump will start when the level is above the high-high level switch (LSHH-35003).

.4 The pumps will stop when the level (LIT/LE-P35012) in the lift station is below the low level setpoint.

.5 The lead pump assignment will rotate after each pump run cycle. A pump with longer off time since last run will always be the lead pump and the pump with longer run time since last stop will always stop first.

.2 In Local Manual:

.1 The pumps can be started and stopped at the local control panel (HS-35010, HS-35020).

.3 The control panel will provide a run, fault, and high-high level alarm to the PCS.

.2 Commissioning and First Start-Up:

.1 The following procedure shall be used for putting the equipment into service for the first time or after a major repair:

.1 Conduct pre-commissioning checks and tests and take any necessary remedial measures.

.2 Calibrate instrumentation.

.3 Power up equipment as per Manufacturer's instructions.

.4 Operate the system manually using the local control panel until the low-low pressure setpoint has been overcome.

.5 When all checks have been completed, place local control panel in Remote and run equipment using the Plant PCS.

.6 Check Local-Auto sequence functions properly.

.2 Start-up Following a Planned Shut Down:

.1 If a pump is being put back into service, the associated discharge isolation valve shall be opened. Then the pump lock-out at the MCC shall be removed and the pump put back into service at the plant PCS.

.3 Planned Shut Down:

.1 If one of the pumps needs to be serviced for maintenance, the pump is disabled at the PCS and locked out at the MCC. The associated isolation valve is closed.

.4 Emergency Shut Down:

.1 In the event of an emergency shutdown of one of the pumps, the pump will stop. Once the cause of the shutdown has been determined, the operator will decide which pump to place into service.

8. FLUSHING WATER

8.1 General

.1 Flushing water addition points are available at all pumps in the system.

.1 Flushing water can be added through an automatic valve XV-P32112 at the suction of P-P3211 and a manual valve HV-P3211-C on the discharge. Valve XV-P32112 can be interlocked with the operation of the pump to automatically flush the pump before each start-up.

.2 Flushing water can be added through an automatic valve XV-P32121 at the suction of P-P3212 and a manual valve HV-P3212-C on the discharge. Valve XV-P32121 can be interlocked with the operation of the pump to automatically flush the pump before each start-up.

.3 Flushing water can be added through an automatic valve XV-P32132 at the suction of P-P3213 and a manual valve HV-P3213-C on the discharge. Valve XV-P32132 can be interlocked with the operation of the pump to automatically flush the pump before each start-up.

.4 Flushing water can be added through an automatic valve XV-P32212 at the suction of P-P3221 and a manual valve HV-P3221-C on the discharge. Valve XV-P32212 can be interlocked with the operation of the pump to automatically flush the pump before each start-up.

.5 Flushing water can be added through an automatic valve XV-P32223 at the suction of P-P3222 and a manual valve HV-P3222-C on the discharge. Valve XV-P32223 can be interlocked with the operation of the pump to automatically flush the pump before each start-up.

.6 Flushing water can be added through an automatic valve XV-P32233 at the suction of P-P3223 and a manual valve HV-P3223-C on the discharge. Valve XV-P32233 can be interlocked with the operation of the pump to automatically flush the pump before each start-up.

.2 Flushing water addition point are available for flushing the scum piping system and scum tanks.

.1 XV-P31102 can be used to automatically flush 350 Scum pipe from Primary Clarifiers 1, 2 and 3. XV-P31112 and XV-P332122 can be used to automatically flush Tank 1A and 1B.

.2 HV-P3311-A, HV-P3312-A, HV-P3312-C can be used to manually flush scum transfer pipeline between dewatering building and primary clarifier building.

.3 XV-P32211 can be used to automatically flush Scum Tank 2.

.4 HV-P3224-B can be used to manually flush Scum pipeline between Tank 2 and Tank 1.

.5 HV-P3501-B and HV-P3502-B can be used to manually flush filtrate pipeline between dewatering building and primary clarifier building.

9. ODOUR CONTROL

9.1 General

.1 The odour control Electrical Control Panel (ECP) shall contain the necessary programming, circuitry, and hardware for an automatic flow control system and send all operating data to the PCS. The ECP shall have the following features:

.1 Temperature of the foul air.

.2 Alarm when no foul air flow rate is detected.

.3 Alarm when foul air fans are faulted.

END OF SECTION