Chapter 3 PROCESS SYSTEM OPERATION

3.1 GENERAL OPERATION

3.1.1 PUMP STATION OPERATION OVERVIEW:

Major components:

1. **Pump sequencer:** its function is to sequence the two submersible pumps, so that each pump is used equally over time. In case of a pump failure (determined by the relevant flow switch FS-1 or FS-2), the sequence switches to the next available pump and initiates an alarm signal.
2. **Pump controller:** ties all control devices and sensors together. The control lights indicate which filling station is in use and which pump is running. It also indicates some of the alarm conditions and provides an emergency power off and reset pushbuttons.
3. **Alarm reporting unit:** its function is to turn on the rooftop strobe at any one of the 10 alarm conditions and to dial pre-programmed phone numbers with a recorded message to give warning of the alarm condition.

Operation:

4. **Pumping one truck:** by pressing the “ON” pushbutton of filling station #1 located on the filling arm valve SV-1 will close and open MV-1. This operation takes approximately three seconds. After the three second delay, the pump sequencer starts the “NEXT” available pump. pressing the same “ON” pushbutton again will have no impact.
5. Pumping must be stopped by pressing the “OFF” pushbutton of filling station #1. Pressing the “OFF” pushbutton will stop the pump that was running. It also closes valve MV-1 and opens valve SV-1 which drains the outside portion of the fill arm.
6. The process is identical for fill station #2 (except it works with valves MV-2 and SV-2).
7. **Pumping two trucks:** the controls are set up so that only one of the two filling arms can be used at a time. This is to guarantee that the water delivered to the truck has enough contact time with the chlorine. The time delay between two fillings depends on the level

of desired chlorination. Higher the chlorination dosage, shorter the required contact time (CT.).

The controls will prevent initiation of the second truck filling until the required delay is not reached.

8. **Pumping water for fire fighting:** by pressing the "ON" pushbutton of filling station #1 located on the filling arm and the "FIRE" button valve SV-1 will close, MV-1 will open, MV-3 will close and MV-4 will open. This operation takes approximately three seconds. After the three second delay, the pump sequencer starts the "NEXT" available pump. Pressing the same "ON" pushbutton again will have no impact. This operation bypasses the water filters speeding up the filling process.
9. Pumping must be stopped by pressing the "OFF" pushbutton on filling station #1. Pressing the "OFF" pushbutton will stop the pump that was running. It also opens MV-3, closes MV-4, closes valve MV-1 and opens valve SV-1, which drains the outside portion of the fill arm.
10. The process is identical for fill station #2 (except it works with valves MV-2 and SV-2 in addition to MV-3 and MV-4).
11. **Pumping two trucks with water for fire fighting**: the process for the first truck requesting water for fire fighting is identical to the description in points 8 to 10 above. While the first truck is filling a second truck can request fire fighting water by pressing the relevant "ON" button. This will initiate closure of the second SV valve and open the unused MV-1 or MV-2 valve. After a three second delay, the second water pump will start doubling the pumping capacity of the station.
12. Pumping must be stopped by pressing the relevant "OFF" pushbutton on filling station. Pressing the "OFF" pushbutton will stop the first water pump. It also closes valve MV-1 (or MV-2) and opens valve SV-1 (or SV-2), which drains the outside portion of the fill arm.
13. Pressing the second "OFF' button will turn off the second water pump and closes valve MV-2 (or mMV-1) and opens valve SV-2 (or SV-1), which drains the outside portion of the fill arm and opens MV-3 and closes MV-4 which resets the station for delivery of drinking water

The chlorination loop:

14. The microchem2 chlorine controller package (CCP-1) is the controlling unit for the primary chlorination process. Since the water flow in the main 100mm water pipe can vary depending on whether one or two pumps are running, the condition of the filters and water level in the lagoon, the flow is precisely measured by the flow meter (FM-1). The CCP-1 sends a 4-20ma signal to its chlorine dosing pump (CP-1 and or CP-2) that is proportional to the water flow measured by fm-1. A water sample is tested continually by chlorination and PH/temperature probes connected to CCP-1 and CCP-1 will adjust the amount of chlorine pumped by CP-1/CP-2 to ensure the required level of primary chlorination. The setting of the CCP-1 loop is proportional
15. CCP-2 is a post-chlorination loop identical to CCP-1 except it is set to a constant flow. It's function is to maintain the chlorination level of water delivered to the trucks and add chlorine if required in time of prolonged inactivity of the station (nights, weekends). The flow is precisely measured by the flow meter (FM-2). The CCP-2 sends a 4-20ma signal to it's chlorine dosing pump (CP-3 and CP-4) that is proportional to the water flow measured by FM-2. A water sample is tested continually by chlorination and PH/temperature probes connected to CCP-2 and CCP-2 and will adjust the amount of chlorine pumped by cp-3 and/or cp-4 to ensure the required level of post-chlorination.
16. The information gathered by ccp-1 and ccp-2 (water delivery, chlorination and PH levels, temperature) is stored in the data recorder and accessed through a USB port or remotely through an IP address.
17. Only one of the CP subcomponent dosing pumps (CP-1 or CP-2) is "ON" the second pump is a backup in case the active pump has failed. This must be switched manually. The CP dosing pump skid also contains calibration and cleaning accessories.
18. The chlorine solution for the dosing pumps is prepared by an "mc4-50" chlorine mixing system (CMS). Once again, the second system is a backup in case the active one fails. It is recommended to keep the backup system dry & clean and only activate it once it is required. Alternatively, liquid chlorine can be used by one or both chlorination systems by reversing the manual valves in front of the dosing pumps. Switching the source of chlorine will also require adjusting the setting of the relevant dosing pumps as the two chlorination medias provide different concentrations of chlorine.

Note that when using MC4-50 chlorine mixers, that it is occasionally necessary to flush the chlorine injection lines with domestic water by closing the manual chlorine valves at both ends of the line and opening the water valves.

19. If the measured chlorine level gets below the set minimum, or higher than the set maximum measured by the two microchems, the pumping of drinking water will stop. This condition will require a station operator to investigate and fix the problem followed by a manual reset of the out of range chlorine condition. This condition will not affect pumping fire fighting water.

System failures and alarms:

1. The alarms are listed in the alarm reporting table on drawing E5. There are 11 alarms connected to the alarm reporting unit. It can also accommodate another five additional alarm inputs in the future if required.
2. **Some of the alarm levels are settable:** a). - the low temperature alarm on thermostat is-1 located in the main pumping room, and b). - pressure drops across the water filters measured by DP-1. DP-1 has two adjustable alarm settings: high (H) - when one truck is being filled (one water pump is running), and high/high (H/H) when two trucks are being filled (two water pumps are running). The settings of DP-1 will need to be established by experience. However, the pressure should not exceed 15lbs across the filter bank when two pumps are running (H/H). The highest the allowed pressure drop across the filters, over time it will take longer to fill the trucks as the filters catch more sediment, but the filters will need to be cleaned less frequently.

Alarm reporting unit relays:

Alarms:

1. Alarm activates if a flow switch (FS-1 or FS-2) senses no flow in 15 (adjustable) seconds after its relevant pump (WP-1 or WP-2) is turned on. Action: check the pump controller, determine which pump failed and why. Repair the problem, reset the pump sequencer and acknowledge the alarm controller.
2. Alarm activates if a differential pressure switch (DP-1) senses higher than set (H) (adjustable) pressure across filters in 15 seconds (adjustable) after one pump is turned on.

Alarm activates if a differential pressure meter (DP-1) senses higher than set H/H (adjustable) pressure across filters in 15 seconds (adjustable) after two pumps are turned on. Action: clean all three water filters, one at a time. Acknowledge the alarm controller.

3. Alarm activates if either chlorination controller panels CCP1 or CCP2 senses out-of-spec conditions for 15 seconds (adjustable). Action: determine the reason for the chlorination controller alarm. Fix the problem, reset the chlorination controllers and acknowledge the alarm controller.
4. Alarm activates if chlorine mixing system senses trouble. Action: check the chlorine mixing system and fix the problem. Reset the chlorine mixing system and acknowledge the alarm controller.
5. Alarm activates if generator controller senses out-of-spec conditions with generator. Action: check the generator controller and determine the cause for the alarm. Fix the problem and reset the generator controller and acknowledge the alarm controller.
6. Alarm activates if normal grid power is lost and automatic transfer switch engages emergency generator. Action: determine the reason why the generator is running. Ensure the generator has enough fuel if the power outage is prolonged. Acknowledge alarm the controller.
7. Alarm activates if domestic cold-water storage tank (DCWST) low level float switch (ls-DCW) detects low water level. Action: check why the DCWST is not topped up automatically and acknowledge the alarm.
8. Alarm activates if waste water storage tank (WWST) high level float switch (lS-WW) detects high water level. Action: arrange to pump out the WWST and acknowledge the alarm.
9. Alarm activates if any of the room fire alarm heat detectors (HD-1, -2 or -3) senses high room temperature. Action: determine the reason for the high temperature. Fix the problem. Acknowledge the alarm.
10. Alarm activates if the room thermostat (TS-2) senses a low adjustable room temperature or if any of the three heat trace controllers sense trouble with the heat trace cables. Action: determine what is causing the alarm. Take appropriate action: (a) provide temporary heat source for the pump room if the room temperature falls below set point

(10*c adjustable), or (b) determine which heat trace controller was activated and act to fix the problem. Acknowledge the alarm.

11. Alarm activates when the water chlorination level is lower that set minimum or higher that set maximum tolerance level.

Alarm reporting unit relays:

1. Programmed to turn "ON" with any of the 1-11 alarm inputs. Turns "ON" an outdoor strobe beacon located outside the pump station to display that the pump station requires attention.
2. Turns "ON" an indicator light on the main panel labeled "any alarm condition #1-11"
3. Programmed to turn "ON" with either alarm input #3 or #4. Turns "ON" an indicator light on the main panel labeled "chlorination alarm"
4. Programmed to turn "ON" with alarm input #7. Turns "ON" an indicator light on the main panel labeled "fresh water tank empty or DWP pump failure"
5. Programmed to turn "ON" with alarm input #8. Turns "ON" an indicator light on the main panel labeled "waste water tank full". Turns "ON" an outdoor warning lamp to indicate full tank requiring service. Full WWST will disable (K3) domestic water pump to prevent overfill, unless emergency eyewash (EW) or emergency shower (ES) is used.

Alarm expander unit relays:

1. Programmed to turn "ON" with alarm input #9. Turns "ON" an indicator light on the main panel labeled "pump room high temperature"
2. Programmed to turn "ON" with alarm input #10. Turns "ON" an indicator light on the main panel labeled "pump room low temperature / heat trace controller trouble"
3. Programmed to turn "ON" with alarm input #11. Turns "ON" an indicator light on the main panel labeled "water chlorination out of limits”.

Pump sequencer operation:

By depressing the "ON" pushbutton at fill station #1 or #2 (sequencer input contacts S1 on or S2 on) the sequencer starts the "next" pump with a delay of three seconds. Pressing the same "ON" pushbutton again will do nothing until the relevant "OFF" button is pressed. Once the pump is running, it can be turned "OFF" by pressing the "OFF" pushbutton (sequencer input contacts S1off or S2off) at the initiating fill station. Pressing the same "OFF" pushbutton again will not do anything. Based on the above, 1 or 2 pumps can run simultaneously but only in “fire” mode.

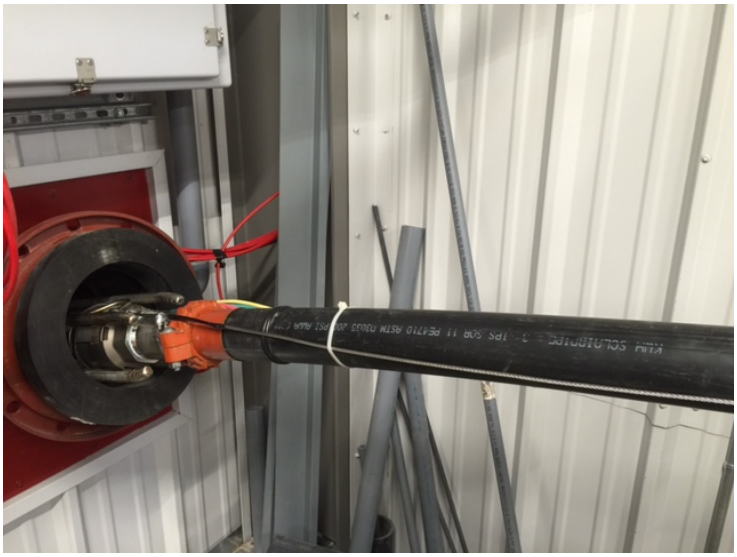
The sequence of the "next pump" is wp-1 -> wp-2 -> wp-1 -> wp-2 -> etc...

Flow switches will provide feedback so that when a pump is turned "ON" it delivers water. If the flow switch of its relevant pump is not "ON" within 15 seconds, the pump sequencer will turn that pump "OFF" and turn the "NEXT" pump "ON". This will cause the affected pump to be taken out of the sequence of the "next pump". It will also turn "ON" a "pump # trouble" alarm light and turn "ON" a set of dry output alarm contacts "pump trouble". Latching of a failed pump "off" can be reset by pressing a "reset" button on the pump sequencer.

3.2 WATER PUMPS

3.2.1 Description

When the trucker pushes the start button the control panel automatically starts one of the two 25HP water submersible pumps located in the raw water intake pipe. Both pumps can run simultaneously. The water pumps are alternating. The Control Panel changes automatically to switch to the other pump in case of failure or the need for maintenance. The operator can force the operation of a specific pump by turning off the other pump.

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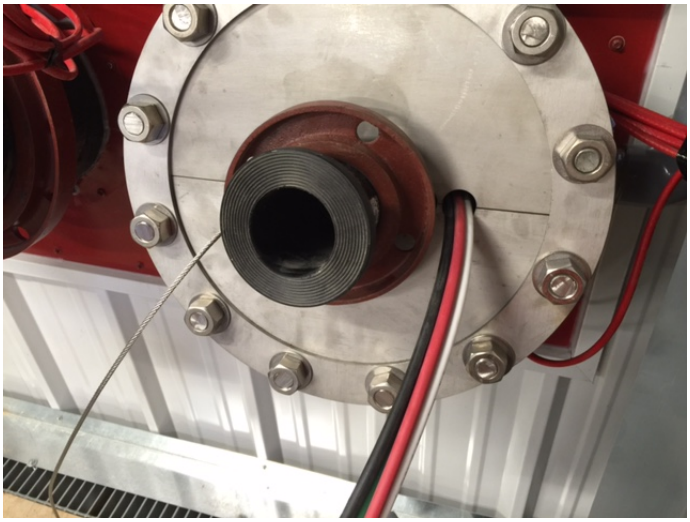


3.2.2 Operation

1. Check daily if the water pumps are working correctly by using the Control Panel.

2. No alarm shown on the control panel and/or the sequencer panel means everything is OK.

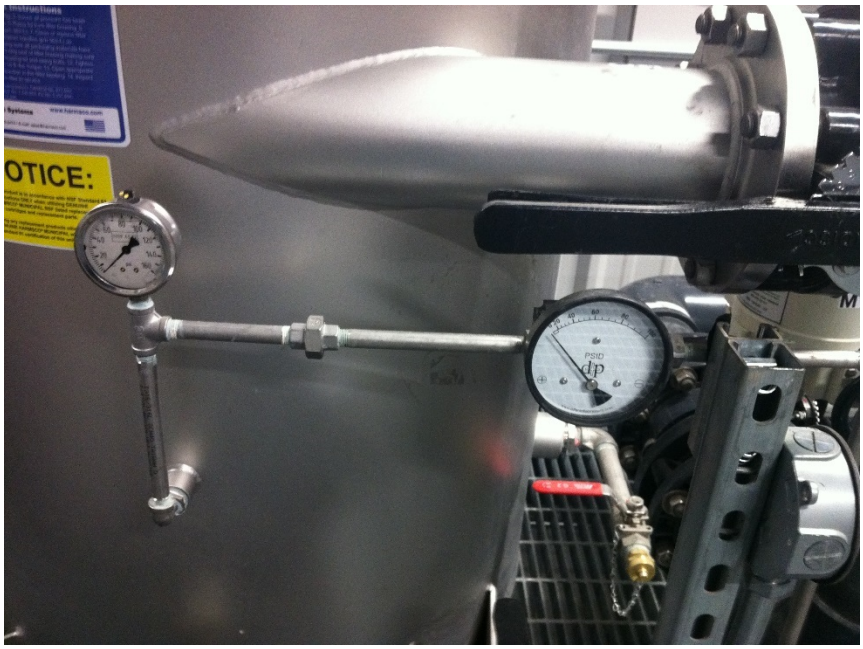
The rest of the system is automatic. No operations should be required. If the system fails to operate properly, go to **Chapter 7**, "trouble shooting". For more information, refer to **Chapter 16, Chapter 28 & Chapter 37**.

3.3 FILTERS

3.3.1 Description

The Filtration building is equipped with three filters housing and two strainers, one for each pump. The filters are positioned in a series for a filtration capacity going from a basket strainer with 75 microns holes to a 1 µm filter. In flow order, as below:

1. Strainer equipped with a basket filter with a 75 microns hole.
2. Filter Housing #1 – 20µm capacity (HC/170-20 Hurricane Fltr Cart) Contains 5 filters per housing.
3. Filter Housing #2 – 5µm capacity (HC/170-5 Hurricane Fltr Cart) Contains 5 filters per housing.
4. Filter Housing #3 – 1µm capacity (HC/170-LT2 Hurricane Fltr Cart) Contains 8 filters per housing.



3.3.2 Filter replacement

Filters need to be changed according to the water quality. Also, filters need to be cleaned, following Harmsco procedures**.**

Step 1

Open pump breaker in truck fill station, Pump P1 and P2. Make sure that the pumps are disabled.

Another option is to flip the filtration mode selector to bypass mode. In this case, the filtration building is bypassed by a motorised valves MV3 & MV4.

Another option with the filter butterfly valves is to isolate the filter that requires maintenance.

Step 2

Close the valves between filter Housing. **Refer to Harmsco for cleaning procedure and filter changes.**

Step 3

Always isolate and remove pressure from housing before servicing. Housing is to be shut off, drained of fluid by first opening the lower drain.

Step 4

Open filter housing by turning eye nuts counter-clockwise, disengaging swing bolts, and removing the lid.

Step 5

Remove the new cartridges from their packaging and make sure centre cores are clear of all obstructions, mainly from shipping materials.

Step 6

Install cartridge by lifting handle into cartridge.

Step 7

Insert cartridge into housing and stand-pipe, cartridge is to contact tube sheet of housing.

Step 8

Position housing O-ring seal in the groove housing.

Step 9

Position Lid onto housing and properly align on seal before applying swing bolts. Do not allow tilting or cocking of lid on gasket.

Step 10

Close filter housing by tightening Eye Nuts clockwise by hand. Use a star pattern several times to tighten all the eye nuts properly.

Step 11

Slowly open inlet valve to begin operation, allowing fluid to fill housing.

Step 12

Open filter housing outlet valve.

Step 13

It is recommended to flush the system by running water through the filter at the recommended rate for 10 minutes.

Step 14

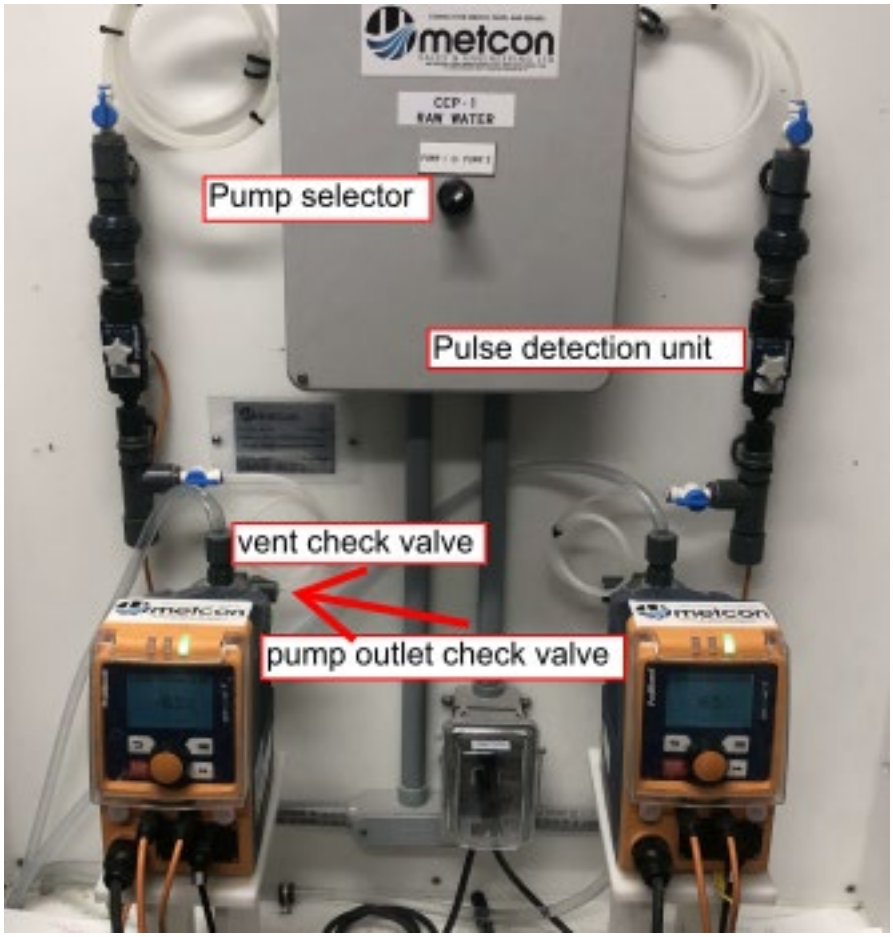
Start pump, if applicable, and operate filter.

Refer to **Chapter 36** for more details

3.4 CHLORINATION DOSING PUMPS (Prominent Solenoid Metering Pump)

3.4.1 Description

Operation of these pumps is the key to proper chlorine injection, Numerous training periods are required to obtain a satisfactory level of understanding of the injection process taking place.



3.4.2 Operation

For chlorine injection we find two distinct locations of injection with two different strategies of operation.

- Main injection located at pump outlet after the flow meter.
    1) In normal mode chlorine injection is proportionnal to water flow. Stroke pulse rate is automaticaly adjusted by the pump depending on the intensity of the 4-20 ma signal received by the flow meter feeding the injection pump .Stroke lenth is adjusted by the operator by turning the knob on the injection pump.Higher stroke lenths give more chlorine content.

2) In emergency mode (failure of flow meter detected by the injection pump) In this condition two actions must be taken by the operator to resume operation.
    a) Injection pump must be operated in manul mode giving a fixed pulse rate when main raw water pumsp are operating
    b) Selector located in the control panel located on the left side of the alarm panel must be turned to automatic position.

- Final injection is located at filter outlet before the 15,000 litre contact tank.

  At this position one only strategy of chlorine injection is available

  1) Selecting manual mode on the injection pump with a slow pulse rate ensures a slow constant injection.The pulse rate is selected by the operator to maintain chlorine level in contact tank overnight and between two truck fills.

3.5 CHLORINE CONTROLLER (Microchem 2 c/w CL4000 sensor)

3.5.1 Description

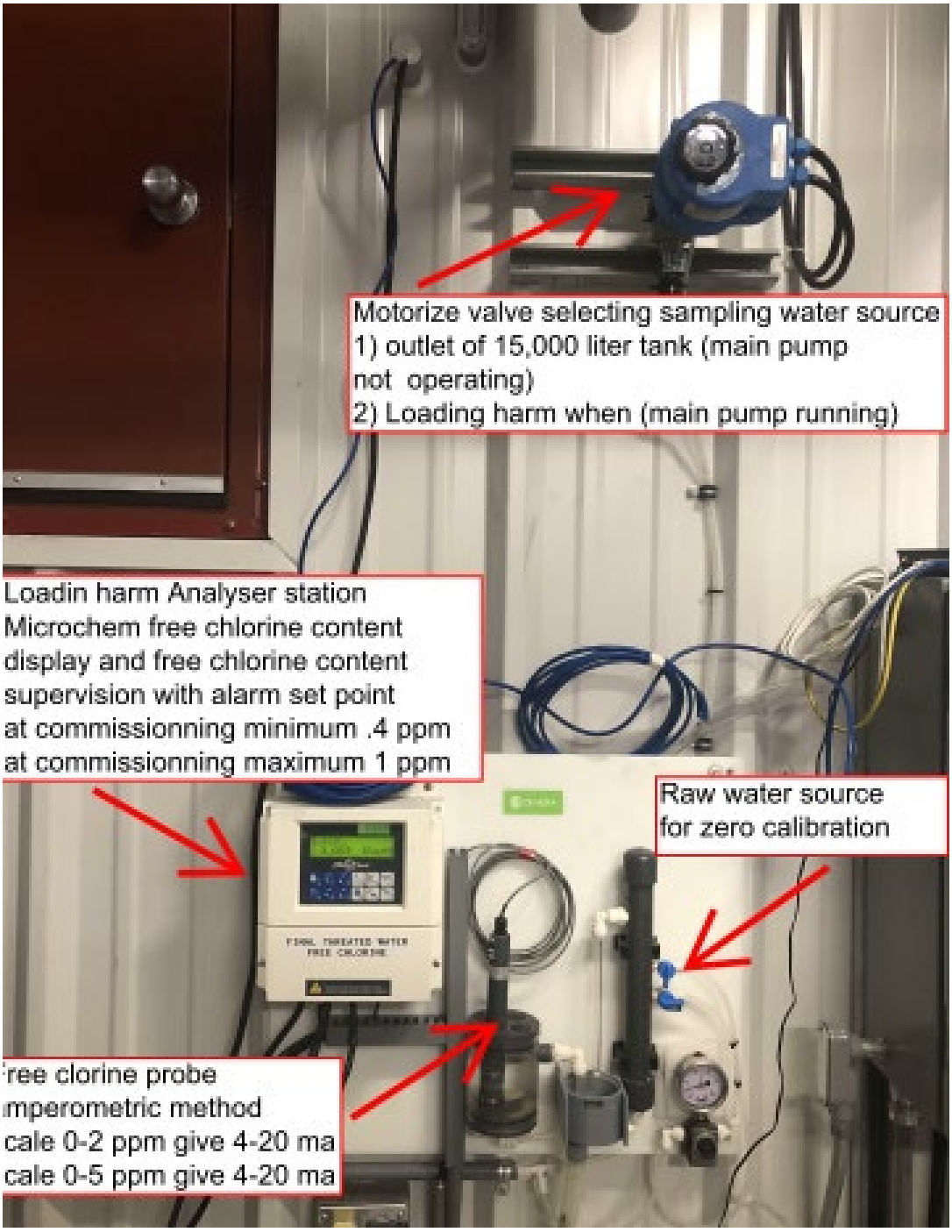
The controller is intended to read and display free chlorine content and ph.

In this installation readings are taken at two locations

- At 15,000 litre contact tank output with display located in chlorine room .

- At loading arm where trucks are loaded and located below loading arm outlet. In this location the controller signals an alarm when chlorine concentration is below .4 PPM and /or over 1 PPM.

Free Chlorine Measurement at Loading Arm



The two key components are the Free chlorine probes and PH probes.

1) The CL4000 (Free Chlorine Probe) supplies a 4-20ma signal to the Microchem controller and this method of reading the free chlorine content is called amperometric because the signal is obtained by circulating an electric current in the water solution for analyzation.

- CL4000 chlorine probes require 30 litres per hour of stable and continuous flow and require time to settle.

- After a water flow interruption numerous minutes are required for the chemical reaction to resume operation. Free chlorine Display value on the Microchem will be in alarm and flashing mode.

2) The PH probe on its side, provides a millivolts value proportional to PH to the Microchem controller.

The Microchem Controller display Free chlorine (CL) and PH value.

3.5.2 Operation

This system is not automatic. The Operator must continuously do a follow up.

-For the main chlorine injection point before filtering the amount of chlorine injected is proportional to water flow. Typically, main water pump supply 1,200 litres of water per minute.

For the main injection, the chlorine injector pump starts automatically once flow is detected in flow meter. Therefore, the P1 is set at 4.5 ma. (when flow reaches the engineering value of 4.5 ma the injection pump starts). Chlorine is added proportionally to the slope selected on P1 anP2 in the injection pump. The flow meter and injection pump are using following the set points.

- P1 4ma is zero flow zero stroke per minute on the injection pump.

- P2 20 ma is corresponding to 3000 litres per minute and 8000 strokes per minute on the injection pump.

- Recommended stroke length - not less than 30%

-For the final chlorination process a constant injection rate of typically 22 strokes per hour with stroke length no less than 30% is used to maintain the free chlorine level in contact tank.

3.6 LIQUIDE CHLORINATOR

3.6.1 Description

3.6.2 Operation

- New Chlorine Hypochlorite 12% barrels (55Litres) are transferd into the pellet mixer MC 4-50 as requested by the CEML engineer.
- The liquid chlorine is now distributed to the chlorine pump via a CPVC Pipe located at the bottom of the tank.
- The Control Panel only indicates if the liquid levels in the container are low.

3.6.3 Safety – Read Material Safety Data Sheets (MSDS)

It is crucial to read the MSDS (shown below) before attempting any Liquid Chlorine transfers to the MC-4-50 tank.

- **Wear the appropriate Facemask with Chlorine Cartrige Filters.**
- **Wear appropriate Gloves to handle Chlorine**
- **Wear appropriate coveralls**

GREAT NORTH CHEMICALS INC.
85 MALMO COURT, P.O. BOX 2, COMP 13 • MAPLE, ON L6A 1R4
(905) 832-2276 • FAX (905) 832-3701

Material Safety Data Sheet

Sodium Hypochlorite 12% - NSF

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Name: Sodium Hypochlorite 12%
Synonyms: Sodium oxychloride; Soda bleach liquor; Javel water; Clorox; Javex.
Chemical Family: Hydrochlorous acid, sodium salt.
Application: Chemical intermediate. Laboratory reagent. Water treatment. Pulp and paper. Bleaching agent. Disinfectant.

Distributed By:
Great North Chemicals
85 Malmo Court
Maople, Ontario
L6A 1R4

Prepared By: Tony Roehrig
Preparation date of MSDS: January 2017
Telephone number of preparer: 1-905-832-2276

24-Hour Emergency Telephone Number (CANUTEC): (613) 996-6666

2. COMPOSITION/INFORMATION ON INGREDIENTS

Ingredients	Percentage (W/W)	LD50s and LC50s Route & Species:
Water 7732-18-5	Balance	Oral LD50 (Rat) >90 mL/kg
Sodium Hypochlorite, Solution 7681-52-9	12-14	Oral LD50 (Rat) = 8200 mg/kg Dermal LD50 (Rabbit) > 10000 mg/kg

Note: Drug Identification Number (DIN) - 02265729

3. HAZARDS IDENTIFICATION

Potential Acute Health Effects:
Eye Contact: Corrosive to eye tissue and may cause severe damage and blindness.
Skin Contact: Corrosive. May cause severe skin irritation. Prolonged contact may lead to burns and blisters and may aggravate dermatitis. May cause whitening or bleaching of the skin.
Inhalation: Corrosive to the respiratory passage. Causes irritation of the mouth, nose and throat. Repeated and/or prolonged exposures may cause productive cough, running nose, bronchopneumonia, pulmonary edema (fluid build-up in lungs) and reduction of pulmonary function. If mixed with acids or warmed to temperatures greater than 40 degrees Celcius, Sodium hypochlorite solutions release chlorine gas. This gas can cause severe irritation of the nose and throat. Exposures to high levels of chlorine gas may result in severe lung damage.

3. HAZARDS IDENTIFICATION

Ingestion: Corrosive. Causes burns to the mouth, throat and stomach. Causes vomiting, nausea, and diarrhea. Coma, shock and death may occur.

4. FIRST AID MEASURES

Eye Contact: Wash eyes with water for a minimum of 30 minutes or until no evidence of the chemical remains. Hold eyelids open during flushing. Seek immediate medical attention.
Skin Contact: In case of contact, immediately flush skin with plenty of water for at least 30 minutes. Get medical attention.
Inhalation: Remove person to fresh air. If not breathing, give artificial respiration. If breathing is difficult, get immediate medical attention.
Ingestion: Rinse mouth with water. Do not induce vomiting. Do not give anything by mouth to an unconscious person. If vomiting occurs spontaneously, keep head below hips to prevent aspiration of liquid into the lungs. Seek immediate medical attention.
Notes to Physician: Due to the severely irritating or corrosive nature of the material, swallowing may lead to ulceration and inflammation of the upper alimentary tract with hemorrhage and fluid loss. Also, perforation of the esophagus or stomach may occur, leading to mediastinitis or peritonitis and the resultant complications.

5. FIRE FIGHTING MEASURES

Flash Point: None.
Flash Point Method: Not applicable.
Autoignition Temperature: Not available.
Flammable Limits in Air (%): Not Available.
Extinguishing Media: Use extinguishing media appropriate for surrounding fire.
Special Exposure Hazards: Keep containers cool to prevent rupture and release of material. Closed containers may explode in fire. Spilled material may cause floors and contact surfaces to become slippery.
Hazardous Decomposition/Combustion Materials (under fire conditions): Chlorine. Oxygen. Oxides of sodium.
Special Protective Equipment: Fire fighters should wear full protective clothing, including self-contained breathing equipment.
NFPA RATINGS FOR THIS PRODUCT ARE: Not Available.
HMIS RATINGS FOR THIS PRODUCT ARE: Not Available.

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures: Wear appropriate protective equipment.
Environmental Precautionary Measures: Prevent entry into sewers or streams, dike if needed. Consult local authorities.
Procedure for Clean Up: Ventilate area. Small spills: soak up with absorbent material and scoop into containers. Large spills : prevent contamination of waterways. Dike and pump into suitable containers. Clean up residual with absorbent material, place in appropriate container and flush with water. Spilled material may cause floors and contact surfaces to become slippery.

7. HANDLING AND STORAGE

Handling: For industrial use only. Handle and open containers with care. Avoid contact with eyes, skin and clothing. Do not ingest. Avoid inhalation of chemical. Empty containers may contain hazardous product residues. Keep the containers closed when not in use. Protect against physical damage. Use appropriate personnel protective equipment. When diluting, add this product to water in small amounts to avoid spattering. Never add water to this material.
Storage: Store in a cool, dry, well ventilated area, away from heat and ignition sources. Store below 29 °C. Do not freeze. Keep away from direct sunlight. Store away from organic chemicals, strong bases, metal powders, carbides, sulfides, and any readily oxidizable material. Storage area should be equipped with corrosion-resistant floors, sumps and should have controlled drainage to a recovery tank. Store in a sealed polyethylene lined container.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls:

Local exhaust ventilation as necessary to maintain exposures to within applicable limits. Make up air should always be supplied to balance air exhausted (either generally or locally). Ventilation required when spraying or applying in a confined area. Ventilation should be explosion proof. Eliminate ignition sources.

Respiratory Protection: Wear a Niosh approved full facepiece respirator for acid gases or a self-contained breathing apparatus for air concentration levels up to 5 ppm. NIOSH approved supplied air respirator when airborne concentrations exceed exposure limits.

Gloves:

Impervious gloves. Neoprene gloves. Nitrile gloves. Rubber gloves.

Skin Protection: Neoprene coated apron or chemical resistant clothing. Impervious boots.

Eyes: Chemical safety goggles and/or full face shield to protect eyes and face, if product is handled such that it could be splashed into eyes.

Other Personal Protection Data: Ensure that eyewash stations and safety showers are proximal to the work-station location.

Ingredients	Exposure Limit - ACGIH	Exposure Limit - OSHA	Immediately Dangerous to Life or Health - IDLH
Water	Not available.	Not available.	Not Available.
Sodium Hypochlorite, Solution	0.5 ppm As For Chlorine.	Not available.	Not Available.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State: Liquid.
Colour: Clear Green to yellow.
Odour: Chlorine.
pH 11.5 - 13
Specific Gravity: 1.21
Boiling Point: Decomposition at 40°C / 104°F
Freezing/Melting Point: -25°C / -12°F
Vapour Pressure: 17.5 mmHg
Vapour Density: Not Available.
% Volatile by Volume: Not Available.
Evaporation Rate: Not Available.
Solubility: Miscible in water.
VOCs: Not Available.
Viscosity: Not Available.
Molecular Weight: Not Available.
Other: Not Available.

10. STABILITY AND REACTIVITY

Chemical Stability: Unstable above 40°C / 104 °F.
Hazardous Polymerization: Will not occur.
Conditions to Avoid: High temperatures. Exposure to light.
Materials to Avoid: Acids. Ammonia. Strong oxidizers. Reducing agents. Metals.
Hazardous Decomposition Products: When heated to decomposition, it emits acrid smoke and irritating fumes. Chlorine. Oxides of sodium. Oxygen.

Additional Information:

Hypochlorites may react with primary amines to form nitrogen trichloride which explodes spontaneously in air. Hypochlorite bleach reacts with urea to form nitrogen trichloride whic explodes spontaneously in air. Some metals accelarate the decomposition of Sodium Hypochlorite. Nickel. Copper. Tin. Iron and its alloys. Manganese.

11. TOXICOLOGICAL INFORMATION

Principle Routes of Exposure

Ingestion: Corrosive. Causes burns to the mouth, throat and stomach. Causes vomiting, nausea, and diarrhea. Coma, shock and death may occur.

11. TOXICOLOGICAL INFORMATION

Skin Contact: Corrosive. May cause severe skin irritation. Prolonged contact may lead to burns and blisters and may aggravate dermatitis. May cause whitening or bleaching of the skin.
Inhalation: Corrosive to the respiratory passage. Causes irritation of the mouth, nose and throat. Repeated and/or prolonged exposures may cause productive cough, running nose, bronchopneumonia, pulmonary edema (fluid build-up in lungs) and reduction of pulmonary function. If mixed with acids or warmed to temperatures greater than 40 degrees Celcius, Sodium hypochlorite solutions release chlorine gas. This gas can cause severe irritation of the nose and throat. Exposures to high levels of chlorine gas may result in severe lung damage.
Eye Contact: Corrosive to eye tissue and may cause severe damage and blindness.

Additional Information: Aspiration may cause lung damage. Corrosive effects on the skin and eyes may be delayed, and damage may occur without the sensation or onset of pain.
Acute Test of Product:
Acute Oral LD50: Not Available.
Acute Dermal LD50: Not Available.
Acute Inhalation LC50: Not Available.

Carcinogenicity:

Ingredients	IARC - Carcinogens	ACGIH - Carcinogens
Water	Not listed.	Not listed.
Sodium Hypochlorite, Solution	Group 3	Not listed.

Carcinogenicity Comment: No additional information available.

Reproductive Toxicity/ Teratogenicity/ Embryotoxicity/ Mutagenicity: Not Available.

12. ECOLOGICAL INFORMATION

Ecotoxicological Information:

Ingredients	Ecotoxicity - Fish Species Data	Acute Crustaceans Toxicity:	Ecotoxicity - Freshwater Algae Data
Water	Not Available.	Not Available.	Not Available.
Sodium Hypochlorite, Solution	LC50 96 h (Pimephales promelas) 0.06-0.11 mg/L flow-through LC50 96 h (Pimephales promelas) 4.5-7.6 mg/L static LC50 96 h (Lepomis macrochirus) 0.4-0.8 mg/L static LC50 96 h (Lepomis macrochirus) 0.28-1 mg/L flow-through LC50 96 h (Oncorhynchus mykiss) 0.05-0.771 mg/L flow-through LC50 96 h (Oncorhynchus mykiss) >0.03-<0.19 mg/L semi-static LC50 96 h (Oncorhynchus mykiss) 0.18-0.22 mg/L static	Not Available.	EC50 24 h Skeletonema costatum 0.095 mg/L

Other Information:
Harmful to aquatic life at low concentrations. Toxicity is primarily associated with pH.

13. DISPOSAL CONSIDERATIONS

Disposal of Waste Method: Disposal of all wastes must be done in accordance with municipal, provincial and federal regulations.
Contaminated Packaging: Empty containers should be recycled or disposed of through an approved waste management facility.

14. TRANSPORT INFORMATION

DOT (U.S.):
DOT Shipping Name: HYPOCHLORITE SOLUTION
DOT Hazardous Class 8
DOT UN Number: UN1791
DOT Packing Group: III
DOT Reportable Quantity (lbs): Not Available.
Note: No additional remark.
Marine Pollutant: No.

TDG (Canada):
TDG Shipping Name: HYPOCHLORITE SOLUTION
Hazard Class: 8
UN Number: UN1791
Packing Group: III
Note: No additional remark.
Marine Pollutant: No.

15. REGULATORY INFORMATION

U.S. TSCA Inventory Status: All components of this product are either on the Toxic Substances Control Act (TSCA) Inventory List or exempt.

Canadian DSL Inventory Status: All components of this product are either on the Domestic Substances List (DSL), the Non-Domestic Substances List (NDSL) or exempt.

Note: Not available.

U.S. Regulatory Rules

Ingredients	CERCLA/SARA - Section 302:	SARA (311, 312) Hazard Class:	CERCLA/SARA - Section 313:
Water	Not Listed.	Not Listed.	Not Listed.
Sodium Hypochlorite, Solution	Not Listed.	Listed	Not Listed.

California Proposition 65: Not Listed.
MA Right to Know List: Listed.
New Jersey Right-to-Know List: Listed.
Pennsylvania Right to Know List: Listed.

WHMIS Hazardous Class:
E CORROSIVE MATERIAL

16. OTHER INFORMATION

Additional Information: This product has been classified in accordance with the hazard criteria of the Canadian Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

Disclaimer: NOTICE TO READER:
Great North Chemicals, expressly disclaims all express or implied warranties of merchantability and fitness for a particular purpose, with respect to the product or information provided herein, and shall under no circumstances be liable for incidental or consequential damages.

Do not use ingredient information and/or ingredient percentages in this MSDS as a product specification. For product specification information refer to a Product Specification Sheet and/or a Certificate of Analysis.

All information appearing herein is based upon data obtained from the manufacturer and/or recognized technical sources. While the information is believed to be accurate, Great North Chemicals makes no representations as to its accuracy or sufficiency. Conditions of use are beyond Great North Chemicals' control and therefore users are responsible to verify this data under their own operating conditions to determine whether the product is suitable for their particular purposes and they assume all risks of their use, handling, and disposal of the product, or from the publication or use of, or reliance upon, information contained herein. This information relates only to the product designated herein, and does not relate to its use in combination with any other material or in any other process.

3.7 FLOW METER

Two flowmeters are present in this installation.

-One is at pump outlet before the valve set up (this meter all water is exiting the pumps.) (Including water when fire button is pressed on loading arm and valves bypass filters)

-One is at filter outlet. (Any water passing through filter is metered)

-Those flow meter supplies a 4-20 mA signal proportional to flow. present setting is

0 flow is 4mA and 3000 liters per minute is 20mA

-The level of this signal must be programmed by the commissioning engineer to suit proportional chlorine injection.

This signal is used by the two chlorine injection pumps used for the main injection proportional to flow. Analog mode on pump.

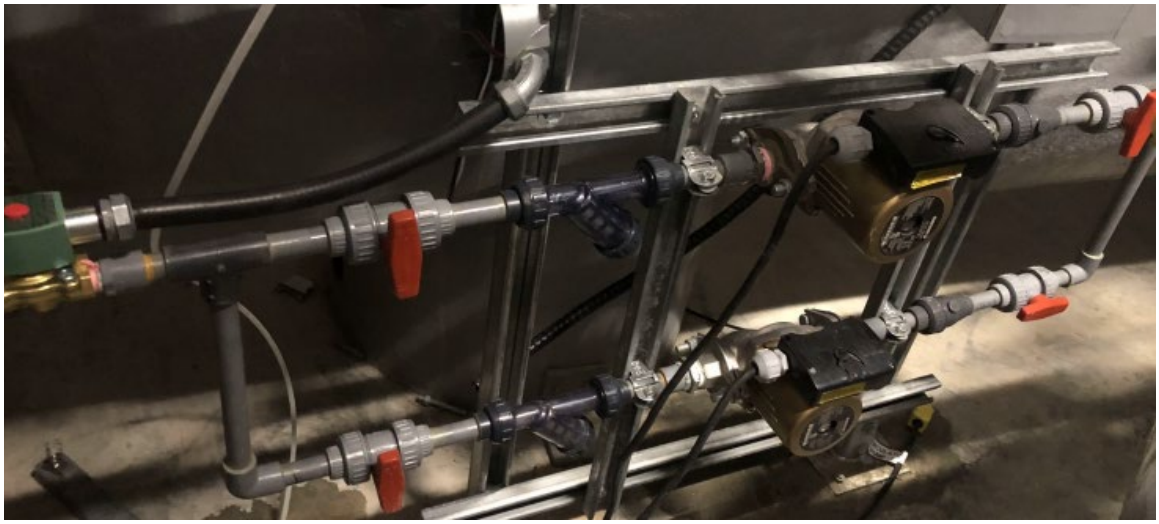
3.8 PROCESS WATER CAPTURE AND TANK FILLING

A simple filling valve is actuated by a float located at process water tank top.

To fill tank water is taken from the 2” circulating loop . Part of the circulated 225 liters is used to cap the tank

3.9 CIRCULATING PUMPS (P2 & P3) (New Circulating Pumps for Microchem2 Probes - Under CCN)

The circulating pumps are used to provide a constant treated water flow to both Microchem2 analysers to determine the Free Chlorine content and are controlled by the Control Panel.



pump stop during truck fill

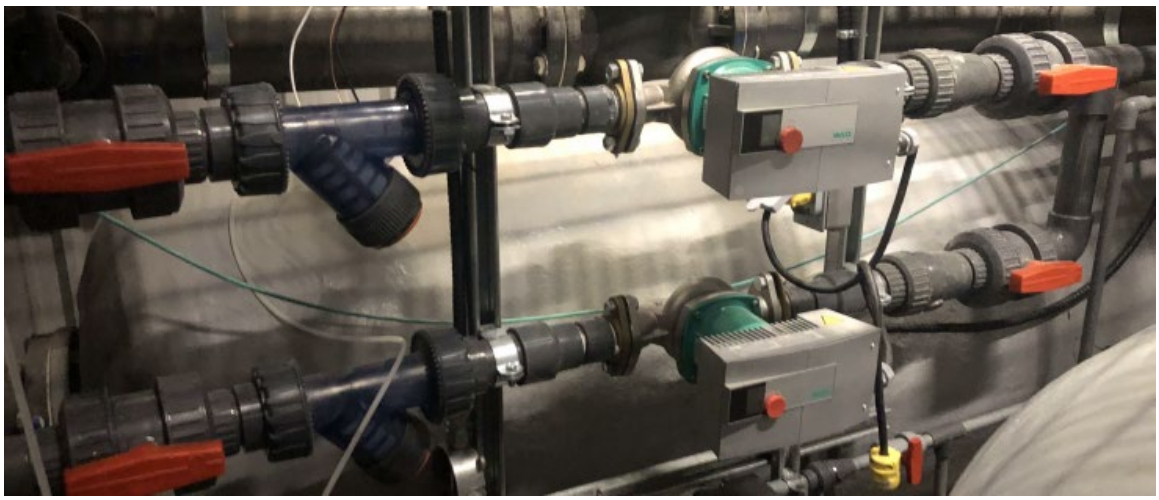
1. Refer to **Chapter 17** for more details

3.10 CIRCULATING PUMPS (PS1 & PS2) (Circulating Pumps for Chlorine Recirculation - Under CCN)

The circulating pumps are used to facilitate diffusion and maintain Free Chlorine level in the 15000 Litre main contact Tank.

Two-hundred and twenty-five liters of treated water are circulated from the 15,000-litre tank outlet to the filter outlet and contact tank inlet.

At all times including overnight and/or between truck filling, chlorine is injected to maintain chlorine level.



Following conditions STOP operation of pumps:

1. During Water Truck fill.
2. Refer to **Chapter 17** for more details