GOVERNMENT OF NUNAVUT

KUGAARUK WATER TREATMENT PLANT

TECHNICAL MANUAL

WATER SUPPLY UPGRADES

Project # 2400

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General specifications

1.1 Safety

(1) It is very important that installers, operators and maintenance personnel read this manual and become thoroughly familiar with the unit. Pay close attention to applicable warnings, cautions and notes to protect your safety and maintain the proper functioning of the unit.

(2) When operating and maintaining the unit, follow the manufacturer's procedures to protect the integrity of the water treatment system.

(3) If any questions arise with respect to any portion of this manual, or if any error or discrepancy is found, please contact the manufacturer.

IMPORTANT – READ THIS MANUAL

This document contains important start-up, operational, and maintenance procedures, that must be followed in order to keep the water treatment unit and its individual components operating at the design level. Failure to follow these procedures can result in damage to equipment and/or decreased water treatment function.

1.2 Kugaaruk potable water treatment plant - general

The new water treatment plant (WTP) contains two identical treatment trains, each capable of delivering 1,134 L/min of filtered and disinfected lake water to the two truckfill stations. Filtering is done by cartridge filters and disinfection by UV radiation and chlorination.

PROCESS DESCRIPTION

Refer to the system process diagram 2400-PI-101 in the manual binder. The new building contains the filtration systems, the UV units and the sodium hypochlorite injection systems. It also contains the domestic water storage tank, water heater, lab sink, eyewash equipment and a sewage tank.

When the system is activated, a raw water submersible pump will start and allow water to fill the water truck. The water is subjected to filtration by one 10 micron and two 1 micron (all absolute) cartridge filters in series (periods of low turbidity, typically October to May). During high turbidity perods (June to September), filtration is done by one 5 micron nominal followed by one 1 micron nominal and one 1 micron absolute cartridge filter in series. Disinfection is done by UV irradiation and sodium hypochlorite injection. The sodium hypochlorite solution is transferred to a solution tank, from where it is injected into the truck fill lines by means of two chlorine dosing pumps.

Once the truck fill control is deactivated by the operator pressing the OFF button, the raw water pump is shut down.

1.3 Functional characteristics

This WTP is designed to treat and disinfect raw river water. The treated water delivered to the truck fill stations will contain a minimum of 0.25 mg/L (0.25 ppm) of free chlorine.

1.4 Systems interfaces

Physical interface – the two raw water pumps move the river water to the new treatment system via the existing intake casings. Treated water goes directly to the truckfill stations. Surplus water is returned to the river through intake casing #2.

Power interface – 208 VAC, 3-phase, 200 A.

Operational interface - a system control panel equipped with a HMI screen indicates the status of the various systems and provides means for operator control.

1.5 Physical description

The container with equipment (dry) weighs approximately 12,000 kg. Inside dimensions are approximately 9.9 m x 3.9 m x 3.3 m.

1.6 Security

As this WTP treats water for human consumption, the system should be secured. Entry should be restricted to authorized and qualified persons only. Unauthorized and unqualified persons should be escorted and supervised by an authorized person. In the event of a break-in, vandalism, or other suspect activity that may have compromised the safety of the water, the appropriate section of the Emergency Response Plan should be activated. The Emergency Response Plan should be developed by the owners, operators, and community officials to deal effectively with issues that may constitute an emergency with respect to the water safety and water treatment plant operations.

2. Main components of the WTP

ID #	Description	Make	Model #	Size
RWP101, RWP201	Raw water pump	Grundfos	300S150-4AA	
RWP101, RWP201	Pump motor	Franklin Electric	236653	15 hp
SL101, SL201	Salinity sensor	Walchem	WEC410-1NDN	
TB101, TB102	Turbidity analyzer	HF Scientific	MicroTol 2	
F1-A, F2-A	Cartridge housing	CUNO (3M)	1-HF-60-H-C-GD	
F1-A, F2-A	Cartridge	CUNO (3M)	HF-60-PP-01-0-01	10 micron
F1-B, F2-B	Cartridge housing	CUNO (3M)	1-HF-60-H-C-GD	
F1-B, F2-B	Cartridge	CUNO (3M)	HF-60-PP-001-0-01	1 micron abs.
PI101,PI201,PI102,PI202, PI103,PI203	Pressure gauge	Winters		0-145 psi
PT101,PT201,PT102,PT202 PT103,PT203	Pressure transmitter	IFM	PA3224	0 – 10 bar
UV-1, UV-2	UV unit	NeoTech D438	UVS4385-500	
P101, P201	UV water circulator pump	Grundfos	UP15-18 BUC7	
F1-C, F2-C	Cartridge housing	CUNO	1-HF-60-H-C-GD	
F1-C, F2-C	Cartridge	CUNO	HF-60-PP-001-0-01	1 micron abs.
PI104,PI204,PI105,PI205	Pressure gauge	Winters		0-145 psi
PT104,PT204,PT105,PT205	Pressure transmitter	IFM	PA3224	0 – 10 bar
FM101, FM201	Magnetic flow meter	ABB	FEV115	
TB201, TB202	Turbidity analyzer	HF Scientific	MicroTol 2	
T301	Chlorine mixing tank	Norwesco	41867	95 L
T302	Chlorine holding tank	Century Plastics	T-55	250 L
P103, P203	Chlorine dosing pump	Grundfos	DDA 7.5 - 16	7.5 L/h
T305	Domestic water tank	Norwesco	40803	398 L
SV107, SV207, SV601	Solenoid valve	Burkert	0290	
P601	Domestic water pump	Shurflo RV	2088-492-4444	
T303	Hydro-pneumatic tank	Watts	PLT-12	45 L
WH-1	Water heater	Eemax	EMT2.5	
SNK-1	Lab sink	Kindred	QSLA2225/8/3	
EW-1	Faucet eyewash	Haws	7620	
(T304)	Sewage tank			1350 L
LS601, LS602, LS603	Level switch	MDI		
-	Main PLC	Siemens	Simatic S7-1214C	
-	Truckfill arms HMI	Siemens	KTP400	
-	Plant HMI	Siemens	TP700	
-	Autodialer	Sensaphone	1400	

Consumables: Sodium hypochlorite at 12%.

2.1 Cartridge filtration

Fig. 1 - Cartridge filter housings and UV module.

The CUNO filter housings contain 10 (optionally 5) micron and 1 micron absolute cartridges. For cartridge installation and operating instructions for these housings, see the “Filters” sections in the manual binder. When the pressure differential over any of the filter housings reaches 240 kPa (35 psi), the cartridge must be changed. A warning and an alarm will be triggered at 206 and 240 kPa respectively, see further section 3.2 below.

2.2 UV disinfection

Because the truck trains cannot drain when the raw water pump is shut off, the NeoTech UV units will be continuously on and water will be circulated through them by pumps P102/P202. Some of the characteristics of the NeoTech D438 unit are as follows:

- 40 mJ/cm^2 at 95% UVT at nominal flow of 1,134 L/min
- NSF Standard 50 Certified
- Two amalgam lamps per unit
- Lamp life 9000 hours
- Pressure drop < 0.95 bar
- Operating power 303 W

Recommended spare parts

- Cleaning kit CK-4-1
- Amalgam lamp kit LK-38
- Lamp sleeve kit QSK-38
- UV monitor calibration UVIM-CAL
- Ballast kit BK-120

For further details regarding the operation and maintenance of the UV units, see section 3 in the manual binder.

2.3 Sodium hypochlorite disinfection

The system consists of a 95 L mixing tank T301 (included for future use) and a 250 L chlorine holding tank T302, from which the solution is injected in the truckfill lines by means of two dosing pumps P103/P203. The sodium hypochlorite arrives at the site in18.9 L pails at a hypochlorite consistency of 12%.

The formula for calculating the required dosing pump flow for a given chlorine demand and system flow is as follows:

Dosing pump flow [mL/hr] = 60 x truckfill line flow [L/min] x Chlorine demand [ppm or mg/L] / (Sodium hypochlorite concentration [%] x 10)

Example:

Truckfill flow = 1134 L/min
Chlorine demand 1.5 ppm
Sodium hypo concentration =12%

Necessary dosing pump flow = 60 x 1134 x 1.5 / (12 x 10) = 850.5 mL/hr

Safety precautions: sodium hypochlorite is in a liquid form. This could result in spills and splashes. Before using hypochlorite for disinfection, a couple of personal eye wash bottles should be purchased along with a protective apron, rubber gloves, goggles, and a face shield. Procedures for handling and dispensing sodium hypochlorite should be carefully read and reviewed before commencement. The solution tank for the hypochlorite should be monitored for fill level. Do not let the tank run empty as the resulting air in the line will have to be purged before chlorination can resume.

2.4 Sample valves

Refer to process diagram 2400-PI-101:

S101, S201 – 10 (optionally 5) micron filter reject (F1-A, F2-A)
S102, S202 - 1 micron filter reject (F1-B, F2-B)
S103, S203 - 1 micron filter accept (F1-B, F2-B)
S104, S204 - 1 micron filter reject (F1-C, F2-C)
S105, S205 - 1 micron filter accept (F1-C, F2-C)
S106, S107 - Product water truckfill lines #1 and #2

2.5 Raw water intake

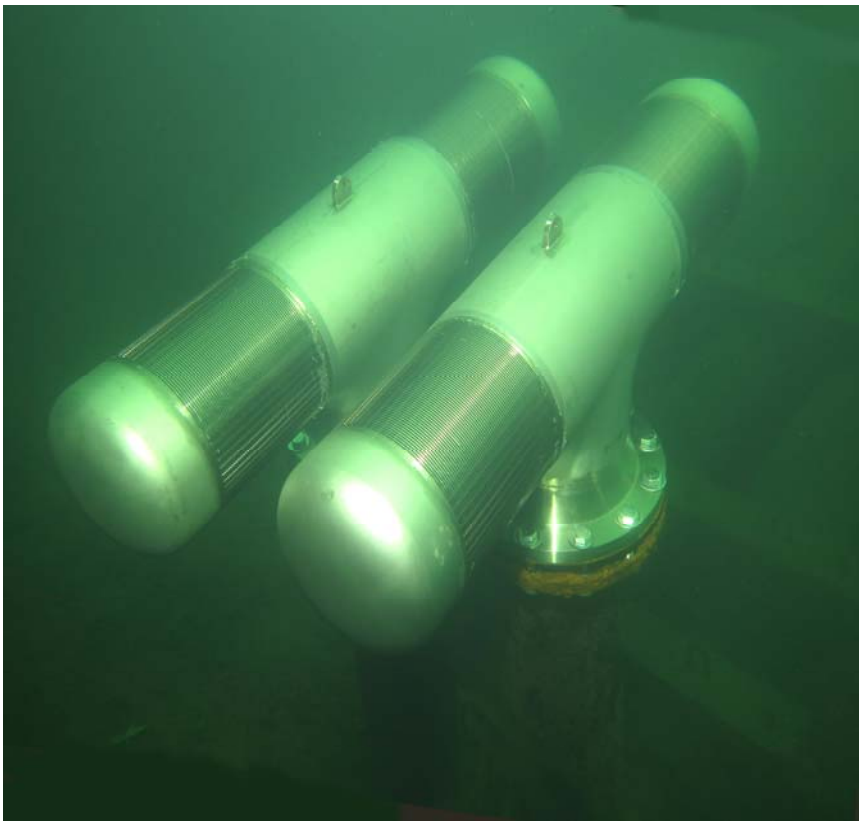


Fig. 2 - A new raw water intake was installed to replace the original intake.

FLUSHING OF INTAKE SCREENS

Refer to process diagram 2400-PI-101. The intake flow is reversed by closing valve V101 (V201) and opening of the normally closed valve V151 (V251) to flush out material collected in the screens.

3. Controls

Fig. 3 – Control panel with HMI and switches

3.1 Control panel

CONTROL PANEL INDICATORS, SWITCHES AND ALARMS		
ID	**DESCRIPTION**	**TYPE**
-	SYSTEM ON/OFF	SWITCH
RWP101	RAW WATER PUMP (HAND-OFF-AUTO)	SWITCH
RWP201	RAW WATER PUMP (HAND-OFF-AUTO)	SWITCH
P102	WATER CIRCULATOR PUMP (HAND-OFF-AUTO)	SWITCH
P202	WATER CIRCULATOR PUMP (HAND-OFF-AUTO)	SWITCH
P601	DOMESTIC TANK PUMP (ON-OFF)	SWITCH
P103	CHLORINE DOSING PUMP (ON-OFF)	SWITCH
P203	CHLORINE DOSING PUMP (ON-OFF)	SWITCH
SV107	DRAIN VALVE FOR TRUCKFILL LINE 1 (H-O-A)	SWITCH
SV207	DRAIN VALVE FOR TRUCKFILL LINE 2 (H-O-A)	SWITCH
SV601	FILL VALVE DOMESTIC WATER TANK (H-O-A)	SWITCH
-	TRUCKFILL ALARM OVERRIDE (ON-OFF)	SWITCH
-	TRUCKFILL ALARM OVERRIDE (ON-OFF)	SWITCH

1st row

System ON/OFF: a switch used to turn the control panel power ON or OFF for service or other reasons.

2nd row, left to right:

RWP101 (*HAND-OFF-AUTO*): in AUTO mode, the raw water pump feeding line 1 will start when the operator pushes the truckfill start button. It will stop as soon as the operator deactivates the truckfill control, allowing any excess water to flow back to the inlet piping, or when the pre-set water volume has been reached.

RWP201 (*HAND-OFF-AUTO*): in AUTO mode, the raw water pump feeding line 2 will start when the operator pushes the truckfill start button. It will stop as soon as the operator deactivates the truckfill control, allowing any excess water to flow back to the inlet piping, or when the pre-set water volume has been reached.

P102 (*HAND-OFF-AUTO*): in AUTO mode, this water circulator pump will be operating as long as the UV-1 unit is not turned off.

P202 (*HAND-OFF-AUTO*): in AUTO mode, this water circulator pump will be operating as long as the UV-2 unit is not turned off.

P601 (*HAND-OFF-AUTO*): in AUTO mode, this domestic water tank pump will be operating as long as pressure switch PS601 is off.

P103 (*HAND-OFF-AUTO*): in AUTO mode, this chlorine dosing pump will start injecting chlorine at a pre-set amount in truckfill line1 when activated by the operator.

P203 (*HAND-OFF-AUTO*): in AUTO mode, this chlorine dosing pump will start injecting chlorine at a pre-set amount in truckfill line2 when activated by the operator.

3rd row, left to right:

SV107 (*HAND-OFF-AUTO*): in AUTO mode, this solenoid valve opens to drain when the truckfill line is shut off to prevent that water is present in the arm outside the building.

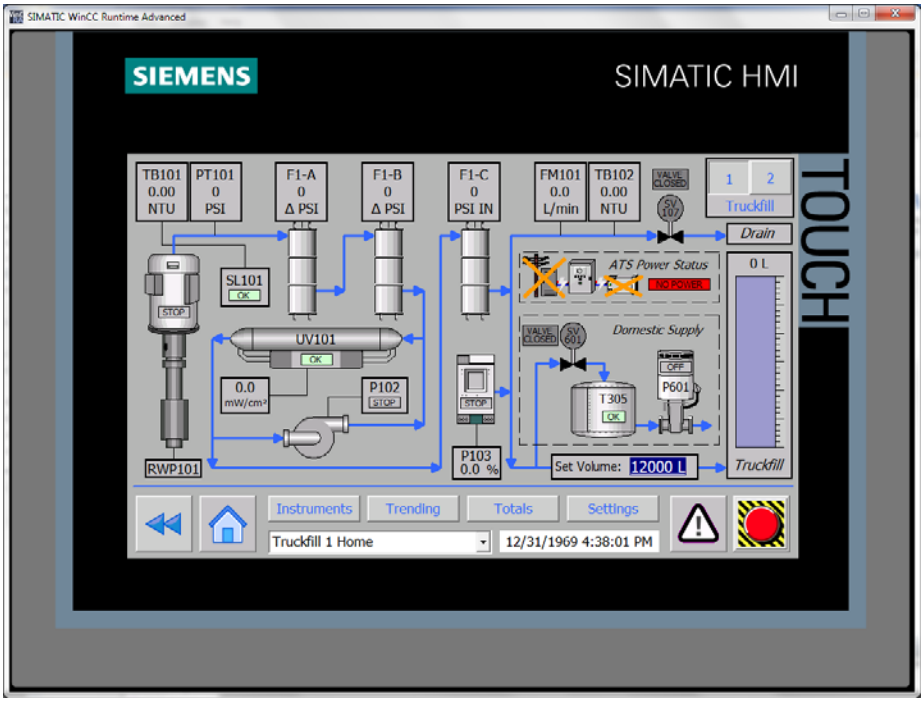
SV207 (*HAND-OFF-AUTO*): in AUTO mode, this solenoid valve opens to drain when the truckfill line is shut off to prevent that water is present in the arm outside the building.

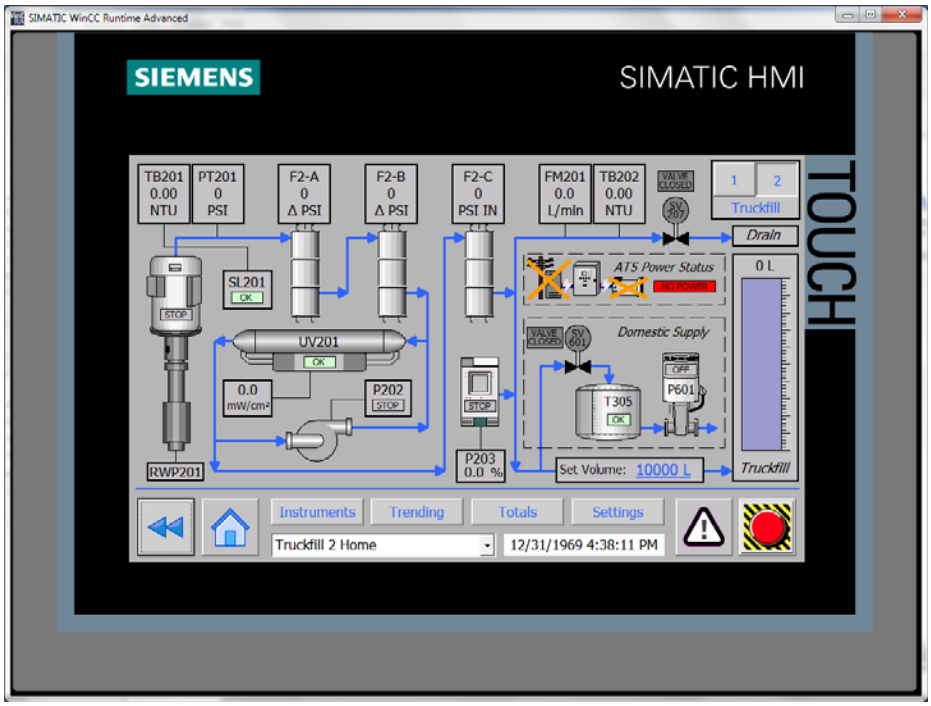
SV601 (*HAND-OFF-AUTO*): in AUTO mode, this solenoid valve opens to fill T305 when a truckfill line is operating.

- In the ON position, this switch overrides all alarms and restrictions and allows for production of water in an emergency, such as a fire.

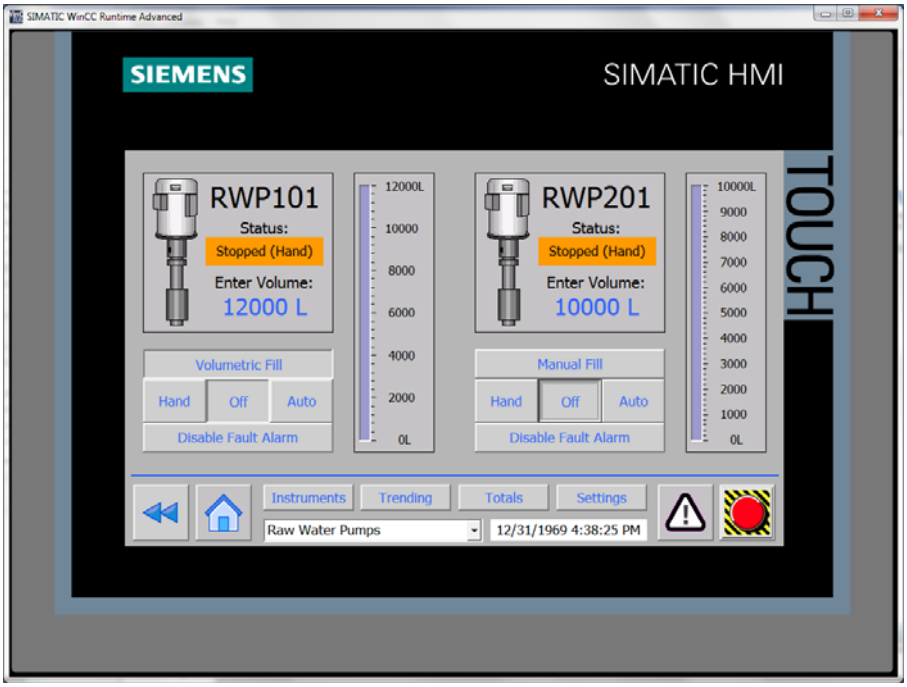
- In the ON position, this switch overrides all alarms and restrictions and allows for production of water in an emergency, such as a fire.

3.2 HMI touch screen

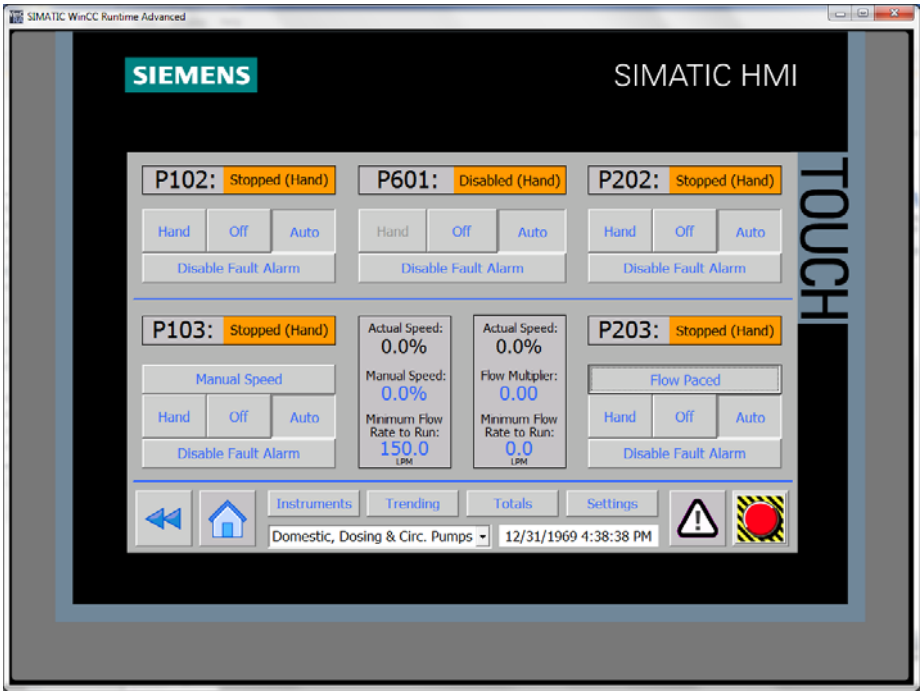




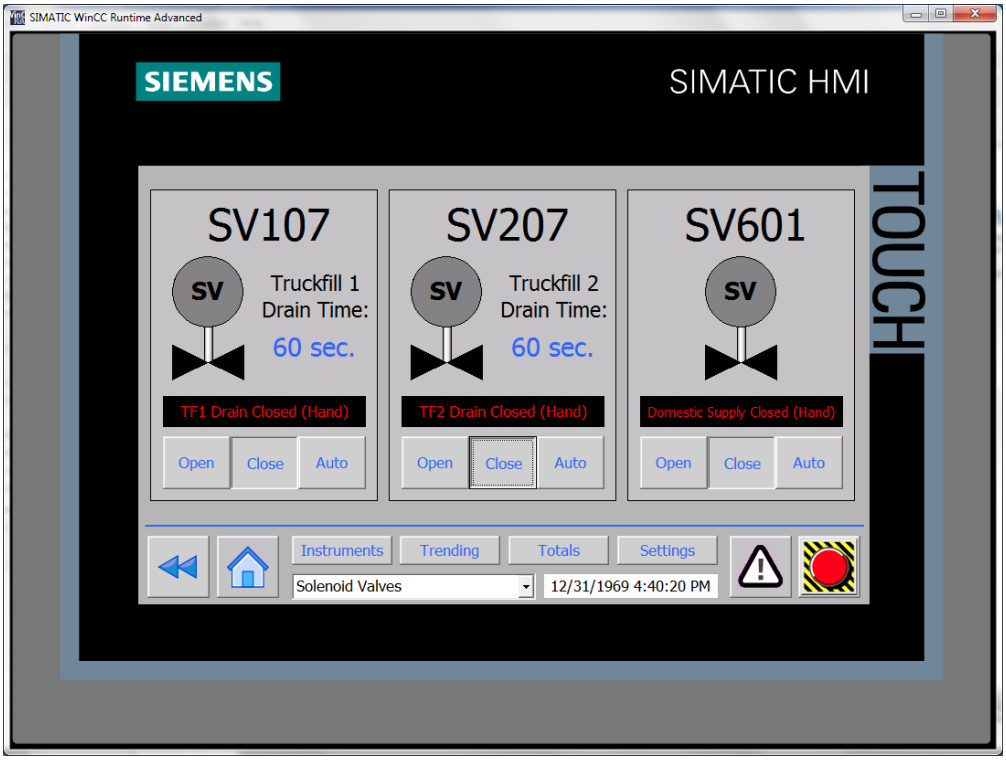
Screens 1 and 2. Overview (home) screens for truck fill lines 1 and 2. Truck fill volumes can be set from these screens. The button in the lower right corner is an emergency stop button that halts both truckfills when pressed and prevents them from running until it is pressed again.



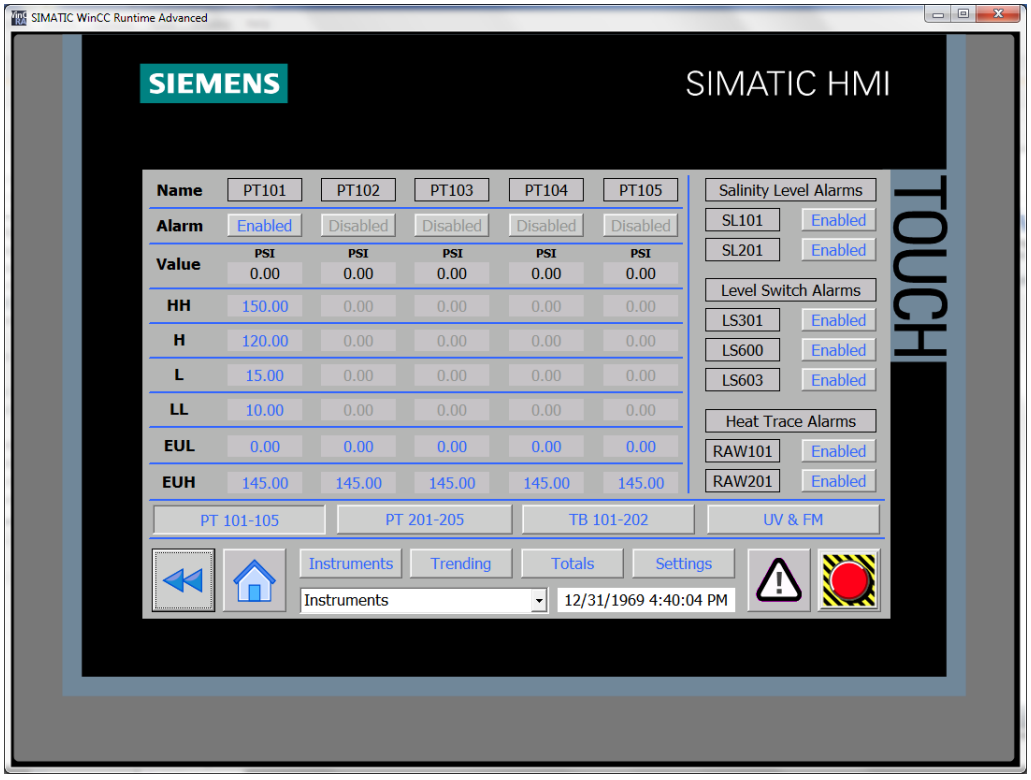
Screen 3. Raw water pump status, operating mode, volume, and manual operation are accessible from this screen.



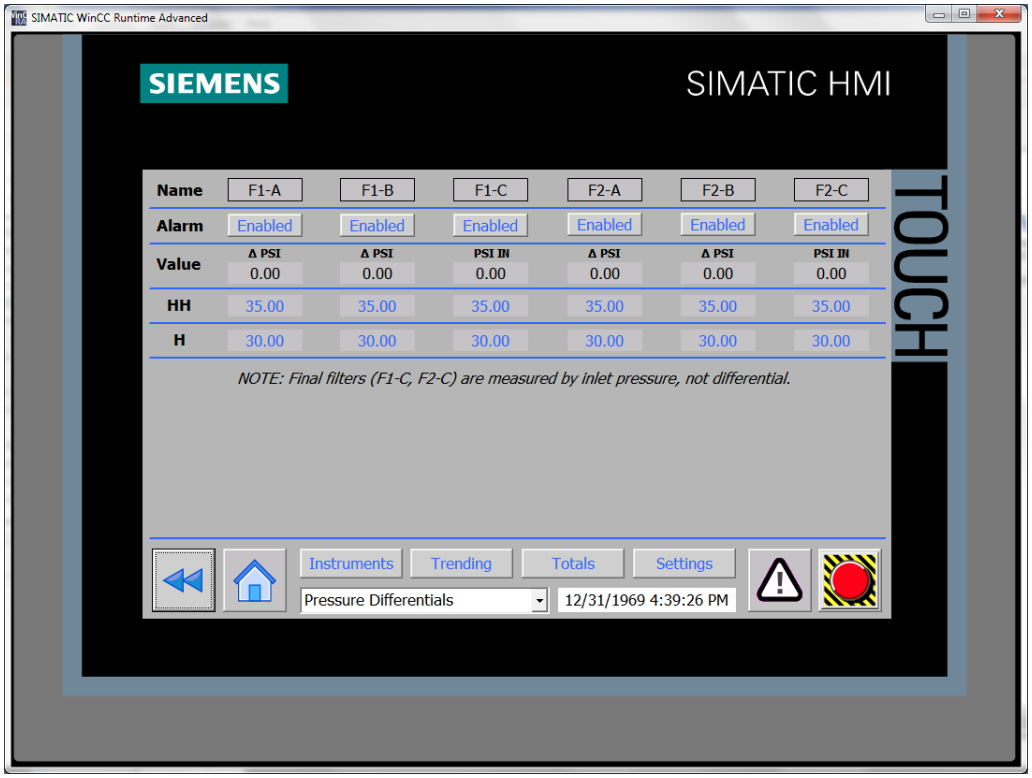
Screen 4. Status and control for UV recirculation pumps P102/P202, domestic pressure pump P601, and sodium hypochlorite dosing pumps P103/P203. Note that the dosing pumps can be run at a manual percentage of the pump's maximum speed or in automatic mode. In automatic mode, chlorine injection is paced to the speed of the truck fill (measured by flow meters FM101/201). The flow multiplier is set as a percentage of current system flow, linearly controlling the pump output speed.



Screen 5. Solenoid valves used for draining left over water from the truck fill and providing water to the domestic water tank can be controlled and monitored from this screen.

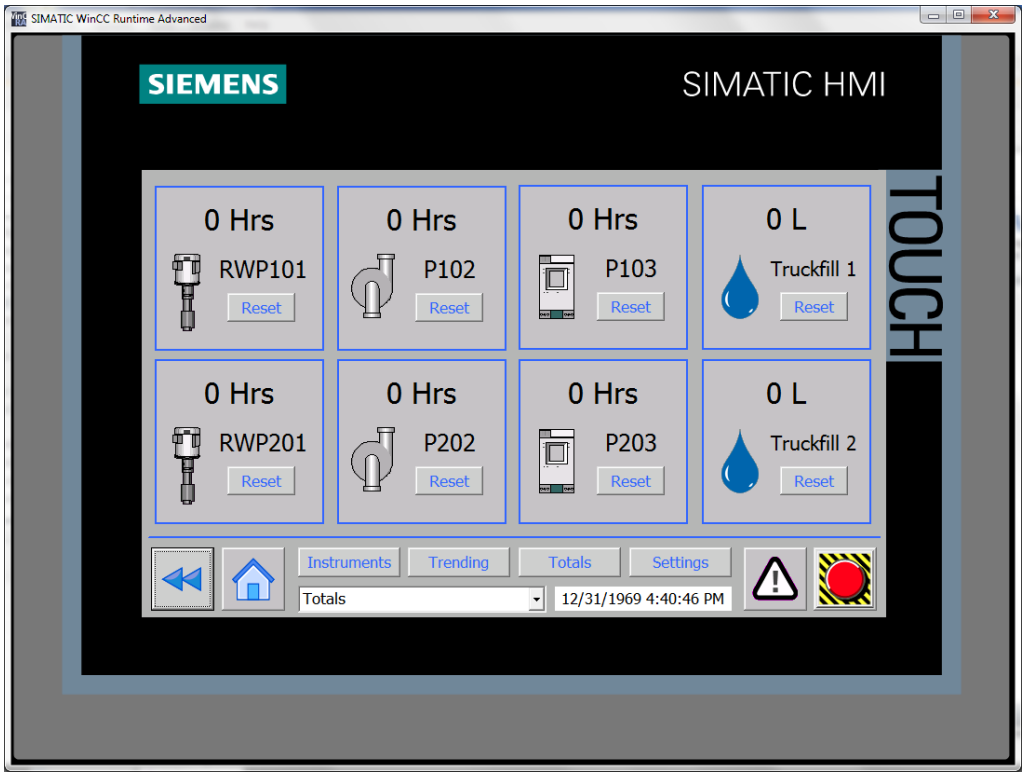


Screen 6. Sensor actual readings, calibration and alarm settings. Parametric minima and maxima for all instruments are entered here. EUL is the min. value assigned, i.e. 4 mA = 0 L/min. EUH is the max. value assigned, i.e. 20 mA = 1200 L/min. When High (H) and Low (L) limits are reached, alarms are triggered. When High-high (HH) and Low-low (LL) limits are reached, the raw water pumps are shut down.

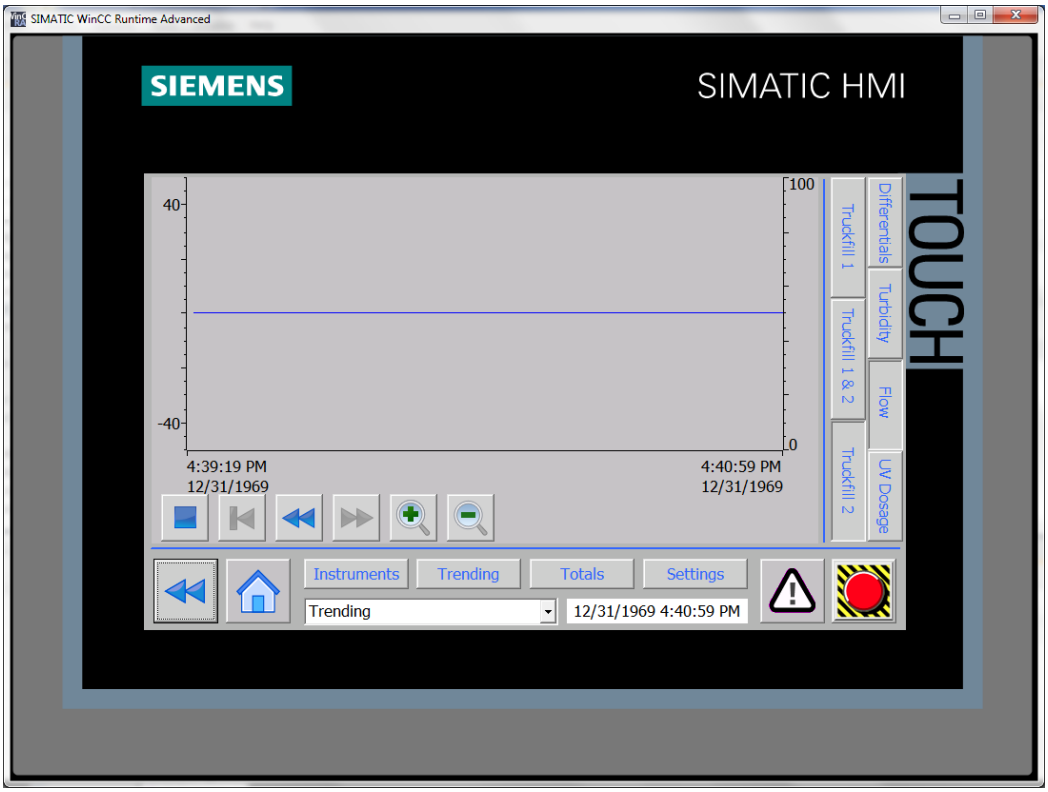


Screen 7. Cartridge filter pressure differentials screen. Alarm values for the filter differentials can be set and disabled from this screen to indicate when filters are nearing or in need of replacement.

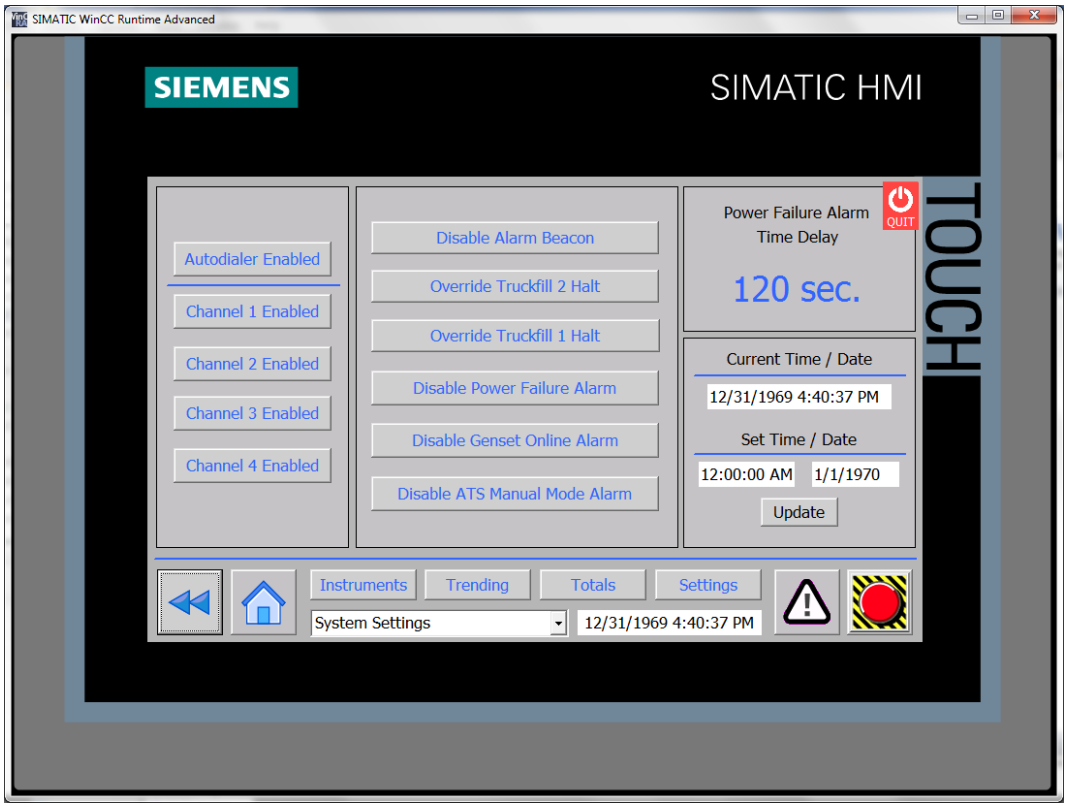
Screen 8. Alarms screen. When an issue with the plant arises, the Alarms screen button will illuminate orange for warnings and flash red for serious problems. From here, alarms can be examined and acknowledged to allow the truck fill to continue running.



Screen 9. Accumulated run totals from each pump and total volume purified by each truck fill is measured here.



Screen 10. Trending screen.



Screen 11. System settings such as Auto Dialer control, Alarm control, and Time can be controlled from this screen.

4. Start-up and operation of the WTP

4.1 General

(1) The WTP is designed to be a reliable and simple system to operate. Once properly installed, the operator needs only to check the main control panel (HMI touch screen) after power-up to ensure that the WTP is functioning normally.

(2) Periodic checks of the control panel are recommended. In most cases, very little maintenance will be required beyond regular replacement of chemicals.

The control panel of the water treatment plant has been designed such that, in the unlikely event of control failure, the plant can be run manually. Manual operation of the plant allows the operator to directly control the individual processes that allow the plant to function, but should mainly be used for start-up/testing only. The operator should be aware that alarms, checks and process control functions are non-existing during manual plant operation, and assistance from other operators might be required.

4.2 Sanitizing the WTP

The cleaning and sanitization procedure should be regarded as an on-going program to be performed regularly and not only for when problems have occurred. Cleaning only removes the organic and inorganic debris. Sanitization, however, eradicates microbial contamination. The two terms are not synonymous.

(1) Cleaning should always come before sanitization, as it is not possible to sanitize a dirty plant.

(2) Sediment may be removed by chemical or mechanical methods. A cleaning treatment may include water, surfactants, and mild acids to remove organic material, and/or alkaline to remove inorganic/mineral deposits. Heavy buildup may require more aggressive means, such as pressurized water, sand blasting or manual scrubbing, scraping and brushing. Use ‘pigs’ to clean transfer lines.

(3) Cleaning alone is not effective in penetrating or eliminating biofilms. However, frequent cleaning can prevent biofilms from becoming established.

There are several ways of sanitizing a water treatment plant. An important point about any sanitation program is not just to consider the specific treatment used but also the contact time. The longer the contact time, the more effective the treatment will be.

a) Hot water: This is extremely effective if 82°C and a minimum of 30 minutes contact time are achieved throughout the entire system. However, water is not a good wetting agent and dissolver of build-ups and, as a result, needs the addition of other chemicals, such as surfactants.
b) Chemical disinfectants: There are two main types of disinfectants, oxidizing and non-oxidizing. These compounds are fast-acting and broad spectrum in activity (see Table 1 below for more details).

Table 1. Chemical disinfectants

	Concentration	Contact time
Oxidizing disinfectants:		
Sodium hypochlorite	0.01 to 0.02%	30 minutes
Peracetic acid	0.01 to 0.2%	5 minutes
Hydrogen peroxide	0.05 to 0.1%	30 minutes
Non-oxidizing disinfectants:		
Quaternary ammonium chloride	0.02 to 0.04%	10 minutes
DBNPA	0.02 to 0.04%	240 minutes

** Be sure to follow the label recommendations and the supplier's MSDS to ensure proper use and handling. Note: these are guidelines on treatment levels and contact time, which should be verified and, if need be, adjusted based on field experience.*

(4) Clean and flush all lines and equipment and send the contaminated water to waste. Do not allow water into the distribution system.

(5) Sanitize the piping and equipment with a concentrated solution for the required contact time plus 50 percent. Drain the solution and neutralize it before sending it to waste.

(6) After cleaning and sanitization

a) Cleaned and sanitized equipment should be drained dry and any open ends covered and labeled as clean to prevent
b) Microbial recontamination. In addition, the following steps are suggested:
• If not completely dry, equipment should be filled with chlorinated water and/or used within a few hours (depending on temperature) or re-sanitized prior to next use.
• Tanks should have manways and openings closed.
• Flexible hosing should be dedicated to cleaning and sanitization and stored to facilitate draining and drying between uses.
• Filters and piping should not be left open to the atmosphere
• Conduct microbiological spot checks to confirm the effectiveness of the sanitization process.

4.3 Water sampling

(1) When collecting water samples for bacterial analysis, special procedures are needed to avoid contamination and obtain samples that are representative of the water being tested. The following guidelines will help you develop Standard Operating Procedures for collecting samples from your automated water treatment system.

(A) Sample frequency

a) Depending on the number of users, daily, weekly, monthly, or quarterly (4 times/year) sampling is most common. See the local regulatory requirements.
b) When starting a sampling program, sample more frequently at first to determine the range and variability of bacteria counts.

(B) Suggested sample locations

a) Before and after any water treatment (e.g. filtration, UV disinfection)
b) After any storage tank
c) Room distribution piping: Sample from the last quick disconnect (QD) in several rooms of the automated watering system. For a worst case, pick rooms farthest from the water treatment system.
d) Rack manifold: Sample either from a drinking valve or from the rack drain valve.

(C) Sampling procedures

The laboratory doing the analysis should approve and confirm sample containers and procedures. The following general guidelines are taken from Standard Methods for the Examination of Water and Wastewater.

a) Use sterilized sample bottles.
b) For water containing chlorine, add sodium thiosulfate or other reducing agent to the bottles before sampling. The reducing agent neutralizes any residual chlorine and prevents continued bactericidal action during sample transit.
c) The tap used as a sampling point should be without attachments (ex. tubing attached to a barbed sample valve).
d) Keep sample bottle closed until the moment it is to be filled. Remove stopper/cap taking care not to touch the inside surfaces of the cap or neck of the bottle.
e) Open and flush the tap for 2-5 minutes before collecting the sample. This procedure ensures that the tap is clean and does not contribute bacteria to the sample. Reduce water flow to permit filling bottle without splashing.

f) If tap cleanliness is questionable, apply a solution of sodium hypochlorite (100-ml bleach/L) to faucet before sampling. Let water run for additional 2 or 3 minutes after treatment. Discard the first 50-200 ml of water before collecting the sample.
g) Fill bottle without rinsing. You will remove some or all of its preservative and ruin the sample.
h) Leave ample air space in the bottle (at least 2.5 cm) to facilitate mixing by shaking before examination. Replace stopper/cap immediately.
i) Label the bottle before using with utility name, sample tap location, date, time & sampler name.

(D) Holding time and temperature

a) Submit your drinking water test sample to the licensed laboratory as quickly as possible after collection. The earlier the laboratory gets your drinking water sample, the quicker it can be tested and the more accurate your test results will be. Ship early in the week to avoid having your sample sit in the laboratory over the weekend before testing.
b) If samples cannot be processed within 1 hour after collection, use an iced cooler for storage during transport to the laboratory (hold temperature below 10 degrees Celsius). Don’t pack the bottles with loose ice as this may contaminate the sample. If you only have loose ice, encase it in waterproof packaging or a sealed container.
c) The recommended maximum transport time is 6 hours, but when this isn’t possible it should not exceed 24 hour.
d) Send the completed Chain-of-Custody form to the laboratory along with the collected sample. If sending it inside the cooler containing the sample, ensure that the form is enclosed inside a waterproof package, e.g., a new zip-lock bag.
e) Record time, low rate and temperature of storage of all samples and consider this information in the interpretation of data.
f) If the results show contamination of E.coli or total coliform, you must take corrective action. Check your Supplying Safe Drinking Water guide and the Procedure For Corrective Action for Non-Residential and Non-Municipal Seasonal Residential Systems that Do Not Serve Designated Facilities and are Not Currently Using Chlorine:
g) Keep test result records for **at least five years**.

5. Plant maintenance

5.1 Preventive maintenance

a) Some components should be paid particular attention. The maintenance procedures for each component can be found in the equipment section of the manual.

b) Trained and qualified personnel who are knowledgeable about the system should perform maintenance. The safety of the person performing the maintenance is paramount, therefore all relevant devices and components should be isolated electrically (via local disconnects which are locked), and isolated fluidly (via isolation valves), BEFORE maintenance begins. The latest regulations should be consulted for appropriate lockout procedures, confined entry procedures and other relevant procedures.

c) Personnel performing maintenance also affect the health and safety of people who consume the water and as such, personnel performing maintenance should be mindful of their practices, tools, and procedures during maintenance operations:

- Hands and clothing should be clean.
- The water treatment building should not be used for general storage of tools and equipment.
- The water treatment plant should have its own tools for servicing, which should not be used for anything other than water treatment plant service.
- Buckets used for mopping floors and general washing should be labeled as such and should NOT be used for washing water treatment components such as filters or pump parts. There should be a dedicated bucket for washing parts, which should be stored up on the shelf, labeled and covered when not in use.
- A weak sodium hypochlorite solution should be used for disinfecting parts such as filters.

5.2 Troubleshooting guide

IF THIS OCCURS:	TRY THIS:
A. No or low water flow	a. Check for alarm lights at HMI touch screen
	b. Check for power at control panel & electrical breaker
	c. Check the ON/OFF switch at control panel.
	d. Check pressure differentials over cartridge filters.
B. Residual chlorine level low/high	a. Check operation of the chlorination system

#	ALARM MESSAGE	DESCRIPTION	AD CH1 - POWER TROUBLE	AD CH2 - PUMP TROUBLE	AD CH3 - WATER QUALITY	AD CH4 - PROCESS TROUBLE
1	TB101 HH	Truckfill 1 Raw Water Turbidity is extremely high. Recommend stopping truckfill.			X	
2	TB101 H	Truckfill 1 Raw Water Turbidity is high				
3	TB102 HH	Truckfill 2 Raw Water Turbidity is extremely high. Recommend stopping truckfill.			X	
4	TB102 H	Truckfill 2 Raw Water Turbidity is high				
5	TB201 HH	Truckfill 1 Treated Water Turbidity is extremely high. Recommend stopping truckfill.			X	
6	TB201 H	Truckfill 1 Treated Water Turbidity is high				
7	TB202 HH	Truckfill 2 Treated Water Turbidity is extremely high. Recommend stopping truckfill.			X	

8	TB202 H	Truckfill 2 Treated Water Turbidity is high				
9	LS301 LL	Chlorine Tank is very low, the truckfill has been shut down				X
10	LS601 LL	Domestic Water Tank is very low, the Domestic Pump has been disabled				
12	LS603 HH	Sewage Tank is full				X
13	UV101 Fault	Truckfill 1 UV has failed, the truckfill has been shut down				X
14	UV201 Fault	Truckfill 2 UV has failed, the truckfill has been shut down				X
15	SL101 HH	Truckfill 1 Raw Water has too much salt, it has been shut down			X	
16	SL201 HH	Truckfill 2 Raw Water has too much salt, it has been shut down			X	
17	F1-A HH	Truckfill 1 Filter "A" Pressure Differential indicates the filter needs to be replaced immediately				X
18	F1-A H	Truckfill 1 Filter "A" Pressure Differential indicates the filter will need replacement soon				
19	F1-B HH	Truckfill 1 Filter "B" Pressure Differential indicates the filter needs to be replaced immediately				X
20	F1-B H	Truckfill 1 Filter "B" Pressure Differential indicates the filter will need replacement soon				
21	F1-C HH	Truckfill 1 Filter "C" Pressure Differential indicates the filter needs to be replaced immediately				X
22	F1-C H	Truckfill 1 Filter "C" Pressure Differential indicates the filter will need replacement soon				
23	F2-A HH	Truckfill 2 Filter "A" Pressure Differential indicates the filter needs to be replaced immediately				X
24	F2-A H	Truckfill 2 Filter "A" Pressure Differential indicates the filter will need replacement soon				
25	F2-B HH	Truckfill 2 Filter "B" Pressure Differential indicates the filter needs to be replaced immediately				X
26	F2-B H	Truckfill 2 Filter "B" Pressure Differential indicates the filter will need replacement soon				
27	F2-C HH	Truckfill 2 Filter "C" Pressure Differential indicates the filter needs to be replaced immediately				X
28	F2-C H	Truckfill 2 Filter "C" Pressure Differential indicates the filter will need replacement soon				

29	Truckfill 1 Intake Line Heat Trace has failed					X
30	Truckfill 2 Intake Line Heat Trace has failed					X
33	RWP101 Fault	Truckfill 1 Raw Water Pump has failed, the truckfill has been shut down		X		
34	RWP201 Fault	Truckfill 2 Raw Water Pump has failed, the truckfill has been shut down		X		
35	P102 Fault	Truckfill 1 UV Circulation Pump has failed		X		
36	P202 Fault	Truckfill 2 UV Circulation Pump has failed		X		
37	P103 Fault	Truckfill 1 Chlorine Dosing Pump is turned off or has failed, the truckfill has been shut down		X		
38	P203 Fault	Truckfill 1 Chlorine Dosing Pump is turned off or has failed, the truckfill has been shut down		X		
39	P601 Fault	Domestic Supply Pump has failed		X		
41	PT101 HH	Truckfill 1 Inlet Pressure is too high, the truckfill has been shut down		X		
42	PT101 H	Truckfill 1 Inlet Pressure is high				
43	PT101 L	Truckfill 1 Inlet Pressure is low				
44	PT101 LL	Truckfill 1 Inlet Pressure is too low, the truckfill has been shut down		X		
45	PT201 HH	Truckfill 2 Inlet Pressure is too high, the truckfill has been shut down		X		
46	PT201 H	Truckfill 2 Inlet Pressure is high				
47	PT201 L	Truckfill 2 Inlet Pressure is low				
48	PT201 LL	Truckfill 2 Inlet Pressure is too low, the truckfill has been shut down		X		
49	Complete Power Failure	The backup generator has failed	X			
50	Service Power Failure	The backup generator should be running	X			
51	Auto Transfer Switch Disabled					
52	UV101 LL	Truckfill 1 UV System is not strong enough, the truckfill has been shut down				X
53	UV101 L	Truckfill 1 UV System is getting weak				
54	UV201 L	Truckfill 2 UV System is getting weak				
55	UV201 LL	Truckfill 2 UV System is not strong enough, the truckfill has been shut down				X
58	RWP101 Switch is not in the "Auto" position					

59	RWP201 Switch is not in the "Auto" position					
60	P102 Switch is not in the "Auto" position					
61	P202 Switch is not in the "Auto" position					
62	P601 Switch is not in the "Auto" position					
63	P103 Switch is not in the "Auto" position			X		
64	P203 Switch is not in the "Auto" position			X		
65	SV101 Switch is not in the "Auto" position					
66	SV201 Switch is not in the "Auto" position					
67	SV601 Switch is not in the "Auto" position					
68	Truckfill 1 is in Alarm Override Mode.	Disable as soon as possible to prevent damage to the plant				
69	Truckfill 2 is in Alarm Override Mode.	Disable as soon as possible to prevent damage to the plant				
70	Touchscreen E-Stop (beside alarms button) is turned on.	No truckfills will run				
71	Truckfill 1 Outside E-Stop is turned on.	Truckfill 1 will not run (twist to turn off)				
72	Truckfill 2 Outside E-Stop is turned on	Truckfill 2 will not run (twist to turn off)				

5.3 Spare parts list

ITEM	QUANTITY	SUPPLIER	COMMENT
MicroTol 2 calibration kit	4	BIPW	Part of contract
MicroTol 2 electronic module p/n 02053	1	BIPW	
MicroTol 2 desiccant pouch p/n 21555R	1	BIPW	
MicroTol 2 pressure regulator p/n 24306S	1	BIPW	
MicroTol 2 replacement cuvette p/n 241 66S	3-pack	BIPW	
NeoTech UV UVIM-CAL	1	BIPW	
NeoTech UV sleeve kit QSK-3S	2	BIPW	
NeoTech UV lamp kit LK-38	2	BIPW	
NeoTech UV ceaning kit CK-4-1	1	BIPW	
NeoTech UV ballast kit BK-120	1	BIPW	
CUNO cartridge filters 1 & 10 micron (3+3)	6	BIPW	1 set part of contract
IFM pressure trans mitter PA3224	2	BIPW	
Burkert solenoid valve 0290	1	BIPW	
Shurflo RV domestic pump p/n 2008-492-444	1	BIPW	
BIPW float switch	2	BIPW	
Electrical/PLC:		BIPW	
3-position selector operator	2	BIPW	
2-position selector operator	2	BIPW	
Contact block holder	2	BIPW	
No contact block	2	BIPW	
NC contact block	2	BIPW	
Nameplates HAND/AUTO	2	BIPW	
Power supply SPD 24120	1	BIPW	
Ste CPU 1214C AC/DC RLY 14D1/10D0/2AI	1	BIPW	
Ste digital input module 16D0, 2A relay	3	BIPW	
Ste digital output module 16D0, 2A relay	1	BIPW	
SIMATIC TP700 Wince6 71NTFT 12MB	1	BIPW	
Ste HMI, KTP400, basic monochrome	2	BIPW	
Softstarter, Sirius 3RW3037-BB14	2	BIPW	

5.4 Maintenance schedule checklist

CHECK LIST

Description	Task	Maintenance Frequency			
		Daily	Weekly	Monthly	Annually
Overall visual inspection	Complete overall visual inspection to be sure there are no alarms, all equipment is operating to design, there are no leaks, and safety systems are in place.	**X**			
Overall audio inspection	Complete overall audio inspection to be sure all equipment sounds normal when in operation.	**X**			
Chlorine pumps	Check for signs of leaking. Check and replace diaphragm as indicated in the pump manual.		**X**	**X**	
Chlorine holding tank level	Check levels of sodium hypochlorite in the tank and fill if necessary.		X		

5.5 Authorized component policy

BIPW only authorizes the use of genuine BIPW spare parts, which meet stringent engineering design specifications and quality standards, and have traceability to having been procured and certified to these specifications by the BIPW Quality Assurance System. The use of any non-BIPW authorized parts, or any parts not having been submitted to the BIPW Quality Assurance System will invalidate any and all factory warranties.

5.6 Factory service

1. To return the WTP components to an authorized service depot, perform the following steps:

   a) Have the unit's serial number and service requirement details ready. BIPW can be reached by telephone at (604) 882-6650 or fax at (604) 882-6659.

   b) A return authorization number is required before returning any components.

   c) Securely package the unit in the foam covering and a box similar to the one it was shipped in.

   d) Insure the package with your shipper.

   e) Write the return authorization number on the package.

   f) Unless otherwise instructed, ship to;

   BI Pure Water (Canada) Inc.
   #2, 9790 – 190th Street
   Surrey, BC, V4N 3M9

5.7 Genset service

Oil level – visually inspect and check – weekly.

Battery charger operation, charge rate – visually inspect – weekly.

Any condition of vibration, leakage, noise, temperature or deterioration – visually inspect/check/clean – weekly.

Ensure that system is set for automatic operation – visually inspect – weekly.

For a more detailed service schedule, refer to the genset manual.

6. WTP warranty

The parts are under warranty by the manufacturer for a period of 12 months from the date of shipping. The warranty covers the cost of any part that is proven defective in material or workmanship with the exception of parts outlined in "Conditional Terms."

CONDITIONAL TERMS

(1) The warranty does not cover the cost of labour or service calls to examine, remove or replace a proven defective part.

(2) A part can only be determined to be defective by an authorized service representative or the manufacturer.

(3) Except as agreed to in writing by BIPW, packing and shipping costs for warranty inspection and/or repairs are not the responsibility of BIPW.

(4) The warranty does not apply to damage resulting from accidents, alteration, misuse, tampering, or abuse. Examples of the foregoing, without limitation, are:

a) Damage to the exterior or interior finish as a result of any of the above.
b) Use of inadequate or defective wiring or improper voltage; loose or blown fuses or open circuit breakers; or improper connections to electrical service.
c) Use with inadequate or defective plumbing, water supply or water pressure.
d) Improper use of controls.
e) Non-compliance with applicable plumbing or electrical codes, laws, ordinances, and regulations.
f) Disassembly or alteration service done by other than accredited BIPW Inc. Service Personnel.
g) Installation where the water supply flow rate is known to be beyond the capacity of the unit.
h) Damage as a result of flood, fire, frost, and other natural disasters.
i) Failure to follow instructions for installation, operation or maintenance contained in the Technical Manual.

BIPW is not liable for consequential or other damages including, but not limited to, loss, damage, personal injury, or any other expense directly or indirectly arising from the use of or inability to use its product either separately or in combination with other products. All other warranties expressed or implied, whether oral, written or in any other form, including but not limited to warranties of merchantability or fitness for a particular purpose, are expressly excluded.