PURESAFE™
WATER SYSTEMS, inc.

PURESAFE FIRST RESPONSE WATER SYSTEM SPECIFICATIONS

SAFE WATER FOR A THIRSTY WORLD™

25 Fairchild Avenue, Suite 250
Plainview, NY 11803
www.puresafewatersystems.com
877 928 7426

PURESAFE FIRST RESPONSE WATER SYSTEM SPECIFICATIONS

ITEM	DESCRPITION	SPECIFICATION
1.	Trailer	All aluminum, fully-enclosed and weatherproof, box size 18.5' L x 8.0' W x 8.0' high on an all aluminum frame with an overall length of 23'. The trailer has tandem 7000 lb. axels with E rated 16" tires, electric brakes, tow able and has a sub-frame designed for lift by helicopter. Trailer is equipped with a spare tire, full front and rear doors and 2 side doors for all around access. The trailer is equipped with leveling legs to both level the unit and take the movement out when positioned on site, and can be safely detached from the hauling unit.
2.	Onboard Power Source	75 KW Diesel Generator with an integrated 250 gallon double walled fuel tank. 480/60/3 mounted in its own area subdivided in the trailer by a firewall.
3.	Raw Water Feed	If there is not a connection to a pre-pressurized source available, the system has a submersible pump which is raft mounted and easily deployed into any source water which is available. The pump is powered by the onboard generator and has a lift capacity of 65'. All hoses are supplied for connections.
4.	Source Pretreatment	The pretreatment train includes inbound source strainers, chlorine injection, (3) Nexsand Multimedia Tanks with auto backwash, (2) Centaur Carbon Media Tanks, (3) 25/1 Gradient filters, anti scalant and bio-inhibitor injection all prior to the Reverse Osmosis Unit. The injectors have flow control automatic monitoring, and the ORP's automatically detect chlorine presence and absence and feed water salinity prior to the high pressure pumps.
5.	Reverse Osmosis Unit	This module contains 6 - 8"x40" seawater membranes in a 3 vessel array. Output varies by source, Freshwater Source 30,000 GPD or 4,719 LPH, Brackish Source 22,500 GPD or 3,539 LPH and Seawater Source 15,000 GPD or 2,360 LPH
6.	Clear Well	The product water is fed into a 250 gallon float controlled HDPE holding tank and re-pressurized for post treatment processing.
7.	Product Water Post Treatment	Product water is treated with Ultraviolet light, (3) 1 micron absolute filters and then ozonated prior to distribution to the fill table or automatic bagging machine. Alternative chlorine injection can be applied when filling tankers, tanks or bladders leaving a residual chlorine

8.	Filling and Packaging	The system has 3 different methods of distribution. You can fill containers at the fill table, take bags of water away in the pre-packaged 1/2 liter bags or attach the NSF certified hose and pump the water off to external water containers. The system has container disinfection prior to filling, and the ability to sanitize utensils and, if needed, medical equipment using Ozone.
9.	Process Control	The system is fully automated including testing and shut down procedures. See detail Control system overview.
10.	Chemical Usage Per Month	@ all salinity levels = 30 days.
	Chlorine	68% active powder = 20 lbs x month. Average cost $2.50 per pound cost per day $0.83.
	Anti-Scalant	2.5 lbs. x month Average cost $122.25 per pound@ 10.16 per day.
	Biological Inhibitor	2.5 lbs. x month Average cost $92.77 per pound@ 7.74 per day.
11.	Components	All components meet or exceed NSF Std 61 for potable water and all electrical items are UL listed.
12	High Pressure Pumps	There are 2 high pressure pumps that can run in serial or parallel depending on the salinity. Both pumps are capable of processing 30,000 GPD of product water from a fresh water source.
13.	Disposables Included	Included with the system is 1 set of disposable filters, approx 1 months worth of chemicals, specialty tools, a water test kit, spare roll of bag film, manuals, and start up guide.
14.	Piping	All piping is done in Sch.80 STD 61 PVC on the low pressure side and Stainless Steel on the high pressure side. Flexible hoses are Kuriyama STD 51 hose.
15.	Warranty	See Service Program highlights

PURESAFE WATER PURIFICATION SYSTEM - OVERVIEW

The PureSafe Water purification system is designed to be robust, operator friendly and straightforward in its operation. The Water Purification system consists of a Treatment Trailer that houses all the integral parts. A water connection (both in and out), drain connection (wastewater out) and power connection are located at various points on the trailer exterior. A built-in power generator is integrated into the system should infrastructure power not be available. An optional raft is available with lay-flat hose discharge to the trailer should no "piped" water be available to the system. A pressure boosting pump is integrated into the system should insufficient water pressure be available to operate the trailer. A dual high pressure pump system allows desalination of the feed water, producing safe, pure water, even if only seawater is available. The system utilizes a multi-barrier approach to ensure potable water production. This approach includes grit removal, pre-chlorination, sand filtration, Granular Activated Carbon (GAC) adsorption, micro-filtration, membrane separation (demineralization with Reverse Osmosis), post chlorination (for water delivery to outside storage tanks), Ultra Violet (UV) sterilization, absolute membrane filtration (for Oocyst removal) and Ozonation (destruction of micro-organisms). The trailer can deliver water suitable for municipal delivery (chlorinated, sterilized and membrane filtered RO product water) or water suitable for bottling (sterilized, membrane filtered and ozonated RO product water).

The system operation is directed by a process controller with a touch screen interface. The process controller provides supervisory monitoring of all treatment processes including pressures, flows, chemical residuals, and salt removal efficiency. In addition, the system automatically initiates key routine maintenance steps such as filter backwashing, system purge (during standby) and special steps taken to ready the system for transport (extended shutdown). In addition, the system prompts the operator when such things as the strainers or disposable filter cartridges require cleaning or replacement. The process controller automatically adjusts the system operating pressure in accordance with the feed water salinity so that the system produces the rated capacity of pure water. Chemical feed pumps automatically adjust for changes in process flow rate and are continuously monitored for injector fluid flow and solution tank level. Safeguards are engineered into the system to prevent delivery of poor quality water. Instrumentation is utilized throughout the system to verify and validate each unit process step. The operators only need to know some basic routines, a familiarity with the process, and how to make a few adjustments. The process controller will monitor and adjust the rest. Once the system is brought back from service, the critical operation data may be downloaded to a computer to validate compliance and archive the systems operation.

PURESAFE WATER PURIFICATION SYSTEM OPERATION

The system has been designed to accommodate the wide range of field conditions including the scarcity of electrical power, scarcity of water pressure, scarcity of municipal water (potable or non-potable), scarcity of road access, and scarcity of deliverable infrastructure. As a result, the system is capable of self contained operation over a wide variation of water qualities. It is also be capable of delivering water in the absence of any pipelines or infrastructure. At the same time, it is able to deliver water through existing infrastructure pipelines should they exist.

As a result of these challenges, the system has been built to be self contained with a diesel generator capable of operating the purification system, perimeter lighting, and other auxiliary needs as required. The system is designed to treat polluted municipal water (tainted city water), non-potable water (river or lake water), brackish water (mixtures of fresh and sea water or highly mineralized sources), and sea water. This is done by utilizing reverse osmosis (RO) as a primary means of removing bacteria, organics and over 98+% of the minerals in the raw supply water. By adding disinfection steps prior to and after the RO process, safe potable water is assured regardless the source water condition.

The system design considers four main groups of water pollutants; suspended material (turbidity), organics (volatile organic compounds, organic acids, biochemical organic compounds, and disinfection byproducts), inorganic compounds (dissolved minerals such as arsenic, lead, or nitrates), and bacteria (pathogens, viruses and parasites). Each of these pollutants is addressed in the design of the system.

Strainer and Sand Filter Operation

As the raw source water enters the PureSafe system, large suspended solids and sand grit (turbidity) are removed by dual strainers prior to entering the system booster pump. The strainers have isolation valves to allow service without system shutdown. Continuous pressure monitoring is provided by in-line sensors that integrate into a central processor and signals an alarm condition and the need for service. The operator is prompted to clean the strainers if the differential pressure is too high (indicates plugging). The operator simply isolates one of the strainers, removes the screen, washes out the grit, reassembles the screen assembly, and repeats the process on the second strainer. The system continues to operate during this time.

Fine turbidity is trapped in the sand media filters, located downstream of the strainers and pressure booster pump. The sand media tanks allow the water velocity to drop and slowly percolate through the fine filtering sands. This action allows the fine particles to settle and become lodged within the sand matrix. Three sand filters are provided in the system and are piped for parallel operation. As the silt and particles fill the sand matrix, the filter will resist flow, causing a pressure loss across the filter bed. The accumulation of particles is removed by reversing the water flow in the filter bed (backwashing) and directing the wash water to drain. Since all three sand filters are subject to similar hydraulic loads and conditions, the backwash cycle is initiated sequentially until all sand filters are backwashed and returned to service. Automatic controls are provided to allow the filters to wash (backwash) and slow rinse before

returning to service. Continuous pressure monitoring is provided by in-line sensors that integrate into a central processor and signal that a backwash cycle sequence will start. This is done automatically with no operator interface required.

Pre-chlorination System Operation

To minimize bacteria in the raw supply water, chlorine is injected and mixed with the feed water before it enters the sand filters. This is done to maximize contact time and minimize biological growth in the filter media and vessels. The chlorine dose rate is adjustable through a chemical feed pump and monitored through an Oxidation Reduction Potential (ORP) controller. If the chlorine dose is too low to yield sufficient free chlorine residual (active disinfectant), or too high (too much disinfectant), the ORP controller signals the central processor, prompting an alarm condition. The operator is prompted to simply adjust the chemical feed pump by turning a knob until the alarm condition clears. In any case, the system continues to operate during this time.

GAC Filter Operation

Organic material is removed by a combination of adsorption and absorption through a catalytic state Granular Activated Carbon (GAC) filter bed. Organic matter is attracted into the micro structure pores of the GAC media and are immobilized and trapped within the matrix of the media. Chlorine is removed by the chemical conversion to salt and carbon dioxide with the media.
Due to the enormous surface area of the GAC media, it may take many months of continuous operation for the filter bed to saturate and/or foul. As this happens, the filter bed begins to plug and chlorine begins to pass through the bed. Continuous pressure monitoring is provided by in-line sensors that integrate into a central processor and signal that a high change in pressure (Delta P) is occurring through the filter bed. In addition an Oxidation Reduction Potential (ORP) controller is integrated into the system downstream of the GAC filter to detect the presence of residual chlorine. The ORP controller signals the central processor, prompting an alarm condition. The operator then simply swaps out the GAC filter bed at a convenient time and the system continues to operate. If the filter bed is not changed within a specified period of time, the system will shut down until the condition is corrected. GAC filter bed change-out takes about 10-15 minutes and is done by means of flexible quick-connect hoses.

RO Pre-filter Operation

Finely divided silts and/or suspended matter remaining in the system feed water are removed by dual gradient disposable filter elements. These elements are designed with a coarse to fine filter matrix, from the outside to the inside of the filter cartridges. This allows high dirt loading with minimal pressure drop and particle release. Three filter housing and isolation valves are supplied with the system to allow

service without system shutdown. Continuous pressure monitoring is provided by in-line sensors that integrate into a central processor and signals an alarm condition to the operator if the differential filter pressure is too high (indicating a plugged condition). The operator then simply isolates one of the filter housings, removes the filter cartridge, installs a new cartridge, reassembles the filter bowl assembly, and repeats the process on the remaining filters. The system continues to operate during this time.

RO System Operation

Inorganic material including dissolved minerals; any remaining micro-organisms, organic material and/or suspended material (turbidity) is removed by the Reverse Osmosis (RO) system. The RO system consists of dual high pressure pumps that force water through a semi-permeable membrane. The membrane rejects 99+% of inorganic material, micro organisms, and turbidity. The membrane also rejects 98+% of dissolved mineral salts. Continuous on-line measurement of salt removal (as a percent of salt rejection) is sent to the process controller. The process instrument compares the quality of incoming water (raw water salinity) to the quality of the processed water (finished water salinity). If the rejection of salts falls below a set value, the finished water is diverted to the inlet side of the RO system for additional processing, until the rejection rate returns to specification. Once the system falls into specification, water is delivered to the clear-well (storage tank). Diversion of low quality product water is automatic, requiring no operator intervention. Constant on-line monitoring of salt removal assures proper operation and process quality.

The amount of water produced (flow rate) is dependent on the feed water temperature and mineral content. Cold water and/or high salt content (sea water) require high pressures to produce a specified flow rate. Typically the system is designed to allow variable recovery rates of supply water to product water. In addition a portion of waste or reject water may be circulated to the front of the system (passed through a second time) to maintain the correct hydraulic flow and system operation. Typically these conditions are maintained by adjusting a series of valves and monitored by flow meters and pressure gauges.

The PureSafe system has been designed to minimize operator intervention in this regard. Dual variable speed pumps are supplied with the system. In low salinity source water conditions (Municipal, well, surface or brackish water), only one pump is required to provide adequate pressure for operation. The second pump is maintained for system back-up. In high salinity conditions, including sea water, both pumps are utilized in series to provide adequate high pressure to produce quality water. By use of variable speed pumps, valves normally used to limit flow and/or pressure to the system are eliminated. Flow sensors are integrated into the product water, waste and recycle pipelines and communicate with the central processor. The product flow sensor controls the first stage variable speed pump (to speed or slow) to maintain the specified flow rate. Should the wastewater flow rate or recycle flow rate fall above or below specified values, an alarm condition alerts the operator that a valve adjustment is necessary. The operator then simply adjusts the wastewater or recycle valve by turning the handle until the alarm condition clears. Should the salinity or water temperature change, the second variable speed pump automatically starts and adjusts to provide the required system output.

RO System Clear-well Operation

The finished water fills a small storage tank that acts as a clear-well. The tank is fitted with level switches and a transfer pump that allow the finished water to enter the final disinfection step or circulate to the front of the system during periods of low or non-use. In addition, the storage tank provides a place where specialty chemicals are added for an extended shutdown cycle. The transfer pump delivers water to the finished water disinfection system, the infrastructure distribution pipeline (if existing), the optional emergency shower, and the bottle filling station.

Finished Water Disinfection-UV and Final Filter

Part of the final disinfection step consists of sterilizing the finished water with high intensity UV light and removal of Oocysts (such as cryptosporidium or Giardia) by means of absolute membrane filters. The UV water sterilizer is fitted with a narrow band UV intensity meter that constantly monitors UV output from the lamps through the water. The UV monitor integrates with the central processor to signal an alarm condition to the operator. Should service be required, the lamp may be removed and replaced easily by the operator without system shutdown. Three filter housings are provided for the absolute membrane filters. Should the product water flow decrease substantially (slow bottle fill times or excessive finished water circulation), the operator may simply isolate one of the filter housings, remove the filter cartridge, install a new cartridge, reassemble the filter bowl and repeat the process on the remaining filters. The system continues to operate during this time.

Ozone and Chlorine Disinfection of the Finished Water

Two options are available for final disinfection, chlorination, or ozonation. These are hand selected by the operator by means of the touch screen provided on the central processor. If the water is to be utilized for infrastructure supply (back-filling a water distribution main) typically the chlorination option is selected. In this mode, chlorine is added to the finished water prior to entering the clear-well. The Transfer pump sends water through the UV water sterilizer and membrane filters prior to exiting the trailer. A lay flat hose may be connected from the trailer to the distribution main by means of a fire hose fitting. The chlorine dose rate is adjustable through a chemical feed pump and monitored through an Oxidation Reduction Potential (ORP) controller.

If the chlorine dose is too low to yield sufficient free chlorine residual (active disinfectant), or too high (too much disinfectant), the ORP controller signals the central processor, prompting an alarm condition. The operator then simply adjusts the chemical feed pump by turning a knob until the alarm condition clears. In any case, the system continues to operate during this time.

On-Site Bottling Operation

If the water is used for on-site bottling, typically the Ozone option is selected. In the ozone option, the process controller starts an oxygen concentrator (a molecular sieve used to deliver 90% pure oxygen to the Ozone system) allowing a short warm-up period. The ozone generator then starts injecting ozone gas into a special in-line injector fitting. The fitting creates micro bubbles of ozone gas that oxidize bacteria on contact. The ozone gas reverts back to oxygen within minutes after application. An Oxidation Reduction Potential (ORP) controller automatically adjusts the ozone generator output to yield sufficient ozone residual to assure microbiological destruction. Should the ozone system fail or too much ozone be applied to the finished water, an alarm is displayed by the process controller. If the UV sterilizer is operational, the system will continue to operate. If both the UV and ORP monitors are in alarm (UV system bulbs at low intensity and the chlorine/ozone levels are out of specification) the system will shut down and alarm the operator.

The Bottle Filling Station

For on-site bottling, a specially constructed fill table has been incorporated into the design at the back of the trailer. The table provides for rinsing and filling bottles of nearly any size and configuration. It should be noted that soiled bottles (dusty or dirty) may require special cleaning with soap, bottle brushes, and water. These should not be rinsed alone before filling. Contaminated bottles (especially those smelling of hydrocarbons) should always be discarded and destroyed. All bottles should be "sniffed" by the filler operator to check for the absence of contamination before rinsing and filling. The filling table consists of two rinsing stations and 6 filling stations. All filling and rinsing are manually controlled for maximum flexibility and versatility. Simple "tap-style" valves are provided for bottle filling and can be opened or closed with a simple motion.
Special ventilator fans are supplied to keep ozone gas from accumulating in the filling area. The rear doors of the trailer are equipped with fold-down work tables to stage inbound and outbound bottles. A bumper mounted step allows the filler operators to minimize soils and mud near the filling station. A splash removal pump is provided under the table to minimize flooding of the fill table and surrounding area.

The onboard bag machine forms, fills, and seals ½ liter bags of processed ozonated water at a rate of 1500 bags per hour. This enables the water to be distributed to the affected population easily and quickly without the logistical problems associated with bottled water. The hourly output is equivalent to 62 cases of 24 bottles of bottled water.

THE CONTROL SYSTEM OVERVIEW

To make the system straight forward and easy to operate, a process control system is integrated into the system and includes a touch screen HMI (human machine interface). The touch screen acts as a switch panel (selector) and alarm center for all operations. The process control system provides for the automatic operation of all valves, pumps, and processes. An integrated instrumentation system provides continuous monitoring of several key process variables and displays alarm conditions on the touch screen should a variable be out of range. Aside from simply displaying an "alarm" or indicator, the touch panel (HMI) prompts the operators to take the required corrective action to remedy the alarm condition. The system has been designed with the goal of delivering emergency drinking water even at the sacrifice of some of the more expensive consumables (the RO membranes). The system however, will not deliver water without proper disinfection, filtration, organic removal, or salt reduction. These variables may be field adjusted but should be considered on a case-by-case basis.

Initial System Hook-up and Start-up

When power is applied to the system through an external 460 VAC 3 phase 60 amp power supply or the internal generator is started, the main control panel disconnect must be closed by turning the disconnect switch handle to the On position. The touch panel display will illuminate indicating the system is ready for commissioning. The Touch screen will prompt the operator to hook-up the supply water, waste water and distribution water as required. Once the operator acknowledges this (by a keystroke), the system starts. The operator is prompted to place the unit in Automatic or Semi-automatic mode.

Automatic Mode Selection

In the Automatic mode, all valves and pumps are started with no operator intervention and with safety sensors and level switches providing on and off control. Once pressure is established after the strainers (greater than 5 psi) the System Booster Pump will start and sequentially backfill the sand filters. Once completed, the sand filter come into service and the remaining air is purged out of the system through the GAC and RO pre-filters.

Once adequate pressure is established after the RO pre-filters, the RO high pressure booster pump will start (soft start). The high pressure pump is controlled by the RO product water flow rate and will slow or speed to produce the specified flow rate of product water. Low quality RO water is diverted to the high pressure pump intake until the proper rejection rate (of minerals) is established. The system will then deliver water to the storage tank (clear-well). Once the clear well is filled, the transfer pump starts and circulates water through the finished water disinfection system. When the clear-well reaches a high limit, an automatic valve opens, diverting water to the inlet of the booster pump (for additional passes through the system). When the water falls to a specified point in the clear-well, the diversion valve closes and water again refills the clear-well. In this way, the system is allowed to run at a steady state, making adjustments and monitoring easier.

Semi-Automatic Mode Selection

In the Semi-automatic mode, the main booster pump will not start until prompted by the operator. Once started, the pump will run automatically until stopped by the operator or stopped automatically by insufficient feed water pressure. Operator intervention is also necessary to start the air purge cycle in the sand filters. Once the cycle is complete, the system will wait for operator intervention to start the RO high pressure pump. Once the pump is started, it operates in an automatic mode shutting down only when stopped by the operator or stopped by inadequate water pressure. All other aspects of the system operation is the same as in "Automatic" mode in that the transfer pump starts automatically and circulates when the clear-well reaches high level. The Semi Automatic mode also allows the operator to initiate a backwash sequence on the sand filters. Once initiated, all aspects of the sequence are the same as in the Automatic mode.

Final Disinfection Selection

Two options are available for final disinfection, chlorination or ozonation. These options are hand selected on the touch screen by the operator in either Automatic or Semi Automatic mode (both modes work in the same way). If the water is to be utilized for infrastructure supply (back-filling a water distribution main) typically the chlorination option is selected. If the water is used for on-site bottling, typically the Ozone option is selected.

Chlorination Mode Selection

In the Chlorine mode, chlorine is added to the finished water prior to entering the storage tank (clear-well). The Transfer pump sends water through the UV water sterilizer and membrane filters prior to exiting the trailer. A lay flat hose may be connected from the trailer to the distribution main by means of a fire hose fitting. The chlorine dose rate is adjustable through a chemical feed pump and monitored through an Oxidation Reduction Potential (ORP) controller. If the chlorine dose is too low to yield sufficient free chlorine residual (active disinfectant), or too high (too much disinfectant), the ORP controller signals the central processor, prompting an alarm condition. The operator is prompted to simply adjust the chemical feed pump by turning a knob until the alarm condition clears. In any case, the system continues to operate during this time.

Ozone Mode Selection

In the Ozone mode, the process controller starts an oxygen concentrator (a molecular sieve used to deliver 90% pure oxygen to the Ozone system) allowing a short warm-up period. The ozone generator then starts injecting ozone gas into a special in-line injector fitting. The fitting creates micro bubbles of ozone

gas that oxidize bacteria on contact. The ozone gas reverts back to oxygen within minutes after application. An Oxidation Reduction Potential (ORP) controller automatically adjusts the ozone generator output to yield sufficient ozone residual to assure microbiological destruction. Should the ozone system fail or too much ozone be applied to the finished water, an alarm is displayed by the process controller. If the UV sterilizer is operational, the system will continue to operate. If both the UV monitor and ORP monitor are in alarm (UV system bulbs at low intensity and the chlorine/ozone levels are out of specification) the system will shut down and alarm the operator.

Standby Mode Selection

In either Automatic or Semi-automatic mode, the trailer process control system is designed to allow for "standby" operation as well as "extended shutdown". The "standby" mode is used when delivery of finished water is interrupted for a period of time (from a hour to a several days). During this time, the system would not be producing water however it may need to be re-commissioned within a few minutes. When the operator initiates this mode, the high pressure RO pump shuts down, the RO feed water valve closes and the transfer pump directs finished water through the RO membranes (purge cycle). This purge cycle removes any high concentrations of minerals, organics etc. from the membrane surface. The RO membranes are purged and stored in purified water. This shortens the time necessary for the system to produce quality water when restarted (placed in the service mode).

Extended Shutdown Mode Selection

The "extended shutdown" mode is used when the requirement for emergency water has ended and the system is ready for de-commissioning and transport. When the operator initiates the "extended shutdown" mode, the process controller initiates a sequential backwash of all sand filters. Once the backwash sequence is complete, the RO system pumps shut down and the process controller prompts the operator to add the specialty storage chemicals to the clear-well (storage tank). Once the operator acknowledges the addition is complete, the transfer pump restarts and mixes the chemicals and water. The system then initiates an automatic purge cycle by pumping the storage solution through the membranes. Once the clear-well is emptied (low level switch deactivated), the transfer pump automatically stops and the operator is prompted to disconnect the supply hose to the trailer. Once the operator acknowledges that the supply water is disconnected, the air compressor starts and air purge cycle commences. Compressed and filtered air forces water from the sand filter beds, GAC filters, RO pre-filters, and RO pressure vessels. In the Automatic mode the compressor stops after a specified period of time.

In the Semi Automatic mode, the compressor remains running until stopped by the operator. Once the air purge cycle starts, the remaining hoses are disconnected (drain hose and/or delivery hose). Once the compressor stops and the cycle completed, the generator is shutdown (or the emergency power supply cabling is disconnected). The trailer is readied for transport.

Exercising the System

During non-use, the system should be "Exercised" on a periodic basis to ensure all systems are operational in the event of an emergency. This is done by hooking the system to a hydrant, starting the generator, and commissioning the system. By placing the system in Automatic or Semi Automatic mode, the system may be started as described above. Once pressure is established after the RO pre-filters and the high pressure RO booster pump start (either automatically or by hand), the operator can adjust the chlorine (and inhibitor) injection pumps as directed by the process controller and verify the instrumentation readings with portable test kits (supplied). The operator can also adjust the waste-water and recycle-water control valves on the RO as directed by the process controller. Once the clear-well fills and the transfer pump starts, the operator can verify that the system is directing water to the supply side of the system (circulating). The operator can also verify that the UV sterilizer is operational.

Data Logging the System Performance

During operation, the system collects key data from the many sensors and analyzers imbedded in the system and record these values in an internal (2 GB) memory module. These files are downloadable to a computer to show both operational trends of the RO membranes (process control) and delivery of potable water (compliance). Since the degradation of the RO membranes and/or GAC filter media often occurs over a period of time (from months to years depending on the conditions) it is useful to plot the system operation over time in an archive. This allows comparison and normalization of data that may indicate that special maintenance may be impending or necessary before further deployment. The data files can also be reviewed by PureSafe and function as a type of supervisory control and automatic data acquisition (SCADA) system.

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