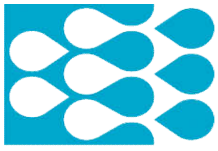
Operating and Maintenance Manual

30 m3/d RO+EDI System



QT Enviro-Tech (Suzhou) Ltd.

General Safety Instruction

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Contents

1 System Description

1.1 What is the use and the application of this system

Resin softening

The principle of softening resin treatment is to pass raw water through sodium cation exchange resin, conventional softening resin with a large number of sodium ions. When the calcium and magnesium ion content in the water is high, the ion exchange resin can release sodium ions, functional groups combine with calcium and magnesium ions, so the calcium and magnesium ion content in the water is reduced, and the hardness of the water decreases. The hardness components Ca2+ and Mg2+ in the water exchange with Na+ in the resin, so as to adsorb Ca2+ and Mg2+ in the water and soften the water.

When the softening resin absorbs a certain amount of calcium and magnesium ions, it must be recycled. The regeneration process is to use salt water in the salt tank to wash the resin layer, and the hardness ions on the resin are replaced. With the waste liquid discharged from the regeneration tank, the resin will restore the softening exchange function.

RO

RO desalination system is designed to produce high quality portable water from seawater or high salinity brackish water.

RO desalination system is based on reverse osmosis (RO) technology. Together with a 2nd pass RO or even one EDI system, RO could provide highly pure water for industrial or commercial use.

RO desalination systems are designed and manufactured on the basis of the industrial standard: ASME, ASTM, IEC, etc.

Before the water is desalinated in the membrane, the water must be free from chlorine, iron, aluminum, silicic acid, particles, organic and biological contaminants, etc.

It´s common that the feed water is pretreated before it passes through the system.

Pretreatment is intended to reduce particles and contaminants that would otherwise damage the membrane, block piping or damage the high pressure pump.

The water filter requires a certain pressure to be able to clean the water. To achieve the necessary pressure, a feed water pump raises the pressure of the feed water before it reaches the filter.

Thereafter, the water flows through a second filter to remove smaller particles, and then through a high pressure pump. The pump increases pressure of feed water until it exceeds the osmotic

pressure, before the water is desalinated in the membrane.

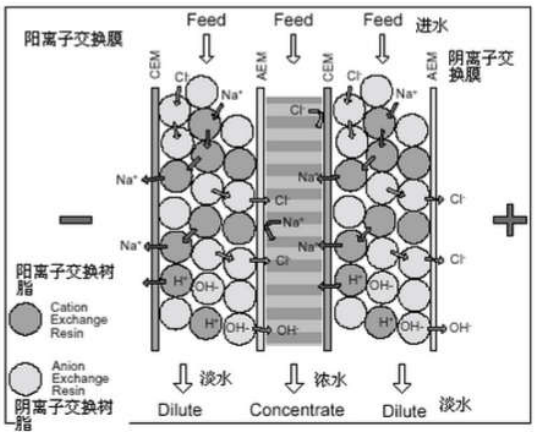
It´s important for the high pressure pump, that water keeps required working pressure when passing, lower pressure can result in pump failure. A pressure control valve is installed before the pump. It automatically stops the flow of water if the pressure is too low.

After the water has passed the RO-module, two flows are produced. One is desalinated water and the other is salt concentrate (brine). The brine is immediately discharged.

The treated water (product water) from the RO-module passes through a conductivity cell that measures the conductivity in the product water.

EDI

EDI refers to the process of removing ions from water using an ion exchange membrane, an ion exchange resin, in the presence of a direct current electric field. Since Ionpure introduced this technology to the market in 1987, it has been continuously improved to reduce costs and improve deionization.



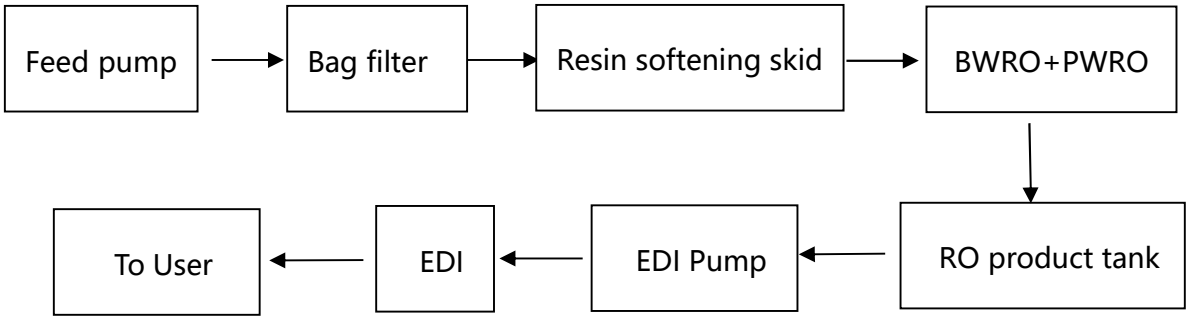
Most EDI products on the market consist of alternating cationic and anionic membranes through which water flows. These alternately placed anion and cation exchange membranes are fixed between two devices with inlet and outlet water, through which water flows through the membrane gap. A concentrated water chamber is formed between positive anion membrane and negative anion membrane, and a fresh water chamber is formed between negative anion membrane and positive anion membrane. Ion-exchange resins are added in fresh and sometimes concentrated water chambers to facilitate intensification of the ion-exchange process in weak electrolyte solutions. Electrodes at both ends of the rack of the CEDI device provide a transverse direct current field that drives the movement of ions in the water through the ion exchange membrane. The result is a decrease in ion concentration in the fresh water chamber and an increase in ion concentration in the concentrated water chamber.

The diagram shows the ion exchange process in two fresh water chambers and one concentrated water chamber.

Large EDI units are composed of many of these basic units that work in parallel.

1.2 Main Process

A process is used as following diagram:



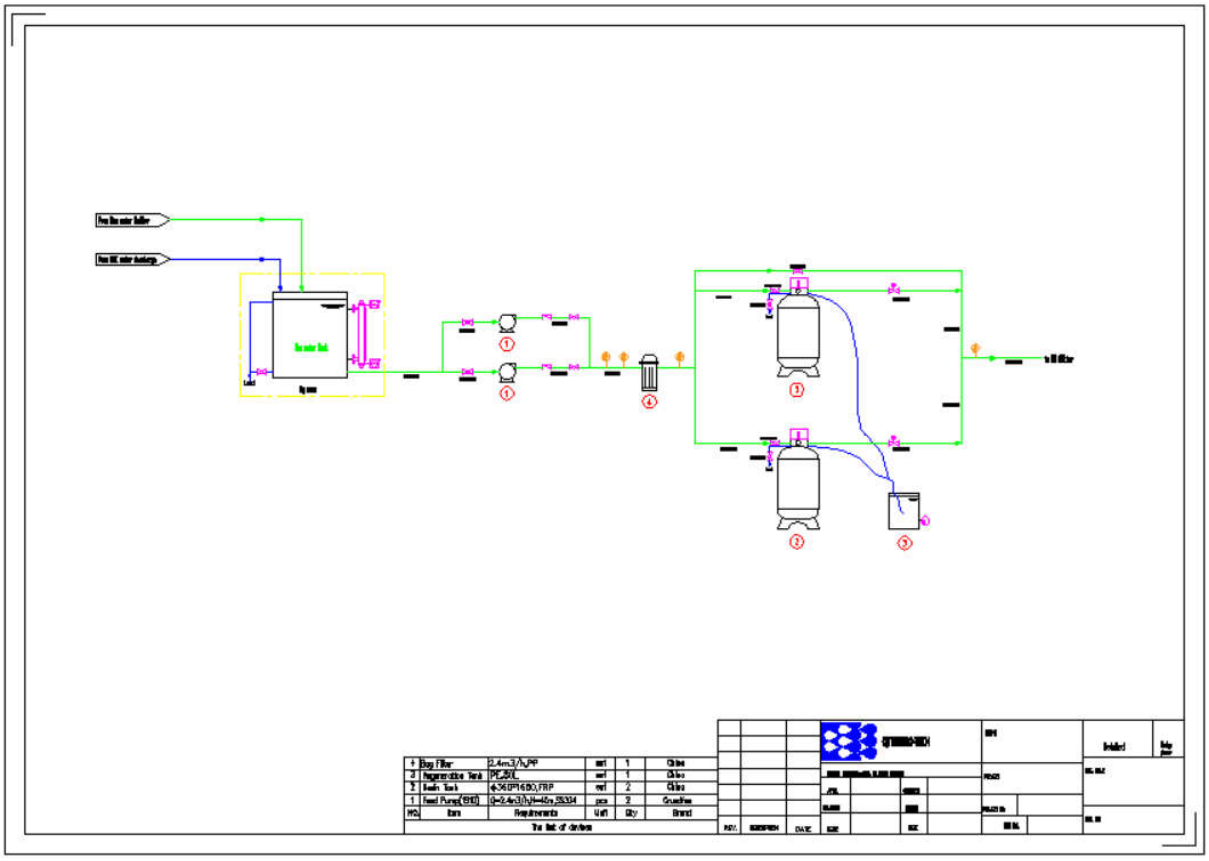
1.3 System Specifications

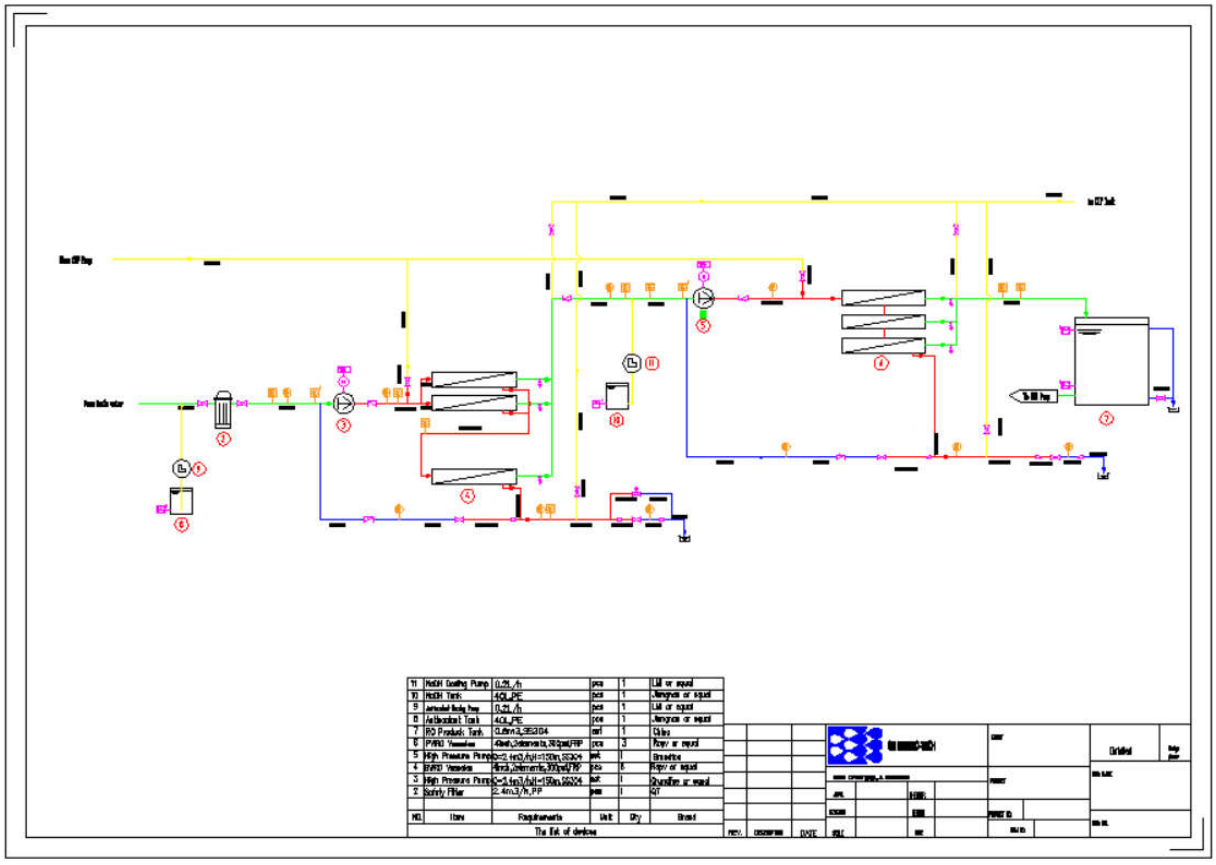
System is based on qualified feed water conditions. If the feed water quality and working conditions are outside of the design basis range, it may lead to contaminate and damage the membrane. If the device is running in a non-standardized production conditions which lead to damage the performance is not within the scope of the warranty.

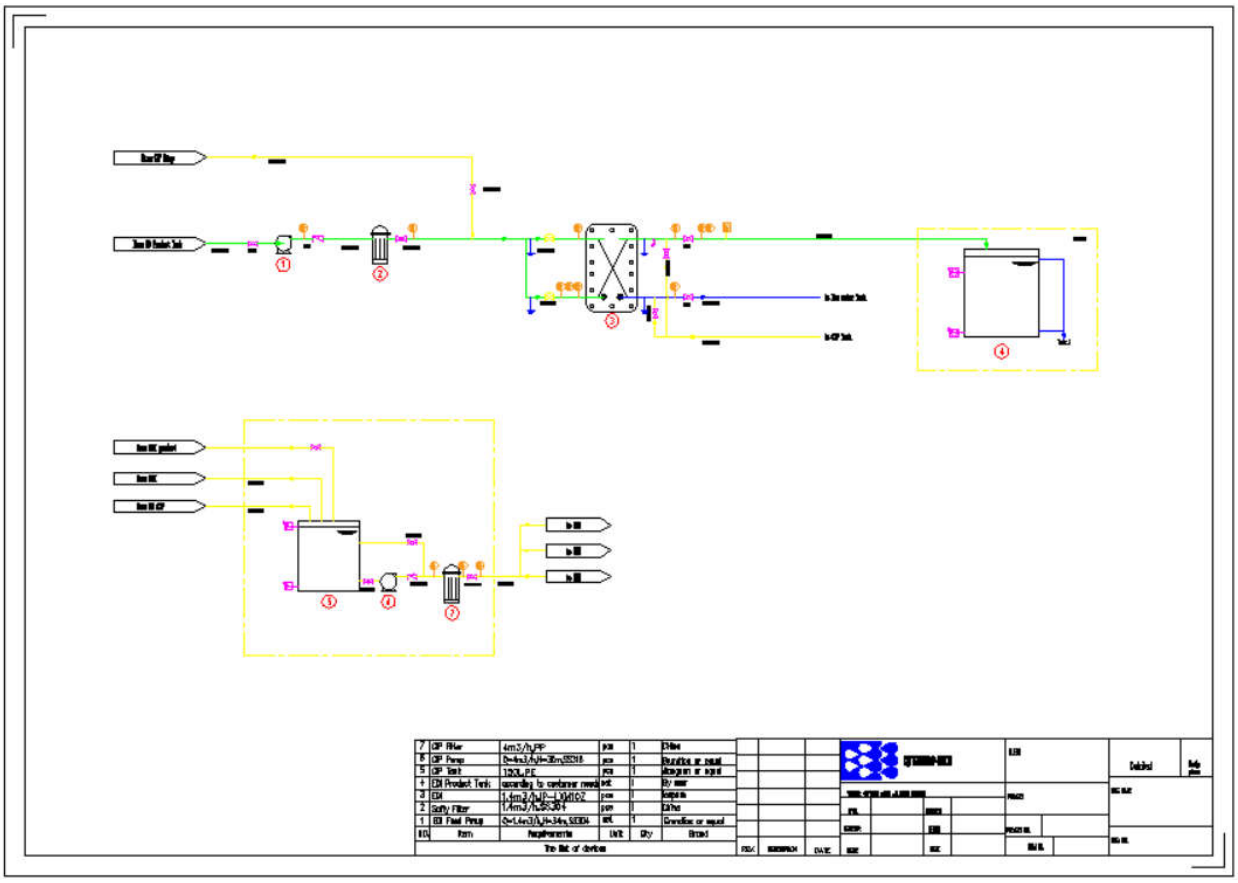
Tab 1: Feed water quality requirements

Temperature	5-40℃	COD	≤20 mg/L
TSS	≤30 mg/L	pH	6-8
Turbidity	≤10NTU	Chlorine	≤500ppm

1.4 Installation Drawing







1.5 Control Panel

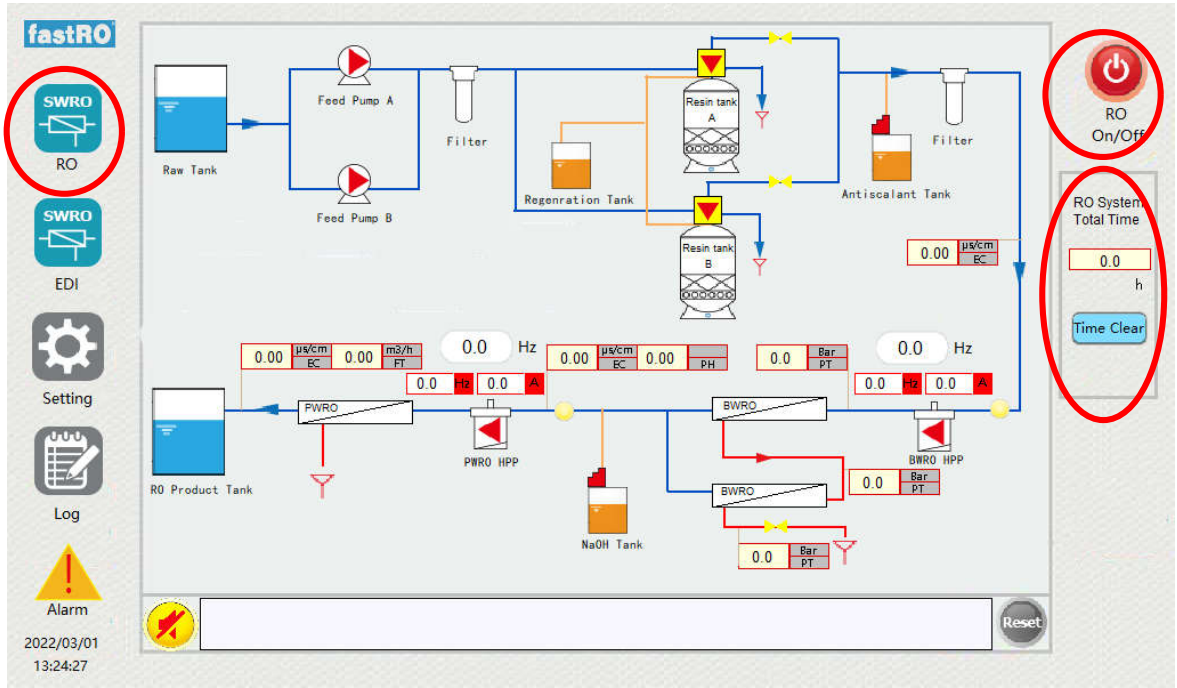
There are three cabinet shown as following:

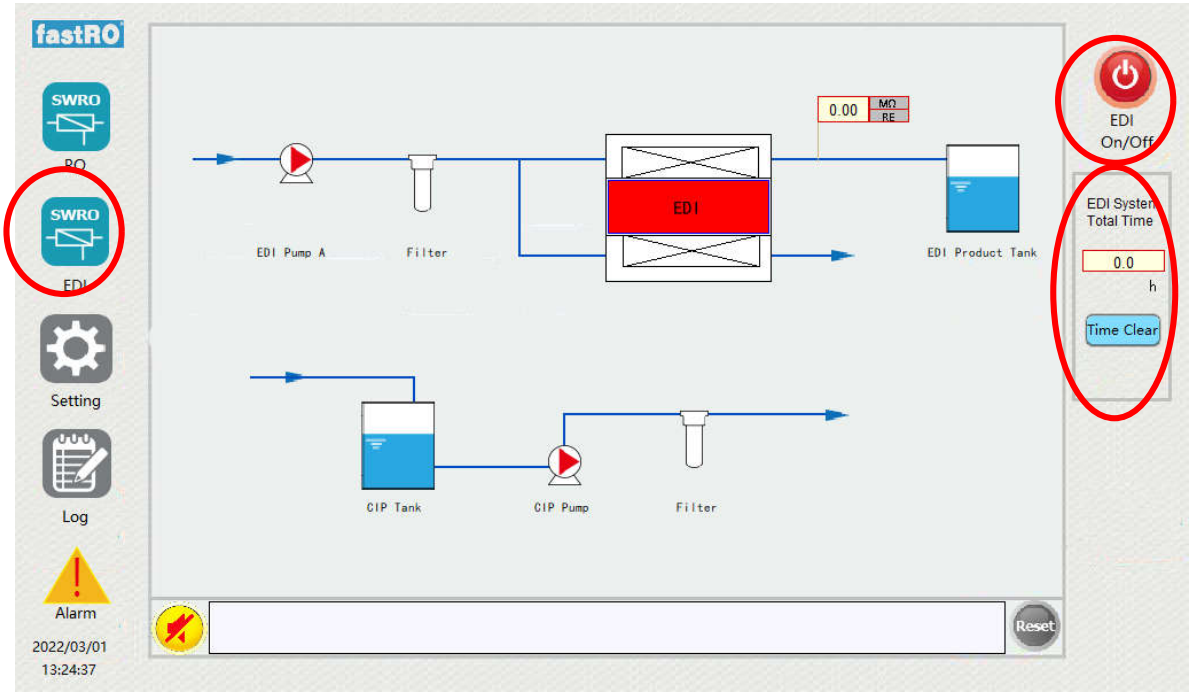
Click RO/EDI in the left directory to enter the corresponding interface.

See how the tank level, valve and pump are running.

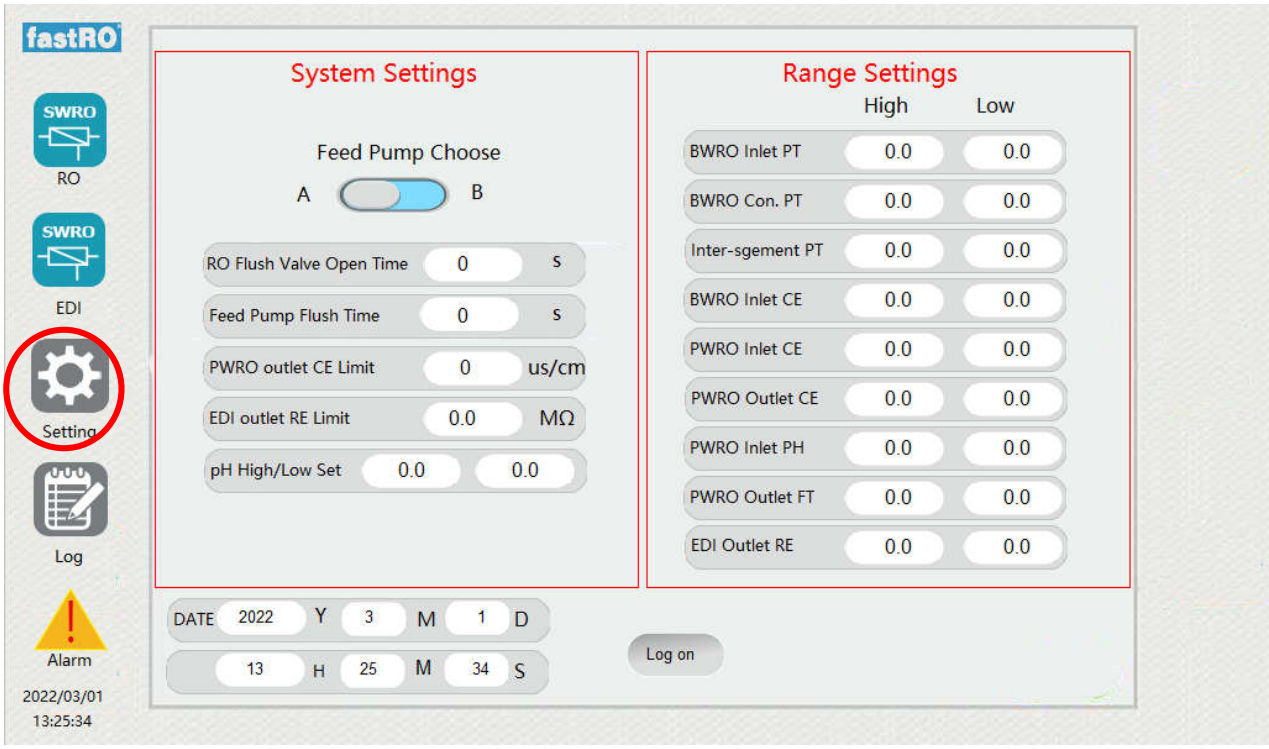
Click "RO ON/OFF or EDI ON/OFF" to Run/Stop the RO/EDI system.

Click "Time Clear" to clear RO/EDI system running time.

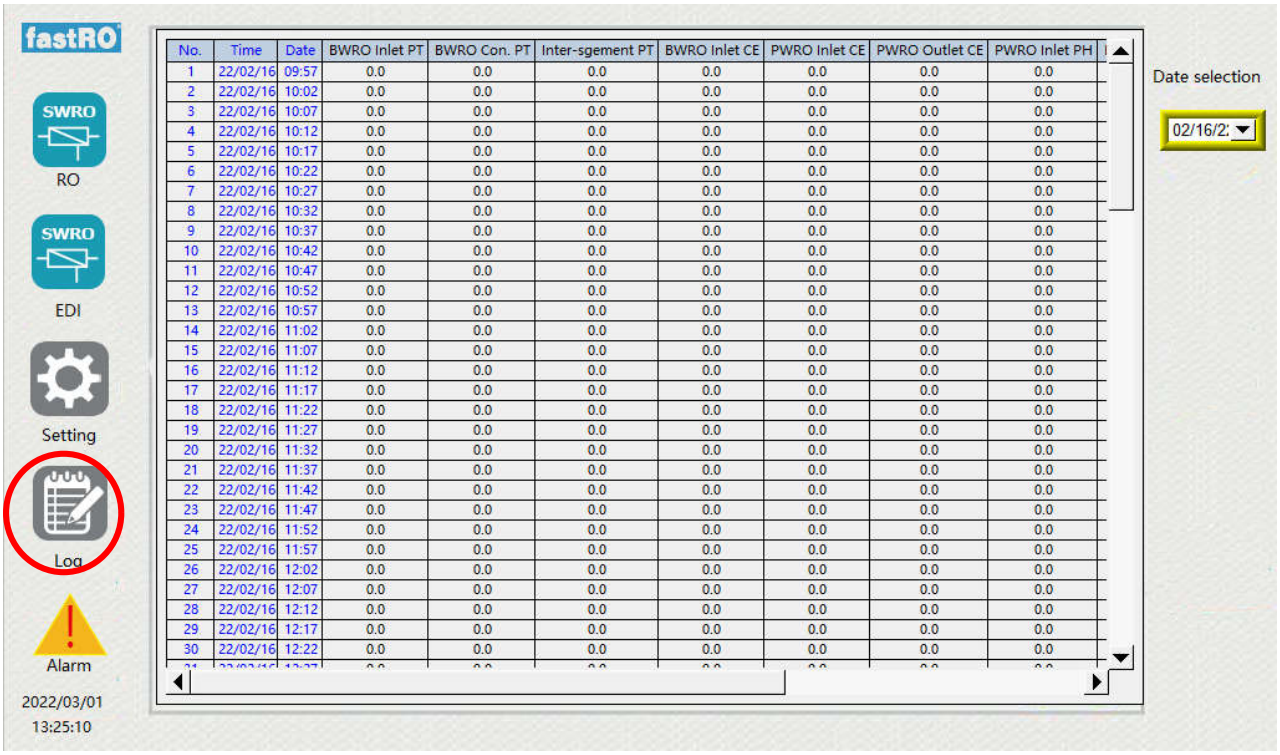




Click "Setting" to enter the step parameter setting interface. Set parameters for Feed Pump, flow rate, pressure, conductivity, PH,pressure...

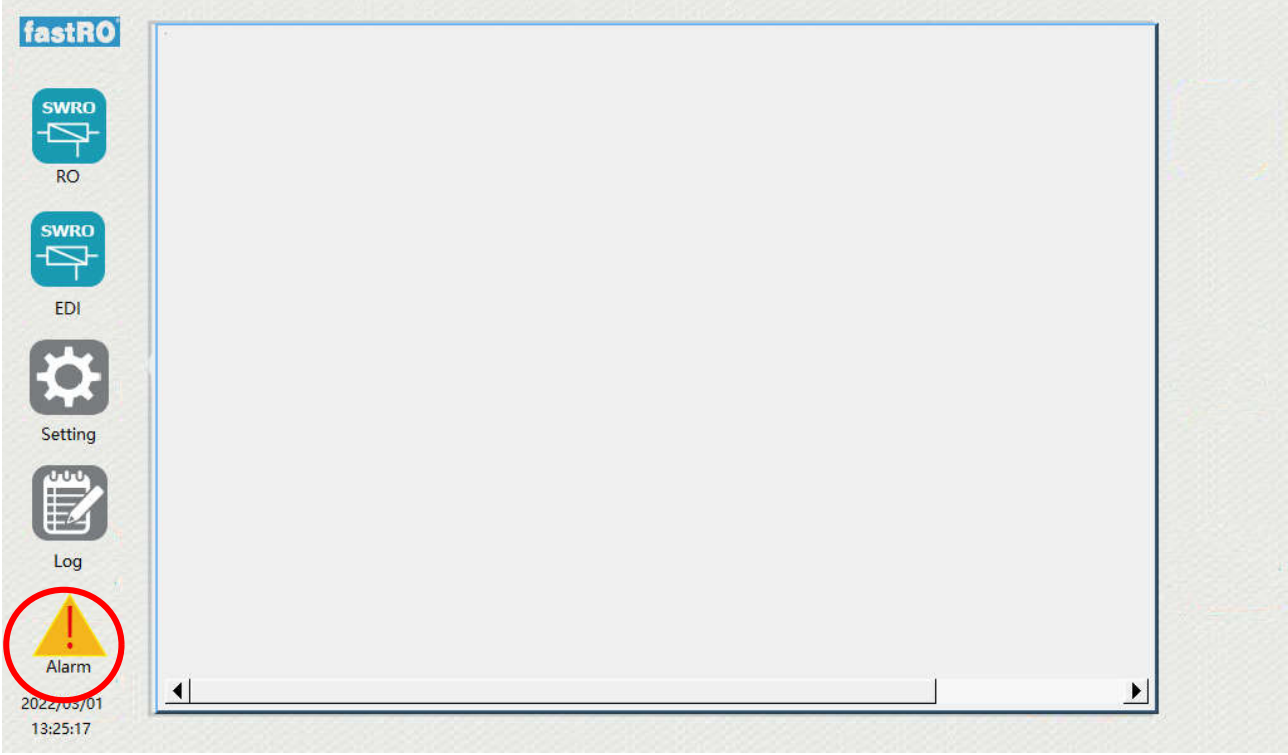


Click "Log" to enter the Field data log sheet.



No.	Time	Date	BWRO Inlet PT	BWRO Con. PT	Inter-sgement PT	BWRO Inlet CE	PWRO Inlet CE	PWRO Outlet CE	PWRO Inlet PH
1	22/02/16	09:57	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	22/02/16	10:02	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	22/02/16	10:07	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	22/02/16	10:12	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	22/02/16	10:17	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	22/02/16	10:22	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7	22/02/16	10:27	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8	22/02/16	10:32	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9	22/02/16	10:37	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	22/02/16	10:42	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11	22/02/16	10:47	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12	22/02/16	10:52	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13	22/02/16	10:57	0.0	0.0	0.0	0.0	0.0	0.0	0.0
14	22/02/16	11:02	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15	22/02/16	11:07	0.0	0.0	0.0	0.0	0.0	0.0	0.0
16	22/02/16	11:12	0.0	0.0	0.0	0.0	0.0	0.0	0.0
17	22/02/16	11:17	0.0	0.0	0.0	0.0	0.0	0.0	0.0
18	22/02/16	11:22	0.0	0.0	0.0	0.0	0.0	0.0	0.0
19	22/02/16	11:27	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20	22/02/16	11:32	0.0	0.0	0.0	0.0	0.0	0.0	0.0
21	22/02/16	11:37	0.0	0.0	0.0	0.0	0.0	0.0	0.0
22	22/02/16	11:42	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23	22/02/16	11:47	0.0	0.0	0.0	0.0	0.0	0.0	0.0
24	22/02/16	11:52	0.0	0.0	0.0	0.0	0.0	0.0	0.0
25	22/02/16	11:57	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26	22/02/16	12:02	0.0	0.0	0.0	0.0	0.0	0.0	0.0
27	22/02/16	12:07	0.0	0.0	0.0	0.0	0.0	0.0	0.0
28	22/02/16	12:12	0.0	0.0	0.0	0.0	0.0	0.0	0.0
29	22/02/16	12:17	0.0	0.0	0.0	0.0	0.0	0.0	0.0
30	22/02/16	12:22	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Click "Alarm" to enter the alarm interface, where you can view the alarm of the device .



2 Installation and System Start

2.1 General Safety Instructions

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2.2 Preparation

Checking following if they are ready:

1. Water intake facility, water tanks
2. Packing list (parts for installation), piping and cable list (responsible by buyer)
3. Necessary chemicals

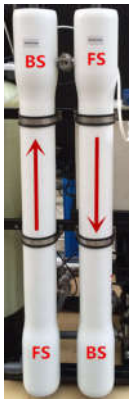
 **Connect all the instrument and equipment cables before energized.**

2.3 How to Install RO Membrane

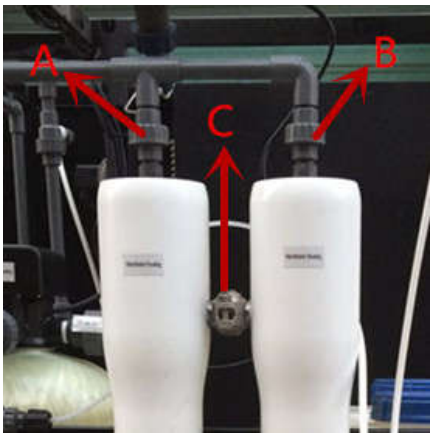
1. Check flow direction of pressure vessels

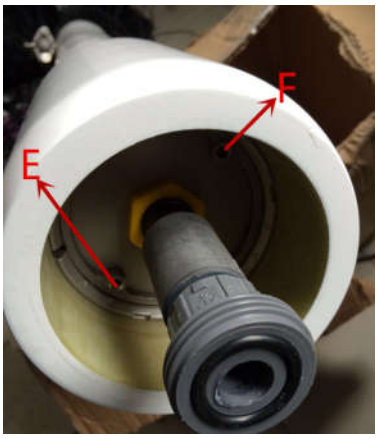
Feed Side (FS): where the inlet side of the flow (the side connected to high pressure pump is always the feed side)

Brine Side (BS): where the outlet side of the flow (the side connected to pressure adjusting valve is always the brine side)



2. Loosen the union A and B.
3. Unscrew the coupling C, remove the connect hose on both side.
4. Unscrew the bolt E and F, Remove all the end cover from the pressure vessels.

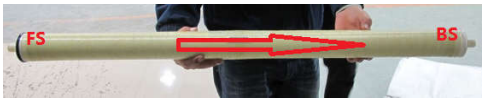




5. Coat sealing rings with glycerol.

6. Put the end cover of the BS back with a plastic hammer, screw the bolt H to fix the end cover.

7. Check the RO membrane.



The side with O-ring is Feed Side.

8. Put the BS of the membrane into the vessel, push the membrane until stopped by the BS end cover.

Caution: the BS of a membrane should always be installed at the BS of a vessel. Wrong installation may damage the O-ring of the membrane and lead brine into the product water.

9. Put the end cover of the FS back with a plastic hammer, screw the bolt H to fix the end cover.

If the membrane need to be replaced, follow the schedule 1-9.

Filter Cartridge Installation

1. Loosen the filter housing with wrench first, then unscrew the filter housing clockwise with your hand.

2. Put the cartridge inside the housing.

3. Screw the filter housing anticlockwise.

Note: use your hand or soft support while screwing out the filter housing.

2.4 Initial start

2.4.1 Pump initial startup

A. Resin feed pump start-up preparation

Three knob switch to the manual position, start the resin feed pump, test positive and negative rotation, open the exhaust plug, exhaust

B. EDI feed pump start-up preparation

Three knob switch to manual position, start EDI feed pump, test positive and negative rotation, open the exhaust plug, exhaust

C. RO high pressure pump start-up preparation

Note: the electric or manual operation of all pumps is automatically switched by hand on the panel of the control cabinet. Switch to manual and then push the manual button.

1. Before starting the system, should test whether the relevant protection devices are effective, such as RO high pressure pump front low pressure protection switch, RO water outlet high pressure protection switch, etc.

2. Connect the pipeline so that all valves are in the correct position. Open the original water pump, open the exhaust wire plug on the RO high pressure pump, exhaust the high pressure pump, and exhaust the system.

3. Click the high pressure pump and test the positive and negative rotation of the high pressure pump (the direction is subject to the arrow on the high pressure pump). Note that the inlet pressure of the high pressure pump must be ≥2bar when starting the high pressure pump.

4. Open the high pressure pump (concentrated water regulating valve, water production valve should be in the open state), according to the recovery rate of the system, adjust the opening of the concentrated water valve.

5. The pump is the key equipment of the system, operation should be careful.

2.4.2 EDI initial startup

Proper EDI equipment start-up is necessary to prepare EDI for normal operation and to prevent EDI module damage due to excessive flow, water hammer or current overload. Following the following procedures can also help ensure that the system is operating within the system design parameters and that the water produced meets the design requirements. The data of the first

system run is an important part of the system startup.

Before starting EDI system, RO system, EDI module installation, instrument calibration and other system inspection should be completed.

Resin and RO start

This part is suitable for starting the device for the first time or restarting the device after it has been shut down for a long time. The operation steps are as follows:

(1) Before starting

A. Check whether the device and valve are correctly installed

B. Check cables between devices to ensure reliable grounding

C. Power on the electric control cabinet

D. Manually start the feed water pump and thoroughly flush the high-pressure pump and all pipes

Note: according to the film manufacturer's suggestion, the film should be washed for 1-2 hours after loading

E. Ensure that the air in the feed pump, security filter, high pressure pump and membrane shell is exhausted

F. Calibration of each instrument (calibration has been done before delivery, in order to avoid damage during transportation, it is suggested to correct)

G. Ensure that the original water tank is not at a low level

H. Check that all valves are in reasonable condition

(2) For the first time

A. Turn on the internal circuit breaker of the electric control cabinet to power on the system

B. The pump and automatic valve are in automatic state after ensuring that all inspections have been made and the exhaust has been completed. Press the "ON/OFF" button corresponding to RO or "ON/OFF" button corresponding to EDI on the panel of PLC control cabinet to start the system

C. Adjust the valve to reach the desired water flow (design value).

D. In the process of starting the high-pressure pump, if any abnormality (such as leakage, abnormal noise, etc.) is found, the power supply of the system should be shut down immediately to stop the system and the cause should be checked

Observe the water conductance and other parameters, and the system runs normally after all the parameters are qualified

EDI start

A. Before connecting pipes to the CEDI, verify that all pre-treatment equipment and pipes meet cleaning requirements.

B. Ensure that all pipes connected to the CEDI module are properly connected and meet cleaning requirements.

C. Check that all relevant manual valves are in correct position and open/close. The inlet valve, water supply valve, ultra-pure water tank inlet valve and concentrated water flow control valve are fully open.

D. During flushing, check all pipe connections and valves to ensure no leaks. Lock the connection if necessary.

E. Check that the cable connections between the CEDI and the power supply module are correct.

F. Start EDI water delivery pump. Adjust valve opening to design flow and design pressure. Check design recovery rate and actual recovery rate.

G. Always check the system pressure and ensure that the system operating pressure does not exceed the maximum operating pressure limit of the module.

H. Adjust valve at design flow rate until production pressure is 2 to 5psig higher than concentrated discharge pressure.

Repeat the above steps until the system is operating in accordance with the design water yield and concentration flow.

3 Normal operation

3.1 Start-up

A. pull on the electric control cabinet interior open, make the system electricity, right after the check valve, the PLC control cabinet panel on three knob switch to automatic, each system corresponding to the valve and pump set to automatic mode, press the RO, EDI part of the "ON/OFF" button the system enters the water making process, RO and EDI partially ordered open automatically.

B.RO will have a flushing process when the system is initially started. After the flushing, RO will automatically enter the running state.

Note: Once the EDI system has been started (in practice, it is inevitable that EDI systems will be more or less shut down and restarted), each shutdown and restart means changes in pressure and flow, as well as mechanical shocks to EDI modules. Therefore, the number of system shutdown and restart should be as little as possible to ensure the smooth operation of EDI system.

Checks before and during system startup should be carried out as a routine task and work records should be kept. Calibration of instruments, alarms, safety equipment and line leak checks should also be performed as a routine.

3.2 Shut down

RO :

A. Press the "ON/OFF" button of RO, the high-pressure pump shuts down, the original pump shuts down, the pneumatic valve is reset, and the system stops making water

B. Turn down the internal circuit breaker of the electric control cabinet, the system will be powered off, and all alarms will be restored

EDI :

A. Press the "ON/OFF" button of EDI, the water production discharge valve will open, EDI membrane reactor will be powered off, EDI feed pump will stop, the system will stop water production, and the pneumatic valve will reset

B. Turn down the internal circuit breaker of the electric control cabinet, the system will be powered off, and all alarms will be restored

Note: start EDI system again after shutdown

Put the valve of EDI system in EDI circulation state, start EDI water inlet pump, check item by item according to EDI start procedure, start EDI system.

3.3 Dosing

As the specific dosage is closely related to water quality, the recommended dosage is as follows:

Chemicals	Chemical purity	Solution concentration	Dosing concentration	Dosing pump setting	Remarks
Antiscalant	100%	10%	10%	0.03L/h（3%）	Adjustable
NaOH	99%	10%	10%	0.2L/h（20%）	Adjustable

4 Performance Recovery – Chemical Cleaning

4.1 When to clean the membrane

In the process of operation, pollutants are accumulated and must be removed. This cause the performance loss: product flow decrease, system pressure increase, salinity in product water increase. Low pressure washing does not guarantee the complete cleaning of pollutants. An enhanced chemical cleaning is required.

4.2 When is RO membrane needs to be cleaned?

1. When feed water salinity, temperature, operating pressure is not changed, the product flow decrease 10%.

2. ΔP of membrane (feed in pressure – brine out pressure) is over 2 bar.

3. Salt rejection rate increase 5%.

The choice of chemical cleaning agents suitable and reasonable cleaning scheme involves many factors, contact the equipment manufacturers, RO membrane manufacturers or RO specialty chemicals and service personnel first. Determine the major pollutants and select the appropriate chemical cleaning agents. Sometimes, for some special pollutants or pollution, special chemical cleaning agents to use the RO manufacturer, and in the application, should follow the instructions provided by the supplier agent and product performance, special circumstances can be taken according to the specific conditions of single element pollution has occurred for testing and cleaning test from reverse osmosis device, to determine the appropriate chemicals and cleaning solutions.

In order to achieve the best cleaning effect, sometimes a variety of chemical cleaning agents are used for combined cleaning. Typical procedures are to carry out low pH cleaning, remove mineral fouling contaminants, and then carry out high pH cleaning to remove organic matter. In some cases, high pH cleaning, removal of oils or organic contaminants, and low pH cleaning are carried out first. Some cleaning solutions incorporate detergents to help remove serious biological and organic debris; and other agents, such as EDTA, are used to assist in the removal of colloids, organic matter, microorganisms, and sulfates. What is needed to consider is that if you choose inappropriate chemical cleaning methods and chemicals, the pollution will worsen and even cause irreversible damage.

4.3 Before chemical cleaning:

1. Select a dedicated chemical, first of all, to ensure that it has been identified by the drug supplier and meets the requirements of membrane components.

2. If the chemicals are in use, be sure that they are listed in the technical manual of the RO membrane supplier and comply with the technical requirements.

3. There are many factors that affect the cleaning effect. It is necessary to adopt a combined method to complete cleaning, including proper cleaning pH, temperature and contact time, which will help to improve cleaning effect.

4. The cleaning in the best humidity recommended, at the same time should contact number as much as possible to reduce the chemical reagents and membrane components, shorten the cleaning time, in order to achieve the best cleaning efficiency and prolong the life of membrane element effect.

5. The pH range of the cleaning solution should be carefully controlled to extend the service life of the membrane element. The conservative pH range is 4~10, allowing the maximum range of 2~12 to be used.

6. The most effective method, typical cleaning is carried out from high to low pH pH cleaning solution, due to the high pH will increase the membrane pore expansion, the conductivity increased by low dose of pH to membrane pore tightening, running above 72h time can be restored, in order to ensure the system is recommended to high desalination rate, low after pH pH if cleaning; to expand the production of water, can be used to lower pH pH after cleaning: when cleaning oil pollution removal components not from low pH, because the oil at low pH will be cured.

7. If biological contamination has occurred in the system, it is necessary to consider adding a bactericidal chemical cleaning step to the cleaning process. The sterilization operation can be performed immediately after cleaning, can also be carried out regularly during or before cleaning operation (such as in a period of time), continuously adding a certain dose, must confirm fungicide use and membrane element compatibility, will not bring any harm to human health survival risk, and can effectively control the biological activity, and low cost. Extreme pH alternately cleaning, basically has reached the bactericidal effect, so you can eliminate the process of sterilization stripping.

8. To be on the safe side, make sure that all hose and tubing inches are under cleaning, temperature, pressure, and pH conditions during cleaning.

9. In order to ensure the safety of dissolved chemicals, remember to slowly add a sufficient

chemical water and stir the measure

10. From the security considerations, not the acid and caustic (corrosive) hybrid material. Before using the next solution, a previously cleaned chemical cleaning solution shall be thoroughly rinsed from the RO system.

11. All cleaning agents must be completely dissolved in water and must not be cloudy or muddy.

12. When the cleaning process is found to be dirty to a certain extent, in order to avoid cleaning the pollutants to re adsorption in the reverse osmosis membrane, it is recommended to replace the new medicine, continue to clean.

4.4 Protection for Stop

For stop less than 3 days, no need to do anything.

For stop less than 15 days, system shall be started for 10min each 3 days or put NaHSO3 (1.8kg) into Flush tank before stop so that reserving solution could be flushing into system.

For stop more than 1 month, system shall be started for 30min each month and put NaHSO3 (1.8kg) into Flush tank before stop.

For stop more than 6 month, membrane is recommended to be cleaned first, then taken off and stored separately. The SF unit shall be backwashed each month for 2h.

Note: The RO membranes should be stored in a dry and well ventilated place without sunshine, and the storage temperature is: 5-35 °C.

Antifreeze protection is required at temperatures below 2°C. QT recommends using Dowcal N from Dow Chemical Company or Chillsafe from Arco Chemical Company.

4.5 Approved cleaning procedures for EDI

Periodically, the LX module may need cleaning or sanitization. Cleaning the module removes scale and resin/membrane foulants. The LX modules can be cleaned and sanitized with five (5) different solutions, depending on what needs to be removed:

· Hydrochloric acid (2%) – for removing scale and metal oxides.

· Sodium chloride/sodium hydroxide (5% brine/1% caustic) – for removing organic foulants and biofilm.

· Sodium percarbonate – for removing organic foulants, reducing pressure drop, and sanitizing.

· Peracetic acid – used for routine sanitizing to discourage the growth of bacterial films.

· Aggressive multi-agent cleaning – this sequential cleaning protocol of caustic, percarbonate,

brine and acid is recommended for heavily biofouled systems.

NOTE: If you are unsure whether the module is scaled or organically fouled, flush first with brine, then clean with NaCl/NaOH followed by brine followed by HCl.

5 Trouble shooting and maintenance

5.1 Trouble shooting

The failure of RO film is usually manifested as the degradation of film performance, physical damage and chemical deterioration. And RO membrane itself for reasons other than the symptoms of failure often appear in RO membrane. Therefore, when investigating the cause, attention is often focused on the analysis of membrane properties. It is indispensable to obtain correct judgment by consulting the operation records and analyzing the quality of raw water.

Fault diagnosis can be carried out in the following order:

A. Check operation records (if any). Confirm the operation status and conditions of the device on the premise of recording the daily operation data.

Investigate for abnormal operating conditions.

B. Add necessary data. Determine whether the overall performance of the device is degraded or partially degraded. If part of the performance is degraded, it can be disassembled

The RO film in question, check its appearance and connected sealing ring and other conditions.

C. Investigation and analysis of the characteristics of raw water.

Test the performance of RO membrane components removed from the device, and check the disintegration of membrane components (membrane analysis, cleaning test).

Problem	Reason	Remedy
Feed pump could not be started	Cable for the motor is wrongly connected. Feed pump failed	Check the cable. Repair the pump.
HPP could not be started	Cable for the motor is wrongly connected. HPP failed	Check the cable and VFD. Repair the pump.
Abnormal noise from HPP	Air in the inlet piping HPP failed	Air bleeding Repair the pump.
Flush pump could not be started	Cable for the motor is wrongly connected. Feed pump failed	Check the cable. Repair the pump.
Motor Valves could not be opened or closed	Cable for the motor is wrongly connected. Valve is blocked by particles Feed pump failed	Check the cable. Disassemble the valve and clean it Repair the valve.
Leaking from connections	Loosen connections or broken bushes or O-rings	Tighten the connections or replace the bushes or O-rings.

EDI Fault card Refer to EDI manual

5.2 Maintenance

5.2.1 Short-term outage - RO

The storage method of short-term outage is suitable for the case that the RO film is still installed in the membrane shell when the device stops running for 5-30 days. The specific steps are as follows:

A. Flush the reverse osmosis unit while taking care to completely remove gas from the system.

B. After filling the membrane shell and related pipes with water, close the relevant valves to prevent gas from entering the system.

C. Rinse every 5 days.

5.2.2 Long-term shutdown - RO

The storage method of short-term outage applies to the case that the RO film is still installed in the membrane shell when the device is out of use for more than 30 days. The protection steps are as follows:

A. Chemical cleaning of the device should be carried out before outage to remove the pollutants accumulated in the RO film during operation to the maximum extent, as the pollutants accumulated during operation may be more difficult to remove after prolonged outage.

B. Prepare 1% SBS(sodium bisulfite) germicidal solution with produced water and circulate the germicidal solution to wash the device.

Method: After checking the valve, press the "CIP pump" open button to start the CIP pump.

When the sterilizing liquid is full of the device, close the high pressure pump, and quickly close all valves of the device to keep the sterilizing liquid in the system, and confirm that the device is fully filled.

C. Note: If the temperature is below 27℃, repeat this procedure every 30 days with a new bactericidal solution; If the temperature is higher than 27℃, the bactericidal solution should be replaced every 15 days.

Flush the unit with low pressure feed water for 1 hour and then with high pressure feed water for 5-10 minutes before the unit is put back into service. Before restoring the unit to normal operation, check and confirm that the produced water does not contain any fungicides.

5.2.3 Shutdown and Storage - EDI

This section contains shutdown procedures for a LX module. Under certain circumstances, bacterial growth can occur quickly in water left stagnant within each module or the overall system.

5.2.4 System Shutdown - EDI

· For off-line periods ≥ 7 days, follow steps below:

· Shut off feed water to LX module(s).

· Drain standing water out of LX module(s).

· Close isolation valves to prevent evaporation of water in membranes and resins.

5.2.5 Startup After Shutdown - EDI

· If desired, sanitize LX module(s).

· Divert product outlet to drain.

· Turn on feed water to LX module(s).

· Operate unit with DC power on, flushing to drain.

· Send to use point when desired product water quality achieved.

5.2.6 Rebuild or Repair - EDI

· Ionpure presently rebuilds LX modules only at approved factories. Due to transportation costs, rebuilding Ionpure LX modules that are installed outside of North
America may not be cost-effective compared to the cost of a new module. Contact your OEM or local Ionpure representative for details.

5.2.7 Disposal - EDI

· Perform a 5 minute once-through flush with DC power off using a 5% NaCl solution at a product flow rate between minimum and nominal flow, and at about 90% recovery.

· Then flush the modules with tap water (drinking water quality) at minimum flow (also with DC power off) for 10-30 minutes.

· The modules can then be discarded as normal (non-hazardous) waste.