5000GPD Recovery Water System Manual

Operation Instruction Catalogue

1.Brief Introduction

The reverse osmosis(RO）device separates the solvent (usually water) in the solution through the reverse osmosis membrane (or semi permeable membrane) with enough pressure.This process has no phase change, no heating, low energy consumption. It is suitable for all kinds of salt containing raw water, especially in the high salt water treatment project. It can be able to remove bacteria, colloids and large molecular weight organics while desalting, and obtain good technical and economic benefits.

2.Main Technology Parameters

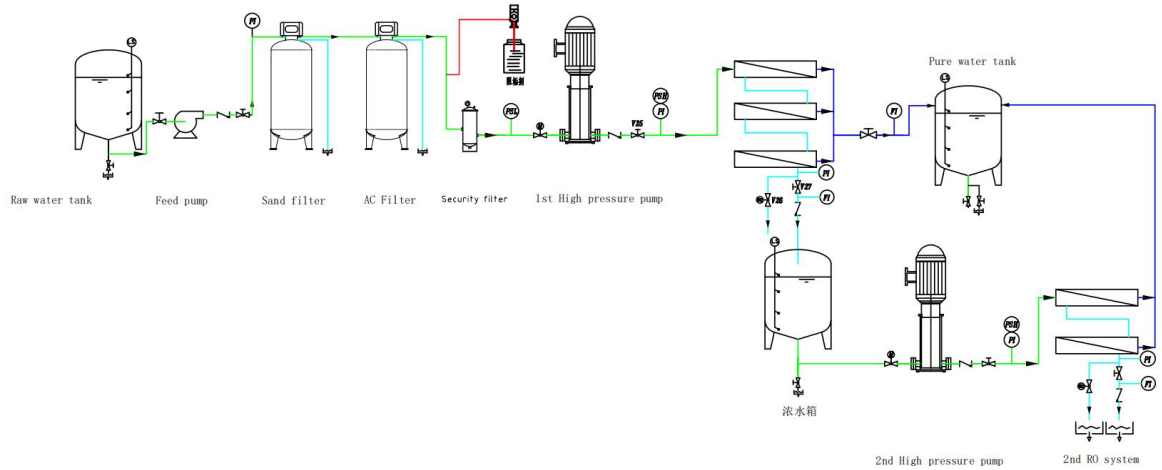
No.	Model	Features	Total Power
1	Smith-RO-5000G	Applicable Voltage 240V	4.8KW

Pre-treatment working pressure	22 psi
Raw water pressure&flow	279GPH
1st RO Outlet water	167GPH
1st RO Reject water	112GPH
2nd RO Inlet water	112GPH
2nd RO Product water	66GPH
2nd RO Reject water	46GPH
Raw water pump motor power	1.1 KW，240V/1P/60HZ
1st RO high pressure pump motor power	2.2 KW，240V/1P/60HZ
2nd RO high pressure pump motor power	1.5 KW，240V/1P/60HZ
Equipment dimension(L*W*H)	100in X 34in X 78in

The open&close status of valves and pumps during operation

Item	Name	Filtration	RO Flushing
1st RO	Feed pump	Open	Open
	Antiscalant dosing pump	Open	Open
	Inlet water valve	Open	Open
	1st High pressure pump(HP)	Open	Open
	1st RO Flush valve	Close	Open
	1st Concentrated regulating valve	Slightly Open	Slightly Open
	1st Concentrated return valve	Slightly Open	Slightly Open
2nd RO	2nd Inlet water valve	Open	Open
	2nd High pressure pump(HP)	Open	Open
	2nd Concentrated regulating valve	Slightly Open	Slightly Open
	2nd Concentrated return valve	Slightly Open	Slightly Open
	2nd RO Flush valve	Close	Open

3.Process Flow Chart (See attachment for detailed)



4. Equipment location

①The equipment is required to be placed on the flat ground, and there should be more than 50cm channel around the equipment for operation and maintenance.

②Do not place the equipment outdoor so as not to accelerate the aging of its mechanical parts.

③Connection pipes should be UPVC or stainless steel to prevent rust contamination.

④Check whether the fixed locking clips and screws are loose.

⑤All switches on the electrical box should be turned off before power on.

⑥Confirm the motor running direction is correct.

5.Equipment Installation

5.1 Loading filter media:

Pour a small amount of water (about 30cm high) into the tanks first before loading the filter media,the height of media in the tanks shall not exceed three quarters of the tanks.Generally, two-thirds of the height is good.

Remark:

①When loading quartz sand, fill in the order of large particles to small particles.

②When loading the activated carbon tank,please fill with coarse sand first to cover the water distributor in the tank, and then pour in the activated carbon.

5.2 Connect water pipe

①Connect the raw water inlet port in front of the feed pump with the water source according to the process flow chart;

②The filter tanks discharge port and 2nd RO concentrated water outlet are connected to the sewer for direct discharge..

③1st RO product port and 2nd product port are connected to product tank.

④1st RO reject water port is connect to middle water tank. And the outlet of middle water tank is connected to the inlet of 2nd RO high pressure pump.

5.3Connect the circuit:

①Connect the liquid level gauges of raw water tank,middle water tank and RO product tank to the electric control box according to the circuit diagram;

②Connect the main wire of the distribution box to the power supply. For the sake of safety, connect it reliably with the grounding wire at the grounding screw of the electric control box. Then plug the dosing pump and automatic control valve power cord into the socket.

6.Preparation before startup

6.1Pipeline and electric control connection

Confirm that the equipment has been connected with peripheral equipment (such as water pump, water tank, electric control, etc.) according to the process flow chart first.

6.2 Pipeline Cleaning

Checked that the equipment pipelines are connected correctly, disconnect all the flexible joints that connected to the equipment, and then clean the pipelines to wash them with clear water for 3-5mins until its cleaned.

Please note that the waste water from cleaning the pipe should be discharged directly, which it is not allowed to enter the RO membrane, so as to avoid the damage to membrane module by large particles. And check whether there is water leakage at each connection of the pipeline.

6.3 Filter tanks Cleaning

Turn the "Auto/Stop" knob of the HMI to the **Stop** state, Adjust the quartz sand filter control valve to **BACKWASH** state,Then **Start the feed pump**, **Open water Inlet valve,**and adjust the pre-treatment water inlet pressure to be greater than 0.2MPa. Only the above actions are completed, the following actions can be carried out!

①Quartz sand filter cleaning

The filter media should be thoroughly cleaned before start. The operation steps are as follows:

●Backwash quartz sand filter:

Adjust the control valve of quartz sand filter to **BACKWASH**, Set the activated carbon filter to **SERVICE**, then perform the backwash for the quartz sand filter for around 20mins until the effluent becomes light or colorless.

● **Forward wash quartz sand filter:**

While completed backwash for quartz sand filter, reset the quartz sand filter control valve to **"FAST RINSE",** keep the activated carbon filter to the **"SERVICE"**, start the feed pump to forward wash the sand filter for around 20mins until the effluent becomes light or colorless.

②Activated carbon filter cleaning

Activated carbon filter cleaning steps are as above.

● **Activated carbon filter backwash**:

Adjust the control valve of activated carbon filter to **"BACKWASH"**, while adjust the quartz sand filter to the **"SERVICE"**, then backwash the Carbon filter for 20mins until the drainage is generally black to light or colorless.

● **Activated carbon filter Forward wash:**

Reset the control valve of activated carbon filter to **"FAST RINSE".** Keep the quartz sand filter to the **"SERVICE"**. Then forward wash the carbon filter for 20mins until the drainage is generally black to light or colorless.

③Cycle cleaning

When the two filters are all cleaned, turn the **" Manual / Stop / Auto"** knob on the panel of the electric control box to **Stop position**. Stop it for 4-5 hours, and then wash them repeatedly (about 2 days) for several times before formal use.

Note: Only the three pre-treatment filters are all cleaned,they can be adjusted to the **SERVICE** stage to enter the normal operation.

For the adjustment method of the control valve, please refer to the manual of Runxin automatic control valve.

6.4 Antiscalant dosing system

The volume of the dosing tank is 40L, Add 4KG Antiscalant liquid to it, and mix it with water to fill the tank.(Please consult the antiscalant manufacturer for the dosage.)

If it is necessary to increase the dosage, the concentration of the solution can be slightly adjusted or the injection volume of the dosing pump can be increased appropriately when preparing the chemical solution.

Operation: when fully automatic operation, it will run synchronous with RO making water. Only need to adjust the percentage (1-100%) if the flow needs to be adjusted. 1% is the minimum flow, 100% is the maximum. Generally set the flow between 20- 30%, please refer to the dosing pump operation manual for specific operations.

7.RO System Manual Operation

7.1 Preparation before system startup

①Confirm that the liquid levels of the Antiscalant dosing tank is normal, and the dosing pump is working well;

②Check that the water level of the raw water tank can meet the needs of RO start-up.

③Check whether the inlet and outlet valves of booster pump, precision filter and high-pressure pump are all open.

④The meters and pressure gauges should also be checked for normal.

⑤Check the power supply of each pump and the control's,confirm the indicator lights of the electric cabinet are normal.

7.2 RO System Manual Operation

1st RO pressure and flow regulation

Manual commissioning of the 1st RO must be completed before commissioning the 2nd RO.

Step 1:

When the RO system enters the formal commissioning operation, open the manual ball valve behind the feed pump and open the valve behind the 1st high-pressure pump. Fully open the 1st concentrate water valve and the concentrate water return valve. Adjust the low-pressure switch setting to 0.5 Bar and set the high-pressure switch to 15 Bar.

Step 2:

On the HMI manual page, start the 1st RO feed pump. Wait until the system is filled with water (indicated by a significant flow reading on the 1st RO concentrate water flowmeter), then start the 1st RO high-pressure pump. After 1-2mins, slowly adjust the 1st concentrate water valve and the concentrate water return valve until the 1st RO product reaches 167 GPH, the concentrate flow reaches 112 GPH, and the return flow reaches 132GPH.

2nd RO pressure and flow regulation

Before commissioning the 2nd RO, ensure the middle water tank is filled to provide sufficient water level for 2nd RO commissioning.

The operation steps are as follows:

Step 1:
When the 2nd RO system enters formal commissioning, first open the regulating valves located before and after the 2nd high-pressure pump. Fully open the 2nd RO concentrate water valve and 2nd concentrate water return valve. Set the 2nd high-pressure switch to 15 Bar.

Step 2:
On the HMI manual page, start the 2nd high-pressure pump. Slowly adjust the 2nd RO concentrate water valve and the concentrate water return valve until the 2nd RO product flow reaches 66 GPH, the concentrate flow reaches 45 GPH, and the return flow reaches 158GPH.

Step 3:
After the 2nd RO manual commissioning is completed, switch the HMI interface to the Process page and Click Auto mode. If all automatic operation conditions are met, the system will begin automatic operation.

If the system does not start automatically, please check whether the liquid levels in all water tanks meet the startup requirements and whether there are any alarm messages.

7.3 RO System Manual Shutdown

①Must Stop high pressure pumps first, then stop the Feed pump.

②Stop the water inlet valve . No need to close product manual valve on the system and keep it open.Also, the concentrate regulating valve adjusted, it generally does not need to adjust again to facilitate the next start.

7.4 RO Shutdown for Flushing

Purpose of shutdown for cleaning: When RO system stops running, as the water inside the membrane is already in a concentrated state, it is easy to be contaminated in a static state, so need clean water to rinse the membrane surface to prevent the deposition of pollutants, thus affecting the performance of the membrane

8.RO System Auto Operation

8.1 Preparation before automatic startup

①Confirm raw water tank liquid level meets the starting requirements.And check the meters are normal.

②Check each water pump and dosing pump are normal.

③Check the control mode on the HMI and adjust it to the Stop position, and check whether the indicator light display on the control box and the automatic control valve head status indication are correct;

④Confirm the opening and closing state of each manual valve meets the system automatic start-stop requirements . Generally, The inlet and outlet valve of water tanks and pumps, as well as RO water product valve should be normally open

⑤The RO concentrated water regulating valve must be in the correct opening position (this valve generally remain open after being adjusted).

8.2 RO System Startup

①Click the **Auto mode** on HMI .

②When the system runs automatically, check its operating status and parameters are normal on HMI. If there is a fault, it should be eliminated in time .

③After putting all the devices into operation, please check the equipment actual operation conditions.Such as the running states of the pumps, whether the flow, pressure and other parameters of each device meet the technical requirements.

④When the system runs normally, the operation of start-stop and flushing of the system will be carried out automatically according to the liquid level of each water tank.If there is an alarm signal, find out the reason first,press "reset" button after timely processing, so that the system continue to operate automatically.If the problem cannot be dealt with, the system should be stopped for maintenance in time.

⑤The operating parameters and any possible malfunction of the equipment should be Recorded.

8.3 System Shutdown

①The system will be shut down depending on the water level of each water tank (The system shuts down when the water level of raw water tank is low or product water tank full);

②It is highly recommended to use the automatic operation mode,because it has an over-pressure protection system, which is conducive to the safe operation for the equipment.

9. Operation precautions

①Th 240V motor is selected for this equipment. It must be noted that the placement direction of the motor is consistent with the direction marked on the pump, otherwise the motor will be damaged.

②In case of water shortage or low pressure, the system will stop automatically and work automatically after water pressure is restored.

③Residual chlorine content of the water entering the membrane should be strictly controlled below 0.1ppm. If the residual chlorine exceeds the standard, the activated carbon filter media in the adsorption filter shall be replaced.

④The pump must not run without water, and the system also can not run without water or air intake.

⑤During operation, if there is any abnormal noise, the system must be stopped immediately to avoid accidents..

⑥Frequently check whether the high pressure pump, feed pump, water cut-off protector and power supply system are in good condition.

⑦When the system is set aside, it shall be started at least once a day (about 1-3 minutes) for a short time to avoid the failure of RO membrane caused by water shortage for a long time.Also the system shall not be placed in the environment of high temperature and subzero temperature.

10. Maintenance and Protection

①After the official start-up, the filter media in quartz sand filter and the activated carbon filter need to be backwash and forward washing once a day, generally 10mins and 5mins respectively. Also,The quartz sand and activated carbon media shall be replaced regularly according to the inlet water quality, generally once every 6-12 months.

②The pp cartridge in the precision filter generally needs to be replaced after 15-30 days of use. If the high-pressure pump cannot work continuously due to special circumstances, the pp filter needs to be checked and replaced.

③Regularly cleaning for the RO membrane

11. Common troubleshooting methods

①Feed pump and high-pressure pump do not absorb water

Check whether the feed pump and high-pressure pump are reversed. If the reverse is found, replace two of the three power terminals of the pump. If it is not, open the exhaust valve of the pump to vent or fill with water.

②Feed pump can not start

Please confirm whether the main equipment has access to power and the thread ends are loose or fall off.Whether the relay pull-on or not. And whether the water shortage protection switch of the raw water tank is disconnected.

③High pressure pump can not start

Please Check whether the relay connected with the high-pressure pump is pull-on, are the wire heads at the connecting bolt loosed and fallen off. In order to prevent the high-pressure pump from idling and damaging, the water cut-off low-pressure protection switch is used to cut off the power supply,thereby protecting the high-pressure pump. If sufficient water supply is provided to make the pressure of the low-pressure protection switch reaches the set, the high-pressure pump will be able to start.

④Regulation of membrane working pressure

The check valves of product flowmeter and concentrated flowmeters control the total water outlet capacity and water production recovery rate(this recovery rate is about 60%). When outlet water decreases, the membrane working pressure will be increased. Also,the water regulating valves at the inlet and outlet of the high-pressure pump is used to adjust membrane working pressure. Max.membrane working pressure is 1.0Mpa,Overpressured water can quickly damage pumps and motors.

⑤Abnormal sound from high pressure pump

Check whether the high-pressure pump is idling. Sometimes, the high-pressure pump will make some abnormal noise when the water is not completely entering, and it will disappear automatically in 1-3mins. If it does not disappear after 3mins, open the exhaust valve of the high-pressure pump to vent or inject water.

⑥Fine white or black suspended particles appear in the purified water

This is because the pipeline is polluted, causing bacteria to grow. The membrane needs to be chemically cleaned. If the equipment equipped with pipeline sterilizer also need to turn on in time to sterilize.