

ANHUI KOYO BEVERAGE MACHINERY.CO.,LTD

安徽蓬源饮料机械有限公司

RO-3000型反渗透处理系统

RO-3000 Reverse osmosis treatment system

(单级RO工艺)

(Single stage RO process)

使用说明书

Operation

Instruction



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一、概述

I. Overview

RO-3000 型单级反渗透处理装置是对以市政自来水为原水，进行水质预处理和反渗透处理的反渗透水处理装置。它可广泛应用于纯净水、茶饮料调配用水、直饮水、苦咸水淡化、住宅小区、医院、宾馆、化工、企事业单位等的纯水处理。

KOYO brand RO-3000 single-stage reverse osmosis treatment apparatus is a reverse osmosis water treatment apparatus that is applied to conduct the water quality pretreatment and reverse osmosis process with the municipal water as raw water. It can be widely used in pure water treatment including the purified water, tea drinks allocating water, drinking water, brackish water desalination in residential areas, hospitals, hotels, chemicals, and enterprise and public institution and so on.

本产品是为制取饮用调配净水而专门设计生产，为提高设备运行的可靠性、稳定性和先进性，对关键性的膜元件采用了先进的低压反渗透膜。采用本公司生产的反渗透水处理装置，并严格按照本说明书规定的安装、调试、操作和维护管理，所制取的净水可达到卫生部《生活饮用水水质处理器卫生安全与功能评价规范——反渗透处理装置》(2001)规定的出水水质卫生要求。

This product is intended for the preparation of drinking deployment water. In order to improve the reliability stability and advancement of the equipment operation, the membrane element as the key component is made of the advanced low pressure reverse osmosis membrane. With the reverse osmosis water treatment equipment produced by our company and in strict accordance with the instructions provided for installation, commissioning, operation and maintenance management, the purified water could reach the water quality hygiene requirements set forth by Ministry of Health in "drinking water health and safety and functional assessment of the processor specification - reverse osmosis treatment device "(2001).

二、水处理工艺流程

II. The water treatment process

自来水→原水增压泵(电磁阀)→石英砂过滤器→活性炭过滤器→保安过滤器→高压泵(投加阻垢剂)→反渗透装置→水箱

Water → raw water booster pump (electromagnetic valve) → quartz sand filter → activated carbon filter → Security filter → high-pressure pump (dosing scale inhibitors) → reverse osmosis unit → tank

三、设备组成

III. The equipment composition

本套水处理设备由原水增压泵、石英砂过滤器、活性炭过滤器、保安过滤器、自动加药装置、高压泵、反渗透系统、纯水箱、压力开关、压力表、流量计、电导率等仪表组成。

This set of water treatment equipment is composed of the raw water booster pump, quartz sand filters, activated carbon filter, security filters, automatic dosing devices, high pressure pumps,

reverse osmosis systems, pure water tank, pressure switches, pressure gauges, flow meters, conductivity rate instrument components and so on.

四、主要技术参数

IV. The main technical parameters

1、预处理系统

1. Pretreatment system

1. 1 适用水源：市政自来水；

1.1 Applicable water source: municipal tap water;

1. 2 进水压力：0.3 MPa；

1.2 Inlet pressure: 0.3 MPa;

1. 3 进水流量：6m³/h；

1.3 Influent flow: 6m³ / h;

1. 4 水温 5-35° 。

1.4 Water temperature 5-35 °

2、反渗透处理系统

2. Reverse osmosis treatment system

2. 1 进水条件

2.1 Inflow conditions

进水压力 0.3MPa

Inflow water pressure 0.3MPa

余 氯 <0.1mg/L

Surplus chlorine <0.1mg /L

浑 浊 度 <1.0NTU

Turbid degree <1.0NTU

污染指数 (FI) <4

Pollution Index (FI) <4

电导率<500us/cm

Conductivity <500us / cm

2. 2 工作压力 1.0-1.5MPa

2.2 Working pressure 1.0-1.5MPa

3、净水流量 3m³/h，额定净水总量 33360m³

3. The water flow 3m³ / h, rated net total at 33360m³

4、出水水质应符合卫生部《生活饮用水水质处理器卫生安全与功能评价规范——反渗透处理装置》(2001)规定的水质卫生要求。

4. Effluent quality should be consistent with the water quality hygiene requirements set forth by the Ministry of Health in the "drinking water processor health and safety and functional

assessment specification - reverse osmosis treatment device" (2001).

五、现场安装及连接

V. On-site installation and connection

1、设备运至客户使用场地打开包装，将设备放置在事先设计好的水处理车间位置上。

1. The equipment is shipped to the customer and opened on the site, and then the device is placed in a pre-designed water treatment plant location.

2、检查整个设备的完好状况，拆去设备的进出口接头、管口及仪表上包堵的防护材料。

2. Check the condition of the entire device, and remove the export and import joint, nozzle of the device and the protective material of the instrument package.

3、根据设计工艺流程来排布并固定设备位置，各单元设备应调整好支承点，使设备处于基本水平且与地面垂直的位置。

3. In accordance with the design process, the equipment is arranged and positioned in place, the device should be adjusted for each unit support point, so that the device is in a substantially horizontal position and perpendicular to the ground.

3. 1、原水增压泵固定在机械过滤器旁边的水平地面上；

3.1. The raw water booster pump is fixed on the level ground next to a mechanical filter;

3. 2、石英砂过滤器放于平整的地基上确保其平衡承重；

3.2. Quartz sand filter is placed on the flat ground to ensure its balanced load;

3. 3、活性炭过滤器放于平整的地基上确保其平衡承重；

3.3. Activated carbon filter is placed on the flat ground to ensure its balanced load;

3. 4、精密过滤器固定在水平地面上；

3.4. Ultra filter is fixed on the level ground;

3. 5、计量泵与加药箱放在反渗透处理装置旁边；

3.5. The metering pump and dosing tank are placed beside the reverse osmosis processing;

3. 6、反渗透处理装置平放在水平地面上；

3.6. The reverse osmosis processing device is placed flat on level ground;

3. 7、纯水箱应放于平整的地基，确保其平衡承重；

3.7. The pure water tank should be placed on flat ground to ensure their balanced load;

3. 8、整套设备最好放在同一平面的直线形上，便于操作与监视。一般情况下各单元设备不需要底脚螺栓固定。

3.8. The entire device is preferably placed straight on the same plane for operation and monitoring. In general, each unit device does not need anchor bolts to fix.

3. 9、水处理车间必需设有排污水明沟。

3.9. The water treatment plant is necessarily equipped with disposal sewerage open trench.

4、根据设计工艺流程，依次用管阀连接组合好各单体设备。

4. According to the design process, pipe valve is applied to combine and connect each single device.

5、石英砂过滤器滤料的填装：组合好各单体设备后开始装填滤料，安装前应检查过滤器是否与地面保持垂直状态，然后，卸下进料口螺栓及封盖，依次“下粗上细”并按其配比数量装入过滤器内，拧紧封盖，并检查进出水口是否拧紧。待调试。

5. Quartz sand filter media are filled: after each single filter is assembled, it can be started to load the filter material. The filter should be checked before installation whether it has been maintained in a vertical position with the ground, and then the inlet bolt and cover are removed, in turn on the basis of the principle " the thick up and the fine down" and put into the filter according to the matching ratio and tighten up the cover, and check if the inlet and outlet are tightened. Be debugged.

6、活性炭过滤器滤料的填装：安装顺序基本同石英砂过滤器，填装净水专用果壳活性炭 100 kg。装填完毕，拧紧封盖，确保密封不渗漏。待调试。

6. Activated carbon filter material is filled: the installation sequence is basically the same as the quartz sand filters, filled with 100 kg of the shell activated carbon. When loading is completed, tighten the cap up to ensure that the seal does not leak. Be debugged.

7、精密过滤器的安装。出厂前滤芯已装好，检查拧紧各法兰密封圈是否良好即可。

7. The installation of the ultra filter. At the factory, the filter element has been installed; check and tighten up all the flange seal.

8、连接计量泵进口与加药箱的管路，及计量泵出口与管道连接；

8. Connect the metering pump inlet and the chemical dosing box pipeline, and connect the metering pump outlet and the pipe;

9、反渗透装置就位应使装置处于水平状态。

9. The reverse osmosis unit should be placed in a horizontal state.

10、反渗透膜元件的安装：安装反渗透膜元件，是本工程调试操作中最关键的部分。安装成功与否，直接关系到产水水质。故因特别注意！具体操作如下：

10. The installation of the reverse osmosis membrane element: the installation of the reverse osmosis membrane elements is the most critical part of the operation in the commissioning of the project. Whether it is successfully installed or not is directly related to the quality of water. Therefore, for special attention! Specific operations are as follows:

A、卸下 RO 膜壳两端封头用清洁水冲洗膜壳内壁。

A. Unload the head ends of RO membrane shell and the clean water is used to wash the inner wall of the membrane shell.

B、每支 RO 膜表面都标有水流方向的指示箭头，装膜时应与膜高压外壳的箭头方向一致，装膜之前可用润滑液涂于 RO 膜末端黑色 O 型圈上，然后以水平状态缓缓装入高压膜

壳内。

B. Each RO membrane surface is marked with an arrow indicating the direction of flow. When installing the membrane, it should be consistent with the direction of the arrow of the high pressure shell of the membrane. Before loading the membrane, the lubricating fluid can be applied to smear the black O-ring on the RO membrane end, and then in a horizontal state, it is loaded slowly into the high pressure membrane shells.

C、当第一支膜装入膜壳内留二分之一位置时，将膜专用连接器涂上润滑油后插入 RO 膜内。第二步，将第二支膜插入专用连接器并以水平状态缓缓装入膜壳内。特别注意：两支膜的箭头应一致。以此类推装好其它膜元件。单芯膜的安装无需重复第二步。

C. When the RO membrane is inserted into the membrane shell in the half position, the special connector of the membrane should be coated with lubricating fluid before it is inserted into the RO membrane. In the second step, the second branch of membrane is inserted into the dedicated connector and in a horizontal state slowly loaded into the membrane shell. Special Note: The arrow direction of two membranes should be the same and so do other membrane components. The installation of the single core membrane should be without having to repeat the second step.

D、装膜完毕，将膜壳两头端盖密封 O 型圈涂上润滑油，装上膜头，上紧卡壳。以保障 RO 膜元件不受机械锤力损伤。

D. Loading the membrane is completed, the two end caps are sealed with the O-ring is coated with the lubricating fluid, the head of the membrane mounted, and the shell should be tightened so as to protect the RO membrane element from damaging by the hammer force.

11、连接总电源、地线并严格检查整个装置电路系统，使处正常工作状态。

11. The main power and the ground electrode are connected and strict check should be conducted on the entire device circuitry, ensuring the normal working condition.

12、接通总电源，电源为三相 380V,50Hz；应检查各水泵是否运转正常。电机逆时针转动方向为正常运转位置。并使各水泵电机接地良好。

12. The main power should be got through with the power supply for three-phase 380V, 50HZ; it is supposed to check whether the water pump is working properly. The counterclockwise rotation direction of motor should be the normal operating position, ensuring each pump motor a good ground connection.

六、设备运行操作

VI The operation of the equipment

1、调试

1. Debug

确认所有管阀安装连接无误、严密，电气连接正确无误后，打开进水阀、总电源。然后进行如下操作：

Confirm that all pipe valves mounting connection is correct, tight and the electrical

connections are correct before you open the inlet valve, the main power. Then the operations are as follows:

第一步：清洗石英砂过滤器

Step one: clean the quartz sand filter

a 反洗：首先把原水箱注满水，调节好机械过滤的反洗模式阀门（即把石英砂过滤器手柄打到反洗状态、）。启动原水增压泵，使水泵往过滤器注水。待过滤器注满水后从排污口流出。第一次开机前，应松开泵体放气螺栓，放尽泵体内空气。

a backwash: First, the original water tank is filled with water and the backwash mode (that is, the quartz sand filter backwash handle hit state) of the mechanical valve filter should be regulated well. The raw water booster pump should be started to fill the water into the filter. The water will be filtered out from the sewage outfall when the filter is filled with water. Before starting out, the pump bleeder screw should be loosened to exhaust all of the air inside the pump.

b 正洗：反冲洗时，每间隔 1~2 分钟把阀门切换到正洗模式（即石英砂过滤器手柄打到正洗状态）。正洗、反洗频繁切换操作，待过滤器产水目测已基本洗净，产水清澈且经检测产水 SDI 指数 ≤ 4 ，方可投入运行。第一次约清洗 30 分钟，平时约清洗 5~10 分钟。

b. positive pressure wash: at the interval of 1 to 2 minutes of the backwash, the valve should be switched to the washing mode (ie quartz sand filter handle hits the flushing state). The positive pressure wash and the backwash should be frequently switched to operate until the water production of the filter is visually washed out, the contributing water is clear and the SDI index ≤ 4 after being tested when it can be put into operation. The first cleaning takes about 30 minutes, usually about 5 to 10 minutes for cleaning.

第二步：清洗活性过滤器

Step two: Clean the active filter

a 反洗：调节好活性炭过滤的反洗模式阀门（即活性炭过滤器手柄打到反洗状态）。打开机械过滤器产水阀使产水往活性炭过滤器注水。待活性炭过滤器注满水后从排污口流出。

a backwash: regulate the activated carbon filter at the backwash mode valve (ie activated charcoal filter handle hits backwash state). The mechanical filter is opened to make the contributing water inject to an activated carbon filter. Activated carbon filter is filled with water before is flows out from the sewage outfall.

b 正洗：反洗时，每间隔 1~2 分钟把阀门切换到正洗模式（即打开活性炭过滤器进水阀、下排阀，关闭反洗阀、上排阀、产水阀）。正洗、反洗频繁切换操作，待过滤器产水目测已基本洗净，产水清澈且经检测余氯 $\leq 0.1\text{ppm}$ ，方可投入运行。

b positive pressure washing: at the interval of 1 to 2 minutes of the backwash, the valve should be switched to the washing mode (i.e. open the activated carbon filter inlet valve and the lower valve as well as close the backwash valve, the discharge valve and the capacity valve). The positive pressure wash and the backwash should be frequently switched to operate until the water

production of the filter is visually clear and the SDI index ≤ 0.1 ppm after being tested when it can be put into operation.

第三步：石英砂过滤器、活性炭过滤器清洗完毕，打开活性炭过滤器产水阀，打开精滤器排气阀。待注满水后关闭排气阀。水源进入反渗透处理装置。

Step three: when finishing cleaning the quartz sand filters and the activated carbon filter, the activated carbon filter producing water valve and the fine filter exhaust valve should be open. The exhaust valve should be closed when being filled with water. Water enters the reverse osmosis treatment plant.

第四步：精密过滤器是过滤产品，开机时，打开排气阀，排尽空气即可。

Step four: as the ultra filter is filtering product, when turned on, please open the exhaust valve to drain the air.

第五步：反渗透主机调试。开机前分别对预处理的产水（即 RO 主机进水）进行检测，当水质符合 RO 主机进水要求时方可进入 RO 系统。

Step five: osmosis host debugger. Respectively, before starting, please test the pretreated water (ie RO host water) when the water meets the host RO water requirements, it can enter the RO system.

RO 系统：开启 RO 进水阀，全额打开 RO 浓水排放阀及 RO 产水排放阀，关闭 RO 产水阀，开启电源，启动高压泵，先使高压泵在低压下（0.30-0.5MPa）冲洗 RO 膜 15 分钟，彻底清除 RO 膜内保护液；并检查和确认高低压管路、阀门无渗漏现象；压力表工作正常。再调节 RO 浓水排放阀，随着 RO 浓水排放阀门逐步关小，产水流量逐步增大，浓水排放流量逐步减少，系统内压力逐步升高，达到 1.0~1.5MPa 时，将压力稳定下来，检查 RO 产水和 RO 浓水排放流量，并通过调节相应阀门，使净水流量及回收率、脱盐率达到装置的设计要求，通过调整好 RO 进水阀及 RO 浓水排放阀，使产水和浓水排放流量比例为（4:6）；正常工作压力范围为 1.0-1.5MPa；产水流量为 3000L/小时；产水脱盐率 $\geq 97\%$ ；并再次检查和确认高低压管路、阀门无渗漏现象；压力表工作正常。全部符合要求后开启 RO 产水阀，关闭 RO 产水排放阀。至此装置可投入正常运行。**特别注意：在 RO 运行时，决不允许同时关闭 RO 产水阀与 RO 产水排放阀。**

RO system: open the RO inlet valve, fully open the RO concentrated water discharge valve and RO product water discharge valve, close the RO permeate valve, turn on the power, start the high-pressure pump, firstly making the high-pressure pump at low pressure (0.30 ~ 0.5MPa) to wash the RO membrane for 15 minutes, completely clearing the RO membrane protection liquid; and check and confirm the high and low pressure pipelines, valves without leakage; pressure gauges work properly. Then adjust the RO concentrated water discharge valve in accordance with the RO concentrate water discharge valve gradually small, gradually increasing the production of the flow of water, concentrated water discharge flow gradually reducing and the system pressure gradually increased, when reaching 1.0 ~ 1.5MPa when the pressure stabilized, please check the RO contributing water and RO concentrated water discharge flow, and by adjusting the appropriate valve to make the water flow and recovery rate and desalination meet the design requirements of the device. By adjusting the inlet valve and RO concentrated water discharge valve, the water production and concentrated water discharge flow ratio is of (4: 6); at the normal operating pressure range of 1.0-1.5MPa; permeate flow at 3000L / h; yield water desalination rate

≥97%; and check and confirm again the high and low pressure pipe road whether there is leakage; the pressure gauge is working correctly. If the RO meets with the requirements, please open the RO product water valve and close the RO product water discharge valve. Until then, this apparatus can be put into normal operation. Special Note: when running the RO, it is never allowed to close the RO product water valve and RO contributing water discharge valve.

正常工作时，阻垢剂计量加药泵必须与高压泵联锁，高压泵开与关计量加药泵同步开与关。

During normal operation, the measurement scale inhibitor dosing pump must be interlocked with the high-pressure pump, whether the high-pressure pump is synchronous of the dosing pump.

第六步：停机

Step Six: Halt

A、反渗透装置每次停机前应先卸压；首先，慢慢调大 RO 浓水排放阀，使装置内部工作压力降低至 0.6MPa 左右时，运行 1 分钟，当工作压力降到 0.3MPa 左右时，再继续运行 1 分钟后关闭高压泵；严禁突然关停高压泵，如突然关停高压泵会造成突然降压及回流，损伤反渗透膜元件及系统。

A. the reverse osmosis unit should be unloaded the pressure before each of its shutdown; first, slowly turn up the RO concentrated water discharge valve with the inner working pressure reduced to about 0.6MPa lasting for one minute. When the working pressure drops to about 0.3MPa, please continue to run for 1 minute before turning off the high-pressure pump; it is prohibited to suddenly shut down the high-pressure pump for which will cause sudden depressurization, reflux and damage to the reverse osmosis membrane elements and systems.

B、关闭原水增压泵。

B. Please turn off the raw water booster pump.

C、关闭石英砂过滤器进水阀。

C. Please turn off the quartz sand filter inlet valve.

D、关闭总电源。

D. Please switch off the main power.

E、非正常停机。

E. Non-normal shutdown.

如遇突然停电、停水或其它意外情况时，首先关闭高压泵，原水增压泵，然后再关总电源及其它阀门。

In cases of sudden power failure, water cut-off or other unforeseen circumstances, please first turn off the high-pressure pump, raw water booster pump, and then turn off the main power and

other valves.

七、运行管理与维护

VII Operation Management and Maintenance

1. 多介质过滤器（砂滤）

1. Multi-media filter (sand filter)

当机械过滤器运行一段时间后（一周左右），由于水中的悬浮物被过滤介质截留，使过滤器阻力逐步增大，因此运行过程中，要每天观察过滤器的工作压力，当压力差高于 0.04MPa 时，应对过滤器进行正、反清洗，清洗一次需约 15 分钟；操作策略：采用 2 分钟反洗切换到 1 分钟正洗，如此连续多次，效果更佳。清洗完毕再正洗 1 分钟后投入使用。

When the mechanical filter runs for a period of time (about a week), due to the suspended solids in the water are trapped by the filter media, resulting in the filter resistance gradually increasing, and thus during the operation, please observe the working pressure of the filter every day. If the differential pressure is higher than 0.04MPa, please conduct backwash and well-wash on the filters with the washing time for about 15 minutes at a time; Operations strategy: two minutes for backwash and then switch to one minute well-wash, if so repeatedly, it will be the better. After cleaning, please conduct well-wash for 1 minute before it is put into use.

冲洗操作程序：

Rinse Procedure:

1.1 反冲洗

1.1 Backwash

- a、开启过滤器手柄到反冲洗状态、
a. open the filter handle to backwash state
- b、开启增压泵进行反洗，一般需 10 分钟左右。注意：操作时要防止反洗流量、压力过大造成滤料流失，待排污阀排出的水质变清，结束反冲洗。
b. open the booster pump to backwash, which normally takes about 10 minutes. Note: When in the operation, please prevent excessive backwash flow and pressure causing loss of the filter material. If the water from the blow-down valve becomes clear, please end the backwash.

1.2 正冲洗

1.2 Positive pressure wash

- a、打开过滤器进水阀、
a. Open the filter inlet valve;
- b、把手柄打到正冲洗状态；
b. Please open the handle to the washing positive pressure wash;

c、正洗正冲洗 5 分钟后，待续工作。

c. With the positive pressure wash lasting for five minutes, the work is continued.

操作策略：清洗时应正、反交替频繁操作！过滤器的工作压力为 0.15~0.35Mpa.

Operating strategy: the cleaning should be positive and negative alternately and frequently to be operated! Filters work pressure is at 0.15 ~ 0.35Mpa.

2. 活性炭过滤器（炭滤）

2. Activated carbon filter (carbon filter)

当活性炭过滤器运行一段时间后（一周左右），由于水中有机物、重金属离子被吸附，过滤器内部污染程度逐步增大，因此运行过程中，要定期对过滤器进行正、反清洗，清洗一次需约 10 分钟；操作策略：采用 2 分钟反洗切换到 1 分钟正洗，如此连续多次，效果更佳。清洗完毕再正洗 1 分钟后投入使用。

When the activated carbon filter has run for a period of time (about a week), because the organic compounds and heavy metal ions in water are adsorbed, the internal filter is gradually contaminated worse, and thus during the operation, the filter should be regularly carried out positive and negative washing, cleaning once lasting for about 10 minutes; operations strategy: two minutes for backwash and then switch to one minute for positive pressure wash, so repeatedly, it is the better. After cleaning, please carry out positive pressure wash for 1 minute before it is put into operation.

冲洗操作程序：

Rinse Procedure:

2.1 反冲洗

2.1 Backwash

a、开启过滤器手柄到反冲洗状态、

a. Open the filter handle to backwash state

b、开启增压泵进行反洗，一般需 6 分钟左右。注意：操作时要防止反洗流量、压力过大造成滤料流失，待上排阀排出的水质变清，结束反冲洗。

b. Open the booster pump to backwash, which normally takes about 6 minutes. Note: When in the operation, please prevent excessive backwash flow and pressure causing loss of the filter material. If the water from the upper blow-down valve becomes clear, please end the backwash.

2.2 正冲洗

2.2. Positive pressure wash

a、开启过滤器手柄到正冲洗状态、

a. Please open the filter handle to the positive pressure wash;

b、正洗 3 分钟后，冲洗操作完成，并打开产水阀，关闭下排阀，待续工作。

b、With the positive pressure wash lasting for three minutes, it come an end. Please open the water production valve and turn off the lower blow-down valve for continuous work.

操作策略：清洗时应正、反交替频繁操作！活性炭过滤器的工作压力为 0.15~0.35Mpa.

Operating strategy: the cleaning should be positive and negative alternately and frequently to be operated! Filters work pressure is at 0.15 ~ 0.35Mpa.

3. 精密过滤器（保安过滤器）

3. Ultra filter (security filter)

精密过滤器过滤精度为 5~10um，运行一段时间后，被前道活性炭过滤器漏出粉末及水中残留悬浮物堵塞，使精密过滤器的进出口水压压力差逐步增高，当高于 0.05MPa 时，应打开过滤器取出滤芯，对其表面进行清洗，然后重新装上使用；如冲洗无效或使用 3 个月，即应调换滤芯。

Ultra filter filtration accuracy is at 5 ~ 10um, after running for some time, blocked by the powder leaking from the front-activated carbon filter and the water residue suspended solids, which result in hydraulic pressure of import and export of the ultra filter gradually increasing. When the pressure is higher than 0.05MPa, please turn on the filters to remove the filter element, and then wash its surface, and finally install again for usage; if wash can not work or it has been used for three months, please consider replacing the filter element.

精密过滤器的工作压力为 0.15~0.35Mpa.

Ultra filter working pressure is of at 0.15 ~ 0.35Mpa.

4、RO 系统

为使 RO 系统正常运行，保持 RO 膜长期工作性能良好，应做到细致维护与科学管理。

4. RO system

In order to make the RO system run normally and maintain a good long-term performance of the RO membranes, the maintenance should be done carefully and the management scientifically.

4.1 严格控制进水水质，保证 RO 系统在符合进水指标要求的水质条件下运行。

4.1 Strictly control the water quality to ensure the RO system to operate in compliance with the requirements of the influent water index.

4.2 在满足净水流量、净水质量的前提下，尽量取低的操作压力。

反渗透处理装的工作压力为 1.00~1.6Mpa.

4.2 Under the requisite of meeting the requirement of the water flow and water quality, please try to get low operating pressures.

Reverse osmosis treatment equipment working pressure is of at 1.00 ~ 1.6Mpa.

4.3 及时调节控制净水和浓水流量的比例达到装置设计的回收率的要求。

4.3 The ratio of pure water flow and concentrated water flow should be controlled and regulated timely to reach the demand of the recovery of device.

4.4 装置不得长时间停运，每天至少运行 15 分钟。(保持 RO 膜永远处于湿润状态)

4.4 The equipment can not stop running for a long time so it should run at least 15 minutes a day. (RO membrane is always kept in a wet state)

4.5 每次停机前，应严禁突然停机（见六、第六步），应缓慢全开浓水排放阀，在低压、大流量的条件下，运行 3~5min，以清除 RO 膜浓水侧膜表面的污垢。

4.5 before each stop, the sudden shutdown should be prohibited (see VI, sixth) by slowly opening the full-concentrated water discharge valve under low pressure conditions and high flow running for 3 ~ 5min in order to clear the dirt on the surface of the RO membrane water concentration.

八、忠告

VIII Advice

严禁未经培训人员上岗操作。

特别是自发电企业，要求电源电压稳定，否则会造成电气设备的损坏。

It is prohibited to allow the untrained personnel to operate.

Especially for those enterprises that generate the power themselves, a supply voltage should be stable, and otherwise it will cause damage to the electrical equipment.

注意：各种过滤器及设备表面应每天用干抹布擦干，做到表面不留水珠。否则不锈钢表面会生水锈。

Note: all kinds of filters and equipment surfaces should be wiped daily with dry cloth to make sure that the surface does not leave water drops. Otherwise, raw steel surface will rust.

特别注意：1、高压泵启动前检查管路是否畅通，RO产水阀门必须打开）， 严禁高压泵无水启动及运行!!!

2、计量泵必须与高压泵连锁，阻垢剂浓度投入精准！

Special Note: 1. please check if the pipeline is smooth before starting the high-pressure pump, and the RO product water valve must be open), no high-pressure pump dry starting and running are allowed!

2. Metering pumps should be connected with the high-pressure pump, and the scale inhibitor concentration should be in taken precisely!

九、常见故障及处理

IX Common faults and handling

故障现象	故障原因	处理方法
原水增压泵不出水	电机倒转； 泵体内进空气； 泵电机烧毁	换相更正； 拧松泵体螺栓并排尽空气至出水正常为止； 检修电机；
石英过滤器出水量减少	过滤器堵塞； 进出水压差增高；	立即反洗
活性炭过滤器出水量减少	过滤器堵塞； 进出水压差增高；	立即反洗
精密过滤器出水量减少	过滤器堵塞； 进出水压差增高；	清洗滤芯； 清洗无效时更换滤芯；
计量泵不工作或加入量有偏差	泵电机烧毁，或堵塞； 没有调节好调节开关	检修电机；清洗管路及药箱， 调准好开关；
高压泵不启动	进水压力不足，低压保护开关有效保护； 相应的开关、接触器失灵；泵电机烧毁	检查预处理过滤装置压力差； 进行反冲洗及精滤器更换滤芯； 检修相应电器；检查电机；
RO装置净水量不足	RO装置的进水压力、水量不足；RO膜污染、结垢；进水水温下降（属正常下降）； 高压泵头磨损；未加或少加阻垢剂；	检查原水进水量、水压及预处理装置的工况，再作相应的改善处理；RO膜清洗、消毒无效时更换膜元件；必要时适当调大高压泵压力；检修高压泵； 检修计量泵及调准加药量。
净水水质变差	首次使用，RO膜内防腐液未洗清；操作压力偏压；膜管堵塞使水质缓慢变差； RO膜管破裂；膜管密封密封圈损坏或未装好；未加或少加阻垢剂；	冲洗RO膜，时间不小于2小时； 调整工作压力；清洗或更换RO膜；更换膜管；装好或更换密封圈； 检修计量泵及调准加药量。

Symptom	Cause	Methods
Raw water booster pump has no flow.	motor reverse; Pump intakes the air; Pump motor is burned	commutation correction; Loosen the pump bolt side by side to make the air exhaust until the water is restored to flow normally; Motor maintenance;
The flow of the quartz filter reduces.	filter is clogged; water pressure difference increases;	Immediate backwash should be carried out.
The flow of the activated carbon filter reduces.	filter is clogged; water pressure difference increases;	Immediate backwash should be carried out.
The flow of the ultra filter reduces.	filter is clogged; water pressure difference increases;	clean the filter element; Replace the filter if the cleaning is invalid;
Metering pump does not work or there are deviations in adding the amount	pump motor is burned, or blocked, Does not regulate the adjustment switch	Maintenance of the motor; washing pipelines and pharmaceutical box, and regulate well the switch;
High-pressure pump does not start	insufficient water pressure, low pressure protection switch is effectively protected; the corresponding switch and the contactor is in malfunction; the pump is motor burned	check pressure differential pre-filtering device; carry out the backwash and ultra filter and replace the filter element; overhaul the corresponding electrical; check the motor;
water shortage in the RO equipment	Insufficient water pressure and water flow of the RO device; RO membrane fouling and scaling; water temperature drops (normal decrease); high-pressure pump head wears; no or less the scale inhibitor;	Check the raw water intake working conditions, water pressure, and the preprocessing device, and then make a corresponding improvement process; RO membrane cleaning, if the disinfection is invalid,

		pressure; check and repair the high-pressure pump; check and repair the metering pumps and align the dose.
Deterioration of water quality	for the first time, RO membrane preservative solution is not cleared; operating pressure bias voltage; membrane tube blockage makes the water slowly deteriorate; RO membrane tube rupture; the sealed membrane tube is damaged or not installed well; no or less scale inhibitor;	Wash RO membrane for not less than two hours; adjust the working pressure; clean or replace the RO membrane; replace the membrane tubes; install or replace the seals; check or repair metering pumps and align the dosage.

十、运行观察记录

为使设备运行处于最佳状态，及时发现问题和采取相应措施，必须重视日常运行的常规的观察记录。其内容如下：

- 1) 原水和产水的电导、余氯、浑浊度；
- 2) RO 系统进水的浑浊度、余氯、污染指数；
- 3) 各节点的压力；
- 4) 原水、浓水、净水的流量；
- 5) 水温等

X Observation records

To enable the device to run at its best, it is essential to promptly discover the issues and take appropriate measures as well as much attention should be paid to the regular observations of the daily operations. The contents are as follows:

- 1) The conductivity, chlorine, turbidity of the raw water and product water;
- 2) Turbidity, chlorine, pollution index of the RO system water;
- 3) The pressure of each node;
- 4) The flow of water of the raw water, concentrated water,;
- 5) Water temperature and so on.

十一、反渗透膜清洗（设有清洗装置的可采用此方法）

XI Reverse osmosis membrane cleaning (cleaning device may be provided with this method)

为保证反渗透装置的正常运行及延长元件的使用寿命，在产水流量、水质比上一次清洗时下降10-15%，或RO膜的压差比上一次清洗后增加10-15%的量时，应考虑RO膜的化学清洗。

(建议由专业技术人员操作)

After the last increase of cleaning in order to ensure the normal operation of the reverse osmosis unit and extend the component life, the production of water flow and the water quality are less than the last wash by dropping 10-15% or RO membrane pressure difference increase by 10-15% of the amount than that of the last wash. Chemical cleaning should be considered to carry out on the RO membrane. (It is recommended acted by the professional and technical personnel)

清洗配方: 1、配制0.2%盐酸溶液, PH值2-3, 最佳温度35°C (用于无机盐结垢)

Cleaning Formulation: 1. 0.2% of the hydrochloric acid solution, PH value at 2-3, an optimum temperature is at 35°C (for inorganic fouling)

2、配制0.1%氢氧化钠+0.025%十二烷基苯磺酸钠 PH值12 最佳温度30°C (用于硫酸盐、有机胶体污染)

2. 0.1% of the sodium hydroxide + 0.025% of the sodium dodecyl benzene sulfonate, PH value at 12, optimum temperature is at 30°C (for sulfates, organic colloids contamination)

操作方法:

Operation:

- 1、准备清洗物品: 36%盐酸4瓶 (500克/瓶)
氢氧化钠4瓶 (500克/瓶)
纯净水100公斤 (严禁使用加臭氧纯净水)
PH值试纸 (1) 1袋。

1. Prepare cleaning items: 4 bottles of 36% hydrochloric acid (500 g / bottle)
4 bottles of sodium hydroxide (500 g / bottle)
Pure water for 100 kilograms (Do not use plus ozone purified water)
One (1) bag of the PH value paper

2、先计算清洗箱贮存2/3清洗用水之重量, 按比例勾兑于加入纯净水充分搅拌使之完全溶解, 倒入清洗箱内, 配制0.2%盐酸溶液, 此时PH为1-2左右, 一边用PH (1-14) 试纸测试至标准值为2-3, (有条件最好使清洗液温度在35-40°C)。

2. First please calculate the weight of the cleaning tank plus storing washing water of 2/3, according to the blending ratio, the purified water was added and stirred to completely dissolve sufficiently, and then poured into washing tank, with the preparation of 0.2% hydrochloric acid solution, then the PH value at about 1-2, with PH (1-14) dipstick tested to the standard value of 2-3 (the best conditions that the cleaning liquid temperature should be at 35-40°C).

3、开启反渗透装置浓水及产水进入清洗箱的循环阀门, 关闭装置浓水排污阀和产水进入纯水箱的产水阀, 开启清洗箱与清洗泵之间的进水阀, 电器控制在手动档, 仅开启清洗泵循环清洗即可, 清洗时间1-2小时, 观察清洗水箱之水, 清洗后水较污浊证明清洗效果较好, 否则效果欠佳, 药剂清洗结束后排尽清洗液, 膜内清洗

液的洗出时间为1-2小时左右，此时应全开浓水排污阀及装置产水排污阀，排污清洗1-2小时方可投入使用。

注：一般选用配方1清洗，配方2的清洗方法同配方1。

3. Please open the reverse osmosis concentrated water and produced water to enter the circulation valve of the wash tank, close the concentrated water drain valve and the water production enter the water production tank valve of the pure water tank, open the inlet valve between the cleaning tank and cleaning pump, manual electrical control, only to open the cleaning pump for cycling washing for 1-2 hours, observe the cleaning the water in the tank cleaning water, if the water after cleaning is dirty that proves better result, otherwise ineffective, please exhaust the cleaning agent liquid after the agent cleaning. The membrane cleaning should be washed out time within about 1-2 hours. At that time, all of the concentrated water plant and producing water blow down valve should be opened and the sewage cleaning should lasted within 1-2 hours before it is put into use.

Note: Formula 1 is generally used in cleaning, while the cleaning method of the formulation 2 is the same as that of the formulation 1.

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附 1

Annex 1

记录表：

Record Form:

日期 Date																			
名称 Name																			
砂滤工作压力 Working pressure of the sand filter																			

炭滤工作压力 Working pressure of the charcoal filter																			
精滤工作压力 Working pressure of the fine filter																			
保安过滤工作压力 Working pressure of the security filter																			
一级RO低压进水压力 Water pressure of Class A RO low-pressure																			
一级 RO 高压进水工作压力 Working pressure of the Class A RO high- pressure water																			
一级 RO 浓水排放工作压力 Working pressure of the Class A RO concentrated water discharge																			
二级RO高压进水工作压力 Working pressure of the Class B RO high-pressure water																			
二级RO浓水排放工作压 Working pressure of the Class B RO concentrated water discharge 力																			
一级 RO 产水流量 Class A of the RO product water flow																			
一级 RO 浓水流量 Class A of the RO concentrated water flow																			
二级 RO 产水流量 Class B of the RO product water flow																			
二级 RO 浓水流量 Class B of the RO concentrated water flow																			

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原水电导率 Raw water conductivity																				
一级产水电导率 Class A of the product water conductivity																				
二级产水电导率 Class B of the product water conductivity																				
原水水温 Raw water temperature																				
絮凝剂计量泵频率 Flocculants dosing pump frequency																				
阻垢剂计量泵频率 Inhibitor metering pump frequency																				
RO 进水余氯 RO inflow water chlorine																				
RO 进水污染指数 SDI (≤3) RO inflow water pollution index SDI (≤3)																				
RO 进水混浊度 NTU (≤2) RO inflow water turbidity degree NTU (≤2)																				

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