High Concentration Membrane Electrolysis Sodium Hypochlorite Generator

Data Sheet

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Catalog

1. Introduction Of High Concentration Sodium Hypochlorite Generator

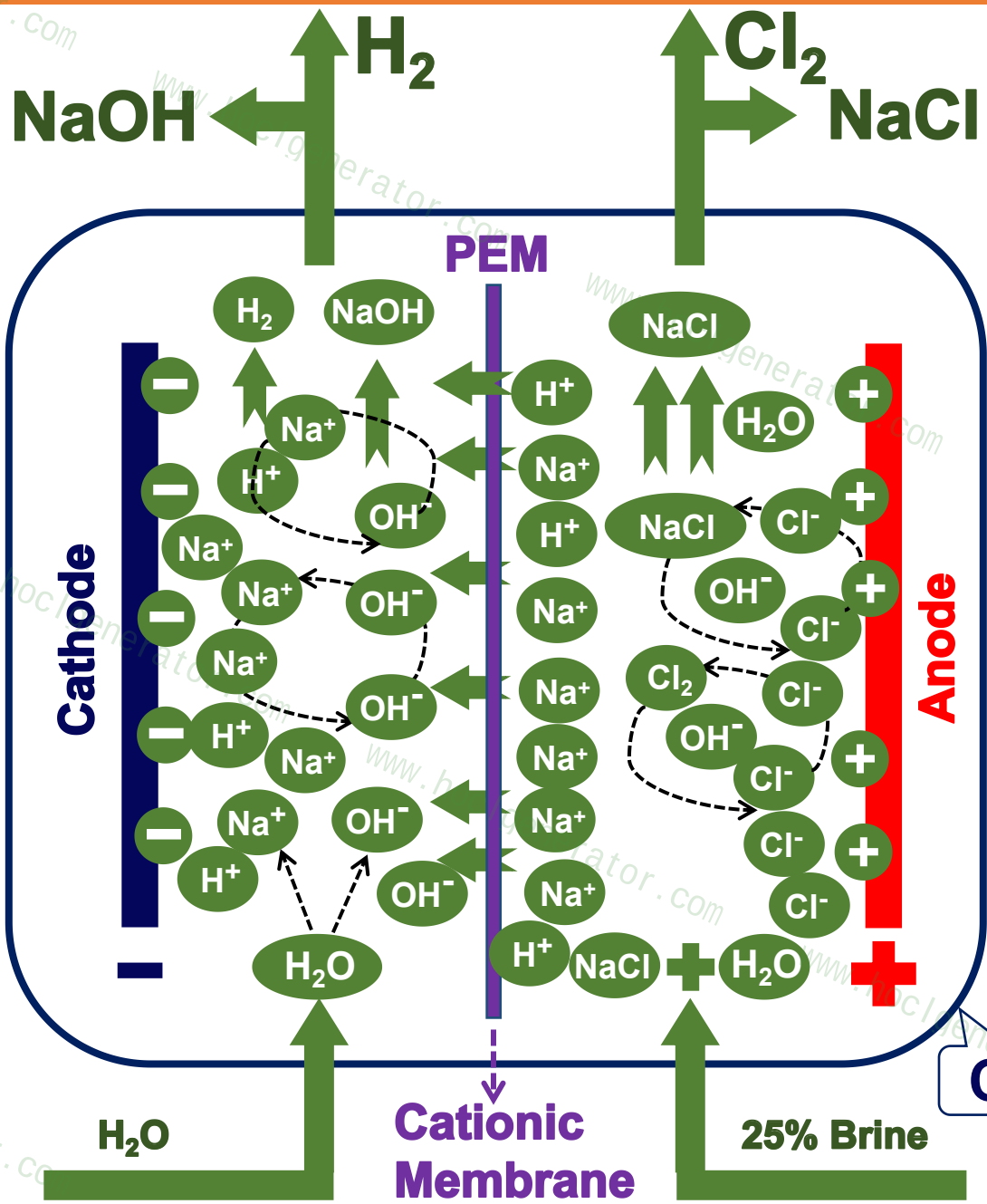
The high-concentration (>10%) sodium hypochlorite generator uses a membrane method to electrolyze sodium chloride saturated brine to generate sodium hydroxide, chlorine and hydrogen, dilute the hydrogen and discharge it, and at the same time collect the chlorine and pass it into the absorption tower. In the absorption tower, the excess sodium hydroxide reacts with chlorine to generate high concentration sodium hypochlorite.

1. Introduction Of High Concentration Sodium Hypochlorite Generator

The device system is composed of pure water device, salt dissolving device, filtering device, alkali dissolving device, electrolytic cell assembly, rectifier power supply, absorption device, cooling device, pickling device, automatic control system, storage device and other parts. The device system adopts ion-exchange membrane electrolyzer for electrolysis. The prepared sodium hypochlorite solution has high purity.

The system adopts PLC programming for automatic program control, which is easy to operate and easy to understand. The automatic recycling of brine makes the salt consumption low. Using online conductivity meter, online specific gravity meter, online pH meter, temperature meter and other control instruments to stabilize the concentration of finished sodium hypochlorite (>10%), and the concentration can be adjusted arbitrarily between 5% and 17%. The output can also be adjusted.

2. Working Principle



A.Anode loses electrons: $2Cl^- - 2e^- = Cl_2\uparrow$ (oxidation reaction)

B.The cathode gets electrons: $2H^+ + 2e^- = H_2\uparrow$ (reduction reaction)

C.Electrolysis reaction:

$$2NaCl + 2H_2O \xrightarrow{\text{electrolysis}} 2NaOH + H_2\uparrow + Cl_2\uparrow$$

D.Sodium hypochlorite reaction (Gas-liquid reaction):

$$2NaOH + Cl_2 \rightarrow NaCl + NaClO + H_2O$$

E.Total reaction:

$$\mathbf{NaCl + H_2O \xrightarrow{electrolysis} NaClO + H_2\uparrow}$$

3. Product Core Advantage

Safety Performance Of High Concentration (>10%) Sodium Hypochlorite Generator

Only Raw Material

SALT

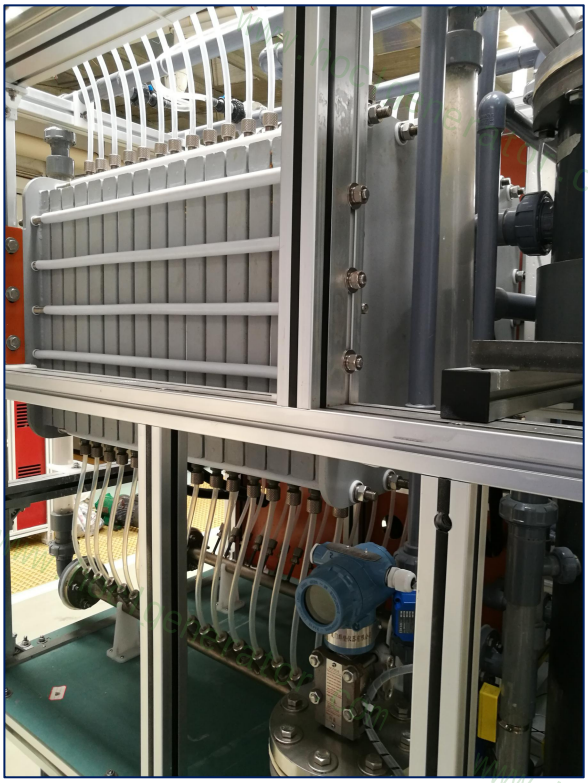
- The main raw material used: salt;Salt can be transported and stored safely and conveniently. It does not have any volatility and other toxicity.
- Using direct current low voltage electrolysis method, there are no dangerous sources such as high pressure, steam, high temperature, etc.
- The hydrogen generated by the electrolysis is diluted to less than 1% and emptied, so there is no danger of explosion.

3. Product Core Advantage

- High-concentration (>10%) sodium hypochlorite generator electrolysis product chlorine and sodium hydroxide are immediately converted into sodium hypochlorite. When a fault occurs, it will automatically shut down and there will be no chlorine leakage.
- The prepared sodium hypochlorite solution is stored in a storage tank. After being diluted, it is a liquid low-concentration chlorine-containing solution, which can be stored stably for a long time under the storage conditions of dark, cool (<30 degrees), and airtight. The concentration drop rate of sodium hypochlorite solution below 10000ppm (1%) is less than 10% when stored for 30 days.
- In case of leakage, only need to wash and dilute with water, which will not cause any harm to the surrounding environment and people.

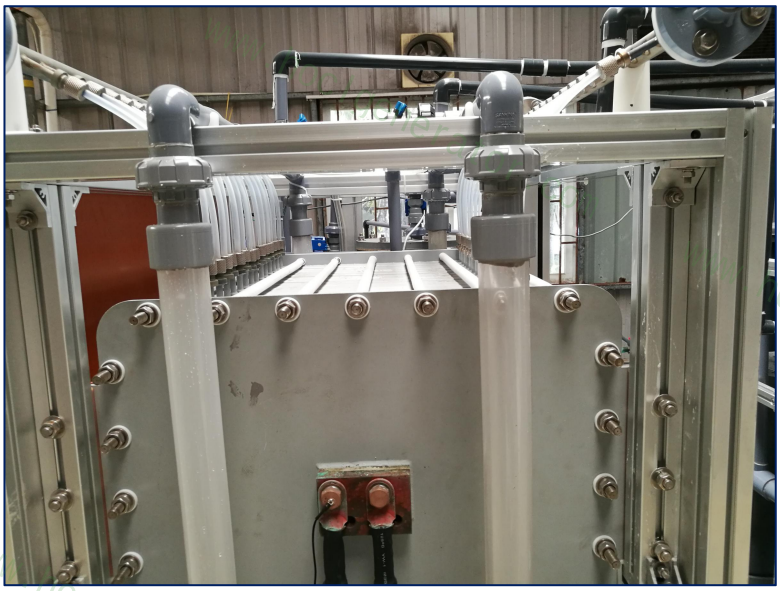
3. Product Core Advantage

Combined ion-exchange membrane electrolyzer and electrode coating



Combined ion-exchange membrane electrolyzer

3. Product Core Advantage



Combined ion-exchange membrane electrolyzer

◆ **Combined ion-exchange membrane electrolyzer**: The frame of the electrolyzer is made of titanium with high corrosion resistance. The electrode is made of titanium-nickel composite material, and both the cathode and the anode are used as active coatings, which have the characteristics of corrosion resistance, high stability and long service life. The ionic membrane adopts imported PEM membrane. The conductive contact surface uses a copper-titanium composite board to reduce the contact voltage and reduce power consumption.

3. Product Core Advantage

Electrode coating

◆**Electrode coating**: The anode surface of the generator electrode is treated with nanotechnology, and coated with ruthenium and iridium oxide. The thickness of the coating is 20 microns, which can ensure the electrode has a long service life.

The electrode structure adopts the patented technology ***Series Electrolysis Electrode Group, ZL201120488431.9***, which makes the electrode's power consumption index very good.

The chlorine evolution potential of the electrode is less than 1.13V, and the enhanced life span is more than 250 hours.

4. The Main Technical Indicators Of The Product

- Salt water concentration: 24-26%
- Consumption of effective chlorine salt for making 1Kg: <2.2kg
- Consumption of making 1Kg of available chlorine and sodium hydroxide (100%): <100g
- DC power consumption for making 1Kg of effective chlorine: <4.0KW
- Effective chlorine concentration setting range: 10%-17% (adjustable)
- Generator working status: automatic control of the whole process, suitable for continuous work
- Anode coating service life: 6 years (recoating and reusable)
- Ion membrane service life:> 2 years (replaceable)
- Design service life of the whole machine:> 10 years

5. Product Specifications

HADA Membrance Electrolysis Sodium Hypochlorite Generator (Available Chlorine Concentration:10-17%)					
SN	Model	Available Chlorine	Available Chlorine Concentrationy	Rated Power	Size (L*W*H)
1	SHT-1KG	1.0 Kg/hr	10-17%	10KW	5.0×1.8×2.5m
2	SHT-2KG	2.0 Kg/hr	10-17%	15KW	5.0×1.8×2.5m
3	SHT-3KG	3.0 Kg/hr	10-17%	20KW	5.0×1.8×2.5m
4	SHT-4KG	4.0 Kg/hr	10-17%	25KW	5.0×1.8×2.5m
5	SHT-5KG	5.0 Kg/hr	10-17%	30KW	5.0×2.0×2.5m
6	SHT-6KG	6.0 Kg/hr	10-17%	40KW	5.0×2.0×2.5m
7	SHT-7KG	7.0 Kg/hr	10-17%	40KW	5.0×2.0×2.5m
8	SHT-8KG	8.0 Kg/hr	10-17%	50KW	5.0×2.5×2.5m
9	SHT-9KG	9.0 Kg/hr	10-17%	50KW	5.0×2.5×2.5m
10	SHT-10KG	10.0 Kg/hr	10-17%	50KW	5.0×2.5×2.5m
11	SHT-15KG	15.0 Kg/hr	10-17%	80KW	Customized
12	SHT-20KG	20.0 Kg/hr	10-17%	100KW	Customized

6. Analysis Of Operating Cost And Investment Payback Period

Salt

AC Power

Operating Costs

Production And Packaging

1L/bottle

Sale And Use

High Profit

6. Analysis Of Operating Cost And Investment Payback Period

6.1 Operating Costs

Index	Code	Value	Remark
Salt consumption	A	2.2kg/kg Cl_2	Salt consumption per kilogram of available chlorine produced
AC power consumption	B	4.5kWh/kg Cl_2	AC electricity consumption per kilogram of available chlorine produced
Operating costs	C	0.658USD/kg Cl_2	The cost of producing per kilogram of available chlorine is equal to salt consumption plus AC power consumption. That is, C=0.0538×A+0.12×B
Cost per liter of high-concentration sodium hypochlorite solution (10% concentration)	D	**0.0658USD/L**	Because each kilogram of available chlorine corresponds to 10L of solution, the cost of producing a high-concentration sodium hypochlorite solution per liter is equal to the operating cost divided by 10, that is, D=C/10

Illustration:
1. The operating cost of the high-concentration sodium hypochlorite generator only includes salt consumption and AC power consumption.
2. Assuming that the price of salt is 53.8USD/ton (0.0538USD/kg) and the price of electricity is 0.12USD/kWh.

Low Operating Cost

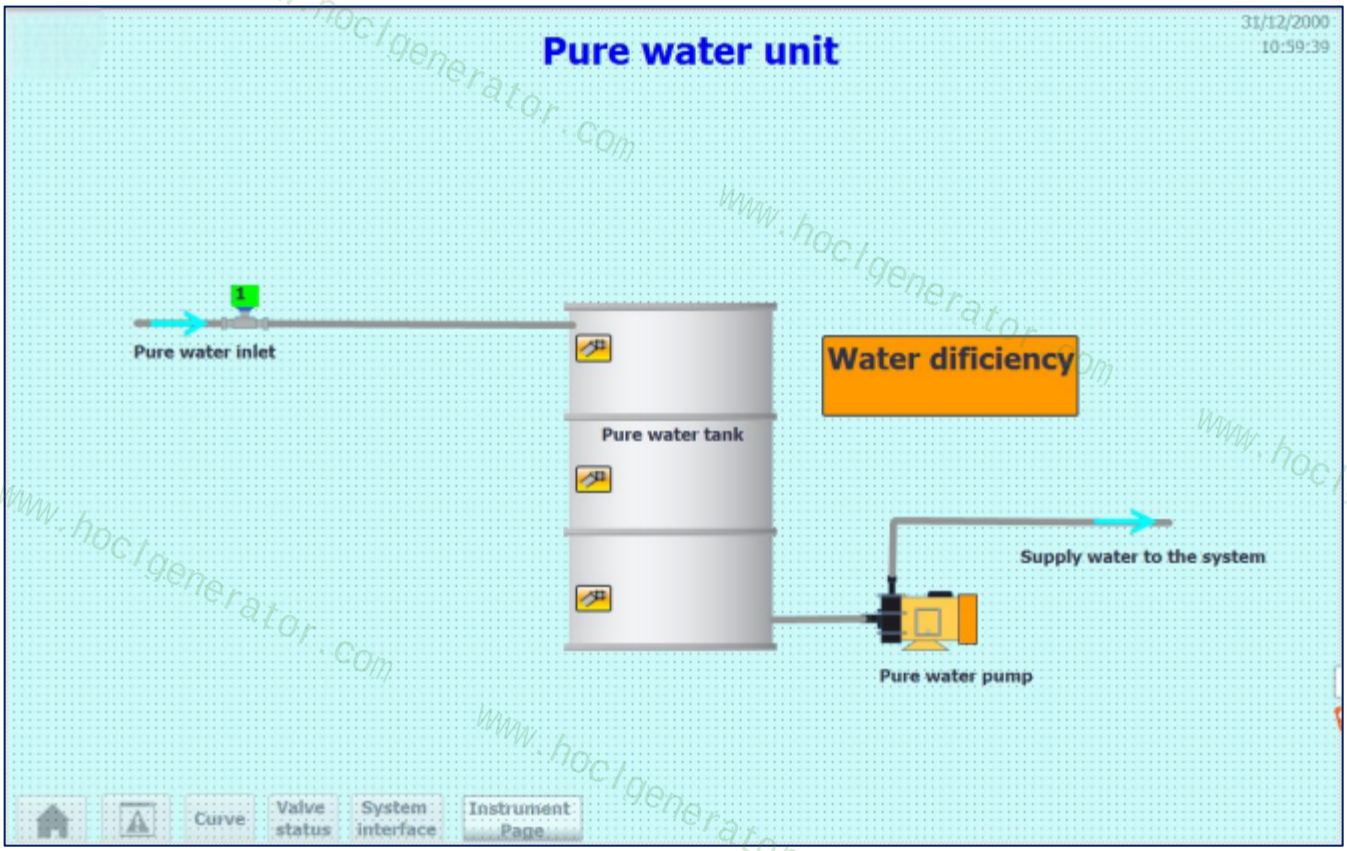
6. Analysis Of Operating Cost And Investment Payback Period

6.2 Analysis of Investment Payback Period

Index	Code	Valve	Remark
High-concentration sodium hypochlorite solution outer packaging bottle price	E	0.077USD/pcs	Packaging cost of high-concentration sodium hypochlorite solution
Sales price per liter of high-concentration sodium hypochlorite solution	F	0.46USD/L	Assuming the selling price per liter of high-concentration sodium hypochlorite solution
Daily sales volume of high-concentration sodium hypochlorite solution	G	1000pcs	Suppose the daily sales volume of high-concentration sodium hypochlorite solution is 1,000 bottles
Daily net profit from sales	H	**317.2USD/d**	Assuming the daily sales net profit of high-concentration sodium hypochlorite solution H=(F-E-D)×G
Equipment price of high concentration sodium hypochlorite generator	I	154000USD/Set	The cost of purchasing the equipment, that is, the investment cost
Investment payback period	J	**486 days ≈1.33years**	Investment payback period, that is, the time period for recovering costs J=I/H

High Profit

7. Product Composition-Pure Water Preparation Device



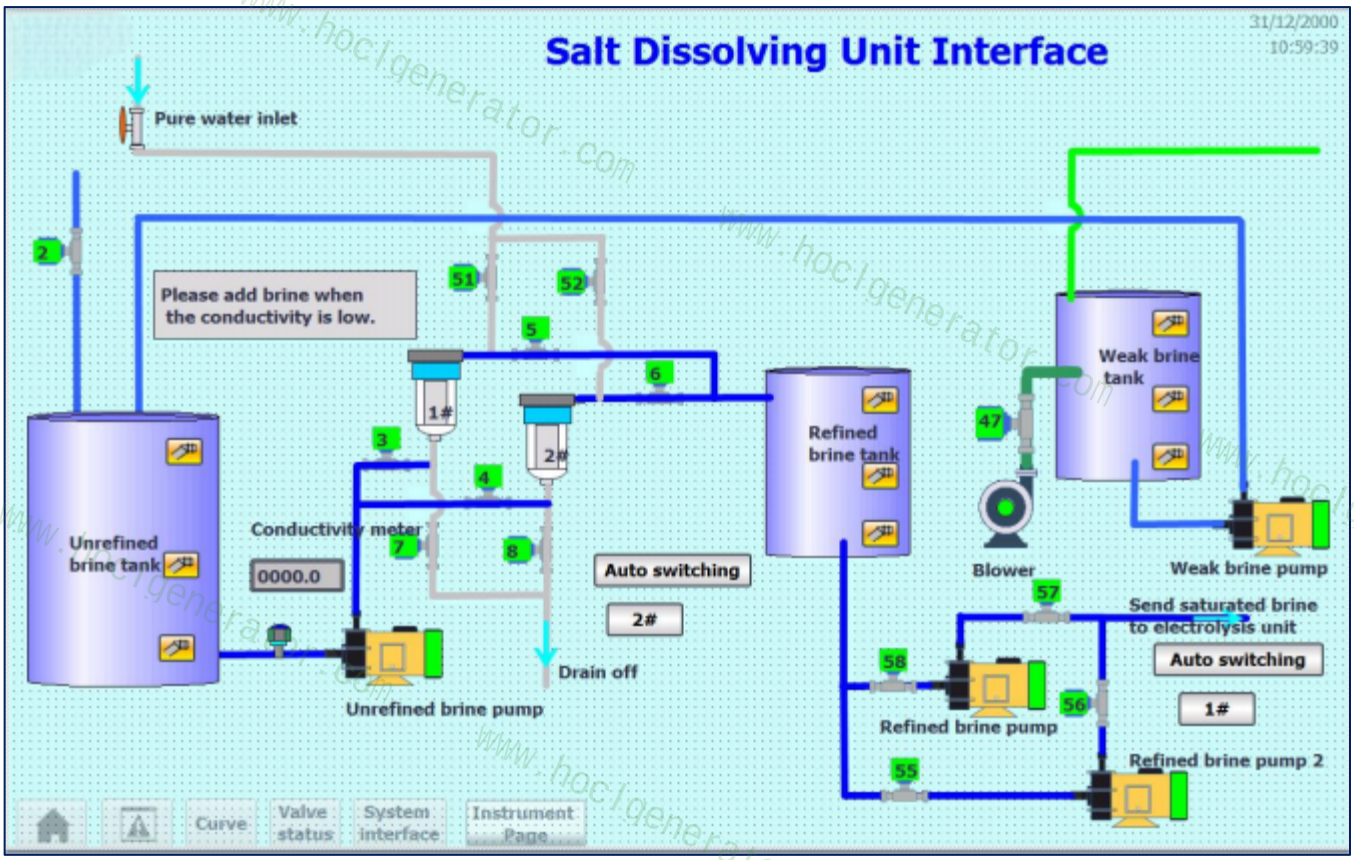
7.1 Material

Pure water tank: PE material

7.2 Function

Pure water preparation and storage, the conductivity of pure water is less than or equal to 10uS/cm, which can meet the production requirements of the later stage.

8. Product Composition-Salt Dissolving Device



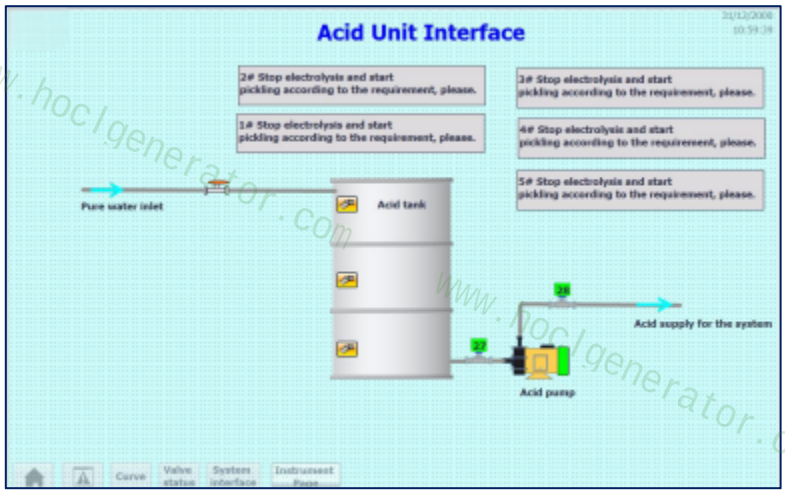
8.1 Materials

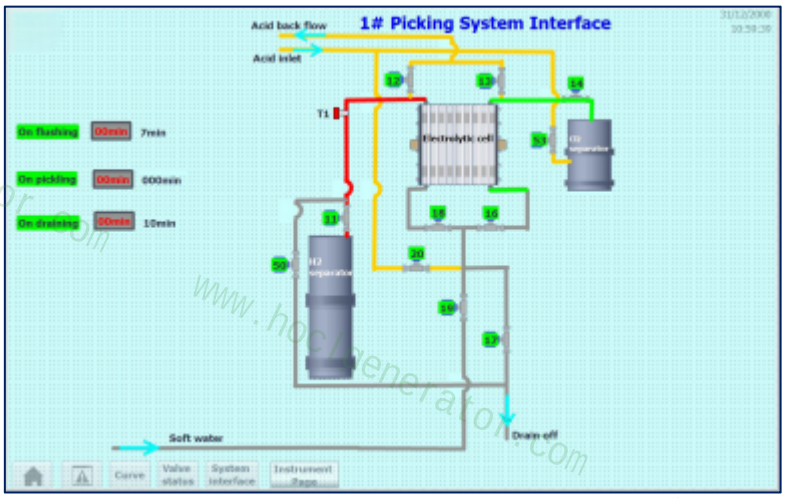
Tank body: PE material

8.2 Function

Pure water dissolves the salt particles to prepare saturated brine (24%~26% concentration) for use in the subsequent electrolysis process.

9. Product Composition-Pickling Device





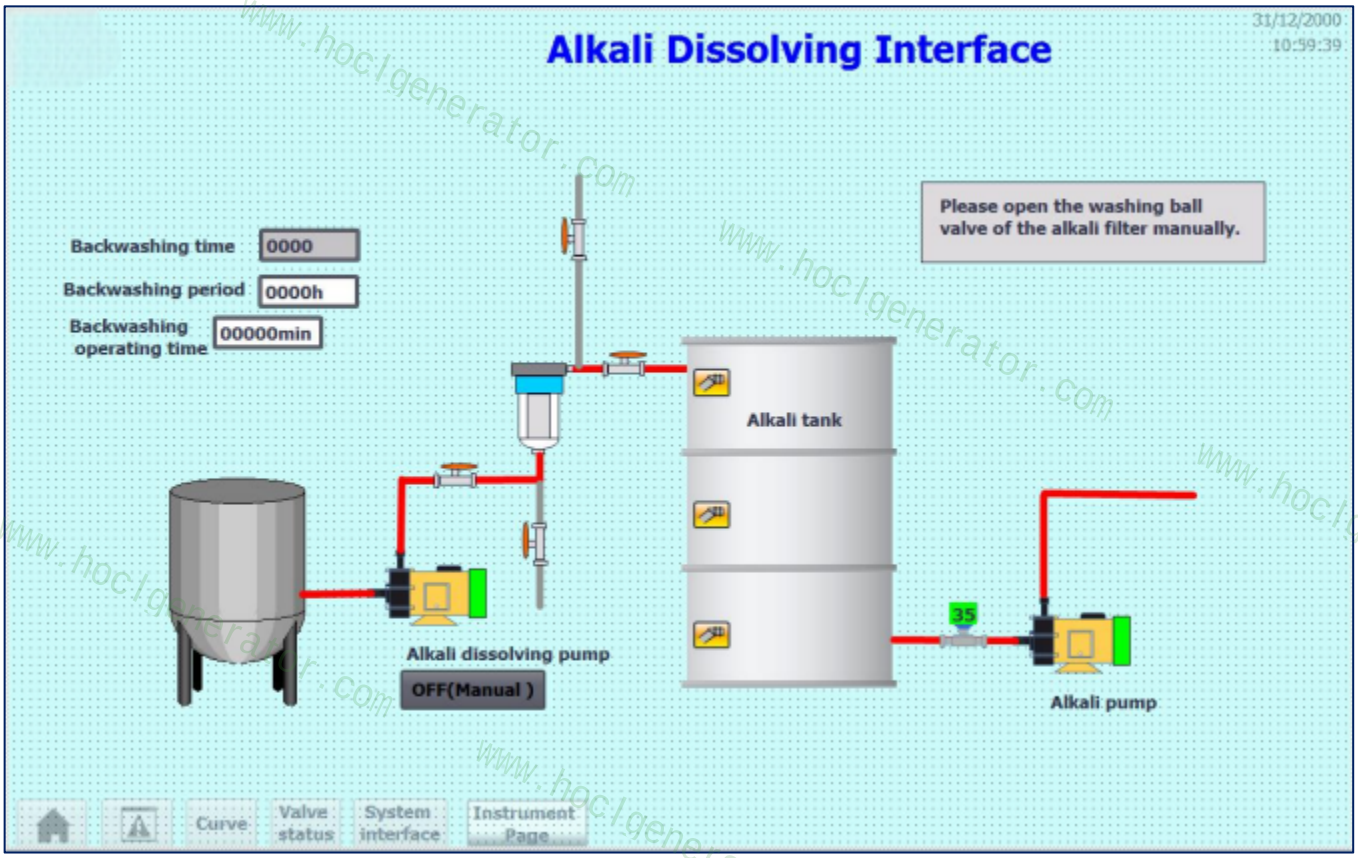
9.1 Materials

Pickling tank: PE material

9.2 Function

After the acid solution is automatically proportioned in the pickling tank, the acid solution is pumped into the electrolytic tank through the pickling pump, and then the electrode plate is cyclically pickled to remove the dirt attached to the electrode plate to ensure the service life of the electrode plate.

10. Product Composition-Alkali Dissolving Device



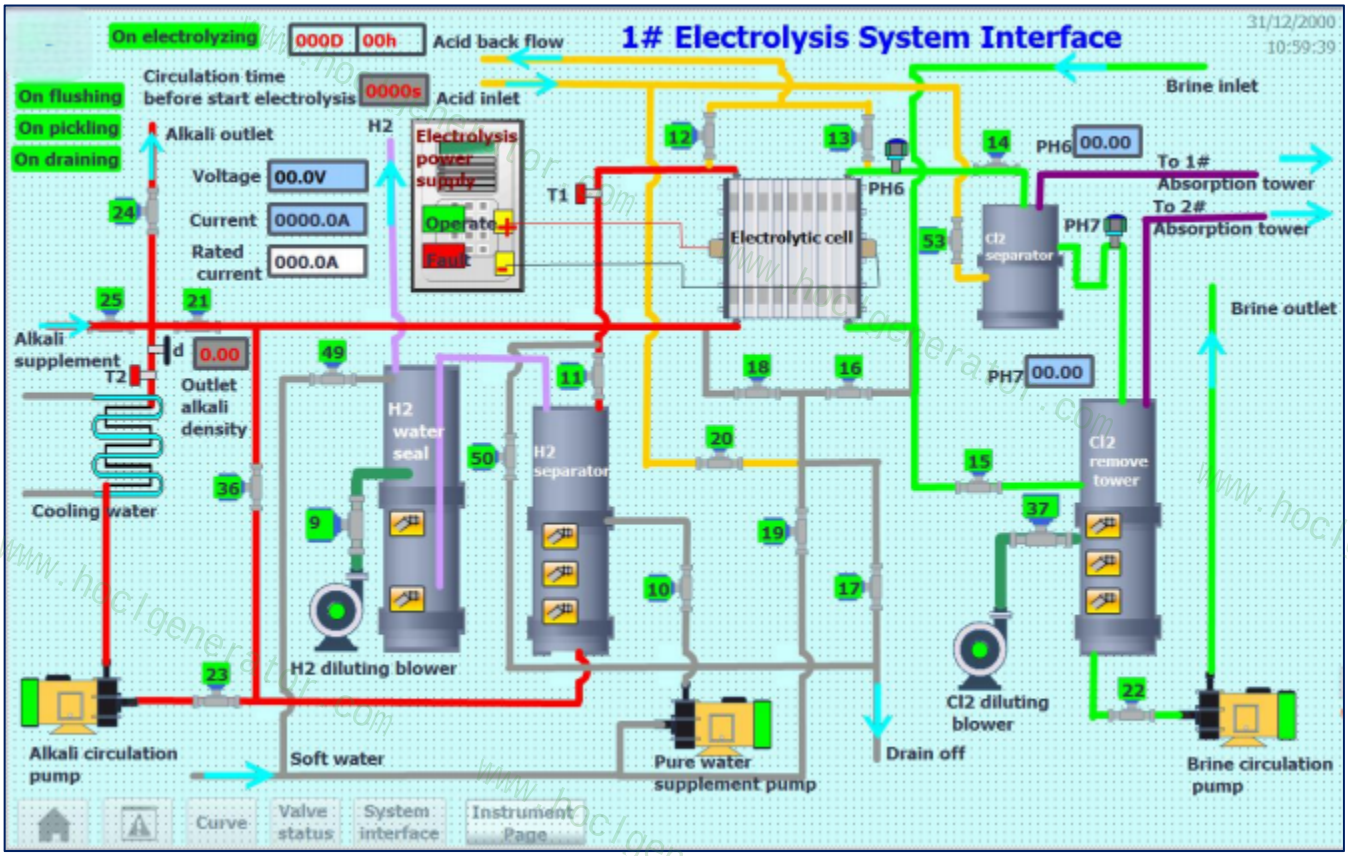
10.1 Materials

Lye tank: PE material

10.2 Function

The lye tank is the equipment for the system to prepare lye (20% concentration), and the lye is used for back-end electrolysis。

11. Product Composition-Electrolysis Device



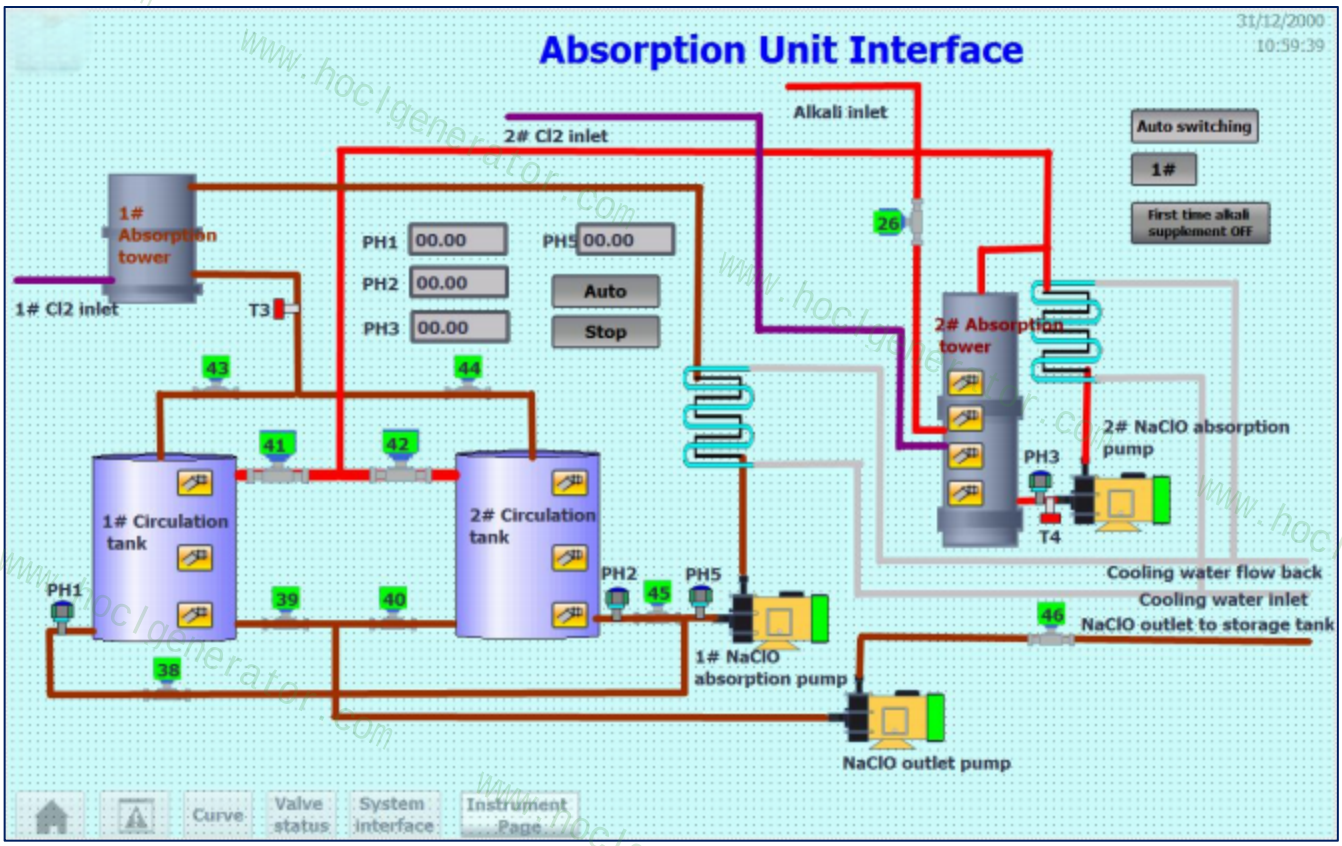
11.1 Materials

Electrode plate: titanium substrate + precious metal coating

11.2 Function

The electrolysis of sodium chloride brine produces sodium hydroxide (commonly known as caustic soda) and chlorine and hydrogen. The hydrogen is diluted and discharged by a hydrogen exhaust blower. After the chlorine is collected, it is used in the back-end absorption tower to meet the production requirements of the latter stage.

12. Product Composition-Absorption Device



12.1 Materials

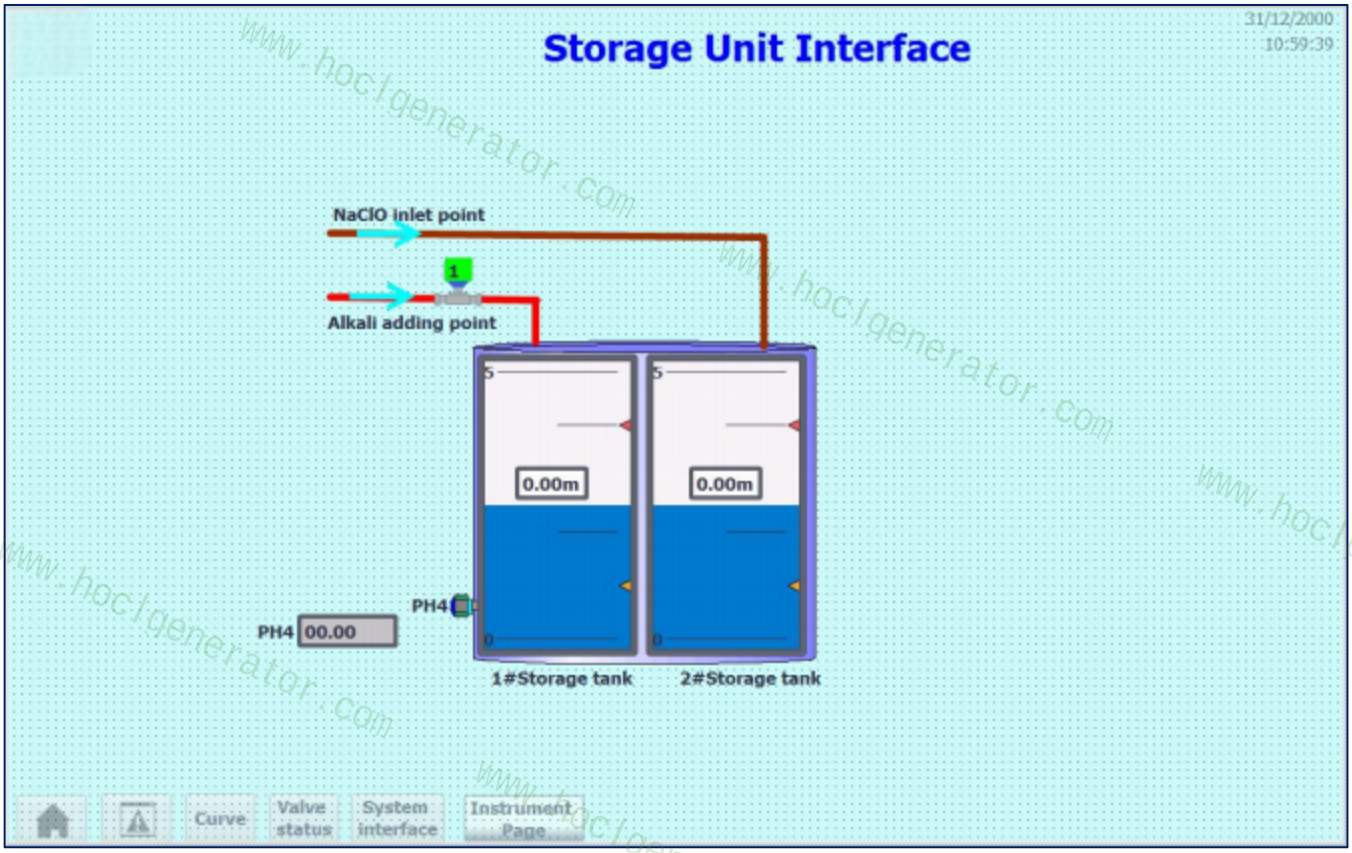
Absorption tower: PVC material

Sodium hypochlorite reaction circulation tank: PE material

12.2 Function

The absorption device is a device that chemically reacts with the chlorine produced by the electrolysis device with excess lye, thereby generating a high-concentration sodium hypochlorite solution.

13. Product Composition-Storage Device



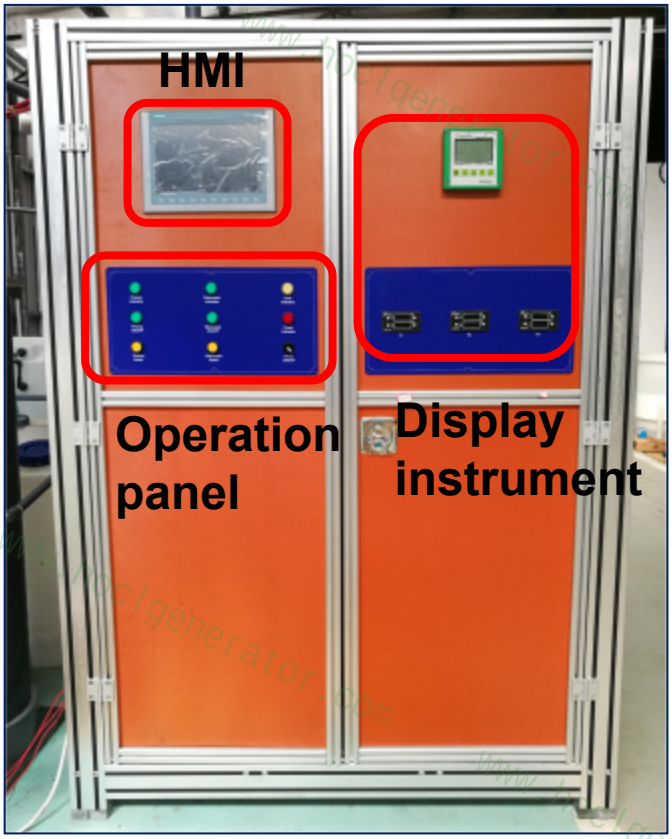
13.1 Materials

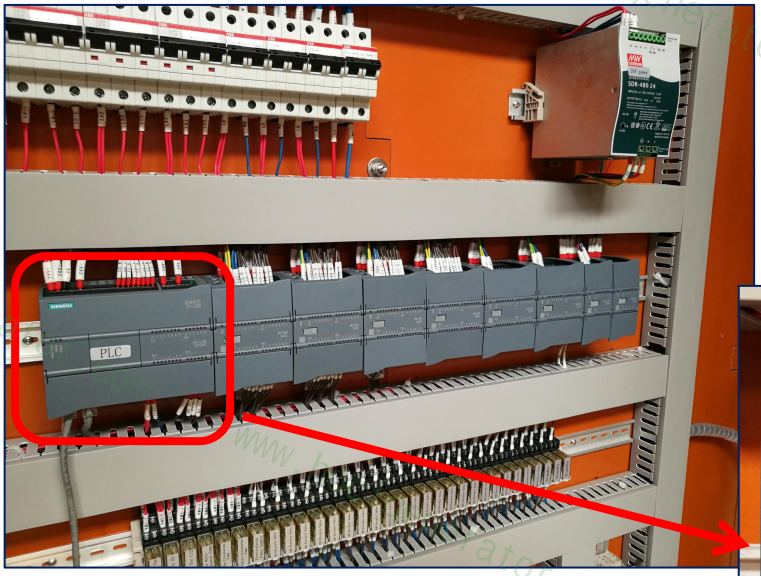
Storage tank: PE material

13.2 Function

Store the high-concentration (>10%) sodium hypochlorite solution produced by the system.

14. Product Composition-System Control Device





System power distribution and control components

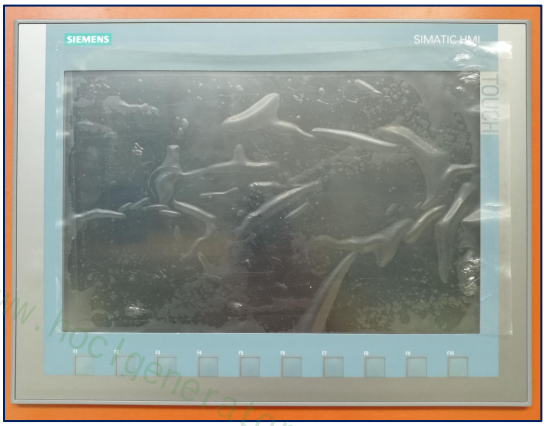
The system uses PLC control

Brand: SIEMENS

Model: S7-1200

14. Product Composition-System Control Device

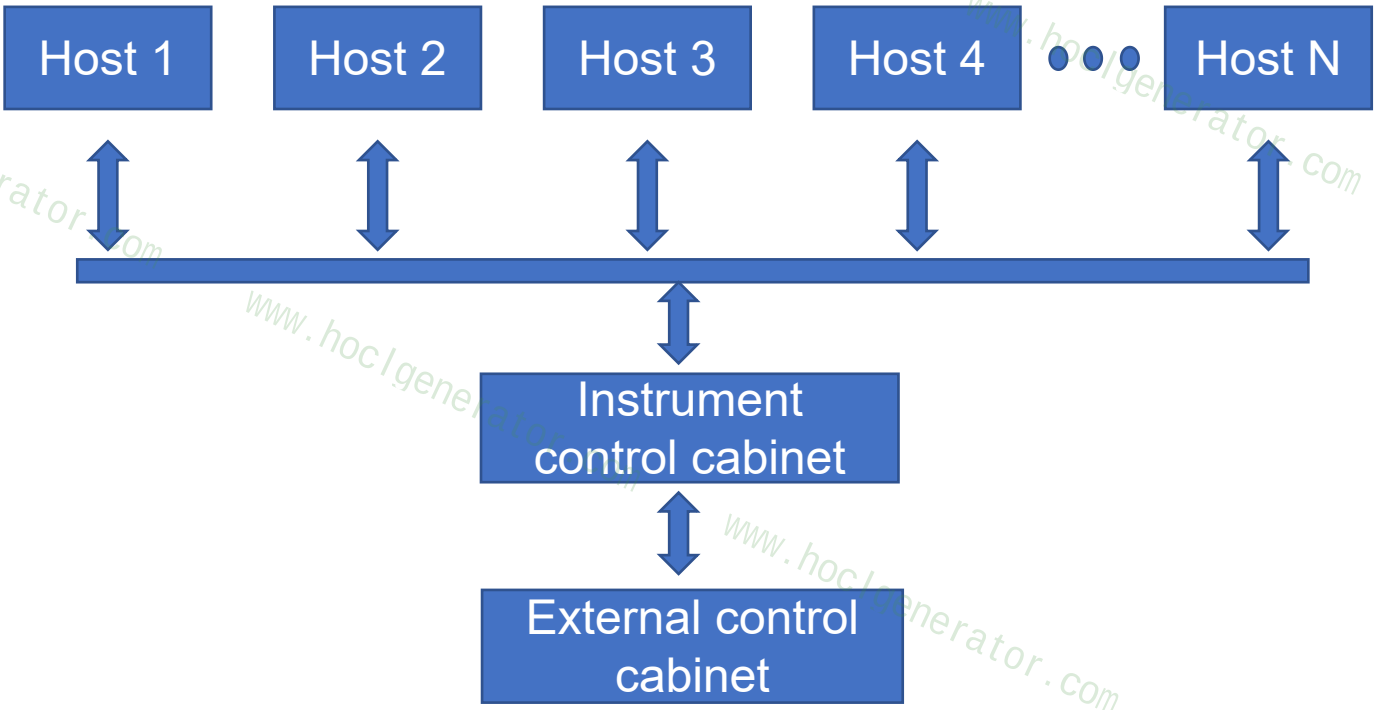
DC power supply control box



HMI

PH value display

Temperature display



Control System Architecture Diagram

14. Product Composition-System Control Device

The control system is mainly composed of N hosts, an external control cabinet and an instrument control cabinet, and each module exchanges data through Ethernet communication (TCP/IP).

13.1 Host

The host directly controls the electric valve, blower, pump and electrolysis power supply in the host unit through the cable, and indirectly controls the start and stop of the absorption unit related to electrolysis and the start and stop of the salt water pump through Ethernet communication, and detects the absorption unit And whether the salt water pump is started normally.

14. Product Composition-System Control Device

13.2 Instrument control cabinet

The instrument control cabinet directly controls the valve and pump of the absorption unit through the cable, and detects the liquid level and the operation signal of each equipment. The instrument control cabinet receives the control signal of the host computer through the Ethernet, and sends the command signal related to the host computer to the host computer. The instrument control cabinet communicates with the external control cabinet via Ethernet, controls external valves and pumps, and receives operating signals of external equipment at the same time.。

13.3 External control cabinet

The external control cabinet connects and controls external pumps, valves and external raw material preparation equipment through cables

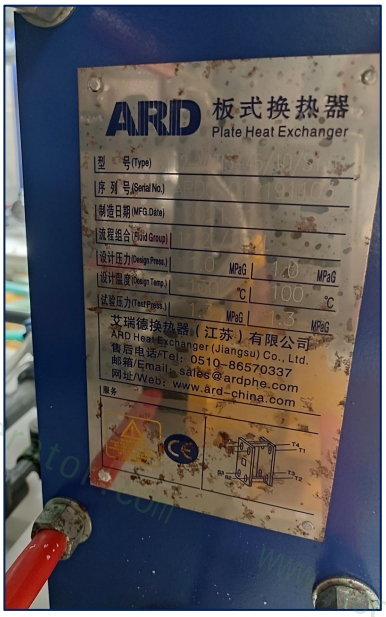
15. The Main Components Of The Product-Electrolytic DC Power Supply

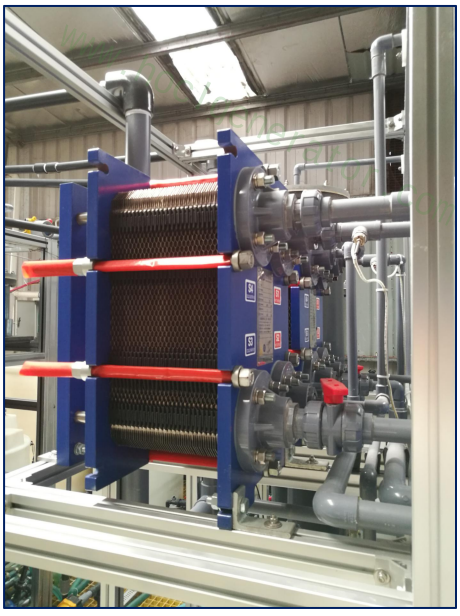
Function: Convert AC power to DC power to provide DC power that meets the requirements of the electrolytic cell.

16. Main Product Components-DC Power Supply Control Box

Function: Control the direct current required by the electrolytic cell and display the voltage of the electrolytic cell.

17. The Main Component Of The Product-Titanium Heat Exchanger



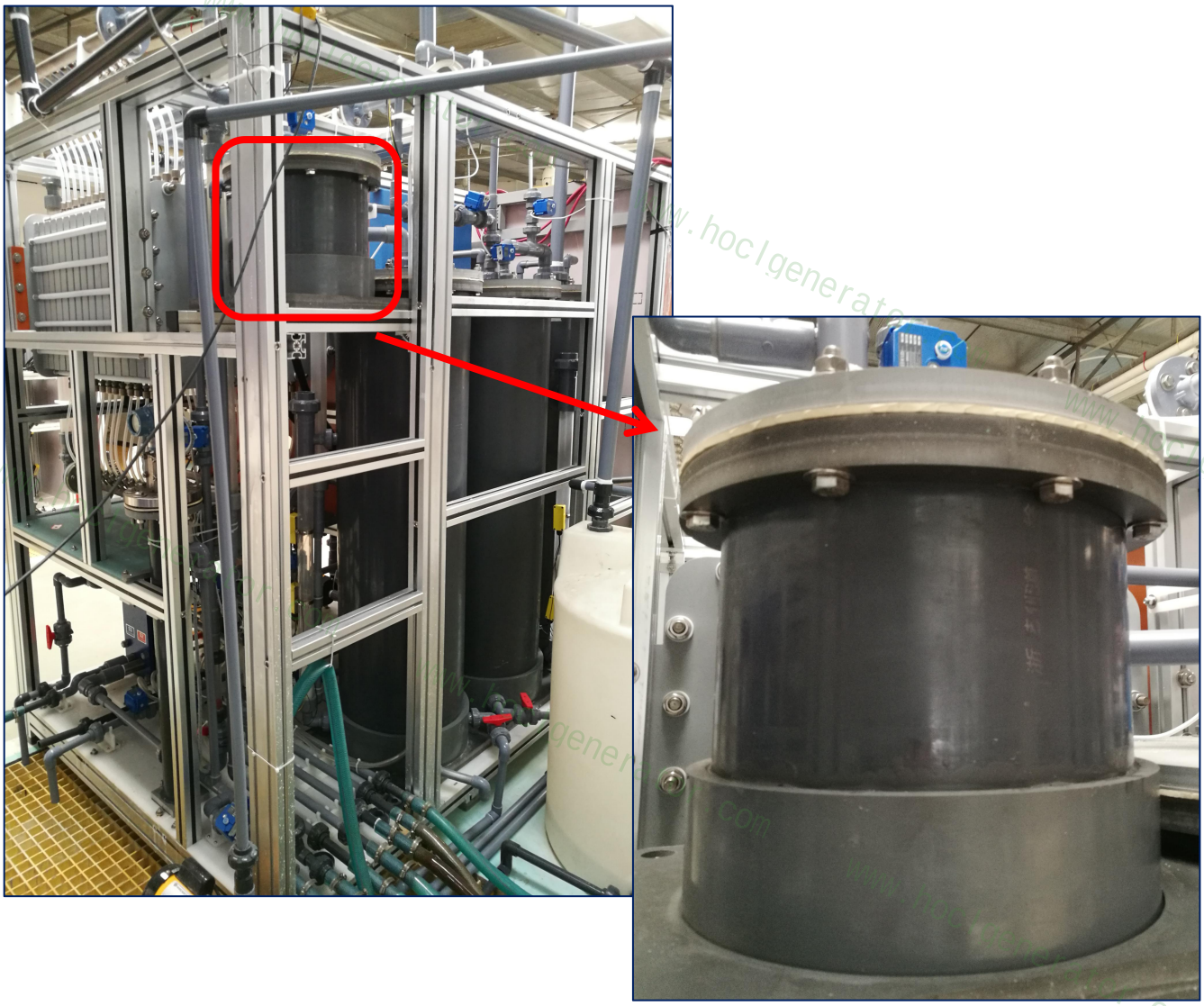


Function: Control the temperature of the electrolytic cell and the reaction temperature of sodium hypochlorite by heat exchange with the cooling water.

18. The Main Component Of The Product-Sodium Hypochlorite Reaction Circulation Tank

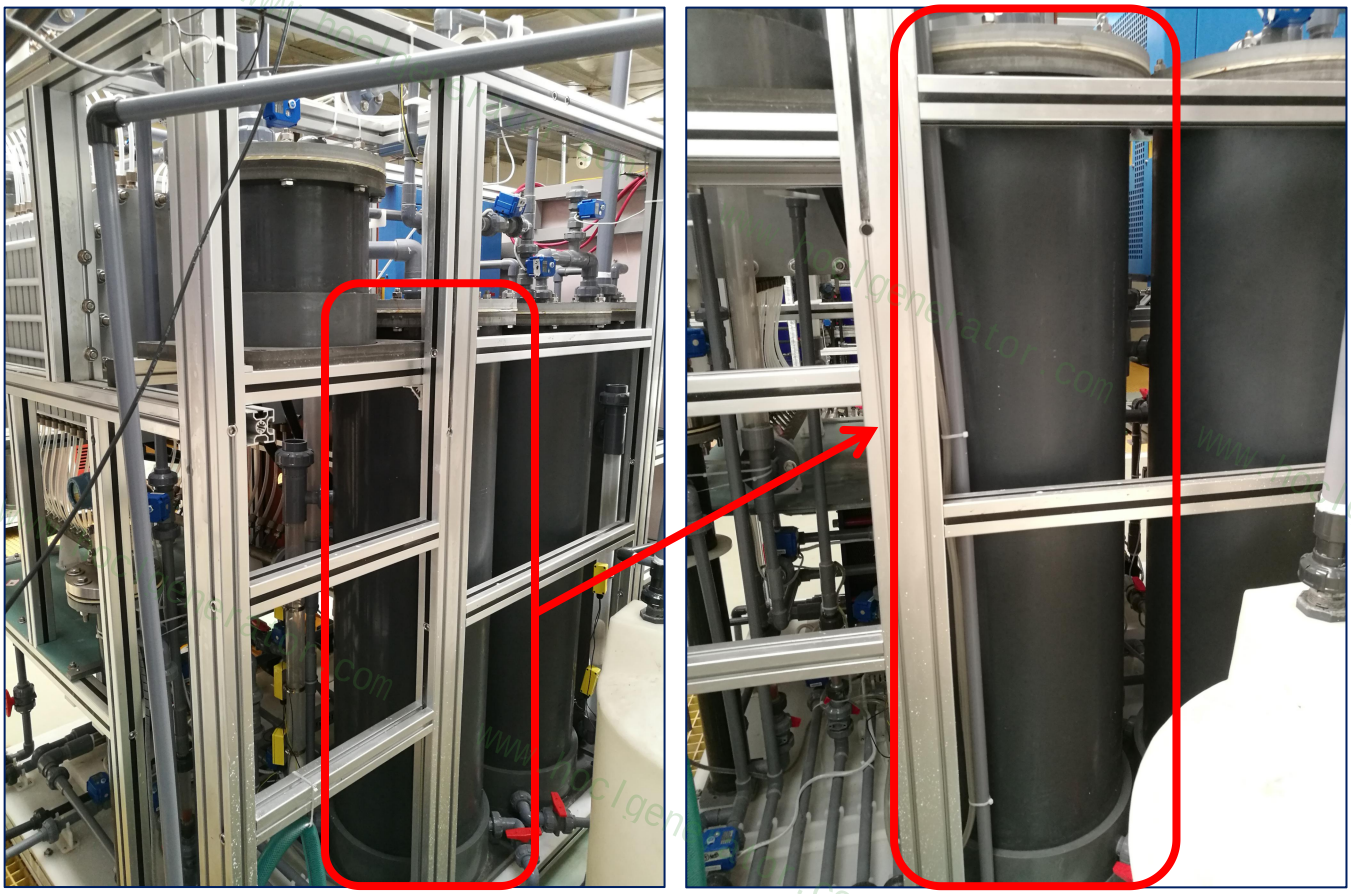
Function: Store the sodium hydroxide solution discharged from the electrolysis and meet the concentration requirements and the sodium hypochlorite solution that has not been reacted.

19. The Main Component Of The Product-Chlorine Separator



Function: The unreacted brine in the anode compartment of the electrolytic cell brings out the chlorine gas in the chlorine gas separator for gas-liquid separation. The separated chlorine gas goes to the sodium hypochlorite absorption tower, and the brine goes to the dechlorination tower.

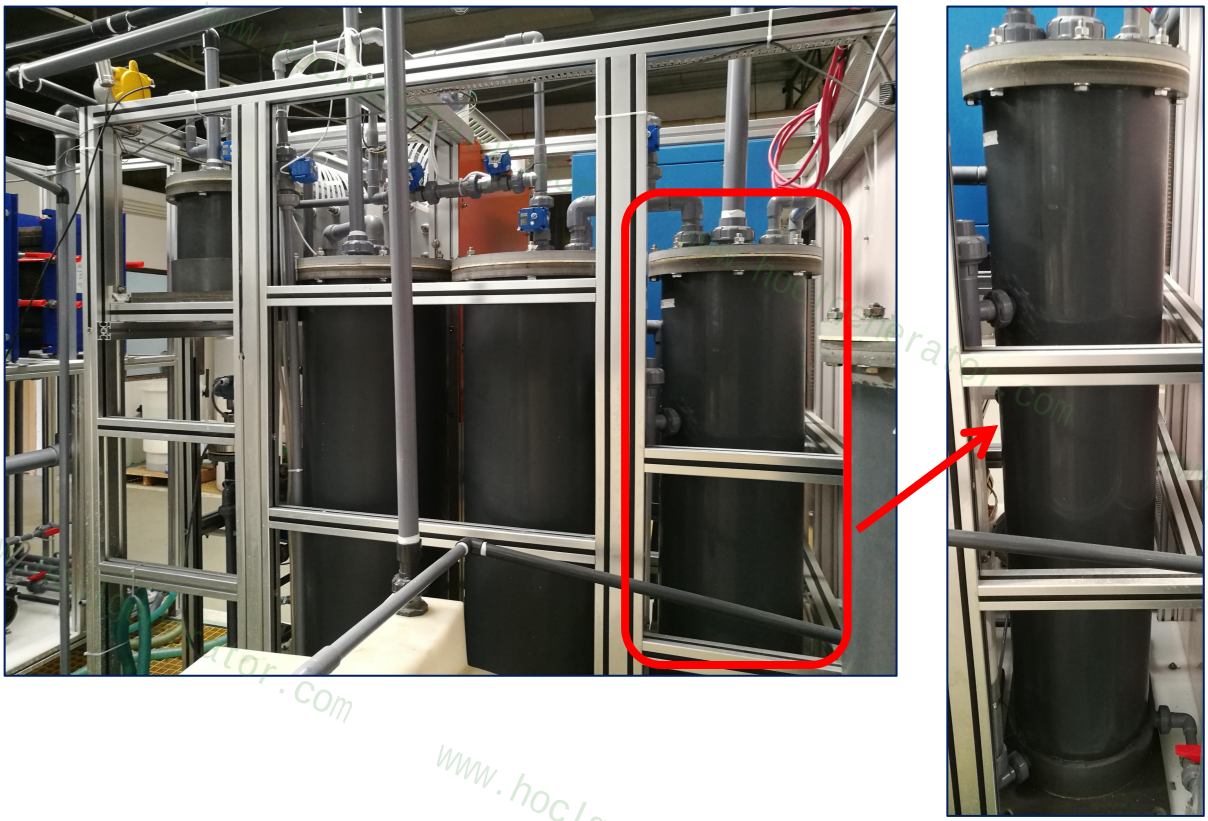
20. The Main Component Of The Product-Dechlorination Tower



Function: The brine after gas-liquid separation has trace chlorine dissolved in it. After blowing in the air with a blower, the trace chlorine in the brine can be blown out and then sent to the sodium hypochlorite absorption tower for absorption. The brine is sent to the light brine tank.

Another function is to store the anolyte emptied from the electrolytic cell when the electrolysis is stopped to avoid galvanic corrosion of the anode.

21. The Main Component Of The Product-Hydrogen Separator



Function: The sodium hydroxide and hydrogen produced in the electrolytic cathode compartment are separated in the hydrogen separator, and the hydrogen enters the hydrogen water seal. After sodium hydroxide is supplemented with pure water, a part of it is circulated to the electrolysis cathode chamber after cooling, and the rest is used as a finished liquid to enter the sodium hypochlorite circulation tank. Another function of the hydrogen separator is to store the catholyte emptied from the electrolytic cell to avoid electrochemical corrosion of the cathode when the electrolysis is stopped.

22. The Main Component Of The Product-Hydrogen Water Seal

Function: Hydrogen water seal makes the hydrogen in the electrolytic cathode chamber generate a certain pressure, so that the ion membrane is always attached to the anode, reducing the wear of the ion membrane due to vibration. The blower blows air into the hydrogen water seal and dilutes the hydrogen concentration to less than 2% for safe emptying.

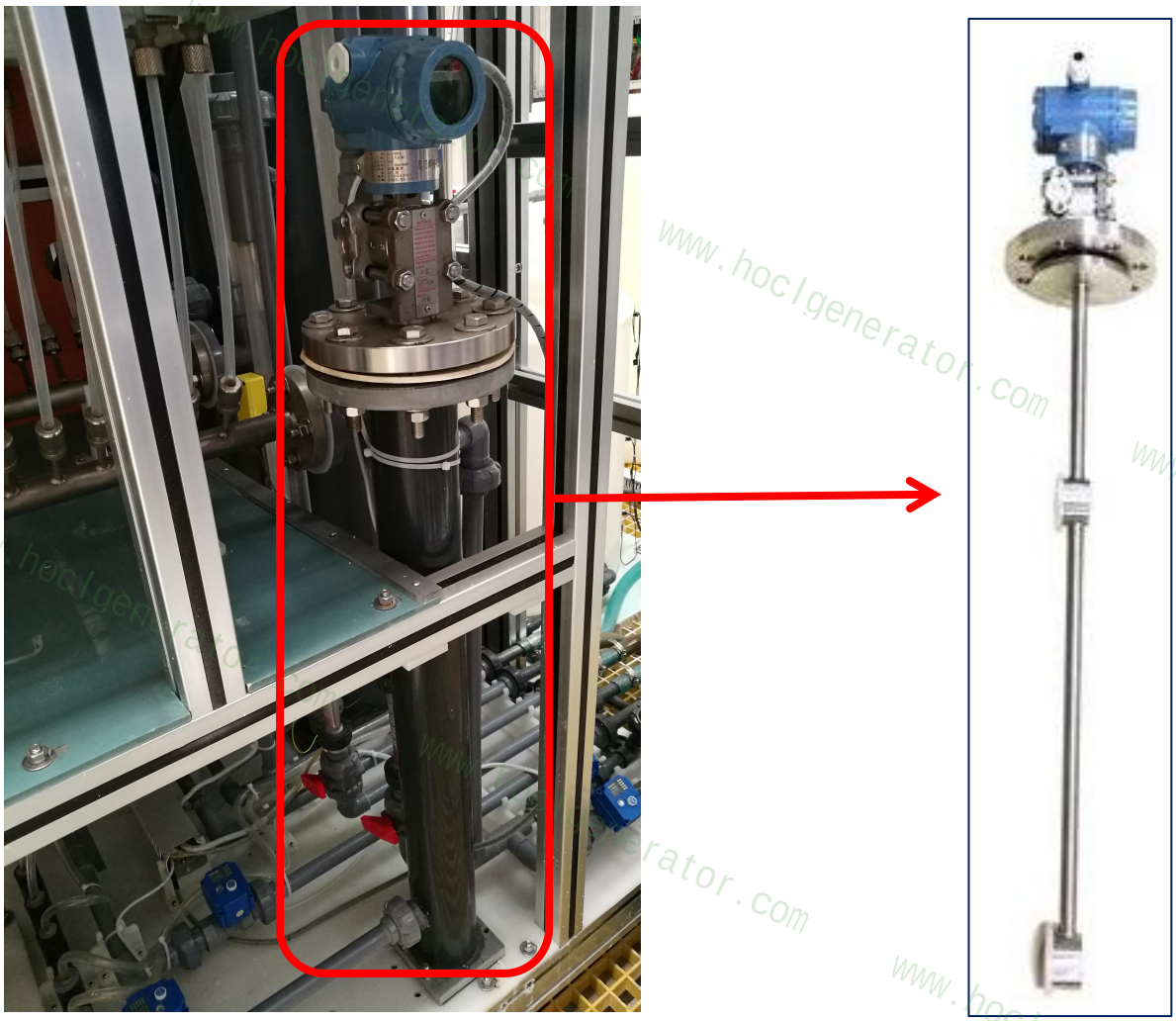
23. The Main Part Of The Product-Absorption Tower

Function: The concentrated chlorine gas separated by the chlorine separator and the sodium hydroxide in the absorption tank undergo a circulating cooling reaction to produce sodium hypochlorite.

24. The Main Component Of The Product-Online Conductivity Meter

Function: There is a linear relationship between the concentration of sodium chloride brine and the conductivity, and the conductivity increases as the concentration increases. Therefore, a conductivity meter is used to detect the concentration of the brine entering the electrolytic cell to ensure that the concentration of the brine reaches the concentration required for electrolysis.

25. The Main Components Of The Product-Online Hydrometer



Function: There is a linear relationship between the concentration of sodium hydroxide and the specific gravity, and the specific gravity increases with the increase of the concentration. Therefore, an online hydrometer is used to detect and control the concentration of sodium hydroxide in the electrolytic cell to ensure that the concentration of sodium hydroxide sent to the sodium hypochlorite for absorption meets the requirements.

26. The Main Components Of The Product-Online PH Meter

Function: There is a linear relationship between the concentration of sodium hydroxide in the sodium hypochlorite solution and the pH value, and the pH value decreases as the concentration of sodium hydroxide decreases.

When the pH value of the sodium hypochlorite solution generated by the reaction of sodium hydroxide and chlorine gas is reduced to 12, the sodium hydroxide is completely converted into sodium hypochlorite，and this is the end point to end automatic control.

27. The Main Components Of The Product-Online Hydrogen And Chlorine Concentration Detector

Function: The hydrogen and chlorine monitoring device is used to monitor the concentration of hydrogen and chlorine in the room of the sodium hypochlorite generator in real time. When the concentration is greater than the set value, the generator system will automatically send out an alarm signal and stop the machine.

28.Production Pictures

28.Production Pictures

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