

**WHSH-M**

Instruction Manual

Gas station with three-stage oil vapor recovery systems

instructions

THREE-STAGE OIL AND GAS RECOVERY UNIT AT GAS STATION



Luoyang Wo Hong Petrochemical Equipment Co., Ltd.

WOHONG PETROCHEMICALS

Preface

Thank you for purchasing the WSH series three-stage oil vapor recovery system for gas stations manufactured by Luoyang Wohong Petrochemical Equipment Co., Ltd. Before installing, operating, maintaining, or servicing the product, please read the instructions carefully, store them properly, and provide them to the end user.

Before use and maintenance, please obtain and carefully read this manual from the supplier, and ensure you have received direct or indirect training from the supplier or manufacturer.

The oil vapor recovery treatment unit is designed and manufactured in compliance with national standards as well as industry-specific standards for environmental protection, petrochemicals, and electrical applications. The product utilizes high-quality components from renowned domestic and international brands.

This manual provides equipment flowcharts, system configuration and functions, system parameter controls, system operation instructions, PLC human-machine interface, electrical control circuit diagrams, fault diagnosis and troubleshooting methods, daily maintenance procedures, and relevant precautions. It serves as a comprehensive guide for proper operation, maximizing the device's performance and ensuring safe operation.

If you encounter any issues during use or maintenance, please contact our company office or the manufacturer immediately or call our after-sales service hotline. We will respond promptly and serve you with utmost dedication.

This manual serves as supplementary technical documentation.

Special Warning

This device operates in an environment containing flammable gases; the cover of the explosion-proof junction box inside the enclosure must not be opened, and all explosion-proof surfaces must be properly sealed.

For equipment debugging or maintenance, personnel must be certified and use combustible gas detection instruments to measure both the interior and exterior of the device as well as its surrounding environment. The explosion-proof junction box cover may only be opened when the combustible gas concentration is below the national safety standard.

During debugging and maintenance, flammable gases must not leak; the concentration of such gases in the air must always remain below national safety standards.

Strictly adhere to the relevant safety operating procedures; otherwise, serious safety incidents may occur!!!



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1、 How the Device Works

1.1 Definition of Three-Stage Oil Vapor Recovery:

The three-stage oil vapor recovery system is designed to treat oil vapors released from fuel tanks during storage. It must be installed at gas stations that have already undergone modifications to their secondary oil vapor recovery systems.

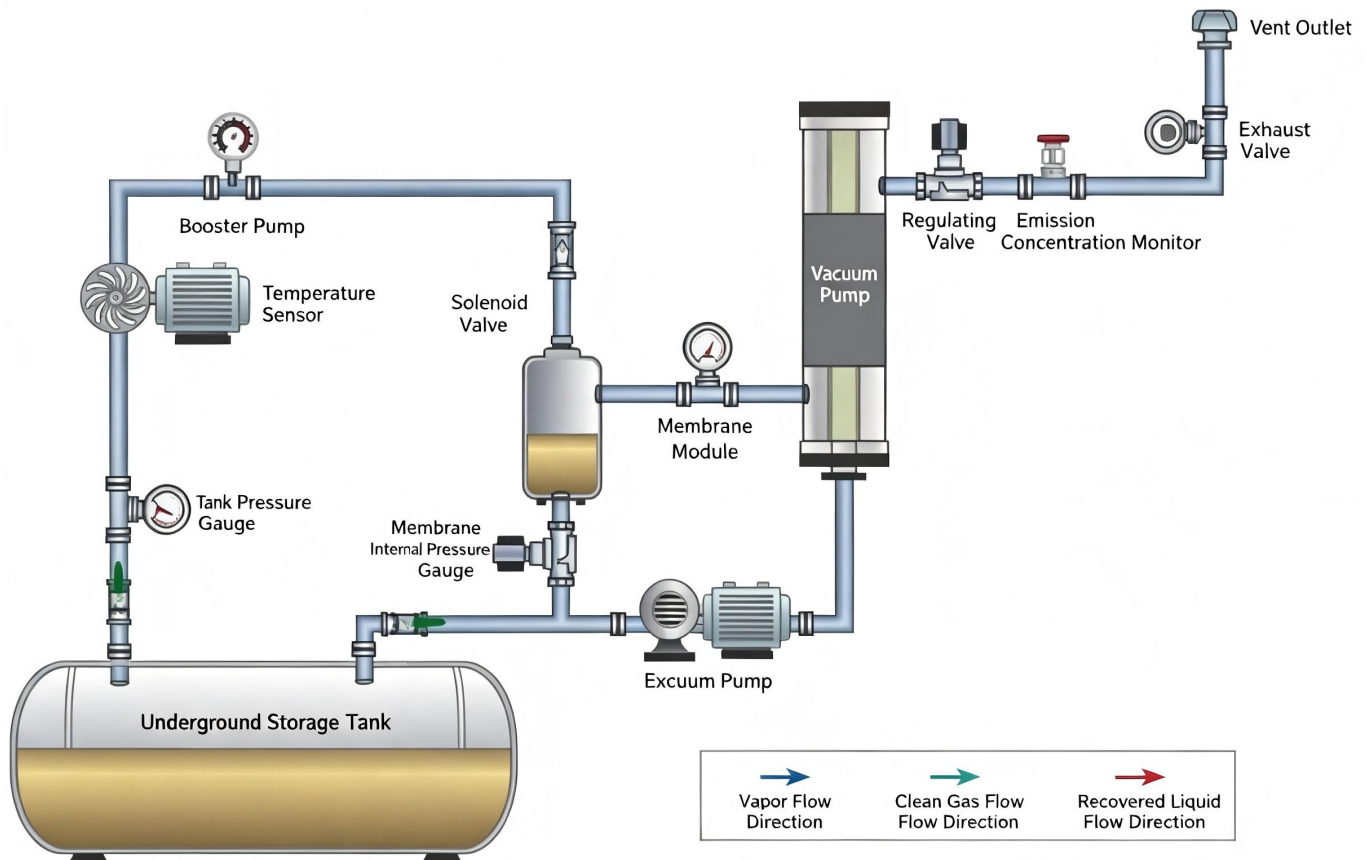
1.2 Working Principle of Three Oil and Gas Recovery Systems:

The three-stage recovery system at the gas station employs membrane separation technology to separate oil/gas/chemicals from air, ensuring compliant exhaust emissions while enabling liquid recovery of oil and gas.

The three-stage recovery system at gas stations is installed at the storage tank's breather valve. When unloading occurs or pressure exceeds preset thresholds, the system automatically activates: a compressor pressurizes and liquefies oil vapor, which then passes through an air-cooled heat exchanger before entering a gas-liquid separator for separation. The cooled liquid flows into the storage tank via pipelines, while residual gas enters a membrane module that separates oil molecules from air. Oil molecules rapidly adhere to the membrane surface and, under vacuum pressure, pass through to reach the central tube, where they are discharged into the tank; air remains trapped within the membrane. When tank pressure drops below the shutdown threshold set by the system, it automatically enters standby mode; upon reaching the preset pressure level again, it resumes operation automatically.

The device is fully explosion-proof, operates safely and reliably, is easy to install, and features simple operation. It is widely used for the recovery and treatment of volatile gases generated in oil storage facilities, chemical plants, ports, and similar locations.

1.3 Device Principle Process Diagram:



2、 Safe Code

2.1 Explanation of Safety Symbols

This manual uses the following safety symbols where safety-related information is presented or on equipment safety warning signs. Please strictly comply wherever these symbols are indicated.



Electrical hazard. Do not touch! The device operates on electrical power and poses an electric shock hazard!

This equipment must be operated and maintained by qualified professionals only. The power supply must be disconnected before turning on the electrical box!

AC 380V! The equipment's power supply must be a three-phase AC power source compatible with its operational requirements.

Direction Arrow! The inlet and outlet directions of the piping shall correspond to the equipment markings.

Non-professionals should not enable this feature! This machine can only be operated by trained personnel or individuals with relevant expertise. **Do not insert your hands inside the machine while it is running!**

Change rotation direction! The direction for the equipment fan to operate normally.

Grounding Mark! The equipment must be properly grounded to ensure the safety of both equipment and personnel.

2.2 Safety Precautions

2.2.1 Strictly comply with all regulations and rules applicable to flammable and explosive areas!

2.2.2 Installation and maintenance personnel must complete and pass safety and technical training before commencing work.

2.2.3 Operations involving electrical components must be performed by personnel with valid electrician qualifications!

2.2.4 During installation, maintenance, or operation of oil vapor recovery equipment, personnel must not wear shoes with nails or synthetic fiber clothing that may generate static electricity.

2.2.5 The use of open flames is strictly prohibited, as is smoking!

2.2.6 Before performing installation or maintenance work, ensure the power supply is completely disconnected and display warning signs such as "Under Maintenance" or "Do Not Close Circuit" at the power source to prevent hazards caused by unauthorized energization.

2.2.7 All tools and spare parts must not be bumped, struck, or dropped randomly to prevent sparks that could cause accidents!

2.2.8 The use of electric tools is strictly prohibited in areas with explosive gas environments!

3、 Product Overview

3.1 Use

This product is primarily designed for recovering oil vapor emissions from gas station vapor recovery systems and gasoline vapors emitted from buried fuel tanks. Through membrane separation technology, it effectively treats these gasoline vapors, achieving energy savings, emission reduction, and compliance with environmental standards.

This product complies with GB50759-2012 and GB20952-2007.

anti-hazard classification : **Exdbebia mbII BT4Gb**

Protection rating: **IP55**

3.2 Product Features

3.2.1 The device housing is fabricated from high-strength cold-rolled steel plate, with its surface treated via electrostatic spraying. It exhibits superior strength, corrosion resistance, oxidation resistance, a clean appearance, and excellent environmental performance, making it suitable for outdoor applications.

3.2.2 Featuring high-quality fully enclosed design with excellent safety performance and strong reliability.

3.2.3 Built-in explosion-proof electrical cabinet equipped with integrated exhaust pipe, fire-resistant cap, and emission detection port, offering easy installation and cost-effective performance.

3.2.4 An automatic pressure control system maintains the underground tank at atmospheric pressure.

3.2.5 The internal structure is compact, and the equipment occupies minimal space.

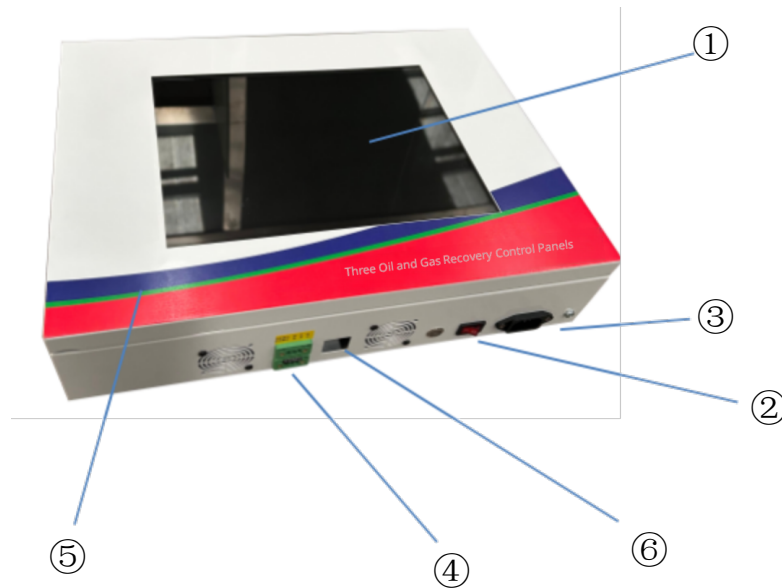
3.2.6 The PLC+ industrial control computer features a high degree of automation, along with a comprehensive human-machine interface and robust functionality.

3.3 Technical Parameter

Project	WHSH-M
Source	AC 380V
Power	2.5kw-3kw
Oil and gas treatment equivalent	4-20m³/h
Methods for oil and gas treatment	Barrier separation
Facility environment	Temperature: -40°C to 70°C; Humidity: 20% to 90% RH
Explosion-proof sign	Ex db eb ia mb IIB T4 Gb
Levels of protection	IP55
Noise	≤75dB
Explosion-proof Certification Number	CNV23.0415X
Outline dimension	1300*900*1120mm
Weight	410kg
Automatic Control Function	Unattended, automatic operation
	Real-time display of system pressure and temperature
	Display system status
	Check operational data
	Display system fault alarm information and provide automatic fault diagnosis functionality.
	Supports remote software updates and parameter adjustments
	Reserve: Standard R485 interface (for remote viewing, management, and data download)

3.4 Device Overview

3.4.1 Indoor Control Display

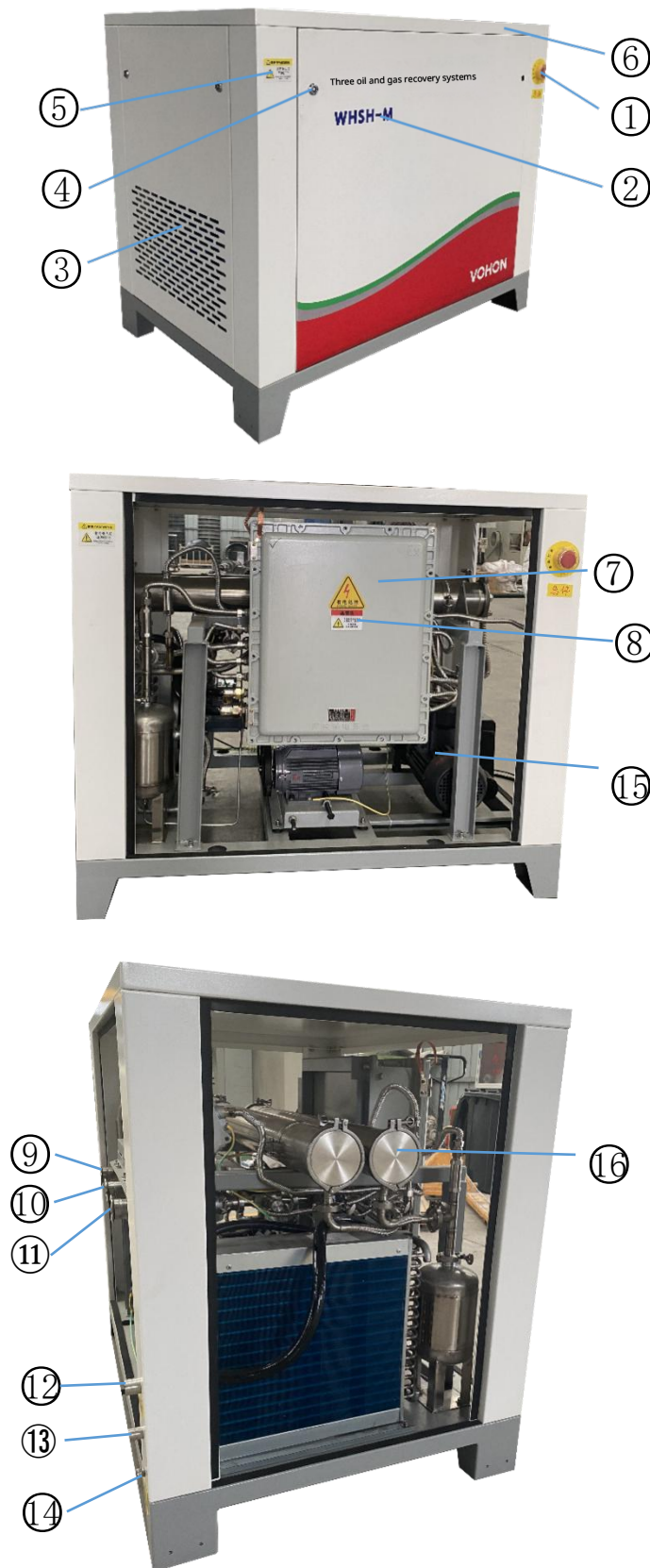


This device runs on the Windows 10 operating system, featuring software developed specifically for this platform with stable performance and user-friendly operation.

(Image for reference only)

- ①Capacitive touch screen (observe the display interface and operations);
- ②Power switch (the on/off button for the controller);
- ③Power interface (connection port between the controller and power adapter);
- ④RS485 signal interface;
- ⑤monoblock ;
- ⑥Other internal interfaces: Audio interface (audio output and input); Ethernet interface (for connecting to gas station network cables); VGA interface; HD digital interface; USB interface (built-in).

3.4.2 Outdoor Unit



The main unit of this product features an aesthetically pleasing exterior design, a compact internal structure, and a well-organized layout. (Images for reference only)

O1 Emergency stop button O2 Device model O3 Vent hole on device door panel O4 Lock hole on door panel
O5 Safety identification O6 Shell top cover O7 Explosion-proof distribution box O8 Electric shock
protection safety identification O9 Oil/gas inlet ⑩ Liquid oil reinjection port O11; Clean air discharge
port ⑫ Power cable (connecting to the circuit breaker in the power distribution room) ⑬ Signal cable
(connecting to the indoor controller) ⑭ Grounding bolt ⑮ vacuum pump ⑯ Membrane Group

4、Install

4.1 Equipment Installation Environment Requirements

4.1.1 During equipment installation, all safety regulations stipulated by the gas station must be strictly complied with.

4.1.2 The equipment shall be installed in an outdoor open area with a level ground surface and adequate ventilation. The installation site must be elevated above the normal ground level by at least 200 mm, and drainage pipes shall be provided around the perimeter to prevent water ingress.

4.1.3 The equipment should be installed in a location with minimal foot traffic, at least 3 meters away from walls and at least 5 meters above the building.

4.1.4 The vicinity of the equipment shall be marked with clear warning signs or guardrails to prohibit unauthorized personnel from operating it.

4.1.5 The installation location should also be chosen in a position that facilitates connecting the gas intake pipe of the oil vapor treatment device to the breathing pipe of the fuel tank at the gas station.

4.1.6 The equipment's operating environment temperature range is: -45°C to 70°C, with a relative humidity of 20%–90% RH.

4.2 Requirements for Foundation Construction, Pipeline Installation, and Assembly

4.2.1 Reserve a sturdy, flat concrete platform measuring 2000×2000×200 mm; adjust the platform height as needed based on site conditions to prevent equipment from getting waterlogged.

4.2.2 The inlet pipe for the oil and gas processing unit has a specification of DN50.

4.2.3 The processed return oil pipe has a specification of DN20.

4.2.4 Pre-installed set of RVV-450/750-2.5×4 + 1×2.5 power cables (1 unit).

One set of RS485-2*2*24AWG 4-core shielded twisted pair cable; power cables and shielded cables must be pre-installed in separate conduits.

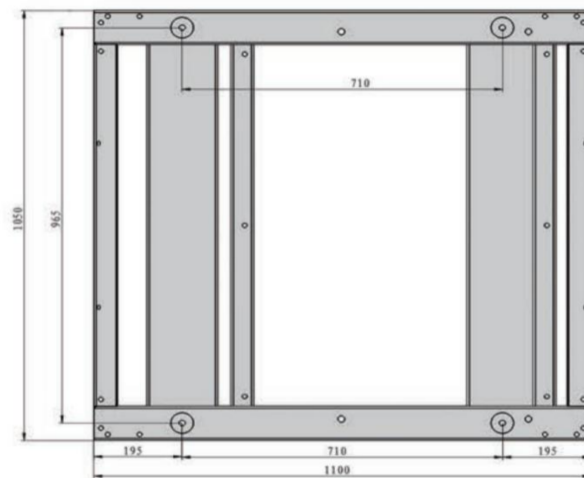
Note: Power supply lines must be equipped with dedicated switches and shall not be shared with other equipment.

4.3 Installation Requirements

- 4.3.1 Connect a secondary grounding circuit outside the grounding mark at the lower end of the equipment, ensuring that the grounding resistance is less than $4\ \Omega$ (refer to SH-3097-2000, Design Specifications for Electrostatic Grounding in Petrochemical Industries); this ensures the safety of outdoor equipment and personnel.
- 4.3.2 The device should be securely installed (with mounting holes provided at the bottom) to prevent displacement due to mechanical vibrations.
- 4.3.3 Install a shut-off valve and a flame arrester on the intake pipe line; install a shut-off valve and a check valve on the return oil pipe line.
- 4.3.4 All associated gas and liquid pipelines must undergo a hermetic pressure test; they may only be put into service after passing the inspection.
- 4.3.5 Loosen the screws on the door of the explosion-proof electrical box, open the door, and connect the AC 380V/50Hz power cord. Ensure all electrical phase wires (yellow, green, red, neutral, and ground) are correctly connected and securely fastened. Seal the gap between the power cord and the wiring inlet properly.
- 4.3.6 Check that the sealing oil (204-1 replacement oil) on the explosion-proof surface of the box door is evenly distributed and provides proper sealing.
- 4.3.7 The intake duct is connected to the oil-gas recovery pipeline of the fuel tank; the return oil port connects to a low-octane gasoline tank; and the clean air discharge port is linked either to a dedicated breathing pipe or to the device's built-in discharge pipe.

4.4 Base Dimensions

Diagram:



4.5 Installation Schematic:



5、Shakedown Test

5.1. Preparation:

5.1.1 Before startup, inspect the surrounding environment of the equipment to ensure there are no obstructions, adequate ventilation, intact pipe connections, and all valves in the open position.

5.1.2 Confirm all electrical connections are correct: phase wire sequence (yellow, green, red), neutral wire, and ground wire.

5.1.3 Ensure the explosion-proof electrical box door is closed and properly sealed.

5.2 Debugging Steps

Commissioning may only proceed after confirming correct pipeline connections, passing gas tightness tests, and passing electrical circuit inspections.

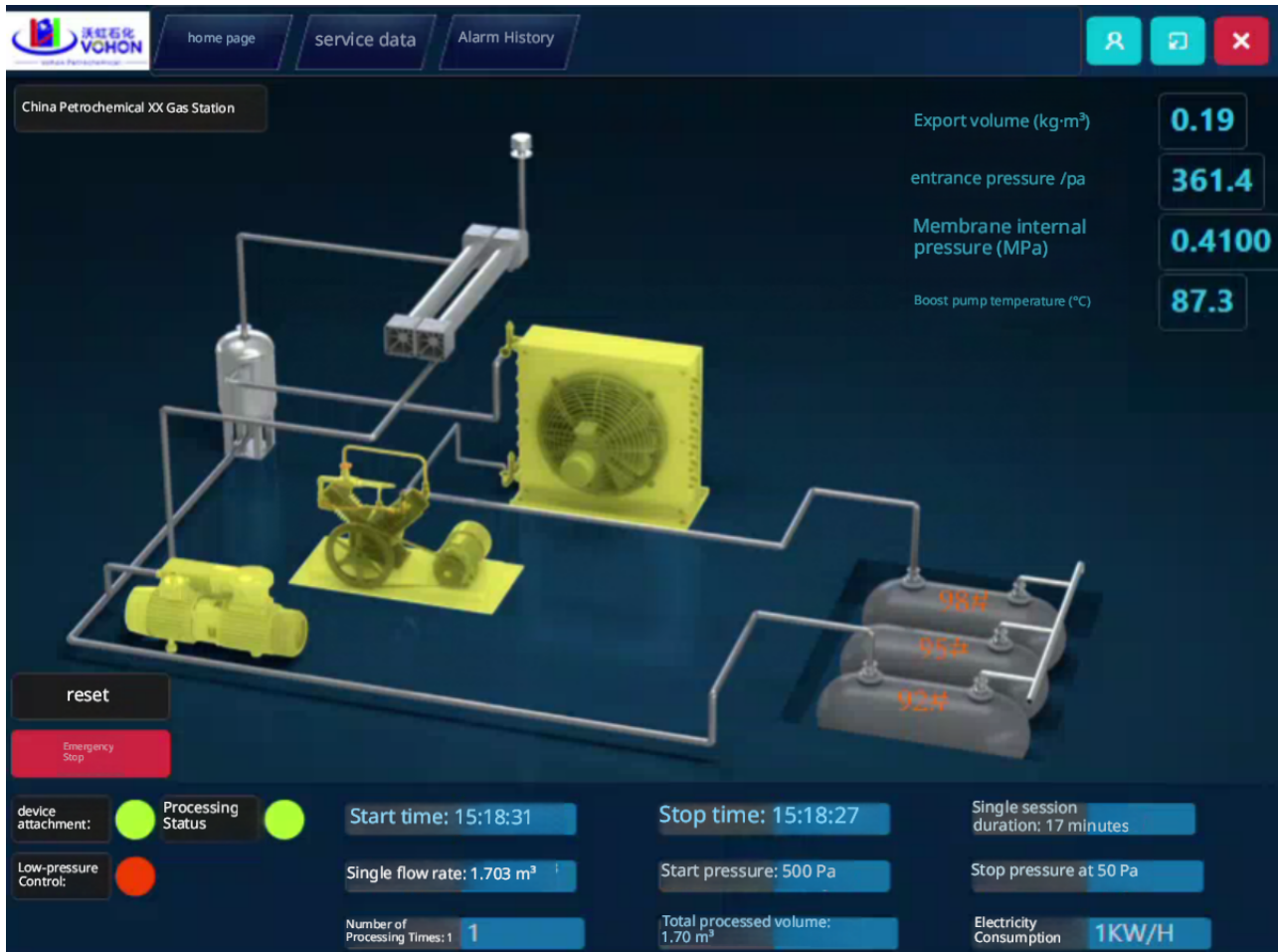
5.2.1 Turn on the indoor power supply switch; the power indicator light on the control panel will illuminate.

5.2.2 After power-on, the device enters automatic operation mode after a 10-second delay.

Note: The phase sequence protector in the explosion-proof box has correct phase sequencing, and its indicator light is green. Otherwise, an alarm will indicate phase sequence error, and the equipment cannot operate.

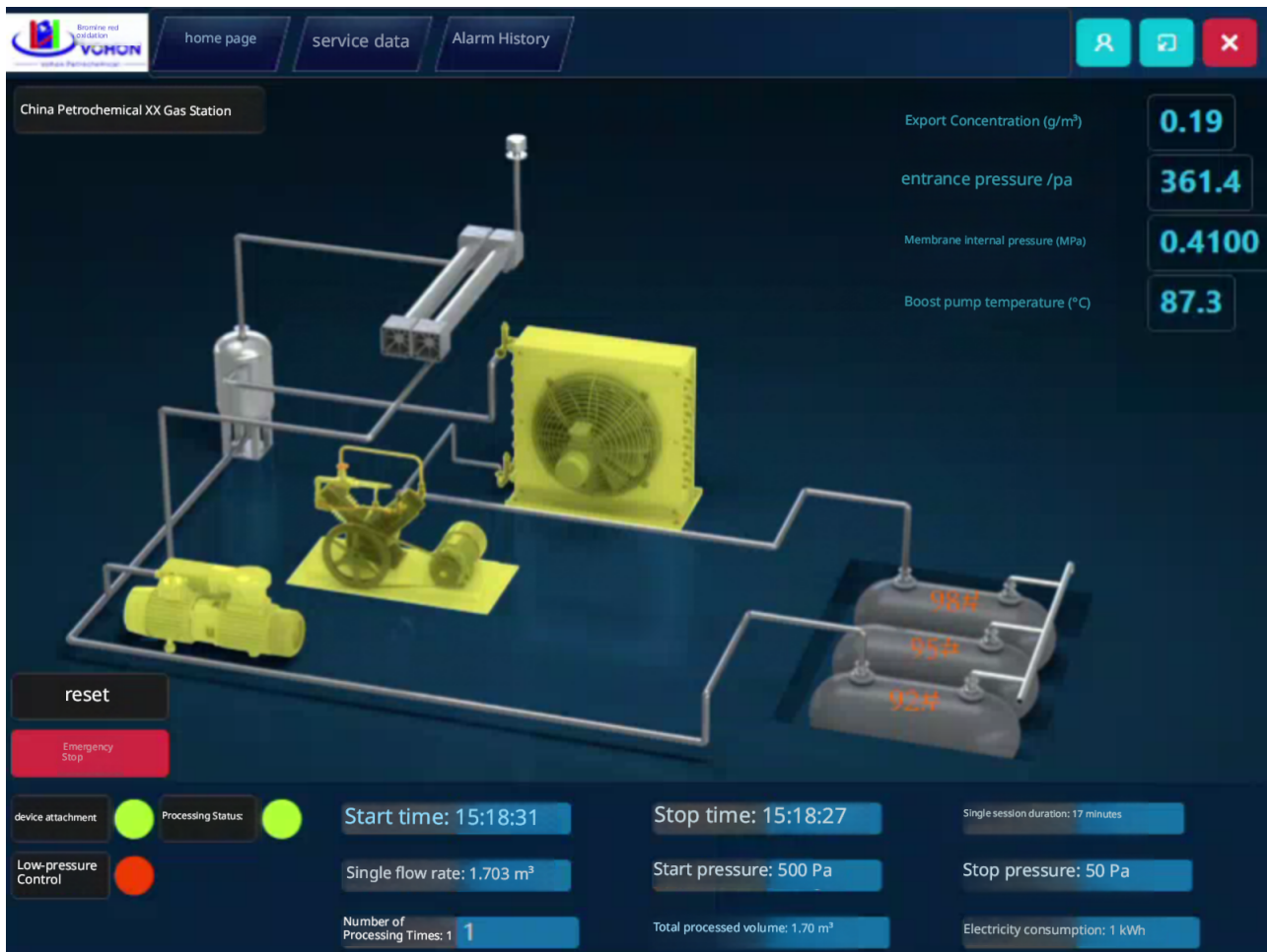
6、Operation Page

6.1 When Powered On, the Operation Interface Displays Device Status and Measurement Values:



(1) An Operation Button Is Located on the Left Side of the Screen Display Area When No Administrator Password Has Been Logged In.

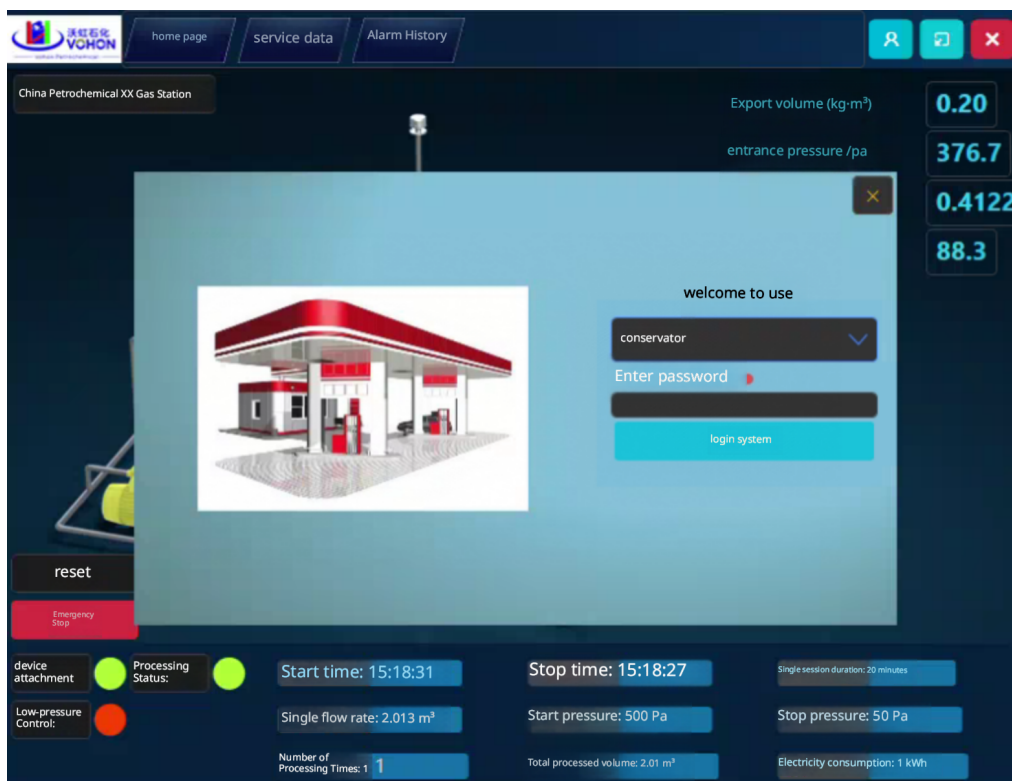
You can switch between screens such as "Operation Data" and "Alarm History." The buttons are shown in Figure (1-1):



(1-1)

(2) The Login Button Is Located in the Upper-Right Corner of the Screen, as Shown in Figure (1-2), for Logging Into the Administrator Account.

For household settings, you can switch to Manual, Operation Parameters, or System Settings to adjust configuration parameters.



(1-2)

6.2 Data Drawing List :

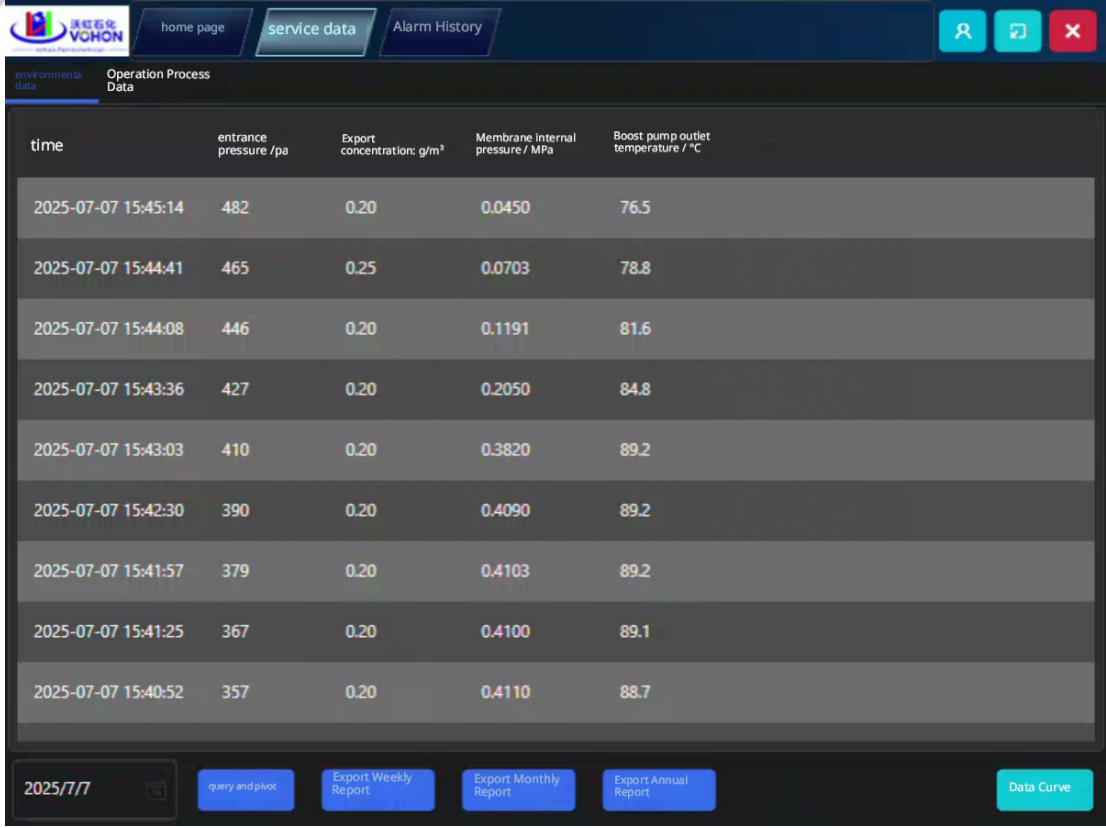


The data chart displays historical data curves.

6.3 Operational Data:

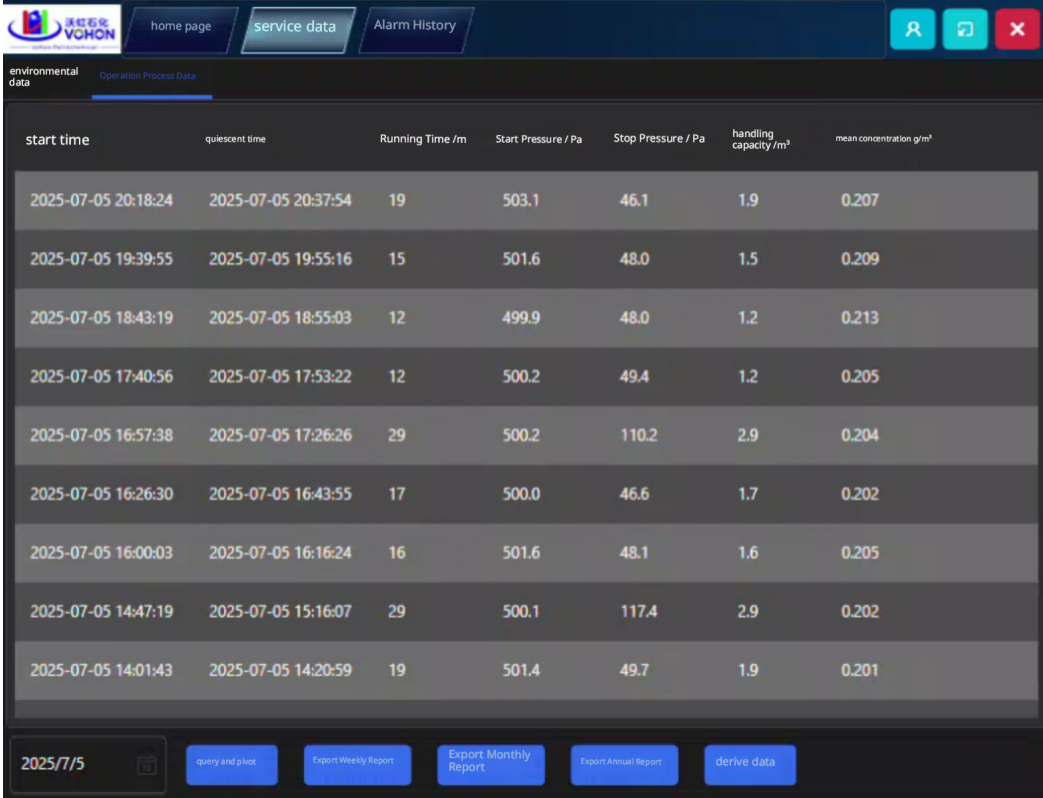
time	entrance pressure /pa	Export concentration: g/m ³	Membrane internal pressure /MPa	Boost pump outlet temperature / °C
2025-07-07 15:45:14	482	0.20	0.0450	76.5
2025-07-07 15:44:41	465	0.25	0.0703	78.8
2025-07-07 15:44:08	446	0.20	0.1191	81.6
2025-07-07 15:43:36	427	0.20	0.2050	84.8
2025-07-07 15:43:03	410	0.20	0.3820	89.2
2025-07-07 15:42:30	390	0.20	0.4090	89.2
2025-07-07 15:41:57	379	0.20	0.4103	89.2
2025-07-07 15:41:25	367	0.20	0.4100	89.1
2025-07-07 15:40:52	357	0.20	0.4110	88.7

Environmental data records the current inlet pressure, outlet concentration, membrane pressure, and temperature every 30 seconds.



time	entrance pressure /pa	Export concentration: g/m ³	Membrane internal pressure / MPa	Boost pump outlet temperature / °C
2025-07-07 15:45:14	482	0.20	0.0450	76.5
2025-07-07 15:44:41	465	0.25	0.0703	78.8
2025-07-07 15:44:08	446	0.20	0.1191	81.6
2025-07-07 15:43:36	427	0.20	0.2050	84.8
2025-07-07 15:43:03	410	0.20	0.3820	89.2
2025-07-07 15:42:30	390	0.20	0.4090	89.2
2025-07-07 15:41:57	379	0.20	0.4103	89.2
2025-07-07 15:41:25	367	0.20	0.4100	89.1
2025-07-07 15:40:52	357	0.20	0.4110	88.7

Historical data includes daily processing time, total processing volume, oil return volume, and other metrics.



start time	quiescent time	Running Time /m	Start Pressure / Pa	Stop Pressure / Pa	handling capacity/m ³	mean concentration g/m ³
2025-07-05 20:18:24	2025-07-05 20:37:54	19	503.1	46.1	1.9	0.207
2025-07-05 19:39:55	2025-07-05 19:55:16	15	501.6	48.0	1.5	0.209
2025-07-05 18:43:19	2025-07-05 18:55:03	12	499.9	48.0	1.2	0.213
2025-07-05 17:40:56	2025-07-05 17:53:22	12	500.2	49.4	1.2	0.205
2025-07-05 16:57:38	2025-07-05 17:26:26	29	500.2	110.2	2.9	0.204
2025-07-05 16:26:30	2025-07-05 16:43:55	17	500.0	46.6	1.7	0.202
2025-07-05 16:00:03	2025-07-05 16:16:24	16	501.6	48.1	1.6	0.205
2025-07-05 14:47:19	2025-07-05 15:16:07	29	500.1	117.4	2.9	0.202
2025-07-05 14:01:43	2025-07-05 14:20:59	19	501.4	49.7	1.9	0.201

Data recorded during operation include: start and stop times, duration of operation, startup pressure, shutdown pressure, processing volume, and concentration.

6.4 Alarm History:

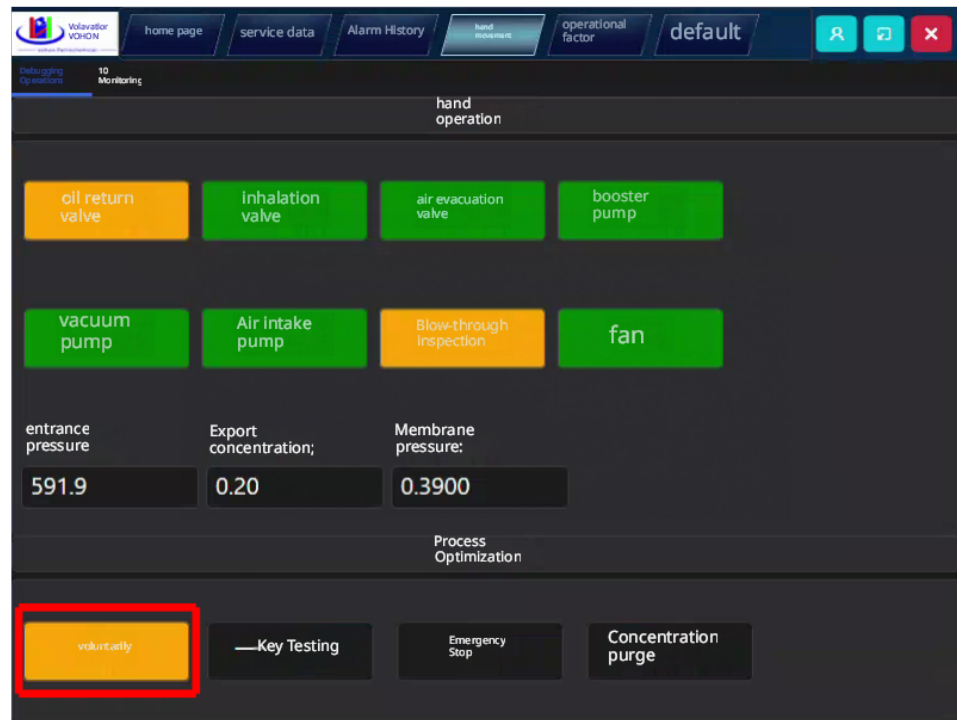
time	content	entry
2025-06-28 10:22:34	The booster pump is operating without feedback.	
2025-06-28 10:22:34	The vacuum pump operates without feedback.	
2025-06-28 10:22:34	The fan is operating without feedback.	

starting time: 2025/6/6 terminal time: 2025/7/7

Interval Query Daily Inquiry Data Export

Historical alarm records include equipment fault information, cases where operating environment parameters exceed set values, status of various equipment components, and emergency stop button operations.

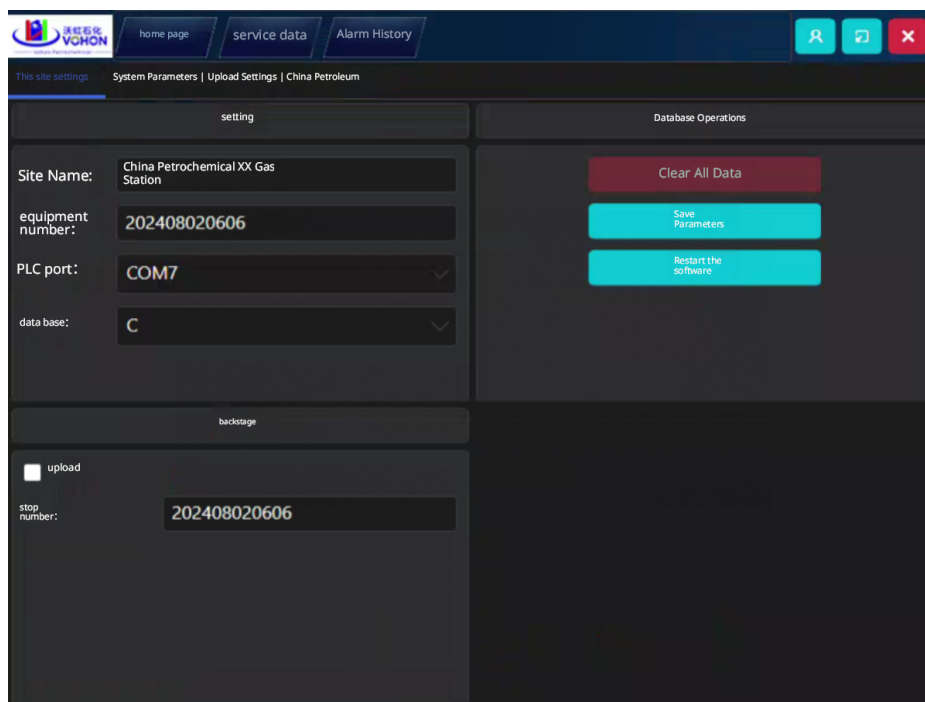
6.5 Manual Interface:



First, manually
click the switch

You can manually turn each control unit on or off as needed during on-site debugging. (To access this interface, log in with an administrator account.)

6.7 Default :



You can configure site name, device number, PLC port number, upload address, and other settings.

6.8 Operational Factor :

 home page service data Alarm History hand movement operational factor default   						
checkbox	address	name	data	Read Operation	write operation	description
☐	V1200	Start Pressure	500	fetch	write in	When the actual pressure exceeds the startup pressure, the equipment meets the startup conditions.
☐	V1204	Stop Pressure	50	fetch	write in	When the actual pressure is below the stop pressure, the equipment stops.
☐	V800	Pressure Start Delay/s	1	fetch	write in	unit /s
☐	V802	Pressure Stop Delay /s	1	fetch	write in	unit /s
☐	V830	Set low-pressure duration	420	fetch	write in	unit /m
☐	V832	Low-voltage operating duration	3	fetch	write in	unit /m
☐		Start on Time Mode Schedule	120	fetch	write in	Unit/m (>1): Set value to the downtime in time mode
☐		Time Mode Duration	10	fetch	write in	Unit/m (>1): Set to the runtime in time mode
☐		Key Test Duration	300	fetch	write in	Unit/s cannot exceed 3000s
☐		Fan stops after a delay	3	fetch	write in	unit /m

Startup Parameters

Air Intake pump

Concentration-dependent

Valve Parameters

Pressure Filtration

Alarm Parameters

Startup Parameters

Select All

Select none

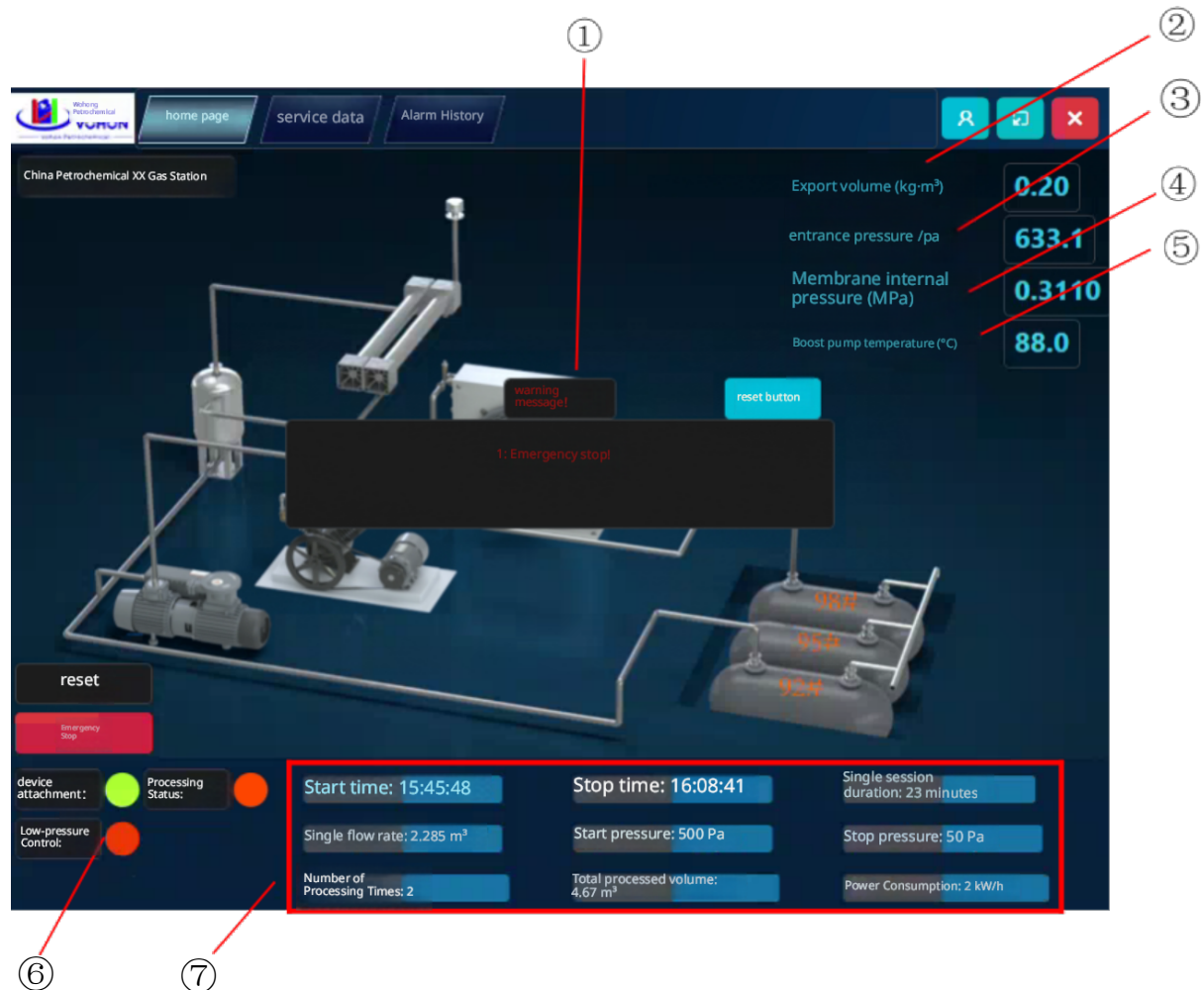
Select to Read

Write to Intermediate

Save Parameters

You can configure specific parameters for each system operation, including sensor range, start pressure, stop pressure, and alarm settings. (Configuration should be tailored to the actual conditions of the gas station.)

6.9 Run Interface Details:



1 、 The alarm information display area shows:② exhaust gas concentration,③ fuel tank pressure,④ membrane module pressure,⑤ booster pump temperature, ⑥ processing status,⑦ start/stop pressure, current processing count, current processing volume, and other information.

7、 Operation and Maintenance

7.1 Operation Management Shall Be Performed by Specially Trained Personnel Who Strictly Adhere to the Relevant Operating Procedures.

7.1.1 During oil unloading from tankers, the equipment operates normally without requiring any manual intervention.

7.2 Equipment Operators Must Inspect the Equipment Monthly:

7.2.1 Power supply is normal; check whether the switches on the explosion-proof electrical panel are secure, verify that the equipment's grounding wires (including secondary grounding) are intact, and ensure no looseness or debris at pipe connections.

7.2.2 After the equipment is started, the oil and gas suction port and exhaust port operate smoothly without any abnormal noise. The equipment appearance is clean; there are no debris piled around the equipment; and the fire extinguishers in the vicinity are within their valid service period.

Special Note: Always turn off the main power supply during maintenance and servicing!

7.3 During maintenance procedures, technicians must disconnect the power supply and strictly avoid working on live equipment. If issues cannot be resolved, immediately cease using the equipment and contact the equipment supplier or after-sales personnel. The equipment may only be reused after the fault has been repaired to ensure safety of both the equipment and its operating environment.

7.4 Recycling device warranty;

7.4.1 After the equipment exceeds the warranty period, if the supplier wishes to perform repairs or maintenance, the user shall cover the travel and labor costs for technicians, and all required spare parts shall be charged at cost.

7.4.2 Additionally attached is the quality warranty card.

8、System Fault Analysis Reference Table:

Hitch	Probable cause	Resolvent
Phase Sequence Protection	Correct phase sequence for the main power supply is incorrect. The main power supply voltage is low; the relevant wiring inside the electrical control box is faulty.	Check the main power supply Check the main power supply line
Overflow in a vacuum pump Vacuum Pump Maintenance	The vacuum pump is overheating due to a mechanical fault; the operating time of the vacuum pump has reached its limit.	Observe the oil level of the vacuum pump through the oil sight glass; if insufficient, inspect and add specialized vacuum pump oil. Check the temperature of the vacuum pump housing. Replace the vacuum pump oil. Return to administrator mode for reset.
High system pressure	Check the explosion-proof electromagnetic valve. Check the pipelines and control system.	Contact your local agent or the manufacturer for technical assistance.
Abnormal emission	Check the solenoid valve Check the pipeline. Check the membrane pressure control system	Contact your local agent or the manufacturer for technical assistance.
Power Supply Phase Sequence Alarm	Power wiring error; unstable power supply voltage	Power outage: Replace any two phase wires, check the cause, and resolve the issue.

9、 Customer Service :

9.1 After-Sales Service Phone Number

Landline: 0379-65290028 Mobile: 13526990215
WeChat:13526990215
maintenance record

Warranty Card

Dear customer, thank you for purchasing products from Luoyang Wohong Petrochemical Equipment Co., Ltd. To ensure optimal service, please carefully read, complete, and securely keep this warranty card after purchase.

Name of user		Contacts	
Customer address		Contact number	
Product name		Product model	
Date of purchase			
Manufacturing No			
Maintenance record	Date	Causes of the fault and troubleshooting measures	

Matters Need Attention :

1、 From the date of purchase, provided the product is installed and used in accordance with the instructions, our company will provide free repairs during the warranty period; after the warranty expires, repairs will incur additional costs such as labor fees.

2、 Repairs resulting from product quality issues beyond the company's control—such as damage caused by improper use, inadequate storage, or unauthorized disassembly—are subject to additional charges.

service call: 17638835177

Fax: 0379-65290028

zip code: 471822

Luoyang Wohong Petrochemical Equipment Co., Ltd. reserves the final right to interpret and modify the terms of this warranty card.



Gas Station Three-Stage Oil Vapor Recovery System Manual

DESCRIPTION OF THREE-STAGE GAS RECOVERY PLANT AT PETROL FILLING STATIONS

**Luoyang Wo Hong Petrochemical
Equipment Co., Ltd.0379-65290028**

www.wohongshihua.com

W2-1, Dongda Science and Technology Park, Luoxin Industrial Cluster Area, Xin'an County