

Integrated Services for Oilfield Production, Operations and Maintenance

KERUI PETROLEUM TECHNOLOGY



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02 Solutions for Cleaning, Testing & Inspection (CTI)

03 Solutions for Oilfield Environmental Protection

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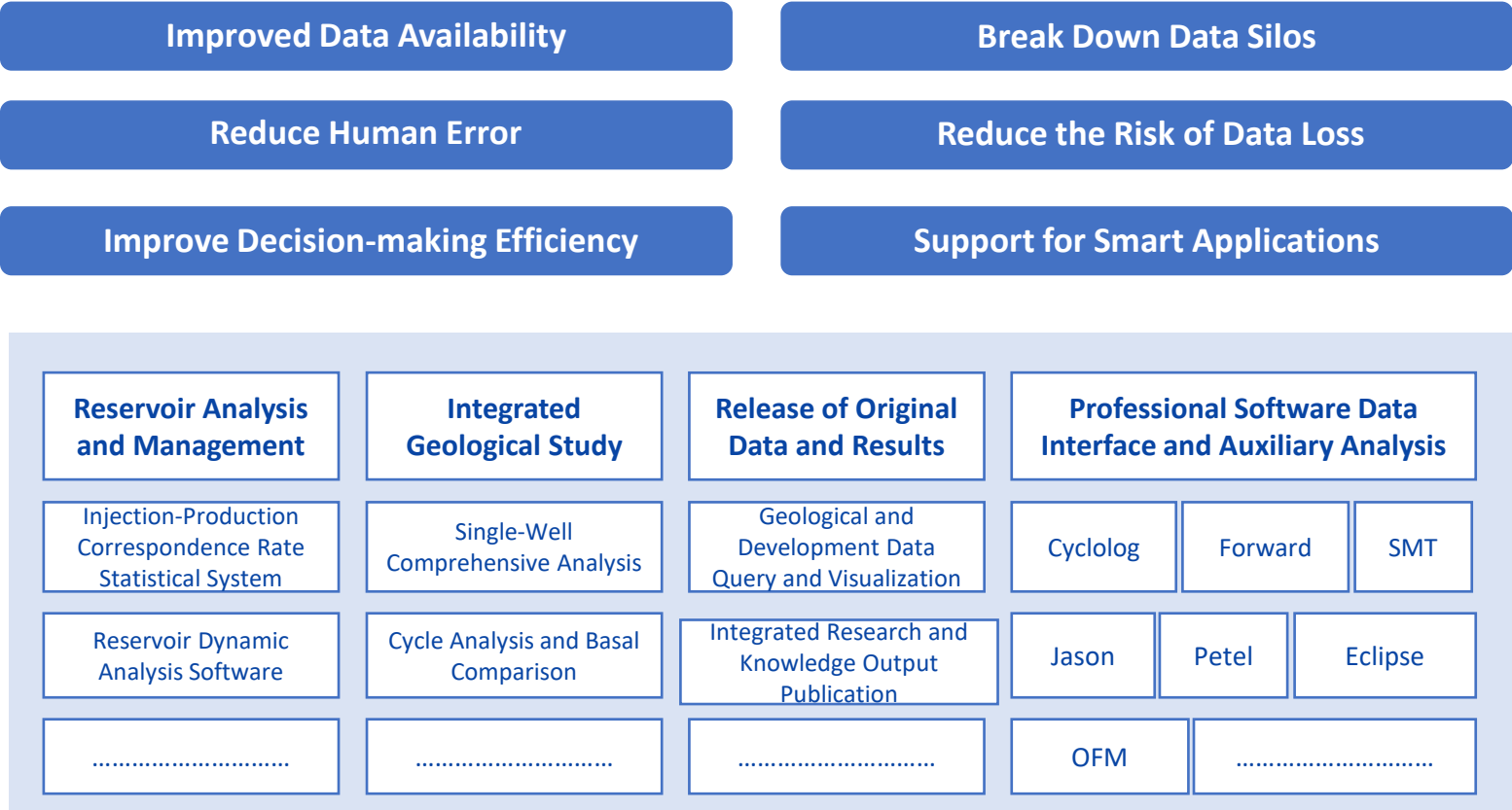


Digital Reservoir Technology

By taking single well, well group and reservoir unit as objects, data fusion is carried out to form unified achievement data resource and provide service for comprehensive application of reservoir.

Existing Problems and Sources

- Historical Data Digitization and Data Governance
- Cross-disciplinary Data and Outcome Integration
- Establish Unified Data Support Services
- Improve the Quality of Newly Acquired Data
- Incorporate Unstructured Data into Management



Oilfield Digital Twin

Focusing on wellhead management and integrating real-time on-site data collection, the system facilitates the integration and application of real-time operational data, static attribute data, process flow diagram data, and spatial topology information for key oilfield production nodes.



■ Deepoil Production Command System

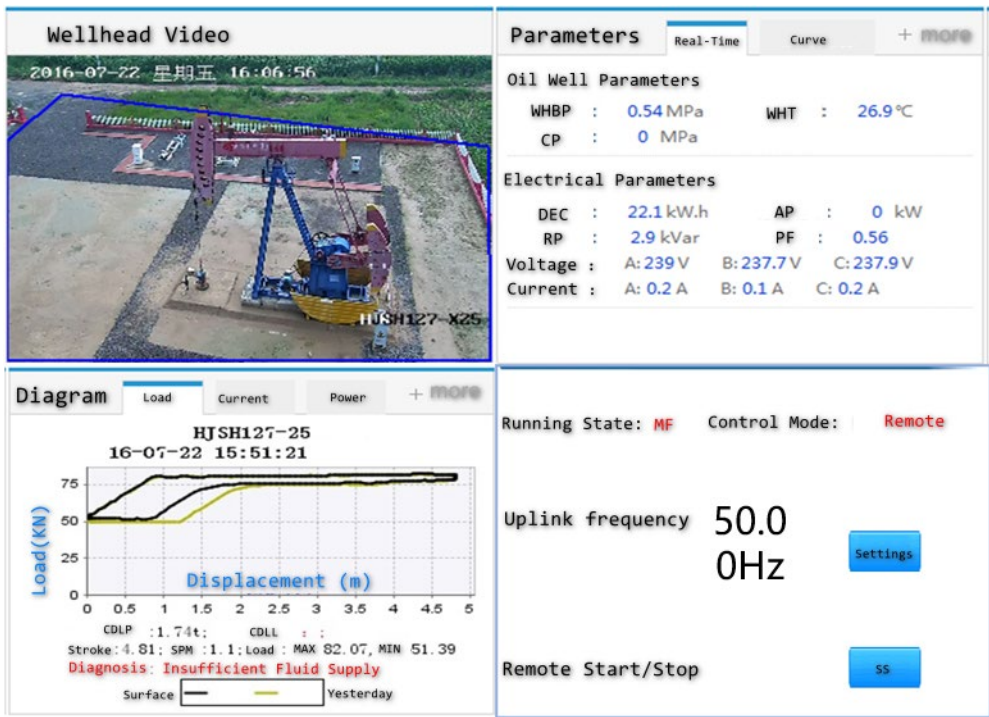
Leveraging front-end data acquisition, real-time video monitoring, SCADA-enabled automated control, and industrial Ethernet networks, the system enables end-to-end digital management of oil and gas production, covering real-time surveillance, remote operation, interdepartment collaboration, and intelligent decision-making. Applicable to onshore and offshore reservoirs as well as unconventional production sites, the command system sets a new standard for smart oilfield operations.

Function Modules	 Production Monitoring	 Alarm and Warning	 Production Dynamics	 Scheduling Operation	 Production Management	 Emergency Response
Sub Modules	Oil Extraction Monitoring	Oil Extraction Alarm and Warning	Oil Extraction Dynamic	Dispatch Online	Oil Extraction Management	Incident handling
	Gas Extraction Monitoring		Gas Extraction Dynamic	Dispatch Meeting	Gas Extraction Management	Emergency plan
	Water Injection Monitoring	Gas Extraction Alarm and Warning	Water Injection Dynamic	Key Work	Water Injection Management	Emergency Process
	Gathering and Transportation Monitoring	Water injection Alarm and Warning	Gathering and Transportation Dynamic	Report Management	Gathering and Transportation Management	Emergency Specialist
	Marine Monitoring		Offshore Dynamic	Planning Management		Emergency Team
	Patrol Monitoring	Gathering and Transportation Alarm and Warning	Workover Dynamic	Data Management	Development Management	Emergency Supplies
Functions	42	31	39	20	41	15

The oil and gas production command system includes **6 major functional modules** such as production monitoring, alarm and early warning, along with **36 sub-modules and 188 business functions**, comprehensively covering the production management business of oil and gas fields.

➤ Production Monitoring Module 01

The production monitoring module includes 7 sub-modules, such as oil production monitoring and gas production monitoring, covering 42 business functions . Relying on front-end intelligent instrument and video devices, the system enables real-time parameter monitoring, video surveillance of the production site and remote control of key equipment.



Diagram

Load

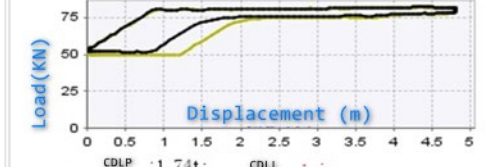
Current

Power

+ more

HJSH127-25

16-07-22 15:51:21



CDLP : 1.74t CDLL : :

Stroke: 4.81 SPM : 1.1 Load : MAX 82.07, MIN 51.39

Diagnosis: Insufficient Fluid Supply

Surface — Yesterday

Running State: MF Control Mode: Remote

Uplink frequency 50.0 OHZ

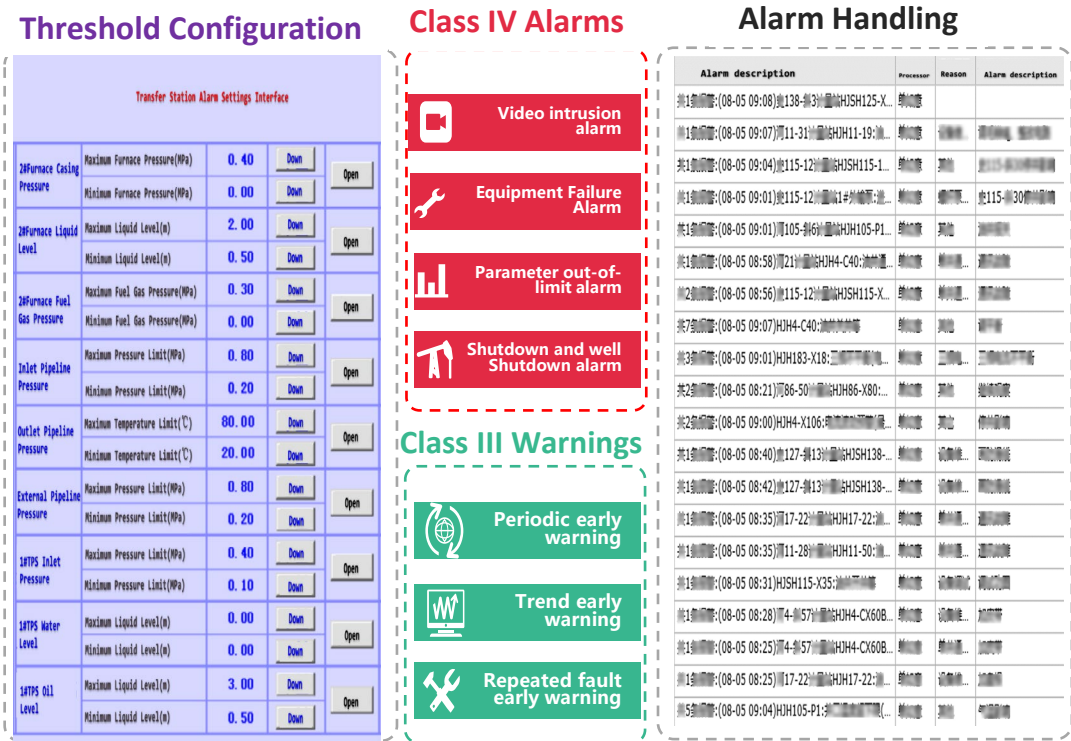
Settings

Remote Start/Stop

SS

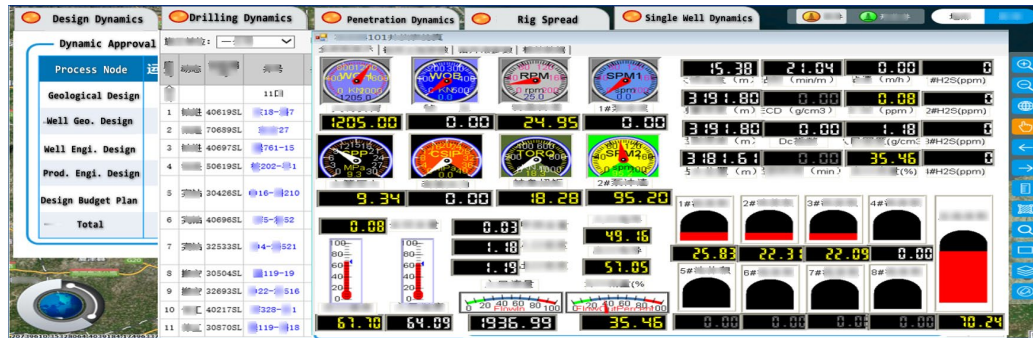
➤ Early Warning and Alarm Module 02

The early warning and alarm module includes 4 sub-modules and 31 business functions, including oil production and gas production early warning and alarm. By configuring parameter thresholds and building early warning mechanisms, the system enables real-time alerts and proactive warnings for abnormal conditions.



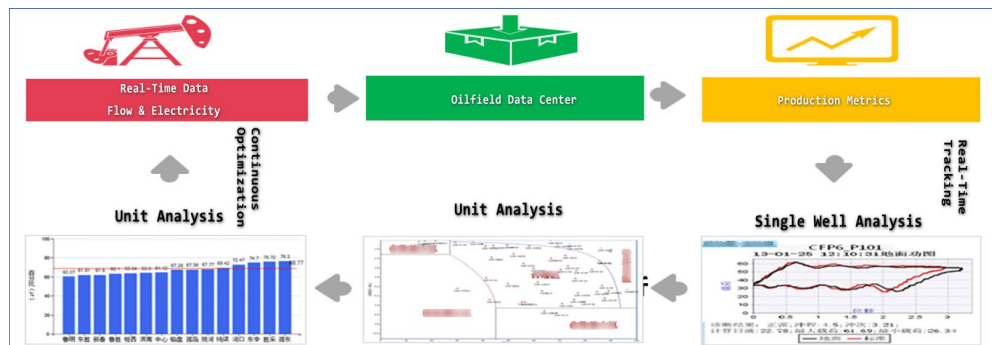
➤ Production Dynamic Module 03

The production dynamics module includes 8 sub-modules and 39 business functions, such as oil production, oil and gas gathering and transportation, operation and construction. It enables the automatic collection of various data throughout the production process, the generation of index summaries, and the visual representation of graphs.



➤ Production Management Module 05

The Production management module includes 41 business functions in 5 sub-modules, such as oil production management and development management. By real-time tracking, dynamic analysis and optimization of key production technical indicators, the analysis provides analytical tools for specialized management.



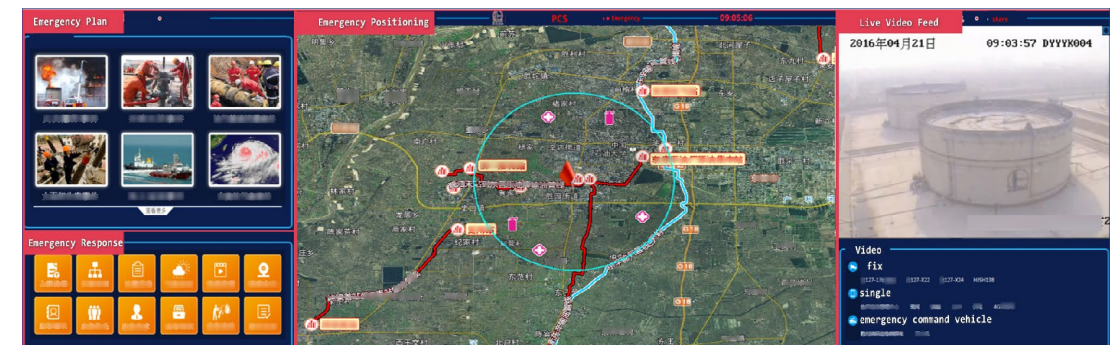
➤ Dispatch Operation Module 04

The dispatch operation module includes 7 sub-modules and 20 business functions, such as online and production meetings. It enables the online operation of production scheduling, management and control of key workflows, automatic push of production information, real-time sharing of scheduling information, and statistical analysis of operation efficiency.



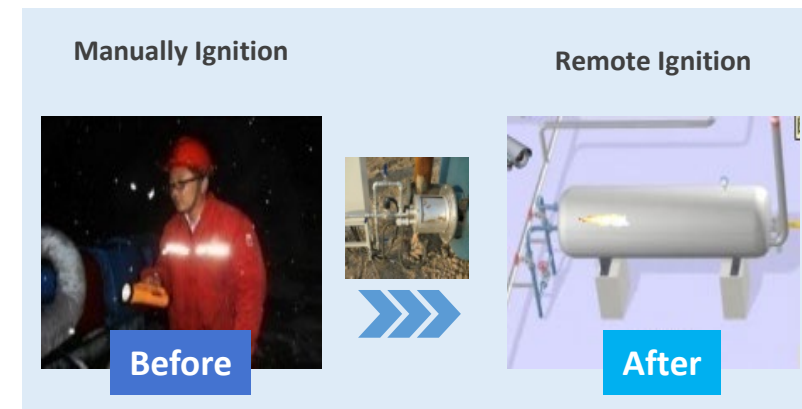
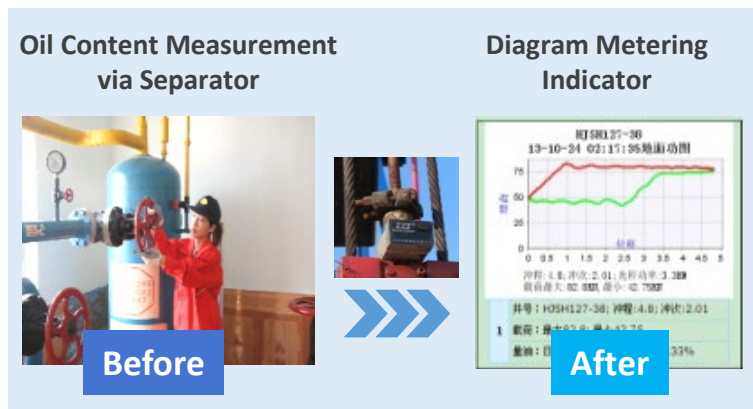
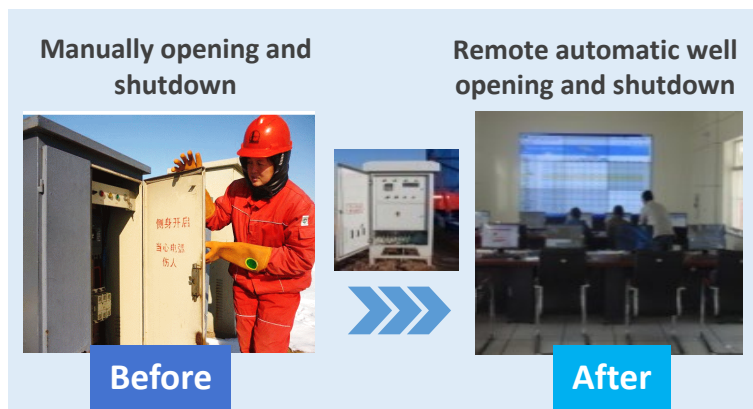
➤ Emergency Response Module 06

The emergency response module includes 5 sub-modules, such as emergency planning and emergency experts. It quickly locates the accident site and surrounding environment, enabling emergency scenes and standardized response procedures.



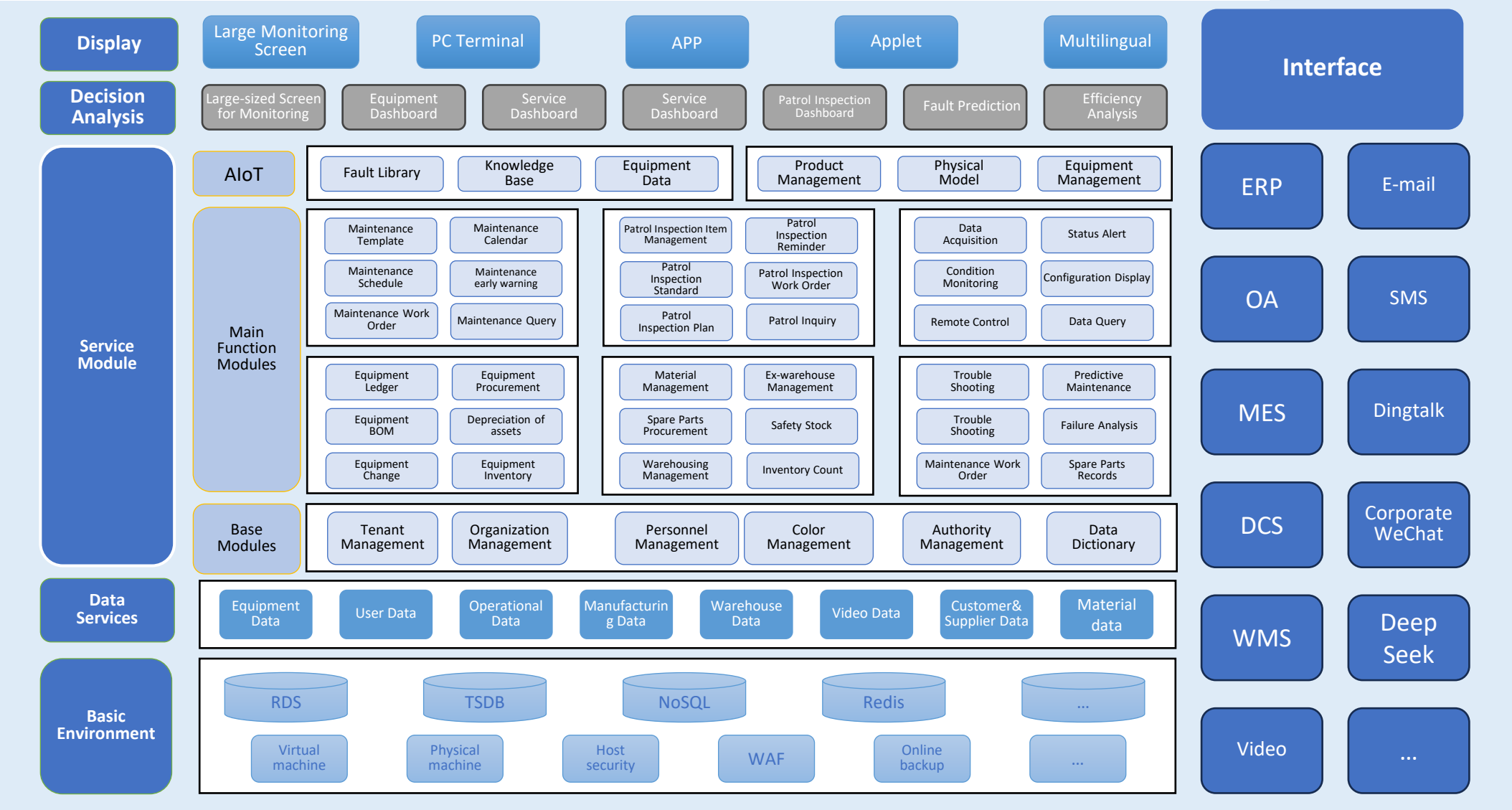
■ Application Outcomes and Case Studies

In major oilfield enterprises in China, the oil and gas production command system has been implemented, covering 55 oil and gas production plants and 242 management areas. Nearly 45,000 wells and over 2,200 stations and storage facilities are monitored.



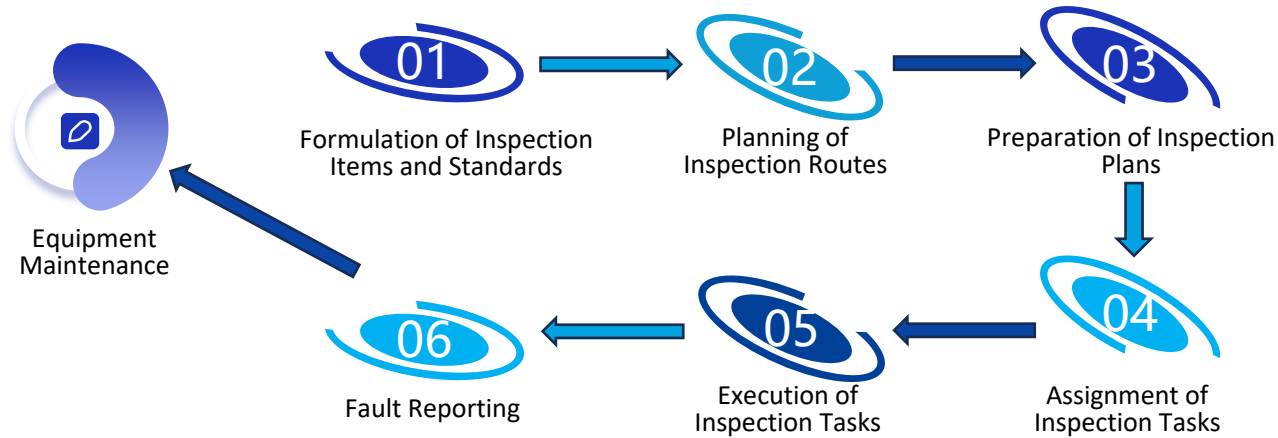
ZHY Oil Production Area: workforce reduced from 2,212 to 911, optimizing 1,301 positions. Wells managed per capita rose from 0.56 to 1.36 (↑143%), and per capita oil & gas output increased from 1,547 to 3,752 bbl (↑2,205 bbl).

■ Deepoil Intelligent Platform for Equipment Operation and Maintenance



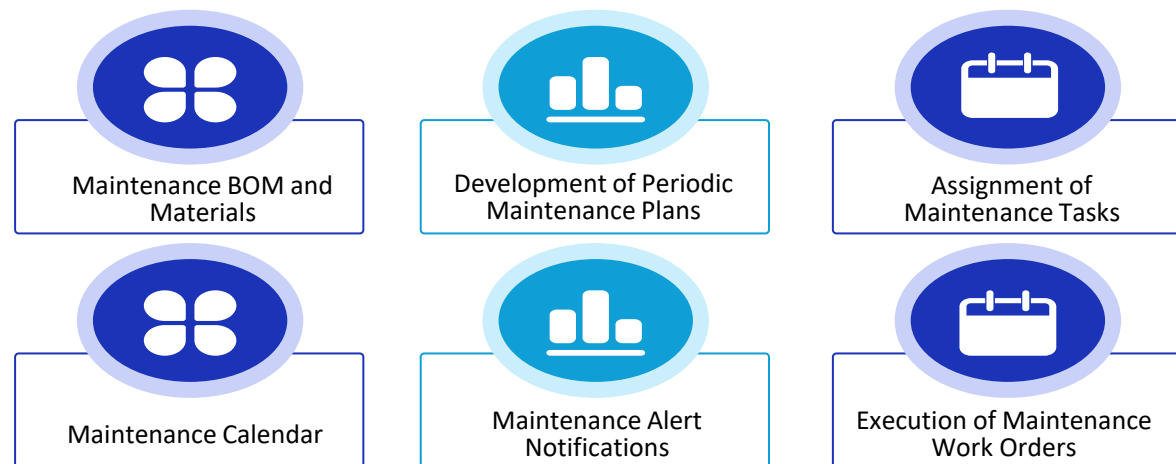
■ Deepoil Intelligent Platform for Equipment Operation and Maintenance

➤ Intelligent Patrol Inspection and Maintenance Function



No	Order Name	Order Type	Order Owner	Status	Actual inspection time
1	[Image]	Inspection	Plan Generation	[Image]	2025-03-21 07:00
2	[Image]	Inspection	Plan Generation	[Image]	2025-03-21 08:01
3	[Image]	Inspection	Plan Generation	[Image]	2025-03-21 07:03
4	[Image]	Inspection	Plan Generation	[Image]	2025-03-21 07:17

➤ Maintenance Management Function



No.	Order Name	Order Type	Actual Start time	Actual End time
1	 Maintenance Plan	Plan Generation	2024-11-14 14:00	2024-11-14 15:00
2	 Maintenance Plan	Plan Generation	2024-12-09 16:42	2024-12-09 17:40
3	 Maintenance Plan	Plan Generation	2024-12-11 10:10	2024-12-11 14:30
4	 Maintenance Plan	Plan Generation	2024-11-12 12:39	2024-11-12 14:40

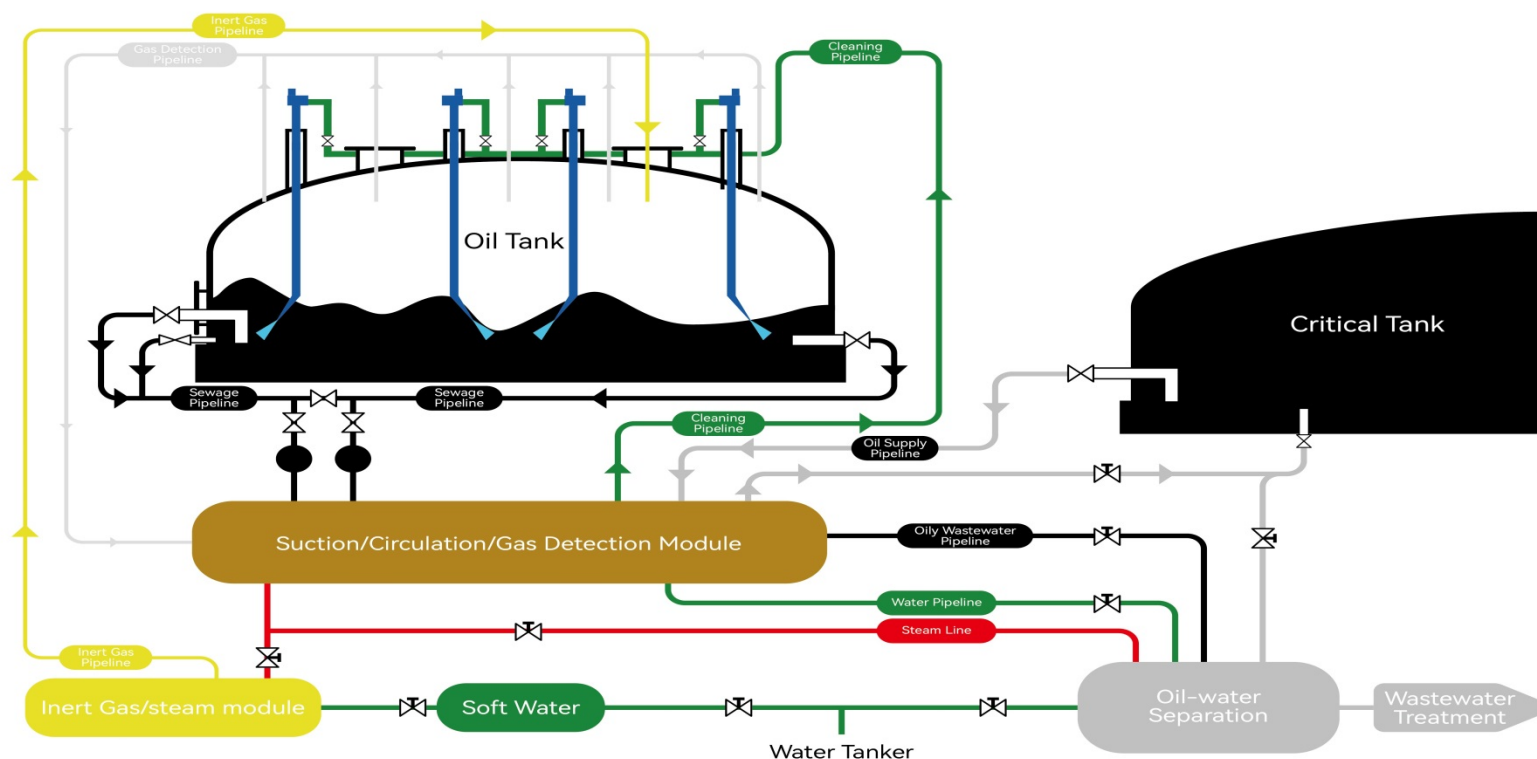
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■ Tank Cleaning and Testing Technology

- **Tank cleaning is aimed to** physically separate oil, water and sand inside the tank, thus meeting the hot work requirement for tank maintenance.
- **The main process equipment for mechanical tank cleaning technology** includes cleaning machine, oil-water separator, nitrogen supply system, etc.



High Efficiency

Recovery of over 95% reusable media

Enhanced Safety

Full-process cleaning under inert gas protection

High Productivity

24/7 continuous operation with advanced automation

Optimal Results

No water or residue left after cleaning. The tank shows its original color, meeting the conditions for hot work.

■ Tank Cleaning and Testing Technology

Magnetic Flux Leakage (MFL) Detection for Storage Tank Bottom Plates



Floormap 3D:

Quick scanning of regular large bottom plate areas



Handscan:

Rapidly scanning of irregular bottom plate areas such as supports/heating coils

➤ **Suitable for Automatic Detection**

The signal is acquired by the sensor, and the software automatically analyzes to identify defects.

➤ **High Reliability**

A computer automatically identifies and alarms defects, reducing the influence of human factors.

➤ **Quantification of Defects**

The magnetic flux leakage signal has a certain correspondence with the shape and size of the defect.

➤ **Determine the Degree and Position of Corrosion**

Determine the extent (area and depth) of base plate corrosion and its location.

➤ **Output of Inspection Results**

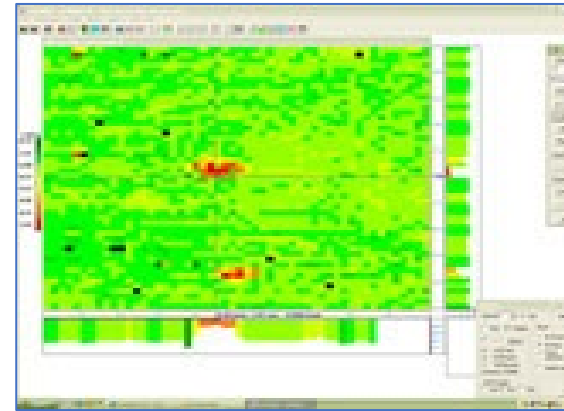
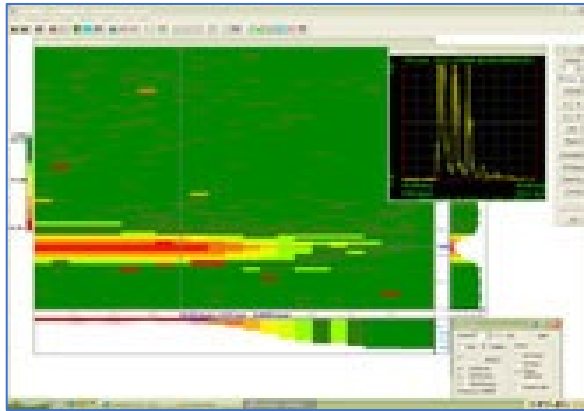
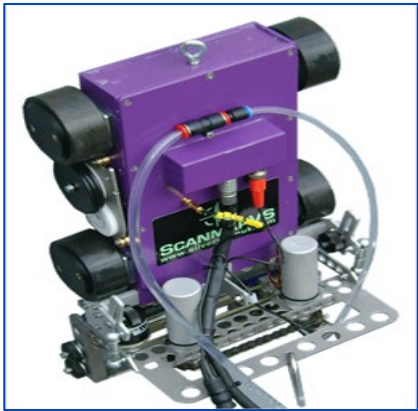
The detection result can be visually observed on a computer screen, and a detection report can also be generated.

➤ **High Efficiency and Environmental Protection**

High detection speed and no pollution.

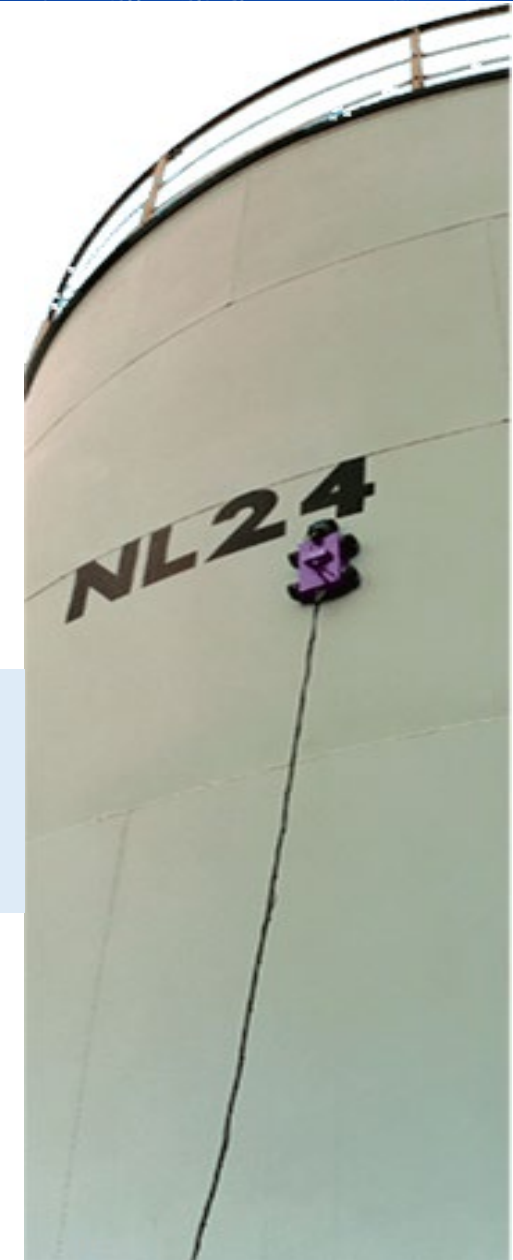
■ Tank Cleaning and Testing Technology

Wall-Climbing Robot Inspection-Tank Wall Inspection



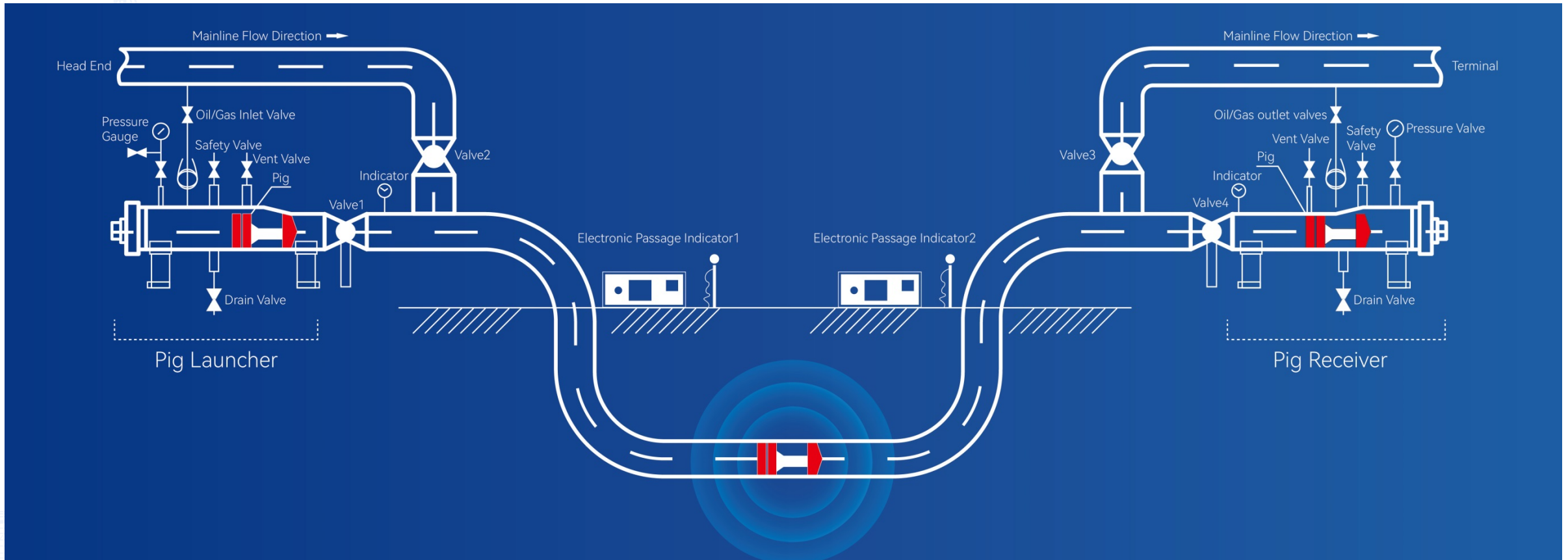
1. Ultrasonic signals are converted into waveforms to determine defect location and size.
2. Detection data is compiled into 2D images, revealing cross-sectional views of internal flaws.
3. The oscilloscope screen displays the horizontal projection of defects on the surface of the tested object.

- ✓ Uses a unique dry-coupled wheel probe, eliminating the need for traditional couplants
- ✓ Climbs vertically, horizontally, and in reverse
- ✓ Scaffolding is not required due to coaxial cable operation



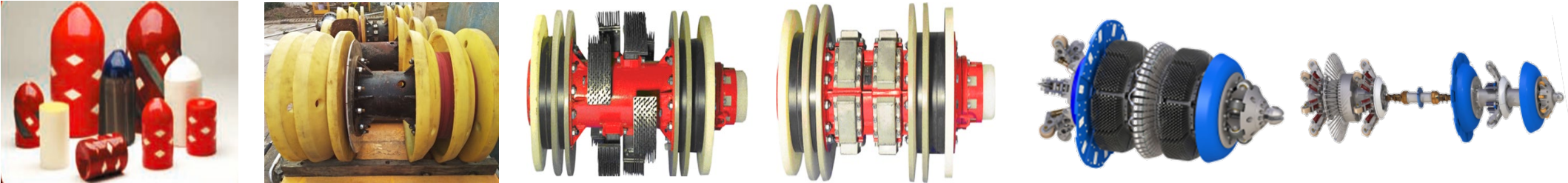
■ Pipeline Cleaning and Testing Technology

Pipeline Cleaning and Inspection Process



■ Pipeline Cleaning and Testing Technology

Pipeline Cleaning and Inspection Tools

Type of Pig	Foam Pig	Gauging Disc Pig	Steel Brush Pig	Magnetic Pig	Cleaning Tools	Inspection Tools
Suitable Pipe Size	Φ168 mm-1219 mm				6"~ 48"	
Allowable Deformation	40%	25%	25%	25%	/	/
Functional Specifications	Blockage can be shattered under high pressure without interrupting pipeline operation.	The exact location of dents can be identified using the tracking device and process flow.	The steel brush runs along the inner wall, effectively removing impurities from the pipeline.	It efficiently removes most impurities and ferromagnetic materials from the pipeline.	Corrosion of internal and external walls, metal loss defects, cracks, weld anomalies, etc.	Changes in pipe diameter, such as dents and ovality; pipeline features, such as girth welds, elbows, and segment lengths.
Pictures						

■ Typical Case

Crude Oil Pipeline Inspection Project – Oil Production Plant A, Eastern China

Pipeline: 5 km × 8" (Station 21 to 99)

- Performed cleaning, geometric deformation inspection, and MFL detection
- 34 metal defects detected, met Owner's requirements

Oil
Pipeline



➤ Implementation Effect

- An **integrated pipeline cleaning and inspection service** was provided.
- Cleaning met acceptance standards.
- Defect locations were accurately identified, providing a reliable basis for repair.
- The service was highly recognized by the client.

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■ Wastewater Treatment Technology

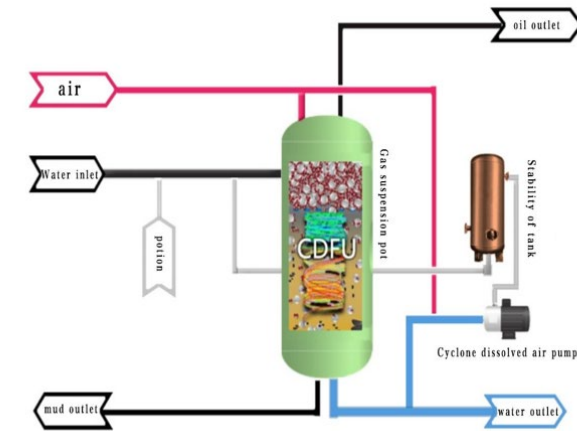
➤ Cyclonic Dissolved Flotation Unit (CDFU)

- Effectively integrating the centrifugal separation technology and dissolved air flotation technology, it is a hybrid apparatus for efficiently separating oil and suspended solids from wastewater.

➤ Technical Features

- The single-stage deoiling efficiency is > 90%, with the **minimum removal particle size $\leq 2 \mu\text{m}$** .
- The skid-mounted equipment occupies a small space, with a retention time of only 1 to 5 minutes.
- High stability and efficient technical integration.
- Strong process adaptability.
- Low operation and maintenance cost.
- High level of automation, safe and reliable.

Flow Chart

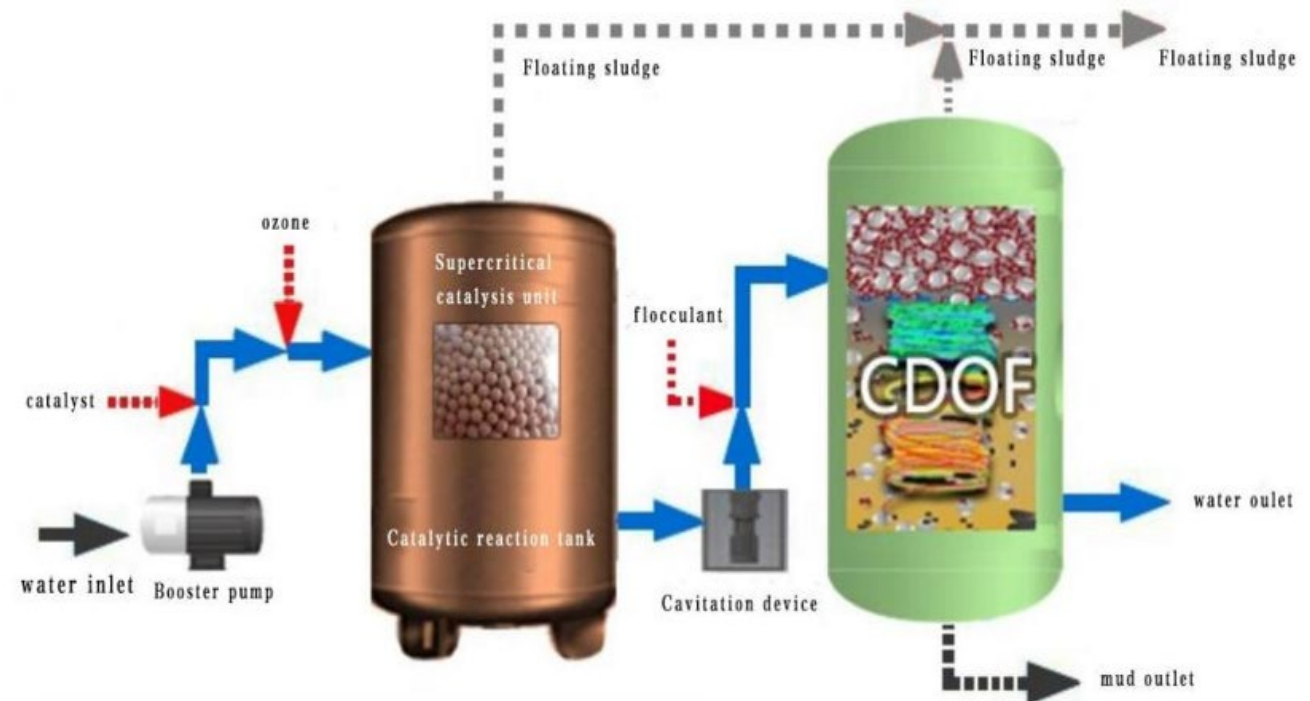


■ Wastewater Treatment Technology

➤ Technical Characteristics of Cyclonic Dissolved Ozone Flotation (CDOF)

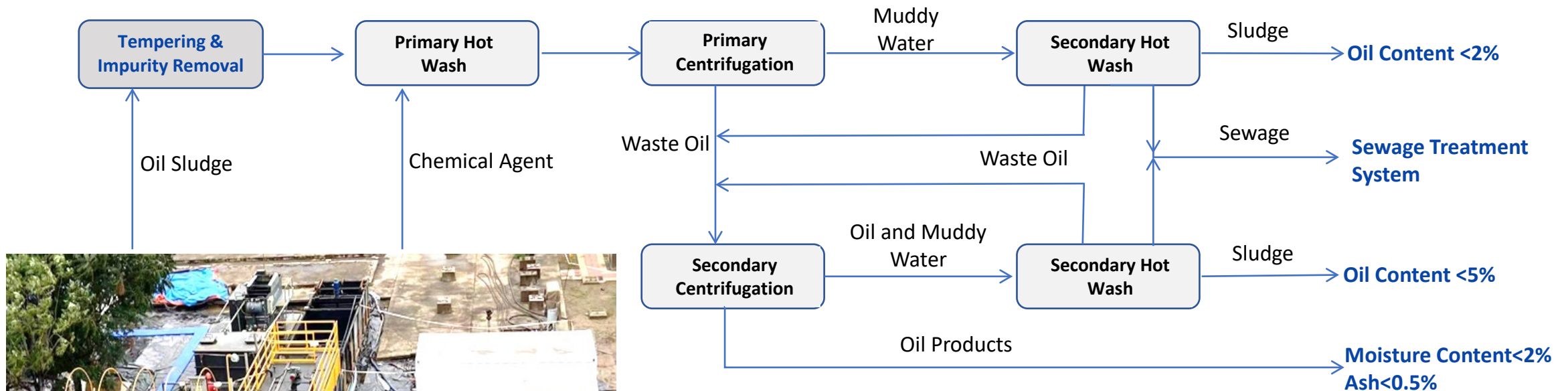
Organic combination of CDFU technology and ozone advanced (catalytic) oxidation technology mainly integrates the following technologies:

- ✓ Cyclonic technology
- ✓ Flotation technology
- ✓ Ozone catalytic oxidation technology
- ✓ Supercritical catalytic technology
- ✓ High efficiency flocculation technology



■ Waste Oil Sludge Treatment Technology

Chemical Hot Washing Technology



➤ Application Scenario

- Oily waste treatment center, oil refinery.
- Tank cleaning sludge, aged oil, and oil-based mud.
- Reduction and detoxification of oil sludge with high water content.

■ Advantages of Chemical Hot Washing Technology

➤ Strong Universality

suitable for various types of oil sludge with high water content and high oil content.

➤ Remarkable Effectiveness

oil recovery rate > 95%, oil high ash and water content < 1%; Solid moisture content < 10%, oil content < 2%.

➤ High-Efficiency and Energy-Saving

low-pressure drive, high-efficiency centrifugal separation.

➤ Proprietary Agent: unique weakly alkaline agent compound formula.



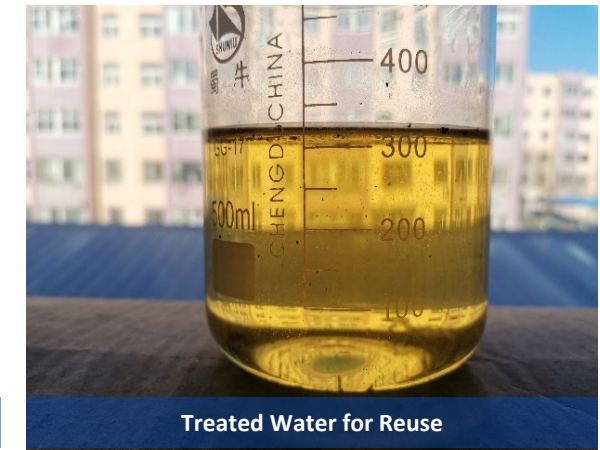
Dross Oil Sludge Pit of Oilfield C



Residue After Chemical Hot Washing



Mud Washing Effluent Generated from Hot Washing



Treated Water for Reuse

■ Associated Gas Recovery Technology

It includes three technologies: casing gas (tank-top gas) recovery, wellsite power generation, and harmless combustion.

➤ Casing Gas Recovery Technology

The twin-screw compressor is used to recover and utilize oilfield associated gas (oil well casing gas and large tank gas).



➤ Harmless Combustion Technology

- The metal-fiber flat-flame burner allows the direct discharge of flue gas after combustion.
- It is mainly applied at lowgasyield well sites where free venting is prohibited.



➤ Associated Gas Power Generation Technology

- The wellhead casing gas is used to generate 400V power for the pumping unit and the well pad.
- Waste heat from jacket water and flue gas is recovered to heat multifunctional tanks and water-jacket furnaces.

- **Process Flow:** Chemical hot washing + agent-assisted cryogenic separation

Petroleum Industry Well Inflow Fluid Quality Inspection Center

Inspection Results Report

[illegible]

Petroleum Industry Well Inflow Fluid Quality Inspection Center

Inspection Results Report

[illegible]

- **Treatment Objects:** Dross oil sludge, tank-cleaning sludge, and aged oil
- **Treatment Highlights:** Residue oil content on a dry basis < 2%, recovered oil ash content < 1%

- **Equipment Scope:** Skid-mounted 4 x 40ft standard containers, 20,000 t/y chemical hot-washing system

■ Typical Case II Sewage Treatment Project of an Oilfield in Western China

- **Year:** 2018
- **Inlet Sewage Oil Content:** $\leq 1,000$ ppm, $ss \leq 500$ ppm



Effect Under Normal Working Condition

Effect Under Impact Conditions



Inlet Water

Primary Effluent

Secondary Effluent

Inlet Water

Effluent

Treatment Capacity: 2,400m³/day

Processing Equipment: Two-Stage CDFU

Treated Water: ≤ 10 ppm, $ss \leq 10$ ppm

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■ Oil and Gas Well Site Separation Technology

➤ Main Application Scenarios

- 1) Exploration wells without surface gathering and transmission facilities during oil and gas testing;
- 2) Oil and gas wells with incomplete surface pipe networks;
- 3) Remote wells and scattered wells without plans for surface pipeline construction.

Multifunctional Oil Collector

Provides gas storage, gas-liquid separation, direct metering, self-heating, pressure-driven automatic loading and other functions.



Quantitative Loading Control System

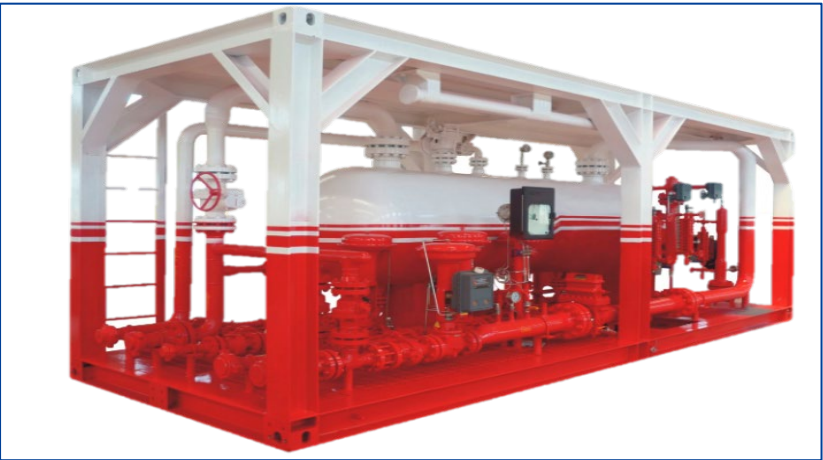
Enables automatic crude oil metering, anti-static and spill prevention, quantitative loading, and safety interlock.



Oil and Gas Well Site Separation Technology

Three-phase Separator

Skid-mounted device with highly automated and independent operation. Capable of separating and metering oil, gas and water phases.



Shell Diameter	800 mm	Shell Length	3200mm
Working Pressure	2175 psi	Liquid Handling Capacity	Liquid volume 200 m³/day
Gas Processing Capacity	Gas volume: 300, 000 m³/day	Applicable Environment	Standard or H2S-containing oil, gas and water

Cyclone Desander

Installed upstream or downstream of the wellhead manifold. Removes sand from wellhead fluid, reducing damage to downstream equipment.



Diameter	3-1/16"	Operation Temperature	-29°C ambient minimum temperature 121°C maximum fluid temperature
Gas Handling Capacity	0-150×10⁴ m³/d	Applicable Environment	Standard or H2S-containing oil and gas water
Working Pressure	10,000 psi	Connection Port	3"FIG1502

Note: The equipment is designed for specific conditions. We offer customized solutions based on the client’s oil and gas well conditions.

■ Oil and Gas Mixed Transportation Technology

➤ Application Scenario

Oil and gas wells with mature gathering and transmission pipeline networks, addressing issues of mixed oil and gas transportation and pressurized drainage.

➤ For Gas-Bearing Oil Wells

Reduces wellhead backpressure, increases oil and gas production, and minimizes wear on downhole rod pumps.

➤ For Gas Wells

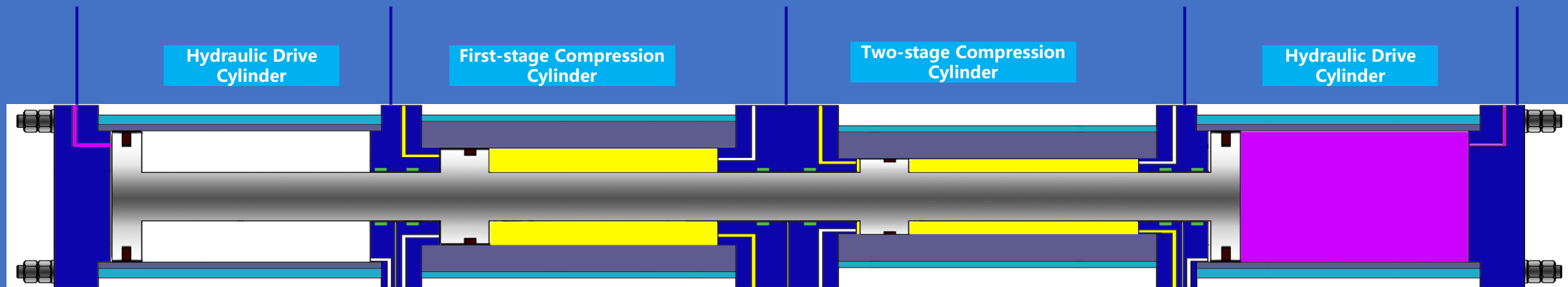
Solves issues such as well shut-in, flooding, and gas lock.



■ Oil and Gas Mixed Transportation Technology

➤ Working Principle

- The hydraulic oil provided by the hydraulic pump enters the hydraulic cylinder to push the piston to reciprocate.
- The gas-liquid mixture produced by the oil and gas well is pressurized step by step after entering the hydraulic cylinder and output.



➤ Technical Advantages

- Unlike conventional liquid injection pumps and gas boosters, the liquid-driven compressor is suitable for gas-liquid mixed transport and pressurization, significantly improving delivery efficiency.
- Compared with conventional plunger pumps, it is capable of handling higher pressure operating conditions.
- The compressor features high cost performance, low maintenance cost, energy and power saving and highly automated.

■ Typical Case: Shanxi XX Natural Gas Mixed Transmission Project



Quantity: 4 sets
Location: Shanxi, China
Start of Production: 2023
Cumulative Production: 8 months
Accumulated Output: 40 million m³ of natural gas

- Implementation Effect
- ✓ Compared with the conventional compressor equipment, the failure rate **decreased by 10%**
 - ✓ Energy-saving and power-saving with higher efficiency, boosting **overall benefits by about 20%**.

Oil & Gas Mixed Transmission Equipment

Compressor	CMP-3.5(0.5-2)-115+115-GL/L
Power	230KW Electric Motor
Inlet Pressure	0.5 - 2 MPa
Discharge Pressure	3.5 MPa
Design Capacity	50000 Nm ³ /d
Compressor Stages	First-stage/Two-stage Compression
Skid Dimensions (Excluding Trailer)	8500 x 2400 x 2300mm
Weight	8.5 t
Applicable Site	Shanxi

Customer Success, Co-Creation and Shared Growth

Shandong Kerui Petroleum Technology Co., Ltd.

