


海默科技（集团）股份有限公司
Haimo Technologies Group Corp.
西安思坦油气工程服务有限公司
Xi'an Sitan Oil and Gas Engineering Services Co., Ltd.



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**Xi'an Sitan Oil and Gas
Engineering Services Co., Ltd.**
西安思坦油气工程服务有限公司

Group Profile

Haimo Technologies Group Co., Ltd. is a multinational company dedicated to providing innovative technologies, products, and services for oilfield production enhancement, production optimization, and oil and gas reservoir management. We offer comprehensive solutions for the digital transformation of oilfields and related industries. Founded in 1994 and restructured into a joint-stock company in 2000, Haimo was listed on the Growth Enterprise Market of the Shenzhen Stock Exchange in May 2010 (stock abbreviation: Haimo Technologies, stock code: 300084).

As a member of Shanghai New Energy Holding Group, Haimo has 17 wholly-owned subsidiaries and 6 holding subsidiaries domestically and internationally, with nearly a thousand employees conducting business worldwide. The Haimo Research Institute is responsible for the company's technology development, high-end talent training, technology introduction and absorption, and the conversion of scientific and technological achievements, providing technical support for various business segments. Our products and services are sold to many countries in regions such as the Middle East, North Africa, Central Asia, South Asia, Southeast Asia, North America, and South America.

Focusing on niche segments within the oil and gas industry, Haimo is an international leader in multiphase metering and production optimization solutions for oilfields, the only domestic manufacturer of subsea multiphase flow meters, a manufacturer with core competitiveness in hydraulic ends of fracturing pumps, a leading domestic manufacturer of downhole measurement/testing tools and production enhancement instruments, and a technological leader in the digitalization of oilfields in China.

Since its establishment, Haimo has adhered to the path of "independent research and development, Made in China," holding a series of independent intellectual property rights in multiphase flow metering, intelligent completion, logging, and hydraulic ends of fracturing pumps. Over 130 of our R&D personnel hold bachelor's degrees or higher, with rich experience in electromechanical design, nuclear physics, mathematics, mechanics, petroleum engineering, and mechanical engineering.

Haimo has a high-quality, professional, and capable marketing and after-sales team, with 8 overseas branches or offices and 17 domestic offices, providing timely and attentive service to our customers.

Leveraging the resource advantages of Shanghai New Energy Holding Group, Haimo will continue to deepen its focus on the oilfield sector, actively explore the integration of new energy with oilfield equipment applications and strengthen the development and utilization of new energy. We aim to advance the integration of oilfield and new energy businesses, promoting diversification and continuously enhancing our comprehensive energy supply capability and green, low-carbon development level.



30

+30 years of experience in the oil and gas industry



17

Wholly-owned subsidiary companies



6

Holding subsidiaries



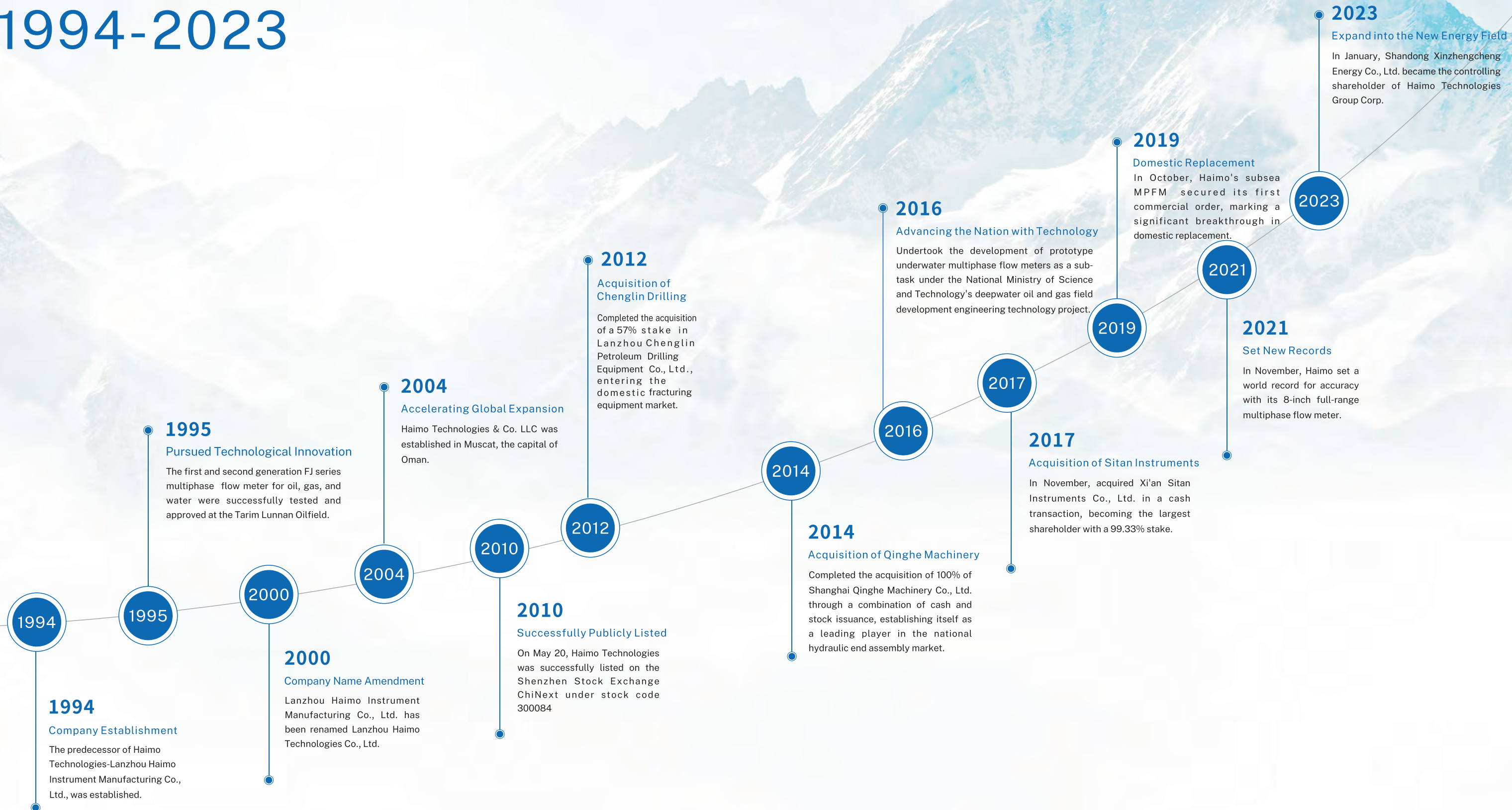
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Offices in China & overseas



Development History

1994-2023



HEART- DISTANCE SERVICE CREDIT OFFER

服务零距离 诚信心奉献

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OVERVIEW	QUALIFICATION	SERVICE ITEMS



Company Profile

公司简介

Xi'an Sitan Oil and Gas Engineering Services Co., Ltd. was established in 2014 and has 190 employees. It is a subsidiary of the Oilfield Services Business Unit of HAIMO. Xi'an Sitan Oil and Gas Engineering Services Co., Ltd. relies on the advanced instruments and technical advantages of the Instrument Company to provide high-quality solutions for oil and gas development.

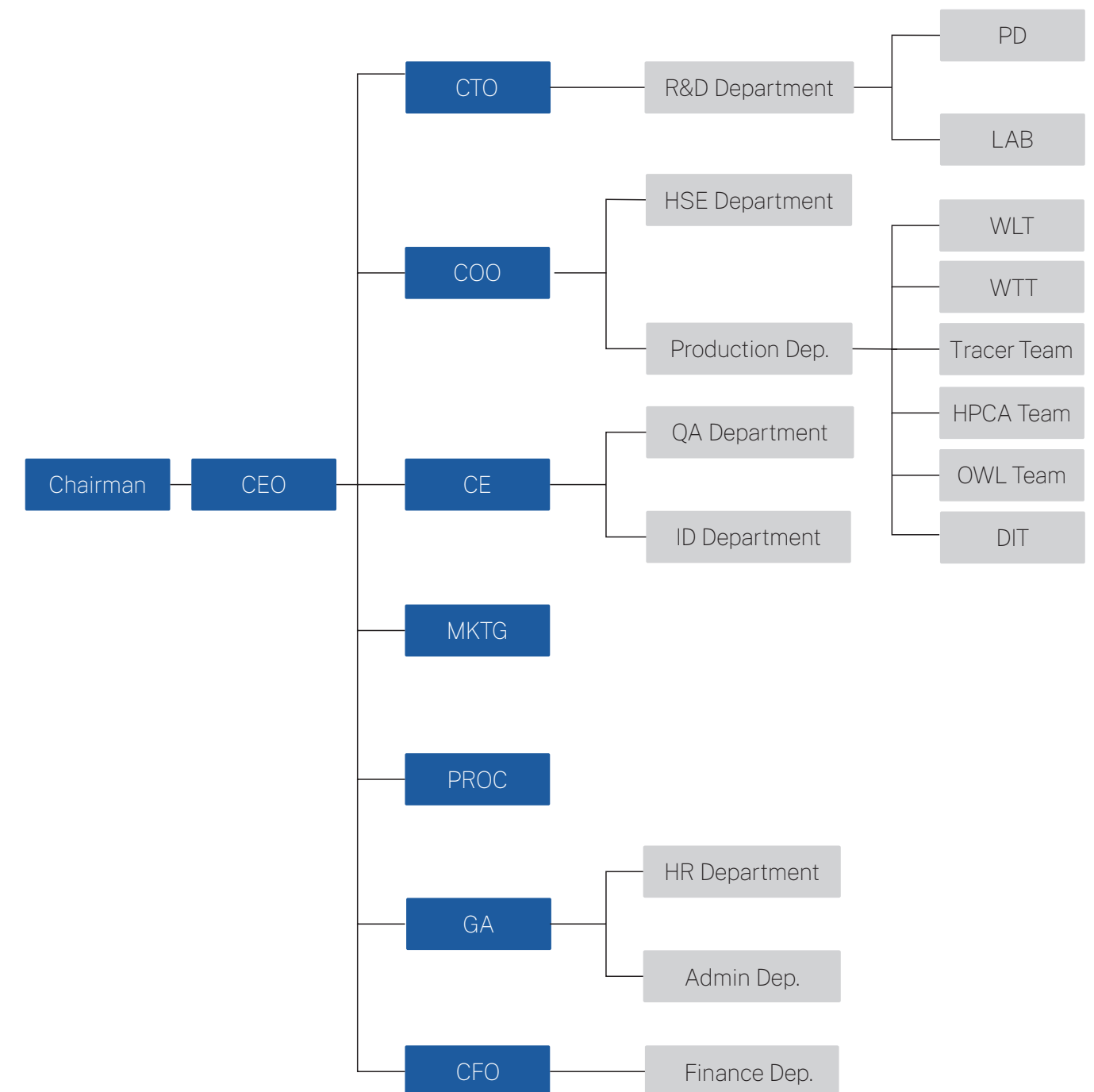
It mainly engages in oil and gas logging, well testing services, interpretation of oil and gas test data, quantitative tracer water-based horizontal well segmentation fracturing effect evaluation, integrated evaluation of oil and gas regions, fracturing fluid flowback resource and harmless treatment, oil and gas environmental management, and other technical services. It can also provide materials supply for specialized engineering vehicles, oilfield instrument equipment leasing, and related services.

Awarded as a "High-Tech Enterprise" by Shaanxi Province for its advanced technology.



Organization

组织架构



Company Culture

企业文化

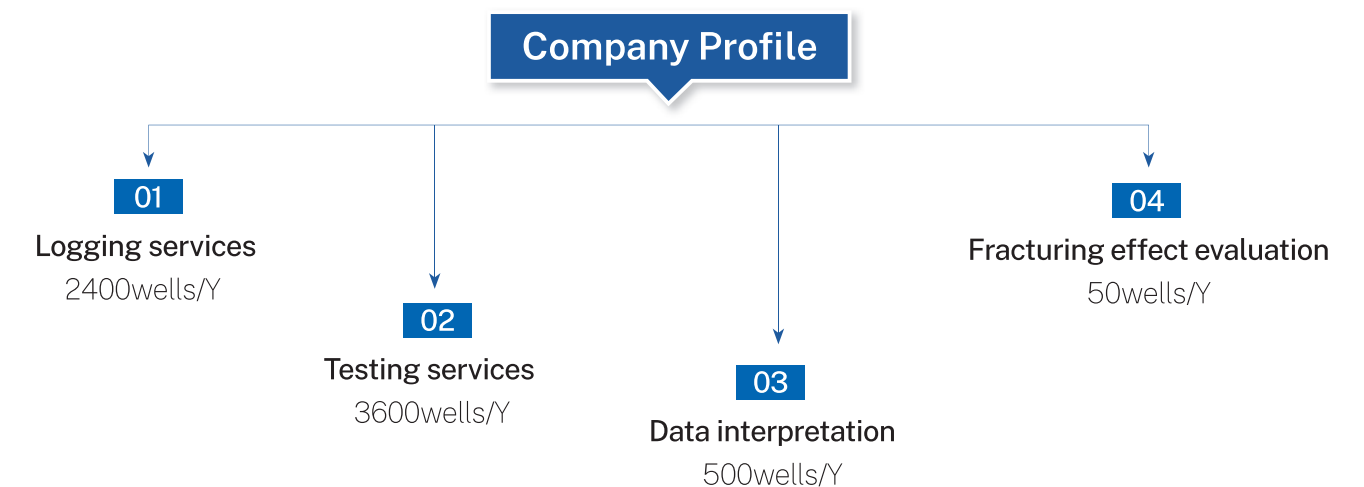


Company Profile

公司实力

The company has a service team of 30 units, including 11 units for production and engineering logging services, 18 units for well testing services, 2 units for tracer monitoring services, 1 unit for oil-water well sampling, and 3 units for open hole logging team.

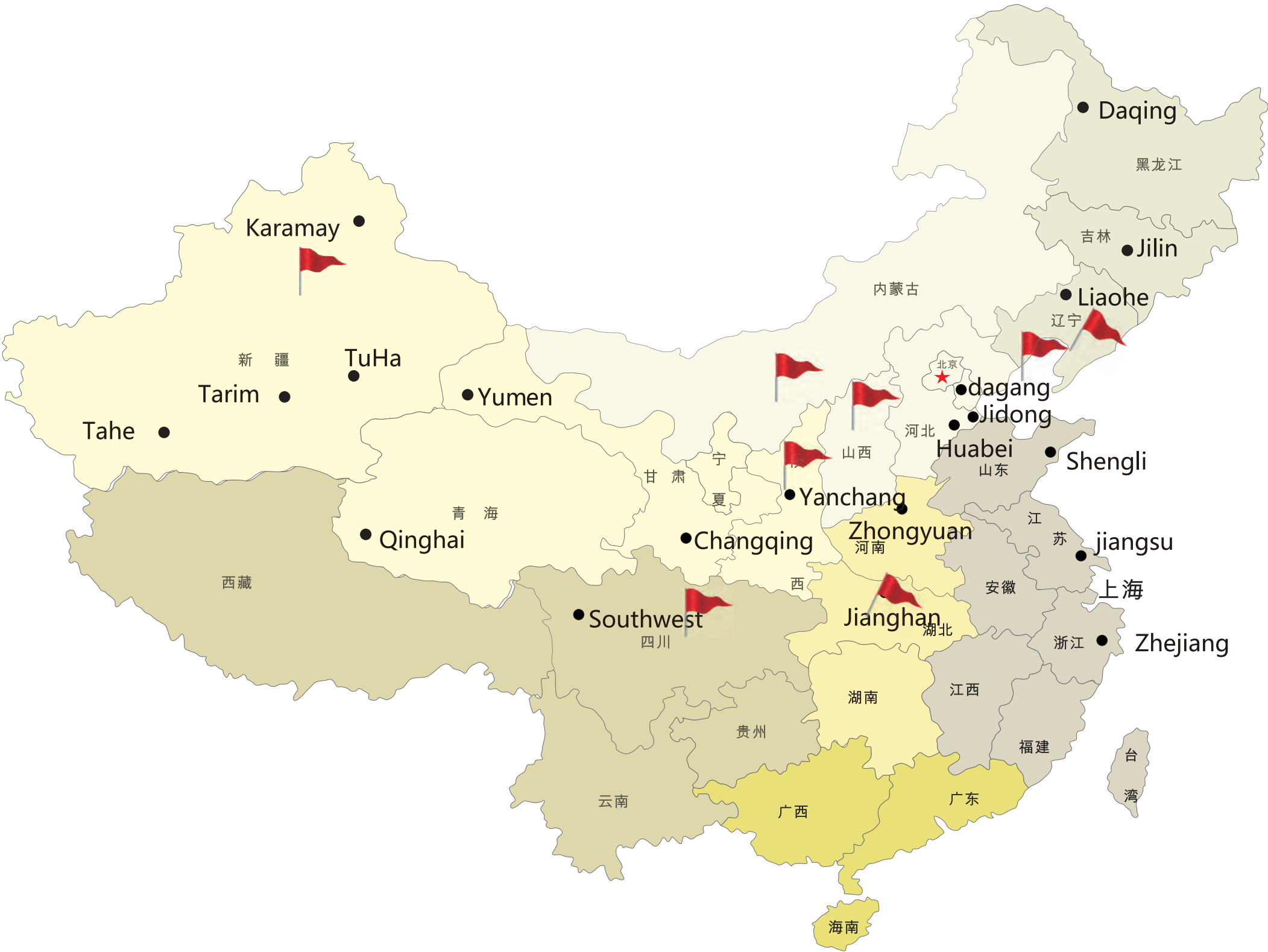
The company is equipped with 8 units of specialized logging trucks, 18 units of specialized well testing trucks, 4 units of specialized hoisting trucks, 13 units of pickup trucks, and has sufficient testing well instruments, safety equipment, and supporting tools.



Business

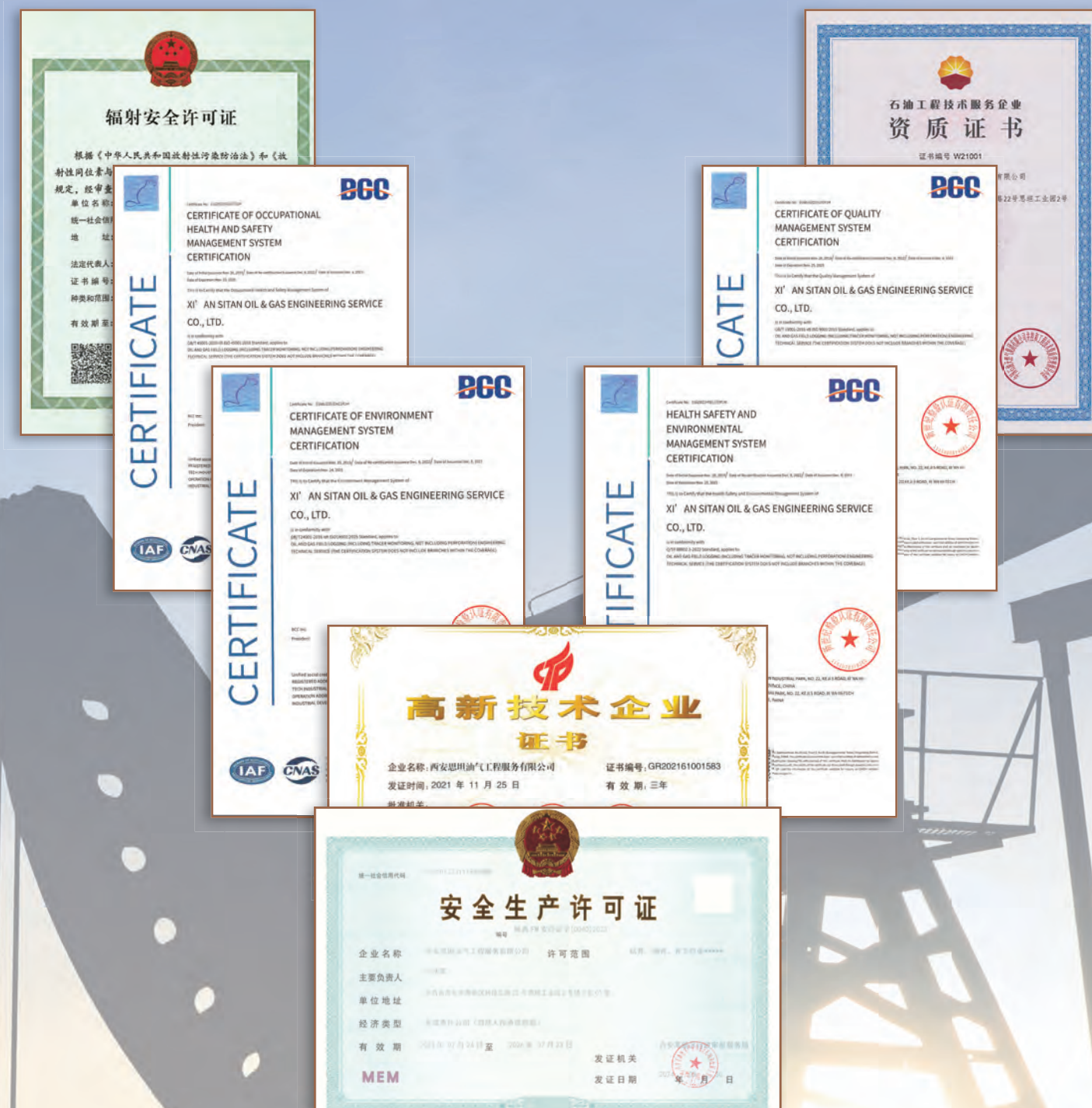
市场分布

	Company business distribution
1	Changqing Oilfield
2	Dagang Oilfield
3	Jidong Oilfield
4	North China Oilfield
5	Qinghai Oilfield
6	Xinjiang Oilfield
7	The CNOOC Market
8	Erlianhot Oilfield
9	Southwest Oil&Gasfield
10	Shanxi CBM



Certifications

资质证书



Patents

专利证书



Service Items

服务项目

01

Well Logging

- | | |
|---------------------------------|--|
| 19 / Open Hole Logging | 23 / Injection Profile Logging |
| 30 / Production Profile Logging | 34 / Cased Hole Logging |
| 43 / Remaining Oil Logging | 48 / Tracer Cross-Well Monitoring Technology |

02

Well test service

- | | |
|---|--------------------------------------|
| 51 / Well test technical service | 54 / Water well deployment service |
| 58 / Analysis test | 60 / High-pressure physical sampling |
| 61 / Oil and gas well echo liquid level detection | |

03

Other services

- 62 / Data interpretation
- 66 / Quantum dot tracerr
- 68 / Online monitoring service for carbon dioxide
- 70 / SmartFrac flowback manager
- 72 / Fracturing backflow treatment
- 74 / Produced water treatment

Heart- distance Service Credit Offer



LOGGING SERVICE 测井服务

— 01 — Open Hole Logging

- Conventional well logging
- projectSpecial well logging project

— 02 — Injection Profile Logging

- Isotopic Injection Profile Logging
- Related Flow Rate Fine Injection Profile Logging
- Pulsed Neutron Oxygen Activation Logging

— 03 — Production Profile Logging

- Annular Fluid Production Profile Logging Technology
- Gas Production Profile Logging Technology

— 04 — Engineering Logging

- Casing Imaging Logging
- Multi-Arm Wellbore Caliper Imaging Logging Technology
- Electromagnetic Inspection Logging Technology
- Cement Bond Log (CBL)Logging Technology
- Gyroscopic Logging Technology
- Electromagnetic Thickness Logging Technology

— 05 — Remaining Oil Logging

- Hydrocarbon Ratio Logging Technology
- Neutron Lifetime Logging Technology
- Pulsed Neutron-Neutron Porosity Neutron (PNN) Logging Technology
- Through Casing Resistivity Logging Technology

— 06 — Tracer Interwell Monitoring Technology

Open Hole Loggin 裸眼井测井

SCOPE OF APPLICATION 适用范围

The ST9000 imaging logging system is mainly used for open hole and cased hole logging services, integrating advanced digital data acquisition system, multitasking computer processing, and imaging technology. This greatly enhances the safety and reliability



Depth Sensor



ST9000 - Surface Winch Face Plate



ST9000 Surface Depth Sensor Logging System

ADVANTAGES 技术优势

- Good interchangeability, this system is fully compatible with the ECLIPS-5700 logging system in terms of communication protocols, measurement accuracy, mechanical interfaces, and software operability. Any downhole tool corresponding to the ECLIPS-5700 system can be completely interchangeable, surpassing or meeting the performance of the 5700 instrument.
- The downhole tool joints and circuit housings are made of titanium alloy, and the threaded connections are made of aluminum bronze, making the instrument lightweight and non-sticky, reducing work intensity.
- The instrument has been shortened by 5.06 meters, which improves safety.
- All use of 296°C solder has improved the reliability of the instrument.
- The product is designed for bare frame 175°C , pressure-resistant design, with an instrument pressure resistance of 140MPa, allowing the instrument to work underground for a long time. It is

more suitable for horizontal wells and long-term continuous logging operations than the original ECLIPS-5700 logging instrument.

- It has a variety of products with different specifications including $\Phi 70$ small diameter, $\Phi 89$ -175°C , $\Phi 89$ -200°C -170MPa.

SYSTEM COMPOSITION

系统组成

ST9000 Complete Imaging Logging System	ST9000 Surface Equipment	Surface System	Surface Data Acquisition System
			Winch Face Plate
			Depth Sensor
	Detection System	Detection System	Surface Detection System
			Resistivity Tester
	ST9000 Downhole Equipment	Conventional Instrument Series	Telemetry, Inclination and Directional Integrated Instrument
			Natural Gamma Ray Spectroscopy Logging Tool
			Continuous Inclinerometer Circuit
			Digital Sonic General-Purpose Electronic Short Tool
			High-Resolution Digital Sonic Logging Tool
			Compensated Neutron Logging Tool
			Formation Density Logging Tool
			Conversion Short Tool
			Dual Laterolog Logging Tool
			Micro-Spherical Caliper Logging Tool
			Constant Power Dual Laterolog Logging Tool
		Imaging Instrument Series	High-Resolution Array Induction Logging Tool
			Cross-Dipole Array Sonic Logging Tool
			Four-Arm Caliper Logging Tool
			Flexible Short Tool
			Insulated Short Tool
			Magnetic Casing Collar Locator (CCL)
			Orienting Tool
			Three Parameters Logging Tool
			Rotating Short Tool

Imaging System



Portable ST9000-DJ Surface
Detection System



Resistivity Tester



DZD-2 Surface Detection System

Conventional Instruments



Natural Gamma Ray Spectroscopy Logging Tool



High-Resolution Digital Sonic Logging Tool



Digital Sonic General-Purpose Electronic Short Tool



Dual Laterolog Logging Tool



Formation Density Logging Tool



Continuous Inclinerometer Circuit



Micro-Spherical Caliper Logging Tool



Conversion Short Tool



Flexible Short Tool



Magnetic Casing Collar Locator (CCL) Short Tool



Telemetry, Inclination and Directional Integrated Instrument



Orienting Tool



Insulated Short Tool



Dual Laterolog Logging Tool



Compensated Neutron Logging Tool



Three Parameters Logging Tool



Rotating Short Tool



Four-Arm Caliper Logging Tool



Constant Power Dual Laterolog Logging Tool

Conventional Instruments



Cross-Dipole Array Sonic Logging Tool



Cross-Dipole Array Sonic Logging Tool



Cross-Dipole Array Sonic Logging Tool



High-Resolution Array Induction Logging Tool



Injection Profile Logging

注入剖面测井

- Isotope Injection Profile
- Related Fine Flow Injection Profile
- Pulsed Neutron Oxygen Activation Logging



Isotope Water Absorption Profile



SCOPE OF APPLICATION

适用范围

Suitable for conventional water injection and layered water injection wells. Logging data can quantitatively determine the water absorption characteristics of each layer in the water injection well, inspect external corrosion in oil-water wells, assess the effectiveness of well plugging and fracturing in production wells, interpret interlayer and intralayer reservoir characteristics, and provide a basis for adjusting water injection in each layer.



ADVANTAGES AND DISADVANTAGES

优缺点

Advantages and disadvantages	
Advantages	The most commonly used logging method at present,mature technology, low cost.
Disadvantages	<ul style="list-style-type: none"> • Serious scaling and fouling on the wellbore wall requires effective correction. • In the case of large borehole phenomena in the formation, the interpretation results may not be obvious.
	<ul style="list-style-type: none"> • For polymer injection wells, the interpretation results are not obvious for liquid with high viscosity and low velocity.

PARAMETERS

测量参数

Magnetic positioning, gamma ray, pressure, well temperature, and flow rate
(electromagnetic or ultrasonic flow meter)

SPECIFICATIONS

技术指标

Technical specifications	
Technical specifications	26mm、30mm、32mm、38mm
Temperature Resistance	-40~175℃
Pressure Resistance	0~100MPa



Remote Magnetic Positioning Gamma Pressure Temperature Short Tool

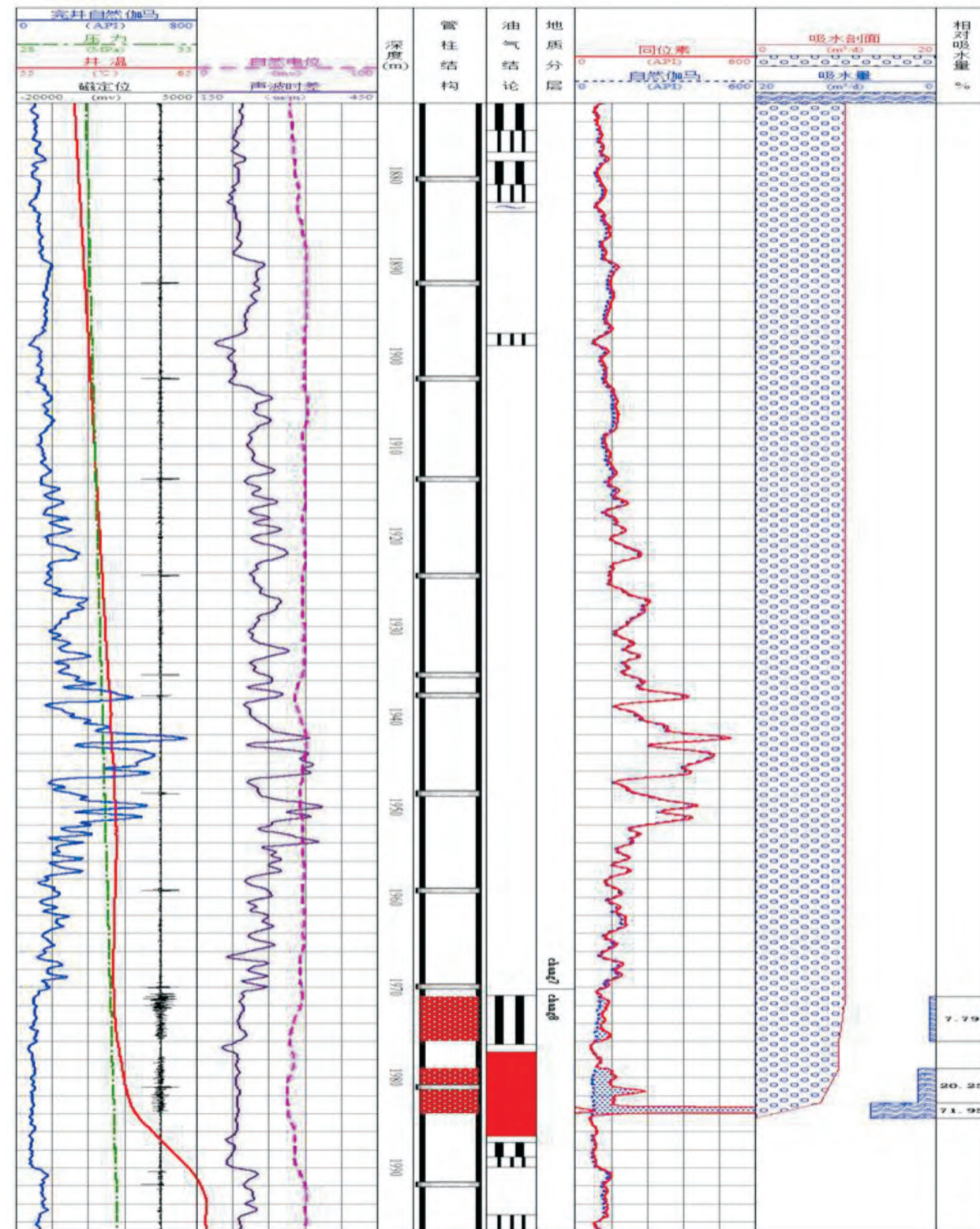


Ultrasonic Flowmeter



Electromagnetic Flowmeter Short Tool

Water Absorption Profile Results Table						
Stratigraphy	Initial Depth	Final Depth	Thickness	Relative Injection Volume	Absolute Injection Volume (m³/d)	Injection Rate (m³/d/m)
chang8	1971.00	1976.00	5.00	7.79	0.78	0.16
chang8	1979.00	1982.81	3.81	20.25	2.03	0.53
chang8	1982.81	1984.50	1.69	71.95	7.20	4.26



2 Related Flow Rate Injection Profile

PRINCIPLE 技术原理

Inject liquid isotopes above the water injection layer or water distributor, and the isotopes flow with the injected water at the same rate. Use a gamma ray logging tool to track the peak of the liquid isotope and simultaneously record the depth where the isotope peak is located and the time between different peaks to obtain the injection water flow rate. By calculation, the injection volume for each layer in the water injection well can be obtained.

SCOPE OF APPLICATION 适用范围

Applicable to conventional water injection with medium to low injection rates and layered water distribution wells.

ADVANTAGES AND DISADVANTAGES 优缺点

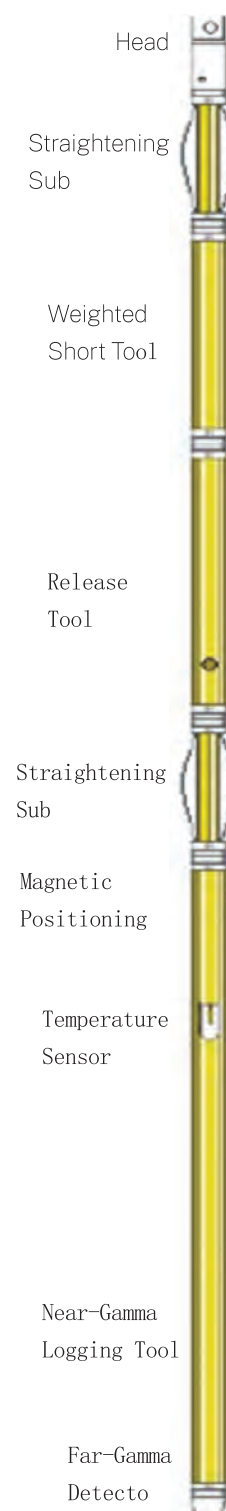
Advantages and disadvantages	
Advantages	The logging results provide absolute water injection volume.
Disadvantages	<ul style="list-style-type: none"> Not suitable for water injection wells with large injection rates; Repeated up and down movement makes it easy to block the water nozzle

PARAMETERS 测量参数

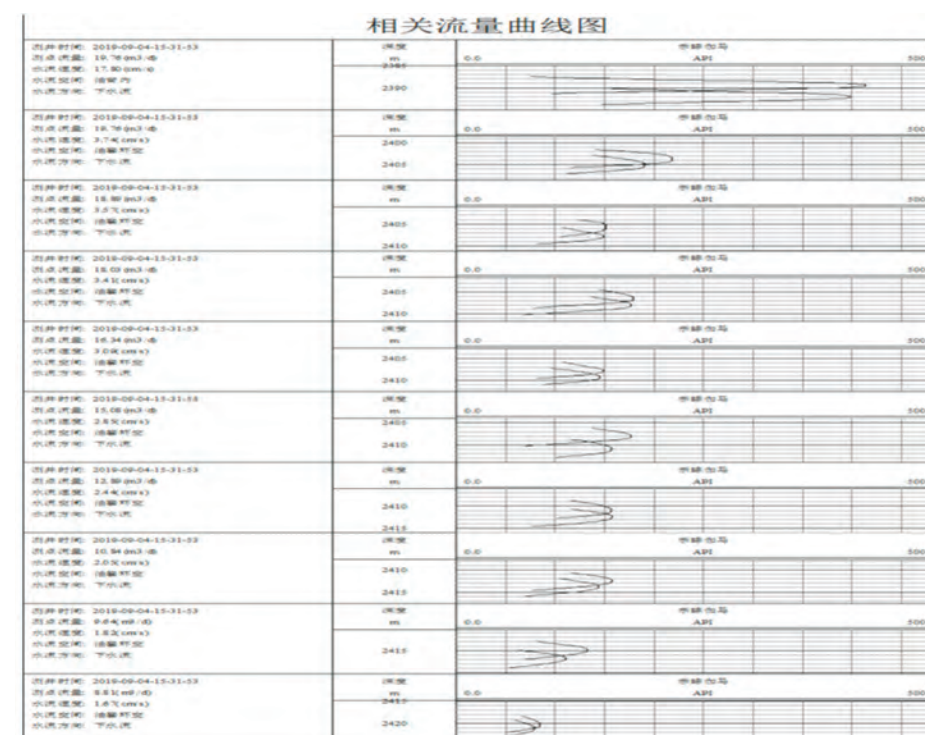
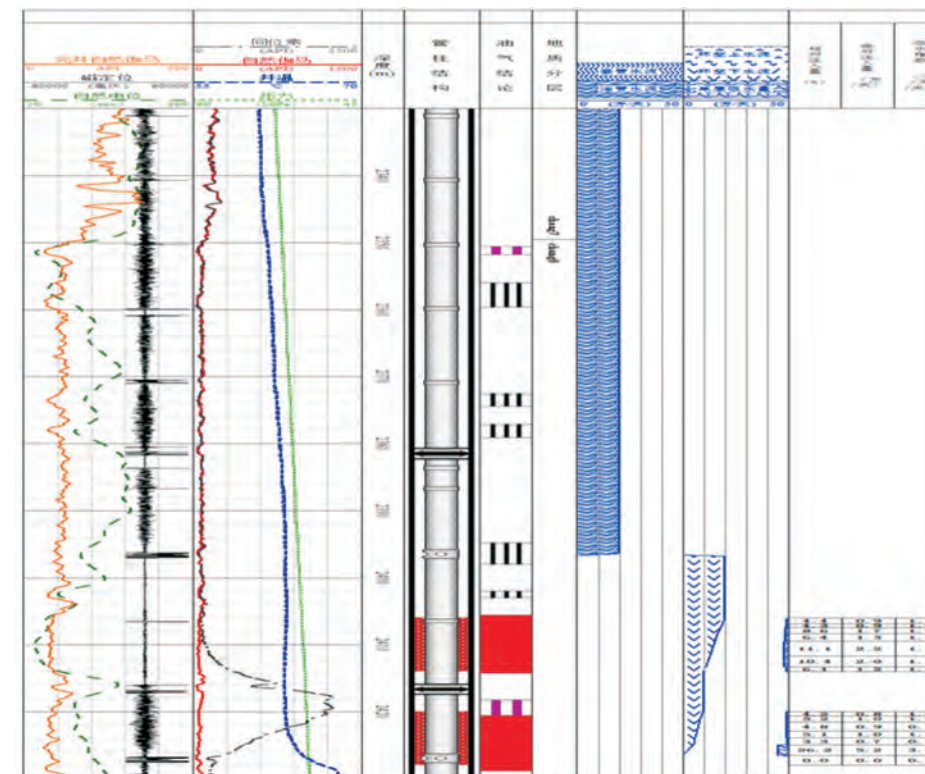
Magnetic positioning, gamma ray, isotope gamma ray, pressure, well temperature, tracer gamma ray

SPECIFICATIONS 技术指标

Technical specifications	
Outer Diameter	26mm、30mm、32mm、38mm
Temperature Resistance	-40~175℃
Pressure Resistance	0~100MPa



RESULT MAP 成果图

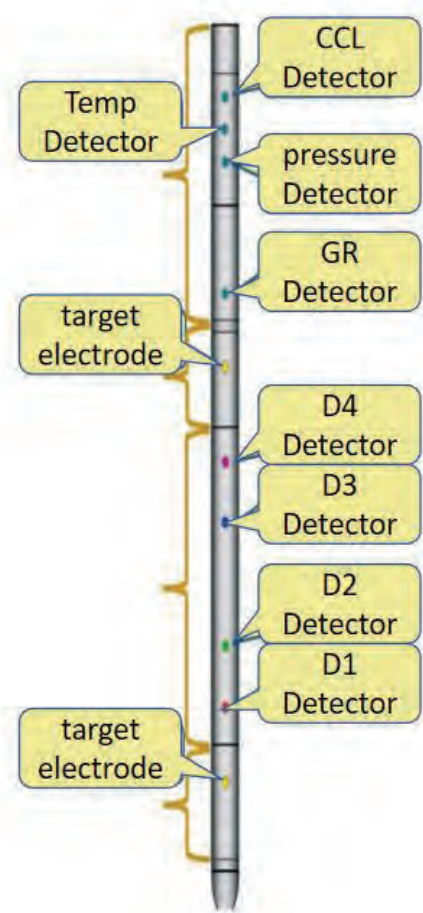


3 Pulsed Neutron Oxygen Activation Injection Profile Logging Technology

PRINCIPLE 技术原理

The neutron generator emits high-energy neutrons that react with the oxygen atoms in the injected water to produce activation. The activated water has a half-life of 7.13 seconds and by measuring the time it takes for the activated water to pass through a gamma ray sensor, the calculated. injection water flow rate at the measurement point can be obtained.

ADVANTAGES AND DISADVANTAGES 优缺点



Advantages and disadvantages	
Advantages	<ul style="list-style-type: none"> • Safe and environmentally friendly, does not use radioactive tracers, no issues with pollution, sedimentation, or contamination; • Not affected by the permeability of the water injection layer, can be applied to large borehole water injection wells; • Not affected by oil, casing, and cement ring, can be used for detecting external corrosion in pipelines.
Disadvantages	<ul style="list-style-type: none"> • High logging costs; • Not suitable for low water injection rate wells.

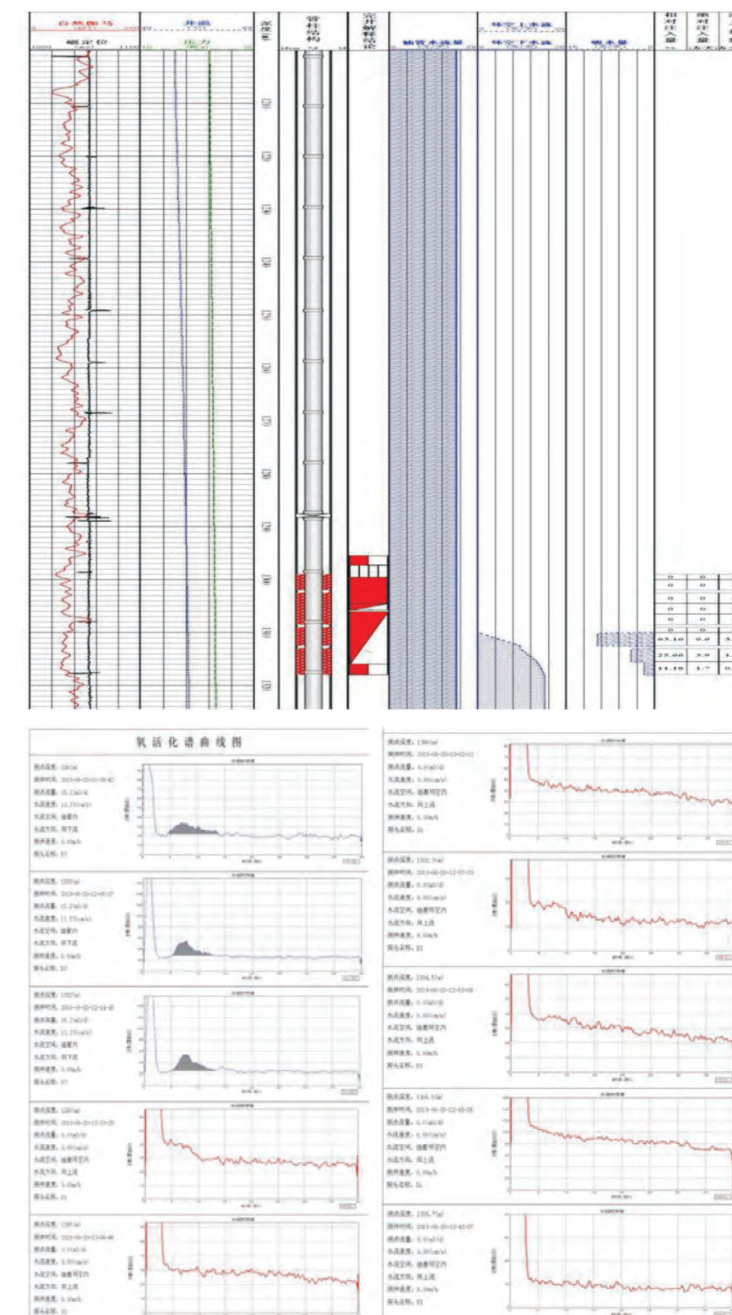
PARAMETERS 测量参数

Pressure, temperature, gamma, magnetic positioning water flow rate.

SPECIFICATIONS 技术指标

Technical specifications	
Outer Diameter	38mm
Temperature Resistance	-40~175℃
Pressure Resistance	0~100MPa

RESULT MAP 成果图





Production Profile Logging

产出剖面测井

- Annular Liquid Production Profile Logging Technology
- Gas Production Profile Logging Technology



Annular Liquid Production Profile Logging Technology



PRINCIPLE

技术原理

Lower logging instruments into the annular space between the tubing and casing, enter the perforated section of the casing, and record parameters such as well temperature, pressure, water cut, and flow rate. By interpreting these data, the liquid production from each layer and the oilwater ratio can be obtained.



SCOPE OF APPLICATION

适用范围

Applicable to beam pump wells with deviated wellbore and no downhole pressure gauge, collar locator, or packer tools.



ADVANTAGES AND DISADVANTAGES

优缺点

Advantages and disadvantages	
Advantages	No need to pull out the tubing string in the well, logging can be carried out in the normal production state, and the data is reliable.
Disadvantages	<ul style="list-style-type: none">• The success rate of wells with a deviation greater than 20 degrees is lower.• Easy to entangle oil tubing, leading to complex engineering processes.



PARAMETERS

测量参数

Magnetic positioning, gamma ray, pressure, well temperature, (umbilical or tracer) flow rate, fluid density, water holdup.



SPECIFICATIONS

技术指标

Technical specifications	
Outer Diameter	23mm、26mm
Temperature Resistance	-40~175℃
Pressure Resistance	0~100MPa

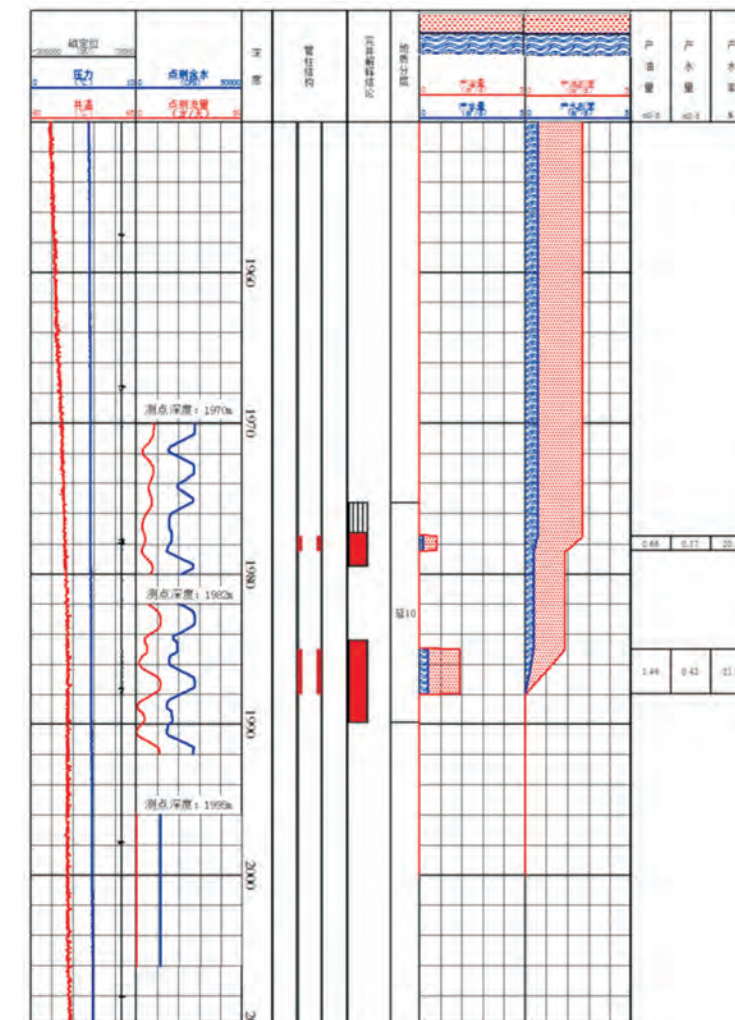


RESULT MAP

成果图

Production Fluid Profile Logging Interpretation Results Table

起始深度 (m)	终止深度 (m)	流温 (℃)	压力 (MPa)	产液量 (m ³ /d)	产油量 (m ³ /d)	产水量 (m ³ /d)	含水率 (%)
1977.5	1978.5	61.72	5.77	0.83	0.66	0.17	20.3
1985.0	1988.0	61.78	5.80	1.91	1.49	0.42	21.8



2 Gas Production Profile Logging Technology

PRINCIPLE 技术原理

Lower the logging tool into the tubing, enter the casing in the perforated interval, and measure parameters such as magnetic positioning, gamma ray, well temperature, pressure, fluid density, water cut, and flow rate. By interpreting the data, parameters such as gas production from each layer and water cut can be obtained.

PARAMETERS 测量参数

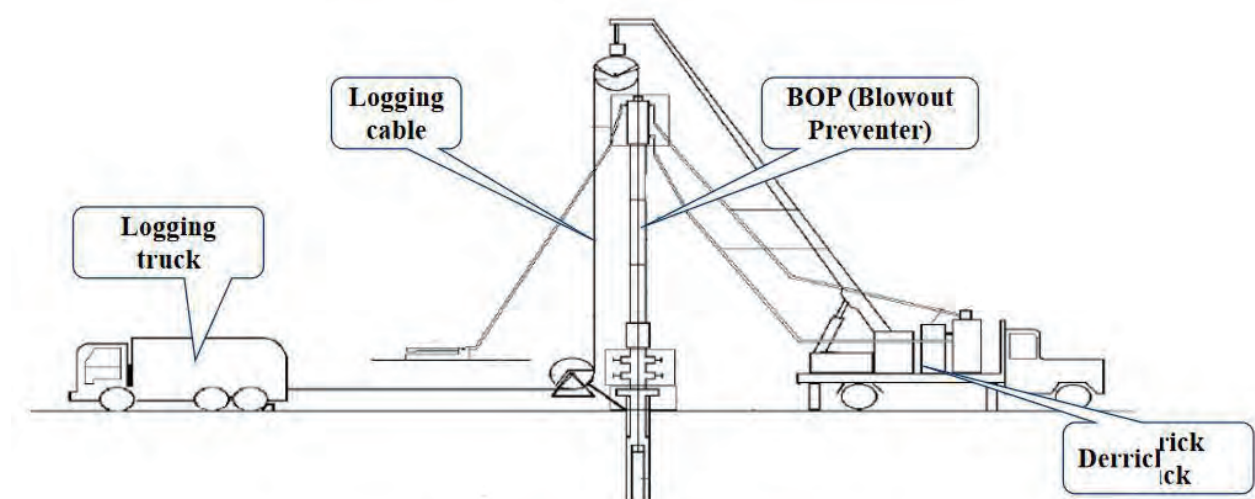
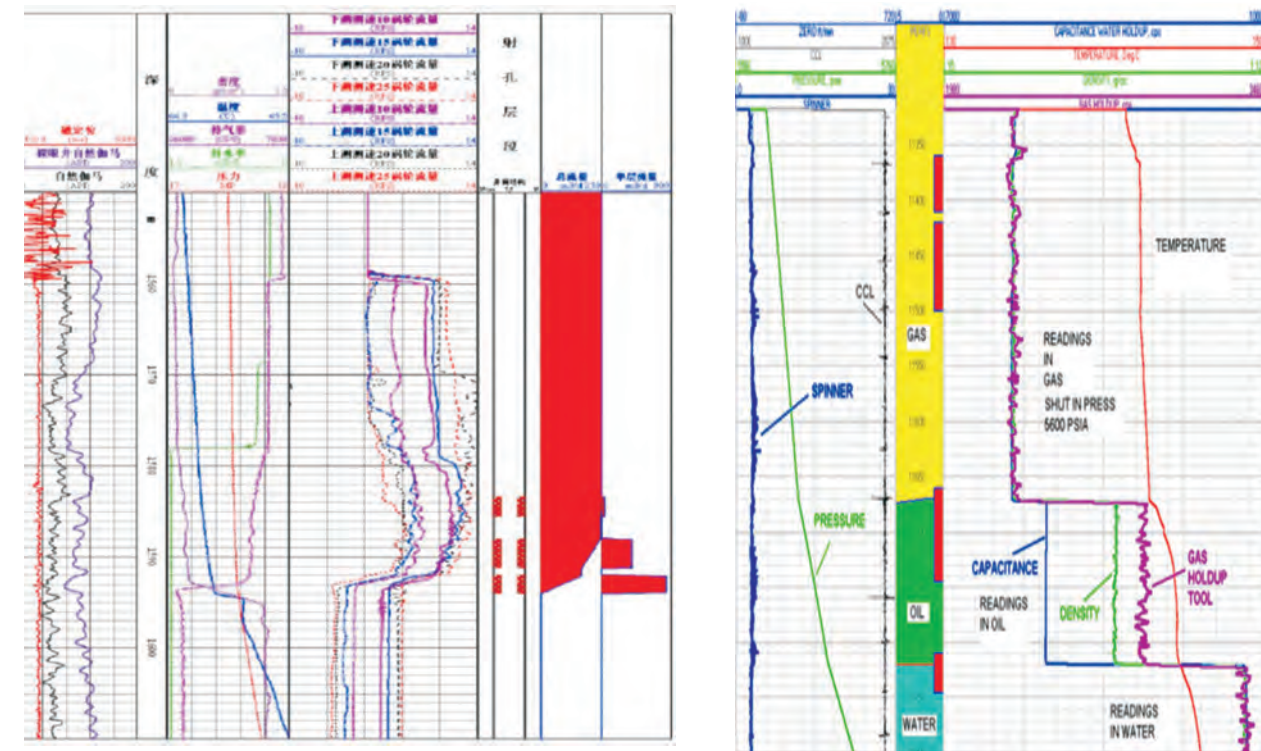
The logging tool consists of CCL, gamma ray, well temperature, pressure, (umbilical or tracer) flow rate, water cut, etc.

SPECIFICATIONS 技术指标

Technical specifications	
Outer Diameter	30~43mm



RESULT MAP 成果图



Schematic diagram of logging operation site



Cased Hole Logging

套管井测井

- Cased Hole Imaging Logging
- Multi-Arm Caliper Imaging Logging Technology
- Electromagnetic Thickness Measurement Logging Technology
- Electromagnetic Flaw Detection Logging Technology
- Gyroscopic Logging Technology
- Cement Bond Logging - CBL
- Cement Bond Logging - RBT



Cased Hole Imaging Logging

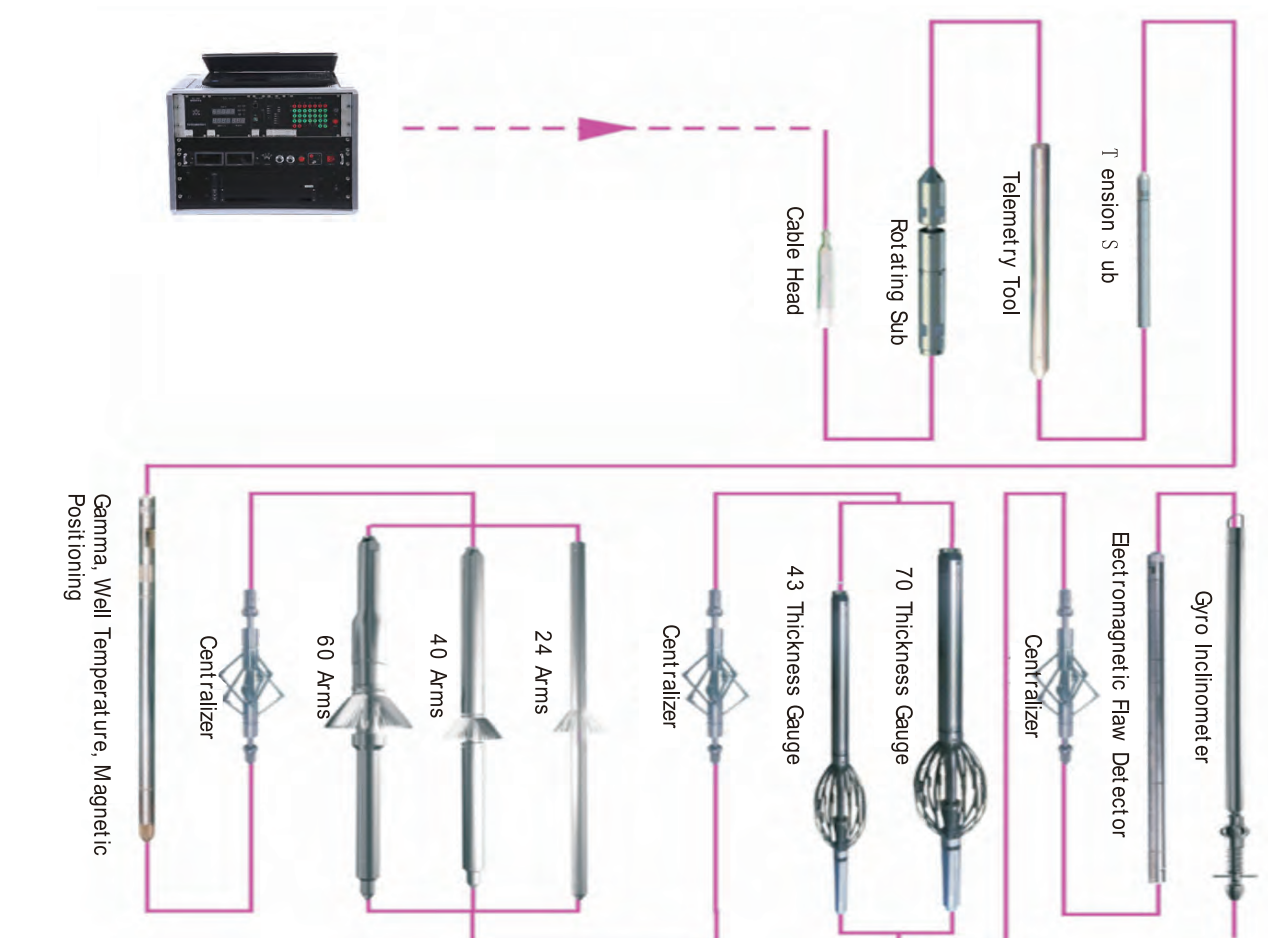


PRINCIPLE

技术原理

Casing Deformation Combination Logging: By going down the well once, the inner diameter, wall thickness, corrosion, cracks, perforations, casing damage location, and formation information can be measured. This method allows for a comprehensive and rapid assessment of the integrity of cased hole wells.

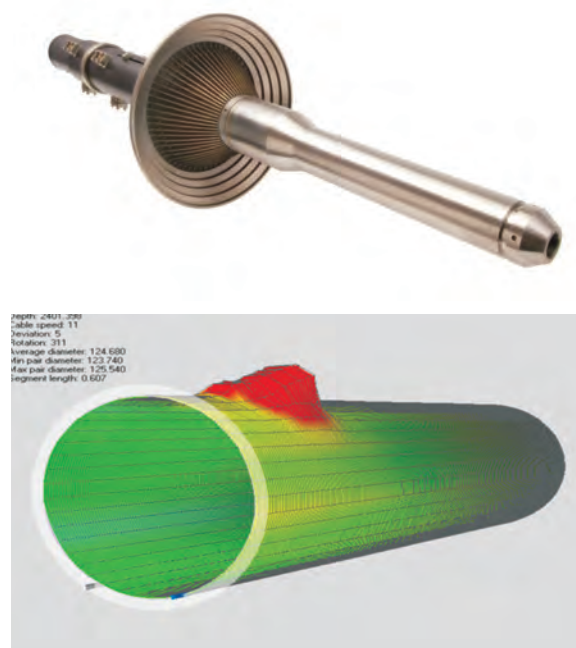
This combination logging tool consists of a multi-arm caliper logging tool, electromagnetic flaw detection logging tool, electromagnetic thickness measurement logging tool, continuous gyro inclinometer, gamma well temperature tool, as well as rotating short circuit, roller centralizer, flexible short section, tension meter, and other components. It can be flexibly combined according to logging requirements.



2 Multi-Arm Caliper Imaging Logging Technology

PRINCIPLE 技术原理

The multi-arm caliper tool uses mechanical probing arms to detect the diameter (radius) inside the casing. By measuring the detected diameter (radius), it can identify casing damages such as twisting, displacement, holes, cracks, and internal wall corrosion.



SCOPE OF APPLICATION 适用范围

Application Range	
24-Arm Caliper Imaging Tool	2-7/8" Tubing
40-Arm Caliper Imaging Tool	5-1/2"-7" Casing
60-Arm Caliper Imaging Tool	5-1/2"-9-5/8" Casing

WELL-LOGGING WAYS 测井方式

Multi-arm caliper imaging logging adopts a combination logging method.	
Combination Method 1	Magnetic Positioning + Well Temperature + Natural Gamma Ray + 40 (60) Arm Caliper Imaging + Electromagnetic Thickness Measurement
Combination Method 2	Magnetic Positioning + Well Temperature + Natural Gamma Ray + 40 (60) Arm Caliper Imaging + Electromagnetic Thickness Measurement 0.75

3 Electromagnetic Thickness Measurement Logging

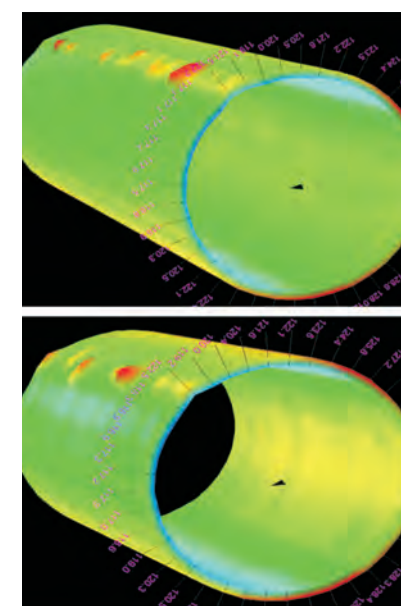
PRINCIPLE 技术原理

The transmitter sub emits an excitation pulse to induce magnetic eddy currents on the casing. When there is a change in casing thickness, the receiver probe detects a corresponding change in induced electromotive force. The casing thickness is obtained by measuring this change in electromotive force.

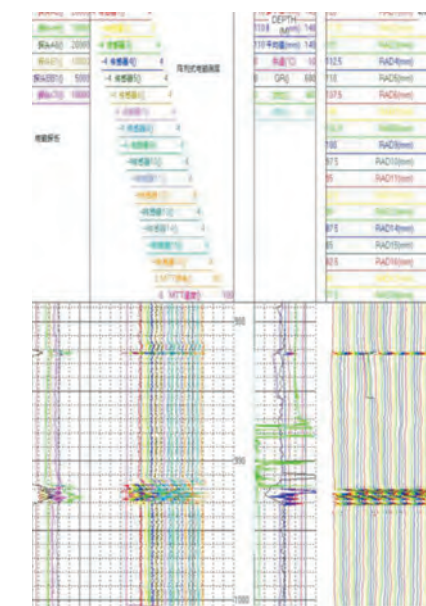


WELL-LOGGING WAYS 测井方式

Electromagnetic Thickness Measurement Logging adopts a combination logging method.	
Combination Method 1	Magnetic Positioning + Well Temperature + Natural Gamma Ray + 40 (60) Arm Caliper Imaging + Electromagnetic Thickness Measurement
Combination Method 2	Magnetic Positioning + Well Temperature + Natural Gamma Ray + 24-Arm Caliper Imaging + Electromagnetic Flaw Detection



Electromagnetic Thickness Measurement Logging Technology Results Chart

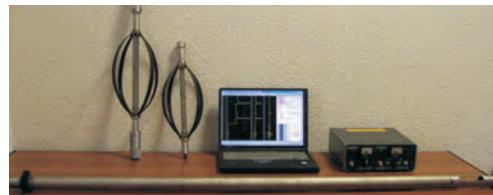


Electromagnetic Thickness Measurement Logging Curve

4 Electromagnetic Flaw Detection Logging Technology

PRINCIPLE 技术原理

Electromagnetic flaw detection belongs to the magnetic logging series and is a typical method of leakage magnetic flux measurement, based on the theory of electromagnetic induction. In a dual-layer pipe structure, the induced electromotive force (ϵ) has a function expression as follows: $\epsilon = f(T_1, T_2, \mu_1, \mu_2, \sigma_1, \sigma_2, D_1, D_2, t_c, EX)$

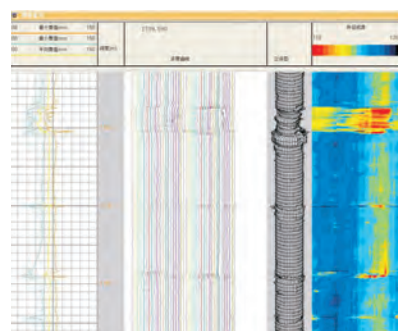


ADVANTAGES AND DISADVANTAGES 优缺点

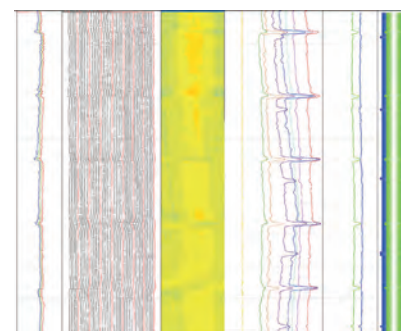
Advantages and Disadvantages	
Asvantage	Multi-Layer Pipe Logging is possible.
Disadvantage	As the number of pipe layers increases, the measurement accuracy decreases.

WELL-LOGGING WAYS 测井方式

Electromagnetic Flaw Detection Logging adopts a combination logging method.	
Combination Method 1	Magnetic Positioning + Well Temperature + Natural Gamma Ray + 40(60) Arm Caliper Imaging + Electromagnetic Thickness Measurement
Combination Method 2	Magnetic Positioning + Well Temperature + Natural Gamma Ray + 24-Arm Caliper Imaging +Electromagnetic Flaw Detection



Electromagnetic Thickness Measurement Logging Technology Results Chart



Electromagnetic Flaw Detection Logging Technology Results Chart

5 Gyroscopic Logging Technology

PRINCIPLE 技术原理

Fiber optic gyroscopic inclinometers use fiber optic gyro sensors for measurements. The instruments have stronger anti-vibration and anti-impact capabilities, high measurement accuracy, a short north-seeking time, and stable operation.

SCOPE OF APPLICATION 适用范围

It is suitable for harsh oilfield working environments, such as wellbore trajectory measurements , directional drilling, and directional perforation operations. Real-time calculations can provide measurements for well deviation angle, azimuth angle, relative azimuth angle, I-board azimuth angle, temperature, sensor information, and other parameters.

FEATURES 产品特点

- Aerospace-grade fiber optic gyro sensors have a long service life,high measurement accuracy, and short north-seeking time.
- Inclinometers automatically seek north without the need to alignwith the wellhead.
- Stronger anti-vibration and anti-impact capabilities, ensuring stableand reliable operation.
- Can be connected to gamma and magnetic positioning logginginstruments for combination logging.

SPECIFICATIONS 技术指标

Technical specifications	
Outer Diameter	Φ50mm
Temperature Resistance	175℃
Pressure Resistance	80MPa



Fiber Optic Gyroscope

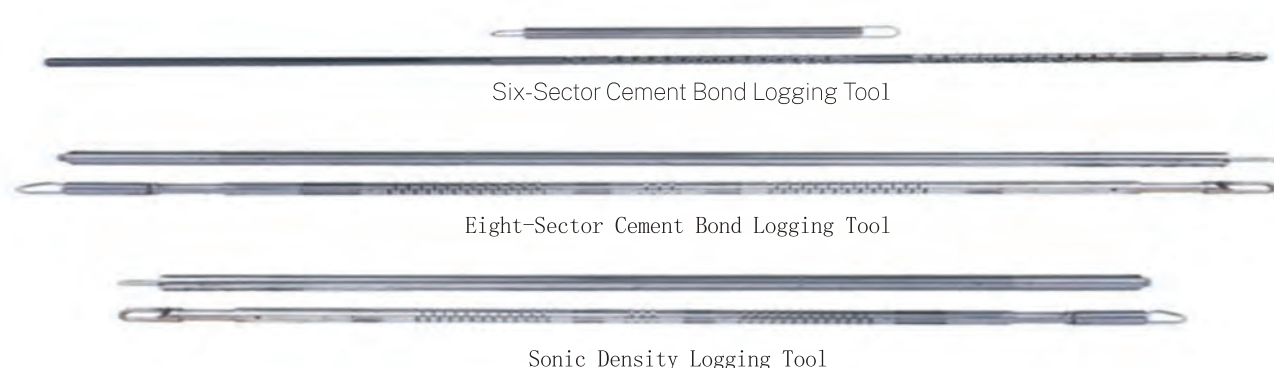
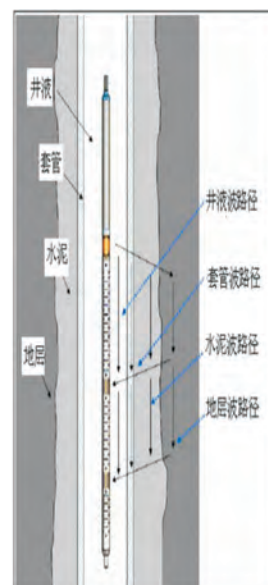
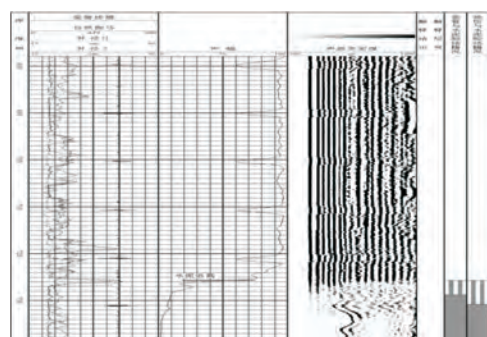
6 Cement Bond Logging Technology (CBL)

PRINCIPLE 技术原理

Cement bond logging uses a sonic transducer to emit sound waves into the wellbore. The sound waves propagate along the casing, cement sheath, and formation layers. The bonding condition between the casing and cement (first interface) and the cement and formation (second interface) is determined by measuring the intensity of the received sound wave signals using a receiver probe.

FEATURES 产品特点

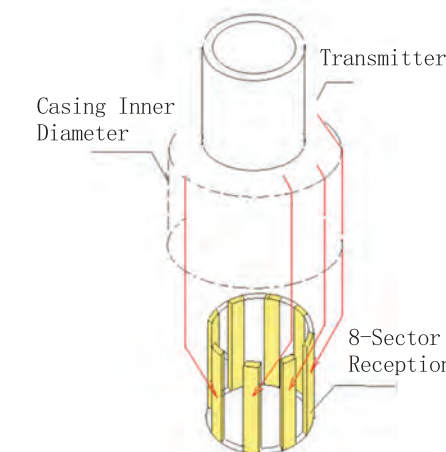
- Logging tools with six or eight sectors for cement bond logging.
- Instrument Outer Diameter: 43mm, 89mm.
- It can perform direct-reading logging, has storage capabilities, and can be used for testing horizontal wells and directional wells in tubing(drill pipe) conveyance mode.



7 Cement Bond Logging Technology-RBT

PRINCIPLE 技术原理

The RBT logging tool consists of a transmitting probe and 8 piezoelectric crystals arranged radially in the center. By measuring the sound amplitude of each sector, the cement sheath is divided into 8 sectors for evaluation.

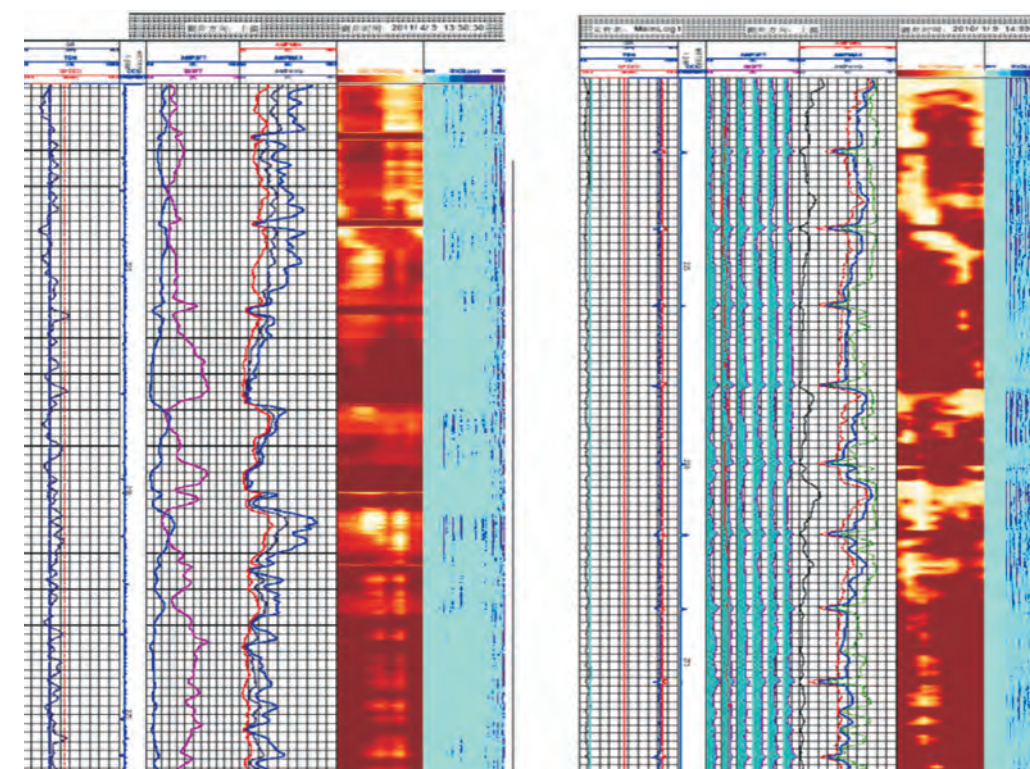


SCOPE OF APPLICATION 适用范围

Applicable for 5-1/2" and 7" casings.

ADVANTAGES 优点

Measure the quality of cement bond in 8 radial sectors of the casing cross-section, with logging results superior to conventional CBL logging.



Remaining Oil Logging

剩余油测井

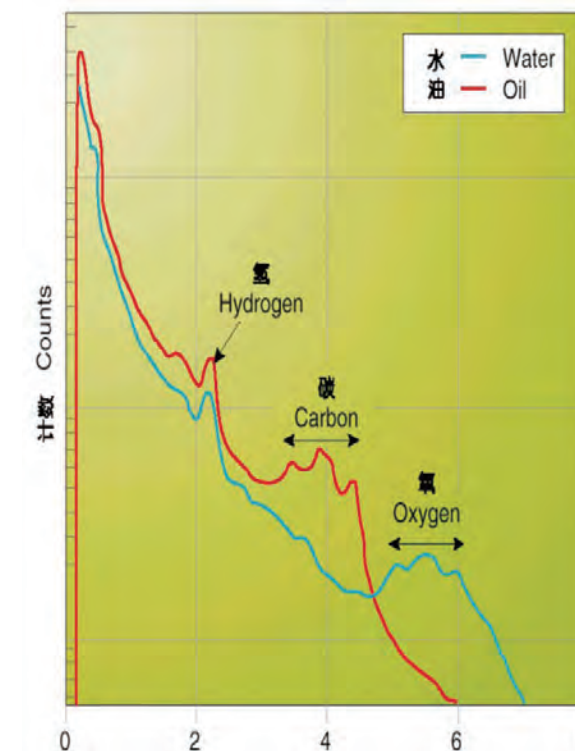
- Methane-Carbon Ratio Logging Technology
- Neutron Lifetime Logging Technology
- Pulsed Neutron-Neutron Porosity (PNN) Logging Technology
- Through-Casing Resistivity Logging Technology

1 Carbon-Hydrogen Ratio Logging Technology

PRINCIPLE

技术原理

In general, the matrix of pure sandstone does not contain carbon or hydrogen elements by itself. This means that hydrogen comes from oil and water, and carbon comes from oil. When using the Carbon-Hydrogen atomic density ratio to measure fluids, with a constant oil saturation, regardless of how porosity changes, the ratio of carbon and hydrogen content will remain essentially unchanged. As the oil saturation decreases, the carbon atomic density decreases while the hydrogen atomic density remains relatively constant (the hydrogen atomic densities in oil and water are similar). Therefore, the carbon-hydrogen content ratio will also decrease. In other words, the carbon-hydrogen content ratio is solely a function of oil saturation.



SCOPE OF APPLICATION

适用范围

Applicable for formations with porosity greater than or equal to 10%.

CHR and COR in pure sandstone (with different porosities and oil saturations)

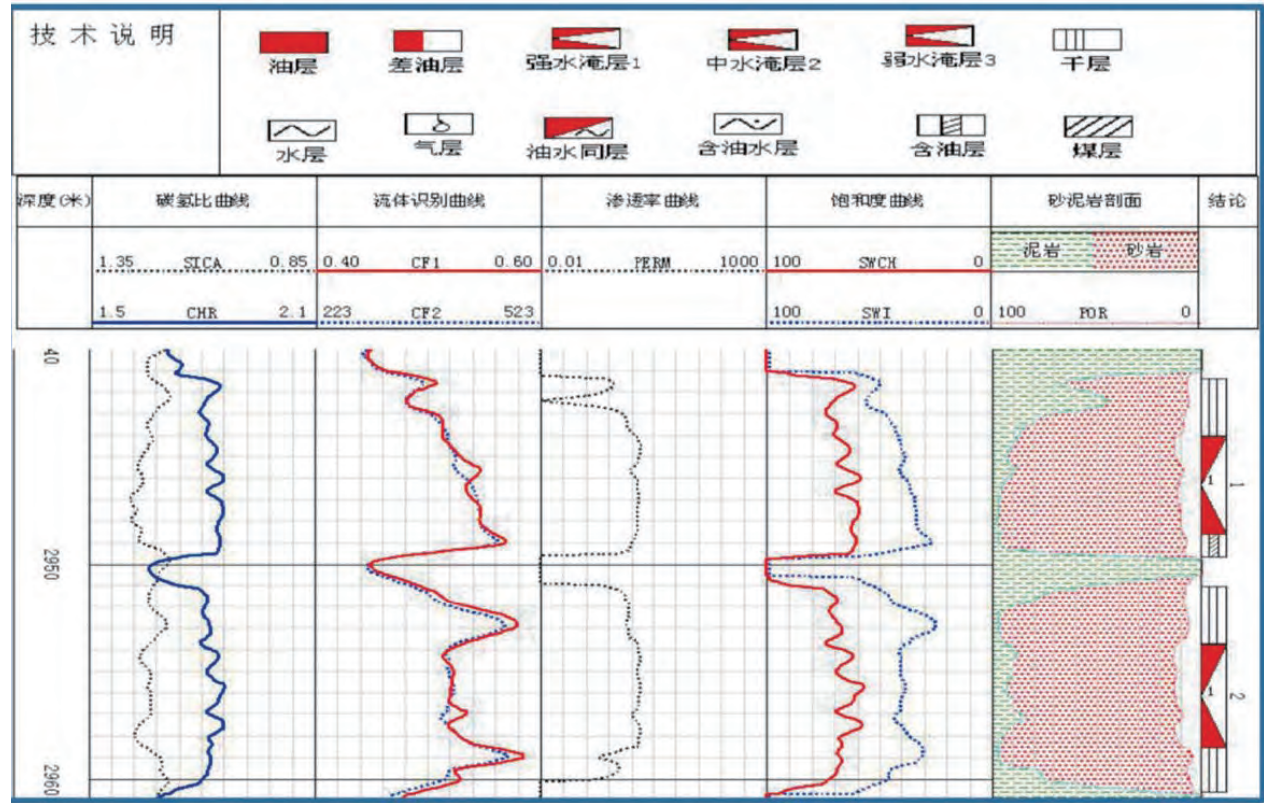
So	CHR				COR			
	Φ 10	Φ 20	Φ 30	Φ 35	Φ 10	Φ 20	Φ 30	Φ 35
0.25	0.1357	0.1357	0.1357	0.1357	0.0186	0.0394	0.0608	0.0756
0.50	0.2639	0.2639	0.2639	0.2639	0.0378	0.0817	0.1331	0.1623
0.75	0.3852	0.3852	0.3852	0.3852	0.0577	0.1272	0.2123	0.2624
1.00	0.5000	0.5000	0.5000	0.5000	0.0783	0.1762	0.3021	0.3796

RESULT
FCH 解释结论

Final Conclusion on FCH Explanation	
1section	Sw63.4%、Swi36.6%、Fw94%、Strong Water Influx
2section	Sw63.9%、Swi37.7%、Fw96%、Strong Water Influx
3section	3section Sw63.5%、Swi38.5%、Fw94%、Strong Water Influx

TEST RESULT
试油结果

Opening 1, 2, and 3 layers with a total water content of 96%, and layer 3 being plugged with awater content of 94%. FCH interpretation is consistent with the test oil conclusion. Low porosity, very low permeability, moderately low salinity, Jurassic sandstone reservoir



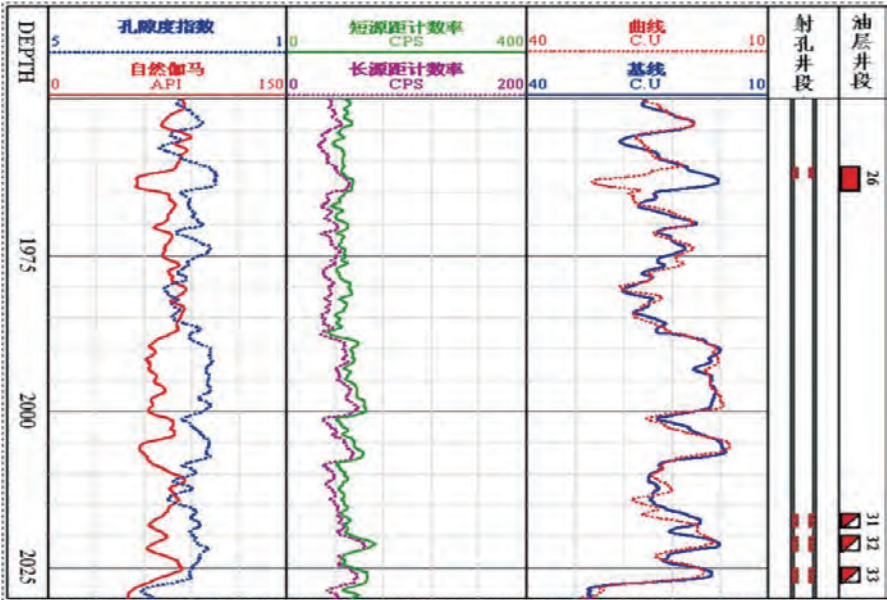
2 Neutron Lifetime Logging Technology

PRINCIPLE
技术原理

High-energy neutrons and formation elements produce inelastic collisions resulting in inelastic scattering gamma rays, elastic collisions, and gradual deceleration, eventually being captured by the formation elements to produce capture gamma rays. Different elements have different capture capabilities for neutrons, and in oil and water wells, the capture crosssection for oil is between 16-22, and for fresh water it is 22. Therefore, this method is not suitable for freshwater oil fields (formation water salinity below 5000 ppm), but has good application effects in high-salinity formation water oil fields (formation water salinity above 10000 ppm).

SCOPE OF APPLICATION
适用范围

Applicable for formation water salinity greater than 10000 ppm.



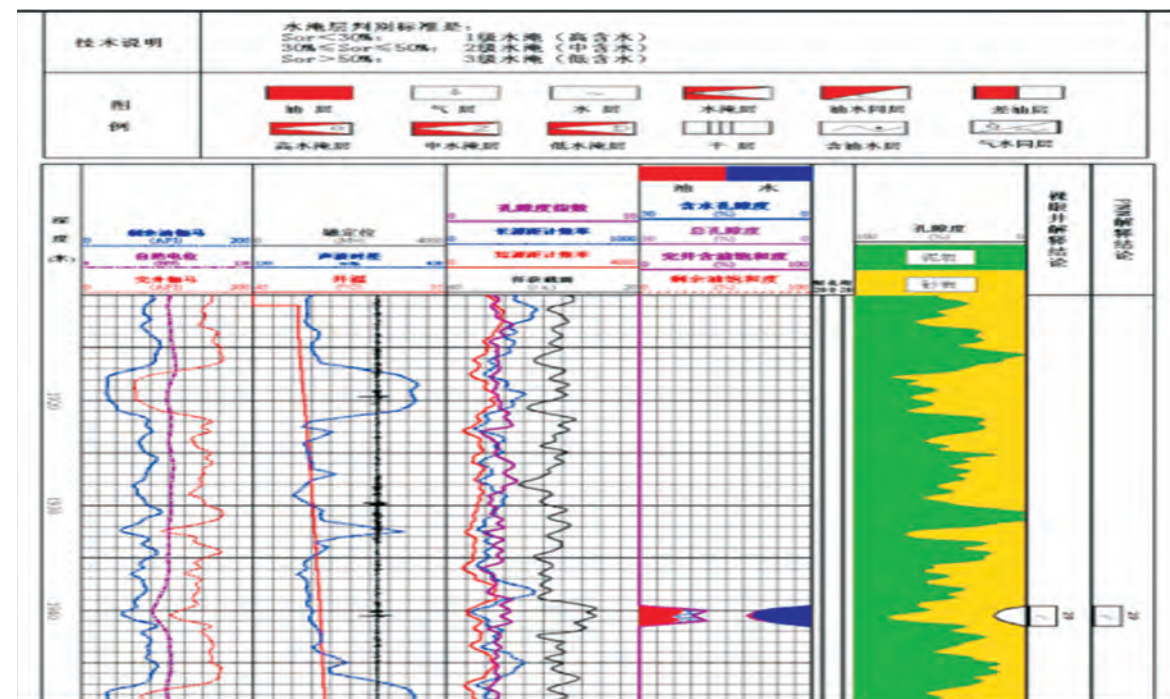
3 Pulsed Neutron-Neutron Porosity (PNN) Logging Technology

PRINCIPLE 技术原理

The instrument consists of a neutron generator, acquisition short sections (near source distance and far source distance), and telemetry short sections. The sensor in the acquisition short sections is a Helium-3 (He3) tube. Therefore, the instrument does not detect gamma rays; it only detects residual neutrons that result from high-energy neutrons being captured by formation elements. Since there are no free neutrons in the formation, the neutrons detected by the He3 tube are only related to the capture of elements in the formation, eliminating the influence of conventional pulsed neutron capture background gamma rays and gamma rays produced by other reactions of high-energy neutrons with formation elements.

SCOPE OF APPLICATION 适用范围

Applicable for formation water salinity greater than 10000 ppm.



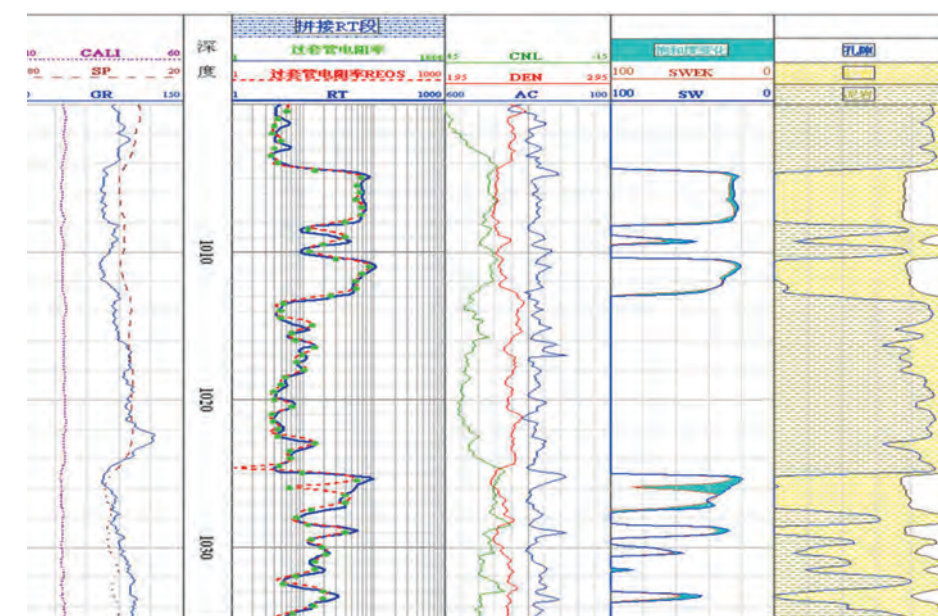
4 Through-Casing Resistivity Logging

PRINCIPLE 技术原理

Through-casing resistivity logging can be used to compare the measured through-casing resistivity values with open-hole logs, providing a more accurate understanding of the remaining oil in different reservoirs of the well. This information can then serve as a precise basis for oil field development.

FEATURES 技术特点

- Without the need for scraping or well cleaning
- Can be compared with resistivity logs from open-hole wells
- No requirement for formation porosity and salinity
- Detects at a significant depth (around 100 meters)
- No environmental pollution



Tracer Cross-Well Monitoring Technology

示踪剂井间监测技术

PRINCIPLE

技术原理

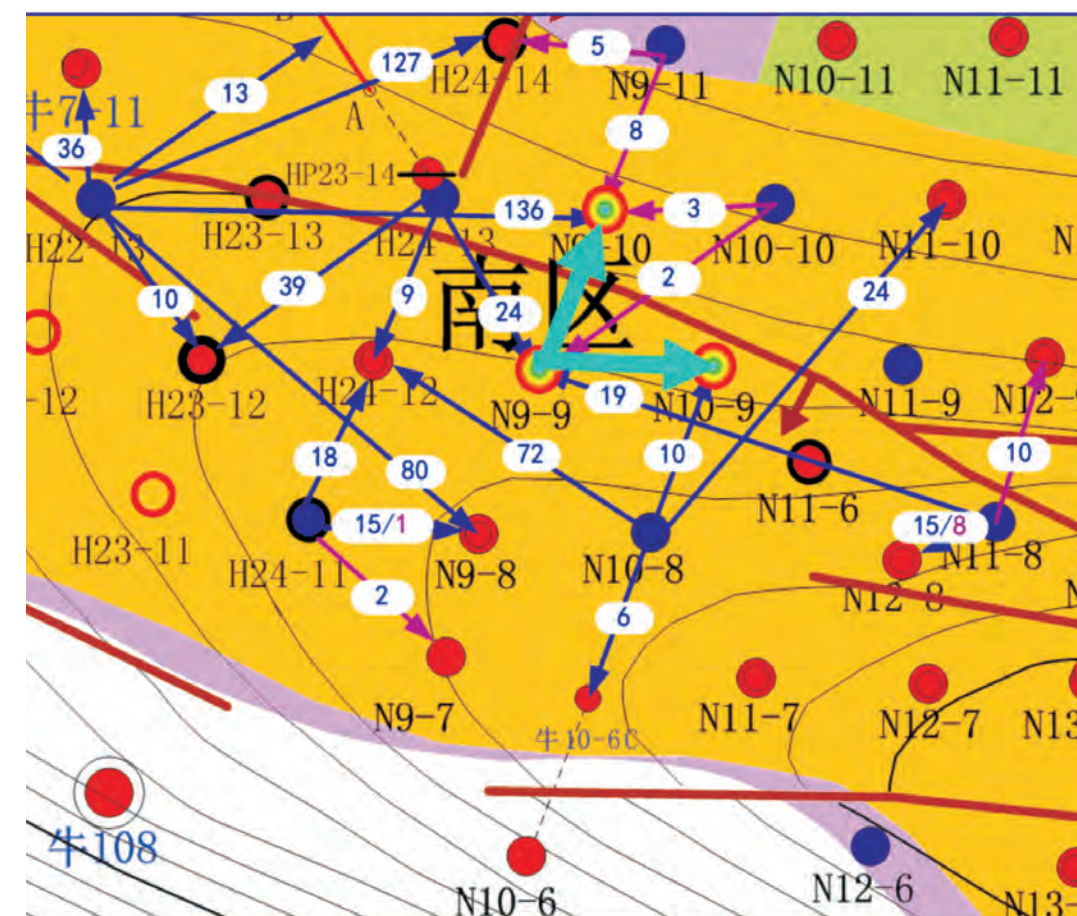
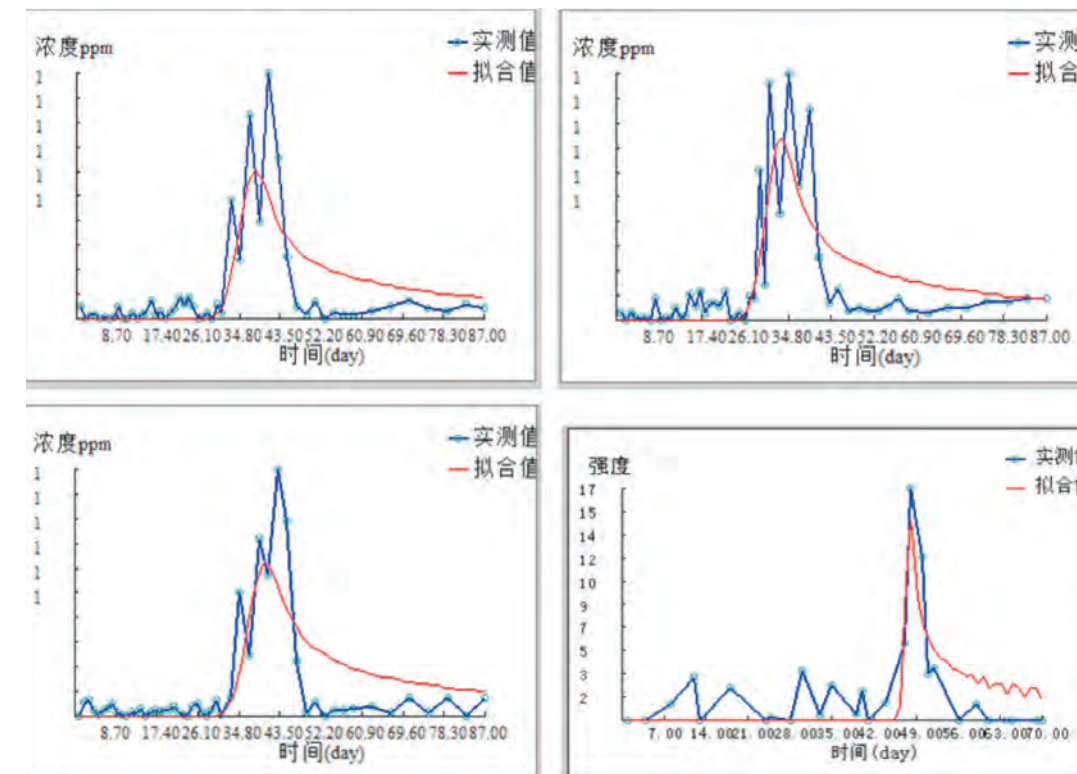
In interwell tracer monitoring technology, tracers are injected into injection wells. According to a designated sampling system, samples are collected and analyzed from corresponding production wells to determine the tracer content in the samples. This information is used to plot the tracer breakthrough curve for the production wells. By comprehensively analyzing the tracer breakthrough direction, propagation speed, and extent of the injected fluid can be obtain curves of the monitoring well group and other relevant data, information such as the movement.

SCOPE OF APPLICATION

适用范围

- Verify the orientation and size of fractures
- Determine the condition of faults and barrier zones
- Determine the oil reservoir plane and vertical heterogeneity
- Determine the size of the pores to provide parameters for selecting and determining the amount of profile control and water shutoff agents.
- Quantitative interpretation results provide suggestions for dynamic adjustments to the development plan.
- Understand the current communication status between injection wells and production wells.
- Understand the direction and speed of fluid propagation from injection wells, flow lines between injection and production wells, and parameters of influence (area, volume, coefficient).
- Understand reservoir stratification, layer-to-layer communication in oil and water wells, the position of water influx zones, and determine the direction of oil well productivity and injection well drive.

Type of tracer	Advantages	Disadvantages
Chemical tracers Acid-based tracers such as ammonium nitrate, ammonium thiocyanate	Low operating costs	Few types , prone to reactions with the formation, require large quantities,
Trace element tracers Rare elements (lanthanides, actinides) complexation, chelating agents	Many types of tracers, small quantities used, less prone to reactions with	High operating costs



WELL TESTING SERVICES 试井服务

Well testing technology is a method used in oil and gas field development to periodically measure the pressure, production rate, temperature, and operational conditions of oil, gas, and water wells. This data is analyzed to understand reservoir characteristics, assess production capabilities, and obtain information relevant for reservoir management.

— 01 — Well testing services

- Downhole shut-in layer pressure testing
- Continuous shut-in layer pressure testing
- Point pressure testing
- Static flow pressure testing
- System well testing
- Pressure build-up testing
- Pressure falloff testing
- Permanent pressure monitoring
- Interference well testing

— 02 — Water well deployment services

- Bridge-centered cable
- Bridge-centered perforation
- Conventional lifting and deployment
- Injection well seal testing
- testing and adjustment
- Bridge-offset cable testing and adjustment
- Water injection and recovery nozzles

— 03 — Analysis and laboratory testing

- Crude oil and water sample analysis
- High-pressure physical property sampling and analysis of crude oil
- High-pressure physical property sampling and analysis of natural gas
- Comprehensive water quality analysis
- Comprehensive air quality analysis
- Analysis of condensate oil

— 04 — Other well testing-04 related services

- High-pressure physical property sampling 45/4
- Echo liquid surface detection

Well Test Technical Service 示踪剂井间监测技术

▶ DOWNHOLE PRESSURE, TEST AND RECORDING MEANS 井下压力、温度录取方式

- Stored-electron pressure gauge
- Direct-reading electronic pressure gauge
- Telemetry electronic pressure gauge system
- Permanent electronic pressure gauge system



▶ ADVANTAGES 技术优势

- A wide range of instrument types, suitable for various testing requirements
- High resolution, high accuracy
- Telemetry electronic pressure gauge system
- Permanent electronic pressure gauge system



▶ PARAMETERS 参数指标

Parameter Name	Parameter Data
Outer Diameter	19mm、22mm、32mm、36mm
Temperature Resistance	175℃
Pressure Resistance	0~105MPa
Accuracy	2‰~3‰

1 Oil and water well pressure testing

Our company's 18 testing teams are all equipped with 4-8 pressure testing instruments of different outer diameters and precision levels. The company has provided the testing teams with 10 sets of Canadian PPS pressure gauges to meet the higher pressure testing requirements of the oil fields. By the end of 2023, the company's testing teams have completed 5173 pressure testing wells. With dual-string deployment of pressure gauges downhole, the testing data is more reliable, and the testing personnel have rich experience in pressure testing.

▶ DEVICE CONFIGURATION 设备配置

YL19, YL22, YL27, YL32, YL36 series electronic pressure gauges, PPS electronic pressure gauges, weight bars



Pressure gauge detail diagram

2 Permanent pressure measurement system

▶ PRINCIPLE 技术原理

The permanent pressure measurement system is mainly used for long-term pressure monitoring in oil field production development wells and coal seam gas drainage and extraction. By using a permanent downhole measurement system, pressure and temperature data can be continuously collected in real-time through surface direct-reading methods, providing data and curve analysis for production management.

▶ FEATURES 产品特点

- Can be used for self-flowing oil wells, gas wells, and coalbed methane extraction.
- Can be used for electric submersible pumps, rod pumps, and other types of oil wells.
- Can be used for multi-layer production pressure monitoring.



Pressure gauge



Controller



cable sheath card

Water Well Deployment Service

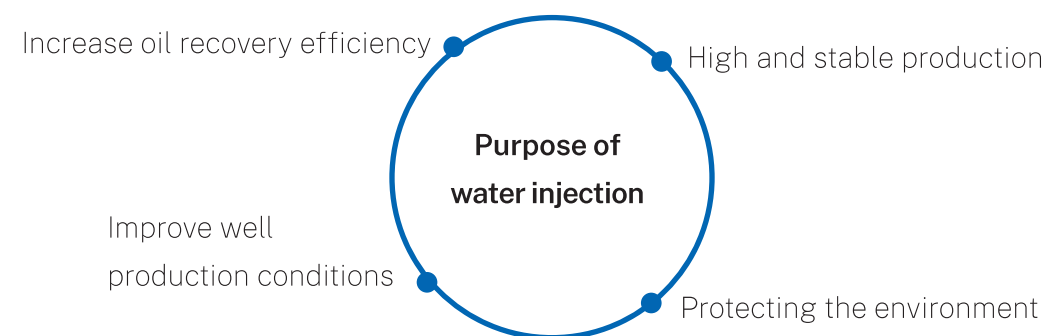
水井调配服务

Currently, water injection is one of the main methods for stabilizing and increasing production in oil reservoirs, widely used in various oil fields. It can improve the production conditions, increase the recovery rate, achieve high and stable production, and protect the environment.

CLASSIFICATION OF WATER INJECTION PROCESS

注水工艺分类

- Bridge-centered eccentric water injection technology
- Bridge-centered concentric water injection technology



Num	Types	Testing tools	Sealing tools	Advantages
1	Bridge centered eccentric water injection process	Bridge centered eccentric cable testing and adjustment	Eccentric direct reading sealing tool	Visualized, high success rate
2	Bridge centered concentric water injection process	Bridge centered concentric cable testing and adjustment	Concentric direct reading sealing tool	Suitable for high deviation and severe wax deposition

1 Bridge-centered concentric cable testing

PARAMETERS

测量参数

Flow, Pressure, Temperature

ADVANTAGES

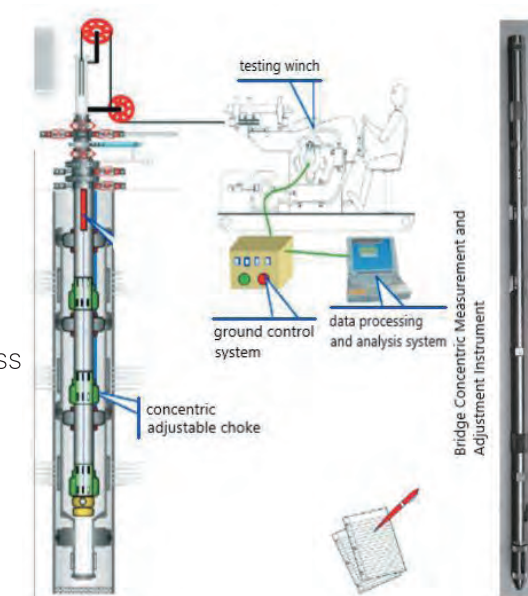
技术优势

- Bridge-centered concentric water injection process
- suitable for deep wells, high deviation wells
- Accurate adjustment, visualized

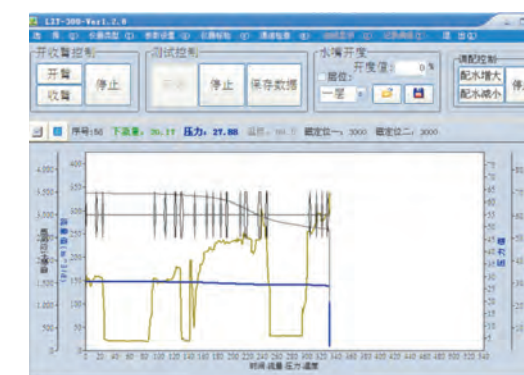
SPECIFICATIONS

技术指标

Technical specifications	
Outer Diameter	36mm、42mm
Flow range	0-100m ³ 0-200m ³ 0-300m ³
Deviation	≤60°
Pressure range	0-80MPa
Temperature range	-40 °C ~150°C



Bridge centered concentric surface controller

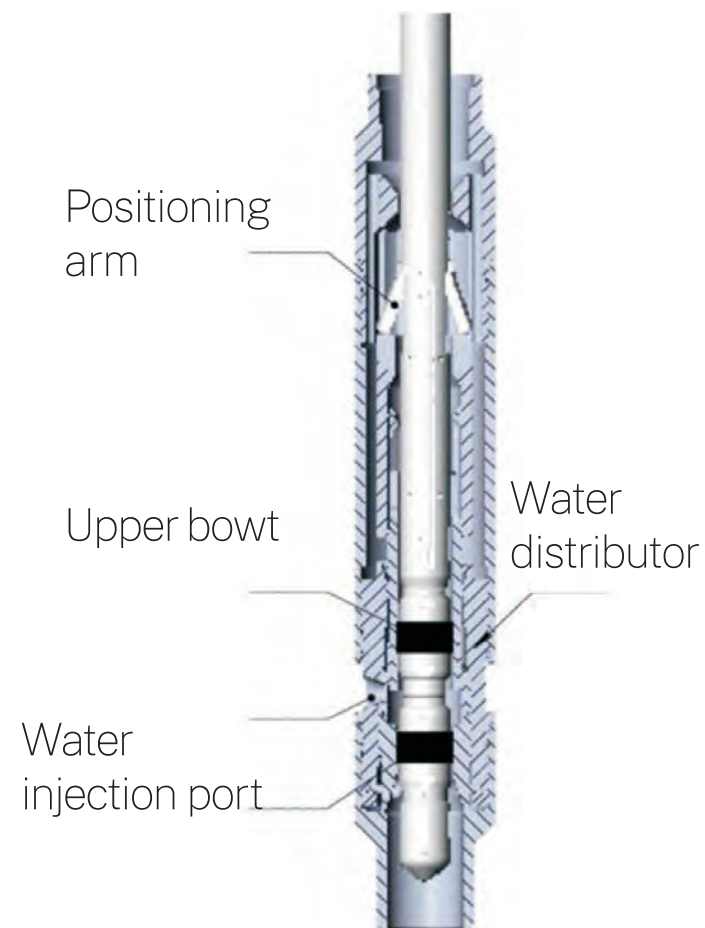
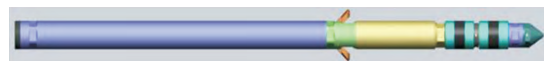


2 Bridge-centered concentric cable testing and sealing

ADVANTAGES

技术优势

- Bridge-centered concentric water injection technology
- Concentric connection, suitable for deep wells, high deviation wells, and wells with severe wax deposition
- Accurate adjustment, visualized



SPECIFICATIONS

技术指标

Technical specifications	
Outer Diameter	Φ42mm
Pressure resistance	100MPa
Working temperature	-40℃ +150℃
Seat seal bowl pressure	20MPa



3 Bridge eccentric cable test and adjustment

PARAMETERS

测量参数

Flow Rate, Pressure, Temperature

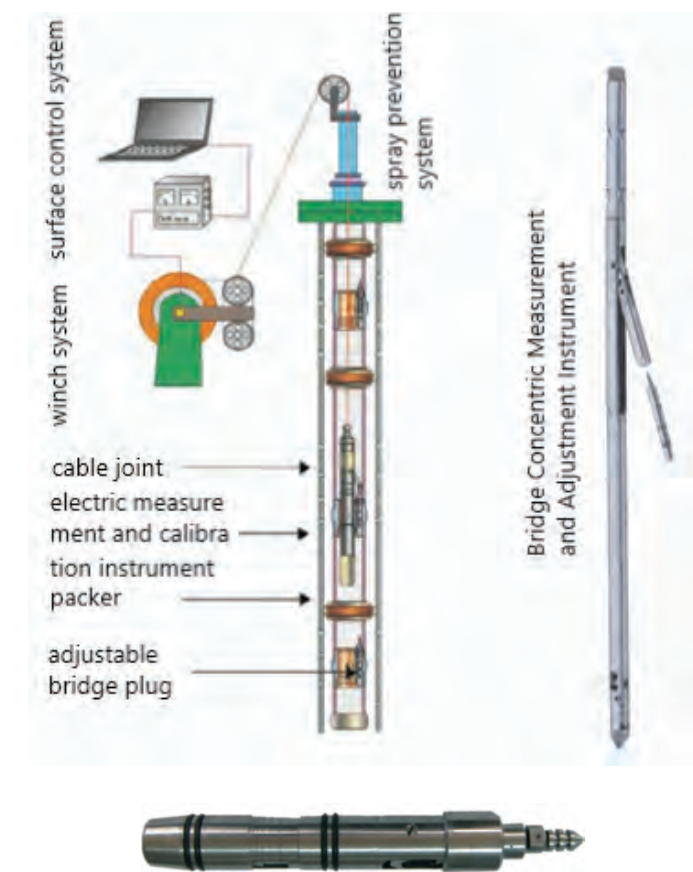
ADVANTAGES

技术优势

- Bridge-centered eccentric water injection technology
- Significantly shorten the operation cycle and improve work efficiency
- Precise adjustment, visualization



Bridge-centered eccentric surface controller



water nozzle

SPECIFICATIONS

技术指标

Technical specifications	
Outer Diameter	42mm
Flow range	0-100m³ 0-200m³ 0-300m³
Deviation	≤25°
Pressure range	0~80MPa
Temperature range	-40 ℃ ~150℃

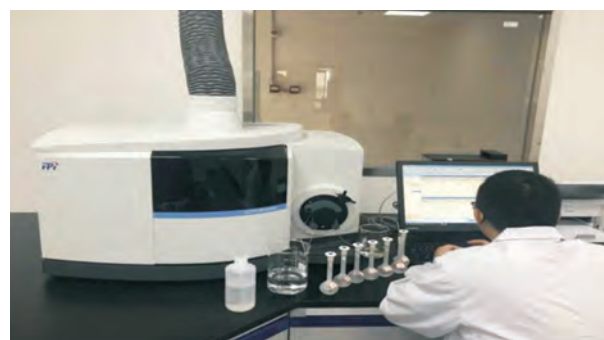
Analysis Test

分析化验

ANALYSIS TEST

分析化验

- Crude oil and water sample analysis
- High-pressure physical property sampling and analysis of crude oil
- High-pressure physical property sampling and analysis of natural gas
- Comprehensive water quality analysis
- Comprehensive air quality analysis
- Condensate analysis



Inductively Coupled Plasma (ICP) trace element detection High-precision ion chromatograph analyzer instrument



Gas Chromatograph-Mass Spectrometer (GC-MS)



F97 Fluorescence Spectrophotometer



Chandlarmixer



rotary viscometer



Rheometer



HAAKE RS-6000 Rheometer



Total Water Quality Analyzer



HACH 2100Q Turbidity Meter



HACH HQ40d pH/Conductivity Meter



High-precision ion chromatograph analyzer

High Pressure Physical Sampling

高压物性取样

ANALYSIS TEST

分析化验

During the well testing process of oil and gas wells, it is a common method to take highpressure fluid samples from the reservoir for oil or gas. By conducting PVT analysis on the surface after sampling the high-pressure physical properties of the reservoir, first-hand data of the reservoir is obtained, providing a theoretical basis for further production development of the reservoir. This helps in formulating development plans, increasing oil and gas recovery rates, determining reasonable production forecasts, and selecting production equipment.



Data reader



Sampler cylinder



Sampler control section

Oil and gas well echo liquid level detection

油、气井回声液面探测

The gas-liquid interface tester for wells uses the echo method to conduct liquid level testing in the annular space. The test waveform can also show the presence of obstacles in the annular space, providing a testing method for high-pressure well annular space liquid level testing and tubing liquid level testing. At the same time, it provides a basis for adding protective fluid to the annular space of high hydrogen sulfide wells.



Low-pressure gun

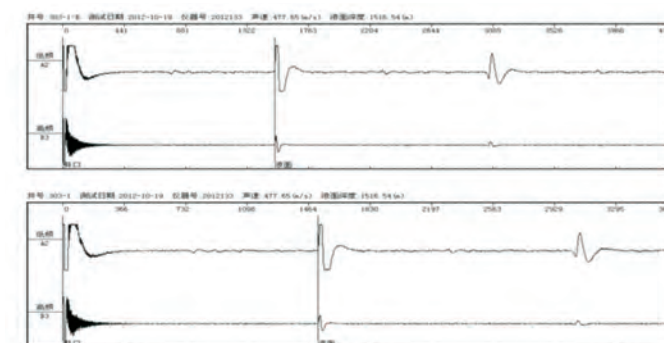
High-pressure gun

FEATURES

技术特点

- The instrument is highly resistant to interference and provides clear test graphics.
- There is a tail gas treatment device, which needs to discharge the tail gas into the alkali solution.
- It has the function of calculating sound velocity based on pressure, density, and temperature.
- The microphone uses a metal sensor, which has high sensitivity compared to traditional microphones.

The liquid level data curve interpreted by the upper computer software for the gas well test is shown in the following figure:



GY-JLY300 data logger

Data Interpretation

资料解释

Xi'an Sitang Oilfield Engineering Services Co., Ltd. has an experienced and highly skilled well logging data interpretation team, equipped with advanced well logging interpretation processing software imported from Schlumberger, Halliburton, and other companies. The company provides comprehensive well logging interpretation services, with interpretations covering over a dozen oilfields in China, and the interpretation results are highly recognized by clients.

LOG INTERPRETATION

测井解释

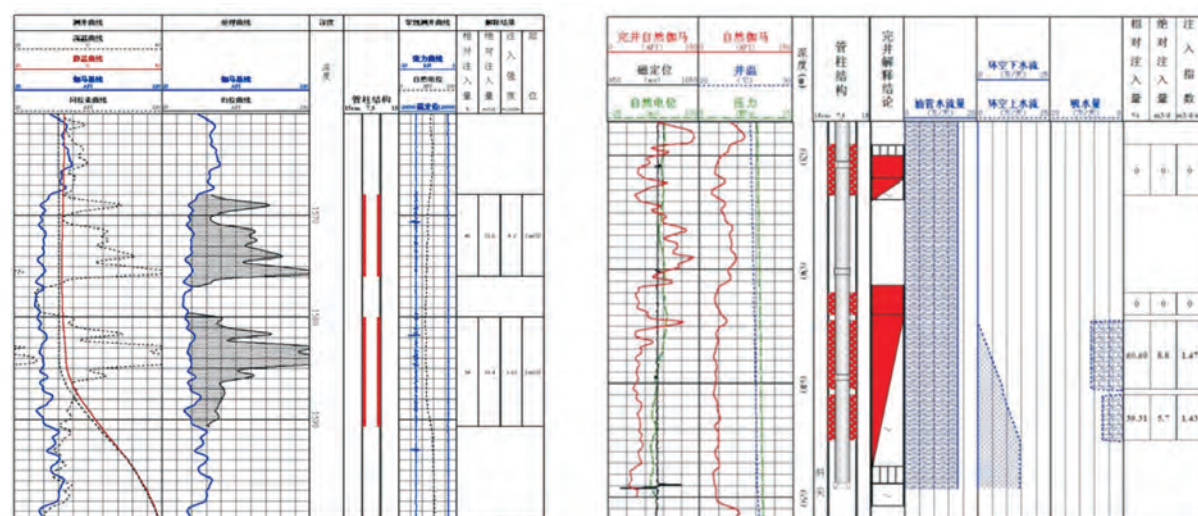
- Injection profile
- Production profile
- Engineering logging
- Residual oil
- Interwell tracer

WELL TEST INTERPRETATION

试井解释

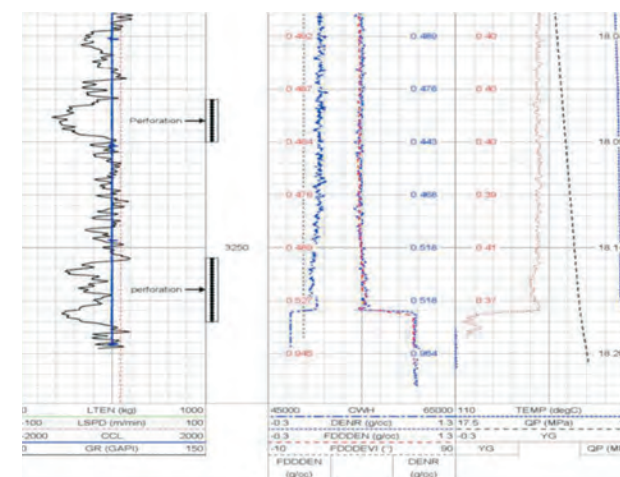
- Pressure point
- Static flow pressure
- Pressure recovery, pressure drop
- System testing
- Interference testing
- Dual-flow testing
- Single-point testing

1 Injection profile

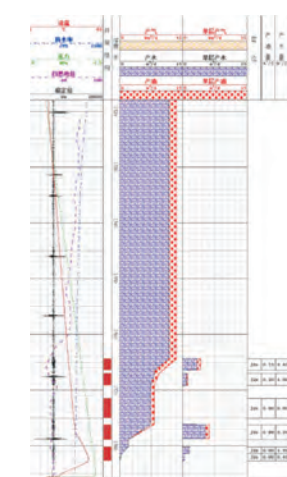


xx 井吸水剖面

2 Production profile

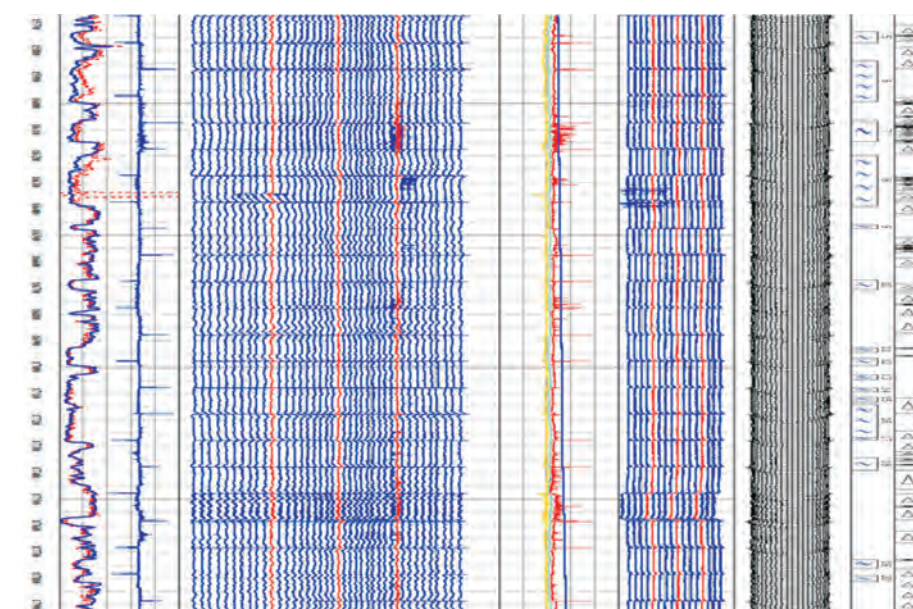


Gas production profile logging curve graph



Liquid production profile logging curve graph

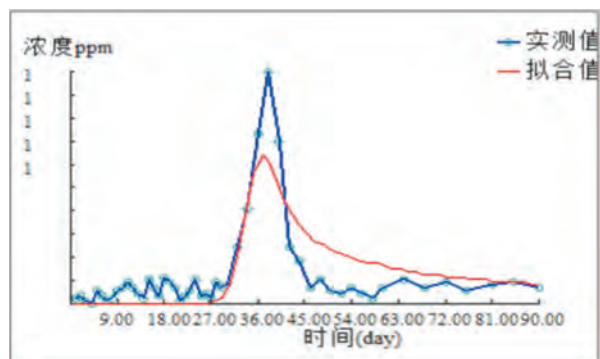
3 Engineering logging



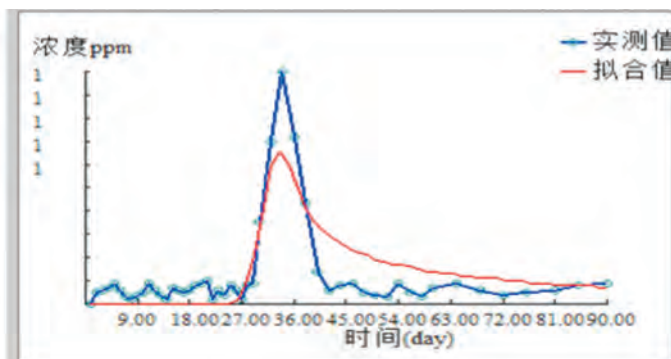
Perforated intervals (points) in the logging data of the XX-XX well section: 1441.77m, 1443.60m

4 Interwell tracer

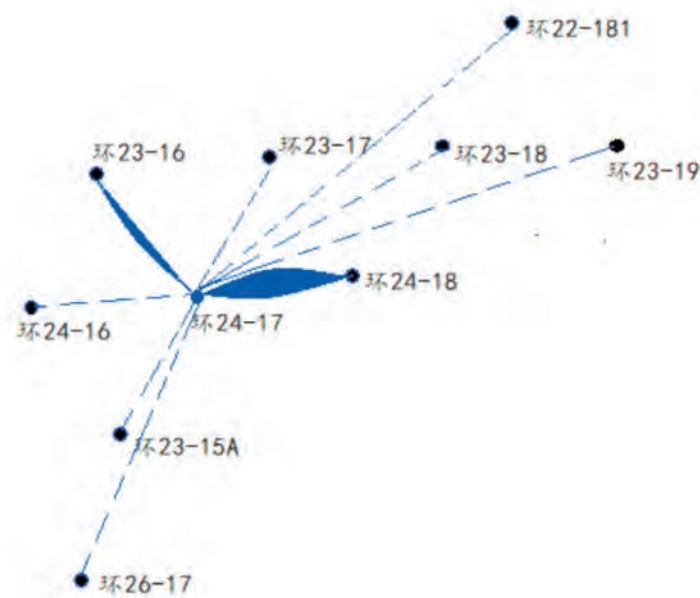
Well 23-16 Tracer Production Curve



Well 24-18 Tracer Production Curve

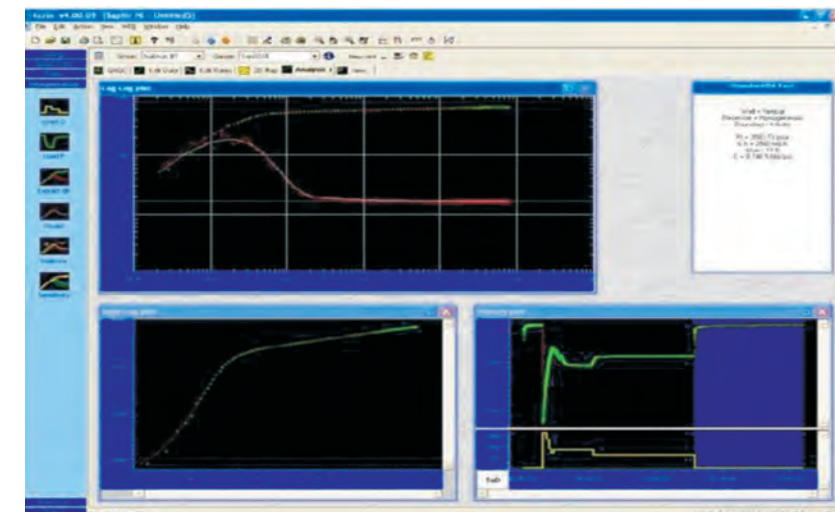


Interwell tracer response in Well Group XX



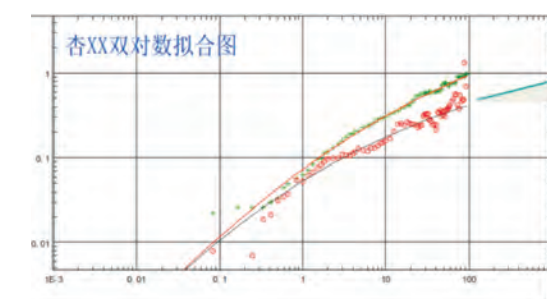
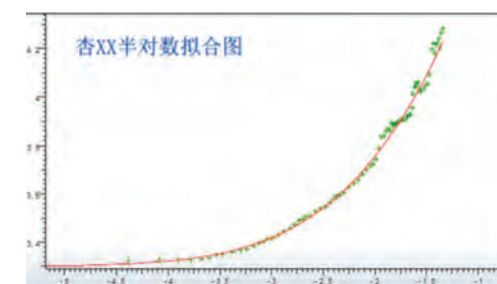
XX Waterflood pattern map of the well group

5 Pressure recovery, pressure drop



6 Dual-rate testing

According to the principles of reservoir fluid dynamics, when a well changes its operating regime, it will cause changes in bottomhole pressure and surrounding formation pressure. This process reflects the properties of the formation and fluids, as well as the boundary conditions of the inner and outer boundaries of the oil drainage area. Based on the superposition principle, shutting in a well is just one way to change the operating regime of an oil well. By continuously monitoring the changes in bottomhole pressure over time (or annular fluid level changes) without shutting in the well, organizing and analyzing the data can provide information equivalent to pressure build-up analysis obtained from shut-in tests. This provides a basis for optimizing the best operating regime of the well and efficiently developing the oil field.



Due to the very low permeability and unclear radial flow characteristics, parameters can only be obtained through fitting analysis of typical curve.

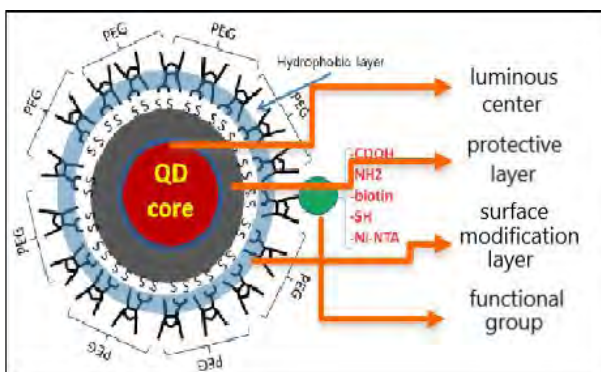
Quantum Dot Tracer

量子点示踪剂

INTRODUCTION

产品介绍

Quantum dots are nanocrystals synthesized through colloidal chemistry. Tracers are labeled using Quantum Dot technology in the polymer, and the polymer is adsorbed on the surface of proppants such as fracturing sand, ceramic beads, or quartz sand to form a polymer coating. When oil, gas, or water comes into contact with the polymer coating on the surface of the proppant, the tracers are released.



USE

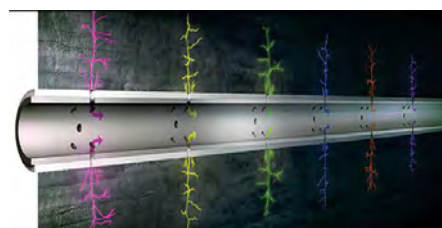
用途

- Horizontal well liquid production profile evaluation
- Horizontal well water finding in old wells
- Quantum dot interwell monitoring
- Temporary blocking effect evaluation

TECHNICAL INTRODUCTION

技术简介

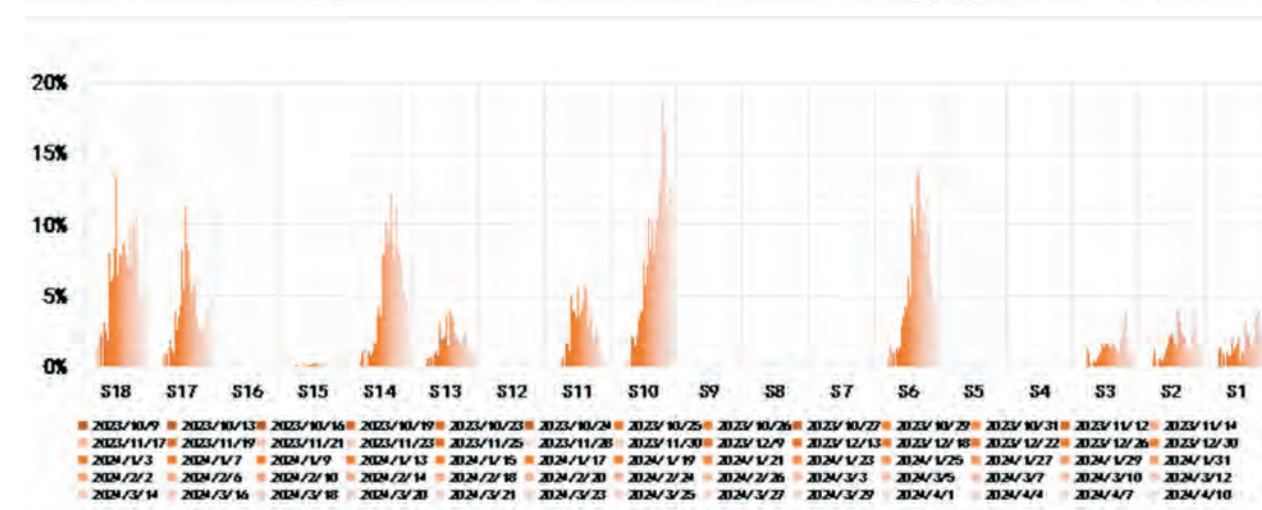
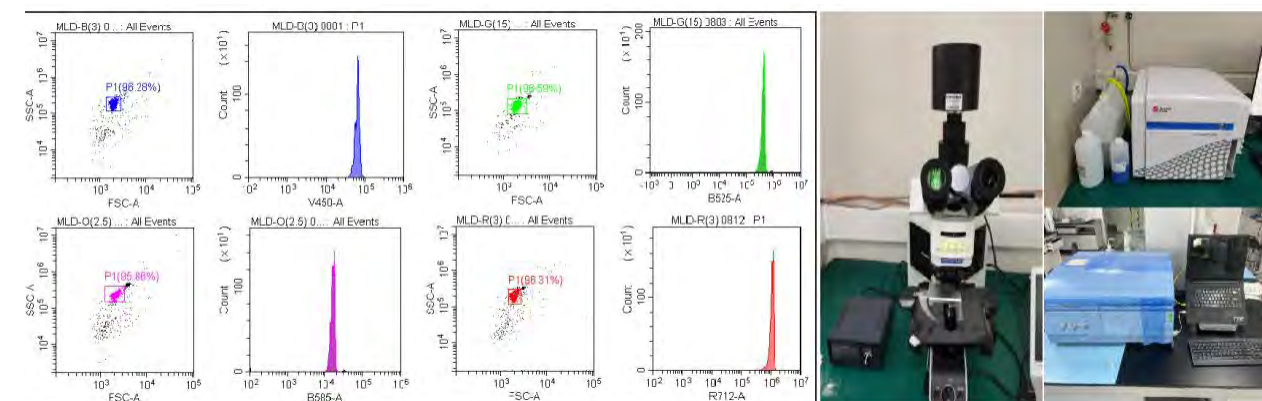
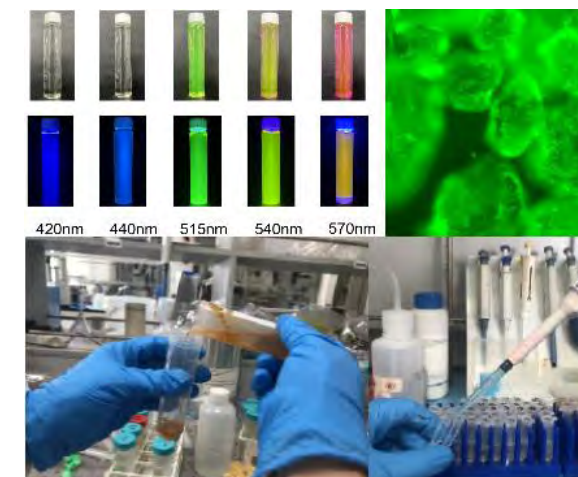
Quantum dot tracer testing for liquid production profile evaluation involves injecting independent quantum dot tracers supported by proppants throughout the entire fracture system along with the fracturing fluid for each test segment. This technology allows for segmenting and marking oil, gas, and water in the reservoir, enabling precise characterization of the dynamic production of each segment by analyzing the quantity of quantum dot tracers in the produced



FEATURES

技术特点

- Simple implementation, does not alter fracturing operation process or increase workload;
- Unique tracer labeling method that allows for simultaneous testing of oil, gas, and water in up to 40 stages of fractured wells;
- Unique tracer labeling method that allows for testing up to 40 stages of fractured wells.
- Testing accuracy reaches parts per trillion (ppt) level.
- Testing validity period > 3 years.



Dynamic oil production profile chart (2023.10.9 - 2024.4.10)

Online Monitoring Service For Carbon Dioxide

二氧化碳在线监测服务

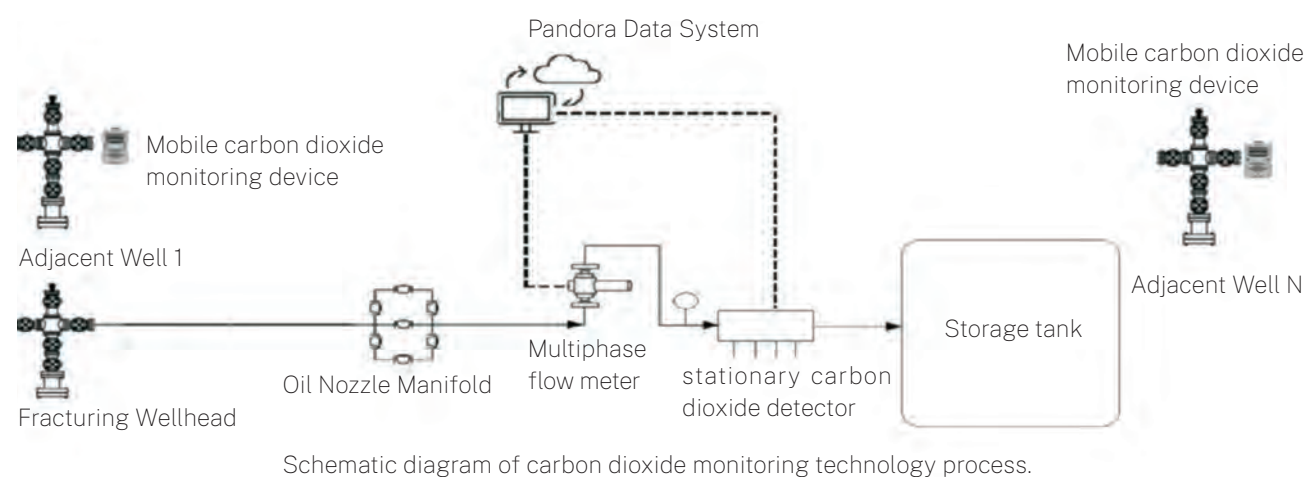
PURPOSE

目的

- Calculate carbon sequestration rate, establish carbon trading, and generate economic value
- Better guide the improvement of fracturing technology to achieve a higher carbon sequestration rate.
- Provide reference basis for the planning and design of corrosion prevention and degassing in oil gathering and transportation stations.

PROGRAMME

方案



$$\text{Carbon dioxide storage rate} = (Q_g \cdot C_{CO_2} + Q_{CO_2}) / Q_{\text{注入}} \cdot 100\%$$

Multiphase flow meter

Measures total flow rate Q and the flow rates of oil, gas, and water ($Q_o/Q_g/Q_w$)

Fixed carbon dioxide monitor

Measure the concentration of carbon dioxide in the gas phase Percentage CO_2

Mobile carbon dioxide monitoring device

Measure the carbon dioxide output from neighboring wells Gas flow rate Q_{CO_2}

PARAMETERS

技术参数

Multiphase Flowmeter Parameters

Scale	Measurement range	Operating pressure	Operating temperature	The gas content Range	Measurement	Measurement uncertain	
						<2 MPa	≥2 Mpa
DN25~DN100	10-2000 m ³ /d	25MPa	-40℃至 120℃	0-90 %	Liquid volume (relative)	5%	5%
					Gas volume (relative)	7%	5%
					Liquid phase water content	2%	2%
				90-100%	Hydrocarbons (relative)	5-10%	5%
					Gas volume (relative)	7%	3%
					Three-phase water holdup (absolute)	1.5%	0.5-1.5%



Figure 1: Multiphase flow meter

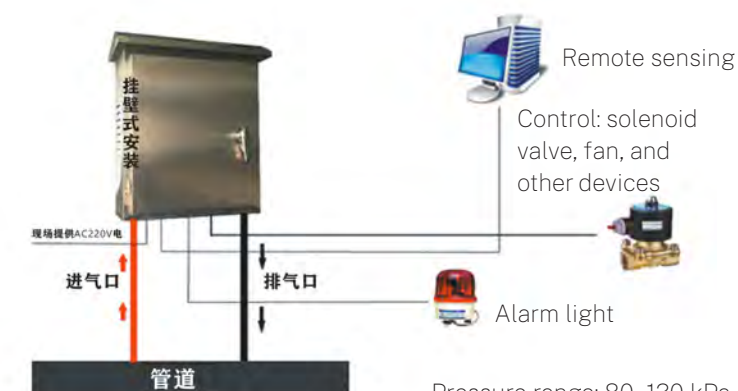


Figure 2: Fixed carbon dioxide monitor

Pressure range: 80~130 kPa (absolute pressure)
Temperature range: -40 to +70 Automatic temperature control, dehumidification, drainag

Parameters of the fixed carbon dioxide monitor

Name	Parameters
Air detection	CO_2
Detection accuracy	$\leq \pm 3\%FS$
Detection principle	Non-dispersive infrared (NDIR) input
Detection range	0~100%VOL
Resolution	0.1%VOL

ADVANTAGE

优势

- Replacing the sampling and intermittent monitoring with continuous monitoring

SmartFrac Flowback Manager

水平井气液砂智能控制及监测

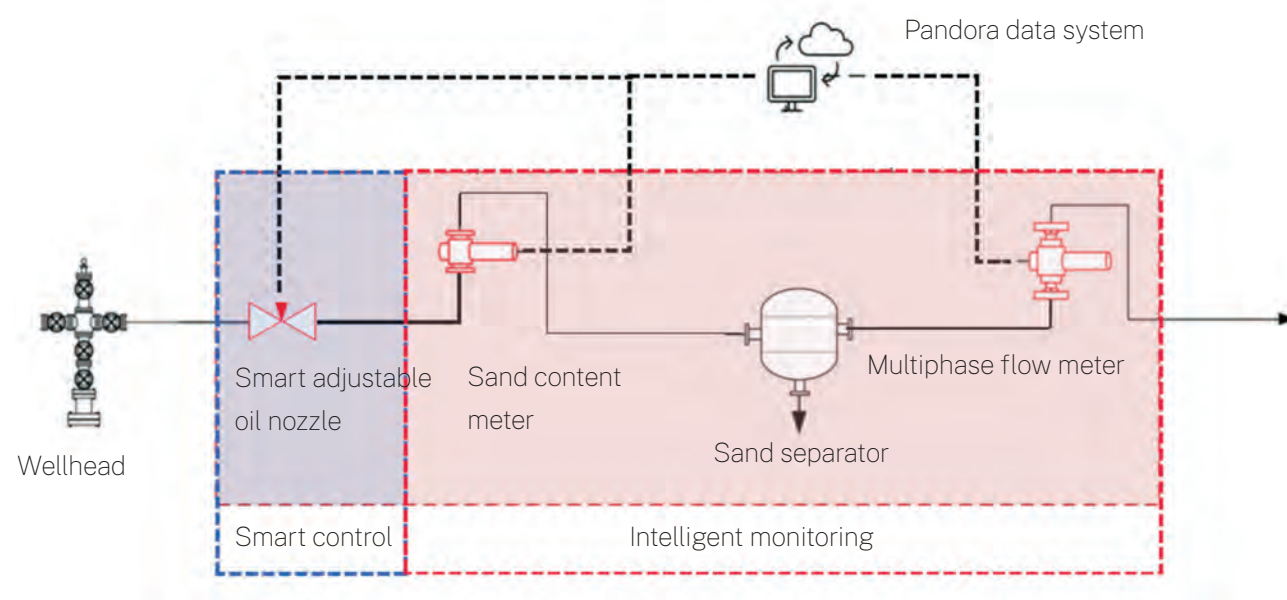
PURPOSE

目的

Implement pressure management, sand control, and optimize backflow system after horizontal well fracturing.

PROGRAMME

方案



- Horizontal well smart adjustable oil nozzle: real-time nozzle control, providing optimal backflow system;
- Sand content meter: measures volume sand content, combines with flow data at downstream flowmeter installation location to calculate sand rate(m^3/min))
- Multiphase flow meter: measures oil, gas, water flow rates (m^3/min), installed downstream of the desander, measures oil-gas-water phases in the absence of sand/low sand content.

PARAMETERS

技术参数

Name	Parameters
Nominal pressure	35MPa
Rated power supply	24VDC \pm 20%
Environmental temperature	(-40~70) $^{\circ}\text{C}$
Rated thrust	6000N
Repeatability error of stroke	$\leq \pm 1\%$
Thrust repeatability error	$\leq \pm 10\%$
Adjustment accuracy	1%
Rated power	$\leq 60\text{W}$
Fast shut-off time	$< 5\text{s}$
Opening and closing time for one operation	30s



ADVANTAGE

优势

- Real-time measurement of instantaneous sand production rate, capturing the start and end time of sand production
- Real-time reflection of backflow liquid dynamic performance (including changes in oil, water, gas, and sand phases);
- Replacing the phase measurement function of the threephase separator, saving the application cost of the threephase separator;
- Real-time adjustment of fracturing backflow system based on sand production situation.



Smart adjustable oil nozzle

Fracturing Backflow Treatment

压裂返排液处理

PRODUCT FORMS

产品形式

- 1 Leverage form
Suitable for centralized construction sites, long-term and large-scale backflow liquid treatment within the processing area.

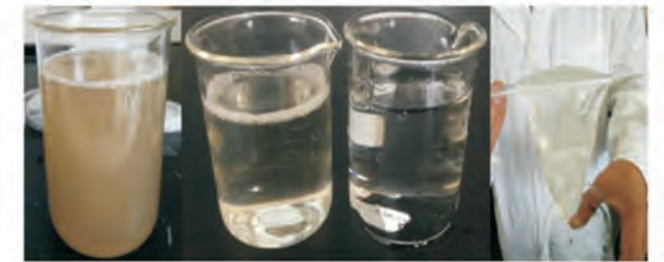


- 2 Vehicle-mounted form
Suitable for decentralized well sites, short-term centralized backflow liquid treatment.

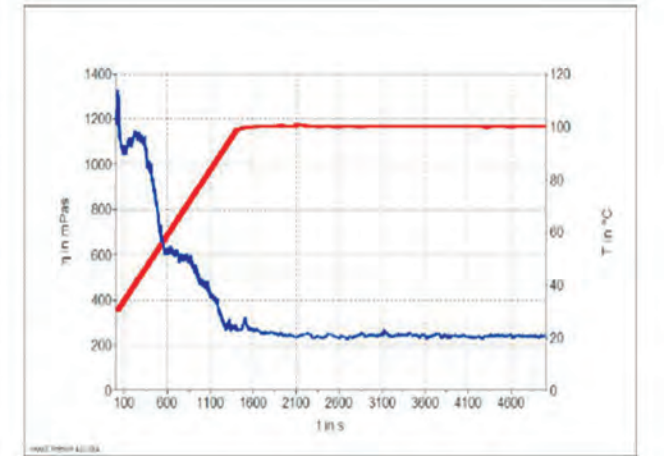


Water quality analysis results before and after backflow liquid treatment

检测项目	单位	返排液原水	絮凝沉降上清液	过纳米材料出水
Cl ⁻	mg/L	3959.86	4647.50	4064.74
HCO ₃ ⁻	mg/L	489.52	1445.64	589.20
SO ₄ ²⁻	mg/L	570	264	100
Fe ²⁺ +Fe ³⁺	mg/L	24	0.37	0.01
B ³⁺	mg/L	48.0	38.0	2.4
Ca ²⁺	mg/L	247.89	94.20	53.44
Mg ²⁺	mg/L	56.09	47.51	35.63
Al ³⁺	mg/L	0.18	0.027	0.011
SS	mg/L	1400	28	3
pH	—	6.70	8.99	6.84
η	mPa.s	1.2	1.0	1.0
G	ms/cm	12480	10121	8762



Photos of the backflow liquid treatment before and after treatment, as well as the selection of arc glue.



Rheological curve of fracturing fluid after backflow liquid treatment with arc glue matching.



Produced Water Treatment

采出水处理

This device integrates multiple process units such as multi-effect liquid seal cyclone, electrocatalytic oxidation, electromagnetic scale inhibition, fine filter, and sludge concentration and dewatering. The effluent water quality meets the injection standards for oil fields and has the advantages of small footprint, short installation and commissioning period, high degree of automation, and ease of operation.



A water injection station in the Changqing Oilfield



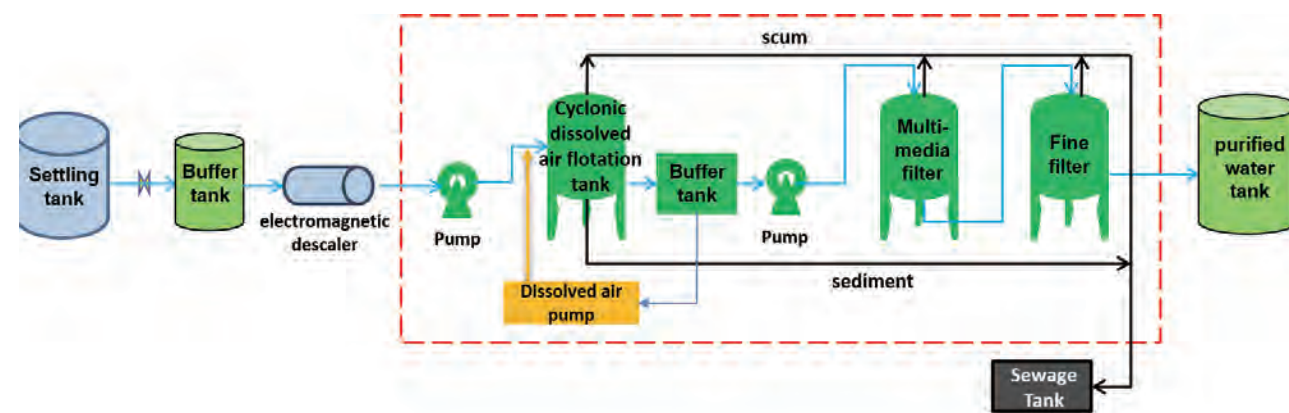
Aerated water photo



Comparison of water quality before and after treatment.



An oil pumping station in the Changqing Oilfield



Employee Training

员工培训

The company regularly organizes safety and business training to ensure safe production while guaranteeing the improvement of employees' professional skills and smooth implementation of operations.

