

MORE KERUI PETROLEUM TECHNOLOGY EFFICIENT IN ENERGY EXTRACTION



ABOUT US

Shandong KERUI Petroleum Technology Co., Ltd. is a technology-driven provider of integrated solutions and technical services, focused on oil and gas field stimulation and technological innovation.

KERUI's business covers technical services for the development of oil and gas fields, clean energy (natural gas, coalbed methane, shale gas, etc.) and new energy (geothermal). We provide integrated solutions and services for customers, such as preparation of exploration and development plans, drilling and work-over, fracturing and stimulation, gas injection EOR, oil and gas field DOM (development, operation and maintenance), in-house laboratory investigation, oilfield chemical additives, downhole tools, etc.

With over 20 years of industry expertise and commitment, KERUI operates in more than 20 countries and employs over 3,000 people. More than 80% of our overseas workforce are local hires. Holding the value of Customer Fulfillment and Joint Creation and Sharing, we are committed to be a world-class value creator in the global energy industry.



OUR MISSION
To Make Energy Extraction Cleaner and More Efficient



OUR VISION
To Be a World-Class Value Creator in the Global Energy Industry



OUR VALUES
Customer Success, Co-Creation and Shared Growth



OUR CORPORATE SPIRIT
**Integrity and Accountability
Pursuit of Excellence**

DEVELOPMENT HISTORY

2001

Started with
Nitrogen Services.

2005

Entered International
Workover Services
Achieved Global
Expansion.

2013

Launched Acidizing,
Fracturing & Coiled
Tubing Operations.
Enhanced the Industry
Chain.

2015

Completed Business
Restructuring & Integration.
Established Oilfield Services
Group.

2018

Expanded Oilfield
Services in Africa.
Started Multi-Country
Drilling & Gas Stimulation
Projects.

2022

Built Core Overseas Market.
Established Full Industry
Chain in the Middle East.

Future

To Be a World-Class Value
Creator in the Global Energy
Industry.

Rapid Growth Stage

Expansion Stage

Foundation Stage

INTERNATIONAL MARKET LAYOUT



COMPANY DEVELOPMENT QHSE PRIORITY



QHSE STRATEGIC OBJECTIVES

- Acquire energy more safely, efficiently, and in an environmentally responsible way.
- Pursue zero injuries, pollution, losses and complaints.
- Achieve internationally advanced standards in QHSE performance.

QHSE VISION

To earn the trust and respect of the industry, customers, and stakeholders through leading QHSE performance.

QHSE CULTURE

Pursuing safety, people-first values, integrity, respect, initiative, and collaboration.

QHSE POLICIES

- People Centric
- Environmental Priority
- Proactive Prevention
- Total Employee Involvement
- Safety First
- Customer First
- Pursuit of Excellence
- Continuous Improvement

QHSE COMMITMENT

Shandong KERUI Petroleum Technology Co., Ltd. always believes that QHSE is the core value of the company. For the benefit of employees, customers, contractors and communities, we are committed to providing effective QHSE management for all production and business activities and workplaces. Good quality, health, safety, and environmental performance are important elements of the company's commitment.

QHSE CERTIFICATES



QHSE MANAGEMENT TOOLS



TECHNICAL CAPABILITIES

KERUI owns a total of five laboratories and research centers: Unconventional Oil and Gas R&D Center, Oil and Gas Generation, Migration and Accumulation Research Center, Oilfield Chemicals R&D Center, Fracturing and Acidizing Laboratory, and Foam Fluid Technology R&D Center. The company has received multiple patents and science and technology awards, and has established technical partnerships with several renowned universities.

KERUI's R&D team consists of 108 professionals - 79 Chinese and 29 international - with over half holding master's or doctoral degrees. We have received multiple patents and science and technology awards, and have established technical partnerships with several renowned universities.

The company currently has over 100 sets of experimental equipment, with an original asset value of more than 30 million RMB. KERUI has the capability to conduct scientific experiments and research across the entire cycle of exploration, development, and production, providing customers with higher-quality and more efficient products and services.

108

Technical R&D Professionals

50%+

Masters and Doctors

PATENTED TECHNOLOGIES

After years of technological research and development, KERUI has obtained a total of 105 patents, including 19 invention patents and 86 utility model patents.



ACHIEVEMENT AWARDS

- 3 subsidiaries recognized as National High-Tech Enterprises
- 2 subsidiaries certified as Technology-Based SMEs
- 1 subsidiary designated as a "Little Giant" enterprise (Specialized, Refined, Distinctive, and Innovative)
- In-house laboratory accredited by CNAS
- Second Prize of the Scientific and Technological Progress Award by the Ministry of Education of China



EXPERT TEAM

- 1 expert receiving State Council subsidies and 4 professor-level senior engineers
- 6 senior engineers, 10+ PhD holders, and 50+ master's degree holders
- Professional: 200+ professionals with 20+ years of industry experience
- International: 100+ employees with 20+ years of overseas work experience



INTEGRATED PRODUCTIVITY SOLUTIONS AND SERVICES FOR OIL & GAS FIELDS

- RESERVOIR EVALUATION
- DEVELOPMENT PLAN PREPARATION
- PLAN APPLICATION AND ON-SITE IMPLEMENTATION

INTEGRATED SOLUTIONS AND SERVICES FOR OIL & GAS PRODUCTION ENHANCEMENT

- RESERVOIR DESCRIPTION
- DESIGN OF OIL AND GAS PRODUCTION
- ENHANCEMENT SOLUTIONS
- APPLICATION OF PRODUCTION ENHANCEMENT TECHNOLOGIES AND SERVICES

INTEGRATED OILFIELD SERVICES

- INTEGRATED SERVICE FOR DRILLING AND COMPLETION ENGINEERING
- INTEGRATED SERVICE FOR RESERVOIR STIMULATION
- INTEGRATED SERVICE FOR CT
- INTEGRATED SERVICE FOR WELLBORE INTERVENTION

INTEGRATED SERVICES FOR OILFIELD PRODUCTION, OPERATIONS AND MAINTENANCE

- DIGITAL AND INTELLIGENT SOLUTIONS FOR OIL & GAS
- SOLUTIONS FOR CLEANING, TESTING & INSPECTION (CTI)
- SOLUTIONS FOR OILFIELD ENVIRONMENTAL PROTECTION
- OIL & GAS SURFACE SUPPORT SERVICES



INTEGRATED PRODUCTIVITY SOLUTIONS AND SERVICES FOR OIL & GAS FIELDS

Full Process

Commercial development evaluation of oil and gas resources based on integrated studies of seismic, geological, reservoir and engineering technologies.

Complete supporting plans for reservoir engineering, drilling, production and surface engineering, and organize on-site implementation to enable rapid production startup.

Reservoir Evaluation

- Reservoir Geological Study and Assessment
- Reservoir Numerical Simulation
- Reserves Evaluation
- Formulation of Development Technical Policies.

Development Plan Preparation

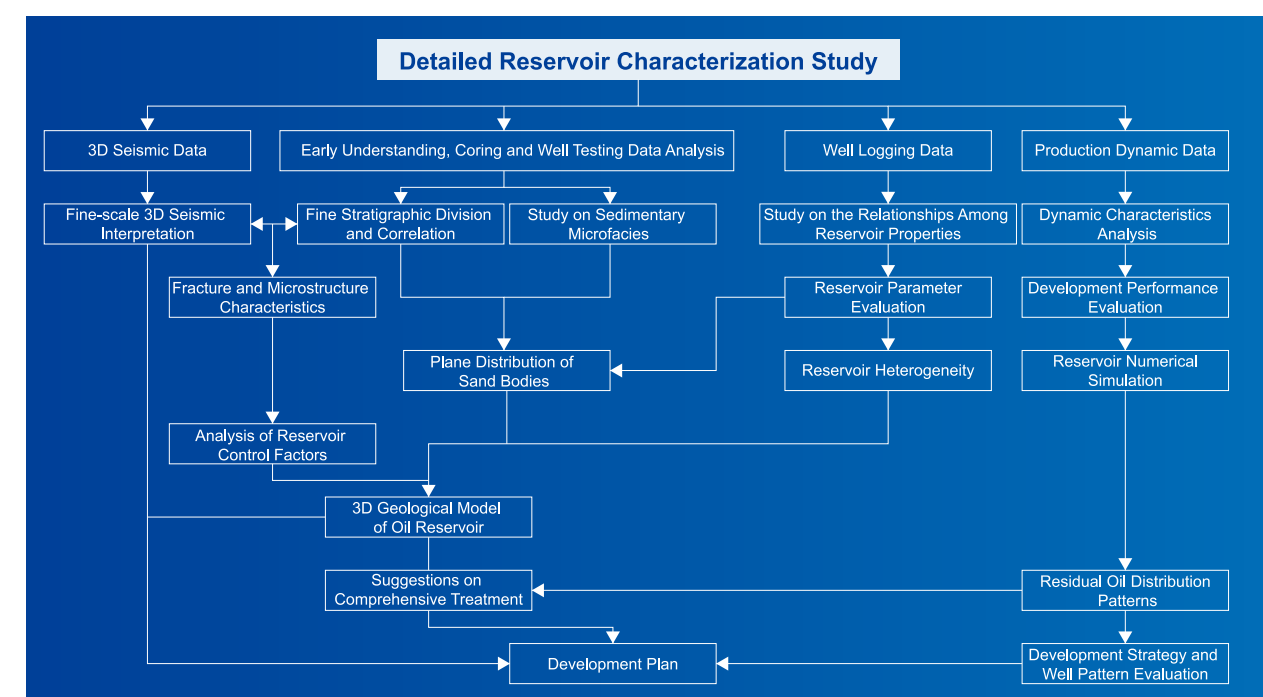
- Reservoir Engineering Plan
- Engineering Plan
- Oil Production Engineering Plan
- Drilling Engineering Plan
- Surface Facilities

Plan Application and On-site Implementation

- Drilling Engineering
- Injection and Production Support
- Surface Support

Research Capability

Through years of research, Kerui Unconventional Oil & Gas Research Institute has developed a standardized workflow for detailed reservoir characterization, plan preparation and operational procedures.



■ **Comprehensive Study and Evaluation of Oil and Gas Reservoir Geology**

Regional Sedimentary Characteristics and Integrated Stratigraphic Correlation, High-resolution Structural Interpretation and Description Integrating Well and Seismic Data, Integrated Reservoir Characterization and Evaluation Based on Well-Seismic Data Fusion, 3D Geological Modeling, Integrated Reservoir Characterization and Reserves Evaluation Combining Static and Dynamic Data.

■ **Reservoir Engineering Study**

Study on Development Policies for Oil and Gas Reservoirs, Reservoir Numerical Simulation and Pattern Analysis, Optimization of Reservoir Development Plan, Requirements for Plan Implementation.

Development Plan Preparation

■ **Geological Research Plan**

Stratigraphic Correlation, Structural Analysis, Reservoir Evaluation, Reserves Calculation & Evaluation, 3D Geological Modeling.

■ **Reservoir Development Plan**

Evaluation of Oil Testing and Production Testing Characteristics and Performance, Evaluation of Reservoir Potential Research on Development Technical Countermeasures, Development Plan Design.

■ **Drilling Engineering Plan**

Reservoir Protection Requirements, Drilling Engineering Design, Production Well Completion Engineering Design, Investment Estimation for Drilling and Well Completion Engineering, Engineering Risk Assessment and Response.

■ **Oil Production Engineering Plan**

Oil (Gas) Production Scheme, Production Supporting Process, Dynamic Monitoring and Reservoir Protection, Investment Estimation for Oil Production Engineering, Engineering Risk Assessment and Response.

■ **Surface Engineering Plan**

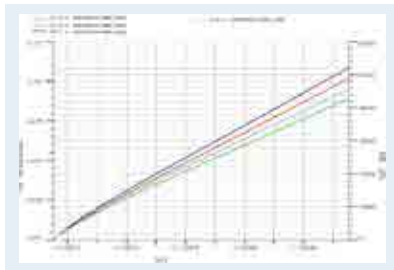
Oil and Gas Gathering and Transmission Project, Produced Water Treatment Facility, Investment Estimation for Ground-works of Other Supporting Projects, Risk Assessment and Response.

Plan Optimization and Economic Evaluation

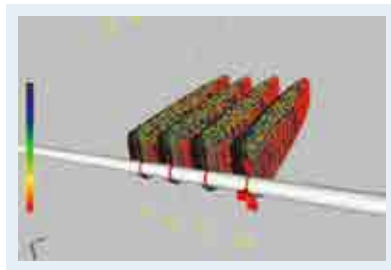
Scientific demonstration, optimization and economic evaluation of multiple reservoir development schemes and supporting technologies are conducted to select the best plan for recommendation and implementation.



Reservoir Development Technology
and Scheme Optimization



Optimization Analysis and Selection
of Process Parameters

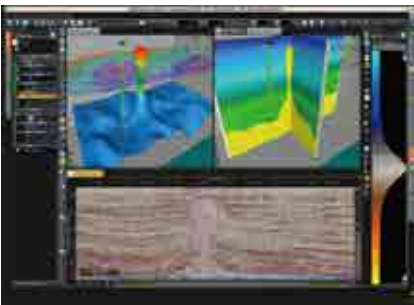


Economic Evaluation of
Development Technology

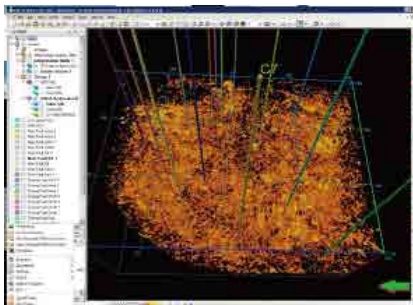
Software and Hardware Environment

■ **Software**

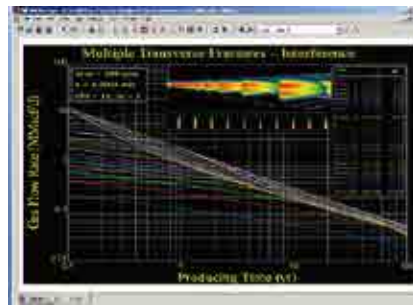
- Cyclog stratigraphic correlation software
- Jason, Strata and other seismic inversion software
- Geoframe and Landmark comprehensive seismic interpretation software
- Petrel geological modeling and numerical simulation software
- Eclipse and CMG reservoir numerical simulation software



Drilling Plan Design



Reservoir Geological Modeling

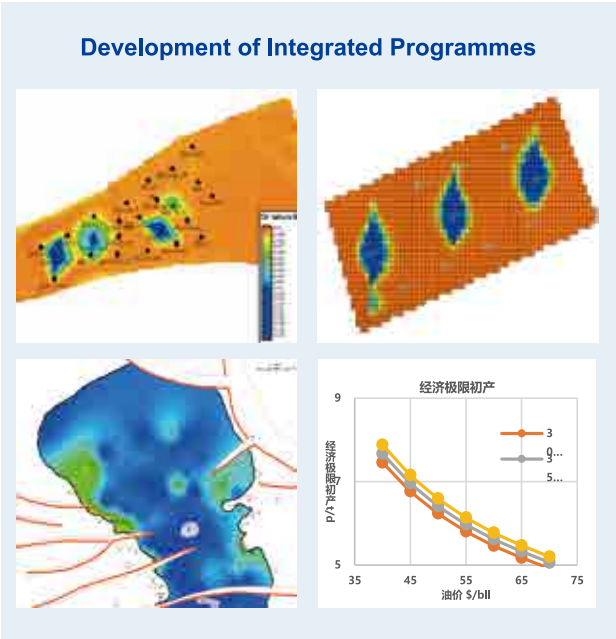
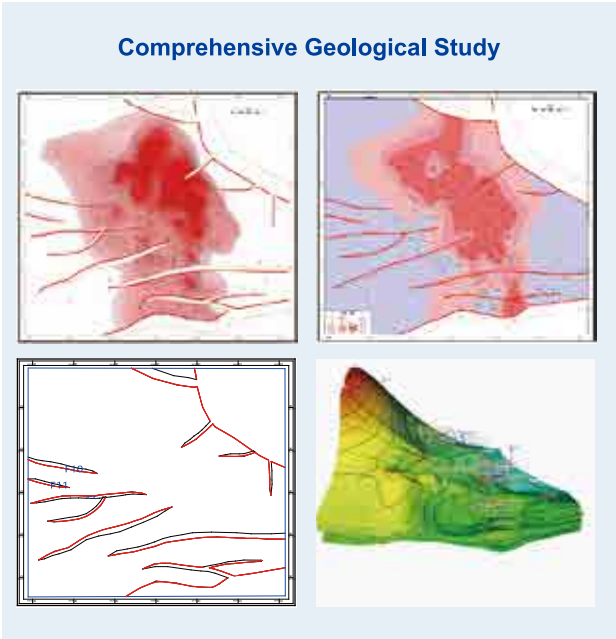


Engineering Plan Design

Scheme Application and Field Implementation

An oil field in China is located in a continental sedimentary basin, with proven geological reserves of about 21.9 million tons and a reservoir depth ranging from 3,700 to 4,000 meters. It is a low-permeability sandstone reservoir.

Through comprehensive research, the preparation of a production capacity development plan and field implementation, a production capacity of 100,000 tons per year was established, with a service life of 20 years and an estimated recovery rate of 20%.



INTEGRATED OILFIELD SERVICES



INTEGRATED SERVICE FOR DRILLING AND COMPLETION ENGINEERING

Capability

16 Drilling Rigs	320 °C Formation Temperature	200,000 m Annual Driling Footage	1.8million m Accumulated Drilling Footage	5,896 m Deepest Drilling Depth
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Core Technology



Extended Reach Directional Well Horizontal Well Drilling Technology

Through directional control, the wellbore trajectory is guided along the designed path to achieve drilling technology for large horizontal displacements or horizontal well sections.



Optimal and Rapid Drilling Technology for Tight Oil and Gas Reservoirs

Drilling technologies utilizing complex well types (e. g., horizontal and multilateral wells) for developing low-permeability, low-porosity reservoirs.



Supporting Drilling Technology for High Temperature Geothermal Wells

Engineering technology for constructing a stable wellbore in ultra-high-temperature formations (>200°C) by using high-temperature-resistant drilling materials, precision cooling systems, and directional drilling techniques.



Shallow Horizontal Well Drilling Technology

Applied for developing oil& gas reservoirs, coalbed methane, and brine deposits with a vertical burial depth of 50–500 meters. Using trenchless directional cross-ing drill rigs combined with while-drilling directional steering technology to create horizontal boreholes in reservoirs and establish production channels.



Special Formations Drilling Fluid Technology

Aiming at various complex formations, a variety of drilling fluid systems are applied to solve issues such as blowout, lost circulation, wellbore collapse, stuck pipe, slow drilling rate, and high-temperature/high-pressure conditions and ensure downhole safety.

Case Study



Indonesia-West Papua

Integrated Drilling Services for Natural Gas Exploration Wells (2011-2016)

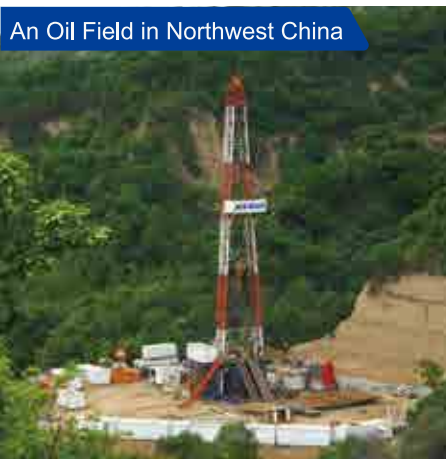
Service Scope:

Drilling, mud, cementing, directional drilling, mud logging, completion

Equipment:

1x3000HP, 1x2000HP, 2x750HP drilling rigs

Seven wells were drilled, with the deepest reaching 5,386 meters, setting the onshore drilling depth record in Indonesia. Personnel were mobilized within 30 days and 9,700 km of equipment transportation was completed in 90 days, demonstrating highly efficient project management and equipment mobilization capabilities.



An Oil Field in Northwest China

Turnkey Drilling Project for an Oil Field (2014-present)

Service Scope: Drilling, mud, cementing, directional drilling, completion

Equipment: 4x1500HP drilling rigs, 1x1000HP drilling rig

By 2024, a total of 81 wells had been completed, including 17 horizontal wells with an average depth of 3,300 meters;

In 2019, a record depth of 5,010 meters was achieved.

The longest horizontal section reached 2,015 meters.



Ethiopia

Integrated Drilling and Completion Project for High-Temperature Geothermal Wells (2019-present)

Service Scope: High-temperature hot dry rock drilling, foam-aerated mud, high-temperature cementing, high-temperature measurement-while-drilling (MWD), geological logging, etc.

Equipment: 2 x 50DB drill rigs

The largest national-level strategic geothermal project in Ethiopia, led by Ethiopian Electric Power Company; To date, 10 wells have been successfully completed, creating the shortest construction period record of Ethiopia geothermal well project and the optimal record of measurement while drilling trajectory control.

INTEGRATED SERVICE FOR RESERVOIR STIMULATION

Service Capability

Conventional Oil & Gas, Coalbed Methane, Shale Oil & Gas, Tight Oil & Gas
"Turnkey" Contracting Services for Reservoir Stimulation

300 Units Fracturing Pump Trucks and Supporting Equipment	15 Teams Experienced Service Professionals	10,000+ Stages Completed	420+ Wells Annual Operational Capacity
25,000 HHP Equipment Capacity	4.3million m ³ Total Fracturing Fluid Pumped	600,000 Tons Total Proppant Pumped	140 MPa Flow Rate Requirement>20 m ³ /min

Core Technology

Optimization of Geological Engineering Integration Solutions

Based on multi-platform simulation software, indoor physical modeling experiments, and block development big data, we optimize the design with the goal of maximizing single-well production.

High-efficiency Staged Stimulation Technology for Horizontal Wells

Offer various staged stimulation technologies for horizontal wells, capable of providing customized high-efficiency stimulation solutions based on field conditions and customer requirements.

Customized Chemical Solutions for Reservoir Stimulation

Laboratory Ability: Establish joint laboratory with leading universities in China to provide customers with optimal products according to reservoir conditions.
Chemical Customization Services: Tailored chemical solutions for each operation, providing customized services for diverse reservoir conditions.

Comprehensive Hydraulic Fracture Diagnosis

Offers a variety of comprehensive hydraulic fracture diagnosis techniques, including microseismic monitoring, distributed optical fiber, and more, enabling real-time, precise analysis of hydraulic fractures and supporting scientific decision-making.

Flowback Management

Enables fast flowback, clean separation, and zero emissions — boosting efficiency by over 30%.

Post-Fracturing Production Profile Monitoring

Quantum Tracer Production Profile Testing Technology: Quantum tracers are injected into different fracturing monitoring stages to measure their concentration in target formations, enabling the determination of fluid and gas production profiles for each interval.
Optical Fiber Logging Technology: Fiber optic sensors are deployed to target formations via coiled tubing (CT) to enable real-time monitoring of downhole temperature, pressure, and other parameters, facilitating continuous distributed measurement for dynamic and profile monitoring of oil and gas wells.

Case Study

Multi-stage Hydraulic Fracturing for Horizontal Wells in Middle East Carbonate Formations (2022-present)
Location: Middle East
Service Scope: Scheme design, fracturing fluid, proppant, staging tools, field construction, flowback after fracturing
20 wells have been completed in total with over 300 fracturing stages; Set a 24-hour fracturing record with 9 stages; Received written commendation letters from customers for three consecutive years.



INTEGRATED SERVICE FOR COILED TUBING

Service Capability

12 sets CT units	9,000 wells cumulative completion	14,000 lbs Injection head with a maximum lifting capacity
7,000 m Maximum depth	15,000 psi Max. Bop pressure	1,600 wells Annual operation capacity



Core Technology

CT Gas Lift Technology

RIH CT below the wellbore static fluid level, and high-pressure gas is injected. As the gas continuously expands, the plunger travels upward, lifting fluids to the surface.

CT Drilling and Milling Technology

The coiled tubing carries drilling and milling tools. It uses pumped-in fluid to drive the motor to rotate, and conducts complex operations such as high-efficiency milling and drilling at blockages in the well, like bridge plugs, cement plugs, and ball seats. This is applied to solve problems such as wellbore plug, casing repair, and debris removal.

CT Fishing Technology

The fishing tools are conveyed to the downhole through coiled tubing, and the fish is grabbed and fished by mechanical or hydraulic means, then recovered to the surface, so as to restore the normal production of the well.

CT Sidetracking with Window Milling

Provide conventional or coiled tubing sidetracking based on field conditions and client requirement.

Double-Layer CT Negative Pressure Sand Washing Technology

With the concentric coiled tubing structure as the core carrier, the sand-flushing fluid enters through the inner tube. By means of the negative pressure adsorption generated by the jet pump, efficient sand flushing is achieved. The sand-carrying fluid is discharged back to the surface through the annulus between the outer tubing and the inner tubing.

Case Study

Integrated Coiled Tubing Solution in an Oil and Gas Field

Location: An oilfield in eastern China

Service Scope: Drilling and milling, fishing, window cutting and sidetracking, auxiliary perforating, gas lift fluid discharge.

The speed drilling and milling cement plug: 15m/h

The length of the fished-out fish reaches: 15meters

The length of window cutting and sidetracking reaches 502m

Six-stage perforation under pressure, reactivated production through gas lift; recovery rate increased by over 40%.



INTEGRATED SERVICE FOR WELLBORE INTERVENTION

Service Capability

29

workover rigs
in operation

2,200

wells

Annual workover capacity

13,500

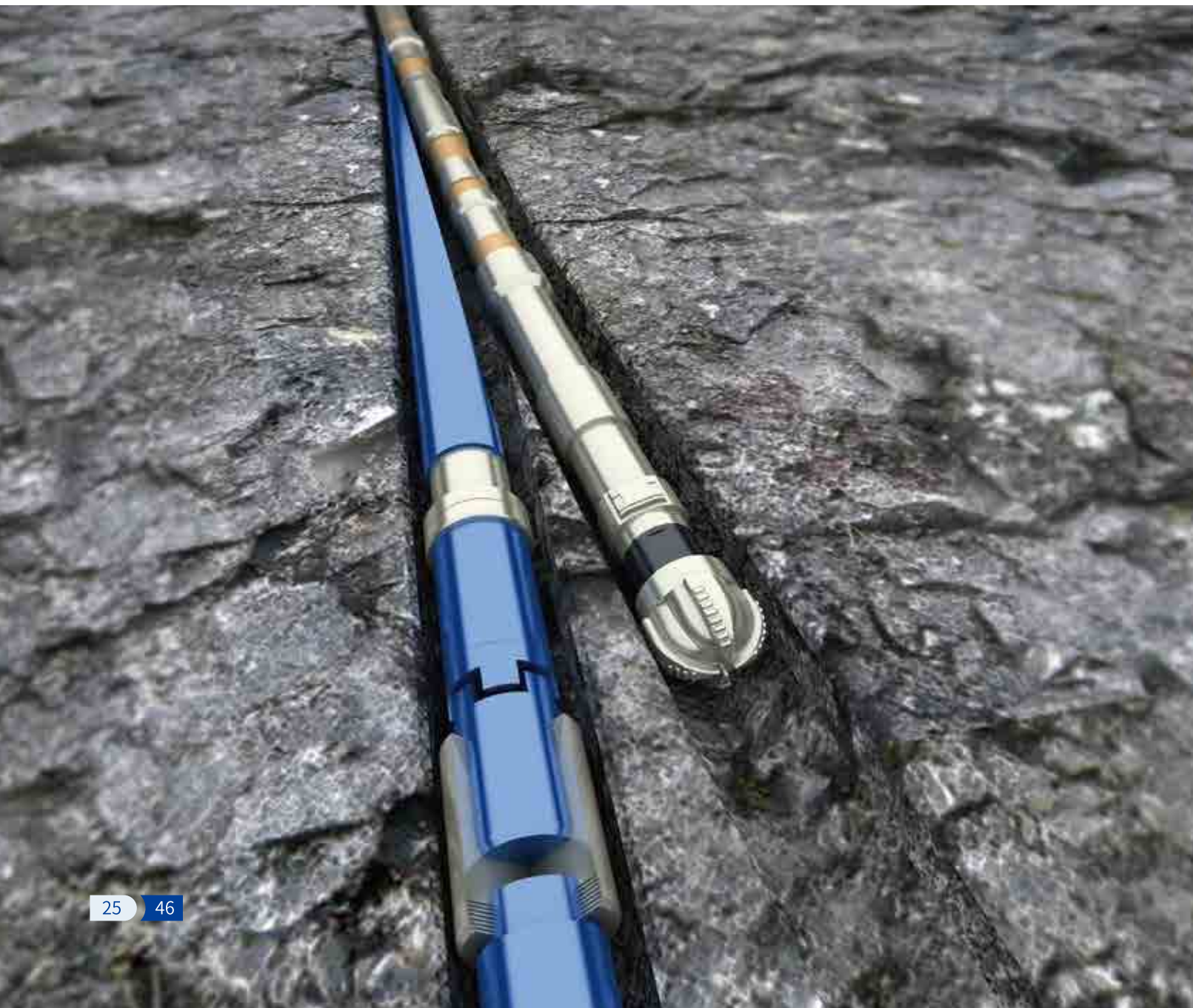
wells

cumulative well
workover operations

118

mm

Min. sidetracked hole

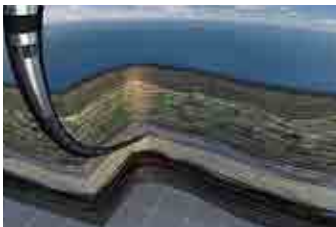


Core Technology



Casing Repair Technology

Casing deformation repair or patching ensures the restoration of oil and gas production.



Sand Control Technology

A process technology that addresses severe sand production issues by combining workover operations (e.g., pulling out original well strings, wellbore cleaning, casing repair) with sand control measures, thereby restoring wellbore integrity and production capacity.



Workover Technology for Water Injection Well

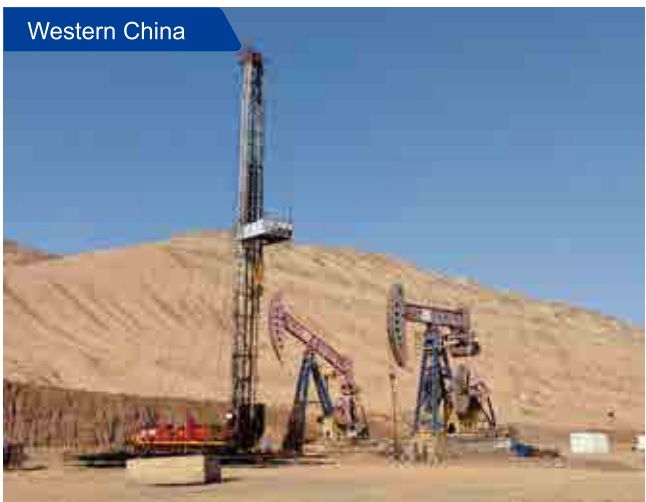
Solve casing damage, deformation, corrosion, and scaling in water injection wells, preventing tubing breakage and pipe stuck.



Workover Technology for Highly Deviated & Horizontal Wells

Casing repair: patching, plugging, reshaping.
Wellbore integrity restoration: Addressing casing leaks and interlayer channeling.
Complex fishing and treatment of down-hole falling objects.

Case Study



Well Intervention Services

Service Scope: Oil and water well workover, normal interventions, maintenance, profile control and injection enhancement.

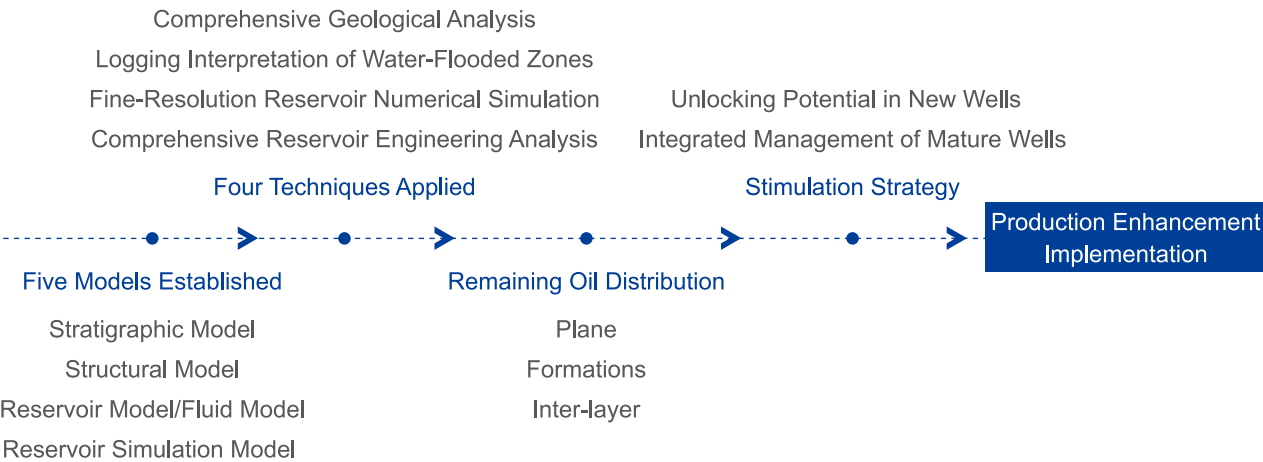
Equipment: 12 workover rigs such as XJ650/XJ550/XJ450/XJ250, and 14 special operation vehicles.

Since 2014, Kerui has delivered integrated downhole services for well maintenance and production enhancement.

Over 4,700 wells completed with a 100% success rate. Key technologies include casing repair, horizontal well jetting, and fishing in injection wells.

INTEGRATED SOLUTIONS AND SERVICES FOR OIL & GAS PRODUCTION ENHANCEMENT

DESIGN OF OIL AND GAS PRODUCTION ENHANCEMENT SOLUTIONS



Research Capability

■ Comprehensive Geological Study

Fine Structural Interpretation of Complex Structural Belts
Sedimentary System Analysis and Reservoir Characterization
Comprehensive Analysis of Hydrocarbon Accumulation
Fine Geological Modeling of Oil and Gas Reservoirs
Reserve Calculation and Evaluation

■ Reservoir Engineering Study

Research on Development Policies and Technologies for Complex Oil and Gas Reservoirs
Study on Reservoir Numerical Simulation and Remaining Oil Distribution
Formulation of Oil and Gas Production Enhancement Plans
Economic Evaluation of Complex Oil and Gas Reservoirs

Different Types of Reservoirs

Integrated Reservoirs	Reservoir Architecture Profiling High Water-Cut Zone Mapping Rhythmite Stratification Modeling	Rhythm Stratification Technology for Thick Oil Zones High-Resolution Intraformational Barrier Prediction
Fault-Block Reservoirs	Fine-Scale Characterization of Fault Tips and Fault Planes Description and Correlation of Low-Order Faults Geological Modeling of Complex Fault Systems	Precision Characterization of Minor Fault Systems
Special Lithologic Reservoirs	Study on the Spatial Distribution of Reservoir Rocks Spatial Distribution and Attribute Characteristics of Fractures	Characterization Technique for Reservoir Spaces and Fractures

GAS INJECTION EOR TECHNOLOGY SERVICES

SERVICE CAPABILITY

- 25** years of gas EOR experience

90+ nitrogen service teams

110+ sets of equipment
- 99.9%** high-purity PSA nitrogen generator

70 MPa (the world's first ultra-high pressure) nitrogen generator

one billion standard cubic meters annual gas injection capacity

CORE COMPETITIVE TECHNOLOGIES

- EOR Technology**
Nitrogen energization & stimulation technology; Nitrogen foam flooding technology;
Nitrogen (foam) assisted thermal recovery technology; Heavy oil viscosity reduction cold recovery technology;
Three-phase ASP flooding technology; Composite-water injection oil recovery technology.
- Production Assistance**
Nitrogen foam sand-washing technology; Water drainage and gas recovery technology;
Natural gas reinjection technology service; Nitrogen displacement/purging technology service.

TYPICAL CASES



Services: Nitrogen Stimulation, Single-well Huff and Puff and Multi-Well Gas Drive(2012-present)

Technical Challenges: (1) As the Tahe Oilfield has progressed into the middle-to-late development stage, the oil-water interface has moved upwards and the residual oil is mainly trapped in the high parts of the structure, existing in the form of "attic oil" with some enriched in micro-fractures and pores. Conventional primary recovery and water-flooding stimulation cannot effectively drive the residual oil. (2) The maximum well depth for operations exceeds 7,000 meters.

KERUI Solutions: Independently developed nitrogen injection tertiary oil recovery technology for fracture-cave reservoirs: Independently developed nitrogen generator for operations at 7,000 meters with an output pressure up to 70 MPa.



Services: Nitrogen Foam Displacement (2014 - present)

Technical Challenges: The viscosity of crude oil on surface in the Tuha Lukeqin Oilfield is 9924mPa·s, making the reservoir a deep ordinary heavy oil reservoir. After water flooding takes effect, water content rapidly increases to over 90%. The significant difference in the oil-water mobility ratio leads to a small injection sweep volume, resulting in a low water flooding recovery rate.

KERUI Solutions: Independently-developed tertiary oil recovery technology through nitrogen foam flooding for heavy oil reservoirs, using nitrogen foam flooding to increase the sweep volume.

APPLICATION OF PRODUCTION ENHANCEMENT TECHNOLOGIES AND SERVICES

Precision Waterflooding Technology

For reservoirs with depleted formation energy and poor waterflood performance, integrate multiple technologies - well-pattern waterflooding optimization, fine-grained zonal injection and water quality classification management to supplement energy and achieve an effective swept volume and displacement efficiency in water injection.

Polymer Flooding Development Technology

By adding high-molecular-weight polymers into the injection water to increase the viscosity of the water phase and reduce its permeability through adsorption and retention, thereby reducing the water-oil mobility ratio, enhancing sweep efficiency and improving the recovery factor.

Compound Water Injection for Low-Permeability Reservoirs

The compound water injection oil recovery technology was developed by combing conventional booster pumps with chemical agents. The injection pressure is slightly higher than the reservoir's fracture pressure, leading to the formation of micro and short fractures around the water injection well. This not only increases water injection volume but also effectively controls water breakthrough. The daily injection rate per well can reach several hundred cubic meters.

Gas Stimulation Technology for Carbonate Reservoirs

High-purity nitrogen is separated from air by nitrogen production equipment and injected into the formation after compression, rapidly replenishing formation energy, displacing remaining oil in the reservoir and enhance oil well production. Two application modes: single-well huff and puff and nitrogen flooding.

Integrated Heavy Oil Production Technologies

A series of technologies specifically for systematic development of high viscosity heavy oil reservoirs; The whole-process dry-keeping technology combines nitrogen foam, steam huff and puff, thermal recovery and oil displacement; Enhances reservoir displacement efficiency, reduces oil viscosity and increases heavy oil recovery.

Flow Field Vector Adjustment /Quantitative Description Technology of High Water Consumption Zones

For high-water-cut mature oilfields with established preferential water injection channels, based on the identification of high water-consuming zones, flow field adjustments are implemented to reduce water cut and improve the development effect.

Water Shut-off, Profile Control and Flooding Adjustment Technology

Aiming at the problems of poor water injection sweep and low water flooding efficiency of the reservoir, this technical series provides integrated solutions to improve planar and inter-layer profile control and injection effects; According to the requirements of different reservoir water flooding processes, water shut-off and profile control, nitrogen foam, three-phase flooding and other processes are provided; Improve the energy supplement and effective sweep volume and displacement efficiency of water flooding reservoir, greatly enhancing the recovery factor of secondary oil recovery.

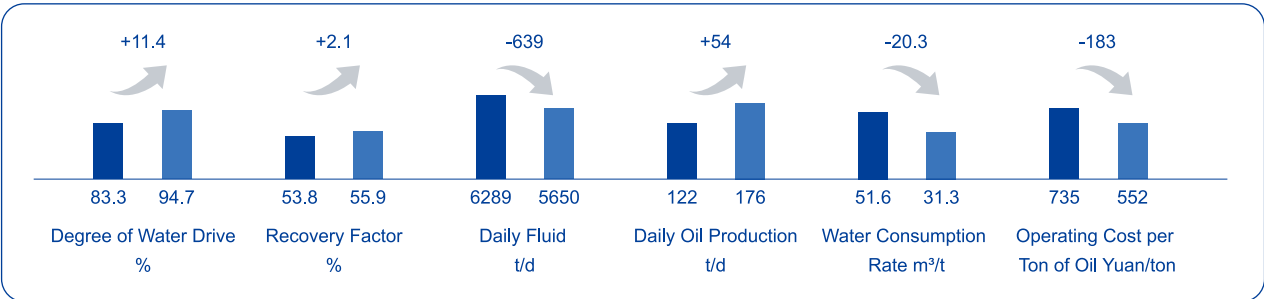
■ Fine Water Injection Technology for Well Pattern Interchange Flow Field Adjustment in G Area

Technical Adjustments

Interchange of upper and lower strata well pattern to change injection-production flow line by 40°
Production well sidetracking for water avoidance in high water consumption area
Blocking and adjustment of deep thick oil layer in the water well
Multi-stage plugging of tubing, workload for old wells changing strata: 89 Wells

Implementation Effect

44% increase in daily oil production
25% reduction in operating cost per ton of oil
35% decrease in water consumption per ton of oil
2.1% increase in recovery factor

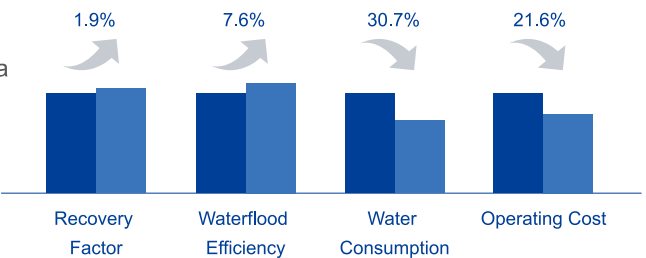


■ Fined Water Injection Technology for Strata Subdivision Flow Field Adjustment in T Block

Technical Adjustment Scheme

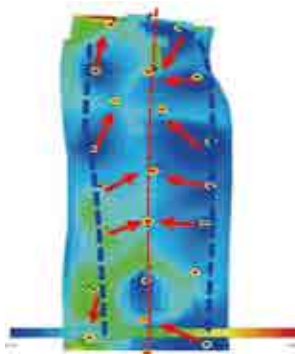
Vertical subdivision of two sets of development strata
Horizontal well pattern transformation
Subdivision water injection in rhythmic layers
Completion of water injection adjustment

■ Before ■ After



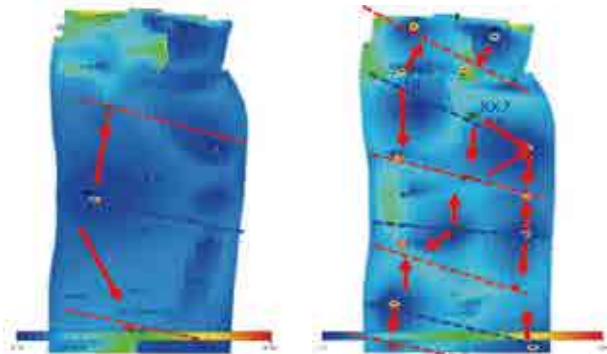
Before Adjustment

Distribution diagram of overlapping residual oil of T blocks 8¹, 8² and 8³



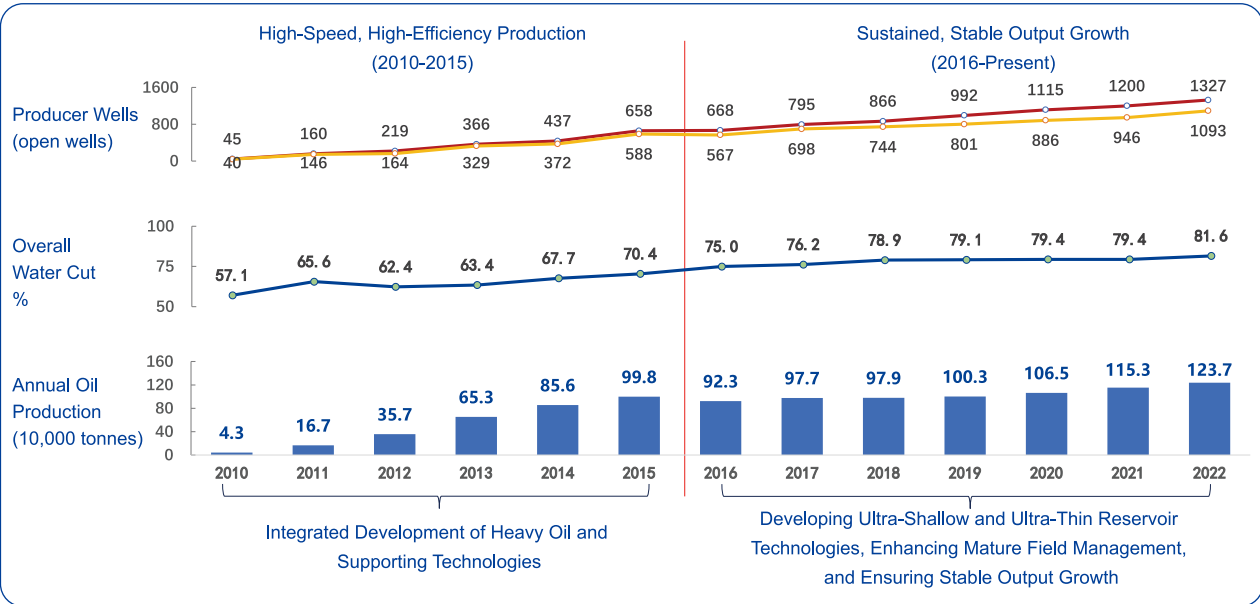
After Adjustment

Residual oil distribution map of strata subdivision development for 8¹⁺³ and 8² of T block



■ Integrated Development Technology Case of Heavy Oil - A Shallow and Thin Heavy Oil Field in Eastern China

Shallow reservoir (150-750 m), thin pay zone (2-6 m), low temperature/pressure (18-35 °C, 2.0-6.1 MPa), and high-viscosity heavy oil (5-9 × 10⁴ mPa·s). Integrated development enabled stable production of over 1 million tonnes annually. In 2022, 1,093 wells produced 1.237 million tonnes of oil, with 81.6% water cut.



■ Compound Water Injection for Low-Permeability Reservoirs in Western China

2022 Stimulation Results - Target Block

5 horizontal wells treated with nitrogen + activated water (with imbibition drag-reducing agents)
Cumulative oil increase: 2,490.8 tonnes; 3 wells with significant response (averaging 830.3 tonnes/well)
Injection pressure 2–6 MPa lower than adjacent wells, achieving absorption enhancement and drag reduction

Effectiveness Statistics of Compound Water Injection Measures in a Certain Block

Well No.	Pre-Operation Production Status			Current Production Status After Operation			Production Days (Days)	Accumulated Oil Production (t)	Accumulated Oil Increment (t)
	Daily Fluid Production (m³)	Daily Oil Production (t)	Water Cut (%)	Daily Fluid Production (m³)	Daily Oil Production (t)	Water Cut (%)			
001	3.33	1.61	51.6	1.55	0.77	51.2	367	415.7	Minor Effect
002	0.8	0.64	19.5	6.64	3.38	41.9	370	1045.4	808.6
003	3.01	1.69	43.7	3.76	2.52	33	350	1539.5	948.7
004	2.16	1.74	19.5	1.33	0.97	31.7	350	508.3	Minor Effect
005	0.9	0.72	20.0	4.46	3.22	27.8	320	963.9	733.5
Total		6.4			11.28			4,472.8	2,490.8

INTEGRATED SERVICES FOR OILFIELD PRODUCTION, OPERATIONS AND MAINTENANCE

DIGITAL INTELLIGENT SOLUTIONS

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.

- Improved Data Availability
- Break Down Data Silos
- Reduce Human Error
- Reduce the Risk of Data Loss
- Improve Decision-making Efficiency
- Support for Smart Applications

Reservoir Analysis and Management	Integrated Geological Study	Release of Original Data and Results	Professional Software Data Interface and Auxiliary Analysis		
Injection-Production Correspondence Rate Statistical System	Single-Well Comprehensive Analysis	Geological and Development Data Query and Visualization	Cycloglog	Forward	SMT
Reservoir Dynamic Analysis Software	Cycle Analysis and Basal Comparison	Integrated Research and Knowledge Output Publication	Jason	Petel	Eclipse
.....			OFM		

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.

Oil Well	Real Time Parameter/Daily Production Report/Reservoir Geology/Operating Well History/ Downhole Pipe String/Equipment Info/Dynamic Monitoring/Analysis and Test
Stations and Depots	Real Time Parameters/Daily Production Report/Process Flow Diagram/Stations and Depots Plan View/Equipment Info/Water Quality Monitoring/3D Model/Underground Pipe Network
Pipeline	Real Time Parameters/Potential Hazard Point/High Consequence Area/Encroachment/ Panoramic Image/Perforation Record/Route Inspection Video/Emergency Resources

■ 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.

Production Monitoring Module

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.

Early Warning and Alarm Module

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 mechanisams, the system enables real-time alerts and proactive warnings for abnormal conditions.

Production Dynamic Module

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.

Dispatch Operation Module

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.

Production Management Module

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.

Emergency Response Module

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.

■ Deepoil Intelligent Platform for Equipment Operation and Maintenance

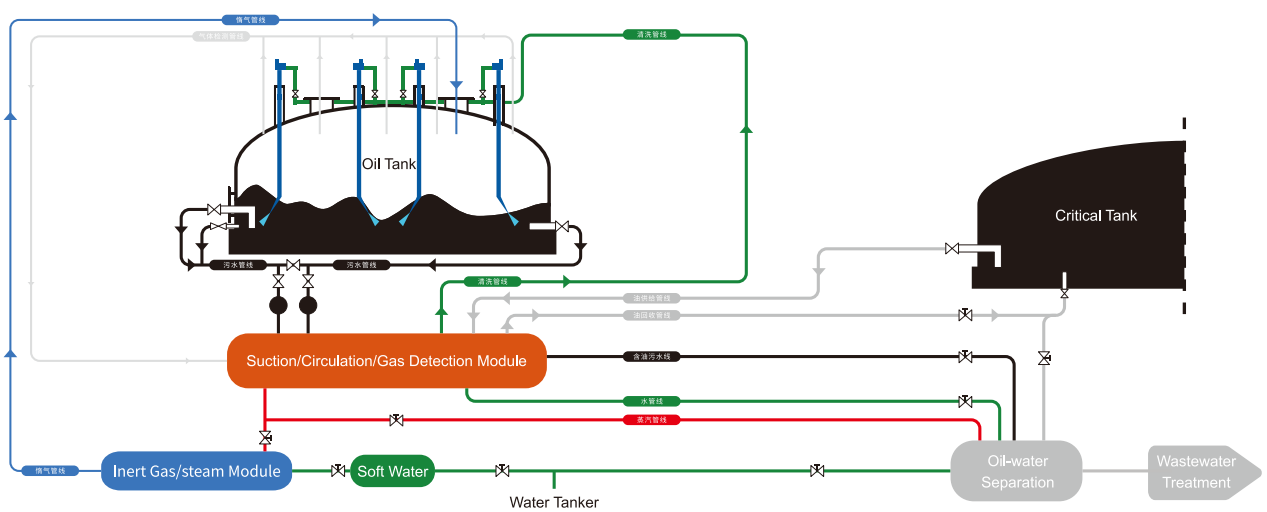
Display	Large Monitoring Screen	PC Terminal		APP		Applet		Multilingual	Interface			
Decision Analysis	Large-sized Screen for Monitoring	Equipment Dashboard	Service Dashboard	Service Dashboard	Patrol Inspection Dashboard	Fault Prediction	Efficiency Analysis					
Service Module	AIoT	Fault Library	Knowledge Base	Equipment Data	Product Management	Physical Model	Equipment Management	ERP	E-mail			
	Main Function Modules	Maintenance Template	Maintenance Calendar	Patrol Inspection Item Management	Patrol Inspection Reminder	Data Acquisition	Status Alert					
		Maintenance Schedule	Maintenance early warning	Patrol Inspection Standard	Patrol Inspection Work Order	Condition Monitoring	Configuration Display					
		Maintenance Work Order	Maintenance Query	Patrol Inspection Plan	Patrol Inquiry	Remote Control	Data Query					
		Equipment Ledger	Equipment Procurement	Material Management	Ex-warehouse Management	Trouble Shooting	Predictive Maintenance					
		Equipment BOM	Depreciation of assets	Spare Parts Procurement	Safety Stock	Trouble Shooting	Failure Analysis					
		Equipment Change	Equipment Inventory	Warehousing Management	Inventory Count	Maintenance Work Order	Spare Parts Records					
	Base Modules	Tenant Management	Organization Management	Personnel Management	Color Management	Authority Management	Data Dictionary					
	Data Services	Equipment Data	User Data	Operational Data	Manufacturing Data	Warehouse Data	Video Data			Customer& Supplier Data	Material data	WMS
Basic Environment	RDS	TSDB	NoSQL		Redis				Video			
	Virtual machine	Physical machine	Host security		WAF		Online backup					

SOLUTIONS FOR CLEANING TESTING & INSPECTION (CTI)

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.



■ Tank Cleaning and Testing Technology

Floormap 3D: Quick scanning of regular large bottom plate areas.

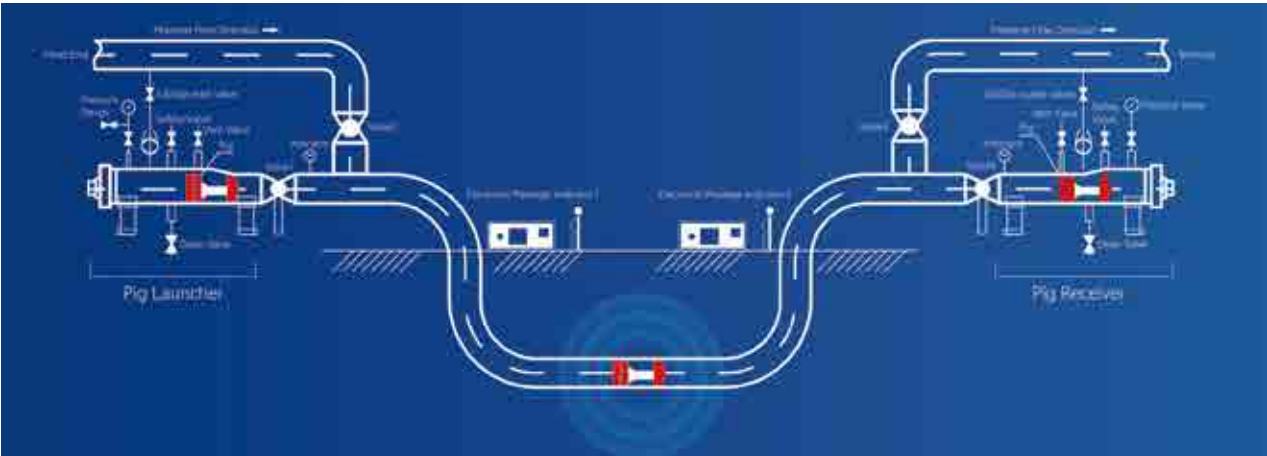
Handscan: Rapidly scanning of irregular bottom plate areas such as supports/heating coils.

Suitable for Automatic Detection The signal is acquired by the sensor, and the software automatically analyzes to identify defects.	Determine the Degree and Position of Corrosion Determine the extent (area and depth) of base plate corrosion and its location.
High Reliability A computer automatically identifies and alarms defects, reducing the influence of human factors.	High Efficiency and Environmental Protection High detection speed and no pollution.
Quantification of Defects The magnetic flux leakage signal has a certain correspondence with the shape and size of the defect.	Output of Inspection Results The detection result can be visually observed on a computer screen, and a detection report can also be generated.

■ 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.

Tank Cleaning and Testing Technology



Foam Pig	Φ168mm-1219mm	40%	Blockage can be shattered under high pressure without interrupting pipeline operation.
Gauging Disc Pig	Φ168mm-1219mm	25%	The exact location of dents can be identified using the tracking device and process flow.
Steel Brush Pig	Φ168mm-1219mm	25%	The steel brush runs along the inner wall, effectively removing impurities from the pipeline.
Magnetic Pig	Φ168mm-1219mm	25%	It efficiently removes most impurities and ferromagnetic materials from the pipeline.
Cleaning Tools	6"~ 48"	/	Corrosion of internal and external walls, metal loss defects, cracks, weld anomalies, etc.
Inspection Tools	6"~ 48"	/	Changes in pipe diameter, such as dents and ovality; pipeline features, such as girth welds, elbows, and segment lengths.

SOLUTIONS FOR OILFIELD ENVIRONMENTAL PROTECTION

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.



■ Technical Characteristics of Cyclonic Dissolved Ozone Flotation (CDOF)

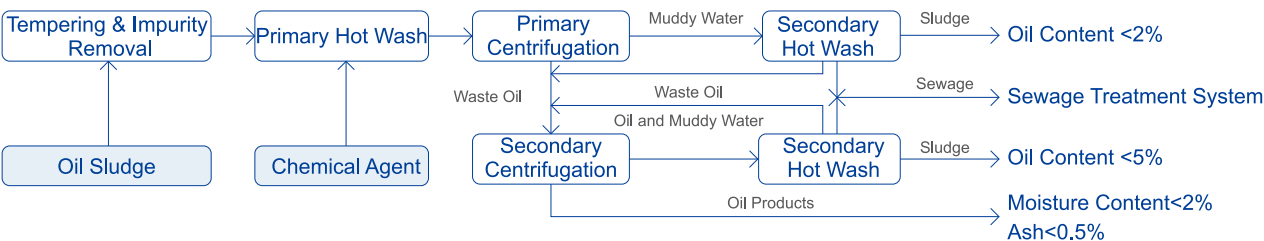
Organic combination of CDFU technology and ozone advanced (catalytic) oxidation technology mainly integrates the following technologies:

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



■ 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.



■ Associated Gas Recovery Technology

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).



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.



Case Study

Process Route: Chemical hot washing + agent-assisted cryogenic separation

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



OIL & GAS SURFACE SUPPORT SERVICES

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.



Three-phase Separator

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



Cyclone Desander

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



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

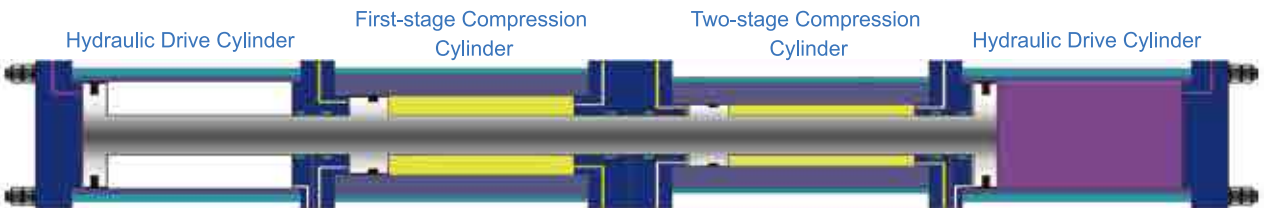
Reduces wellhead backpressure, increases oil and gas production, and minimizes wear on downhole rod pumps.

For Gas Wells

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

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.

Case Study

Natural Gas Mixed Transmission Project

Quantity: 4 sets Oil & Gas Mixed Transmission Equipment

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%.



CUSTOMER APPRECIATION



100+

GLOBAL STRATEGIC PARTNERS AND
COOPERATIVE CUSTOMERS

 中国石化 SINOPEC	 PetroChina	 中国海油 CNOOC	 延长石油 YANCHANG PETROLEUM	 eni		 NNPC
 Bashlykhan Joes MAYNOON OILFIELD	 KAZAKHSTAN PETROLEUM	 COSL	 ADDAX PETROLEUM	 CNNE	 Kuwait Energy Subsidiary of United Energy Group Limited	 دلييل البترول DALEEL PETROLEUM L.L.C.
 Bapco Upstream	 BRAVA energia	 KBM	 MIO Mongolian Oilfield	 የኢትዮጵያ ኤሌክትሪክ ኃይል Ethiopia Electricity Power	 Mellitah Oil & Gas B.V.	 振华石油 ZhenHua Oil
 HALLIBURTON	 Baker Hughes	 CMC 中机公司 CHINA NATIONAL MACHINERY IMP. & EXP. CORP.	 山东高速 SDHS	 Schlumberger	 XCMG 徐工集团	 CAMC 中工国际
 Weatherford	 HUAWEI	 中国石油大学 (华东) CHINA UNIVERSITY OF PETROLEUM	 中国地质大学 CHINA UNIVERSITY OF GEOSCIENCES	 西南石油大学 SOUTHWEST PETROLEUM UNIVERSITY	 中国矿业大学 CHINA UNIVERSITY OF MINING AND TECHNOLOGY	