PE short-process oilfield produced fluid treatment system solution -an intelligent, efficient and green solution covering the entire oilfield



Yixia Invention (Beijing) Technology Co., Ltd.

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01.Company Profile



Company Profile

Yixia Invention (Beijing) Technology Co., Ltd. is a powerful alliance of technology research and development with high-end manufacturing, strategically collaborating with military supply factories and universities.,achieving a synergy of "1+1>2".

The company focuses on petrochemical wastewater and seawater purification technologies,aiming to solve the problems of water purification and utilization in the global petrochemical and coastal industries.The company 's self-developed short process PE treatment technology for oifield produced fluid,withits intelligent,modular and pollution-free features,is leading the technological transformation of the industry.

- YiXia Invention :Water treatment experts with multiple core technologies of independent intllectual property rights provide cuting-edge technology research and development and solution support for the project.
- military supply factory:A military enterprise with national second-class confidentiality qualifications and weapons and equipment manufacturing qualifications,possessing world-class high-precision and large-scale precision metal parts processing and manufacturing capabilities,providing solid hardware manufacturing and supply chain guarantees for the project.

Core expert team

Experts	Senior background and domain expertise	Honors and Achievements
Dr. Zhu Tongde	Chief water treatment expert, former assistant Director of the Science and Technology Department of the Ministry of Petroleum, and former researcher at the Finnish National Academy of Sciences.	With over 30 patents, he led the development of three series of products for the PE short process technology.
Dr. Zhang Hongfei	Water treatment expert, former School of Environmental Engineering, Tsinghua University, specializing in electrochemistry and fuel cells.	Three invention patents, leading the research and development of fast-ion electrode materials.
Dr. Liu Bowen	Water treatment expert, former School of Environmental Engineering, Tsinghua University, with a focus on Marine environmental science and seawater purification technology.	Two invention patents, involved in the development of nuclear power wastewater treatment devices.
Dr. Sun Zhaohu	Refrigeration expert, former Institute of Physics and Chemistry, Chinese Academy of Sciences, Professor-level Senior engineer.	With four invention patents, he was awarded the Technical Special Prize of the China Refrigeration Society.
Dr. cheng kuiwei	Refrigeration expert, former Institute of Physics and Chemistry, Chinese Academy of Sciences, Professor-level senior engineer.	Three invention patents and the first prize for the transformation of scientific and technological achievements of the Chinese Academy of Sciences.

Qualifications and patents

The company has a complete qualfcationcertification system and solid technical property nghts protection

At present,the company has more than 40 core independent intellectual property rights,including over 20 invention patents

Key patents listed:

- A process method and device for medicine-free sterilization of oilfield reinjection water(ZL201810285340.1)-
- Core technology of E module
- Control method and device for high-pressure water injection pumping station (ZL00105544.5)-System control core
- A Composite wastewater treatment method and apparatus(ZL20106601664.4)-Process method Foundation
- Intelligent recovery method for Associated gas from oil fields(ZL20231317153.4)-natural gas processing
- unit technology
- An integrated device for associated gas dehydration (ZL202210146428.1)-natural gas processing unit technology

Qualifications and patents



























02 Industry pain points and technological Revolution



Traditional craft pain points: High costs, low efficiency, unsustainable predicaments

Conventional oilfield production fluid treatment processes rely on the model of "large tank sedimentation+chemical agents",

There are many difficult-to-cure pain points:

Lengthy and complex proc

Relying on multiple stages of gravity sedimentation,chemical dosing and filtration separation,it takes up a lot of space and has a long construction period.

High operating costs

The continuous addition of various chemical agents such as demulsifiers,biocides,scale inhibitors,coagulants,etc.,and the large amount of chemical sludge produced,the subsequent treatment costs are extremely high.

Environmental and safety p

The continuous addition of demulsifiers,biocides, scale inhibitors,large amounts of chemicals and sludge poses a persistent threat to the environment; At the same time,equipment corrosion and scaling are severe,pipeline leakage risks are high,and production safety hazards are significant.

Low level of automation

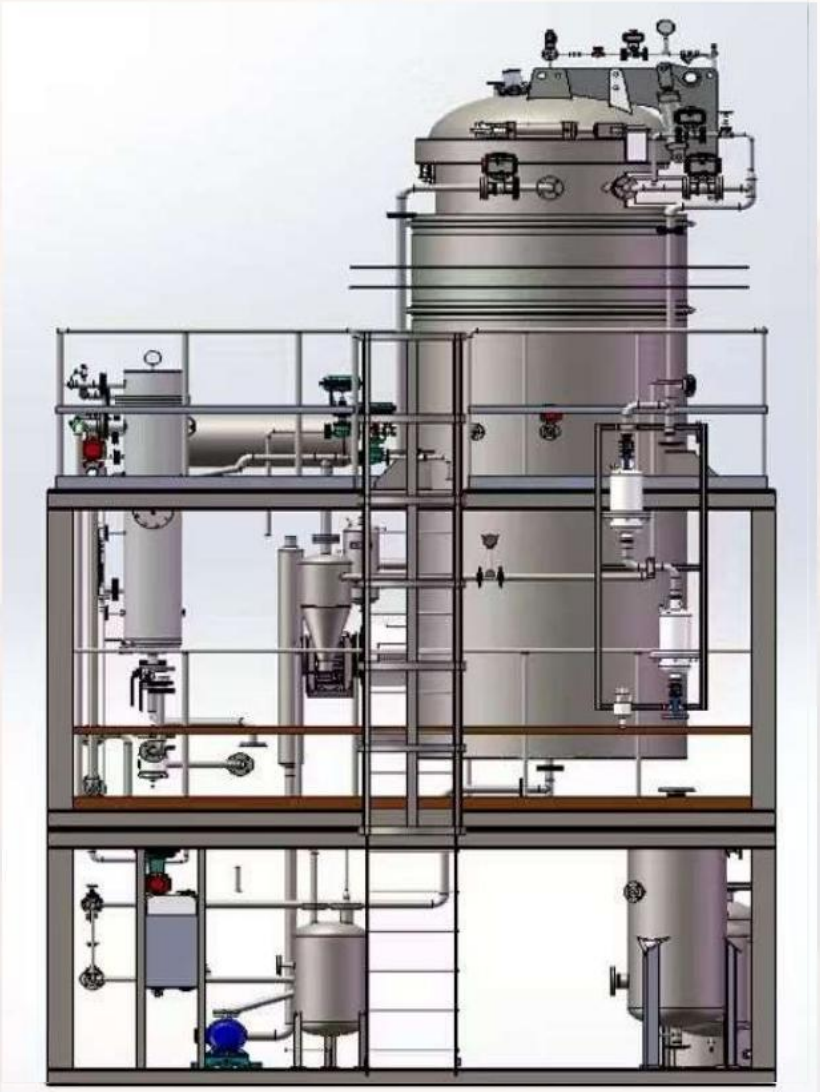
Heavy reliance on manual operation and intervention leads to low productivity and difficult management.

Resources cannot be recycl

Emulsified oil and dissolved oil are difficult to be effectively demulsified and recycled,resulting in crude oil waste.

New process solutions:Precisely addressing traditional pain points

Disruptive innovation in PE short process technology



Process Innovation:From Lengthy to Minimalist

The PE process integrates the traditional multi-stage tandem process into two core modules of "physical demulsification(P)+electrochemical purification(E)", achieving a process reduction of more than 60%and a floor space reduction of 80%,completing the paradigm shift from traditional engineering construction to modular rapid deployment.

Cost reconfiguration:From high to extreme

Through the two core technologies of "zero chemical agent addition"and "zero sludge generation",the cost of **continuous** agent procurement and subsequent sludge treatment is completely eliminated,achieving a reduction of more than 95%in the combined cost per ton of water treatment and a fundamental change in operational burden.

Safety and environmentalprotection:From risk to reliaBsgpurce regeneration:From Waste to revenues

Eliminate the introduction of chemical pollutants at the source and achieve clean production.Electrochemical technology simultaneously achieves sterilization,desulfurization,and anti-corrosion,eliminates the risk of equipment corrosion and leakage, and significantly enhances the intrinsic safety of production.

Using nanoscale demulsification materials and turbulent motion methods,100%of emulsified and dissolved oil that is difficult to handle with traditional processes is recovered into high-quality crude oil,tuming environmental pressure into significant economic benefits.

Smart upgrade:From human control to intelligent control

The entire system integrates a 5G+Beidou remote intelligent monitoring platform,enabling unmanned operation and remote maintenance on a global scale,and promoting a comprehensive upgrade of the production management model from relying on human experience to digital and intelligent.

A comprehensive comparison of the new and old processes

Comparison Dimensions	Traditional physicochemical processes	PE short process	Advantages of PE technology
Core Principles	Gravity sedimentation +chemical demulsification Dependent on time and chemicals	Physical movement demulsification + electrochemical purification Technology-driven,no wait	Efficiency revolution:Processing speed up by90%
Process flow	Long process,multiple units in series 5 to 7 processing units	Ultra-short processes,module integration 2 core modules	Process Revolution:60%simplification,80%floor space reduction
Chemical agents	6-8 chemicals Demulsification,sterilization,scale inhibition, coagulation,etc	Zero chemicals Physical+electrochemical synergy	Environmental Revolution:Zero secondary pollution, clean source
Sludge production	A large amount of chemical sludge 3 to 5 tons per 10,000 tons of water	Zero sludge discharge Eliminate it at the source	Solid Waste Revolution:Eliminating the problem of sludge treatment
Cost per ton of water	$4.2 High operating burden	$0.1 disruptive low costs	Cost revolution:Operating costs reduced by more than 95%
Construction period	More than 12 months The civil engineering works are complex	About 25 days Modular rapid deployment	Speed Revolution:90 percent shorter production cycle
Degree of automation	Local monitoring,manual operation Rely on experience	Smart remote,unattended 5G+Beidou system	Smart Revolution:Digital,Automated Management
Resource recycling	Partial waste Emulsified oil is difficult to handle	100%recycled Turn waste into treasure	Value Revolution:Creating additional economic benefits

03.Core advantages of PE Short Process technology



Outstanding processing performance and wide applicability

P module



Core functions:Demulsification,oil removal, suspension removal

Maximum daily processing capacity :3,000 m^3

Key effluent indicators:Oil content ≤20mg/L

E module



Core functions:Sterilization,desulfurization, preservation

Maximum daily treatment capacity: 30,000 m^3

Key effluent indicators:SRB sterilization rate 100%

Sulfur removal rate 98%

Outstanding processing performance and wide applicability

EF module



Core functions:Electrochemical filtration, suspension removal

Maximum daily processing capacity: 30,000 m³

Key effluent indicators:Suspended solids≤2mg/L

Oil content≤5mg/L

N module



Core functions:Deacidification,dehydration, liquefaction of natural gas

Maximum daily processing capacity:100,000 m³

Key indicators of liquefied gas: Compliant with national standards

Revolutionary "zero chemicals,zero sludge"environmental advantage

Source control

Technically,it eliminates the introduction of chemical agents and eradicates the generation of chemical sludge, achieving truly clean production.

Full recycling of resources

Recover 100%emulsified dissolved oil that is difficult to handle in traditional processes into high-quality crude oil,turning environmental pressure into economic benefits.

Full-process anti-corrosion

The electrochemically generated active material can form a dense passivation flm on the inner wall o the pipe for active anti-corosion, significantly extending the service life of the equipment.

Significant intelligence and economic benefits



Intelligent operations and maintenance

Integrated 5G+Beidou remote monitoring system enables unattended,remote control and early warning of faults worldwide,significantly reducing management complexity and security risks.

Cost disruption

The combined cost per ton of water treatment has dropped from $4.2 in traditional processes to $0.1,a reduction of more than 95%.

Efficient investment

The modular skid-mounted design reduces the overall investment by 40%, shortens the construction period by 90%,and shortens the payback period from 3-5 years to 1-2 years.

04 Project Implementation and investment prospects



Flexible and efficient project implementation model

01-

Modular delivery

All equipment is pre-integrated skid-mounted modules for "ready-to-use and quick docking",greatly simplifying on-site construction.



02 –

Standardized replication

Mature product lines can be flexibly combined like building blocks to quickly match different processing scales from single Wells to large combined stations.



03 -

Full-cycle service

Provide full life cycle service support from solution design,installation and commissioning,personnel training to remote intelligent operation and maintenance.



A clear and considerable overall return on investment

PE short process technology is one

It combines extremely high environmental value with excellent return on investment

Strategic technological upgrades

Take a project that processes 10,000 tons of produced fluid per day as an example:

Direct investment savings:The PE process saves 40%of the initial construction investment compared to the conventional process.

Annual operating cost savings:Savings of more than $15 million per year on chemicals and sludge treatment alone.

Additional revenue creation:By recovering emulsified oil,millions of extra dollars in crude oil sales revenue can be added each year.

Hidden value enhancement:Improving production safety and stability,avoiding environmental risks,and enhancing the green image of the enterprise.

05.Technical specifications and equipment parameters



P0/Pw250-B3 Module Performance Parameter Table 2	
Application Field	Oilfield produced fluid and oily wastewater treatment; removal of sulfides, dissolved oxygen and iron ions from river water, etc.
Model	P0210-B3 Pretreatment Module (mobile skid-mounted) Pw125-B3 Wastewater Treatment Module (mobile skid-mounted)
Explosion-proof & Protection Rating	Exd IIB T4, IP56-IP65; suitable for onshore/offshore flammable/explosive or non-explosive areas
Max. Daily Treatment Capacity (m^3)	P0210-B3 Pretreatment Module: 5000 Pw125-B3 Wastewater Treatment Module: 3000
Design Specifications	Demulsification efficiency 100%; sulfide removal efficiency ≥95% Dissolved oxygen removal efficiency ≥98%
Inlet/Outlet Conditions	P0210 Pretreatment Module – Inlet: water phase ≤10%, gas phase ≤30%; Outlet: crude oil water content ≤0.5%, associated gas water content ≤0.5%, oily water oil content ≤200 mg/L. PW125 Treatment Module – Inlet: oil ≤1000 mg/L, SS ≤500 mg/L; Outlet: oil ≤10 mg/L, SS removal efficiency ≥70%.
Module Dimensions (mm)	3500×3500×8500 (L×W×H)
Power Supply (AC)	380V 50Hz, three-phase four-wire system, bottom cable entry
Weight (t)	17.5
Operating Weight (t)	28.6
Max. Pressure (MPa)	P0210: 0.5 MPa Pw125: atmospheric pressure
Installed Power (kW)	P0210: 120; Pw125: 120
Operating Power (kW)	≤80% (depends on water salinity, sulfide content, pH, temperature, and properties of crude oil and wastewater)
Ambient Temperature (° C)	≤60
Medium Temperature (° C)	40–90 (optimal 65–70)
Relative Humidity (%)	0.9
Electrical Explosion-proof	Exd IIB T4, suitable for flammable and explosive working conditions
Service Life (years)	15 years
Operation & Manning	Automatic unattended operation, remote service
Maintenance cycle (days)	3 years
Product delivery cycle (days)	100 (effective working days, excluding statutory holidays)
Remarks	The parameter values in this table are designed based on general oil-water properties. They may vary depending on the specific oil-water characteristics of different oilfield production blocks.

E500-B3 Sterilization (Anti-corrosion) Skid-Mounted Module Performance Parameter Table 4	
Application Field	Petroleum, marine, nuclear power, chemical industry, and seawater purification
Model	E210-B3 (mobile skid-mounted)
Explosion-proof & Protection Rating	Exd IIB T4, IP56-IP65; suitable for flammable/explosive or non-explosive areas
Daily Treatment Capacity (m^3/d)	12,000
Sterilization (Anti-corrosion) Design Specifications	SRB sterilization rate 100%, anti-corrosion rate 100%,Sulfide removal rate 98%; Inlet sulfide ≤5 mg/L
Module Dimensions (mm)	3,200×2,100×2,300 (L×W×H)
Container Dimensions (mm)	4,500×2,400×2,850 (L×W×H)
Power Supply (AC)	380V 50Hz, three-phase four-wire system, bottom cable entry
Weight (t)	8.5
Operating Weight (t)	13.5
Max. Pressure (MPa)	0.6
Installed Power (kW)	90
Operating Power (kW)	≤45
Ambient Temperature (° C)	≤50
Medium Temperature (° C)	≤55 (inlet water temperature)
Relative Humidity (%)	90%
Service Life (years)	Equipment: 15 years; Electrodes: 3 years (repairable or replaceable)
Operation & Manning	Automatic unattended operation, remote service
Maintenance Cycle (days)	Self-cleaning (online self-cleaning of electrodes)
Product Delivery Cycle (days)	120 (effective working days, excluding statutory holidays)
Remarks	Operating power depends on water salinity, sulfide content, pH, temperature, and other wastewater properties.

EF500-B3 Electrochemical Filtration Module Skid-Mounted Equipment Performance Parameter Table 3	
Application Field	Petrochemical, nuclear power, steel mills, metallurgy, ships and naval vessels, and seawater purification, etc.
Model	EF250-B1 Electrochemical Filter (mobile skid-mounted)
Explosion-proof & Protection Rating	Exd IIB T4, IP56-IP65; suitable for flammable/explosive or non-explosive areas in the petroleum industry
Daily Treatment Capacity (m^3)	6,000–10,000
Filtration Specifications	After filtration: Suspended solids ≤2 mg/L, Oil content ≤5 mg/L, Sulfide ≤1 mg/L
Inlet Constraints	Inlet oil content ≤30 mg/L, Inlet sulfide ≤5 mg/L
Module Dimensions (mm)	Diameter 3500, spherical body.
Power Supply (AC)	380V 50Hz, three-phase four-wire system, bottom cable entry
Weight (t)	15.5
Operating Weight (t)	25
Max. Pressure (MPa)	0.6
Installed Power (kW)	120
Operating Power (kW)	≤45 (depends on water salinity, sulfide content, pH, temperature, and other wastewater properties)
Ambient Temperature (° C)	≤55
Medium Temperature (° C)	5–50 (inlet water temperature)
Relative Humidity (%)	90%
Service Life (years)	Equipment: 15 years; Filtration electrodes: 3 years
Operation & Manning	Continuous operation; automatic unattended operation, remote service
Maintenance Cycle (days)	Self-cleaning (online self-cleaning of filtration electrodes)
Product Delivery Cycle (days)	100 (effective working days, excluding statutory holidays)
Remarks	The above parameters are designed for general water filtration. Values may vary for filtration of special water types.

N-10B3 Natural Gas Treatment Skid-Mounted Equipment Performance Parameter Table 4	
Application Field	Natural gas, coalbed methane, shale gas
Model	N-10B3 (mobile skid-mounted)
Explosion-proof & Protection Rating	Exd IIB T4, IP56-IP65; suitable for flammable/explosive or non-explosive areas
Daily Treatment Capacity (sm^3/d) Skid-Mounted	10×10^4
Design Specifications (PPI)	Absorber operating pressure: 5 MPa; Regenerator: 0.05 MPa; Temperature: 100–120° C
CO_2 ≤50 ppm, H_2 S ≤5 ppm	
Module Dimensions (mm) / Container Dimensions (mm)	9-module skid combination
Power Supply (AC)	380V 50Hz, three-phase four-wire system, bottom cable entry
Weight (t)	7.8
Operating Weight (t)	14.4 (per single module)
Max. Pressure (MPa)	5.5
Installed Power (kW)	120
Operating Power (kW)	≤45
Ambient Temperature (° C)	≤50
Medium Temperature (° C)	≤55
Relative Humidity (%)	90%
Service Life (years)	Equipment: 15 years
Operation & Manning	Remote service
Maintenance Cycle (days)	Self-cleaning
Product Delivery Cycle (days)	120 (effective working days, excluding statutory holidays)
Remarks	Operating power depends on natural gas properties, sulfide content, pH, temperature, and feed gas characteristics.

06.Success stories and application scenarios



Empirical evidence of successful cases in domestic oil fields in China

Case 1:China <s:1>Daqing Oilfield (Station 418&Station 413)

- Challenges:High polymer production fluid,emulsified oil,dissolved oil,complex water quality.
- Solution:Use the P-500 module for demulsification and oil removal.
- Results:The effluent was clear without adding any chemicals,and the emulsified oil and
- dissolved oil were 100%recovered into good oil.

There is no sludge accumulation at the bottom of the equipment, and it has been running stably for more than 8 months.









A successful case study of domestic oil fields in China

Case 2:No.1 Artificial Island in Dongnanpu Oilfield,Beiji,China

- **Challenge:Severe excess of bacteria(SRB)in**
- **reinjection water**

Conventional chemical biocides fail due to bacterial resistance.

- **Option:Introduce the E-280 electrochemical sterilizer.**

- **Results:100%of the bacteria content in the delivered water**
- **met the standard;**

Sterilization costs dropped sharply from 900,000 yuan per year to 239,500 yuan;

The reduction amounts to 74.7%,saving more than 27 million yuan annually.



Petrochina Jidong oilfield Company

PETROCHINAJIDONG OILFIELDCOMPANY

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The electrolyti sterilization devicehasbeen succesfull putinto use on South Fort Onelsland

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On October26,according othe Ground Engineeingand Intormaton Technoloy ResearchInstuteofNanpuOperation Ae,the electolti stenization device of the No.lartficialisland water teatmen station has ben putinto use,and te testresultsof the etemal waterqualiy have methe L-leve waterquality rquirementsfor one consecutive mont,anditsestimated that more than 2.7milion yuan wl besaved annualy.

TheN0.1artical sland watertreatnentstaton,hich was put into usein 209,treated the produced water from thestrata and provided wate for theinjection welsin theNo.1,N0.2 and No,30i production areas of Nanpu.To ensure thequalityof teinected water mesthe standards an to pren baceialcontamination of thestata,snce the wate treatment stafion was putinto operation,aterhasbentreated by ading biocide extemaly nd the waterquafityhas ben monitoredi real ine Recenty,technians found that thetreated waterqualiy resuisfuctuated great,with bacterialcontent exceding the standard and faing to met th B1-evel waterqualityrequrement.

Excesive bacterial ontentn inected watercan have asignificantimpacton waterinjection foresenoirdevelopment Technicinsanalyzed hat hemain eason forthe excessie bacteial contentistheincresein bacterial esitance withte adion ofungidesforalongertime.To meet production neds and solve the problemof eKCessie bacteral contenti the extemal water,th operation area promptyintrodued electrolyti sedlingkiling devices and completed the construction of **suppotingpipelinesandeletical equipment The devce tizeste ionic** substancesalready presenti he wastewater.**Undethe action ofthe leticfeld fore,it** establshe astong ionic curentfield and ioni curent Duing the rapid migraton ofions,aseniesofelectrochemical eactionsocu,thereby generating new substances withighconcentrationsofatie groupsforsufuremovaland stenizaton achevingsteniaton.

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(Conmespondentszha Jnlong and WeiCanchu,Editorzhang Yu)

Source:News Center

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A successful case study of domestic oil fields in China

Case 3:Treatment of High Concentration Produced Fluid in Jidong Oilfield,China

- **Challenge:The water quality at multiple wellheads and injection stations needs to be stably up to standard.**
- **Solution:Deploy an integrated PE treatment system.**
- **Results:The oil content in the treated outlet water and wellhead water was verified to be 0.0 mg/L by a third-party testing cent**
  All indicators far exceeded industry standards.











A wide range of applications

PE short process technology and its modular products have formed a complete product matrix that can cover the vast majority of water treatment scenarios in the energy and chemical fields

Application industries	Specific scenarios	The core problem to be solved	Applicable to Core Modules
Oil and gas field exploitation	Production fluid treatment, reinjection water purification, associated gas treatment	Oil removal, suspension removal, sterilization, sulfur removal, preservation, resource recovery	P, EF, E, N series
Coastal industry	Nuclear power plant cooling water, steel plant circulating water, chemical plant wastewater	Sterilization and anti-corrosion, scale removal, suspended solids filtration	EF, E series
Ships and offshore platforms	Ballast water treatment, production water treatment, domestic sewage treatment	Space constraints, high reliability requirements, anti-corrosion	Integrated skid-mounted series
Unconventional oil and gas	Shale gas, coalbed methane extraction water treatment	High-difficulty emulsion demulsification and complex water quality purification	P, E series custom

Global Leadership·Green Revolution

Professor Zhu Tongde and his team,after more than 30 years of continuous research and engineering practice,successfully overcame a series of systematic technical problems in the full-process treatment of oilfield produced fluids,achieving a fundamental reconstruction of high-tech new processes.

Once the technology is applied globally,it is expected to bring trillions of dollars in combined costs to the oil industry each year and eliminate hundreds of millions of tons of chemical pollutants from the source,achieving a double revolution of huge economic and environmental benefits.

With its disruptive contribution of "zero chemicals,zero sludge,full recycling",this technology will become a major innovation in the field of global energy and environmental protection,and the project has the potential to win the international authoritative Nobel Prize in Energy and Environment.

The PE short process technology is not only a technological breakthrough,but also an industry benchmark leading global oil and gas production into a new stage of green,intelligent and sustainable, and will make a huge contribution to the global energy and environmental protection industry!

Yi Xia Invention is willing to be your reliable partner

Let's open a new chapter of efficient,clean and smart production in oil and gas fields together

Thank you for watching

