Natural Gas Treatment

More Efficient in Oil & Gas Extraction
Contents

- Introduction
- Natural Gas Treatment Business Scope
- Technology
- Projects
- Global Marketing and Service Network
Who we are

What we do

One group of companies, 5,000 employees in 45 countries

Professional oilfield solutions provider

Largest oilfield equipment manufacturer

Oilfield Engineering
EPC contractor

Well Drilling

Drilling Rig

Equipment Assemble

Oil & Gas Processing Equipment

Nitrogen Injection

Well Cracking Service

Gas Compressor

EPC Project
Oilfield Surface Engineering Business Division

- One of the core Business Area of Kerui Group, headquartered in Beijing.
- Established long term strategic cooperation partnership with China Petroleum Engineering Co., LTD. (CPE)
- Business scope involves the engineering consultant, survey, design, construction, general contract service (EPC) and skid-mounted equipment manufacture.
- Focus on oil and gas gathering, storage and treatment, crude oil refinery, sewage water
Natural Gas Treatment Business Scope

Business scope:

- Natural gas purification and treatment equipment
- LPG processing plant
- CNG, LNG processing plants
- Gas stations and utilities
- Gas injection station
- Skid-mounted equipment for gas treatment plant
Natural Gas Purification and Treatment Equipment
Natural Gas Purification and Treatment Equipment

- Facilities for gas purification and treatment, oilfield associated gas collection, purification and treatment.
Natural Gas Purification and Treatment Equipment

- Natural gas purification and treatment technology
- Skid-mounted natural gas processing equipment
Natural Gas Purification and Treatment Process

- Gas from Gas Well
- Oilfield Associated Gas

Three Phase Separator

Crude Oil dehydration

Three Phase Separator

Sewage Deoiling

Dehydration

NGL Recycling

Exhaust Gas Treatment

Sulfur Recovery

H₂S

CO₂ Recycle or Vent

Sulfur

Natural Gas Oil (C₅+)

LPG (C₃, C₄)

C₂

C₁

CNG

LNG

Commodity Crude Oil

Oil Field Output Water (for Injection)

Condensate

Water
Process Description

- Gas well gas will be separated into gas, sewage and condensate through separator.
- Oilfield associated gas will be separated into gas, sewage, crude oil.
- Then acid removal, water removal, NGL recovery process will be used for gas treatment to get the CNG, LNG, LPG and Natural gas oil.
- Commodity crude oil is obtained by dehydration and stabilization.
- The sewage water will be injected after de-oiling processing.
Membrane Deacidification Technology

- Because of different permeability, gases with fast penetration rate including steam, H₂, CO₂, would firstly permeate the membrane and accumulate while gas with slow penetration rate including CO, CH₄, N₂ would be detained and accumulate, which successfully separates mixed gases.

Process description
Natural Gas Purification Technology

Amine sweetening processes

Process Description

- Remove the solid and liquid impurities from raw gas by inlet separator and then use alkanolamine absorber to remove acid gas. Separate the raw gas again to get relatively pure sweet gas.
- After flash distillation, heat exchange, regeneration, cooling and other processes, alkanolamine solution is recycled.
Natural Gas Purification Technology

Natural Gas Pressure Boost Triglycol Dehydration Process

**Process Description**

- The gas will be separated, compressed, cooled and re-separated, and then feed into dehydration skid for water removal, then it will be exported.
Natural Gas Pressure Boost Molecular Sieve Dehydration Process

Process Description
- Remove the free water, oil and solids from the raw gas through the separator; compress the separated raw gas for twice to get high-pressure gas; and then remove the free water again through the compressor outlet separator. Inject methanol to prevent the gas from freezing before the raw gas enters the molecular sieve dehydration tower. Then dehydrate the high-pressure raw gas through high-pressure adsorption molecular sieve.
Natural Gas Purification & Treatment Technology
Natural Gas Pressure Boost Propane Low-temperature Dehydration and Heavy Hydrocarbon Removal Process

- Remove the free water from the raw gas through the separator; compress the separated raw gas for twice to get high-pressure gas; then remove the heavy hydrocarbon and water from the high-pressure gas through heat exchange, separation and cooling, and the dry gas will be exported.
- Before the gas enters the heat exchanger, injection of ethylene glycol is required to prevent the gas from freezing. The ethylene glycol can be recycled and reused.
Process of Throttling Cryogenic Cooling for Dehydration & Dehydrocarbon

- Remove the free water from the raw gas through separator; cool down the separated raw gas through heat exchanger and decrease the temperature by adjusting the J-T valve; separate the dry gas, ethylene glycol rich solution and liquid hydrocarbon through the three-phase separator.
- Before the gas enters the heat exchanger and J-T valve, injection of ethylene glycol is required to prevent the gas from freezing. The ethylene glycol can be recycled and reused.

**Process Description**
Projects - natural gas purification and treatment

- Completed site survey, design and project execution of Hutubi gas field, Basin gas field, Mahe gas field, Kela Beatuty gas field, Kazakhstan Aryskum Natural gas treatment plant and more than 180 domestic and oversea projects.

- Completed natural gas production capacity of 16 billion m³.
Projects---natural gas purification and treatment

- Xinjiang karamay gas field natural gas treatment project
- Gas processing capacity: $3 \times 10^6$ m$^3$/d
- LPG recovery and condensate oil treatment: 300 t/d
Projects -- natural gas purification and treatment

The Xinjiang Basin fifth gas field surface construction project

- Natural gas processing: $1.5 \times 10^6 \text{m}^3/\text{d}$.
- LPG recovery and condensate treatment: 300 t/d
Projects--natural gas purification and treatment

Xinjiang Oilfield Hutubi Gas storage project

- **Natural gas processing**: $4.5 \times 10^9$ m³ / a.
- **Gas injection**: $2.8 \times 10^9$ m³/a
Projects -- natural gas purification and treatment

Xinjiang Mahe gas treatment plant

- Natural gas processing:
  \[1.5 \times 10^6 \text{m}^3/\text{d}\]
- LPG recovery and condensate treatment: 300t/d
Projects--natural gas purification and treatment

Ongoing projects

- Survey and design work for Aktyubinsk gas field construction project (designing capacity of $3 \times 10^6$ Nm$^3$/d)
- Pakistan KPD Section 667 project (a capacity of $7 \times 10^6$ Nm$^3$/d)
LPG Processing Plant
LPG Processing Plant

➢ Using a variety of refrigeration technology to collect C₃, C₄ component from raw gas, proceed SNG production according to the demand
LPG Processing Plant

LPG recycle and processing technology

- LPG recovery and condensate oil stability technology
- LPG mixed air SNG production technology
LPG Recovery and Condensate Oil Stability Technology

Expander refrigeration separation technology
Expander Refrigeration Separation Technology

Process description

The feed gas through two-phase separation, compression, air cooling (removal solid-liquid impurities, booster, cooling), through the heat exchanger in cooling water into the secondary separator, light hydrocarbon into steady light hydrocarbon isolated device; After the separation of gas into the molecular sieve unit after dehydration, the heat exchanger in cooling, into the deethanizer and lighter C1 and C2 components from the top of the tower into the expander refrigeration, provide cold energy for the heat exchanger, expansion of gas compression, transmission after cooling. Other components from ethane bottom out, into the gas tower, after a heavy light hydrocarbon liquid and flows into stable device, a lighter from liquefied gas on the top of C3 and C4 component, by condensation from liquefied gas products.
LPG Recovery and Condensate Oil Stability Technology

Propane refrigeration separation process

- Gas Heat Exchanger
  - Ethylene Glycol
  - Feed Gas
  - Sewage

- Ethylene Glycol Regeneration Tower
  - Ethylene Glycol Rich Fluid
  - Ethylene Glycol Barren Fluid

- Propane Evaporator
  - Three-phase Separator A
  - Three-phase Separator B

- The Heater
  - Light Hydrocarbon
  - Dry gas
  - Liquefied Gas

- Liquefied Petroleum Gas Tower
  - Mixed hydrocarbon

- Deethanizer
  - Dry gas
  - Ethylene Glycol

- Dry gas
  - Liquefied Gas
  - Cooler
LPG Recovery and Condensate Oil Stability Technology

Process description

After raw material gas into liquid separator removes solid impurities, to prevent hydrate generated, adding glycol, after add alcohol gas after heat exchanger cooling into the three-phase separator, A lighter gases isolated again add alcohol after propane evaporators fell to a low temperature, B into the three-phase separator, again isolated gas as A fuel gas after heat exchange or transmission; Ethylene glycol isolated rich three-phase separator into the ethylene glycol regeneration unit, recovery of ethylene glycol; Three-phase separator liquid isolated after buffer into the deethanizer light hydrocarbon, lighter C1 and C2 components flowed from the top of the tower as a fuel gas or oil transmission, other components from ethane bottom out, into the gas tower, the heavier lighter hydrocarbon from liquefied gas tower bottom after cooling into the tank or transmission, and the lighter components of C3 and C4 from liquefied gas tower, by condensation from liquefied gas products.
LPG Recovery and Condensate Oil Stability Technology

J - T valve refrigeration separation technology

Diagram showing the process flow of LPG recovery and condensate oil stability technology, including components such as compressors, heat exchangers, separators, coolers, and pumps.
LPG Recovery and Condensate Oil Stability Technology

Process description

Feed gas by separator removed liquid solid impurities, with gas from the top of the deethanizer entering into the compressor to get pressurized, fell to a low temperature after heat exchanger, enter the separator, liquid hydrocarbon by flash tank is isolated from the flash, flash off gas back to the entrance of separator, liquid hydrocarbon after flash after cooling in the form of light oil transmission; Separator gas heat into the lower isolated separator, separator at the top of the flow of gas through the throttle valve throttle cooling further into the next level separator separation, the separation of gas as a fuel gas after heat pressure or transmission, after separation of the liquid hydrocarbon by pump pressurized into deethanizer and C1 and C2 lighter components flowed from the top of the tower into the level of the compressor, the other components by the heat transfer into the butane tower, heavy component from bottom in the form of light oil transmission, C3 and C4 flowed from the top of the tower after cooling the liquefied gas products.
Projects — LPG factory

◆ Project: Xinjiang LPG Plant  
◆ Project scale: LPG and condensate oil stability of 300 t/d
Projects—LPG Plant

◆ Project: Xinjiang Oil filed CaiNan Gas Field LPG Plant
◆ Scale: LPG & Condensate oil, 300t/d
Projects—LPG Plant

◆ **Project**: XinJiang ShiXi LPG Plant
◆ **Scale**: LPG & Condensate Oil Stable, 200t/d
LPG Mixing Air Product SNG Technology

Processing description

Through pump increase energy, LPG was gasification by heat exchanger. The gasification LPG mix with condense, dry air become SNG, SNG was used same function with pipeline gas equal burn heat value’s commodity gas and city pipeline gas.
Projects—SNG

◆ **Project** : Zoomlion LPG Mixing Air Station  
◆ **Scale** : Mixing capacity 8000Nm³/H
CNG, LNG Processing Plant
CNG, LNG Processing Plant

CNG, LNG Processing Technology

- CNG mother station, daughter station construction technology
- LNG processing plant technology
- LNG terminal technology

2x1.5×10^6 m³/d Natural gas plant renderings
CNG Gas Station Introduction

CNG Filling Gas Mother Station

Process description

- The gas was feed from pipe network into CNG Mother station, through filtering, metering, drying, compressor boosting, stabilization tank, the gas will be distributed to different channel by sequence control panel.
- Through filling gas column the natural gas is handling in CNG Trailer, transportation to daughter station.
- Through gas sales machine directly filling gas into automobile.
- Natural gas get into group gas storage cylinder to storage.
CNG Gas Station Introduction

CNG Gas Daughter Station

- Filling natural gas in CNG Trailer through unloading arm to filter and compressor, removed impurity and boosting, and then natural gas pass Sequence control panel to go to different channel.
- The gas will be injected to automobile through gas sale machine.
- To be stored in storage cylinder
LNG Project Introduction

It includes LNG liquefaction plant, LNG terminal station, LNG Gas Station, LNG Refueling Station (Mother station, Daughter station). The LNG Refueling Station process is similar with CNG gas station.
Natural Gas Liquefaction Plant

Feed Gas -> Compressor -> Condenser -> Gas Liquid Separator

Condensed Gas Liquid -> Absorption Tower -> Gas Liquid Separator

LNG Storage Tank -> Condenser

Cold Box

Molecular Sieve Dehydration

ACF

Demercuration

Gas Liquid Separator

Flash Drum

Unloading BOG

Amine Liquid Regeneration

Condenser

Acid Gas

Sewage

Sewage

LNG Storage Tank

Dust Filter

Condenser

Molecular Sieve Dehydration

Gas Liquid Separator

Sewage

Sewage
Natural Gas Liquefaction Plant

Process description

Remove liquid and solid impurities from the raw gas through gas liquid separator, increase the pressure of the raw gas by compressor and cool down by condenser; remove the sulfur and carbon in the absorption tower. After removing the acid, cool and separate the gas through condenser and separator, and dehydrate the gas through molecular sieve; after dehydrating, using filter to remove the mercury through removal unit; further decrease the temperature of the gas through heat exchanger; finally store the liquefied natural gas into the storage tank. The amine rich solution which flows from the bottom of the absorption tower is recycled and reused.
LNG Receiving Terminal

As a facility to storage and transport LNG, LNG Receiving terminal has the following technical process:

- LNG is shipped to the dock by LNG vessel and unloaded into the LNG storage tank for storage at the LNG Receiving terminal. The LNG is gasified according to client’s requirements.

- The vapor from LNG ships and LNG storage tank is then re-compressed and re-condensed into liquefied natural gas through recovered gas compressor and re-condenser.

- Afterwards, this liquefied natural gas, together with the LNG from the storage tank, is gasified through gasifier and feed into the metering station to decrease the pressure. Finally the gas is exported via pipeline.

- Another part of the LNG from the LNG storage tank is loaded to tankers for transportation to the gas filling stations.
LNG gasification station is a receiving, storage and distribution satellite station, as well as an intermediate station where towns or gas companies transfer gas from the manufacturers to the end-users. The main process is as follows:

Unload LNG from tankers to storage tank. Flash steam flows from the tank top and is heated by BOG heater before entering the BOG storage tank. Then the LNG flows out from the bottom of the tank, and is gasified and heated. Finally, the LNG, together with the flash vapor, is added with stench and flows out.
Projects—LNG  CNG

◆ Project: Nanning LNG Gas Station
◆ Gasification capacity: $1.2 \times 10^4 \text{Nm}^3/\text{H}$
Projects — LNG  CNG

Hami LNG Plant

Yunnan LNG Station

Miton CNG Refueling Mother Station

Shanxi Sanjiao CNG filling station extension project
Natural Gas Station & Utilities
Natural Gas Station & Utilities

- Gas、Diesel power station
- Hot oil heater system
- Instrument air system
- Fueling system
- Nitrogen system
- Water treatment system
- Flare stack system
Natural Gas Power Generation Device

Gas → Natural Gas Pretreatment → Gas Generator Set → Transformer → User

Gas Generator Set

Recycling Cooling Water System
Diesel Generator Set

Diesel Generator Set

Diesel

Transformer

Recycling Cooling Water System

User
The oil was heated into designed temperature and the hot oil was pumped into heating equipment for heat exchange. The cooled oil was pumped into the heater via circulation pump for heating again, which forming a complete heating systems.
After the air passes through air filter to filter out dust and dirt, it is compressed by the compressor, into the utility gas storage tank. Compressed air will be stored in buffer tank for some time, the moisture carried in the air and particles are further separated, the separated air, is dried, enters the tank meter, supply air for the pneumatic instrument.

There are two sets of dryers for each system, one for dryer, another one for regenerating. The air must be feed from the bottom of the dryer and export from the top.
The fuel was pumped from the bottom of the tank, it will be filtered for solid impurities removed in the filter, then transported to fuel user.
The nitrogen generated from the Nitrogen generation equipment will be stored in the tank. Then it will be distributed to hot oil expansion tank, hot oil storage tank, instrument air system and amine storage tank for nitrogen seal.
The used water will be flows to the water pool via cooling down by the cooling tower. Chemicals will be injected into the water pool (corrosion inhibitor, scale inhibitor and bactericidal algaecide), then the water can be used for heat exchangers. Water should be feed once water was lost because of evaporation.
Ground Flare System

- Radiation Heat Shield
- Long Term Burny Flames
- Igniter
- Flare
- High Pressure Generator
- Anti-backfire Device
- Ignition Fuel Gas
- AC220V 50HZ
- Water Sealing Tank
- Knock-out Drum
- Acid Gas Tank
- Vent Gas
- Acid Gas
Two source for flare gas:

- One is overall plant all unit emission air, emission though separate tank dehydration, get into water sealed tank, go against water sealed get into torch burning.

- Another source is the production process emission toxic acidity gas, through acid gas tank get into torch burning.

- The ignition control boxes control fuel gas transmission to igniter, as soon as activate high voltage cable transmission to high voltage ignition electrode arc ignition.
Natural Gas Injection Station
Feed gas firstly goes to separator to get free water and liquid hydrocarbons, then goes to compressor before cooler. Pressurized feed gas goes to high efficient separator to get free water and liquid hydrocarbons again. Separated natural gas goes to molecular sieve dehydration to get rid of water, then will be sent to injection well after metering, pressurizing and cooling.
Skid – Mounted Natural Gas Plant
Skid – Mounted Natural Gas Plant

- Input separation unit
- Ethylene glycol recycle and regeneration unit
- Propane cooling unit
Skid – Mounted Natural Gas Plant

- Liquefied gas tower
- LPG-natural gas heat exchange
- Liquid Gas Storage Tank
Skid – Mounted Natural Gas Plant

- Stabilization light hydrocarbon Tank
- Heat Exchanger
- Loading/Unloading
Skid – Mounted Natural Gas Plant

- LPG unloading/unloading
- Heat Exchanger
- Ethylene Glycol Injection Skid
Skid – Mounted Natural Gas Plant

Nitrogen Station

The Hot Medium Heater

Recycle pump Skid
Deethanizing Column Unit

Condensate buffer tank

Deethanizing column bottom Reboiler
Skid-mounted Products

- Integrated heating three-phase separator
- Quadruple effect separator
- Light hydrocarbon recovery
- Methanol injection
- Launching/receival chamber
- Metering system
Skid-mounted Products

- Metering separator
- Wellhead gas separator
- Molecular sieve dehydration
- TEG dehydration
- Membrane deacidification
- Amine deacidification
## Experiences List

<table>
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<tr>
<th>No.</th>
<th>Project</th>
<th>Location</th>
<th>Scale of Construction</th>
<th>Start Date</th>
<th>Completion Date</th>
<th>SOP Time</th>
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<tr>
<td>1</td>
<td>Xinjiang Shixi Natural Gas processing project</td>
<td>China</td>
<td>100×104m³/d</td>
<td>1997.5</td>
<td>1998.11</td>
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<td>2</td>
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<td>150×104m³/d</td>
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<td>3</td>
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<td>60×104m³/d</td>
<td>2004.8</td>
<td>2005.9</td>
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<td>Xinjiang oil extraction second plant Natural Gas Processing Plant</td>
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<td>60×104m³/d</td>
<td>2006.1</td>
<td>2007.12</td>
<td>2007.12</td>
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<td>Xinjiang Mahe gas field surface construction project</td>
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<td>300×104m³/d</td>
<td>2007.4</td>
<td>2007.11</td>
<td>2007.11</td>
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<td>300×104m³/d</td>
<td>2009.4</td>
<td>2009.12</td>
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<td>Xinjiang oilfield company Hutubi gas storage project</td>
<td>China</td>
<td>2800×104m³/d</td>
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<td>2013.5</td>
<td>2013.6</td>
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<td>Xinjiang Ake gasfield surface construction project</td>
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<td>300×104m³/d</td>
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# Oversea Experiences List

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<th>No.</th>
<th>Project Name</th>
<th>Country</th>
<th>Scale of Construction</th>
<th>Start Date</th>
<th>Completion Date</th>
<th>SOP Time</th>
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<tr>
<td>1</td>
<td>Zanarol oil field the third stage oil &amp; gas treatment plant</td>
<td>Kazakhstan</td>
<td>design scale 325 × 10⁴ Nm³/d</td>
<td>2006.03</td>
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<td>design scale 300 × 10⁴ Nm³/d</td>
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<td>4</td>
<td>Zanarol oil field Moisture reinjection project</td>
<td>Kazakhstan</td>
<td>Gas injection station scale 15 × 10⁴ Nm³/a Gas distribution station scale 13.4 × 10⁸ Nm³/a</td>
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<td>Pakistan KPD block 667 natural gas treatment plant</td>
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<td>7</td>
<td>AYSKUM oil field natural gas treatment station project</td>
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An International Enterprise with Great Global Marketing and Service Network

Global Branch Organization

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