Solutions for Frac Spread Suitable for China Large-scale Shale Gas Fracturing
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1 China Shale Gas’s Requirements for Frac Spread
American is a world leader in shale gas development technology and its commercialization is also the most successful. Application of the cluster well, horizontal well and multi-stage large-scale fracturing largely increase the output of shale gas.
China's shale gas fracturing

China is a country rich in shale gas storage.

China shale gas exploration has begun, the state will also list this as a separate mineral resources for development.

With the development of shale gas mining technology, higher demands on the equipment. Large-scale fracturing operation trends “continuous operation, heavy load and long operation time”.

Learn from foreign experience in the success of shale gas development, the ability to fit China's shale gas development, what problems that large-scale fracturing of shale gas is currently facing, what is the new demand for new equipment? Let's take a look at the current problems.
Problems in China’s Shale Gas Fracturing

1. Deposit and Geographical Environment: Mountains, Poor Road Conditions,

Small Wellsite

Mountain Area + Small-scale Wellsite

Plain + Large-scale Wellsite
Problems in China’s Shale Gas Fracturing

2. large-scale operations, more proppant and sand-carrying fluid, sand tank and tank take large area, need intensive labor.
3. Centralized control problem of large-scale operations

Numbers of equipments of different manufactures involved in the construction work, the control system is not uniform, cannot realize centralized control, personnel requirements for dispatching on-site are very high.
Problems in China’s Shale Gas Fracturing

4. Deep storage, high pressure construction

MoXi 8# Well is a key exploratory well and it has several difficulties such as low permeability, high anisotropy and quick reaction of acid rock. JEREH’s 2500HHP truck mounted fracturing units have joined in the acidizing fracturing operation performed to this well. The operation has been lasted for 287 minutes, the maximum operation displacement was 5.4 m³/min and fracturing fluid of 759.36 m³ was injected into the well. The maximum operation pressure gets up to 130.03 MPa, which set the record of highest working pressure of fracturing units in China.
Problems in China’s Shale Gas Fracturing

5. Water and environment protection

Mountain: bad water and storage conditions
Surroundings: farmland, villages
Will the Frac Spread that applicable for N.A. suitable for China’s Shale Gas Fracturing Operation?

Based on this, JEREH has also developed shale gas fracturing units more suitable for China’s Shale Gas Fracturing Operation.
China Shale Gas’s Requirements for Frac Spread

Large-scale Operation

In Small-scale Wellsite
2 New Concept
Solutions for “Large-scale Operation in Small Well Site”
Units Solutions for China’s Shale Gas Fracturing

1. To the question how to achieve the mining of unconventional energy sources in complicated geological condition, JEREH first proposed the idea of new concept solutions, namely the “Large-scale Operation In Small-scale Wellsite”. This proposal is a revolutionary breakthrough for current traditional shale gas fracturing and it is more applicable for mining of unconventional oil and gas in harsh geological environment. Compared to traditional operation, it will save operation area up to 50% and operators up to 40%, and the overall development expenses will be reduced significantly.
Units Solutions for China’s Shale Gas Fracturing

With many years of research and tracking for North American unconventional oil and gas and large fracturing operation, as well as studies on the domestic status quo, Jereh had developed generation after generation of fracturing equipment with advanced and reliable performance. Fracturing equipment upgrades, not just for the upgrade of installed power and the output, but on the basis of investigation and study in domestic large-scale fracturing applications, to "provide customers with one-stop solution", to developed the new upgraded equipment.
Units Solutions for China’s Shale Gas Fracturing

1. For the rugged mountain roads and small wellsite

Car, lightweight fracturing equipment - with good, small footprint

Standalone Power fracturing truck - the power density per unit area

Dual 240 barrels Blender - the power density per unit area

Telescopic Vertical sand tank – reducing sand tanks and footprint

Continuous fracturing fluid hydration truck - reducing tanks and footprint
Units Solutions for China’s Shale Gas Fracturing

2. For tank and sand tank taking more areas, labor intensity
   - Vertical Sand Tank: reducing sand tanks and footprint
   - Water treatment and pumping, continuous fracturing fluid hydration
   - Wind sent sand trucks and transport belt: reduce labor intensity and improve efficiency and security

3. For large centralized control
   - Large network centralized control and data acquisition, processing, remote transmission system

4. For high pressure
   - Large high-pressure fracturing trucks and manifold (20000psi)

5. For water supply and environmental protection
   - Fracturing fluid handling and recycling system
Units Solutions for China’s Shale Gas Fracturing

Innovation of Key Unit:

**Fracturing Units:** 3100HHP truck mounted fracturing units adopt OFM 4000 fracturing pump. If the required horsepower is 40,000 hhp, thirteen sets of units can meet the requirement since their horsepower can get 40,300 hhp. Compared with 2000HHP truck mounted fracturing units, 7 more sets of units will be not required. Dual fuel operation can be achieved at the same time.

**Sand Blender:** In large-scale fracturing operation, usually two sand blenders will be used (one for standby). The single 240 bbl sand blender manufactured by JEREH can be used both for operation and for standby. Meanwhile, there is less pipe connection required.

**Data Van and Data Acquisition System:** instrument control center specially designed for long-term operation, it works with the site command center satellite transmission system.

**Technical innovation of the coiled tubing unit:** heavy-duty double truck mounted coiled tubing units which have the largest capacity in the world and can meet the requirements of high occupancy and maneuverability.
Units Solutions for China’s Shale Gas Fracturing

Innovation of Continuous Sand Transmitting Devices:
The adoption of sand truck and sand silo reduces land occupation by $\frac{3}{4}$ than that of the sand storage tank.

Localization of Continuous Hydration Unit:
The adopted dry powder real-time mixing device is applicable for various operation requirements in different countries.

Backflow fracturing fluid handling and recycling system
Introduction for Equipments Suitable for China Shale Gas Field
Introduction for Equipments Suitable for China Shale Gas Field

Jereh 3100hhp Frac Pummer
3100 HHP Truck Mounted Fracturing Unit Breaks the Record of Single Unit Fracturing Output Horsepower

Jereh 3100hhp Frac Pumper successfully passed the industrial testing recently, with the highest output power of 3,115 hydraulic horsepower, setting a new record of one single frac unit’s highest output power in the world oil & gas exploitation. This unit is the first super-power fracturing pumper exceeding 3,100hhp output power in the world.
Currently the engine-driven pump in the world that has been put into use is with maximum input power of 4000HP;
Has achieved a high-power continuous operation conditions, the use of long-stroke design, can well adapt to the development of shale gas reserves of power demand conditions;
Compared with the conventional 3000, in the case that the input power increase by 30%, the entire volume and weight of the pump maintains the original parameters;
Turbo fracturing equipment

Turbine engine applications in fracturing equipment make the single hydraulic horsepower lifting and single weight lowering possible;

4000 fracturing car weighs just 31 tons, which meet the licensing requirements.

In addition, could use natural gas as fuel, more economical, lower maintenance costs, cleaner emissions, all this will become a reality.
Introduction for Equipments Suitable for China Shale Gas Field

A new generation of sand equipment (240BBL)

Closed sand mixing system, the only technology available to achieve pulse sand Blender.

<table>
<thead>
<tr>
<th>Product Type</th>
<th>HSC40</th>
</tr>
</thead>
<tbody>
<tr>
<td>Displacement</td>
<td>38m³/min (240BPM)</td>
</tr>
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</table>
Introduction for Equipments Suitable for China Shale Gas Field

Large volume Coiled tubing Truck

Lift cylinder truck, large volume, high mobility and reliability.
Introduction for Equipments Suitable for China Shale Gas Field

Large volume Coiled tubing Truck

Field-proven large volume coiled tubing truck.
Introduction for Equipments Suitable for China Shale Gas Field

Fracturing fluid Hydration Unit

<table>
<thead>
<tr>
<th>Product Type</th>
<th>HPGYC100</th>
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<tbody>
<tr>
<td>Displacement</td>
<td>10m³/min (60BPM)</td>
</tr>
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</table>
Fracturing fluid hydration truck

Efficient hydration technology, automatic control of formulation and viscosity. The unique viscosity enhancing design, effectively reduce hydration time.
Introduction for Equipments Suitable for China Shale Gas Field

Continuously sand conveying system

- Sand Truck
- Sand Silo Truck
- Sand King
- Sand Conveyer
Domestic large-scale fracturing sediment system status:
Introduction for Equipments Suitable for China Shale Gas Field

Continuous sediment program layout

- **SAND SILO**
- **PNEUMATIC SAND TRUCK**
- **AIR TRANSMITTING PIPE**
- **SAND CONVEYER**
- **SAND BLENDER WITH NO AUGER**
**Pneumatic sand Truck**

**Pneumatic Sand Truck——Volume of 15m³, pneumatic conveying**

- No aerial lifting operations, to avoid dangerous high-altitude operations;
- Transport efficiency is 20 times of the transfer efficiency of artificial;
- Simple structure design, less maintenance costs;
"Self-supporting" and "Self-elevating" Procedures of Sand Silo

Transport to the wellsite

Place the vehicle, elevate the silo

Silo self-elevating

Silo gets self-supported

Introduction for Equipments Suitable for China Shale Gas Field
Frac Spread for China’s Shale Gas Fracturing Operation

Sand Silo Truck

--Occupied area: about 8\(\text{m}^2\); Max. Sand Storage Capacity: 45m\(^3\)

• Interchangeable chassis, features flexible and economic;
• Simple and Quick Operation of Silo;
• Solar Energy/External Dual System Power;
• Integrated Control and Surveillance

<table>
<thead>
<tr>
<th>Product Type</th>
<th>SGC-45</th>
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<tbody>
<tr>
<td>Volume</td>
<td>45m(^3)</td>
</tr>
<tr>
<td>Maximum conveying capacity</td>
<td>5.9 m(^3)/min</td>
</tr>
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</table>
Sand Conveyer

The unique design of the hydraulically driven belt transmitting system ensures a quick and steady transmission. The adopted belt is of undulating type and it can ensure a better transmission of the proppant to the feed opening of the sand blende.

<table>
<thead>
<tr>
<th>Product type (13003 Replaceable parameters)</th>
<th>SST-350</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum sand conveying capacity</td>
<td>350 m³/h</td>
</tr>
</tbody>
</table>
Introduction for Equipments Suitable for China Shale Gas Field

Foldable Continuous Sand Transmitting Device-Based on China’s Present Situations

<table>
<thead>
<tr>
<th>Product type</th>
<th>SSQ350</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conveyor system</td>
<td>Belt conveyor</td>
</tr>
<tr>
<td>Maximum sand conveying capacity</td>
<td>350 m$^3$/h</td>
</tr>
</tbody>
</table>
Introduction for Equipments Suitable for China Shale Gas Field

Work with sand blender

The sand conveyer can transmit sand to the hopper of the sand blender continuously and steadily and its transmitting capacity is 10,000 kg/min.
Introduction for Equipments Suitable for China Shale Gas Field

Backflow fracturing fluid handling and recycling system
Introduction for Equipments Suitable for China Shale Gas Field

Backflow fracturing fluid handling and recycling system

For fracturing wastewater and oily waste harmless environmental treatment, or recycling to meet emission standards, to reduce the ecological damage to the environment.
Frac Spread for China’s Shale Gas Fracturing Operation

Centralized control and remote transmission

- Integrated Automation Control Concept
- Ring redundant network
- Remote Transmission
- Number of mining multi-screen display
Frac Spread for China’s Shale Gas Fracturing Operation

“Large-scale Operation in Small-scale Wellsite” 3D Animation
Thank you!