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Chinese company launches new fracking rigs

Submitted by Charlotte Owen on Wed, 2012-05-02 12:15

02nd May 2012

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Chinese rig exporters launch shale gas exploitation solution at this year's OTC

A new, integrated drilling and fracturing site which could cut down on the amount of equipment used for shale gas exploration has been launched by Chinese rig manufacturers, Honghua Group Limited at this year's Offshore Technology Conference (OTC).

Compared to a conventional fracturing site, the shale gas solution has three main advantages, believes the company. Firstly it requires less equipment, allowing for a significantly smaller footprint and quick deployment.

The set of new, highly automated rigs includes three types, operating simultaneously to drill vertical and horizontal sections. Honghua's system provides a 6000 horsepower fracturing pump; three dual-pump fracturing trucks can reach the same capacity generated by 20 trucks in a conventional operation. Additionally, only six of Honghua's flexible water tanks can satisfy fracturing operations that would generally require 30 tanks.

It also allows for a cost savings of at least 10 per cent as compared to conventional solutions. In addition to the obvious cost advantages associated with a reduction in equipment, Honghua replaces the conventional diesel generator with a gas generator, allowing the use of self-produced shale gas for power generation. With Honghua's solution, about 178 tons of diesel fuel per well can be saved.

In addition the system could save up to 226 tons of carbon emissions per well. After completion, it is estimated that 60 per cent of the land occupied can be reutilised, according to Honghua.

"We are very pleased to launch this new solution at OTC 2012. This represents a significant step in land drilling and fracturing and we are excited to bring this innovative technology to the US," said Zhang Mi, Honghua Group, Chairman & President.

The integrated solution is scheduled to be commercially implemented in a large scale within two years.



China completed its first horizontal well in Sichuan in 2011

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Drilling system: Honghua chairman Zhang Mi shows off a 6000-horsepower fracturing pump at OTC 2012 in Houston

Honghua unveils natgas-powered drill system

Chinese land-rig builder Honghua Group has unveiled a new shale-gas exploration system that would run off produced gas, allowing drillers to move away from more-costly and polluting diesel.

3 May 2012 21:08 GMT [UPDATED 3 May 2012 21:08 GMT](#)
By [Luke Johnson](#)

Honghua, China's biggest exporter of drilling rigs, says its new integrated drilling system can save drillers at

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Complete Equipment and System Integrating by Using of Gas Power-gen and Power Grid and VFD System

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Part 3: The Advantage of Honghua Shale Gas Solution

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Part 1: Brief Introduction of Honghua Shale Gas Exploiting Solution

Shale Gas Production Block Plan



Surface Plan

- One block is cover about 140 to 220 km² (34600 to 54360 acres) .
- Set 15 to 24 well sites for drill and production gas.
- The space between site is about 3-5km.
- One central gas power station will be built to serve for production well sites.

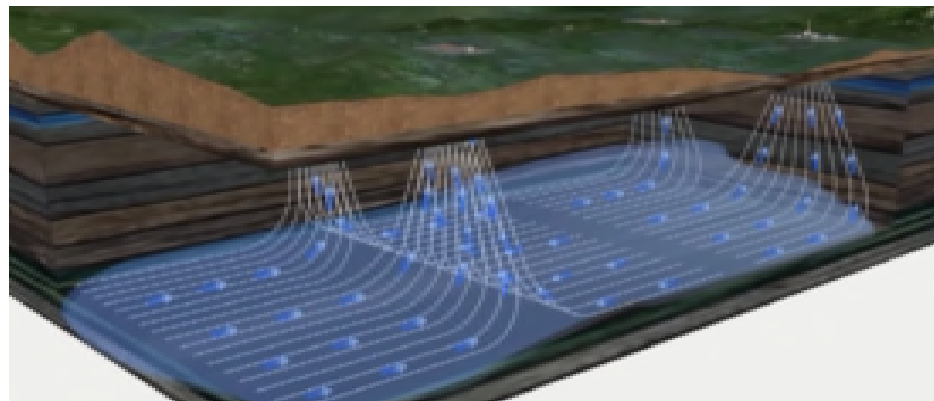
Well Bottom Plan

- Two well bottom spacing is 200 to 300 meters.
- One well site covers about 10 km² (2470 acres) the shale gas reservoir.

Aerial View of a Production Block



Well Bore Matrix of a Production Block



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Production Well Site Layout



Each well site will occupy 8000 m² (2 acres) and allow a maximum of 20 horizontal wells to be drilled; each well head space 4-5 m .



Well Site Main Equipment

Drilling Equipment:

- 1 Set super single Rig
- 1 Set ZJ50DBS(1500HP VFD) rig
- 1 Set Air drilling equipment(if necessary)

Fracturing Equipment:

- 1 group 36000HP(3 Trucks) Frac unit group
- 1 group (Total 2400m³) Flexible Frac water tank
- 1 Set coiled tubing Unit(If necessary)

Power Convert modules:

- Substations
- 1 Set VFD system for drilling system
- 1 Set VFD system for fracturing group

Other auxiliary equipment.

- 1 Set Cementing Unit
- 1 Set MCC system
- Well site camp.
- Other equipment

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Production Wells and Operation Equipment of a Production block



Production Wells

- In one block:

24×

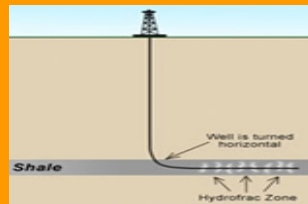
Wellsite



- In one well site:

20×

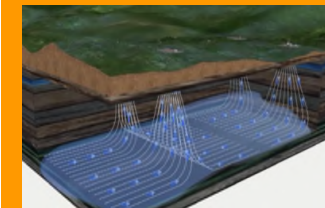
Well



- In total:

480×

Well



- Operation Equipment

8×

1500HP VFD Rig



+ 2×

Super Single Rig



+ 2×

36000HP Frac group



- One block makes up an E&P unit; drilling 100 wells per unit annually completes E&P plan in 5 years

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Drilling Process

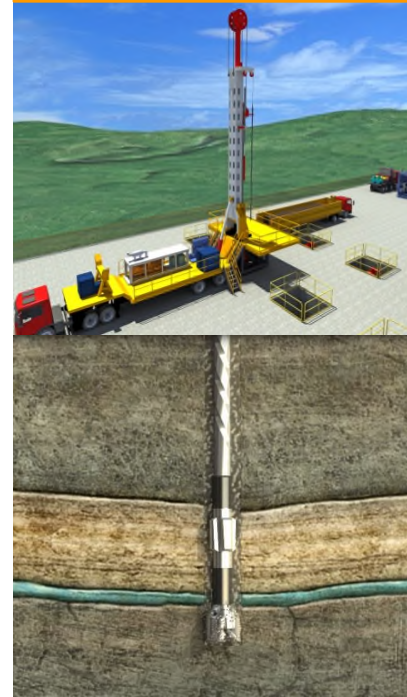


Two Rigs Simultaneous Operation



Super single rig
Max. hook load: 170mt-225mt
1500 AC rig
Max. hook load: 315mt

Super Single Rig



1500HP AC Rig



After finishing vertical section drilling, the super single rig will be moved forward 4 to 5 meters to the next well and repeat the above drilling operation. At the same time a 1500 HP AC rig will continue to drill the horizontal section of the first well.

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Fracturing Equipment Arrangement



Fracturing Equipment on Well Site



Frac Truck



Coiled Tubing Unit



Sand blender and
container truck



Flexible Water Tank



Different techniques apply to different well conditions. After multi-stage fracturing, the shale gas will flow up to wellhead.

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Gas Power station and Waste Water Treatment



Gas Power Generators



Power Substation

Main Equipment

Gas Power Generator	4X15000 ekW Gas Turbine 12X4000 ekW Gas Engines
Total Power –gen Capacity	40-60MW
Transformer	Up to 14m
Waste water treatment capacity	10000m3/d
Gas treatment capacity	30,000m3/d

Gas Power gen:

Supply electricity for whole block drilling and fracturing operations
Produce the electricity by gas turbine or gas engine.

At the early stage, gas supply for power station can be provided from other production block or LNG.

Waste Water Treatment:

Treat the waste water that produced during drilling , fracturing and gas production.

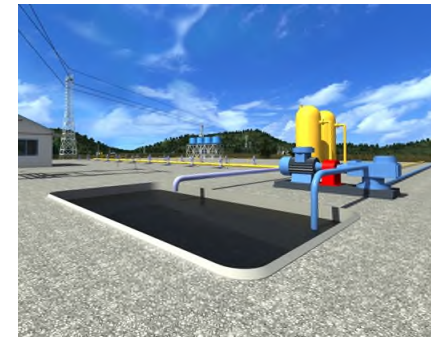
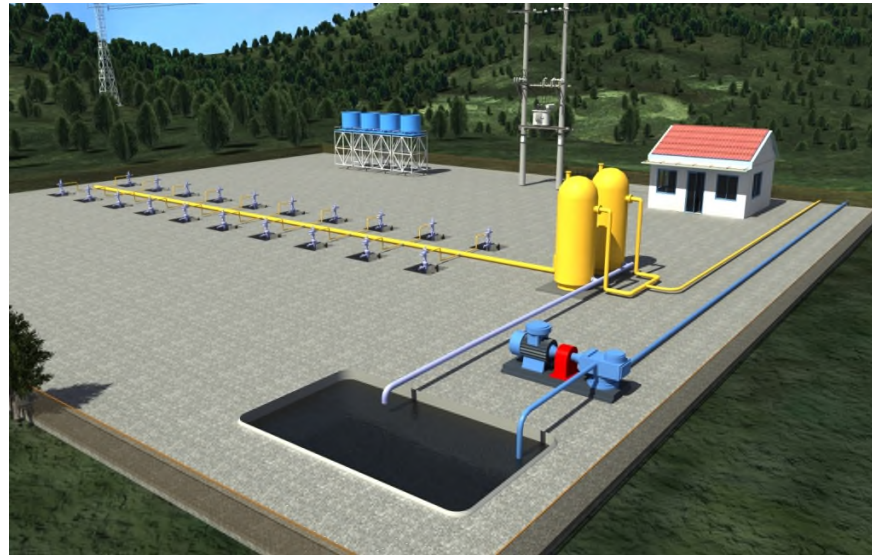
Fresh water will be recycled for use by the well sites.

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Gas Gathering station



- After finish all the drilling and fracturing work, the well site is ready for transferring production site and install the gas gathering equipment.
- After gas-water separation and supercharging, majority of the gas collected from each well site will be distributed to the public gas pipeline or the block gas power station .
- If necessary, gas compressor will be used to assure the gas transfer.
- 60% of the well site land can be recycled back for farming use.
- Re-fracturing operation can also be considerate if needed .



Aspect of part of shale gas production block



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Part 2: Introduction of Equipment for Shale Gas Solution

ZJ30 Super Single Rig



Specifications

Nominal drilling Depth	3000m
Tubular Length	Up to 14m
Max. Hook load	900kN
Max. Push load	100kN
Max. Mast Height	26.3m
Drill Floor Height	3.0m
Clear Height blow RT	2.0m

Features :

- Small footprint, quick installation and transportation, and high automation.
- HPU is powered by AC motor.
- Simple and high efficiency pipe handle system.



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ZJ 50DBS AC Rig

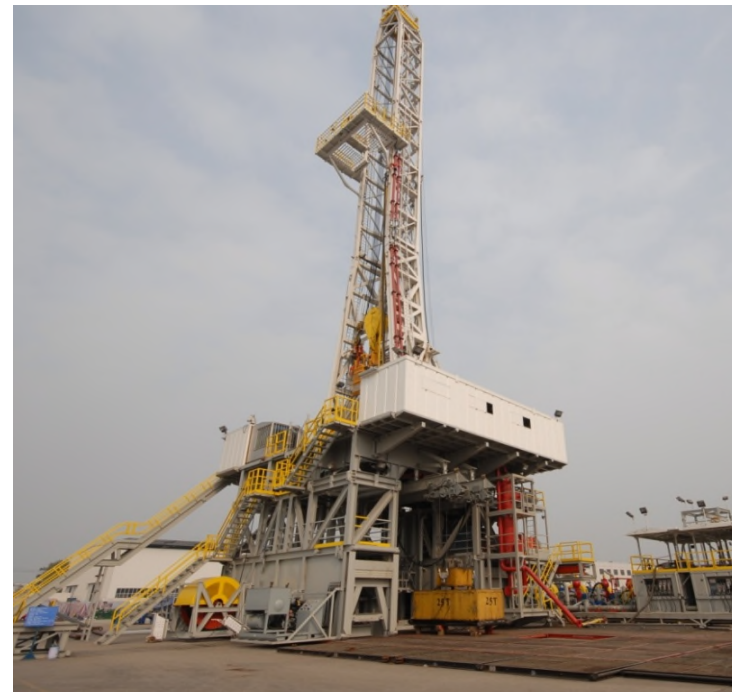
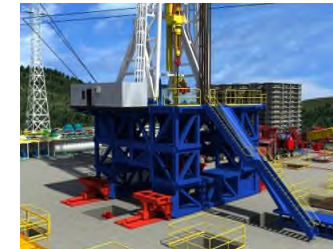


Specifications

Nominal drill depth(127mm DP)	5000m
Max. hook load	3400kN
Travelling line system	6×7
Wire line Dia.	35mm
DW rated input power	1200kW(1609HP)
DW gear	one gear stepless
RT opening Dia.	952.5mm(37 ½")
MP rated power/Qty.	1176kW(1600HP)/ 2
Mast effective height	45m

Features :

- AC VFD drive drawworks and mud pump system
- Equipped with HH direct drive Top drive system.
- Equipped with automatic catwalk ,Iron Roughneck and other automatic tools.
- Rig walking system for muti-well drilling.



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5ZB105-4500 Fracturing Pump

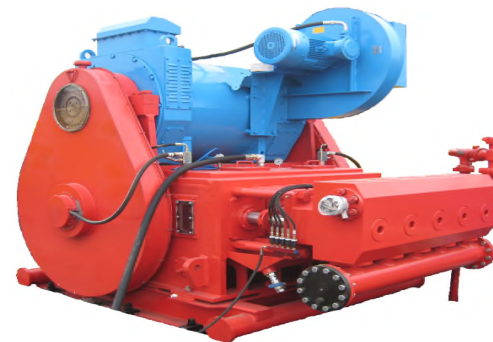


Features

- The most powerful Fracturing pump on the market.
- Design to handle harsh conditions for shale gas fracturing.
- Compact transmission structure realize two pumps on a trailer. total 12000 hydraulic horse power.
- PLC controlled overpressure protection.

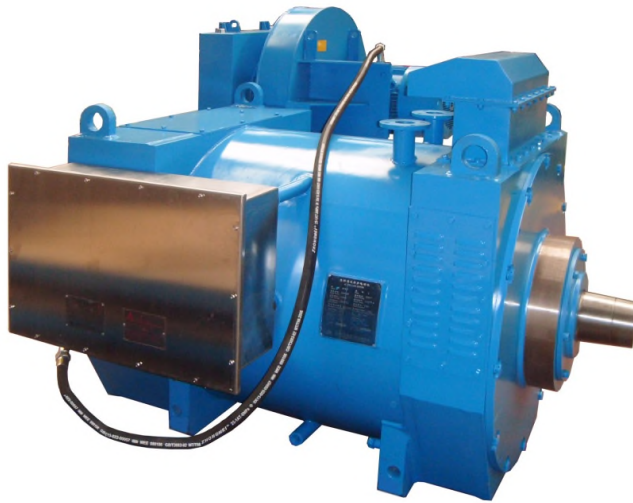
Specifications

Max. Input power	6,000 HP (4,500 kW)
Max. Pump Speed	275 SPM
Stroke Length:	10 Inches (254 mm)
Gear Ratio:	4.58 : 1
Max. Rod Load Capacity	211,310 lb (940 kN)
Max. pressure	15000psi (at 4in plunger)
Max. Pump Rate	1167GPM (at 5in plunger)
Flow Rate at 75Mpa	3.47m ³ /min (216SPM)
Flow Rate at 105Mpa	2.32 m ³ /min (225SPM)
Electrical Voltage	2200V/3000V
Dimension	3200mmX2650mmX 2800 mm
Approx. Weight	28,000 kg(Incl.Motor)



HHUS00003600

4500kW Fracturing Pump drive Motor



Specifications

Motor Type	Three Phase Induction motor
Rated Power	4500kW
Rated Voltage	2200V/3300V
Rated Current	936A
Rated torque	71800N·m
Rated Speed	940r/min
Rated Frequency	63Hz
Power Factor	0.875
Efficiency	96.2%
Weight	6000kg

Features:

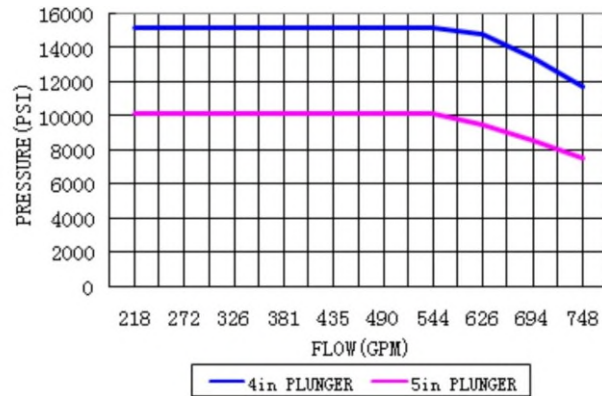
- One 6000 HP double shaft extension AC motor direct drive the pump from dual side.
- Adopt medium voltage motor which is Integrated designed with pump.
- The motor cooling system Combine Blower and water circulating cooling.

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HH6000 Fracturing Pumping Performance



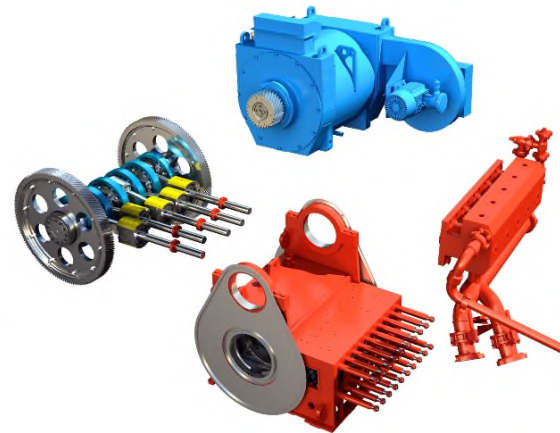
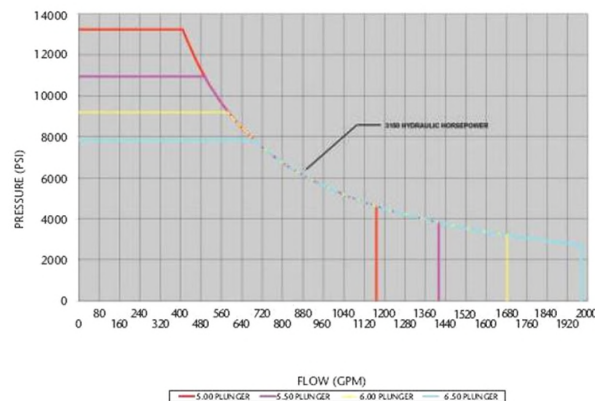
HH 6000 VFD drive frac pump Curve



Features:

- Achieves high efficiency, flow rate and pressure can be adjusted stepless by VFD .
- With the wide constant pressure range and overload capability ,more suit for shale gas fracturing.

Diesel drive 3500 frac pump Curve



HHUS00003602

HS 300 AC Motor Drive Sand Blender Truck



Specifications

Max. Discharging Rate	16m ³ /min(100bbl/min)
Max.Pressure	0.7Mpa(100psi)
Max.Sand Flow Rate	300m ³ /h
Blender Size	1.5 m ³
Suction Centrifuge Pump	12"X12"
Discharge Centrifuge Pump	12"X10"
Max.sand Density	2.5 g/cm
Total motor power	535kW
Unit Weight	22,000kg



Features

- Driven by AC-VFD motor, Flow rate and pressure can be adjusted accurately.
- Easy to realize remote control.

HHUS00003603

Coiled Tubing Unit



Specifications

Tubing Range	2~2-7/8in
Nominal Depth	5000m
Injector Pull capacity:	90t
Injector Push capacity	45t
Rated Pressure	105MPa
Tubing Reel OD	3500mm
Tubing Reel Core	2438mm
Reel Length	6000mm

Features

- Compact design, All equipment on one trailer.
- Combined with the an workover mast no need crane when operation
- High efficiency on cluster well pad operation.



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SHG400A Flexible Water Tank

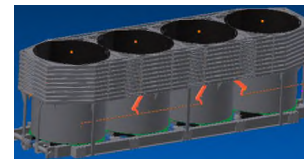


Specifications

Single tank Volume	400 m ³
Group Volume	2400m ³
Single Tank Trans. Dimension:	14.5m×3.8m×3.2m
Group Footprint	400m ²
Single Tank Weight	36.5 Mt

Features:

- 5 times volume of traditional water tank.
- $\frac{1}{4}$ occupied area of traditional water tank.
- $\frac{1}{6}$ transportation unit of traditional water tank.



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DQ315DBZ Top Drive System

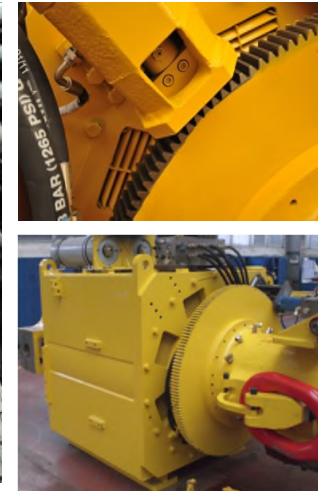


Specifications

Model	DQ315DBZ
Max load(API8C)	3150kN(350ton)
Range of speed	0-220 r/min
Working Torque (Continuous)	45000 N.m(33,200ft.lb)
Make-up & break out Torque	60000 N.m(33,220ft.lb)
Max Torque (Simultaneously)	70000 N.m(44,250ft.lb)
Brake Torque	45000 N.m(25,800ft.lb)
Motor rated power	445kW(385hp)
Clamping range(OD)	86-197mm(3 ½"-7 ¾")
Working pressure of Hydraulic system	16 Mpa(2,285psi)
Working pressure of centre pipe	35 Mpa(5,000psi)
Net Weight	12.3 T (27120lb)
Dimension (L× W× H)	5300×2135 ×1850 (mm)

Features:

- Motor drive the main shaft directly, gearless transmission.
- Grease lubrication is applied for bearing.
- Modularized design enable assembly and maintenance.



HHUS00003606

5NB2400GZ Quintuplex Mud Pump Unit



Specifications

Max. Power Input	2400 HP (1800 kW)
Max. Pump Speed	160 SPM
Stroke Length:	304.8 mm(12 in)
Max. Pump flow rate	103L/s(1939GPM)
Max. Pump Pressure	52Mpa(7500psi)
Max. Liner Size	180mm
Motor Voltage	600V
Max. Motor speed	780rpm
Size of suction Pipe	305 mm (12 in)
Size of Discharge Pipe	130mm(5 1/8in)
Dimension	4290 mmX 2445mmX 2548mm
Nominal Weight	29,928 kg(Incl. motor)



Test in Factory



Test on drilling site



Features

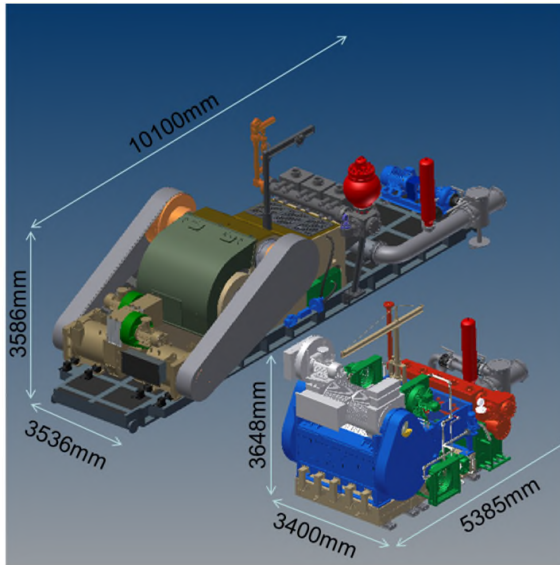
- One 2400 HP VFD motor direct drive from dual side .
- With high flow rate and light weight compared to same power level mud pump.
- Five cylinders reduced the fluid pulsation and dampener is removed;
- Cooled lubricant extended lifetime of the oil and improved the cooling for the bearing;
- In-line sensor communication with motor protect pump from overpressure;
- Liner and valve replacement is a lot easier with the help of a designed puller;
- Access to crosshead and slide bearing are available without removing the crankshaft.

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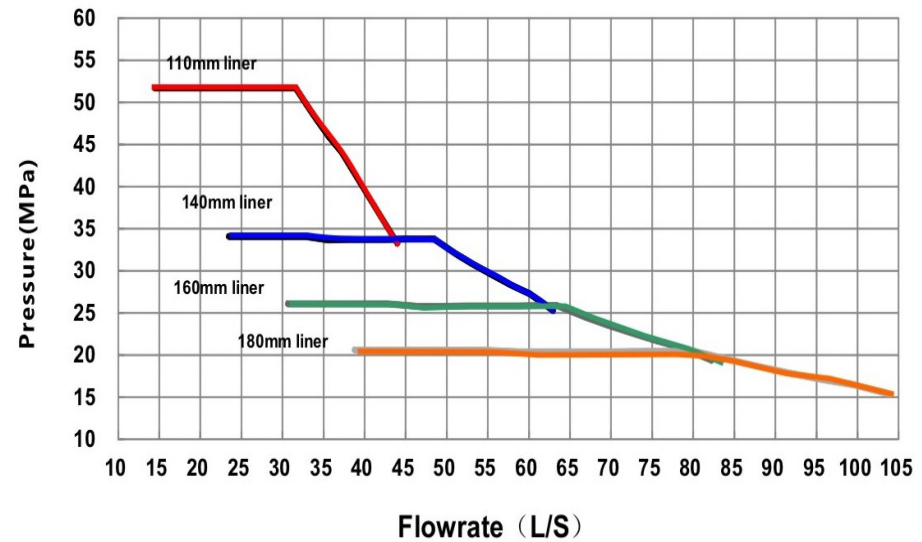
5NB2400GZ Quintuplex Mud Pump Unit



Pump Set Size comparison



Pump Pressure-Flow Rate Curves



Advantages:

- The maximum pump flow rate is 103L/s(1939GPM).
- About 2/3 of weight and size compare to traditional triplex pump.

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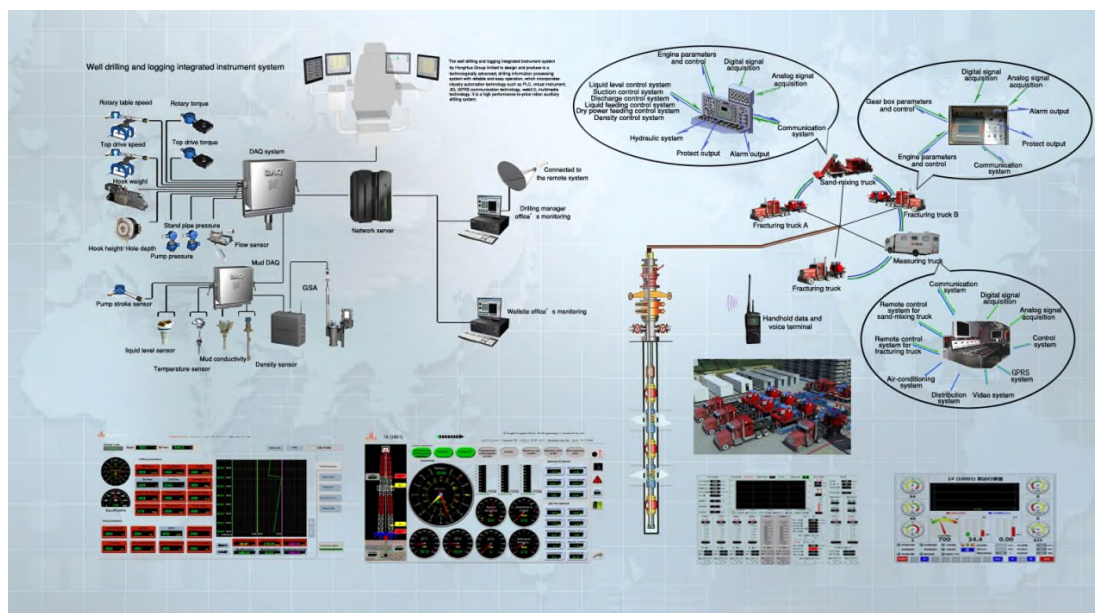
Electrical Drive and Control System for Drilling and Fracturing



System Network Model

The system include:

- Gas power gen and power distribution.
- Medium Voltage Variable frequency drive system.
- Medium voltage AC motor.
- Fracturing system remote control and monitory system.
- Drilling system control
- Well site communication network.



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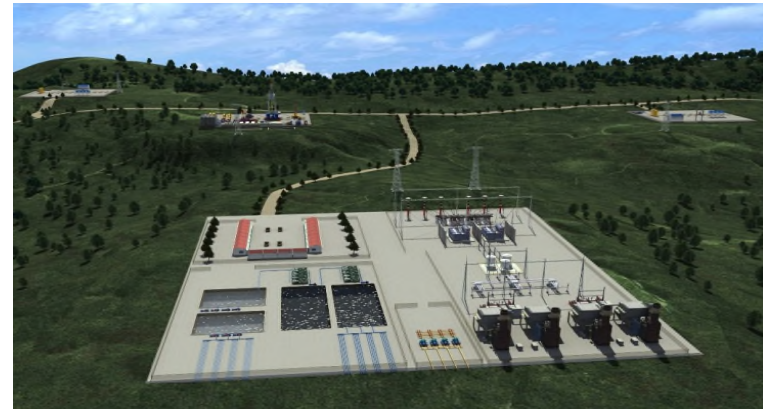
Part3: The Advantage of Honghua Shale Gas Solution

The Advantages of Honghua Integrated Solution



Honghua integrated shale gas solution:

- To establish substation and electricity transmission network ahead;
- To exploit gas by using gas power-gen.
- Complete process can be standardized and efficiency will be further improved.
- The whole operation can be easily duplicated to large-scale industrial production.



Drilling

- Vertical plus Horizontal Sections Pattern.
- Three types of equipment and two circulation systems comprise three sets of schemes
- Muti-well operation simutanously,improve the drilling efficiency.

Fracturing

- 6000HP VFD drive frac pump totally changed the condition.
- Flexible water tank reduce the area occupation.
- VFD drive character more suitable for harsh condit ion which the shale gas fracturing

Conclusion:

Honghua's solution has the advantages of higher efficiency, smaller area occupation, obvious emission reduction and lower cost.

HHUS00003611

Equipment Cost Analysis: Equipment on Production Well Site on a Block



Equipment	Unit	Amount	HH Electric Equipment		Conventional Equipment		Savings (in 10000 RMB)	Notes
			Unit Price (in 10000 RMB)	Total Price (in 10000 RMB)	Unit Price (in 10000 RMB)	Total Price (in 10000 RMB)		
Super Single Drilling Rig	Set	2	2000	4000	2600	5200	(1200)	HH no Diesel Engine
1500 HP VFD Drilling Rig	Set	8	4000	32000	6000	48000	(14000)	HH no diesel generator Including VFD and top drive
Coiled Tubing unit	Set	2	1200	2400	2200	4400	(2000)	
Fracturing group (36000HP)	Set	2	10200	20400	18000	36000	(15600)	6000HP each pump, total 36000HP Including VFD system
Frac water tanks and Sand Tanks with Other Accessories	Set	2	500	1000	800	1600	(800)	2400m³ water and 150m³ sand
Cementing Equipment	Set	2	1300	2600	1500	3000	(400)	
Subsurface Instrument (M/L WD)	Set	8	1100	8800	1100	8800	-	
Drilling and Downhole Tools	Set	8	1000	8000	1000	8000	-	
Water Supply and Sewage Treatment System	Set	1	3000	3000	3000	3000	-	
Other Supporting Facilities	Set	8	180	1440	180	1440	-	HH equipment does not contain power source
Total				83,640 (USD 134 mn)		119,440 (USD 192.6 mn)	(34,000) (USD 58.6 mn)	Including electric control equipment

28.4%

HHUS00003612

Equipment Cost Analysis: One Gas Power –gen and distribute system Cost



Investment Items	Specification	Unit Price (in 10000 RMB)	Number of Sets	Total Price (in 10000 RMB)	Notes
Electricity Network	35kV	Appr.0.6 mn/km	84km	5040	
Gas Gen-set	4500kW	10 mn/set	12	12000	
Central Substation	50MW	Appr.500/km	1	2500	
Fixed Substation		20	24	480	For well site permanently
Mobile Substation #2	35kV / 2.3kV 12.5MW	300	2	1200	For frac unit drive
Mobile Substation #1	35kV/0.69kV 8MW	280	8	2240	For drilling rig drive
Total				23460 (USD 36.7 mn)	

Conclusion

- The cost to build one power station and related facilities is about 36.7 million USD.
- Equipment on Production Well Site for a Block is cost 134 million USD.
- It reduce the cost about **10%** for all of drilling and frac .equipment for a block.

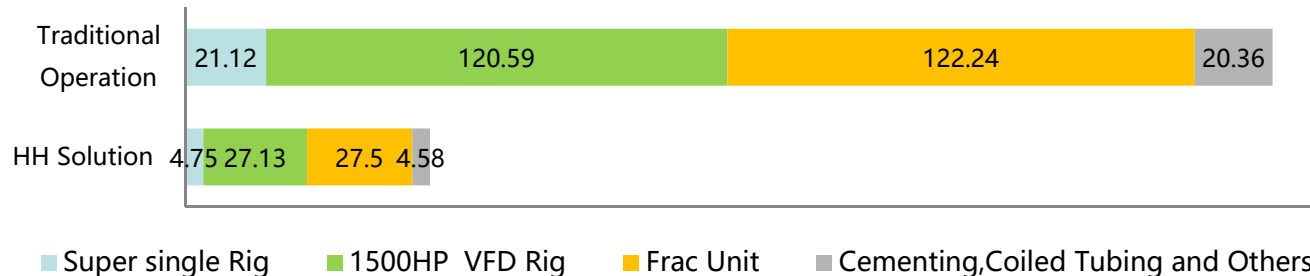
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Operation Cost Analysis – Fuel Costs



Estimated fuel Costs in a Block

Equipment	Total Power (kW)	Service Time per Well (Days)	HH Electric Equipment				Conventional Equipment				Savings per Well (in 10000 RMB)	Total Annual Savings of 100 Wells (in 10000 RMB)
			Gas Engine Unit Consumption (m³/kW h)	Gas Price	Consumption per Well (m³)	Price (in 10000 RMB)	Diesel Engine Unit Consumption (kg/kW h)	Diesel Price	Consumption per Well (T)	Price (in 10000 RMB)		
Super Single Drilling Rig	1684	8	0.304	1.8	26400	4.75	0.202	8000	26	21.12	(16.37)	(1636.80)
1500HP VFD Drilling Rig	2950	34			150733	27.13			151	120.59	(95.45)	(9345.47)
Frac Units (Total 36000HP)	22922	7			152798	27.50			153	122.24	(94.73)	(9473.48)
Cementing, Coiled Tubing and Others	1800	7			25452	4.58			25	20.36	(15.78)	(1578.02)
Total					355383	63.96			355	284.31	(220.34) (USD 0.34 mn)	(22033.77) (USD 34.43 mn)



■ During E&P process, replacing distributed diesel engines with gas power station for power supply may **reduce emissions 32000 tons per year**

Conclusion

- for one sample well ,the fuel costs saving is about 340,000 USD. if 480 wells are drilled in five years, It is going to save 163.2 million USD

HHUS00003614

Hope To Cooperate With You

Thank You!