

SYTFP-2500 型压裂车技术协议

Technical Agreement of SYTFP-2500 Fracturing Truck

甲方：

Party A

乙方：

Party B

就甲方委托乙方生产制造 SYTFP-2500 型压裂车的技术事宜，进行了认真商谈，达成如下技术协议： On the technical matters that Party A entrusted Party B to produce and manufacture SYTFP-2500 fracturing truck, we had serious discussions and reached the following technical agreement:

1. 说明 explain

1.1 设备为车装式，适合于非等级路面驾驶，适用于油田现场环境。

1.1 The equipment is car-mounted and suitable for non-grade road driving and suitable for field environment.

1.2 该压裂车适合许多类型不同液体的泵送作业，包括：带支撑剂压裂液的水力压裂，酸化压裂，高压泵入不同液体（液体，混合液）以及压力测试等。

1.2 The fracturing truck is suitable for pumping operations of many different types of liquids, including hydraulic fracturing with proppant fracturing fluid, acidizing fracturing, high pressure pumping into different liquids (liquids, mixtures) and pressure testing.

1.3 工作环境温度：-40~+40 °C。 Working environment temperature :-40~40°C.

1.4 该设备可在车台控制箱就近控制和在 40 米外仪表车远程控制。 1.4 The equipment can be controlled nearby in the platform control box and remotely in the instrument car 40

meters away.

2. 概述 summary

SYTFP-2500 型压裂车包括以下部件： SYTFP-2500 fracturing truck includes the following components:

- “北方奔驰”8×4 底盘 8×4 chassis
- “康明斯”QSK50-C2500 型发动机 Cummins QSK50-C2500 engine
- “凯星”SE23800B 型液力机械传动箱 "Kai Xing" SE23800B hydraulic mechanical transmission box
- LF5ZB—2500 型卧式五缸柱塞泵 LF5ZB-2500 horizontal five cylinder piston pump
- 卧式安装的柴油机散热器 Horizontal mounted diesel radiator
- 液压驱动系统 fluid power system
- 液压控制系统 Hydraulic control system
- 仪表控制系统 Instrument Control System
- 高压管汇 High pressure manifold
- 低压管汇 Low pressure manifold

主要外形尺寸： Main dimensions:

总 长: Total length 11300 mm

总 高: Total height 3950 mm

总 宽: Total width 2500 mm

总 重 量: total weight 38000 Kg

3. 设备规格: Equipment Specifications:

3.1 汽车底盘 automobile chassis

型 号 : 北方奔驰 ND5440TTZZ02 (国 V)

Model: North Benz ND5440TTZZ02(V)

发动机型号: WP12.375E50 (375 马力)

Engine model: WP12.375E50(375 horsepower)

排量 / 功率: 9726 / 280 (ml/Kw) Displacement/power :9726/280(ml/Kw)

轴 距: 1500+4750+1450 mm

Wheelbase: 1500 + 4750 + 1450 mm

轮 距: 1995 / 1800 (前 / 后) mm

Distance :1995/1800(front/back) mm

驱动方式: 8×4 Drive mode :8×4

总 质 重: 44000 Kg

Gross mass: Kg 44,000

轮 胎: 12.00-20, 配置 1 个备用轮胎及备胎架。

备胎升降机构电动控制 Tire :12.00-20, equipped with 1 spare tire and
spare tire frame.

Electric control of spare tire lifting mechanism

油 箱: 总容量 1200L, 铝合金油箱盖带锁, 带油水分离器 Fuel tank: total capacity
1200 L, aluminum alloy tank cover with lock, with oil water
separator

长 L: 11835 mm

宽 W: 2495 mm

高 H: 3430 mm

长驾驶室带空调、带卧铺、装沙漠空滤器

Long cab with air conditioning, sleeper, loading desert air filter

3.2 车台发动机: 3.2 Platform engines:

Model: Cummins QSK50-C2500 engine

rated power: Kw/2500Hp 1864

Rated speed: rpm 1900

Maximum torque: N·m 9601

Cylinder diameter :159×159 mm

Cylinder count :16 cylinder V type

Engine electrical connector protection class: IP67:

ECM provide programmable protection systems

Distal and proximal instrument engine fault alarm function

Inspiratory mode: turbocharged water cooled

Double filter cartridge, air filter plug indicator

Exhaust manifold, dry, water cooled four superchargers,

Double vent, round flange

SAE 0# flywheel, SAE 0# flywheel housing

Horizontal mounted combined radiator includes diesel engine heat dissipation,

transmission box heat dissipation, fracturing pump heat dissipation,

hydraulic system heat dissipation and diesel fuel heat dissipation.

Drive radiator fan motor driven by fuel pump in drive box

Host quality: Kg 5596

型号：“康明斯”QSK50-C2500 型发动机

额定功率：1864 Kw/2500 Hp

额定转速：1900 rpm

最大扭矩：9601 N·m

缸径行程: 159×159 mm

汽缸数: 16 缸 V 型

发动机电器接插件防护等级: IP67

ECM 提供可编程的保护系统

远端和近端仪表发动机故障报警功能

吸气方式: 涡轮增压水冷

双滤芯, 空滤堵塞指示器

排气歧管, 干式, 水冷式四个增压器,

双排气出口, 圆式法兰

SAE 0# 飞轮, SAE 0# 飞轮壳

卧式安装的组合式散热器包括柴油机散热、传动箱散热、压裂泵散热、
液压系统散热和柴油机燃油散热。

传动箱取力器油泵驱动散热器风扇马达

主机质量: 5596 Kg

3.3 台上传动箱: 3.3 Transmission box on platform:

Model : " Kaixing "SE23800B hydraulic mechanical transmission box

maximum input power :2300 Kw (3128 hp)

Maximum torque :12880 N.m

Highest Speed :2100 r/min

SAE 0# connection

Filter with direct mounting

Top and side of belt

Transmission Box Manual Electronic Control Shift

型号：“凯星”SE23800B 型液力机械传动箱

最大输入功率：2300 Kw(3128 Hp)

最大扭矩：12880 N.m

最高转速：2100 r/min

SAE 0#连接

带直接安装式滤清器

带顶部与侧部取力口

传动箱手动电控换挡

DC 驱动液压换挡总成，带变矩器锁定限制器 DC drive hydraulic shift assembly with torque converter locking limiter The two oil pumps installed on the lower side of the transmission box are respectively used for lubrication of the power end and the hydraulic end of the five-cylinder pump. The oil pump installed on the force picker on the transmission box is used to drive the engine fan motor of the diesel engine.

安装在传动箱下侧取力器上的两个油泵分别用于五缸泵动力端、液力端的润滑。

安装在传动箱上取力器上的油泵用于驱动车台柴油机风扇马达。

档位 速比 Gear Speed Ratio

I 3.79 : 1

II	2.73 : 1
III	2.22 : 1
IV	1.78 : 1
V	1.59 : 1
VI	1.28 : 1
VII	1.00 : 1
VIII	0.72 : 1 (锁定)

液力变速箱为电控换挡，变速箱可在任意档位间进行切换，也可在任意档位立即空档。 The hydraulic gearbox is electrically controlled shift, the gearbox can be switched between any gear, or immediately neutral in any gear.

3.4 发动机/液力机械传动箱的安装 3.4 Installation of engine/hydraulic mechanical drive case The engine / hydraulic mechanical transmission box and the automobile chassis are installed with isolation, and rubber pads are used for isolation. The engine/drive box is connected into a separate whole, mounted in three-point form by bracket, one flexible mounting point at the front and two flexible mounting points at the rear. The installation system eliminates the alignment problem during installation and reduces damage to the engine/drive box due to installation alignment.

发动机/液力机械传动箱与汽车底盘采用隔震安装，使用橡胶垫进行隔震。发动机/传动箱连接成一个单独整体，靠托架以三点形式安装，一个柔性安装点在前部，两个柔性安装点在后部。安装系统消除了安装时的对准问题，减少了发动机/传动箱因安装对准而发生的损坏。

3.5 传动轴 3.5 Drive Shaft

传动箱和五缸压裂泵用一个标准传动轴连接，正常工作时安装角度不会超过生产厂家规定的最大角度，传动轴上装有可拆卸的护罩。在护罩上开孔，用于给万向轴加注黄油。

the drive box and the five-cylinder fracturing pump are connected with a standard drive shaft, the installation angle will not exceed the maximum angle specified by the manufacturer when working normally, and the drive shaft is equipped with removable guard. A hole in the shield is used to butter the universal shaft.

3.6 液压系统 3.6 Hydraulic systems

The hydraulic system is responsible for the power of the diesel engine start-up and the diesel engine fan drive system on the platform. It comes from the hydraulic pump driven by the force picker on the automobile chassis and the force picker on the transmission box, respectively.

The hydraulic system is equipped with all associated equipment such as fuel tank, filter, relief valve, one way valve, etc. to ensure the integrity and functionalization of the system.

液压系统是负责台上柴油机启动和柴油机风扇驱动系统的动力，它分别来自于汽车底盘取力器和传动箱上取力器驱动的液压泵。

液压系统装有所有与之相关的设备，如油箱、滤清器、溢流阀、单向阀等，以确保系统的完整和功能化。

3.7 压裂泵 3.7 Fracturing pump

Model: LF5ZB-2500 horizontal five cylinder piston pump

Quality: Kg 9250

型 号: LF5ZB-2500 卧式五缸柱塞泵

质 量: 9250 Kg

动力端 Power terminal

The power end shell is a whole welded steel piece, the crankshaft and the pinion shaft are all alloy steel forgings, the gear adopts bilateral helical gear, the connecting rod is

alloy steel forgings, and the shaft sleeve and bearing are cast lead-tin copper alloy.

动力端壳体为整体焊接钢件，曲轴和小齿轮轴均为合金钢锻件，齿轮采用双边斜齿轮，连杆为合金钢锻件，轴套和轴瓦为铸造铅锡铜合金。

泵轴功率： 1864 Kw(2500 Hp) Pump shaft power :1864 Kw (2500HP)

Water power: Hp 1875

Spindle: Integral forging forming crankshaft

Pump body: welding assembly

Skateboard: bobbin integral structure

In-pump deceleration:

Type :2 bevel gear bilateral input

Deceleration ratio :6.353

Lubrication mode: forced pressure oil lubrication, all the way into the crankshaft lubrication shaft sleeve and bearing, all the way lubrication cross and cross head guide plate.

水 功 率： 1875 Hp

主 轴： 整体锻造加工成型曲轴

泵 身： 组焊件

滑 板： 筒形整体结构

泵内减速：

型 式： 2 斜齿轮双边输入

减 速 比： 6.353

润滑方式： 强迫压力油润滑，一路进曲轴润滑轴套和轴瓦、一路润滑十字头和十字头导板。

液力端

液力端主要由泵头体、吸入和排出阀总成、柱塞、盘根等组成。Hydraulic end

The hydraulic end is mainly composed of the pump head body, suction and discharge valve assembly, plunger, packing, etc.

泵头体为整体合金锻件。柱塞表面喷镀耐磨合金粉，具有良好的耐磨性及抗腐蚀性。柱塞密封为三件组合式密封盘根，由盘根压环、盘根座圈等排列构成。柱塞与小连杆用卡箍联接，拆卸方便。the pump head body is integral alloy forgings. Plunger surface spray resistance to running-in gold powder, with good wear resistance and corrosion resistance. The plunger seal is composed of three-piece combined sealing disk root, which is arranged by disk root pressing ring, disk root seat ring and so on. The plunger and the small connecting rod are connected with clamps for easy disassembly.

柱塞直径： 4"、 4.5"

冲 程： 8"

最高压力： 105 MPa

最大排量： 3.1 m³/min

液力端材料： 40CrNiMoA 高强度钢

盘根润滑： 齿轮油泵强迫压力油润滑

Plunger diameter :4",4.5" Stroke :8"

Maximum pressure :105 MPa Maximum displacement :3.1 m³/min

Hydraulic end material :40 CrNiMoA high strength steel

Root lubrication: Gearing oil pump forced pressure oil lubrication

2500 型压裂车压力、排量表（按总机械效率 75%计算） Pressure and displacement gauge (75% of total mechanical efficiency) for Type 2500 fracturing truck

柴油机 转速	档 位	冲 次	4"柱塞		4.5"柱塞	
		1/min	排量 m ³ /min	压力 MPa	排量 m ³ /min	压力 MPa
1900 r/min	1	78.9	0.65	105.0	0.822	92.00
	2	109.5	0.902	90.00	1.141	68.90
	3	134.7	1.109	75.00	1.404	57.01
	4	168.0	1.383	61.00	1.751	45.20
	5	188.1	1.548	54.50	1.960	41.00
	6	233.6	1.923	43.80	2.434	33.60
	7	299.1	2.462	34.30	3.116	26.10
	8	超速档不使用 Overspeed gear is not used				

排出管汇

压裂泵排出管汇由 3"弯头，3"整体式高压短管组装而成。压裂泵排出管的一端装有进口压力传感器及弹簧式安全阀。压力传感器与近控台的上数据采集器相连接，用于显示压裂泵的排出压力，另一端用于与井口或压裂车高压管汇相连，排出口的接口处装有外扣由壬接头。1502扣形。

Discharge manifold

Fracturing pump discharge manifold is composed of 3" elbow ,3" integral high pressure short pipe. One end of the fracturing pump discharge pipe is equipped with inlet pressure sensor and spring type safety valve. The pressure sensor is connected with the data collector on the near control table to show the discharge pressure of the fracturing pump,

the other end is used to connect with the high pressure pipe sink of the wellhead or fracturing truck, and the interface of the outlet of the discharge is equipped with an outer buckle by a nonnon joint. 1502 buckle shape.

吸入管汇 suction manifold

The suction of the fracturing pump is two interfaces, equipped with two pieces of 4" butterfly valve, and the outer buckle is connected by nonnon.

FIG206 buckle shape, suction manifold downward tilt, easy to empty liquid.

压裂泵的吸入为两个接口，装有两件 4"蝶阀，外扣由壬接头。

FIG206 扣形，吸入歧管向下倾斜，便于排空液体。

4 控制系统 4 Control systems

The control system is divided into two parts: near control and remote control.

Both parts can carry on the construction control to the fracturing vehicle separately.

The near control part is mainly used for the debugging and testing of fracturing truck.

控制系统分为近控和远控两个部分。

两个部分都可对压裂车分别进行施工控制。

近控部分主要用于压裂车的调试及检测。

4.1 车台仪表箱 Desk Meter Box

仪表箱采用减振弹簧垫安装，带有前盖，主要参数均为液晶数显屏显示。The instrument box is installed with damping spring pad with front cover, the main parameters are LCD digital display screen.

- 车台发动机参数显示屏 Engine parameter display screen
- 车台发动机转速控制开关 Engine Speed Control Switch for Platform
- 车台液力机械传动箱参数显示 Parameter Display of Hydraulic Mechanical Transmission Box in Platform

- 五缸泵工作参数显示 Working parameters of five-cylinder pump
- 启动油压参数显示 Start oil pressure parameter display
- 传动箱档位控制阀 Gearbox control valve
- 车台发动机预热开关 Platform engine preheating switch
- 立即停车开关 Stop immediately
- 电源开关 mains switch
- 照明开关 light switch
- 断路保护器 Broken circuit protector
- 用于向远控箱传输信号的计算机数据采集器等 A computer data collector used to transmit signals to a remote control box, etc.

4.2 手提式远控箱 4.2 Portable remote control box

由于压裂作业时压力高，危险性较大，可用远控箱进行远离压裂车工作现场的操作控制以及压裂车的等工作，方便而安全。 Because of the high pressure and high risk in fracturing operation, remote control box can be used to keep away from fracturing truck

It is convenient and safe to do field operation control and fracturing truck.

远控仪表箱面板包括下列仪表 Remote control instrument box panel includes the following instruments

- 车台传动箱换挡开关 Shift Switch for Platform Drive Box
- 车台发动机立即怠速开关 Platform engine idling switch immediately
- 车台发动机转速表 Platform engine tachometer
- 泵排量表、压力表 Pump gauges, pressure gauges
- 车台发动机、液力机械传动箱工作状态指示灯

- Working status indicator light for engine, hydraulic mechanical drive box
- 远控仪表箱电源开关 Remote control instrument box power switch
- 车台发动机启动、停止按钮 Platform engine start and stop button
- 车台发动机调速旋钮 Engine speed control knob
- 传动箱闭锁指示灯 Drive Box Locking Indicator
- 超压保护装置（包括压力显示、压力预置、超压保护和复位开关） Overpressure protection device (including pressure display, pressure preset, overpressure protection and reset switch)
- 超压保护为双重保护装置: 立即怠速, 立即空档 Overpressure protection is dual protection: idle immediately, neutral immediately
- 远控箱电缆为 5 芯屏蔽电缆, 耐油性能好, 存放在近控箱内左侧, 电缆插座配有插座护套, 具有防水功能。The remote control box cable is a 5-core shielded cable with good oil resistance, which is stored on the left side of the near control box. The cable socket is equipped with socket sheath waterproof function.

5. 其它 5. Other

5.1 Attachments

Randomly equipped with two sets of hydraulic end components assembly

5.1 随车附件

随机配备两台套 _____ 液力端易损件总成

5.2 资料

- 底盘车技术资料（原厂） 各 1 套
- Chassis Vehicle Technical Information (Original Factory) 1 set each
- 车台发动机技术资料（原厂） 各 1 套
- Platform Engine Technical Data (Original Factory) 1 set each

- 传动箱技术资料（原厂） 各 1 套
- Transmission Box Technical Data (Original Factory) 1 set each
- 压裂车产品说明书 各 2 套
- 2 sets of fracturing truck product instructions

5.3 组装与调试 5.3 Assembly and commissioning

压裂车的组装及调试按工厂的装配和检验规范进行 Fractor assembly and commissioning according to factory assembly and inspection specifications

压裂车的组装包括下列项目： The fracturing truck assembly includes the following items:

- 副大梁与底盘的联接 Connection of secondary girder to chassis
- 发动机和传动箱的联接 Connection of engine and transmission box
- 发动机和传动箱在底盘上的安装 Installation of engine and drive box on chassis
- 大泵及底座在底盘大梁上的定位和安装 Positioning and Installation of Large Pumps and Base on Chassis Beam
- 传动轴的联接 Connection of drive shaft
- 高低压管汇的安装 Installation of high and low pressure manifold
- 电路系统的安装 Installation of circuit systems
- 液压系统的安装 Installation of hydraulic systems
- 气路系统的安装 Installation of gas path system
- 工具箱及各种护罩的安装 Installation of Toolbox and various shields
- 灭火器的安装 Installation of fire extinguishers

组装前大泵经过空跑合试验；液压管线经过循环清洗并用堵盖保护，避免前脏物进入；高压管汇经过压力试验。 Before assembly, the large pump goes through the air running test; the hydraulic pipeline is cleaned by circulation and protected by plugging cover to avoid the

entry of the front stolen goods; and the high pressure pipe sink passes the pressure test.

组装中，对关键的工序按检验卡片的项目逐项检验，并记录数据。 In assembly, the key process is checked item by item of inspection card, and the data is recorded.

装配过程满足以下基本要求： The assembly process meets the following basic requirements:

- 全部管线固定牢固，保证设备工作时不发生松动 All pipelines are fixed firmly to ensure that the equipment does not loose when working
- 液压管线布置在有摩擦处加橡胶保护护套，合理固定，设备运转时不发生摩擦 The hydraulic line is arranged with rubber protective sheath at the place where there is friction, which is reasonably fixed and does not occur when the equipment is running
- 传感器配带防护套 Sensor with protective case
- 油箱加油、放油、观察油面方便 Fuel tank refueling, oil discharge, easy to observe oil surface
- 高速旋转部件带防护罩 High speed rotating parts with protective shield
- 气割毛边磨平 Gas cutting edge grinding
- 焊缝保证强度，表面光滑 Weld ensure strength and smooth surface

组装完毕后，按以下程序试验： After assembly, test according to the following procedure:

- 对泵头体的工作腔、排出腔、高压管汇等进行静水压试验，各部不得有渗漏现象 Hydrostatic pressure tests are carried out on the working cavity, discharge cavity and high pressure pipe sink of the pump head body. No leakage is allowed in all parts
- 发动机启动试验 Engine start-up test

- 整机空载跑合试验。检查液、气、电及润滑系统是否正常工作 No-load run-off test. Check that the fluid, gas, electricity and lubrication systems are working properly
- 厂内整机负荷试验。以清水为介质，检测各个挡位的压力、排量及其它参数 Plant load test. Detect pressure, displacement and other parameters of each gear with clear water as medium
- 现场整机负荷试验。以混砂液为介质，检测各个挡位的压力、排量及其它参数，是否达到设计要求并取出参数 field whole machine load test. Using sand mixture as medium, the pressure, displacement and other parameters of each retaining position are detected to meet the design requirements and the parameters are taken out

5.4 喷漆

压裂车整机的颜色为 红色。组装前，自制零部件中的非加工面均涂底漆。组装和调试完毕后，整机用清洗剂高压喷射清洗，确保无油污，再进行表面打磨处理，然后喷涂底漆、面漆。卡车、发动机和传动箱保持原色，不另行喷漆。 5.4 Painting

The color of the whole machine of the fracturing truck is red. Before assembling, the non-machined surfaces in the self-made parts are all coated with primer. After assembly and debugging, the whole machine is cleaned by high pressure spray of cleaning agent to ensure that there is no oil pollution, and then the surface is polished, and then the primer and topcoat are sprayed. Trucks, engines and drive boxes are kept in primary color and are not sprayed separately.

6. 其它. Other

6.1 设备到达需方后，甲方通知厂家到现场负责理论和实际技术培训。

6.1 Upon arrival of the equipment at the buyer, Party A informs the manufacturer to take charge of theoretical and practical technical training on site.

6.2 整机保修期为一年。保修期内，因乙方制造组装质量问题，由乙方免费提供维修和现场技术服务。因甲方操作造成的机具损坏，有甲方承担配件费用，乙方免费进行现场维修。保修期外，乙方保证及时提供周到的服务。

6.2 The warranty period is one year. During the warranty period, due to Party B's manufacturing and assembly quality problems, Party B shall provide maintenance and on-site technical services free of charge. Due to the equipment damage caused by Party A's operation, Party A bears the cost of accessories, and Party B carries out on-site maintenance free of charge. Outside the warranty period, Party B guarantees timely and thoughtful service.

6.3 甲方来厂验收设备时，发生的协议非整改项目费用由甲方承担。

6.3 When Party A comes to the plant to check and accept the equipment, Party A shall bear the cost of the agreed non-reform project.

6.4 本协议经双方代表签字生效，与合同具有同等法律效力，并作为乙方供货、排产、外购材料的依据。

6.4 This Agreement shall enter into force with the signature of the representatives of both parties and shall have the same legal effect as the Contract and shall serve as the basis for Party B to supply, arrange production and purchase materials.

6.5 未尽事宜双方协商解决。

6.5 The outstanding matters shall be settled through consultation between the parties.

甲 方：

签 字:

乙 方:

签 字: