Dual-Engine Dual-Pump Cementing Truck YLL5361TGJ

Technical Specifications

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Dual-Engine Dual-Pump Cementing Truck Technical Specifications

1. Scope

This technical specification sets out the technical requirements, test methods, inspection rules, markings, packaging, transportation, and HSE requirements for the cementing truck.

This technical plan applies to the production and quality inspection of cementing trucks.

2. Overview

The dual-engine dual-pump cementing truck is designed for cementing operations, acidizing operations, pressure testing, and other fluid pumping operations in inland and desert oilfields. The truck features a high-pressure three-cylinder plunger pump driven by a diesel engine with an automatic transmission. The mixing system is driven by an open hydraulic system, offering high mixing energy and good mixing quality. The three-cylinder plunger pump is a single-acting pump, with the advantages of being compact, lightweight, and having a large displacement, making it suitable for pumping various common types of oilfield treatment fluids. The design and manufacturing process of the entire truck fully consider minimizing maintenance/repair requirements in oilfield environments, with a layout that ensures operators can easily and clearly monitor all control switches, instruments, and the operation of all systems on the truck.

3. Normative References

The following documents are essential for the application of this document. For referenced documents with a date, only the version with the indicated date applies to this document. For referenced documents without a date, the latest version (including all amendments) applies to this document.

SY/T 7333-2016 Petroleum and Natural Gas Drilling and Production Equipment – Cementing Equipment

SY/T 5557-2016 Cementing Equipment Specifications

GB/T 1495 Limits and Measurement Methods for Vehicle Exterior Noise at Accelerated Driving

GB/T 1589 Limits of Vehicle Outline Dimensions

GB/T 17691-2018 Heavy-Duty Diesel Vehicle Pollutant Emission Limits and

Measurement Methods (China Stage VI)

GB/T 20891-2014 Non-Road Mobile Machinery Diesel Engine Exhaust Pollutant Emission Limits and Measurement Methods (China Stage III and IV)

GB/T 4094 Symbols for Vehicle Control Components, Indicators, and Signal Devices

GB/T 4785 Installation Regulations for External Lighting and Light Signaling Devices on Motor Vehicles and Trailers

GB/T 4785 Installation Regulations for External Lighting and Light Signaling Devices on Motor Vehicles and Trailers

GB/T 7258 Technical Conditions for the Safe Operation of Motor Vehicles

GB/T 11567 Side and Rear Lower Protection Requirements for Motor Vehicles and Trailers

GB/T 15084 Performance and Installation Requirements for Vehicle Rearview Mirrors

GB/15741 License Plates (Frames) and Their Position for Motor Vehicles and Trailers

GB/T 18099 Photometric Performance of Side Marking Lamps for Motor Vehicles and Trailers

GB/T 18411 Road Vehicle Product Labels

QC/T 739 General Technical Conditions for Oilfield Special Vehicles

SY/T 5305 General Technical Conditions for Welding of Petroleum Drilling and Production Machinery Products

SY/T 5308 General Technical Conditions for Painting of Petroleum Drilling and Production Machinery Products

QC/T 252 Performance Testing Regulations for Special Vehicles

4. General Technical Requirements

All supplied equipment and accessories shall be brand new, unused, and genuine.

The design specifications, manufacturing processes, and product technical quality of all supplied equipment shall comply with relevant international standards, Chinese national standards, and industry standards.

The design and manufacturing requirements of the equipment shall conform to the provisions of SY/T 7333-2016.

The technical performance configuration of all supplied equipment components shall be reasonable.

The layout of all supplied equipment shall be reasonable, facilitating equipment operation, inspection, and maintenance.

The equipment shall be configured with necessary operating platforms, access passages, work ladders, and warning labels. All exposed moving parts and high-temperature components shall have safety protective devices. The various discharge ports of the equipment shall be directed to safe positions. The equipment shall be equipped with firefighting equipment according to standards. All safety protection measures shall be designed and configured reasonably. The side and rear protection devices shall comply with the requirements of GB/T 4785 and GB/T 11567.

All supplied equipment shall have good sealing and vibration resistance to ensure it can operate in humid, rainy, and other weather conditions, and can withstand operating environmental temperatures from -29℃ to +45℃.

The equipment shall be fully configured with necessary hydraulic, pneumatic, lubrication, cooling, and control systems.

The instruments and meters of all supplied equipment shall use the International System of Units (or International System of Units with Imperial Unit equivalents; hydraulic/pneumatic/electrical circuits shall be labeled with codes).

Each supplied piece of equipment shall be fully configured with the special tools required for routine maintenance, servicing, and commissioning, and shall be equipped with a nighttime construction lighting system.

To adapt to the environment of the purchaser, the chassis shall use a China Stage V emission standard engine. Documentation required for vehicle registration within China will not be provided. Additionally, special tools for the equipment's daily maintenance, servicing, and commissioning will be provided.

5. Main Performance Parameters

Net weight	≤36, 000 kg
Overall Dimensions	≤12280 mm (length) × 2550 mm (width) × 4000 mm (height)
Maximum Pressure	Not less than 100 MPa (3" hydraulic end)
Maximum Displacement	Not less than 3.0 m^3/min
Maximum mixing capacity	Not less than 2.3 m^3/min
Cement slurry density control range	1.0~2.5 g/cm^3
Cement slurry density accuracy	±0.024 g/cm^3
Operating temperature	-29~+45 ℃

6. Main Component Requirements

The main components of the cementing truck include:

1 SITRAK 8×4 chassis

2 CAT C15-540 diesel engines (non-road China Stage III emissions or above)

2 Allison 4700OFS_P transmission gearboxes

1 set of 4 1/2" three-cylinder plunger pump, 1 set of 3" three-cylinder plunger pump

2 sets of 6×5 centrifugal pumps (circulation pump and booster pump)

2 sets of 4×3 centrifugal pumps (injection pump and water supply pump)

1 mixing tank

1 metering tank

1 set of manual control mixing system

1 set of hydraulic system (open hydraulic system)

1 set of pneumatic system

1 set of lubrication system

1 set of electrical system

1 set of control system

1 set of high-pressure manifold

1 set of low-pressure manifold

1 set of hydraulic oil cooling system (hydraulic pump driving cooling fan)

6.1 Chassis - SITRAK 8×4

The chassis is a SITRAK 8×4 chassis, with the following basic configuration:

Product Name	Class II cargo chassis
Drive type	8×4
Permissible total mass	44000kg
Wheelbase (mm)	1950+4525+1350
Front overhang/rear overhang (mm)	1492/2350
Engine model	MC11.44-60 (China Stage VI emissions)
Rated Power (kW)	Not less than 320
Maximum torque (N.m/rpm)	2200 N·m/1000~1400rpm
Transmission model	ZF16S2230 TO

Product Name	Class II cargo chassis
Braking system	Intelligent electronic braking system, dual-circuit brake
Steering mechanism	Adjustable steering wheel height and tilt angle, steering wheel lock
Tire specifications	First and second axles: 2×385/65R22.5, middle and rear axles: 4×12.0/R20 Spare tire: 1×385/65R22.5
Cab	CH7-U type cab
Fuel tank	1 × 600L
Power take-off	Full power take-off

6.2 Engine

The power for the truck is mainly provided by two CAT C15-540 series engines, which drive the three-cylinder plunger pump through two automatic transmission gearboxes. The engines are equipped with protective covers. The specifications for the CAT C15-540 engine are as follows:

Model; CAT C15-540

Engine power: 540HP (403BkW) @ 2100RPM

Emission standard: Euro III

Peak torque: 2468Nm/1400RPM

Cooling system: Vertical fan radiator cooling

Starting method: Electric start

Speed control: Electrical Control

6.3 Transmission Gearbox

The two Allison 4700OFS_P transmission gearboxes provide 5-speed shifting and neutral, equipped with a PTO for powering hydraulic and lubrication systems. The engine and transmission are mounted using a three-point fixed installation method. The specifications for the Allison 4700OFS_P transmission gearbox are as follows:

Model; 4700OFS_P

Maximum net input power: 600 hp (447 kW)

Maximum input speed: 2400 rpm

Maximum input torque: 2508N.m

Transmission ratios for each gear

Gear position	I	II	III	IV	V
Gear ratio	7.63	3.51	1.91	1.43	1.00

Equipped with a PTO to drive the lubricating oil pump.

6.4 Transmission Shaft

The heavy-duty drive shaft is installed between the transmission gearbox and the three-cylinder plunger pump, including a heavy-duty universal joint and flange assembly. The installation angle of the drive shaft complies with the maximum installation angle recommended by the manufacturer.

The drive shaft is equipped with a metal protective cover, and a simple window is provided at the universal joint for easier maintenance and servicing of the drive shaft.

6.5 Three-Cylinder Plunger Pump

The STP600 three-cylinder plunger pump is a reciprocating, positive displacement, horizontal, single-acting three-cylinder plunger pump. The maximum rated input power of the pump is not less than 600 horsepower. The pump is designed for intermittent oilfield service operations such as acidizing, cementing, fracturing, well stimulation, and gravel packing. The pump mainly consists of the power end, reducer assembly, and hydraulic end assembly. The power end is designed with high-strength steel, and the hydraulic end is designed with a forged steel monolithic structure. It is equipped with easily removable intake and discharge valves, replaceable valves and valve seats, surface-coated plungers, and removable packing boxes.

The hydraulic end specifications for the plunger pump are 3" + 4 1/2". The available hydraulic ends include four specifications: 3", 3 1/2", 4", and 4 1/2". The specific parameters are as follows (for short-duration operating conditions):

Model/Type				Reciprocating, offset, horizontal single-acting plunger pump							
Stroke				6” (152.4 mm)							
Maximum brake horsepower				4.6: 1							
Gear position	Engine speed (rpm)	Gearbox transmission ratio	Stroke rate (strokes/min)	Flow rate L/min				Pressure MPa			
				4 1/2"	4"	3 1/2"	3"	4 1/2"	4"	3 1/2"	3"
1		7.63	60	280	221	169	123	45	55	70	100
2		3.51	130	609	481	368	271	25	31	42	57
3		1.91	239	1118	883	676	496	14	17	23	31
4	2100	1.43	319	1494	1180	904	676	10	13	17	23
5	2070	1	450	2105	1662	1274	936	7	9	12	17

Note: Volume efficiency: 100%, mechanical efficiency: 90%. It is recommended that the diesel engine and plunger pump operate at 70%–80% of full power.

6.6 Lubrication System

The equipment is equipped with two independent lubrication systems.

The bearings and gears in the power end of the plunger pump are lubricated with continuous pressure oil for forced lubrication.

The packing and centrifugal pump packing in the hydraulic end of the plunger pump are lubricated by the lubrication pump, which pumps lubricating oil from the oil reservoir to lubricate the packing and oil seals.

The discharge port on the hydraulic end lubrication waste disc shall be no smaller than 2" and shall be connected to a hose leading to the side of the truck for easy liquid connection.

6.7 Metering Tank

The volume of the metering tank is 4 m^3, divided into two chambers, each 2 m^3. It can measure the displacement of liquids and the volume of mixed water, and it can also be used for batch mixing and injection of chemical additives. The two chambers can be used for separate measurement or can be interconnected.

6.8 Mixing System

The mixing system mainly consists of a high-energy mixer, diffuser, mixing tank, mixing blades, circulation pump, and fresh water pump. The mixer ensures that dry cement entering the fresh water and circulating mud is thoroughly wetted. The kinetic energy required for mixing is supplied by the fresh water centrifugal pump and the circulation centrifugal pump. The diffuser is used to remove gases from the dry cement and eliminate dust in the mixing tank.

6.8.1 Mixing Tank

The volume of the mixing tank is not less than 1.8 m^3. The lower part of the mixing tank has a conical structure with a discharge port at the lowest point. This discharge port is equipped with a pneumatic control valve to achieve zero tank residue.

The mixing tank is equipped with a stirrer, and the top is fitted with a high-energy mixer, diffuser, and other components. The exhaust port of the diffuser is equipped with a detachable rotary elbow.

6.8.2 Injection Centrifugal Pump and Water Supply Centrifugal Pump

The fresh water centrifugal pump is a 4×3 centrifugal pump, with the following technical parameters:

Model; 4×3

Suction Port Size: 4"

Discharge port size: 3"

Working pressure: 0.7~1.12 MPa

Maximum Displacement: 1.6 m³/min

6.8.3 Circulation/Booster Centrifugal Pump

The circulation centrifugal pump is a 6×5, with the following technical parameters:

Model; 6×5

Suction Port Size: 6"

Discharge Port Size: 5"

Working pressure: 0.2~0.35 MPa

Maximum Displacement: 3.18 m³/min

6.8.4 Control of Mixing System

The mixing system can adjust in real time according to changes in mud density, ash supply capacity, water supply conditions, and mud flow rate, ensuring stable mud density.

Maximum mixing capacity: 2.3 m³/min

Mud density: 1.0–2.6 g/cm^3

Mud density error: ±0.024 g/cm^3

6.9 Hydraulic System

The hydraulic system consists of a transfer box, hydraulic pump, hydraulic motor, hydraulic oil tank, control valve, overflow valve, filter, and related fittings/hoses.

The hydraulic pipeline connections are arranged in easily accessible maintenance positions.

All hydraulic power is provided by the chassis engine, and the transfer box drives 1 injection pump, 1 circulation pump, 1 stirrer, 1 infusion pump, and 1 water supply pump, as well as providing power for hydraulic cooling.

6.10 Pneumatic System

The chassis air compressor provides a 0.7 MPa air supply for the entire pneumatic system. The chassis air storage tank serves as the air storage for the entire system, and a check valve is installed before the chassis air compressor pipe enters the chassis air storage tank. The air system is primarily used to control various pneumatic butterfly valves, air horns, etc.

6.11 Electrical System

The electrical system consists of the chassis electrical system and the truck electrical system, with both systems operating independently.

The chassis electrical system powers all electrical components of the chassis truck.

The truck electrical system is powered by the truck engine. It is equipped with a set of truck batteries, with a voltage of 24 V.

The functions of the truck electrical system are as follows:

Provide power to all lighting on the truck to ensure nighttime operation;

Power the truck engine's computer control system;

Power the mixing system's computer system.

6.12 Control System

The instrument control box is made of stainless steel, durable, and convenient for the operator to observe and monitor. The display screen is suitable for both daytime and nighttime operation, and the instrument box is equipped with a dustproof cover. The control switches are flexible, reliable, durable, and easy to operate. The main functions of the control console are:

Control the mixing system;

Control the truck engine, equipped with an engine throttle and engine display computer;

Monitor the transmission and three-cylinder plunger pump, equipped with power-end oil temperature and oil pressure gauges;

Monitor the hydraulic, pneumatic, and electrical systems, equipped with hydraulic, air pressure, and voltage gauges;

The console is equipped with various alarm lights and indicator lights;

The console is equipped with an air horn;

LED lighting is installed at the console, metering tank, and mixing tank.

6.13 High-Pressure Manifold

The high-pressure manifold is 2″ and consists of 2″ flexible elbows, pressure sensors, plug valves, and straight pipes, with a direct-reading pressure gauge installed. The manifold pressure capacity is 15,000 psi.

Discharge port size: 2" FIG1502 female union (external thread, no wing nut).

The elbows on the high-pressure manifold are C-type elbows. The manifold is

equipped with an inductive pressure sensor and a 2″ mechanical safety valve (adjustable pressure). When the pressure exceeds the set value, the safety valve opens, and the plunger pump is relieved, thus protecting the plunger pump from overpressure. The discharge line of the safety valve is a rigid pipeline.

The plunger pump discharge pipeline is equipped with a 2″ manual plug valve.

The plunger pump is equipped with a vent pipeline, which can relieve pressure to the metering tank. Each pump's vent pipeline has two 1″ manual plug valves installed.

6.14 Low-Pressure Manifold

The low-pressure manifold uses a manual butterfly valve for the mixer fresh water inlet, while the other valves use pneumatic control butterfly valves. The pneumatic control butterfly valves are equipped with manual backup devices. In the event of an air system failure, the valves can be manually operated without dismantling any components. A drain valve is installed at the lowest point of the manifold for post-operation flushing, maintenance, and draining. The working pressure of the low-pressure manifold is 0.5 MPa. A pressure gauge is installed on the injection manifold.

7. Paint and Anti-Corrosion Treatment Requirements

The overall color of the cementing truck is red. The truck engine and transmission gearbox will retain their original color and will not be repainted.

8. Accessories Included

8.1 Accompanying Documentation

No.	Name	Language Requirements	Qty.
1	Product user manuals and operation and maintenance manuals	Chinese	1 set
2	Chassis user and maintenance manuals, on-board tools, and certificate of conformity	Original	1 set
3	Engine user and maintenance manual	Original	1 set
4	Transmission gearbox user and maintenance manual	Original	1 set
5	Original certificate of conformity	Original	1 set
6	Shipping list	Chinese	2 copies

8.2 Accessories and Tools

No.	Name	Qty.	Notes
1	3 kg hammer (with wooden handle)	1	

2	24" pipe wrench	1	
3	Fresh water suction pipe assembly	1	
4	Mixing tank cleaning pipe	1	Installed on the vehicle
5	Valve seal ring guide sleeve	1	
6	Valve seal ring press-in top cover	1	
7	Suction valve plunger	1	
8	Plunger insertion device	1	
9	Hex Key Wrench	1	
10	Valve cover puller	1	
11	Packing gland wrench	1	
12	Drive shaft rotation wrench	1	
13	Centrifugal pump rotation wrench	1	
14	Plug valve high-pressure sealing grease	1	
15	Valve seat puller	1	

8.3 Spare Parts (Included with Equipment)

3" plunger pump consumable parts list

No.	Material Code	Name	Qty.	Associated component
1		Self-lubricating first ring	3	Seal assembly
2		Pressure main ring	3	Seal assembly
3		Isolation ring	3	Seal assembly
4		Oil seal 3"	3	Seal assembly
5		O-ring	3	Seal assembly
6		Retaining ring	3	Seal assembly
7		O-ring	3	Seal assembly
8		Retaining ring	3	Seal assembly
9		Valve seat	6	3" hydraulic end
10		O-ring seal	6	3" hydraulic end
11		Seal ring	6	Suction cover/discharge

No.	Material Code	Name	Qty.	Associated component
12		Support ring	3	Suction cover assembly
13		O-ring seal	6	Suction cover/discharge
14		Valve assembly	6	3" hydraulic end
15		Seal ring	6	Valve assembly
16		Spring	6	3" hydraulic end
17		Oil seal assembly	3	Power End
18		Sealing Gasket	2	Discharge Flange
19		Rubber ring	2	Discharge Flange
20		O-ring	2	Discharge Flange
21		Dust seal ring	2	Measuring pipe
22		Oil seal assembly	1	Gearbox
23		3" plunger	3	3" hydraulic end

4.5" plunger pump consumable parts list

No.	Material Code	Name	Qty.	Associated component
1		Self-lubricating first ring	3	Seal assembly
2		Pressure main ring	3	Seal assembly
3		Isolation ring	3	Seal assembly
4		Oil seal 4.5"	3	Seal assembly
5		O-ring	3	Seal assembly
6		Retaining ring	3	Seal assembly
7		O-ring	3	Seal assembly
8		Retaining ring	3	Seal assembly
9		Valve seat	6	4.5" hydraulic end
10		O-ring seal	6	4.5" hydraulic end
11		Seal ring	3	Suction cover assembly
12		Valve assembly	6	4.5" hydraulic end
13		Seal ring	6	Valve assembly
14		Spring	3	4.5" hydraulic end

No.	Material Code	Name	Qty.	Associated component
15		Discharge spring	3	4.5" hydraulic end
15		Seal ring	3	Discharge cover assembly
16		Oil seal assembly	3	Power End
17		Sealing Gasket	2	Discharge Flange
18		Rubber ring	2	Discharge Flange
19		O-ring	2	Discharge Flange
20		Dust seal ring	2	Measuring pipe
21		Oil seal assembly	1	Gearbox
22		4.5" plunger	3	4.5" hydraulic end

Other consumable parts

No.	Coding	Name	Qty.	Associated component	Notes
1		3" butterfly valve seal ring	4	3" butterfly valve	
2		4" butterfly valve seal ring	4	4" butterfly valve	
3		5" butterfly valve seal ring	4	5" butterfly valve	
4		6" butterfly valve seal ring	4	6" butterfly valve	
5		Seal ring	4	High-pressure discharge manifold	
6		Water seal ring	1	6×5 centrifugal pump	
7		Oil seal	3	6×5 centrifugal pump	
8		Sealing strip	1	4×3 centrifugal pump	

9. Assembly and Commissioning

The assembly and commissioning at the factory shall follow the factory's assembly and inspection standards, with the purchaser's technical personnel participating in the final pre-shipment commissioning. Dedicated performance tests shall be conducted according to the provisions of SY/T7333.

The supplier is responsible for commissioning the equipment at the user's site

and training the operating personnel. The assembly process must meet the following basic requirements:

All pipelines are securely fixed to ensure no loosening during operation.

Hydraulic pipelines are arranged and fixed reasonably, ensuring no friction during equipment operation.

High-speed rotating parts are equipped with protective covers.

Rough edges from gas cutting are smoothed.

Welds must guarantee strength and have a smooth surface. After assembly, the following tests shall be conducted:

Check for any leakage at all parts.

Engine startup test.

No-load run-in test of the entire machine. Check if the hydraulic, pneumatic, electrical, and lubrication systems are working properly.

Full-load test of the entire machine. Using fresh water as the medium, test the intake and discharge liquid volumes.

10. Marking, Packaging, and Transportation

10.1 Markings

The cementing truck should have a product nameplate installed in a prominent location, with the label conforming to the provisions of GB/T 18411 and GB/T 7258. The content of the label should include the following:

Country of manufacture, manufacturer name, trademark;

Vehicle Identification Number (VIN);

Product model;

Product Name:

Overall vehicle dimensions;

Gross weight;

Chassis engine model;

Maximum net power of chassis engine;

Curb weight;

Main Technical Parameters

Factory serial number;

Production date.

10.2 Packaging and Transportation

The truck shall be shipped in bare condition, with exposed parts of key components that are in contact with each other coated with lubricating grease or rust inhibitor or fitted with protective accessories to prevent rusting, scratches, or damage during transportation. When rail transport is used, reliable measures for hoisting, positioning, fastening, vibration-proofing, and anti-theft shall be implemented to prevent any displacement, loosening, or loss. The technical documentation for the vehicle must be placed in waterproof plastic bags and packed together with the vehicle accessories. The technical documentation includes:

Certificate of conformity;

Product user and maintenance manual;

Delivery list, spare parts list, packing list;

Spare parts list of accessories (including special tools);

Technical documentation for the chassis at the time of shipment.

11. Quality Requirements and After-Sales Service

The supplier must strictly design and manufacture according to the requirements of this technical specification, and the supplier is fully responsible for the manufacturing quality. The product warranty period is 18 months after delivery from the factory or 12 months of usage (excluding consumable parts), whichever comes first, (for export projects, the warranty period may be determined through mutual consultation due to reasons such as designers being overseas). During the warranty period, if issues arise due to the supplier's manufacturing and assembly quality, the supplier shall provide repair parts and on-site technical support free of charge. If equipment damage is caused by the purchaser's operation, the purchaser shall bear the cost of parts, while the supplier will provide free repair technical support. After the warranty period, if quality issues arise, the supplier will be responsible for the costs and free resolution if it is determined by both parties and third-party technical experts that the issue is due to design, manufacturing, or material defects.

Upon receiving notification from the purchaser, the supplier must respond within 2 hours and provide technical support to resolve the issue.

12. Technical Training and Technical Service

At the time of delivery, the supplier shall organize the main technical personnel for theoretical and practical operation training on the equipment.