APPENDIX 2 – DETAILED SPECIFICATIONS FOR EQUIPMENT

Technical Specification for XJ150 Workover Rig

1. Main technical requirements
1.1 Technical standard and reference
➢ SY/T5202-2004 Petroleum Workover Rig
➢ API Spec 4F (3rd edition) Specification for Drilling and Well Servicing Structures
➢ API Spec Q1 (7th edition) Specification for Quality Programs
➢ Quality system: ISO9001-2001 for Quality Assurance in Design, Development, Production, Installation and Servicing

1.2 Overall specifications
➢ Service depth 2600m (φ2 7/8” EUE tubing), 8500’
➢ Nominal hook load 300kN, 68,000#
➢ Max. static load 585kN, 132,000#
➢ Drawworks horsepower 150hp
➢ Traveling system 3×4
➢ Drive type, carrier 6×6
➢ Dia., wireline φ22mm, 0.866”
➢ Traveling dimensions 15.4m×3m×3.85m (16m single stage mast, 52.5’)
➢ Max. speed 60km/h (Limiting speed: 45km/h)
➢ Min. turning radius 14m, 46’
➢ Traveling weight 24000kg, 53,000#

(Total weight varies according to different configurations)
➢ Ambient temperature -29 ~ +50 °C
2. Specifications of main parts

2.1 Power system

2.1.1 Diesel engine

The 4-stroke diesel engine is comprised of engine body, cooling system, lubricating system, oil supply system, air intake and exhaust system, and control system, etc. Fitted with full-range speed governor, the engine throttle can be controlled in cab and on driller’s console by air. The engine is complete with engine tachometer, water temperature gauge, oil pressure gauge, oil filter and fuel filter etc. The exhaust system is fitted with anti-flaming muffler. The intake system is fitted with turbocharger, air cooler and air filter etc. The engine is supported by three points, w/ PTO ports for steering oil pump and air compressor. Complete with engine hood.

2.1.2 Hydraulic transmission

Hydraulic transmission is comprised of torque converter, lockup clutch and gear box etc. It can realize the flexible drive of engine power and absorb the impact and vibration of working machine in order to protect the engine. The performance of hydraulic transmission should be compatible with the mating engine. When turbine speed reaches the locking point, the impeller and turbine will be locked mechanically. And the hydraulic torque converter runs under high transmission efficiency. The hydraulic transmission is equipped with main control valve, oil filter, oil temperature gauge and oil pressure gauge. Complete with PTO port for main oil pump. Power is supplied to main oil pump through air-controlled hydraulic clutch. The transmission oil is cooled via the heat exchanger on the engine. The transmission has several forward gears and one reverse gear. And gears can be shifted in cab and on driller’s console.

2.1.3 The selection for engine and transmission

<table>
<thead>
<tr>
<th>Model and hp, engine</th>
<th>Model, hydraulic transmission</th>
<th>Drop box</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAT C7/250hp</td>
<td>ALLISON 4700 OFS</td>
<td>Self-made</td>
</tr>
</tbody>
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2.2 Chassis

The main vehicle frame is fabricated from wide flange H-steel. Heavy-duty axles with wide wheelbase, 1 front axles and 2 rear axles, carrier with 6×6 drive. The first axle: 10t steering driving axe, steel plate spring suspension. The second and third axle: 13t
driving axle, rigid balance beam suspension. Hydraulic assist steering. Cab is COE type with single seat. Interlock for wheels and axles. All controls of carrier are centralized in cab.

- Axle base: 5265+1370mm, 207" + 54"
- Wheel base: 2180 mm, 86"
- Drive type: 6X6
- Approach angle: 23°
- Departure angle: 13°
- Min. turning radius: 14m, 46'
- Max. climb gradient: 32%
- Min. ground clearance: 0.34m, 13.4"
- Max. speed: 60km/h (Limiting speed 45km/h)
- Front tires: 445/65R22.5 (single tire)
- Rear tires: 445/65R22.5 (single tire)

2.3 Right angle gear box
Cast steel housing, forged steel spiral taper gear, input and output axles are all made of premium alloy steel, oil bath splash lubrication.

2.4 Drawworks

---Main drum:
- Groove diameter × length: φ344mm×693mm, 13.5" x 27.2"
- Groove structure: φ22 LEBUS groove
- Diameter × width, brake rim: φ970mm×260mm, 38.2" x 10.2"
- Cooling type, brake rim: air pressure splash water cooling
- Model, clutch: ATD-224H thrust disk clutch
- Max. fastline pull: 120kN; 27,000#

---Overwinding crown saver
2.5 Mast

Derrick, single stage, raised and telescoped by hydraulic cylinders. Inclination angle can be adjusted by screw rod. Crown is box type. Cast steel sheaves approved of dynamic balance test. Rope groove is designed to adapt the wirelines as per API 8C. A kick-back post is set on the sheave seat to prevent ropes from jumping. Crown shaft has been heat-treated and defect-detected. Handrails are set around crown platform.

- Clear height: 16m
- Max. static load: 585kN (6 lines); 132,000#
- Inclination angle: 5°
- Traveling system: 3×4
- Max. wind rate: 110km/h (about 10 degrees)

2.6 Hydraulic system

It is mainly used for steering aid while the rig is driving, for leveling carrier frame, raising, lowering and telescoping mast in rig up, and hydraulic application of wellhead tools during workover jobs. The controls of the system are centralized near driller's console. Important operation controls are multiple protected. Key parts of system are imported with reliable and stable performance.

- Max. displacement, oil pump: 96.5ml/rev
- Max. pressure, hydraulic system: 14MPa; 2030 psi
- Hydraulic oil: 46# anti-wear hydraulic oil
- Tong cylinder: Single tong: Travel × Pull × Qty.: 1200mm×80kN×1, 47.2” × 18,000#×1
- Hydraulic winch: Single hydraulic winch: Hook load × Qty: 30 kN×1, 6700# × 1

2.7 Air system

Air system is used for workover rig driving and workover jobs control. It is equipped with multilevel drying, purifying and anti-freezing device to process the compressed air. The power source of air system comes from the air compressor driven by the engine. Driller's console can control drawworks drum, rotary table, throttle and shutdown of diesel engine, gears of drawworks and rotary table, emergency brake of drum, air spider, air bleeding valve of crown, relief of oil pump etc. Key parts of system are imported, stable and reliable.

- Max. displacement, air compressor: 0.4m³/min