Haico Oilfield fzco
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90K Nitrogen Pumping Unit
Technical Specification

1.0 General Information

The 90K nitrogen unit is designed to supply gaseous nitrogen at flow rates up to 90,000 SCFH (1500 SCFM) and pressures up to 10,000 psig. The minimum outlet gas temperature at full rate will not be lower than 70 degrees Fahrenheit. The energy required to vaporize the liquid nitrogen comes from two sources; engine heat recovery and hydraulic system heat recovery.

1.1 Unit Weight and Dimensions

Height 96 in
Length 150 in
Width 96 in
Dry Weight 13,000 lb
Wet Weight 15,000 lb

1.2 Capacities

Maximum pressure (LN2 Discharge) 10,000 psig
Maximum Flow Rate 90,000 SCFH (1500 SCFM)
Minimum Flow Rate 75 SCFM
Hydraulic reservoir 96 Gallons
Diesel fuel reservoir 140 Gallons
Pneumatic reservoir 30 Gallons

2.0 Major Components

2.1 Engine

Caterpillar C9 electronic engine rated at 350 BHP at 2100 RPM. The engine is also equipped with emergency shutdown, low oil pressure shutdown, rig saver over-speed shutdown, alternator, exhaust heat exchanger, stainless steel fuel tank, electronic engine controls on the control panel and air starter.

2.2 Triplex Pumps

CS&P make ICPE-100 triplex pump equipped with external lubrication system for improved performance at low speeds. The pump has an independent lube system including a lube tank and lube pump-motor combo. The pump also includes the following specifications.
Max. Working Pressure 10,000 PSI
Maximum Pumping Rate 90,000 SCFH = 16 Gal. LN2
Minimum Pumping Rate 4,500 SCFH = 0.8 Gal. LN2
Pump Rotation Bidirectional
Stroke 0.90”
Max. Cont. Speed 900 RPM
Max Int. Speed 1200 RPM
Minimum Speed 60 RPM
Max. Power 120 HP
Cold End Bore 1.25”

2.3 Pump Drive and Transmission System

The pump drive is Durst 2-hole pump drive. The pump drive is used to run a hydrostatic transmission consisting of one (1) variable displacement pump and one (1) fixed displacement motor. The pump drive also provides the power to run all the other hydraulics circuits in the unit.

2.4 Control Panel

The operator control panel contains all controls and indicators required for complete unit control. The operator control panel is mounted in a stainless steel control console that has been designed to be weather resistant. A description of each control mounted in the control panel is given below:

3.0 Major Circuits

3.1 Triplex Drive Hydraulic Circuit

This circuit consists of a piston pump and gear motor connected in a closed Loop configuration to form a hydrostatic transmission. This circuit serves the Purpose of driving the ICPE-100 triplex pump up to its rated speed of 1200 RPM.

• Engine Throttle Control • Engine Tachometer
• Engine Oil Pressure • Engine coolant Temperature
• Engine Start • Engine Stop
• Engine Emergency Kill • Air Pressure
• LN2 Charge Pressure Control • LN2 Charge Pressure
• Cryo Boost Hydraulic Pressure
• Heat Builder Pressure Control
• Heat Builder Back Pressure • Hydraulic Pump Charge Pressure
• Coolant Circuit Temperature before Vaporizer
• Coolant Circuit Temperature after Vaporizer
• Coolant Circuit Pressure • Coolant Pump Hydraulic Pressure
• Triplex Pump Control • Triplex Pumping Rate SCFM
• Triplex Circuit Hydraulic Pressure
• Triplex Motor Temperature
• Triplex Lube Oil Pressure • Triplex Lube Oil Temperature
• LN2 Discharge Pressure • GN2 Discharge Pressure
• GN2 Discharge Temperature • Over pressure Shutdown

3.2 Heat Generation Hydraulic Circuit

This circuit is incorporated in the same triplex drive circuit by adding a sequence valve and a Tube and Shell style heat exchanger. The purpose of this circuit is to generate the necessary heat to vaporize the liquid nitrogen.

3.3 Low Pressure Nitrogen Circuit

This circuit consists of a CS&P make cryogenic 1.5” X 2.5” X 6” centrifugal pump and high durability Worcester C4 cryogenic valves with extended bonnets. This circuit also includes a Y-style strainer filter. All the low pressure pluming is made of 316 stainless steel. The tank connectors are 1 ½” on the suction and 1 ½” on the return.

3.4 High Pressure Nitrogen Circuit

This circuit consists of a CS&P make ICPE-100 triplex pump and pot vaporizer. The vaporizer is made of 316 and 304 stainless steel. All the fittings and plumbing are made with 316 stainless steel high pressure tubing and are hydrostatically tested to 10,000 psi. This circuit also includes a pulsation dampener and all the necessary relief and check valves for safe and smooth operation.

4.0 Other Features and Components

4.1 Skid and Protective Frame

The Nitrogen Pumping unit is mounted to a heavy duty skid and surrounded by a protective frame. Both the skid and protective frame are constructed of mild steel with both square and rectangular hollow sections of grade ASTM 500-99-Gr. B. The nitrogen unit can be moved via the forklift tubes that are incorporated into the base skid or the four lift eyes on the protective frame. Provisions for storing treating iron are also provided on the skid assembly. In addition to the protective frame, major components are protected by additional guards incorporated in the skid and protective frame.

4.2 Painting

The skid, protective frame and all other structural supports and lifting frames are sandblasted to white metal and painted to meet off-shore requirements using a layer of zinc oxide, than a layer of intermediate high built Epoxy, and finally a top layer of Acrylitha Enamel chemical resistance paint. This system has an excellent record of withstanding off-shore conditions.

5.0 Safety Features

- Anti static and fire resistant belts.
- Non-metallic fan.
- Coolant over-temperature shutdown.
- Coolant loss of flow shutdown.
- Loss of lube oil pressure shutdown.
- Emergency shutdown.
- Over pressure shutdown.
- Over speed shutdown.

6.0 Testing

The completed unit is tested as per requirements of manufacturer. The unit could also be tested and certified at the same facility by an
independent third party.

P.O.Box: 263103, Jabel Ali Freezone, Dubai, United Arab Emirates,
Tel: +971 4 8818234 Fax: +971 4 8818235 Mob: +971-50-6445174 Email:arif@haicoltd.com
Web: www.haicofzco.com