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ENERGY SERVICES LTD.

*putting*  
*safety*  
*and the*  
*environment*  
*first*



## Flameless Nitrogen Pumper

*safe*

**no open flame required to heat liquid nitrogen prior to pumping**

*efficient*

**heat retrieved from exhaust, engine water coolant  
& excess horsepower**

**units are able to travel on 75% road bans carrying 3000 scm<sup>3</sup> of gas  
and 7700 scm<sup>3</sup> on 100% bans**

*clean*

**no open flame means no uncontrolled combustion**

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## The concept

**Leader Energy Services Ltd.** has developed a **Flameless Nitrogen Pumper** to provide a safer, more efficient and more environmentally responsible method of heating and vaporizing liquid nitrogen in the energy industry.

## The difference

Traditional nitrogen pumpers use open combustion diesel heaters to heat the  $N_2$ , a process which is inherently dangerous and results in considerable pollutants. The Flameless System eliminates open flame from the process, using the chassis engine to vaporize tank contents.

## The method

The Flameless Nitrogen Pumper uses four major components to heat the nitrogen without open combustion...

- heat exchangers to retrieve heat from engine, exhaust and coolant
- a transfer fluid to carry the energy
- a shear heat generator to convert excess horsepower to heat
- a heat exchanger to transfer the heat from the transfer fluid to the product

## The applications

- Nitrogen is used with coiled tubing for well bore clean outs of frac sand or fluids
- Nitrogen, being inert, is used for purging and testing in plants or of pipelines / flowlines
- Nitrogen is used for well kick arounds to blow water or foreign matter out of the well bore tubing prior to perforating operations
- Nitrogen is used for underbalanced / overbalanced perforating operations for well completions
- Nitrogen is mixed with well treating fluids to promote flow back, density control of treating fluid, to reduce hydrostatic weight of work over fluid or assist removing differentially stuck pipe





### ***Potential Hazards reduced***

- The open combustion process heater, with its unavoidable occasional flare ups, is an ignition source for all flammable products

### ***Potential Health Hazards reduced***

- Respiratory irritation from burner discharge
- Eye irritation from burner exhaust
- Respiratory irritation from heated vent fluid

### ***Potential Environmental Hazards reduced***

- Excessive air pollution from burner exhaust





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## Specifications

### Flameless Nitrogen Pumper

Patent Pending

#### Truck

Kenworth	12X2 (Tridrive)
Chassis	300"
Engine	Cummins ISX 600
Electrical	12 Volt
Transmission	Fuller RTL0189188
Front Axle	DANA SPICER EFA-20F4 20K
Rear Axle	DANA SPICER TDS583P Ratio: 4.33
Diff Lock	TDS583P
Tires/Wheels	FR. 425/65R22.5 20PR RR 11R24.5 14PR
Frame	11-5/8 X 3/8"
Fuel Tanks	150 US GAL 24.5" AI.
Air Equipment	Air Dryer: Bendix AD-9 Nylon Air Tubing All Valves Bendix

#### Nitrogen

Storage	
Tank Volume	3000 gal liquid N <sub>2</sub> / 7700 m <sup>3</sup>
Insulation	Vacuum and glass insulated
Plumbing	Stainless Steel
Pumping	
Max Pressure	10,000 psi / 70 mpa
Max Flow	85 m <sup>3</sup> /min
Pump	Triplex 0-85 m <sup>3</sup> /min
Cold ends	1.625"
Boost Pump	1.5"X2.5"X6"
Valves	Autoclave
Heat Exchange	
Exhaust	Air Glycol Exchanger
Excess Horse Power	Dynamic Heat Generator
Water Jacket Heat	Heat Exchanger
Control	
Heat Control	Electronic Control
Pressure Control	Adjustable Automatic Max Pressure Shut Down
Flow Control	Electronic Hydraulic Stoker
Treating Iron	46m of 1"x 70 MPa

#### Power Delivery

Power Transfer	600 HP Tower
Triplex Drive	
Hydraulic Pump	135 cc 6000 psi close loop pump system
Hydraulic Motor	270 cc 6000 psi double close loop motor
Boost Pump, Water Pump and Valving	
Hydraulic Pump	105 cc 6000 psi open loop pressure compensated Auxiliary pump
Motors	Bent Axis and linear motors

#### Control Cab

Size	48"X92" Access door on driver's side
Panel	15"X88"

#### Gauges Pressure

Triplex Drive Hydraulic  
Triplex Drive Charge  
Auxiliary Main  
Power End Lube  
Water Main  
Boost  
High Pressure N<sub>2</sub>  
Tank  
Hydraulic Oil  
Power End Oil  
Coolant Circuit

#### Temperature

#### Controls

Flow Control	Reostat
Valve Actuation	Toggle switch Automatic Mode
Heat Control	Toggle Switch Automatic Mode

#### Electronics

Power Source 12 volts  
Auto heat control  
Auto engine load

#### Safety Features

Automatic Heat Control  
Over Pressure Shutdown  
Low Temperature Heat Transfer  
Full view of pressure equipment from operator's console

#### Lighting

Fixed movable floodlights for all working areas

#### Pup Trailer

Pintle hitch hookup  
3000 gal liquid N<sub>2</sub> / 7700m<sup>3</sup>  
Air brakes



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