

Horizontal Pumping System and Hydraulic Jet Pumps



Flex Flow horizontal pumping system

The GR Energy Services Flex Flow* system combines a unique horizontal pumping system (HPS) with a versatile hydraulic jet pump (HJP) that together provide many advantages over conventional lift systems:

- Lower operating cost leading to reduced LOE
- Less maintenance with minimal downtime (98% to 100% run time)
- Highly mobile with unique trailer-mounted horizontal pumping system
- Efficient filtration system that prevents impurities from entering the pump and wellbore
- Versatile downhole jet pump that can be used in many completion scenarios (conventional, reverse circulation and concentric) and in conjunction with gas lift.

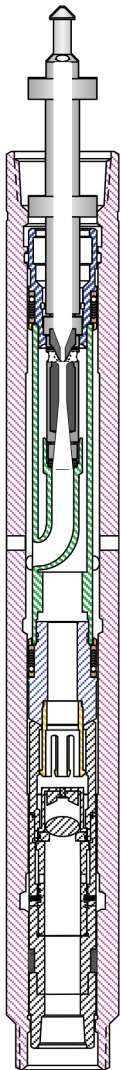
Compared to conventional ESP systems, the GR Flex Flow system saves operators lease and operating costs by eliminating the common issues of gas locking and solids handling, maintaining production over a wide range of rates and reducing well intervention and maintenance downtime.

Benefits of the GR Flex Flow hydraulic jet pump

The GR Flex Flow hydraulic jet pump consists of a nozzle, throat and diffuser. A high-pressure fluid is pumped down the tubing through a nozzle where the fluid velocity increases, creating a low-pressure differential. This pressure differential draws in production fluid from the formation, and the mixed fluids pass through a throat and into the diffuser where the fluid is converted into low-velocity/high-pressure fluid.

Many features of the hydraulic jet pump make it a better choice in challenging oilfield environments. The pump operates efficiently in vertical, deviated and horizontal wells, is versatile enough for multiple well pad applications, and can sustain production rates up to 100,000 BF/D. It has excellent gas and solids handling, and can handle returns up the casing (conventional) or up the tubing (reverse flow). No workover rig is required for pump change-out, there are no moving parts downhole, and it can be retrieved easily by wireline or hydraulics for onsite maintenance.

The advantageous use of hydraulic jet pumps over conventional pumps can be determined with NODAL analysis. GR uses NODAL analysis to demonstrate the quicker response time and enhanced accuracy of Flex Flow HJPs.



Hydraulic jet pump

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Capabilities of the GR Flex Flow horizontal pumping system

GR Energy Services deploys a unique trailer-mounted horizontal pumping system that can be used to power fluid for single or multiple jet pumps or for a SWD test pump to help determine sizing for permanent equipment. This highly mobile HPS requires little maintenance, so service callouts are kept to a minimum. In addition, it has a robust filtration system that prevents impurities from entering the pump or the wellbore.

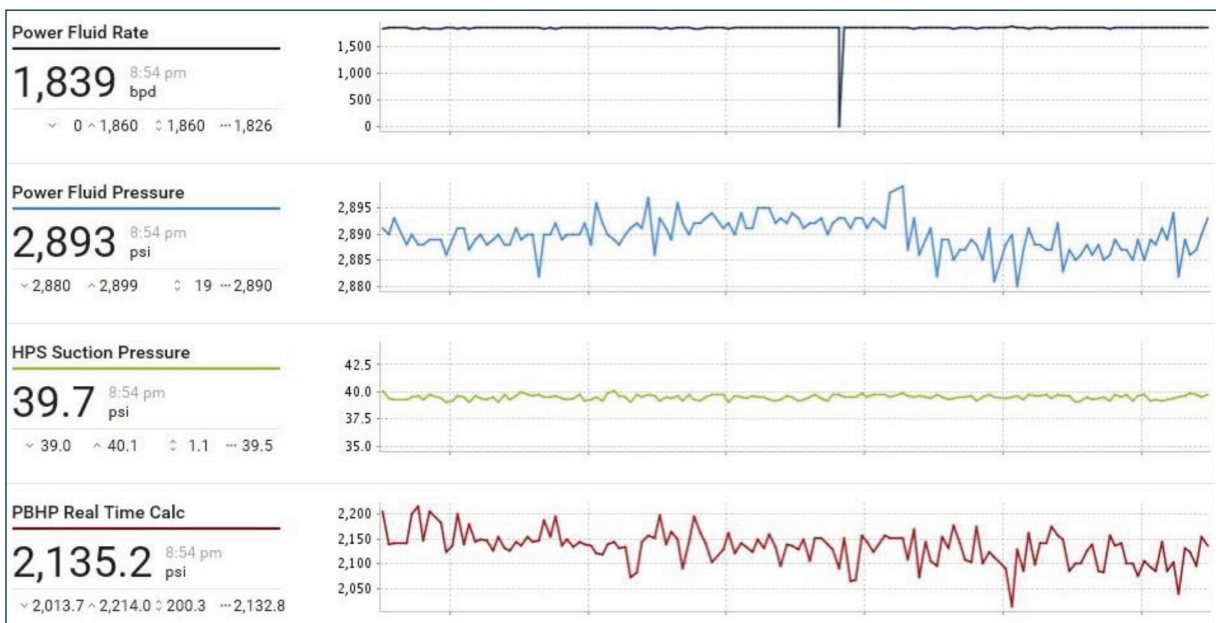
The HPS includes the following components:

- Centrifugal pump, consisting of stages, each with one impeller and one diffuser, that move the fluid through the pump and up into the production string. The impeller rotates and energizes the fluid, creating a velocity head, while the diffuser slows and redirects the fluid, creating a pressure head.
- 480-V, 3,500-rpm motor, with three horsepower options—100, 300 and 500 hp.

- Thrust chamber, which carries the thrust load developed by the multistage pump. It connects to the motor shaft on one end and the pump shaft on the other.
- VFD with HP/kVA delivery capabilities.
- Dual pot filter system for suction.
- Charge pump for suction, which supplies power fluids from the tanks to the HPS.
- 40-ft trailer with stabilizers.

Real-time online monitoring of well conditions

The HJP and HPS can be monitored remotely to make adjustments that optimize system efficiency, including production and producing bottomhole pressure, as well as start/stop, speed change and troubleshooting. Digital cellular and satellite enabled, the programmable logic controller (PLC) can report to tablets, mobile phones and computers with multiple notification options (email, text message and phone calls).



Screen shot from Apollo monitoring system showing real-time fluid rate and pressure, suction pressure and producing bottomhole pressure.

*Mark of GR Energy Services