Efficient Gas Well Dewatering with Jet Pumps and Diaphragm Surface Pumps

By: J&J Technical Services
Speakers: Bill Charrier
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Brief History of Jet Pumps

Early jet pump systems performance was poor and troublesome created a negative view of J.P. technology within the industry

- Jet pump design shortcomings
- Large and difficult to handle
- Inefficient pump performance
- Difficult to optimize
- Expensive to service
- Surface equipment problems
- Poor support from suppliers
Old Jet Pump Assembly and Large Triplex Power Fluid Pump

Old JP BHA
The JJ Tech Line of Jet Pumps

Jet Pump Product Line:
- JP-1.6
- JP-2.0
- JP-2.3
- JP-2.8
- JP-3.5
Jet Pump Design and Optimization Software

Improved Pump Design:
- Greatly enhanced efficiency
- Internals are pumped to surface for servicing
- Improved metallurgy
- Adapted to multiple completions sizes and configurations

Software for Completion Design & Optimization:

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Basic Jet Pump Operation

Combinations:
- 15 Nozzles Sizes
- 17 Throats Sizes
Jet Pump Benefits

- A proven dewatering and oil pumping system
- Highly scalable output range:
  - 30 - 4000 BPD
- Very efficient
- No down-hole moving parts
- Sand handling capability
- No gas-locking issues
- Deviated / horizontal wells
- Can be installed in slimhole completions
- Continuous Corrosion / Scale / Paraffin control
- Pumpable / fishable carrier
Surface Pump Packages

- Diaphragm separation of “dirty” pump fluid and plungers
- Plungers operate in a clean oil reservoir
- Oil reservoir is at atmospheric pressure outside of the cylinder assembly
- Patented for use in oilfield Jet Pump applications
- Sizes from 15 to 80 HP
High Pressure Diaphragm Pumps

- Hydraulic actuated Viton diaphragms
- Nickel aluminum bronze fluid end
- Cartridge type check valves
- Sealless design so environmentally safe
- Pressures up to 5000 psi rates up to 3200 bpd
Typical Surface Skid Package
Typical Surface Installation
Downhole Operation

- Power fluid is pumped down the small diameter tubing thru the Jet Pump
- Formation fluid enters the Jet Pump from below
- The combined power fluid and formation fluid travel to the surface via the annulus created by the smaller OD tubing inside the larger production tubing
- Gas is the free to flow up the casing to the surface from the perforations
Typical Gas Well Dewatering Downhole Configuration

- 2.375, 2.875 or 3.5 inch Production Tubing is run with a seating nipple set below the perforations

- The jet pump housing (1.6” OD) is configured with a hold down seal assembly and a strainer nipple on the bottom

- The jet pump housing is run on Coiled Tubing or integral joint tubing and stabbed into the seating nipple
Horizontal Installation

- Jet Pump run on concentric string set in horizontal for gas well dewatering
- Set at TD around 87 degrees
Horizontal with Sump Installation

- Jet Pump run on concentric string set in sump for gas well dewatering
Typical Oil Well or Frac Flowback Downhole Installation

- Same basic concept as gas well de-watering with production tubing, casing and packer
- Power fluid is pumped down the production tubing to the jet pump
- Formation fluids and gas enter the jet pump
- Combined production fluid and formation fluids travel to the surface via the tubing casing annulus
Reverse Flow Configuration

- Reverse flow jet pump set in vertical for sand removal or corrosive environment
New Select Flow 2.0 Jet Pump

- Pressure sensor recorder integrated into down hole jet pump
- Removable housing and standing valve allows for well stimulation without workover

**2.0 Select Flow combines JJ Tech’s patented jet pump design with a versatile bottom hole assembly**

**Features / Benefits:**
- Standing valve is wire line retrievable
- Pump can be run in normal or reverse flow
- Normal flow pump can be reverse circulated to surface
- Larger internal flow passages increase efficiency over other designs
Case Studies

• Cutting Costs: Jet Pump vs. ESP
• Eliminate Workovers: Sand Removal
• Accelerated Frac Flow Back
Cutting Costs: Jet Pump vs. ESP

**Objective:** Decrease operating costs by installing Jet Pump
Customer replaced 4 ESP’s in a 12 month period

**Results:** Two years after installing JJ Tech Jet Pump,
No workover rig has been needed, and well remains as productive as it was on ESP

**Advantages of Jet Pump vs. Electric Submersible Pump**
- Can produce moderate to high volumes of solids
- Has no moving parts down-hole
- Can produce high volumes of oil
- Software can calculate PBHP based on production volumes
• **Customer provided well schematic indicating ESP failures**

• **Jet pump has been in the ground since 2/11/10. Never has been pulled.**
Cutting Costs: Jet Pump vs. ESP

- T-8045 Natural Gas Skid
- 2.0 Jet Pump
- Oklahoma gas well
Eliminate Workovers: Sand Removal

Problem: Operator could not produce well for 4-5 days due to leftover Frac sand in wellbore

Solution: Install Reverse Flow HSP Jet Pump to bring frac sand to surface along with production

Results: Well has proven productive, and Jet Pump recovers 1-5 gallons of 20/40 mesh frac sand to surface daily

Advantages of Jet Pump vs. Rod Pump
Jet Pump can produce moderate to high volumes of sand

Jet Pump has no moving parts downhole

Concentric tubing strings eliminates workovers due to: “Rod Cut Tubing” and “Rod Parts”

Software can calculate PBHP based on production volumes
Eliminate Workovers: Sand Removal

Jet Pump Software Analysis

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Eliminate Workovers: Sand Removal

Reverse Flow Jet Pump Surface Diagram

- Tubing / Power Fluid and Produced Fluid
- Casing / Power Fluid
- T8045 Surface Pump Skid
- Power Fluid Vessel
- Pump Suction
- Produced Fluid to Separator
- Power Fluid and Produced Fluid
- Power Fluid
Accelerated Frac Flowback

Objective: Recover frac fluid as fast and economical as possible while bringing production to the market immediately

Results: Moved 66,920 bbls of fluid (21,630 bbls oil / 45,290 bbls water) and 40,305 mcf in 89 days. Averaged 752 bfpd and 453 mcf/d. Produced moderate volumes of proppant. This process would have taken 442 days on a rod pump producing 150 bpd.

Advantages: Jet pump can produce moderate to high volumes of sand
Gas can be brought to market immediately
No backpressure is put on formation (as with Nitrogen)
Software can calculate PBHP based on production volumes and HP usage
Frac fluid is evacuated much faster which reduces formation swelling.
Accelerated Frac Flowback
Accelerated Frac Flowback
Typical Frac Flowback Surface Installation
Thank You

For More Detailed Information On Our Case Studies, Please Visit Our Website...

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