Successfully Producing Unconventional Wells Using Modern Automation Combined with Progressive Cavity Pumps

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Progressive Cavity Pumps

Limitations:
- Depth limitations ~6500’
- Temperature limitations ~250F
- 45 API crude
- Chemical compatibility
- Appropriate design and application requires regional specific experience.
Standard PCP Equipment

- Drivehead
- Rod Lock BOP
- Well Head
- Tubing / Rod String
- Rotor
- Stator
- Anchor
Standard PCP Equipment
System Status Screen

Screen Links:
- Setpoints
- System Settings
- Alarms
- Config 1 (Admin)
- Config 2 (Admin)

Run Status
- 1 - RUNNING

Red Speed Setpoint
- 350.0000 rpm

Flow Rate
- 2992.2500 bbl/Day

Production Since Turnover
- 1999.1929 bbl/Day

Total Production
- 77146.9300 bbl/Day

Yesterday Production
- 2176.0000 bbl/Day

Average Flow
- 2960.0000 bbl/Day

VFD Output Current
- 47 A

VFD Output Frequency
- 58.64 Hz

VFD Output Voltage
- 345.20 V

Polish Rod RPM
- 353 rpm

Current Torque
- 516,000 lbf-ft

Tubing Pressure
- 256.2500 psi

Casing Pressure
- 81.5000 psi

Flowline Pressure
- 91.1250 psi

Flow Indicator
- 0 - Flow

Demand Poll
- 2021

Downhole Pressure
- 0.0050 psi

Target Level Set
- 0

PEAK RESET

Auto Delay Sec Ramp
- 8 Seconds

Start Delay Sec Ram
- 8 Seconds

Run Mode
- 0

Pump Efficiency
- 109 %

START 
STOP

Start/Stop
- 1 - START

ALARM RESET
Run Status History
Variable Frequency Drive

- Used to control electric motor speed
- Monitors torque and uses setpoints to limit stresses on equipment
- Programmable safety shutdowns
- Specific feature set related to PCP
- Easily incorporated with SCADA for remote visibility
- Reduces overall power consumption
Sensors

- Down Hole Sensor
  - Vibration
  - Temperature
  - Pump intake pressure
  - Pump discharge pressure
  - Pump inclination
Sensors

- Surface Wedge Meter
  - Monitor flow at surface
  - Detect gas slugs
  - Detect reduced production at surface
Automation and Control
Example A High Deviation

- Directional well
- Pump landing depth 4700’
- 7” Casing
- 2 7/8” Tubing
- Initial production rate 1600 BPD @100HP
- Current production rate 800 BPD @75HP
- 39 API Crude
- Landed below the perfs no gas separator
Example A High Deviation
Example A High Deviation
Example B Frac to Drawdown

- Horizontal Well
- Pump landed in the vertical @ 1826’
- 7” Casing
- 3 ½” Tubing
- Initial production rate 3500 BPD (100HP 3 Phase 480V)
- Current production rate 450 BPD (40HP 3 Phase 480V)
- 39 API Crude
- 25000 PPM H2S
- High chlorides
- On Progressive Cavity Pump for 2+ years
- Two post frac pump changes year 1
- Third pump running for over a year
Example B Frac to Drawdown
Example C Horizontal

- Horizontal Well
- Pump landing depth 3125’
- Pump landed @ 90°
- 5.5” Casing
- 2 7/8” Tubing
- Current production rate 1200 BPD
- Gas rate 700MCF
- 40 API Crude
- 60HP 3 Phase 480V Motor @1200 BPD
Example C Horizontal
Example C Horizontal
Example D Economics

- Horizontal Well
- Pump landing depth 3000’
- 5.5” Casing
- 2 7/8” Tubing
- Current production rate 950 BPD water 50 BPD oil.
- Previous ESP install electrical cost 2X PCP installation
- 50HP 3 phase 480V motor @1000 BPD
Example D Economics
Down Hole PMM Driven PCP

- Rod Less
- No rod wear on tubing
- Permanent magnetic motor
- Lower power usage
- Higher capital expense
- Casing size restrictions
Progressive Cavity Pumps

- Why Should Oil Companies Use PCPs:
  - Lower Electrical Cost Per Barrel than ESP and Rod Pump
  - Lower Capital Cost than ESP and Rod Pump
  - Wide Production Span
  - Solids Handling
  - Higher Production Rate than Rod Pumps
  - Superior Gas Handling Capabilities
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