Progressing Cavity Pumping Systems
Progressing Cavity Pumping System Advantages

- Low Capital Cost
- Low Surface Profile for Visual and Height Sensitive Areas
- High System Efficiency
- Simple Installation, Quiet Operation
- Pumps Oils and Waters with Solids
- Low Power Consumption
- Portable Surface Equipment
- Low Maintenance Costs
- Use In Horizontal/Directional Wells
- C-FER, WFT Proprietary
Progressing Cavity Pumping System Limitations

- Limited Depth Capability
- Temperature
- Sensitivity to Produced Fluids
- Low Volumetric Efficiencies in High-Gas Environments
- Potential for Tubing and Rod Coupling Wear
- Requires Constant Fluid Level Above Pump
PCP Systems – Basic Operating Principles

- One of the newest forms of artificial lift (early ’80s)
- Classified as positive-displacement pump
- A single, helical-shaped rotor turns inside a double-helical, elastomer-lined stator
- In the most common configuration, the energy is transmitted from surface through a rod string
PCP System Advantages

- Continuous, smooth, and efficient operation
- Most efficient ALS, even for extreme viscosities
- Low capital and operating cost
- Low profile and small footprint

- No valves to clog or wear
- Best artificial-lift method for sand-laden wells
- Will never become inoperable due to gas lock
Evolution and Growth of PCP Systems

1980

- 50 B/D (8 m³/d)
- 2,000 ft (600 m)

- 50 hp (37 kW)
- 200 ft-lbf (270 N•m)

- Low rate, shallow wells
- Heavy oil
- Limited elastomer options
  - Trial-and-error selection process
- No backspin braking control
- Zero monitoring and control
- Rods from RRP applications

- Pump Displacement
- Pump Lift
- Number of PCP Installations
- Surface Torque
- Surface Power
Evolution and Growth of PCP Systems

More than 60,000 wells operating with PCP systems

- Higher rates, deeper wells
- Heavy, medium and light oils; CBM dewatering
- Local and remote monitoring and control
- Safe backspin control systems; environmental stuffing boxes
- VSDs; downhole and surface sensors
- High-torque rods and connections; COROD® continuous rod
- 300 B/D (8 m³/d)
- 10,000 ft (3,050 m)
- 300 hp (220 kW)
- 2,500 ft-lbf (3,400 N•m)
Engineering a Well-integrated, Fit-for-purpose PCP System

Driveheads and stuffing boxes

Controllers, automation and software

Rod string options
- Types
- Materials
- Geometries

Installation options

Downhole monitoring

Pump options
- Rotor geometry
- Elastomer composition

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Elastomers

- The elastomeric stator is the most critical component of the pump
- Responsible for ~80% of all pump replacements
  - Commonly the first to show wear for successful applications
  - Most common failed element for catastrophic short-life failure

Burned stator caused by pump off

Extreme swelling due to fluid incompatibility
Safe and Reliable Driveheads

- When a PCP system shuts down, accumulated energy is released and causes the system to spin backward.
- To protect drive components, backspin forces must be controlled.
- G-Series driveheads feature a wet brake system that uses centrifugal force, in conjunction with cams and springs.
DuraSeal™ Environmental Stuffing Box

- Minimal maintenance required
- Redundant sealing ensures continued performance if main seal is damaged
- Robust bearing system manages misalignment between wellhead and drivehead
- Internal leak-detection system available
Monitoring, Control, Protection, and Optimization

- mPOD™³ multipoint digital gauge delivers accurate and reliable monitoring of:
  - pump vibration
  - pressure and temperature at pump intake and discharge

- Combined with WellPilot® VSD, this system optimizes production, protects the pump, and maximizes run life