

# PMM-PCP System

Highly efficient production system in challenging and deviated wells

## Applications

- Deviated and horizontal wells
- Low flow rate and unstable inflow wells
- Heavy oil and viscous oil wells
- Wells producing with higher solids volume or scale
- High lift system adaptability to variable conditions

## Benefits

- Improved system reliability through the
  - elimination of rods and rod-wear associated failure
  - elimination of downhole gearbox and associated failure
- Reduced OPEX through lower power consumption
- Improved viscous or abrasive production in deviated wellbores
- Reduced wellhead equipment footprint and environmental risk

## Features

- Low-speed, high-torque PMM
  - Speed range of 120-1,500 rpm
  - Torque up to 1,670 lb-ft
- Independent thrust chamber to carry and equalize developed thrust load
- Flush valve to reduce and smoothen starting torque impact on motor and system
- Downhole monitoring sensor
- Surface variable speed drive
- Handles up to 50% free gas
- Handles up to 0.6 g/l solids
- No fluid emulsification

Wells producing large volumes of sand and abrasives, high-viscosity fluids, or high gas-to-liquid ratios are considered technically challenging for electric submersible pump (ESP) systems and even more so at lower flow rates. While more suited to these conditions, progressing cavity pump (PCP) systems encounter limitations to their application from well depth and deviation, resulting in inferior system run life and performance efficiency.

For these conditions, the Borets PMM-PCP system is a cost-effective lift system that overcomes such challenges to help increase well productivity and operational performance.

### Operating conditions

Pump depth *	7,874 ft (2,400 m)
Water cut at pump intake	up to 99%
Fluid specific gravity	up to 1.4
Produced water pH *	6.0...8.5
Fluid viscosity *	up to 1,000 cP
Solids content	up to 0.6 g/l
Mohs' hardness number	up to 5
Free gas content at pump intake	up to 50%
H <sub>2</sub> S content	up to 0.125%
Fluid temperature *	80°C – 120°C

\* depending on design

Borets PMM-PCP system is an electric submersible progressing cavity pump that incorporates a downhole permanent magnet motor (PMM). The downhole driven PMM-PCP system provides all the advantages of PCPs in viscous or abrasive fluids while eliminating the wear-risks associated with a steel rod string to surface.

Utilizing a low-speed 10-pole PMM to deliver sufficiently higher torque, the Borets PMM-PCP system also reduces downhole mechanical complexity by eliminating the need for a speed-reducing gearbox required by electric submersible PCP systems using downhole induction motors. Borets PMM technology is well proven to operate at lower current, increased efficiency, and reduced power consumption than an equivalent induction motor.

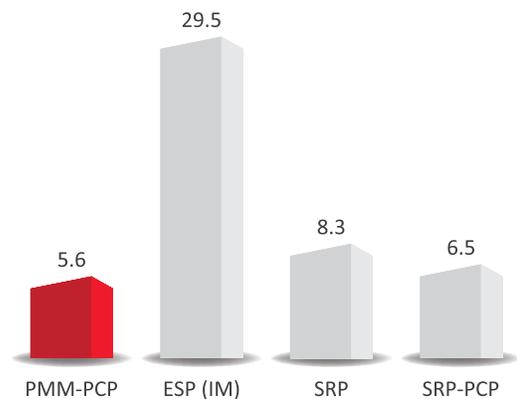


1. Flush Valve
2. PCP
3. Thrust Chamber
4. Motor Seal
5. PMM
6. Downhole Sensor
7. VSD
8. Power Cable

The PMM-PCP system effectively extends the application range of PCPs to highly deviated well-bores where this technology was not previously considered because of the well bore geometry limitations. In this manner, the Borets PMM-PCP system enables lower rate or more viscous fluids to produce from deviated wells with lower power consumption than historically deemed feasible with ESPs or conventional PCPs.

In one study, power consumption was directly measured on several hundred low flowrate wells in Russia, producing with different forms of artificial lift. Analysis showed that the Borets PMM-PCP system consumed the least power per unit volume of fluid lifted than the other forms of lift considered in this study.

### Power Consumption per 1 m<sup>3</sup> of fluid produced



### PCP Specifications @ 500 rpm

Pump series	Flow range, 120-750 rpm	Max. head	Max. pump power consumption	Max. recommended motor power
362	6-283 bpd 1-45 m³/d	8,203 ft 2,500 m	16.1 hp 12.0 kW	24 hp 18 kW
406	25-1182 bpd 4-188 m³/d	9,187 ft 2,800 m	35.9 hp 26.8 kW	48 hp 35 kW

### Low-speed PMM Specifications @ 500 rpm

Motor series	Max. power	V	A	Max. efficiency	Power factor	Max. torque
456	60 hp 45 kW	157 – 1063	34	79%	0.96	620 lb-ft
562	159 hp 119 kW	247 – 2343	36.5	83%	0.96	1,670 lb-ft

