

# PERMANENT MAGNET MOTOR

Borets high efficiency Permanent Magnet Motor (PMM) lowers operating cost and enhances reliability for a successful producing environment

## APPLICATIONS

- Gas slugging environments common with unconventional and deliquification
- Deviated and horizontal wells

## FEATURES & BENEFITS

- High energy efficiency up to 93 % for a standard & high speed PMM & 79 % for a low speed PMM:
  - Provides power cost savings up to 12 %
- 40 % shorter motor length & lighter motor weight comparing to the conventional induction motor:
  - Enable ease of installation and improves the ability to run through higher deviations
- The ability to ride through conditions that would cause a conventional induction motor to trip:
  - Provides improved production potential and mitigates problems associated with frequent starts and stops
- Single section motors capable of delivering 228 HP (406 series), 400 HP (456 series), 760 HP (512 series) & 980 HP (562 series):
  - Reduce installation time and save money by eliminating tandem motors for certain applications. Also shorter length improves ability to run in highly deviated sections
- No slip design reduces heat with no energy wasted on slip:
  - Improves reliability by reducing heat and insulation degradation especially in severe environments such as intermittent flow in unconventional wells
- PMM designs range from 250 up to 6,000 rpm:
  - The PMM wide operating range provides energy efficient system solutions by coupling it to a conventional ESP, a Wide Range, Wear Resistant (WR2) Pump or a Progressing Cavity Pump (PCP)
- Locked rotor bearing design for improved run life

Borets breaks from convention by merging the unique properties of Permanent Magnet Motor (PMM) technology with the traditional design of today's submersible pump systems. The result is an efficient and highly flexible system capable of operating in applications that were once deemed cost-prohibitive or impossible for the technology of yesterday.

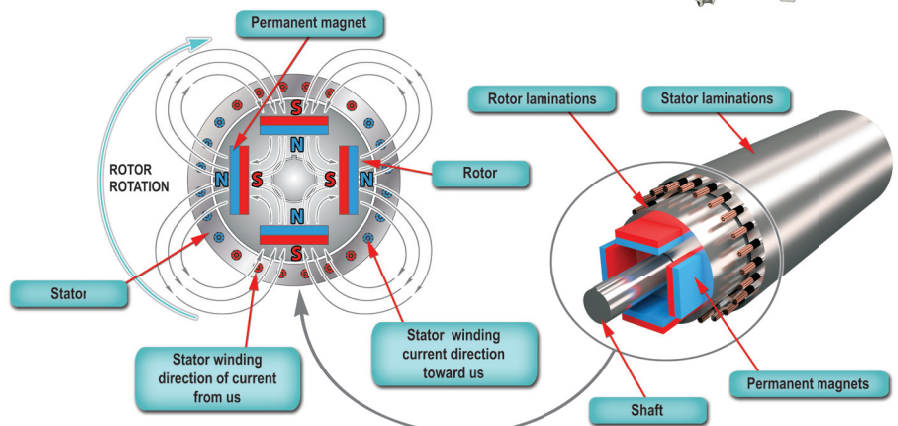
The Borets Permanent Magnet Motor improve system reliability & efficiency through a series of technical revolutionary advancements over a conventional induction motor (IM) thus maximizing a well's potential while reducing operating costs.

## PMM OPERATING PRINCIPLE

The PMM incorporates a rotor with permanent magnets that are made of sintered hard-magnetic materials. The magnets produce the rotor flux that requires less power for field generation.

As a result, the PMM has a higher power density and is shorter than a conventional IM of the same horsepower rating. The increased efficiency and the synchronous operation also translate into reduced electrical losses, lower operating current and less heat generation.

With less heat generated, the motor cooling requirements are reduced and it is possible to operate the system with PMM at lower flow rates than with conventional induction motors. Adaptive surface control allows the system to respond to changing well conditions and extend system run life by optimizing or eliminating cycling in low flow conditions, thus ensuring the maximum production rate. As a result, the faster and more accurate control of the motor allows for an expanded operating range.



## PMM-ESP & PMM-PCP APPLICATIONS

Borets offers three PMM rotor design options:

1. **Standard rotor** with adjustable speed range from 500 to 3,900 rpm for conventional ESPs.
2. **High-speed rotor** with adjustable speed range from 3,000 to 6,000 rpm for WR2 ESPs.
3. **Low-speed rotor** with adjustable speed range from 250 to 2,000 rpm for PCP.

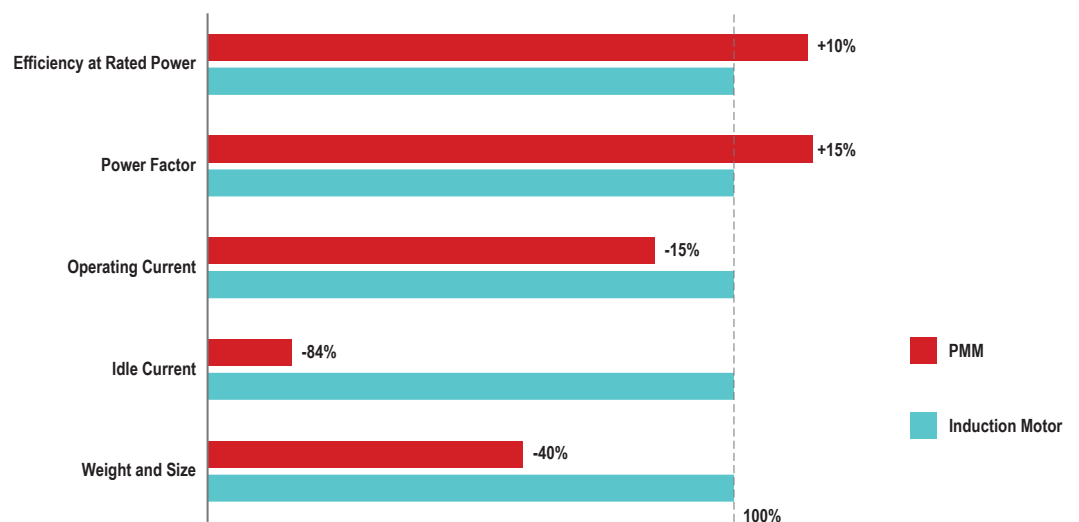
PUMP	RPM	MOTOR SERIES	25	50	100	150	200	400	600	800	1000 (HP)	
PCP	250-2,000	456	7	60								
ESP	500-3,900	406	12					228				
		456	20					400				
		512		40					760			
		562			50					980		
WR2	3,000-6,000	406	27					376				
		456			94			241				

## 40 % shorter motor length



### PMM Advantages

(By convention the induction motor characteristics are taken as 100%)



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