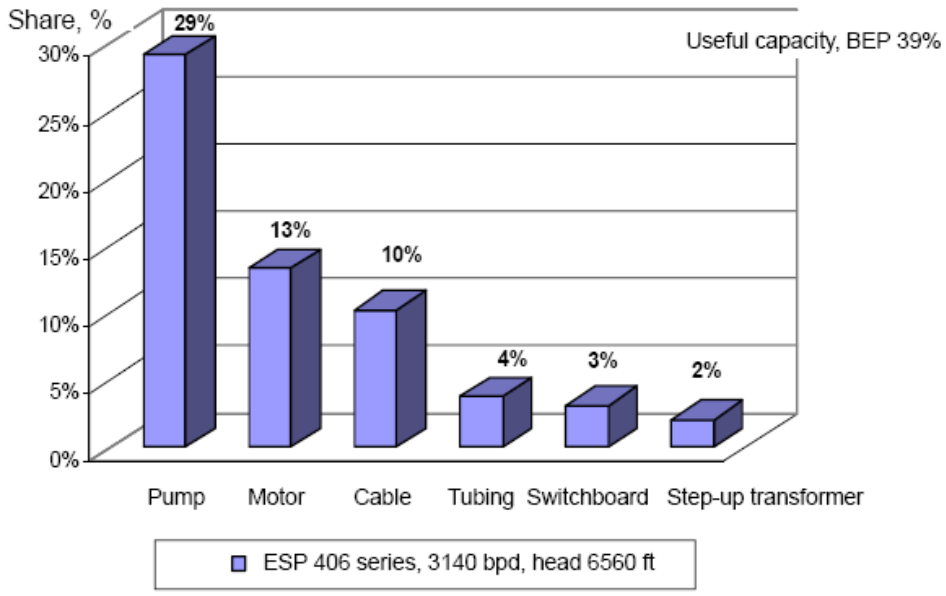
NOVOMET UNIQUE "POWER SAVE" TECHNOLOGY

Novomet has a strong focus on new and innovative technologies that provide our Customers with the best value and best in class ESP solutions. One of our more recent priority developments is 'Power Save' technology which enables our Customers to save up to 25% of the total ESP system power cost (compared with conventional ESP systems).

Background

With a conventional ESP design application, typically the overall system efficiency is approximately 39% with losses totaling +/-61 %.

The losses can be broken down into the following segments:



As detailed in the chart above, the major losses are with the pump and motor (29 % and 13 % respectively). These figures are relatively consistent in the industry as the conventional ESP system consists of a 3 phase, 2 pole, oil filled induction motor driving a multistage centrifugal pump (using radial or mixed flow type stages).

Novomet has approached this design challenge with the following goals in mind:

1. *Improve overall system power efficiency by +/-25%*

2. *Long term reliability is the same (when compared to conventional ESP systems)*

3. *The Power Save system must include a Variable Speed Controller (VSC) option that is*

compatible with the high efficiency ESP and the conventional design ESP

4. *The Power Save system should be available in standard ESP type configurations to suit 'typical' well applications/requirements (eg 300/400/500 series equipment in 5-1/2" to 9-5/8" casing)*

5. *Easy installation methodology (same process as conventional ESP equipment)*

6. *Can be installed using existing well completion equipment, ESP power cable, MLE, penetrators etc)*

7. On a 'like for like' basis, the PMM motor is smaller/lighter than the conventional asynchronous design

Power Save technology incorporates two important design factors that differentiate the system from conventional equipment. These are:

* *Permanent Magnet Motor (PMM)*
* *High efficiency Pump stage design using different geometry*
* *Integration of Novomet's 'Powder Metallurgy' pump stage technology*

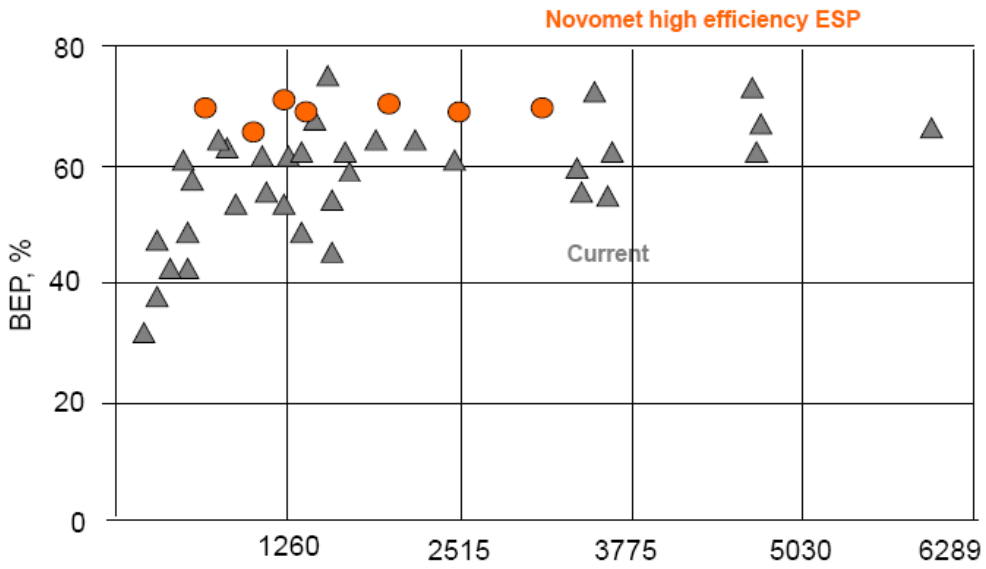
Power Save Features & Benefits

Power Save is designed to bring a number of benefits to the Customer, including:

* *Lower power consumption- lower cost of production/ lower OPEX*
* *Lower dimensions of Power Save systems – lower time of installation procedures – lower workover/rig cost- increased production uptime*
* *Competitive pricing with conventional ESP systems*
* *Total "cost of ownership"(including: purchase price + OPEX + repair costs) of Power Save ESP systems is less than of conventional ESP systems*

How are these benefits achieved:

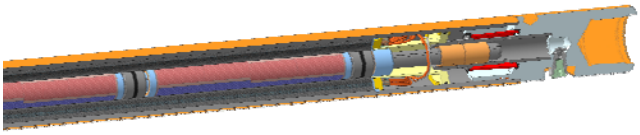
Power Save pumps are designed to rotate at higher RPM than the conventional system resulting in higher pump efficiency

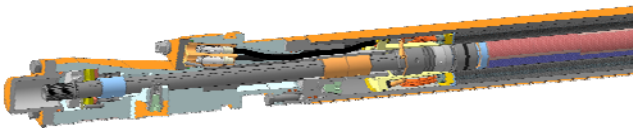


Power Save incorporates a number of enhanced fit for purpose parts and components, e.g.

Permanent Magnet Motors

* *Advanced stage geometry and upgraded materials for shaft, stages and bearings*
* *Integration of high efficiency (92%) Novomet Permanent Magnet Motors (standard asynchronous motor efficiency is +/-84%)*



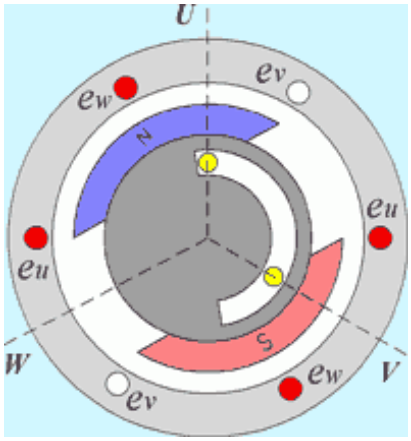


PMM Design Features

PMM is a synchronous motor, thus rotor slip is zero (in a traditional asynchronous induction motor, the rotor slip is approximately 6%)

The rotor is equipped with permanent magnets with two ports where north and south interlace with one another. Rotor magnets are made from rare-earth alloys.

To optimize efficiency and minimize stator losses, the stator laminations are made from Novomet proprietary material.



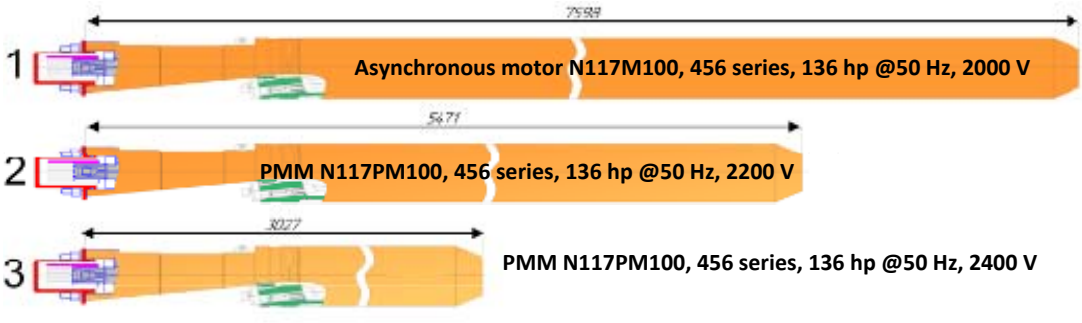
The Stator is filled with a special high temperature epoxy (rating @ 500 deg F) which significantly increases the insulation resistance (by a factor of 10 times).

PMM Stator Sections

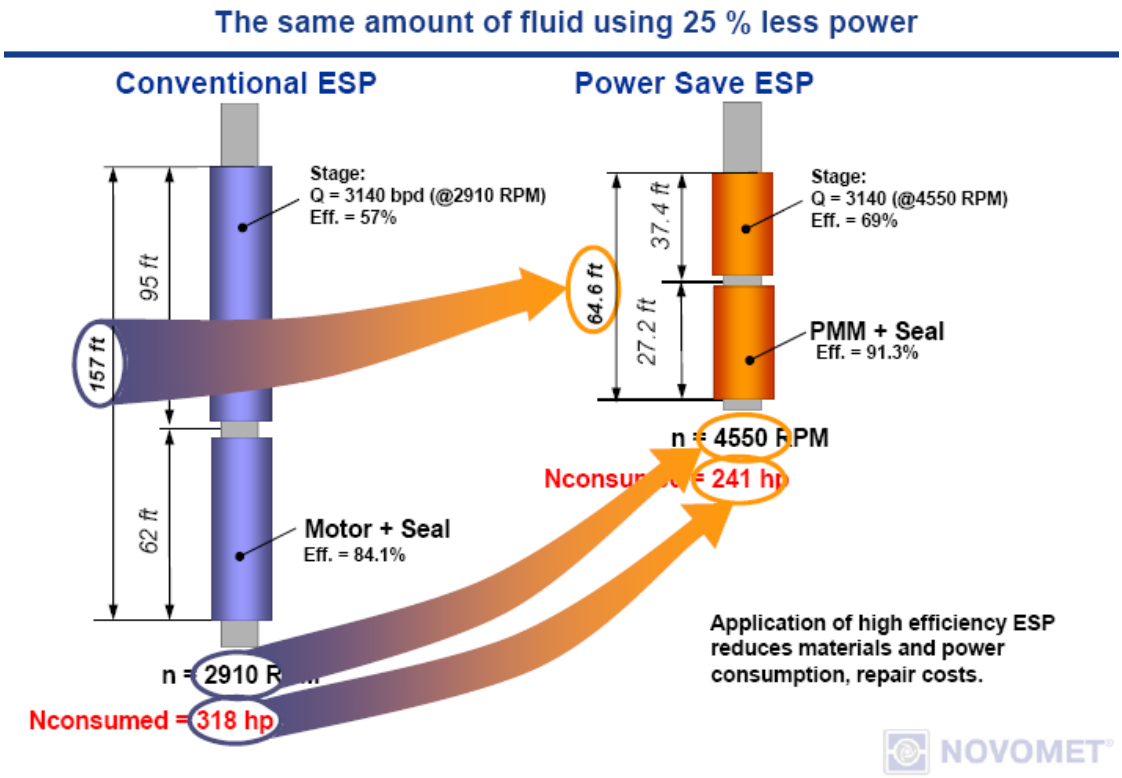
The table and diagrams below have an intention to detail some of the key differences between a PMM and a conventional induction motor with the same HP rating.

PMM vs. Asynchronous for the Same Power Output

Motor designation	Parameters								
	Rated power, hp	Rated voltage, V	Inom, A	Nominal RPM	Eff., %	Power factor.	Min velocity of cooling fluid, m/s	Instal. length, ft	Wt, Lb
PMM: 456 series, 136 hp, RPM-3000	136	2200	36	3000	92	0.95	0.1	17.9	946
PMM: 456 series, 136 hp, RPM-6000	136	2400	37	6000	92	0.95	0.4	9.9	487
As. M: 456 series,136 hp	136	2000	40	2910	84	0.859	0.3	24.9	1244



Comparison of Conventional ESP and Power Save Systems operation:



Novomet Range of Permanent Magnet Motors

Description	Speed range, RPM	Power range, HP
Commercial production		
319 series, 6000 RPM	1000 – 6000	30 – 122
456 series, 3000 RPM	500 – 4200	16 – 306
456 series, 6000 RPM	4200 – 6000	30 – 544
512 series, 3000 RPM	500 – 4200	86 – 410
Trials		
406 series, 6000 RPM	1000 – 6000	Pmax = 380
456 series, 500 RPM	100 – 500	Pmax = 55
456 series, 1000 RPM	500 – 1500	Pmax = 109
512 series, 6000 RPM	4200 – 6000	Pmax = 820
562 series, 6000 RPM	1000 – 6000	Pmax = 1080
728 series, 6000 RPM	1000 – 6000	Pmax = 1635

Tandem Motors		
319 series, 6000 RPM. tandem	1000 – 6000	Pmax = 220
456 series, 3000 RPM, tandem	500 – 4200	Pmax = 610

Novomet Pump Range of Power Save ESPs

Series	Capacity, BPD/BEP, %								
272	189/48	315	503						
319	126	108	215	786					
338	126	786							
362	252	189	314	503	786	1321	1572	2012	2516
406	503	629	1006	1415	2012	2516	3145	5660	
449	5031	6289							
535	1887	3145	4088	4717	6289				
677	4717	6289	10062	12578	15723				
			503	Stages for launching into commercial production in 2011					
			6289	Stages for trials					