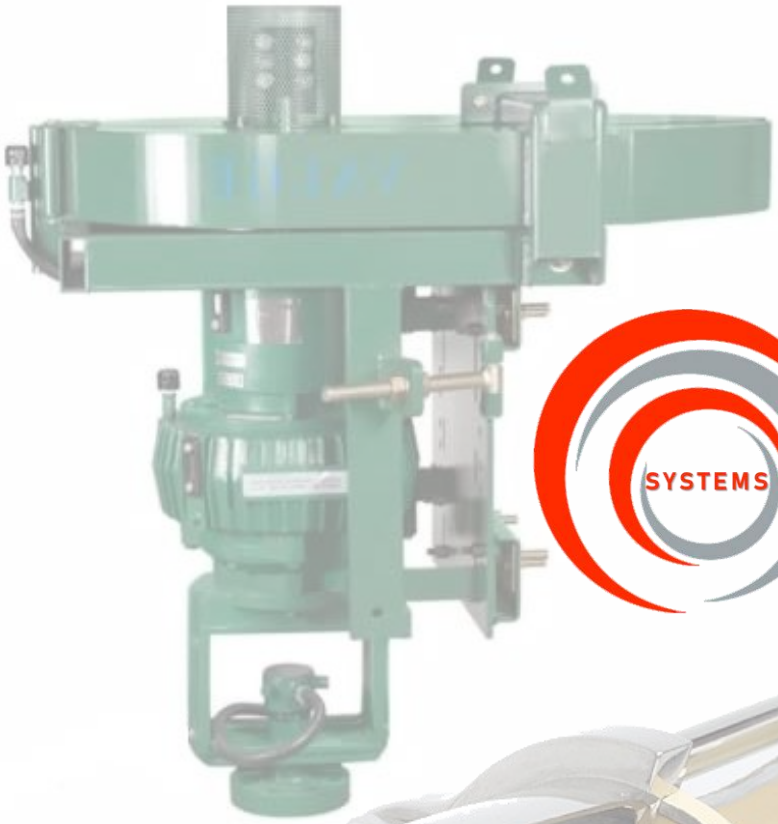

SYSTEMS oiltech

PROGRESSIVE CAVITY PUMPS and WELLHEAD DRIVE SYSTEMS

quality integrity innovations

Our Company

OILTECHSYSTEMS OÜ is a part of a group of companies working in oil and gas industry which produce, engineer and develop systems with the most advanced plastic technologies for the conduction free of corrosion of all kind of fluids at high pressures and temperatures.

The group is working worldwide providing services, installations, products and performing turn key projects.

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Content

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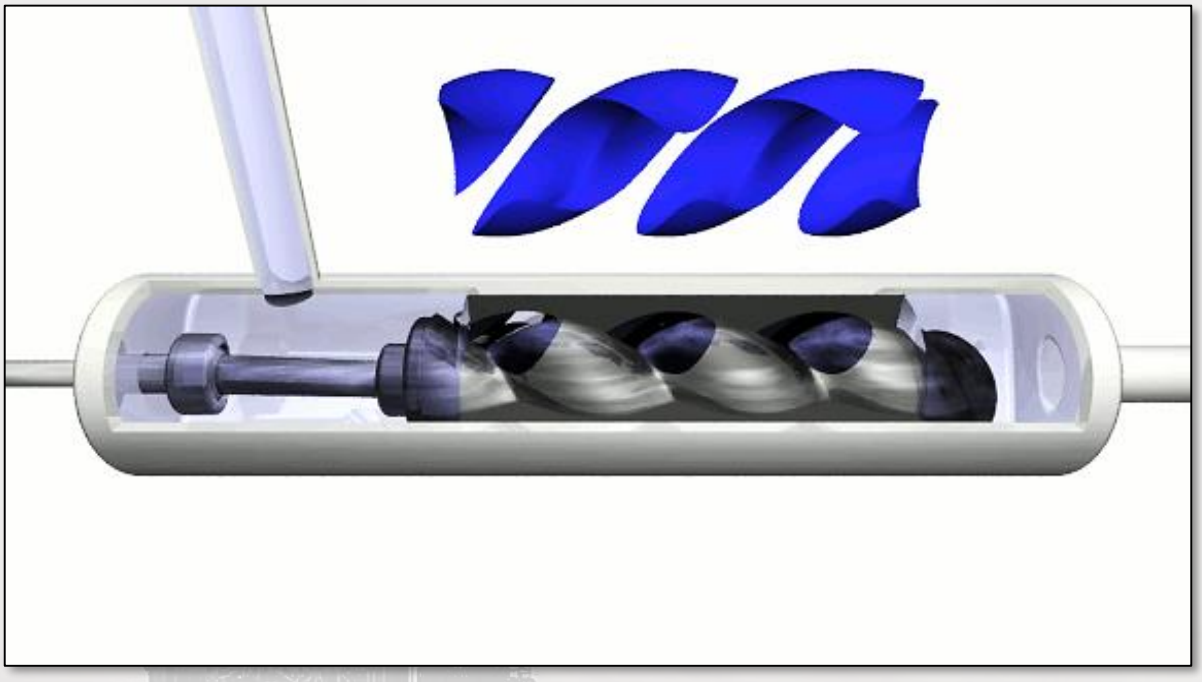
Progressive cavity pump

The operation principle of the progressive cavity pump (PCP) is a helical rotor of steel with circular profile that rotates inside a stator with double the pitch, that is made of an elastomer, normally vulcanized inside a carcass of carbon steel.

Depending on the geometry of the rotor and the stator, sealed cavities between suction and discharge are formed. The opening and closing of these cavities creates a depression in the suction nozzle, which causes the fluid to be suctioned and develops a volumetric flow directly proportional to its rotation.

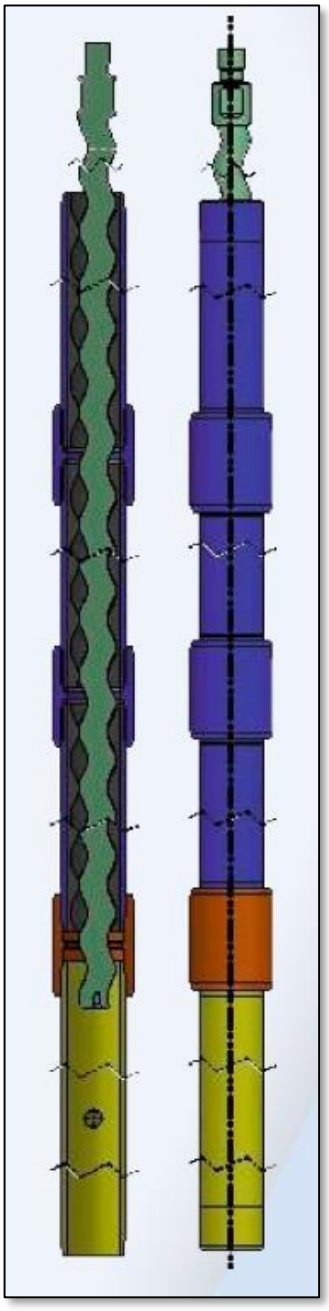


The progressive cavity pump operation principle allows the pumping of highly viscous fluids, chemically aggressive and containing solids up to a certain size, where the centrifugal pumps do not have a good performance.

PCP Advantages

Progressive cavity pumps have many advantages. Here are some of them:

- ✓ Progressive cavity pump is able to operate with much lower suction pressure than rod pumps. As a result, the well column requires less fluid to feed the pump. Under atmospheric suction pressure, it can function with the fluid level of the well close to the suction intake of the pump without affecting its performance. This enables well production to be increased to the maximum level of fluid available.
- ✓ The PCP pumps do not require a heater, even when pumping high viscosity oils.
- ✓ Pumps oil and water with solids.
- ✓ No internal valves to clog or gas lock.
- ✓ Continuous smooth operation helps in preventing and controlling production of undesired reservoir fluids and particles.
- ✓ Minimal maintenance costs.



PCP Applications

Some applications of Progressive cavity pumps:

Pumping of sewage

Pump with diesel engine

Pump in a sugar and alcohol plant

Pumping of sulfuric acid in a plant

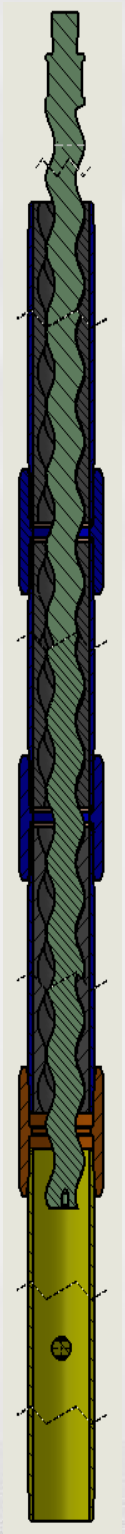
Main applications:

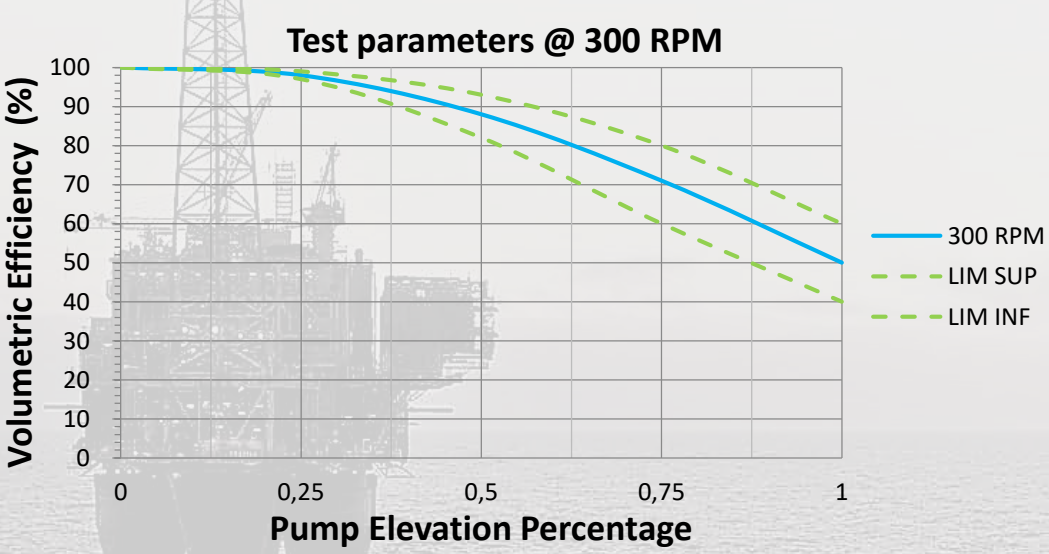
- ✓ Heavy crude
- ✓ Medium crude
- ✓ Coal Bed Methane (CBM) / Coal Seam Gas (CSG)
- ✓ Shale oil and water

PCP specification sheet

2 3/8" PUMPS					
AVAILABLE MODELS		2OT-1900	2,5OT--1200	3OT--600	3OT--1000
Pump Performance (m^3/day @ 100RPM)		2	2,5	3	3
Pump Lift m (ft)		1900 (6234)	1200 (3937)	600 (1968)	1000 (3281)
Nominal Pressure kPa (psi)		18632 (2702)	11768 (1707)	5884 (853)	9807 (1422)
Nominal Lift Torque N.m (ft.lbs)		40,58 (29,93)		26,26 (19,368)	40,58 (29,93)
ROTOR	Rotor Superior Connection	1/2" API			
	Rotor Head Diameter	27mm			
	Rotor Total Length	2643		1833	2643
	Minimum Tubing Size	2 3/8" (Min. DRIFT 48,28mm)			
STATOR	External stator Diameter	2 3/8"			
	External Coupling Diameter	78 mm			
	Superior Connection	2 3/8" NU			
	Stator Total Length	2160		1350	2160
	Tag Bar Length	410			
	Inferior Tag Bar Connection	2.3/8" NU			

2 3/8" PUMPS					
AVAILABLE MODELS		4OT--1900	5OT--1200	6OT--600	6OT--1000
Pump Performance (m^3/day @ 100RPM)		4	5	6	6
Pump Lift m (ft)		1900 (6234)	1200 (3937)	600 (1968)	1000 (3281)
Nominal Pressure kPa (psi)		18632 (2702)	11768 (1707)	5884 (853)	9807 (1422)
Nominal Lift Torque N.m (ft.lbs)		78,78 (58,11)	81,17(59,87)	54,91 (40,50)	78,78 (58,11)
ROTOR	Rotor Superior Connection	5/8" API			
	Rotor Head Diameter	35mm			
	Rotor Total Length	3130		2193	3130
	Minimum Tubing Size	2.3/8" (Min. DRIFT 48,28mm)			
STATOR	External Stator Diameter	2.3/8"			
	External Coupling Diameter	78 mm			
	Superior Connection	2.3/8" NU			
	Stator Total Length	2625		1688	2625
	Tag Bar Length	410			
	Inferior Tag Bar Connection	2.3/8" NU			





TEST CONDITIONS
WATER WITH 5% SOLUBLE OIL
TEMPERATURE 60°C +/- 10°C

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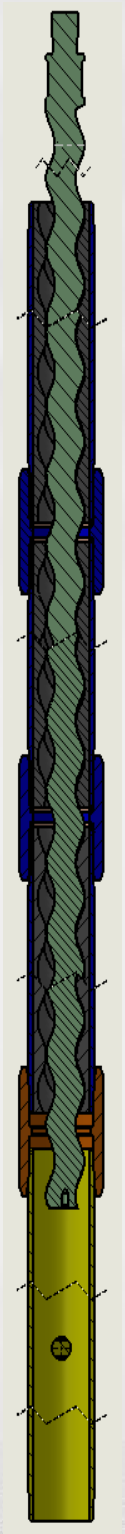
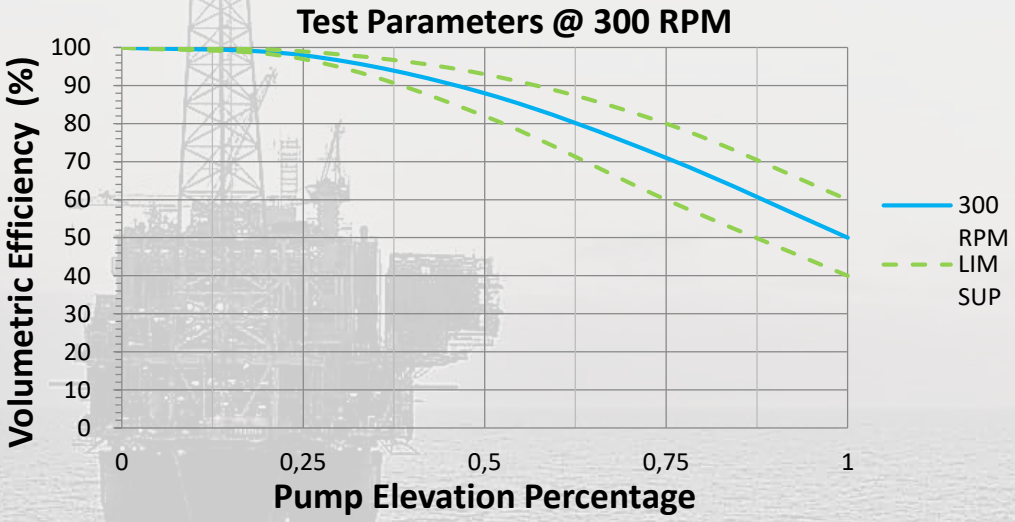
PCP specification sheet

2 7/8" PUMPS					
AVAILABLE MODELS		9OT-1900	12OT--1200	16OT-600	16OT--1000
Pump Performance (m^3/day @ 100RPM)		9	12	16	16
Pump Lift m (ft)		1900 (6234)	1200 (3935)	600 (1968)	1000 (3280)
Nominal Pressure kPa (psi)		18632 (2702)	11765 (1700)	5885 (850)	9800 (1420)
Nominal Lift Torque N.m (ft.lbs)		200 (145)		120 (88)	200(145)
ROTOR	Rotor Superior Connection	7/8" API			
	Rotor Head Diameter	44 mm			
	Rotor Total Length	4304		2992	4304
	Minimum Tubing Size	2 7/8" (Min. DRIFT 48mm)			
STATOR	External Stator Diameter	2 7/8"			
	External Coupling Diameter	89 mm			
	Superior Connection	2 7/8" NU			
	Stator Total Length	2363		3675	2363
	Tag Bar Length	504			
	Inferior Tag Bar Connection	2 7/8" NU			

3 1/2" PUMPS					
AVAILABLE MODELS		16OT--1900	20OT--1200	22OT--600	22OT-1000
Pump Performance (m^3/day @ 100RPM)		16	20	22	22
Pump Lift m (ft)		1900 (6234)	1200 (3935)	600 (1968)	1000 (3280)
Nominal Pressure kPa (psi)		18632 (2702)	11765 (1700)	5885 (850)	9800 (1420)
Nominal Lift Torque N.m (ft.lbs)		195 (140)		330 (240)	195(140)
ROTOR	Rotor Superior Connection	1" API			
	Rotor Head Diameter	60mm			
	Rotor Total Length	4844		3444	4844
	Minimum Tubing Size	3 1/2" (Min. DRIFT 60mm)			
STATOR	External Stator Diameter	3 1/2"			
	External Coupling Diameter	106mm			
	Superior Connection	3 1/2" NU			
	Stator Total Length	4200		2800	4200
	Tag Bar Length	504			
	Inferior Tag Bar Connection	3 1/2" NU			





TEST CONDITIONS
WATER WITH 5% SOLUBLE OIL
TEMPERATURE 60°C +/- 10°C

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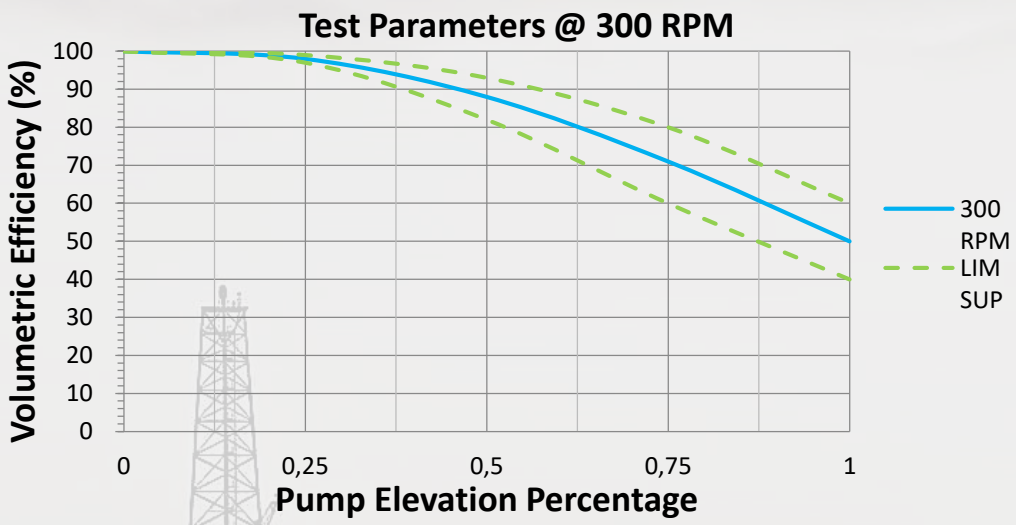
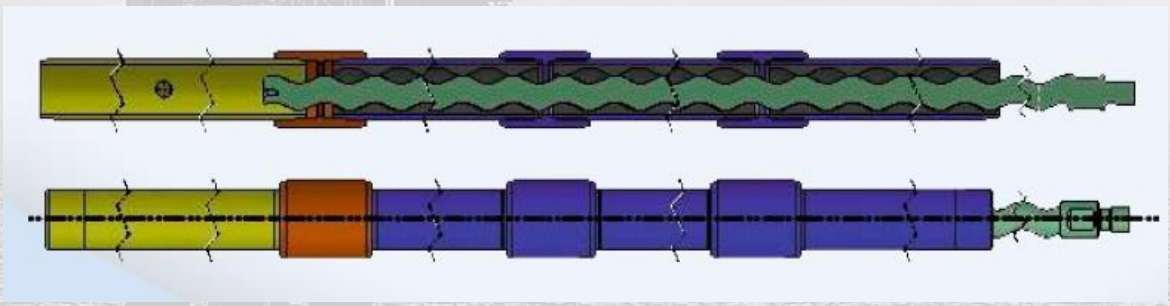
PCP specification sheet

4" PUMPS				
AVAILABLE MODELS		38OT--1900	48OT--1200	67OT--1000
Pump Performance (m³/day @ 100RPM)		38	48	67
Pump Lift m (ft)		1900 (6234)	1200 (3935)	1000 (3280)
Nominal Pressure kPa (psi)		18632 (2702)	11765 (1700)	9800 (1420)
Nominal Lift Torque N.m (ft.lbs)		859 (634)	**773(570)**	688 (507)
ROTOR	*Rotor Superior Connection*	1" API		
	Rotor Head Diameter	61 mm		
	Rotor Total Length(mm)	5734		5384
	Minimum Tubing Size	3.1/2" (Min. DRIFT 72,82mm)		
STATOR	*External Stator Diameter*	4"		
	External Coupling Diameter	114 mm		
	Superior Connection	4" NU		
	Stator Total Length (mm)	5075		4725
	Tag Bar Length	504		
	Inferior Tag Bar Connection	4" NU		



TEST CONDITIONS
WATER WITH 5% SOLUBLE OIL
TEMPERATURE 60°C +/- 10°C



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PCP specification

MODEL	ISO MODEL	A(in)	B(mm)	C(mm)	D(mm)	E(mm)	F(in)	Tubing min ø(in)	Casing min ø(in)	Drive head
2OT - 1900	002 19 041	2 3/8"	20	2160	2643	410	3/4" (1/2")	23/8"	41/2"	OTD-1H-15
2,5OT – 1200	003 12 041									OTD-1H-9
3OT – 600	003 06 041			1350	1833					
3OT – 1000	003 10 041			2160	2643					
4OT – 1900	004 19 041		25	2625	3130		15/16" (5/8")			OTD-1H-15
5OT – 1200	005 12 041									OTD-1H-9
6OT – 600	007 06 041			1688	2193					
6OT – 1000	007 10 041			2625	3130					
9OT – 1900	010 19 050	2 7/8"	32	3675	4304	504	13/16" (7/8")			OTD-1H-15
12OT -1200	012 12 050									OTD-1H-9
16OT – 600	016 06 050			2450	3080					
16OT – 1000	016 10 050			3675	4304					
16OT – 1900	016 19 050	3 1/2"	40	4200	4844		13/8" (1")	27/8"	51/2"	OTD-1H-9
20OT – 1200	026 10 050									OTD-1H-15
22OT – 600	021 12 050			2800	3444					OTD-1H-9
22OT - 1000	026 06 050			4200	4844					

NOTE: When tubing diameter is smaller than stator diameter, the first production tube connected to the stator (orbit tube) must have the same diameter as the pump stator

PCP pump model identification

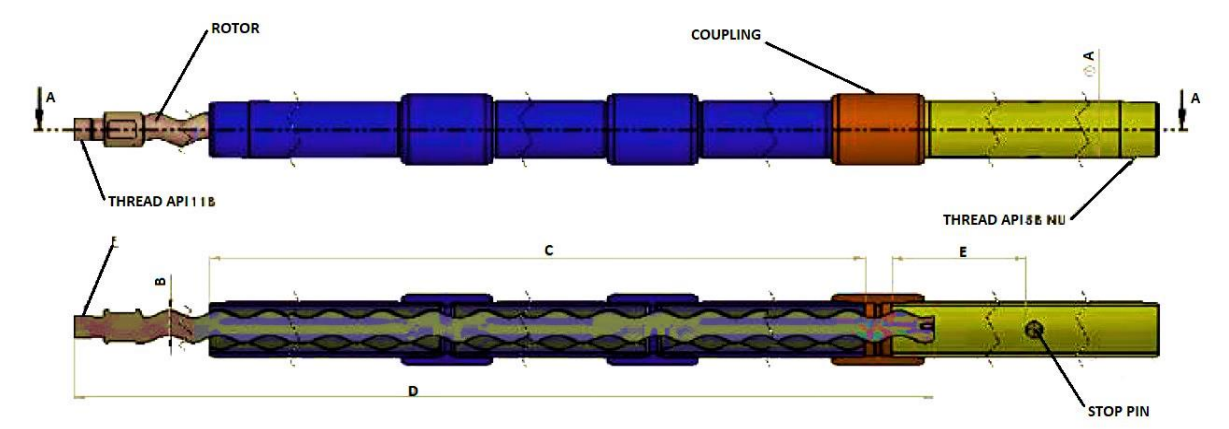
16 OT - 600

- Depth (m)
- PCP pump
- m^3/ day @ 100RPM

ISO pump model identification

016	06	050
Daily Production m3/ day @ 100RPM	Lifting Capacity meter of water/100	Distance from bottom of stator to Tag Pin (cm)

*As recommended by ISO in WD 15136



PCP elastomer guideline

The selection of an elastomer for a Progressive cavity pump depends on the crude composition.

The table below shows the main properties of the most common elastomer in Progressive cavity pump applications.

MAIN PROPERTIES	NBRM	NBRA	HNBR
Hardness (Shore A)	65	65	70
Maximum Temperature (˚F/˚C)	195/90	210/100	300/150
Service Temperature (˚F/˚C)	175/80	190/88	265/130
Mechanical Resistance	++	++	++
Abrasion Resistance	++	+	++
Carbon Dioxide (CO_2)	-	+	++
Hydrogen Sulfide (H_2S)	-	-	++
Aromatic's Resistance	+	++	+
Hot Water	-	+	+
Steam	-	-	-
APPLICATION	Heavy crudes with low content of aromatic and/or presence of abrasives	Light and medium crudes (26<˚API<40) with high aromatic contents.	Heavy and medium crudes (with low aromatic contents) under high temperature or presence of H_2S

Legend: ++ Very good +Good -Weak

HARD CHROMIUM LAYER FOR ROTOR	
Normal	0,12 mm (0.005")
Thick	0,30 mm (0.012")

PCP spare parts

Complete line of rotors and stators for Progressive cavity pumps.

STATORS

Stators for replacement at progressive cavity pumps.

ROTORS

Rotors for replacement at progressive cavity pumps.

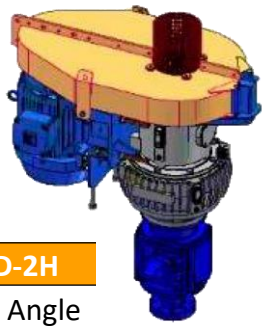
Wellhead drive motor

Wellhead drive motor main advantages:

- ✓ *PCP wellhead drive motor is attached directly to the wellhead, eliminating the concrete base required by some other pumping systems.*
- ✓ *The space required for installation on the well is much smaller and lower than many other artificial lift systems.*
- ✓ *Unlike other pumping systems, PCP system has a much lower risk of accident if people or animals come near to the wellhead.*
- ✓ *The API flange allows direct connection without adapters when changing from other systems to the PCP system.*
- ✓ *The simple design minimizes maintenance and requires little lubrication.*
- ✓ *The bearing system of the PCP wellhead drive motor provides minimal vibration.*
- ✓ *It can be easily adjusted to production rates or changing rotations by mechanical process or with speed controllers (or with a simple change of acceleration if using internal combustion motors).*
- ✓ *Equipped with safety device to prevent the polished rod from ejecting.*
- ✓ *Hydrodynamic brake system for automatic and safe controlled release of energy stored at rod string (backspin).*
- ✓ *Safe against leakage and mechanical failures.*

Wellhead drive motor technical parameters

The table below shows technical parameters of the basic wellhead drive motor models.



MODEL	OTD-1H	OTD-2H	OTD-1H-M	OTD-2H
Shaft Mount Type:	Vertical Input Shaft	Vertical Input Shaft	Vertical Input Shaft	Right Angle Input Shaft
Box Type:	Bearing box	Bearing box	Bearing box	Bearing box
Shaft Type:	Hollow shaft	Hollow shaft	Solid shaft	Hollow shaft
Wellhead Connection (mm): (in):	79,375 3 ⅛	79,375 3 ⅛	79,375 3 ⅛	79,375 3 ⅛
Polish Rod Size (mm): (in):	38,1 1 ½	38,1 1 ½	N/A	38,1 1 ½
Sealing System:	Packing Rings	Packing Rings	Packing Rings	Packing Rings
Max. Torque Rating at Polish Rod (Nm):	5600	6535	5600	1430
Max. Axial Load Capacity (ton):	9/12/15	9/15/30	9/15	9/15
Max. Power (kW): (hp):	44,74 60	74,57 100	44,74 60	44,74 60
Max. Speed at Polish Rod (RPM):	600	600	600	600
Gearbox - Gear Reduction:	N/A	N/A	N/A	4,1
Hydraulics Compatible:	Yes	Yes	Yes	Yes
Belts Compatible:	Yes	Yes	No	Yes
Maximum Driven Sheave Size (mm):	600	711	N/A	250
Minimum Driven Sheave Size (mm):	500	500		125
Maximum Driving Sheave Size (mm):	240	240		250
Minimum Driving Sheave Size (mm):	130	130		125
Maximum Sheave Ratio:	5	6		2
Minimum Sheave Ratio:	2	2		1

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Wellhead drive motor technical parameters

Wellhead drive motor can be supplied with different options of stuffing boxes, according to the drive model and wellhead connection requirement.

Stuffing boxes

Characteristics:

- Provides continuous compression adjustment of packing elements from a spring loaded assembly.
- Bronze guide bushings to keep the polished rod aligned to prevent the stuffing box from premature wear.
- Dual protection (top & bottom) against leakage.
- 1" NPT bottom leakage drain.
- Open access to run a clamp to lock the polished rod in position for maintenance or removal of the drive.

Wellhead drive motors are supplied with a Hydrodynamic Brake System. This system is designed to release the resultant torque stored at the rod string by the time the prime mover is shut-down (maintenance, power failure, etc). The full release of the stored energy is made gradually in a continuous and uniform way to avoid the risk of accidents.

Brake system

Wellhead drive motor applications

Some applications of wellhead drive motor:

Drive head with hydraulic brake in operation

Right Angle drive head

Drive head with hydrodynamic brake retarder in operation

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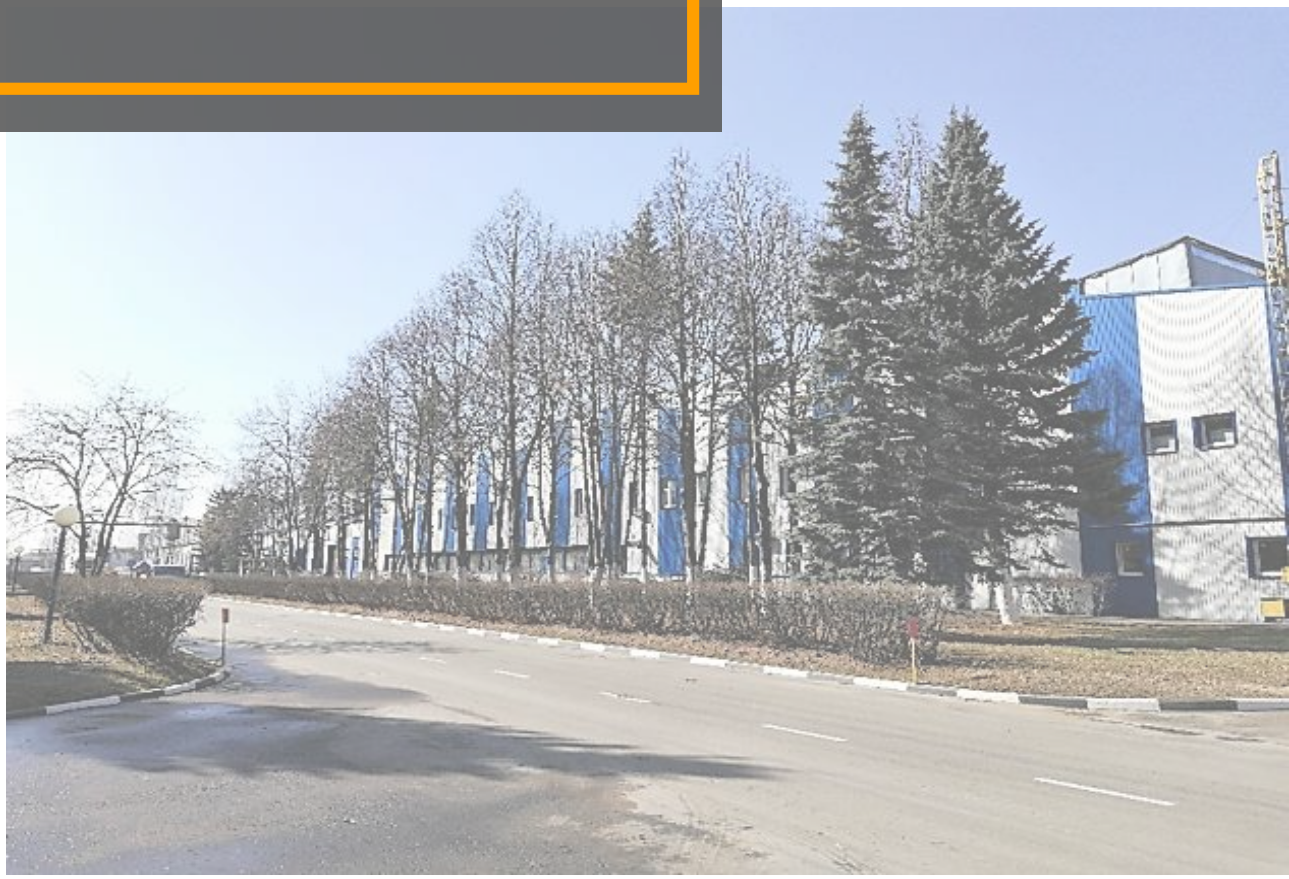

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