



OILGEAR

SUBSEA PUMPING PRODUCTS

Summer 2016 - Rev A

Oilgear Subsea Pumps

Oilgear is a subsea hydraulic products company whose pumping products are focused on these niches:

- a) Applications that combine low viscosity fluids with variable displacement
- b) High pressure, low viscosity applications
- c) Hydraulic intensification applications
- d) Applications that combine the pumping of difficult fluids/gases with variable displacement



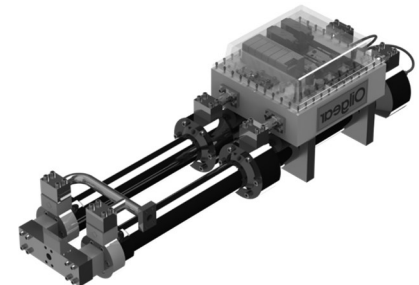
**Variable Displacement
(350 Bar)**



**Fixed Displacement
(750 Bar)**



**Hydraulic
Intensifiers**



**Custom Pumping
Solutions**



OILGEAR

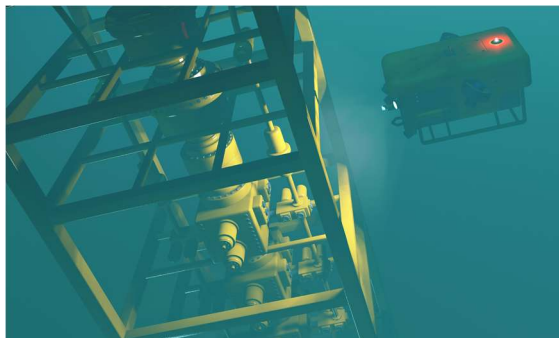
Variable Displacement Pumps (350 Bar) - Summary

Value Proposition

- **A proven, low-cost, rugged pump for pumping environmentally-friendly hydraulic fluids**
- Variable displacement, so you don't need a VSD
- Available in many sizes and control options

History

- ✓ 40 years of in-field experience
- ✓ Developed specifically for low viscosity fluids



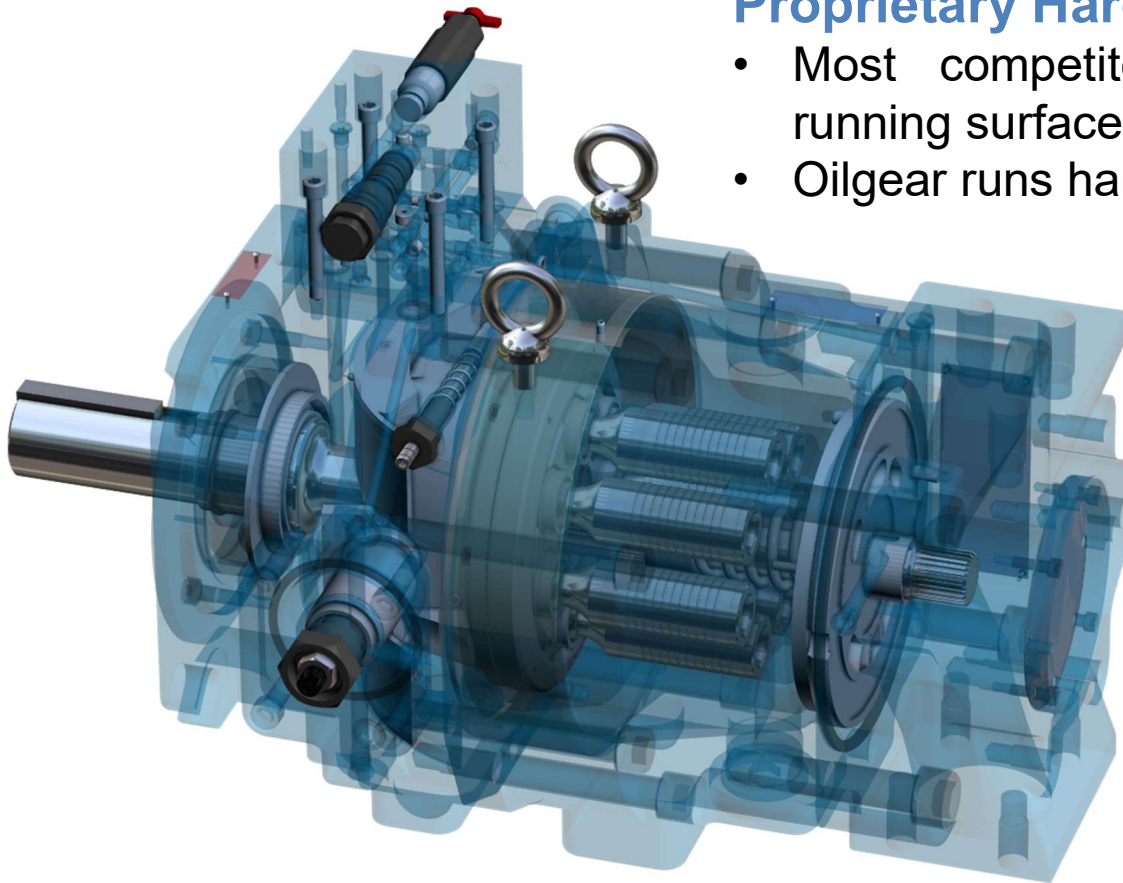
Applications

- ❑ Offshore and subsea HPU's (ROV, rig main, BOP)
- ❑ Oceanic™, Pelagic™, Stack Magic™, Erifon™, etc.
- ❑ API 53 skids

Variable Displacement Pumps (350 Bar) - How it Works

Variable Displacement, Axial Piston Pump

- As the main shaft rotates, the pistons glide on the swashplate
- By adjusting the angle of the swashplate, the pump output can vary from zero to full flow



Proprietary Hard-on-Hard Technology

- Most competitors employ a sacrificial soft running surface
- Oilgear runs hard-on-hard (Rockwell 65)
 - This allows Oilgear pumps to operate on **low viscosity fluids**, and makes the pump extremely **dirt-tolerant**

Hydro-Dynamic Bearings

- The Oilgear pump does not rely on a mechanical bearing, so it is not limited by bearing life

Variable Displacement Pumps (350 Bar) – Options

Specifications

The Oilgear subsea PVS pump product line is comprised of products from Oilgear's PVWJ and PVG lines that have been adapted for subsea usage

Part Number Prefix	Theoretical Maximum Displacement		Rated Continuous Pressure		Flow Rate (at 1800rpm)		Maximum Speed
	in ³ /rev	cm ³ /rev	psi	bar	gpm	l/min	rpm
PVS-011	0.66	10,8	5000	344,8	4.2	15,9	3000
PVS-025	1.55	25,4	5000	344,8	10.9	41,3	3000
PVS-048	2.93	48,0	5000	344,8	21.1	79,9	2700
PVS-064	3.88	63,6	5000	344,8	27.4	103,8	2400
PVS-065	3.98	65,0	5000	344,8	28.8	108,9	2700
PVS-100	6.00	98,3	5000	344,8	42.4	160,5	2400
PVS-150	9.16	150,0	5000	344,8	63.0	238,5	2400

Control Options

- Single pressure compensated
- Dual pressure compensated
- Low pressure compensated
- Electronic proportional
- Soft start
- High-low pressure compensated
- Horsepower limited
- Load sensing

Other Options

- Available in rear, side, or top/bottom ported
- Left-hand or right-hand rotation
- SAE keyed or SAE splined shaft
- Thru-shaft availability
- Fixed and variable designs
- Stroke limited

Fixed Displacement Pumps (750 Bar) - Summary

Value Proposition

- A proven, rugged, **high pressure pump** for pumping environmentally-friendly hydraulic fluids

Applications

- BOP pressure testing
- Subsea production control
- Oceanic™, Pelagic™, Stack Magic™, Erifon™, etc.**

History

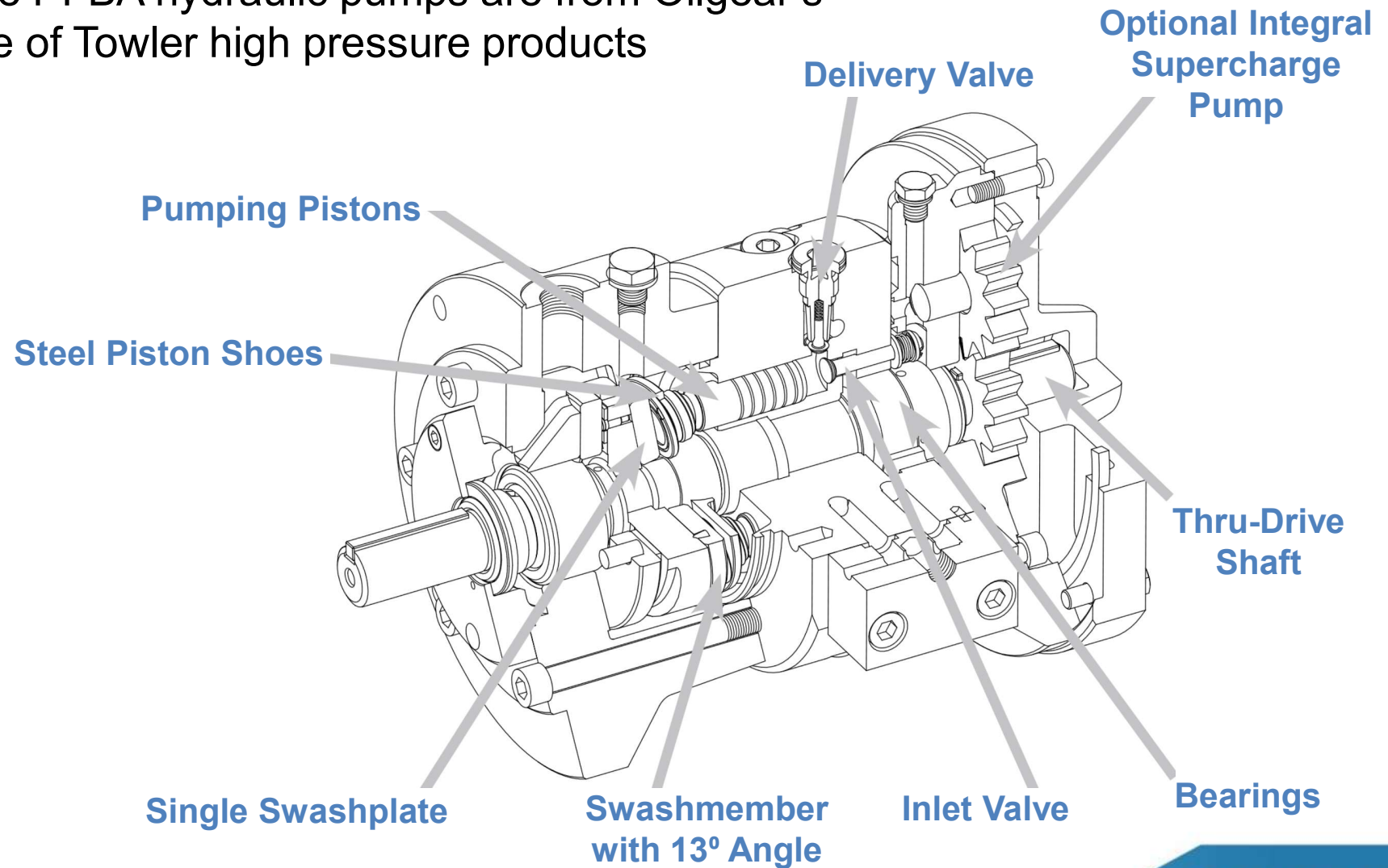
- ✓ 45 years of in-field experience
- ✓ Developed specifically for extreme life on low viscosity fluids



OILGEAR

Fixed Displacement Pumps (750 Bar) - How it Works

The PFBA hydraulic pumps are from Oilgear's line of Towler high pressure products



Fixed Displacement Pumps (750 Bar) – Options

Specifications

The Oilgear PFBA hydraulic pump generates tremendous power in a compact package

Part Number Prefix	Theoretical Maximum Displacement		Rated Continuous Pressure		Flow Rate (at 1800rpm)		Maximum Speed
	in ³ /rev	cm ³ /rev	psi	bar	gpm	l/min	rpm
PFBA-02	0.183	3,0	14500	1000	1.30	4,9	1800
PFBA-2	0.275	4,5	14500	1000	1.96	7,4	1800
PFBA-2/2	0.549	9,0	14500	1000	3.91	14,8	1800
PFBA-4	0.564	9,25	14500	1000	4.12	15,6	1800
PFBA-6	0.839	13,75	10150	700	6.17	23,4	1800
PFBA-8	1.129	18,5	8700	500	8.56	32,4	1800



Options

- Internal boost
- Clockwise (left hand) or counterclockwise (right hand) rotation
- Four different seal material options
- SAE A or B mounting
- Through-shaft tandem pump configuration

Subsea Hydraulic Intensifier Pumps - Summary

Value Proposition

- Extreme life, self-reciprocating intensifier
- Designed for compatibility with challenging subsea fluids
- Available in various intensification ratios and flow rates
- **Patent pending**

Applications

- Boosting of pressure for ROV tooling
- Seal testing
- Boosting of energy in subsea accumulators
- Chemical injection**

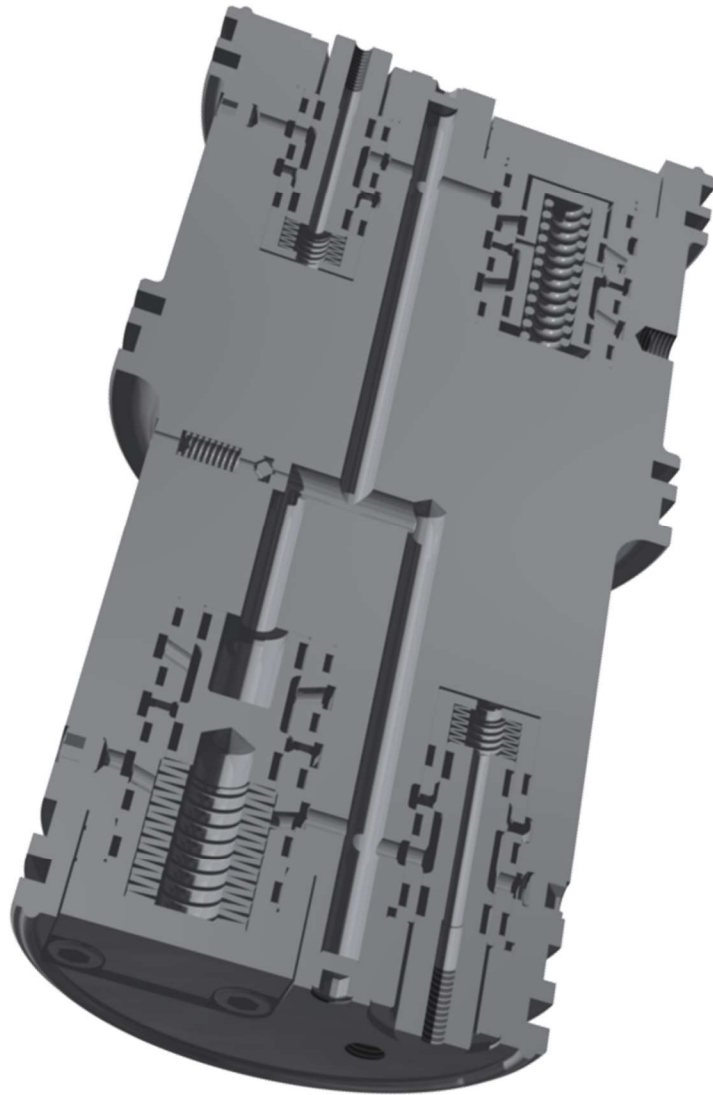
History

- ✓ In 2016, Oilgear developed its own subsea hydraulic intensifier pump because of reliability concerns with the competitors' products



OILGEAR

Subsea Hydraulic Intensifier Pumps - How it Works



Self-Reciprocating

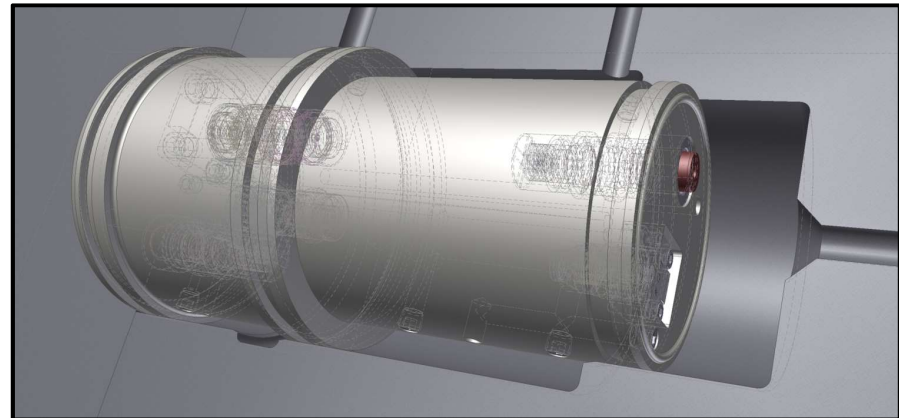
- The intensifying cylinder has end-switches that get mechanically toggled at the extremes of its stroke
- These switches determine the state of the intensifier's pilot signal
- The state of the pilot signal, in turn, determines if the intensifier is on its power stroke or its recycle stroke

Self-Contained

- All of the intensifier's **logic elements travel within the cylinder**

Velocity Limited

- Unlike the competition, the Oilgear intensifier **cannot overspeed**



Subsea Hydraulic Intensifier Pumps – Options and Materials

Options

SSI-X-XX-X-XX

Intensification ratio

A = 1.5:1 ratio
B = 2:1 ratio

Max output pressure

08 = 517 bar (7500 psi)
15 = 1035 bar (15000 psi)

Max flow rate

1 = 3,8 lpm (1.0 gpm)
3 = 11,4 lpm (3.0 gpm)
6 = 22,8 lpm (6.0 gpm)

Reserved for customization
For example: Custom materials,
port type, port location, etc.

Materials

Body

316 SS

Valve stems and cages

Nitronic 50

Valve seats

Nitronic 60

Elastomeric seals

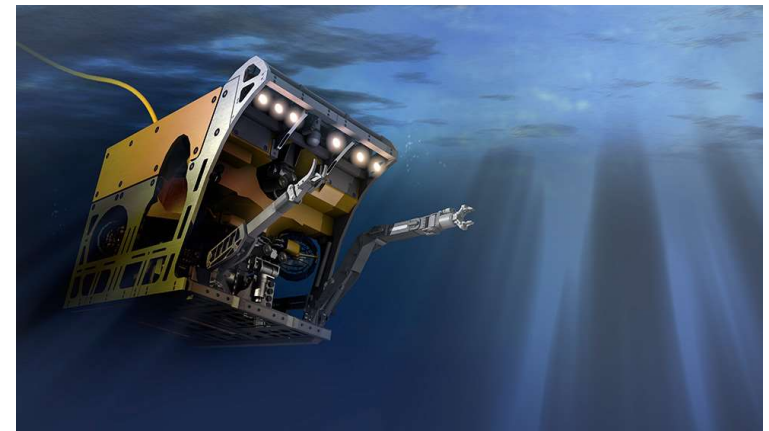
HNBR

Bolts

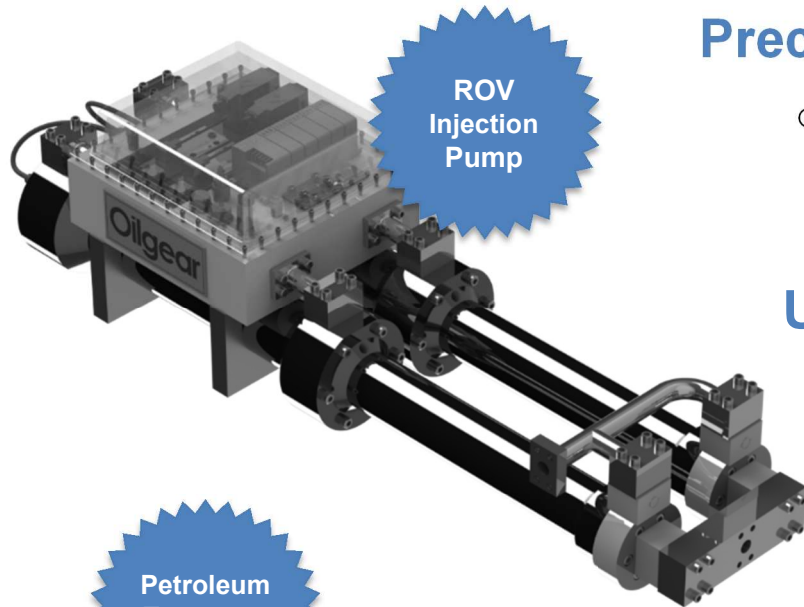
Nitronic 50

Springs

Elgiloy



Custom Pumping Solutions - Summary



Precision Pumping

- Using its proprietary Transfer Barrier™ design and control techniques, Oilgear offers precision pumping for challenging situations

Ultra-High Pressure Pumping

- Up to 4000 Bar

Pumping Harsh Media

- The Transfer Barrier™ approach allows Oilgear to pump the harshest media
 - ✓ Hydrocarbons
 - ✓ Chemicals
 - ✓ Cryogenic LNG



