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
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 HPUs (ROV, rig main, BOP)
- Oceanic™, Pelagic™, Stack Magic™, Erifon™, etc.
- API 53 skids
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
### 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.

<table>
<thead>
<tr>
<th>Part Number Prefix</th>
<th>Theoretical Maximum Displacement</th>
<th>Rated Continuous Pressure</th>
<th>Flow Rate (at 1800rpm)</th>
<th>Maximum Speed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>in³/rev cm³/rev psi bar</td>
<td>gpm l/min rpm</td>
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<tr>
<td>PVS-011</td>
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<td>5000 344,8 4.2 15,9</td>
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<td>PVS-025</td>
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</table>

### 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
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

<table>
<thead>
<tr>
<th>Part Number Prefix</th>
<th>Theoretical Maximum Displacement</th>
<th>Rated Continuous Pressure</th>
<th>Flow Rate (at 1800rpm)</th>
<th>Maximum Speed</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>in³/rev</td>
<td>cm³/rev</td>
<td>psi</td>
<td>bar</td>
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</table>

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
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