Content

- Subsea HPUs in general
- Seatools SHPU offerings
  - Standardized SHPUs
  - Custom SHPUs
  - Subsea electro-hydraulic drive train elements & solutions
- In need for a SHPU?
Subsea HPUs in general
Purpose, applications, and considerations
Why use SHPUs?

- Obviously because hydraulic power is required for a subsea actuator (valve, cylinder, thruster etc.)
- Often alternative to direct hydraulic power via hydraulic umbilical from surface
- Advantages electro-hydraulic configuration via SHPU:
  - Eliminates burden of hydraulic hose handling
  - Improved efficiency. $\eta_{\text{umbilical}}$ can be easily be 75% for high power applications
  - Minimization of system latency. Of particular importance for e.g. dredging process control or subsea vehicle DP
  - Reducing chance of oil spillage
- Sometimes it is the only option, e.g.:
  - Depth is too great for direct hydraulic
  - Electric actuator not available or TRL is insufficient (e.g. DHSV)
Advantage SHPU – Umbilical handling

Example: 40 kW of subsea hydraulic power required for cylinder actuation

<table>
<thead>
<tr>
<th>Umbilical comparison</th>
</tr>
</thead>
<tbody>
<tr>
<td>Configuration</td>
</tr>
<tr>
<td>Umbilical type</td>
</tr>
<tr>
<td>Required hydraulic power</td>
</tr>
<tr>
<td>Umbilical Ø</td>
</tr>
<tr>
<td>Umbilical weight</td>
</tr>
<tr>
<td>Umbilical MBR</td>
</tr>
</tbody>
</table>

- Umbilical handling more difficult, especially in current conditions (umbilical catenary)
- Far larger umbilical reel required, with higher installed power (for CT function)
- Forces on tool can become significant, with tool positioning difficulties as a result
Marinization of subsea hydraulic systems is not a straight forward matter amongst many others aspects the following should be considered:

- Pressure compensation
- Reservoir design
- Marine growth
- Hyperbaric effect on hydraulic oil
- Material selection
- Intervention & maintainability
- Dynamic seal design
- Permeability of dynamic barriers
- Connectors

Furthermore, typical reliability levels of subsea HPUs need to be higher than surface HPUs because subsea HPUs are often used at remote locations, harsh environments, and involve high OPEX operations.
Seatools SHPUs
And related drive train elements
Seatools SHPU solutions

- Standardized SHPU solutions
- Custom SHPU solutions
- Electro-hydraulic drive train solutions
Standardized SHPU range

Benefits
- Short lead times
- Plug & play units
- Customization

Customization
- For each unit flow & pressure range
- The basic configuration of the subsea HPU can be further complemented with a range of components and auxiliary systems

Example applications
- Dredging components (e.g. suction arm) & tools
- Subsea installation tools
- Subsea valve actuation
## Standardized SHPU range (2)

### Product sheet contents:
- Detailed hydraulic, electric & mechanical specifications
- Configurational items
- Optional items

<table>
<thead>
<tr>
<th>SHPU Power (kW)</th>
<th>Maximum Operating Depth (msw)</th>
<th>Volume Flow Capacity Range (l/min)</th>
<th>Maximum Continuous Pressure Range (bar)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.6</td>
<td>1000</td>
<td>1.42 - 8.7</td>
<td>135 - 260</td>
</tr>
<tr>
<td>8.6</td>
<td>150</td>
<td>8.27 - 26.6</td>
<td>145 - 276</td>
</tr>
<tr>
<td>21.3</td>
<td>150</td>
<td>20.9 - 60.6</td>
<td>160 - 300</td>
</tr>
<tr>
<td>37</td>
<td>75</td>
<td>up to 103.7</td>
<td>50 - 350</td>
</tr>
</tbody>
</table>

**Product sheet** is available for each SHPU model.
Standardized SHPUs – constituents

Basic configuration includes:
- Housing / fixed volume oil reservoir (1)
- Suction filter (2)
- Electric motor (3)
- Hydraulic pump (4)
- Overpressure relief valve (5)
- Check valve (7)
- Piping
- Sensors (water ingress, E-motor temp.)
- Hydraulic and electric connectors

Optional items:
- External box cooler (11)
- Subsea pressure compensator / reservoir (10)
- Pressure filter (6)
- Hydraulic consumers (9)
- Control components (8)
- Instrumentation
Custom made SHPUs

► Benefits
  ▪ A suitable SHPU for every application
  ▪ Plug & play units
  ▪ One-stop shop

► Extensive track record
  ▪ Water depth rating: 0 – 6000 msw
  ▪ Power rating: 0.1 – 450 kW
  ▪ Supply voltage: Up to 6 kV
  ▪ Shock loads: Up to 15G, 5 ms
  ▪ E-motor types: AC/DC and servo
  ▪ Battery powered

▲ Small sized, 0.2 kW SHPU. This custom designed and build SHPU is battery powered and has a depth rating of 3500 msw.
Custom made SHPUs – Examples

 <-> SHPU at which the powerpack is combined with a number of other hydraulic and electric components. Smart modularization allows for (cost-) efficient subsea hydraulic system designs.

 <-> Modular 225 kW SHPU unit with 7 pump units. This SHPU, with an open pump housing configuration, also features integrated cooling means.

 <-> Duo 120 kW, subsea hydraulic powerpacks in a closed pump housing configuration.
Next to SHPUs, Seatools supplies auxiliary components and sub-systems of the subsea drive system.

This ranges from components such as:
- Compensators & reservoirs
- Subsea sensors

to sub-systems such as:
- Controls
- Umbilical winches

In fact, Seatools can deliver the entire subsea drive train from control panel to actuator.
Typical subsea drive train
In need for a SHPU?
In need for a SHPU?

- Seatools gladly assist you with finding an optimal SHPU solution
- As a starting point, the following basic information is useful to assess your case and advice on a potential SHPU solution:
  - Functional requirements
    - Required pressure & flow rate
    - Number and type of hydraulic consumers
  - Operational requirements
    - Depth rating
    - Type of hydraulic fluid
    - Operational temperature limits
  - System integration:
    - Available power supply
    - Mechanical integration limitations
    - Impression of remaining hydraulic circuit & modularization
  - General:
    - Desired scope of supply (i.e. single SHPU or other drive train elements)
    - Required delivery time
- On the basis of this information, Seatools drafts an initial hydraulic diagram to facilitate further discussions on potential solutions
Get in touch

Would you like to discuss your project with our experts? Contact us via:

- General sales department:
  - E: sales@seatools.com
  - T: +31 (0) 186 68 00 00