Navigating the present, focusing on the future.

WELLOPS DECO SERVICES

• Riserless
• Openwater
• Abandonment
• Module

R.O.A.M.
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Agenda

- Context
  - Helix’s current capabilities/activities in P&A
  - Recent examples of LWI approaches
  - Current limitations in P&A
- ROAM
  - Specification
  - Methodology
- Discussion
Who We Are

**Well Intervention**
Seven (7) dedicated well intervention vessels

**Construction ROV Vessels**
Three (3) state of the art construction ROV vessels

**Remotely Operated Vehicles**
Our Robotic fleet includes small support assets to the latest 200 horsepower vehicles

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Who We Are

3 Regional Offices
- Headquarters - Houston, Texas, USA
- Aberdeen, United Kingdom
- Rio de Janeiro, Brazil

1,480 Employees Worldwide
Our employees take pride in being part of a global company that has set industry records and continues to make the most of opportunities where others see none at all.

~ $500M Liquidity
~$1Bn market capitalization NYSE:HLX

Core Characteristics

- EXPERIENCE
- INNOVATION
- VALUE

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Subsea Well Access Systems

Subsea Intervention Lubricator (SIL)
RISERLESS

Intervention Riser System (IRS)
RISER TO SURFACE
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Well Intervention Vessels
Riserless

SEAWELL
The Seawell is a custom designed, dynamically positioned light well intervention and saturation diving vessel.

WELL ENHANCER
The Well Enhancer is the world's first monohull vessel capable of coiled-tubing intervention.

SKANDI CONSTRUCTOR
Skandi Constructor is a 120 m long advanced light well intervention (LWI) vessel.
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**Well Intervention Vessels**

**Riser-based**

- **Q4000**
  - The Q4000 is the Gulf of Mexico's premier deepwater well intervention vessel, capable of performing a wide variety of subsea operations.

- **Q5000**
  - The Q5000 Well Intervention Semi-submersible is a next-generation design based on Helix Well Ops' Q4000.

- **SIEM HELIX 1 & 2**
  - The Siem Helix 1 and Siem Helix 2 are advanced well intervention vessels capable of completing a wide range of subsea projects.

- **Q7000**
  - The Helix Q7000 DP Class 3 semisubmersible is an advanced, harsh environment well intervention Unit.
OGUK 2017 figures estimate that there are 2447 wells forecast to be plugged and abandoned in the North Sea in the UK, Denmark, Netherlands and Norway between 2017 and 2025. 1624 of those are in the UK sector.

Around 300 Subsea wells in the UK Central North Sea are forecast to be abandoned in this time frame.

How we tackle these wells in the near term will address one of the largest challenges facing the North Sea long term – that is encouraging and not deterring future E&P investment.
Operator drivers

1. Cost reduction:
   Rigs now cheaper

2. Risk reduction:
   Still carry a risk with a lack of info
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focusing on the future.

P&L Pre abandonment

Case Study

Scope: Plug and suspend the well.

12 wells 95 days in field = avg. 7.5 days per well exc. diving

- Tree Cap Barriers and TC removal
- SIL Deployment
- Drift to HUD
- Bullhead tubing to reservoir
- Set deep plug
- Cut tubing
- Set HOS at SSSV
- Shallow plug c/w gauges
- Recover and reconfigure SIL
- Set plug and prong in the annulus tailpipe
- Recover SIL
- Install debris cap

At a later date
Rig can arrive
Interrogate gauges
Pull tree
Run BOP
Pull tubing
Through tubing cementing

- MSV Seawell, SNS, Spring 2017,
- 30m Water depth
- DSV/LWI SIMOPS
Coiled Tubing

• CASE STUDY

A WORLD FIRST FROM AN LWIV VESSEL

Operations
• Drift
• Milling
• 4 gun runs totalling~880ft (new zones)
• Venturi Junk Basket clean-up

Results
• 27 days in field
• 105,000 running feet (8 runs in total)
• Additional oil in excess of 1200 boepd

Capabilities
• Milling
• Long tool strings (guns and straddles)
• N2 lift
• Chemical spotting
• Cement (P&A)
## Traditional thinking...

<table>
<thead>
<tr>
<th>Rig</th>
<th>Why</th>
<th>Cons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Semi/Modu or Jack Up</td>
<td>Reliable and proven</td>
<td>Costs &amp; inefficiency</td>
</tr>
<tr>
<td>EDP LRP</td>
<td>Reliable and proven</td>
<td>Cost and availability</td>
</tr>
<tr>
<td>21” Marine Riser</td>
<td>Reliable and proven</td>
<td>Costly and slow</td>
</tr>
<tr>
<td>BOP for Well Control</td>
<td>Reliable and proven</td>
<td>Heavy (&gt;250Te)</td>
</tr>
<tr>
<td>Separate DSV</td>
<td>Reliable and proven</td>
<td>Can impact campaign costs</td>
</tr>
</tbody>
</table>
Alternative thinking...

<table>
<thead>
<tr>
<th>Rig</th>
<th>Q7000 c/w ROAM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modu or Jack Up</td>
<td>DP3 vessel</td>
</tr>
<tr>
<td>EDP LRP HP Riser</td>
<td>IRS</td>
</tr>
<tr>
<td>21” Marine Riser</td>
<td>Open water</td>
</tr>
<tr>
<td>BOP for Well Control</td>
<td>IRS/ ROAM</td>
</tr>
<tr>
<td>Separate DSV</td>
<td>Combined DSV / LWI upfront</td>
</tr>
</tbody>
</table>
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ROAM

SUBSEA SERVICES ALLIANCE
Helix | Schlumberger
ROAM Overview

Primary Use Cases:

1. To act as a barrier to the environment while displacing or washing contaminants from casing surfaces and annular regions;

2. To provide the ability to perform pressure tests and in-flow tests;

3. To act as well isolation device in the event of DP incident
ROAM - Expanding HWIV Capabilities
**ROAM Specifications**

<table>
<thead>
<tr>
<th>Operations</th>
<th>Barrier to environment during upper abandonment operations; e.g., while setting packers, perforating casing, setting cement plugs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design Certification</td>
<td>System and component level independent review (Lloyds)</td>
</tr>
<tr>
<td>Compatibility</td>
<td>Horizontal and Vertical Trees and Wellheads</td>
</tr>
<tr>
<td>Nominal Bore Size</td>
<td>18-3/4” Production Bore (18.720” drift)</td>
</tr>
<tr>
<td></td>
<td>3-1/16” Circulating Bore</td>
</tr>
<tr>
<td>Pressure Rating</td>
<td>10,000 psi</td>
</tr>
<tr>
<td>Hydraulic Operating Pressure</td>
<td>5,000 psi</td>
</tr>
<tr>
<td>Water Depth</td>
<td>Up to 3000m</td>
</tr>
<tr>
<td>Design Life</td>
<td>20 years</td>
</tr>
<tr>
<td>Temperature Range (Wetted components)</td>
<td>32°F to 180°F</td>
</tr>
<tr>
<td>Material Class</td>
<td>DD minimum (NACE MR0175)</td>
</tr>
</tbody>
</table>
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### 18-3/4” 10K Cameron TL Double BOP

<table>
<thead>
<tr>
<th><strong>Operators</strong></th>
<th>Shear bonnets with Tandem Boosters and integral sequencing valves (both cavities)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Rams</strong></td>
<td>Double ‘V’ Shear (DVS) rams (both cavities)</td>
</tr>
<tr>
<td><strong>Accessibility</strong></td>
<td>Side Ram removal with hydraulically operated bonnets</td>
</tr>
<tr>
<td><strong>Locking Device</strong></td>
<td>Cameron RamLocks (both cavities)</td>
</tr>
<tr>
<td><strong>Max Shear Pressure</strong></td>
<td>2,800 psi</td>
</tr>
<tr>
<td><strong>Side Outlets</strong></td>
<td>4x 3-1/16” 10K BX-154 API Studded, 625 inlaid</td>
</tr>
</tbody>
</table>

### 18-3/4” 10K Cameron DL Annular BOP

| **Accessibility** | Quick-release top for efficient packer changeout with no loose parts |
| **Packer Operating Pressure** | 1500 psi |
| **Side Outlet** | 1x 3-1/16” 10K BX-154 API Studded, 625 inlaid |

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## Shutdown Modes - HPU

<table>
<thead>
<tr>
<th>Level</th>
<th>Initiated</th>
<th>Effect</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>ESD</td>
<td>Pushbuttons at Operator Station</td>
<td>Vents hydraulic supplies to HPU reservoir</td>
<td>ROAM supply fluid is vented, shuttling SPM valves, and closing all valves and rams</td>
</tr>
<tr>
<td>EQD</td>
<td>Pushbuttons at Operator Station</td>
<td>ESD activated first, followed by command to guillotine to sever subsea jumper</td>
<td>ESD sequence, followed by guillotine cut, all valves and rams are closed subsea</td>
</tr>
<tr>
<td>Safety S/D</td>
<td>Upon loss of power to HPU</td>
<td>Loss of power vents hydraulic supplies to HPU reservoir</td>
<td>ESD sequence</td>
</tr>
</tbody>
</table>
## R.O.A.M sequence

<table>
<thead>
<tr>
<th>Step</th>
<th>Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>One</td>
<td>Set reservoir cement suspension plug CT via IRS</td>
</tr>
<tr>
<td>Two</td>
<td>Cut tubing and plug above</td>
</tr>
<tr>
<td>Three</td>
<td>Recover IRS and hang-off under deck cart</td>
</tr>
<tr>
<td>Four</td>
<td>Deploy ROAM</td>
</tr>
<tr>
<td>Five</td>
<td>Unlatch TH on workstring with closed annular</td>
</tr>
<tr>
<td>Six</td>
<td>Circulate annulus, casing surfaces clean</td>
</tr>
<tr>
<td>Seven</td>
<td>Open annular and pull tubing open water</td>
</tr>
<tr>
<td>Eight</td>
<td>Log cement behind casing and interpret data</td>
</tr>
</tbody>
</table>
ROAM / IRS Circulation Path
To summarise

- To reduce cost, a change in approach is required

- FEED study with major GoM client >75% suited to ROAM

- ROAM; in combination with Q7000, is just one approach that can help address the challenge.
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Thank you

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