Rigless P&A of Subsea Wells
– Experiences and improvements
**Gyda 2/1-11**

- Subsea exploration well
- Drilled and suspended by BP in 97
- Primary and secondary plug in place
- RPM logg ran in 2012 confirmed no gas in annulus

- **Objective:**
  Establish top-to-surface cross sectional cement plug for permanent P&A

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**Final P&A Barrier Diagram**
**Gyda 2/1-A-11**

<table>
<thead>
<tr>
<th>Well information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Installation:</td>
</tr>
<tr>
<td>Well no.:</td>
</tr>
<tr>
<td>Well type:</td>
</tr>
<tr>
<td>Validity:</td>
</tr>
<tr>
<td>Revision:</td>
</tr>
<tr>
<td>Prepared:</td>
</tr>
<tr>
<td>Approved:</td>
</tr>
</tbody>
</table>

**Plug & Abandonment**

<table>
<thead>
<tr>
<th>Well barrier elements</th>
<th>Verification of barrier elements</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRIMARY BARRIER</td>
<td></td>
</tr>
<tr>
<td>1. Open hole cement plug</td>
<td>500 meter 6 1/2 open hole cement plug, Tagged.</td>
</tr>
</tbody>
</table>

| SECONDARY BARRIER     |                                  |
| 1. Cased hole Cement Plug inside 7" liner and 9 5/8" casing | Cement plug set on lagged open hole cement plug, 500 meter cross sectional plug, Tagged with 20 kbc and pressure tested to 200 psi (200 kPa) (2.04 g OBM) |
| 2. 7" liner and 9 5/8" casing cement | Full return on 7" liner, Top of 9 5/8" casing cement @ 3325 m MD BRT verified with Sonic log |

<table>
<thead>
<tr>
<th>OPEN HOLE TO SURFACE BARRIERS</th>
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<tr>
<td>1. Casing cement</td>
</tr>
<tr>
<td>2. Casing</td>
</tr>
<tr>
<td>3. Cement plug</td>
</tr>
</tbody>
</table>

**Well Integrity Issues** | **Comments / Notes**

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Service providers

Island Offshore

- AOC – Application of consent
- HC vent system
- 400+ interventions under pressure

Offshore Installation Services

- 100+ P&A jobs
- SWAT tool
Animation
Planning and preparations

- NORSOK and zones
  - Shortcomings

- Mobilisation
  - Deck layout
  - Seafastening

- Deck
  - 120 meter, 1470 m²
  - Utilize available facilities
Planning and preparations

➢ Trial in Port
  • Calm waters
  • Optimized handling
  • Less operational stress
In operation

- Upper perforation
  - Had to use smaller charges with less penetration capability

- Circulation
  - Insufficient circulation rate
  - Perforation confirmed no gas in annulus
  - Had to re-perforate
  - Bullheaded mud through 20” shoe

- Placed 200 m cross sectional cement with full returns
In operation

- Casing hanger seal assembly leaking after perforation
  - Small volume
  - Dye-pill seen coming out of wellhead
  - Top cement tagged at expected and theoretical depth
Summary

• The operation on 2/1-11 took 7 days
• No HSE incidents related to the well activity
• Our impression is that there has been little development of the particular technology and equipment over the last 15 years
• In spite of winter season we had little lost time due to weather
• To achieve adequate circulation without losing integrity was our main issue on both wells

• We like the concept, but see a need for increased focus on R&D of the equipment and method