Vessel-Based Suspended Well Abandonment

Presented by:

Michael Noble, OIS
Business Development Manager
Introductions & Agenda

Introductions

• **Michael Noble**, Business Development Manager, OIS
• **Kevin Bainbridge**, Intervention Superintendent, OIS
• **Nick Wood**, Business Development Manager, UK, Claxton Engineering
• **Vegard Dale**, Business Development Manager, Norway, Claxton Engineering

Agenda

• **Introduction**
• **Experience**
• **Well Decommissioning Considerations**
• **Well Categorisation**
• **Vessel Versus Rig**
• **Vessel Based Well Abandonment Spread**
• **2012 Multi-Operator Campaign Case Study**
INTRODUCING ACTEON

WHERE WE WORK

OUR CLIENTS

Contractor 20%
Independent Operator 22%
EPIC Contractor 11%
Driller 9%
Major Operator 24%
NDC 14%

Operating Areas
- Foundations and Moorings
- Risers, Conductors and Flowlines
- Marine Electronics, Instrumentation and Surveys

...Supported by...
- Activity Management
- Manpower Provision

ACTEON COMPANIES

Acteon Locations
Acteon Company Project Experience

2H offshore
aquatic
CAPE
CiS
claxton
FLUKA
ENGANHARIA LTDA
InterAct
INTERMOOR
LVD
MENCK
MIRAGE
NCS survey
OIS
PULSE
SRP
SEATRONICS
TEAM

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Well Abandonment Services

- We employ a vessel based, diver-less solution to the permanent abandonment of Exploration and Appraisal wells.

- OIS project manages the entire operation including all procedures required to support client’s suspended well decommissioning needs.

- Claxton Engineering supply the Suspended Well Abandonment Tool (SWAT) System and the SABRE abrasive multi-string cutting system.

- OIS has successfully completed 16 UKCS multi-operator campaigns since 1996.

- During this time OIS has had no reportable environmental incidents or a single offshore lost time incident.
Experience

The team has successfully abandoned 109 wells since 1996:

- 9 wells were Category 1
- 47 wells were Category 2.1
- 50 wells were Category 2.2
- 3 wells were Category 2.3

### Our Clients

<table>
<thead>
<tr>
<th>Nexen</th>
<th>Centrica Energy</th>
<th>GDF Suez</th>
<th>Dana Petroleum</th>
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<tbody>
<tr>
<td>BP UK</td>
<td>Amerada Hess</td>
<td>Total</td>
<td>Maersk</td>
</tr>
<tr>
<td>Nippon</td>
<td>Gas de France</td>
<td>CNR</td>
<td>Ithaca Energy</td>
</tr>
<tr>
<td>Premier Oil</td>
<td>Tullow Oil</td>
<td>Conoco</td>
<td>RWE</td>
</tr>
<tr>
<td>Marathon</td>
<td>Enterprise Oil</td>
<td>Kerr McGee</td>
<td>Talisman</td>
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Well Decommissioning Considerations

• In the UK the Department of Energy and Climate Change (DECC) is actively requesting operators to fully abandon suspended wells which have come to the end of their production life-cycle.

• Operators are obliged to fulfil their responsibilities with the decommissioning of non-revenue generating assets but this can often meet resistance. (Well re-entry plans, internal budgets, partner approval).

• We are aware of the specific requirements required in Norway...
  
    • If a vessel is to be directly involved with a live well then there is a need to have the **Acknowledgement of Compliance (AoC)**.

    • The 3 vessels that have this: Island Wellserver, Island Frontier and Island Constructor – 2 of which OIS has chartered for previous well abandonment campaigns.

    • However, the AoC considerations are less clear upon issues of well control in the case of suspended wells, in which there is **no live well control**.

• **NORSOK D-010** (well integrity in drilling and well operations) standards are also a major consideration.
Well Categorisation Requirements

- Wells requiring insertion of shallow cement plugs across the well bore and annuli are classed as **category 2** with the following sub-categories in place:
  - Category 2.1 – One casing string.
  - Category 2.2 – Two casing strings.
  - Category 2.3 – Three casing strings.

- In order to be classed as **category 2**, wells **must** have deep set permanent cement plugs in place. If they do not then they are not suitable for intervention using the OIS systems.

- Upon insertion of shallow cement plugs (**Norway requirement 150ft of good cement** / UK requirement 100ft), a well will be classified as **category 1**.

- **Category 1** wells not only require removal of well head and casing (**Norway requirement - casing to be cut 15ft below mudline** / UK requirement -10ft) but also any **permanent guide base, temporary guide base** or associated **subsea structure**.

- Wells can now be abandoned using a rig based and vessel based intervention methods to form permanent internal barriers.
Vessel Versus Rig

• A vessel based approach provides **significant cost savings** when compared to the hire of a rig. The day rate for vessel (incl. fuel) is approximately 30%-40% of the cost associated with a rig.

• Projected statistics for 2013-2016 suggest **extremely limited rig availability**.

• A vessel is able to **move quickly and easily** between work site locations, conducting operations using dynamic positioning, which when compared to a semi-sub or a jack-up or drilling rig, which require positioning and moorings, **ensures significant time savings**.

• Typical intervention **operational times are reduced** with a vessel. These are between 36hrs to 60hrs (indicative) depending on the categorisation of the wells.

• Lifting operations for well stubs, well heads and structures is **safer and more efficient** when executed with a vessel crane.

• For well abandonment operations OIS does not require the use of a heavy WIV, rather a **DP light construction** or **dive support vessel**.

**Vessel Specification for SWAT:**

• **DP 2 Support Vessel with a min 800m² deck space.**
• **100 Tonne lifting capacity crane.**
• **Work class ROV.**
• **Moon pool for deployment and recovery of SWAT.**
• **Ideally below deck cement storage and recovered mud/seawater storage.**
• **Accommodation for 30 project crew.**
Suspended Well Abandonment Tool (SWAT) System

- The SWAT System is designed to permit **perforation**, **circulation** and **cementation** of multiple casing annuli.

- The SWAT system has been used to abandon over 80 category 2 subsea wells in the UKCS.

- OIS is awaiting publication of the revised **NORSOK D-010** (well integrity in drilling and well operations) standard to assess tool compatibility.

- Designed for deployment from the back deck or ideally through the **moon pool** of a light **CSV**. The tool is landed on the well head and **controlled from the surface** through an umbilical.

- SWAT is **versatile** and can be **configured** to suit different categories of subsea wells.

- Achieved by perforation of intermediate strings and the setting of additional abandonment plugs.

- 100% redundancy as one **complete spare system** is carried on deck.

- The system received the **Queen’s Award for Engineering Innovation** and **Petroleum Institute Platinum Award**.

  ....6 minute SWAT animation
SABRE Abrasive Cutting Tool

- The SABRE abrasive water jet cold cutting system severs multiple well head and casings internally.

- The **abrasive jet** is capable of cutting through virtually any material including composites such as **cemented casing strings**, regardless of casing load or eccentricity.

- SABRE is a **diverless** operation.

- Cutting manipulators available to suit all standard casing sizes.

- The tool has no impact on adjacent infrastructure.

- Environmentally friendly naturally occurring cutting medium; garnet (semi-precious stone) and water.

- Casings can be cut and recovered **simultaneously** or individually.

- Cutting jet can be controlled to **selectively cut casing strings**.

- Modular system equipment spread can be adapted to a wide range of applications due to the small deck footprint.
2012 Multi-Operator Campaign

• Our most recent UKCS campaign consisted of 9 wells which were successfully abandoned for 3 operators.

• We plan and execute all operations from the initial review of well schematics to the production of end of well reports.

• This includes vessel charter supporting clients with legal notifications and dispensations.

• OIS manage all 3rd party equipment and have long standing relationships with trusted suppliers, including:
  – Experienced personnel
  – ROV and survey
  – Intervention
  – Severance
  – Cementing
  – Perforating
  – Logistics
  – Sea-fastening and welding
  – Waste disposal (recovered structures and recovered annular fluids, i.e. oil based mud)
  – Emergency response during offshore operations
Removal of Structures and Frames

OIS prides itself on its ability to engineer solutions to technical challenges associated with well access.

Structure Removal (2012 Campaign):

<table>
<thead>
<tr>
<th>Structure</th>
<th>Action</th>
<th>Method</th>
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<tbody>
<tr>
<td>Juliet 47/24a-5</td>
<td>Protective frame</td>
<td>Dril-Quip running tool</td>
</tr>
<tr>
<td>Juliet 47/24a-5</td>
<td>TA Cap</td>
<td>Over-shot with 5-7/8” grapple</td>
</tr>
<tr>
<td>Cavendish 43/192-4z</td>
<td>6-Slot drilling template</td>
<td>Recovered using recovery rigging</td>
</tr>
<tr>
<td>Cavendish 43/192-4z</td>
<td>Debris Cap with 66ft stinger section</td>
<td>Recovered &amp; cut into sections on deck</td>
</tr>
<tr>
<td>Foxtrot 49/30b-10</td>
<td>Structure and net guard recovered</td>
<td>Straight pull, recovery rigging</td>
</tr>
</tbody>
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Removal of Temporary Abandonment Caps

OIS and Claxton Engineering has a proven track record designing bespoke solutions to client’s specific well needs. This includes designing and engineering a diverless Temporary Abandonment Cap Recovery Tool (TACRT) in 2011 for Centrica. Specific benefits of the TACRT include:

- Applies torque directly to cap.
- Independent of surface sea state / tidal effects.
- Requires no drill pipe to surface.

**TA Cap Removal Operations (2012 Campaign):**

<table>
<thead>
<tr>
<th>Well</th>
<th>Details</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minke Well 44/24-4</td>
<td>13-3/8” x 9-5/8” combined TA Cap</td>
<td>Ingram Cactus/Plexus</td>
</tr>
<tr>
<td>Minke Well 44/24a-5</td>
<td>13-3/8” x 9-5/8” combined TA Cap</td>
<td>Ingram Cactus/Plexus</td>
</tr>
<tr>
<td>Cavendish Well 43/19a-4z</td>
<td>20” TA Cap and 9-5/8” TA Cap</td>
<td>Ingram Cactus/Plexus</td>
</tr>
</tbody>
</table>

- Overall Recovery Duration = 19hrs
- Overall Recovery Duration = 19.75 hrs
- Overall Recovery Duration = 22.5 hrs

This equates to an average of 15.3 hrs / TA Cap
Multi-Operator Efficiencies

- Careful planning ensures that candidate wells are within close proximity to minimise transit times.
- Campaigns consist of wells which require a consistent equipment spread.
- Costs are proportional to the ratio of wells.
- The risks associated with waiting on weather are shared.
- Lump sum costs such as mobilisation/demobilisation are shared.
- Transits to the mobilisation/demobilisation point and between work sites are shared.
Thank you...