Subsea Intervention: Is It Worth It?

Drummond Lawson
Subsea Intervention

Is It Worth It?

- Subsea development timeline
- Why Intervene?
- What can you achieve?
- Intervention methods
- Intervention drivers
- What is in the market?
Size of UKCS Discoveries

[Graph showing the size of UKCS discoveries from 1980 to 2000, with lines for average size, maximum size, and number of discoveries per annum.]
Drilling and Intervention costs on Subsea Wells are approximately 10 times corresponding platform costs.

Yet.....

Subsea Recovery Rate is less than dry wells:

- Platforms (dry trees): 57%
- Subsea (wet trees): 43%
Subsea Well Productivity

“Platform wells produce 25% better than subsea because of routine intervention”

• Equivalent to $20.7 Billion per annum production short fall
• Norwegian Petroleum Directorate (NPD) estimates well intervention could improve subsea recovery factor by 5%
• Equates to $5.15 Billion per annum prize
Subsea Well Productivity
Why Intervene?

For Well Diagnostics:
• To measure flow characteristics
• To gather geological data
• To gather fluids date

For Well Modifications & Repair:
• Shut off water production
• Reservoir fracturing and stimulation
• Re-perforating and perforating new intervals
• Opening and closing valves
• Replacing Gas Lift valves or Safety Valves
• Setting Plugs
• Removing Scale, etc…..
Unique Subsea Challenges?

Safety

• Hazardous working environment
  – Dynamic movement between vessel and wellhead
  – Remotely operated equipment – no tactile feedback
  – Weather
  – Subsea currents (especially in very shallow / deep water)

Technical Challenges

• Hydrostatic pressures
• High reliability required (high cost of repairs)
• Subsea deployment & recovery expose equipment to severe loadings & vibration
Subsea Intervention Categories

• Category A
  – Well operations using subsea lubricator

• Category B
  – Well operations using open water high pressure riser

• Category C
  – Well operations using high pressure riser inside marine riser and drilling BOP
Intervention Category C

Semi sub rig with Drilling BOP and Marine Riser.

High Pressure Riser is run inside Marine Riser

High cost
Time consuming
Intervention Category B

Can be done from light rig or boat.

High pressure work over riser run open water from rig / boat to subsea well

Cheaper than C
Less time consuming than C
**Intervention Category A**

Dynamically positioned vessel used to deploy riserless system in 1 or 2 lifts

Lowest cost well intervention
Shortest operational times
What Can Intervention Achieve?

**Category A**

Light Intervention
Wireline & Slickline

Logging
Zonal Isolation
Wireline perforating
Plug set & recover
Valve / Sleeve shifting
GLV change out
WRTRSSV install
Xmas Tree Changeout
Acidising
Well Abandonment (Cat 2.2 or better)
## What Can Intervention Achieve?

<table>
<thead>
<tr>
<th>Category A</th>
<th>Category B</th>
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</thead>
<tbody>
<tr>
<td>Light Intervention</td>
<td>Medium Intervention</td>
</tr>
<tr>
<td>Wireline &amp; Slickline</td>
<td>Wireline, Slickline &amp; Coil</td>
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<tr>
<td></td>
<td>All Cat A plus:</td>
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<td>Flowline Intervention</td>
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<td>(TCP Guns + Unloading)</td>
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<td>ESP Changeout</td>
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<td>Scale squeeze, Acidizing &amp; Fracturing</td>
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<td></td>
<td>Sand or Scale Cleanout</td>
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<td>Zonal isolation (plug or patch)</td>
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- Logging
- Zonal Isolation
- Wireline perforating
- Plug set & recover
- Valve / Sleeve shifting
- GLV change out
- WRTRSSV install
- Xmas Tree Changeout
- Acidising
- Well Abandonment (Cat 2.2 or better)
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<td>Scale Milling</td>
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Drivers For / Against Intervention

Drivers For Intervention:
• Increase subsea well ultimate recovery (Statoil aiming for 55% by 2009)
• Improve economics of subsea production (esp. deepwater)
• Meet regulatory obligations
• Gather data for improved field management
• High oil price

Factors Against Intervention:
• High cost of intervention
• Weather risk to intervention economics
• Low incremental production increases on small fields
• High remedial costs if tools get stuck or dropped
• Perceived lack of capabilities for some intervention methods
• Low oil price
How To Bridge The Gap?

How do we mitigate the factors against intervention?

Factors Against Intervention:
- High cost of intervention
- Weather risk to intervention economics
- Low incremental production increases on small fields
- High remedial costs if tools get stuck or dropped
- Perceived lack of capabilities for some intervention methods
- Low oil price

- Reduce intervention cost (Statoil aiming for $1MM / well)
- Reduce weather sensitivity of operations (purpose built vessels & equipment)
- Lower cost = higher benefit even for small fields
- Improve remedial capabilities of low cost intervention systems (currently in development)
- Improve range of intervention operations possible with low cost intervention systems (currently in development)
Low Cost Subsea Intervention

What's In or Coming To The Market?

- **Exprogroup**
- **Seatrac**
- **FMC**
- **Well Ops**
- **Currently Operational**
- **Being Upgraded**
- **In Development**
- **Oceanengineering**
Subsea Intervention Vessels

What’s In or Coming To The Market?

- Well Ops Seawell - Operational
- Island Frontier - Operational
- TSMarine “Havila Harmony” (2007)
- Island “Wellserv” (2008)
- Well Ops “Seawell II” (2008)
Subsea Intervention: Is It Worth It?
YES!
Questions