Shallow Water Well
Conductor Life Extension
Strategy
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SUT China
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Agenda

- Background
- Pre-Assessing
- Detailed Analysis & Repair
- Conclusions

Learn more at www.2hoffshore.com
Background
Background

Wellhead & Tree

Surface Casing
Conductor

Annular Liquid Level

Top of Cement

Intermediate Casing

MSL

Guide/Centralizer

Mudline

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Background

North Sea

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Number of Fixed Platform</td>
<td>~190</td>
</tr>
<tr>
<td>Service Life &gt; 15 years</td>
<td>~120</td>
</tr>
<tr>
<td>Service Life &gt; 25 years</td>
<td>~50</td>
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</tbody>
</table>

Gulf of Mexico

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>Total Number of Fixed Platform</td>
<td>~4000</td>
</tr>
<tr>
<td>Service Life &gt; 30 years</td>
<td>~1200</td>
</tr>
<tr>
<td>Service Life &gt; 40 years</td>
<td>~400</td>
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</tbody>
</table>

Ref: Wall Street Journal

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Corrosion has been found in some of the well conductors in South China Sea, eg:

- **Yacheng13-1 Gas Field**: Heavily corroded occurs at the tidal zone.
- **Weizhou11-4 Oil Field**: Perforation is found in some conductors.
- **Huizhuo26-1 Oid Field**: Heavily corroded occurs on the conductors.

Ref: 
*Research and Application of Platform Baseline Management*

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Localized Conductor Defects

Conductor Crack

Pitting Corrosion

Perforations

Guide Failure

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## Generalized Wall Loss

<table>
<thead>
<tr>
<th>Elevation above Seabed (m)</th>
<th>WT along Conductor Circumference (mm)</th>
<th>Mean WT Loss (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>28</td>
<td>North 18.3 East 19.2 South 19.4 West 20.6 Mean 19.4</td>
<td>6.0 23.7</td>
</tr>
<tr>
<td>26</td>
<td>North 19.7 East 18.9 South 19.7 West 19.2 Mean 19.3</td>
<td>6.1 23.8</td>
</tr>
<tr>
<td>24</td>
<td>North 17.5 East 20.0 South 20.3 West 19.5 Mean 19.3</td>
<td>6.1 23.8</td>
</tr>
<tr>
<td>22</td>
<td>North 16.6 East 18.3 South 20.0 West 13.7 Mean 17.1</td>
<td>8.3 32.5</td>
</tr>
<tr>
<td>20</td>
<td>North 17.1 East 18.9 South 18.3 West 14.9 Mean 17.3</td>
<td>8.1 31.9</td>
</tr>
<tr>
<td>18</td>
<td>North 9.9 East 10.3 South 9.7 West 11.4 Mean 10.3</td>
<td>15.1 59.3</td>
</tr>
<tr>
<td>16</td>
<td>North 12.6 East 12.6 South 10.3 West 11.4 Mean 11.7</td>
<td>13.7 53.9</td>
</tr>
</tbody>
</table>

**Conductor OD (mm)** | 762
---|---
**Conductor ID (mm)** | 25.4
**Maximum WT (mm)** | 19.4
**Minimum WT (mm)** | 10.3

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Conductor Life Extension Strategy

Group ‘Similar’ Defects

Pre-Assessment

Detailed Assessment

Repair or Mitigation

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Pre-Assessing Defects
Pre-Assessing Defects

- Localized defects
  - Qualitative Risk Assessment
    - System Identification and Description
    - Hazard Identification
    - Consequence Identification
    - Description of the Risk

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Pre-Assessing Defects

- Generalized Wall Loss
  - Screening Tool

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Detailed Assessment
Detailed Assessment

- Calculate global bending loads for operational and extreme conditions
- Calculate axial loads through the conductor for production and work-over scenarios

**Local Defects:** Estimate local combined stresses at the defect location

**Generalized Wall Loss:** Conduct a conductor stability evaluation

Conductor Repair or Threat Mitigation

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Global FEA – Bending Moments

- Equivalent pipe model represented by beam elements;
- Laterally supported at guide locations;
- Nominal and extreme wave and currents simulated.

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Axial Load Determination

Axial Load on the Conductor during Well Construction

- Land and cement 20 inch surface casing
- Land BOP
- Land and cement 13-3/8 inch casing
- Land and cement 9-5/8 inch casing
- Land and anchor 7 inch tubing
- Remove BOP
- Land tree
- Remove tree
- Land HWOU
- Pull 7" Tubing

Well Construction | Production | Work-Over

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Local FEA

- Develop local FE model;
- Identify boundary conditions;
- Apply global bending and axial loads.

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Local Sleeve Repair

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Generalized Wall Loss

- The key concern for the conductor with weakened walls is the decrease in stability.
- Conductor stability is assessed under the calculated buckling load as per recommendations provided by Stahl and Baur\(^1\).

1. Stahl and Baur – “Design Methodology for Offshore Platform Conductors”, Published by Society of Petroleum Engineers (SPE), Paper OTC 3903, Published at OTC 1980.

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Span Supports

Guides

Buckling

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Conclusions
Conclusions

- It is important to understand the role of well conductors in well integrity;
- Any repair design should be based on a detailed assessment of all operational and extreme loads;
- Generalized wall loss must be viewed from the standpoint of conductor stability.

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Questions?
Thank you