Life Extension of Subsea Umbilical Systems – Assessment Process

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Typical Life of Field Model

Life Extension of Subsea Umbilical Systems

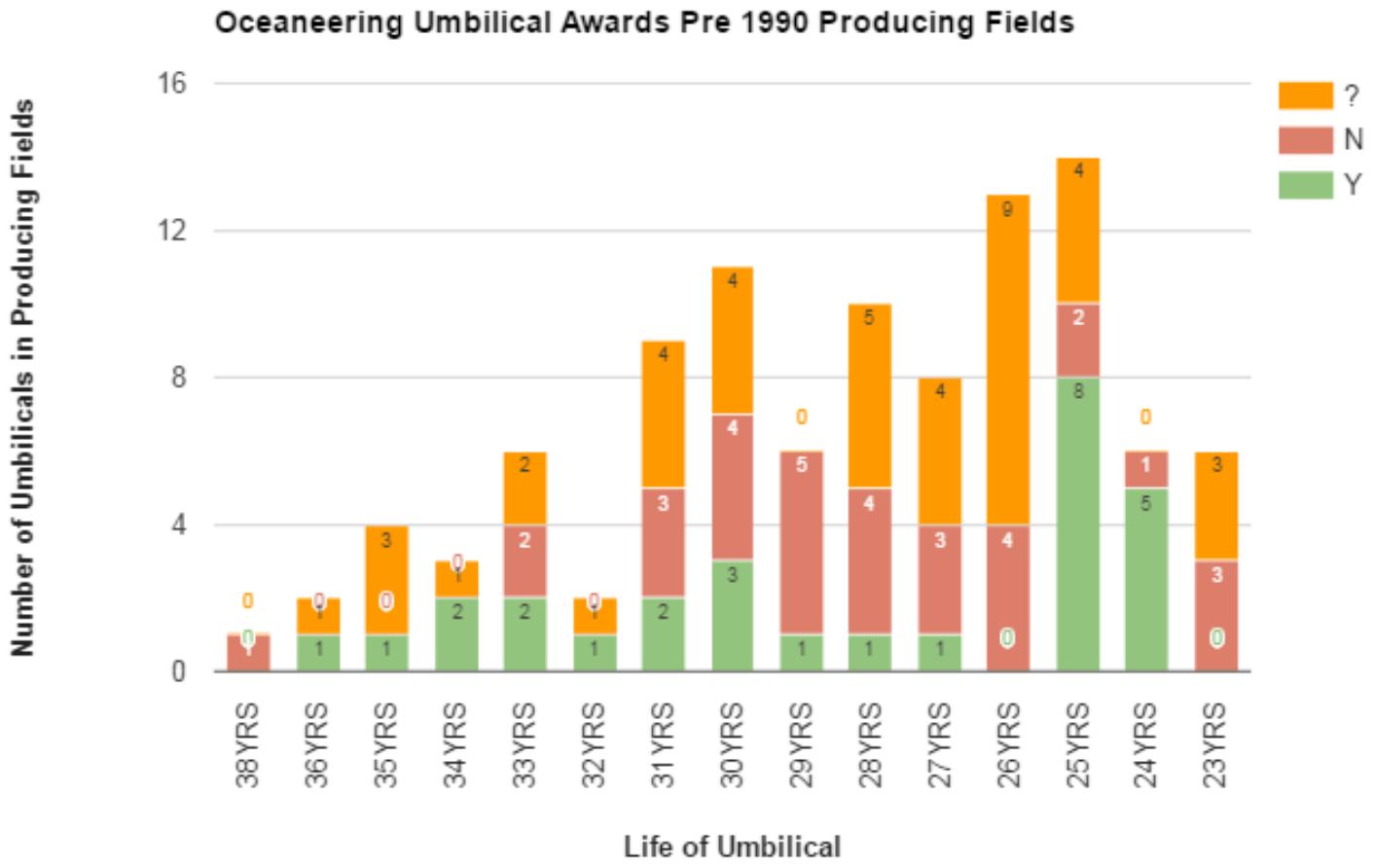
Why is ALE such an important consideration?

- Assets in many parts of the world have reached (or will soon reach) the end of their originally specified design life.
- Technology allowing the extension of the life of fields
- Better assessment of oil/gas reserves
- Use of existing infrastructure to support new developments (tiebacks) and minimize overall CapEx cost.
- Asset replacement, in order to cover a short life extension, is not always cost-effective.

ALE: Ageing and Life Extension

Life Extension of Subsea Umbilical Systems

Why is ALE such an important consideration?



Life Extension of Subsea Umbilical Systems

The Oceaneering Approach

- There are no specific guidelines from industry standards.
- Oceaneering approach is based on the "*Guidance on the Management of Ageing and Life Extension for UKCS Oil and Gas Installations*" (Issue 1, April 2012) and the *"Guidance on Ageing and Life Extension Aspects of Electrical, Control & Instrumentation Equipment"* (Issue 1, May 2014).

Asset Life Extension Assessment

Discovery

Identify Potential Asset Life Extension Issues

Understanding of current condition, asset risk register, and, where applicable, historical review:

- A systematic assessment of asset performance history should be conducted to support asset life extension goals and requirements;
- A review of available asset documentation should be conducted in support of this.
- Assimilation of the gathered data is a precursor to identifying and evaluating any issues required to be resolved in support of asset life extension.

Reference: *"Guidance on the Management of Ageing and Life Extension for UKCS Oil and Gas Installations"* document (Issue 1, April 2012)

Asset Life Extension Assessment

Risk Identification

Identify Potential Risks via Gap Analysis

This involves a **critical review of what is and isn't currently known about asset condition**. This should consider:

- Original, current, and any anticipated standards applicable to the equipment
- Potential degradation mechanisms
- Ageing/wear out models
- Existing life extension strategies, if available
- Known anomalies and defects
- Best practice

Reference: *"Guidance on the Management of Ageing and Life Extension for UKCS Oil and Gas Installations"* document (Issue 1, April 2012)

Asset Life Extension Assessment

Risk Assessment

Rating Identified Risks

This assessment should **identify any gaps that should be addressed** to support the proposed period of life extension.

- Does current condition of equipment/system and credible threats to integrity of the equipment/system give confidence that it can remain fit-for-purpose for the proposed extension?
- Could the degradation/failure occur?
- If this degradation occurred, would it be identified through the current inspection/testing regime?
- Has the degradation/failure occurred in the asset's history or in other installations?
- Could the issue occur or re-occur during the Life Extension period?
- What action is required in each of the above cases?

Reference: *"Guidance on the Management of Ageing and Life Extension for UKCS Oil and Gas Installations"* document (Issue 1, April 2012)

Asset Life Extension Assessment

Reporting

Supporting the ALE Recommendations

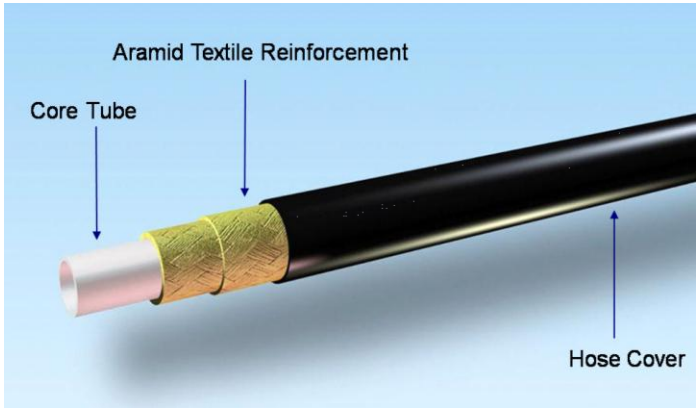
- The output from the gap analysis is the basis for establishing the work scope required to support the specified asset's life extension goals.
- An Asset Life Extension report capturing the output from the process should be generated.
- Commercial aspects will also be considered within the report.

Reference: *"Guidance on the Management of Ageing and Life Extension for UKCS Oil and Gas Installations"* document (Issue 1, April 2012)

Typical Issues Related to Umbilical Systems

Chemical Compatibility

- Long(er) term effects of exposure to operational fluids;
- Effects of temperature and UV radiation
- Changes in fluids
- Fluid Mixtures



Electrical Performance Remediation

- Reverses the effects of water ingress into electrical cables and equipment
- Can extend the life of failing umbilicals:
- ‘Buys time’ whilst a new umbilical is procured
- Used instead of installing a new umbilical
- Can be used to postpone field abandonment

Typical Issues Related to Umbilical Systems

Fatigue Damage Verification Analysis

Reassess umbilical fatigue damage using:

- Installation information;
- Actual riser configuration;
- Latest Met-ocean data and RAO Curves;
- Modern tools and methods;

Armour Wires Integrity

- Potential use for Umbilical wires integrity verification
  - Corrosion
  - Breaks
  - Dents
- Work-in-progress - ongoing trials to characterize armour wire defects

Typical Issues Related to Umbilical Systems

Anode Mass Verification

- Re-assessment of the required mass of anodes for the desired life extension

Visual Inspection

Hang-off point inspection for:

- Hose fittings condition;
- UV Degradation;
- I/J-Tube Flange Bolts condition;
- Methanol trap seals condition

Discussion and Conclusions

What can we do differently?

- What would help making these decisions years from now?
  - Better document and data management
    - Design documentation
    - Failure reports
    - Inspection reports
    - Performance monitoring

      Pressure cycles,

      Electric readings,

      Strain,

      Temperature,

      Vibration,

      etc

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