Life Extension of Subsea Umbilical Systems – Assessment Process

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Typical Life of Field Model

**Planning & Pre-Drill**
- Early Phase Studies & Front End Planning
- Conceptual Studies
- Engineering Studies
- Surveying

**Drilling & Completion**
- ROV Services
- ROV Tooling
- Dredging
- BOP Controls
- BOP Intervention
- IWOCs
- Subsea Valves
- Communications

**Installation & Construction**
- ROV Services
- ROV Tooling
- Umbilicals
- Subsea Hardware
- Connection Systems
- Pipeline Repair
- Installation Services
- Diving
- Dredging
- Communications

**Production & Maintenance**
- ROV Services
- ROV Tooling
- Flow Assurance
- Umbilicals
- Cutting Services
- Subsea Hardware
- Connection Systems
- Pipeline Repair
- Asset Integrity
- Diving
- IMR Services
- Communications
- Asset Tracking
- Dredging

**Decommissioning**
- ROV Services
- ROV Tooling
- Decom. Services
- Pipeline Repair
- Diving
- Communications
- Dredging
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

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

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

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

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