Integrity Management of Subsea Facilities through the use of Cross Industry Good Practice Guidance

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Contents & Presentation Structure

- Introducing the Energy Institute (EI)
- EI Technical Work Programme
  - Technical Committees
  - Good Practice Guidance Development
  - Recently published EI Subsea Guidance

Announcing New Guidance for the Management of Subsea AVIFF

- Invite Call to Subsea Industry
- Questions and Answers
EI Activity
Introducing the Energy Institute
The Energy Institute (EI) is the professional body for the energy industry, delivering professionalism and good practice across the depth and breadth of the energy sector.

The EI:
• is a learned society
• is a not for profit organisation
• has charitable status
• is a Royal Chartered body
EI: Sharing energy knowledge...

Delivering **good practice** and **professionalism**
Members & Member Organisations

- The EI has 15,000 individual members from across the energy sector
- The EI has over 300 company members, working in and supporting the wider energy sector
- The EI has a number of key technical partners supporting the EI in the delivery of good practice and professionalism

Branches

- The EI HQ has a main office in London and a presence also in Aberdeen
- The EI has a network of branches through the UK and also internationally
- International branches include Lagos, Dublin, Abu Dhabi, Hong Kong, Kuala Lumpur, Singapore
EI Technical Work Programme

A core pillar of the EI is the development and publication of good practice. This is facilitated through the EI Technical Work Programme, which is supported by the EI’s Technical Partners.

“The EI’s Technical Programme aims to provide industry with cost effective, value adding knowledge on key current and future issues.”

The role of the EI is to act as an honest broker between industry and regulator, supporting and facilitating self-regulation in the energy industry.
EI Upstream Activity

Technical Committees
EI’s Technical Partners

The technical partners support the EI in the delivery of good practice guidance for the wider industry to:

1. Demonstrate to regulatory authorities industry is operating using good practice
2. Assist industry operations /achieve their objectives.
3. Provide a forum for regulators to access industry on technical issues

This is achieved by:

1. Setting the strategic direction for the EI’s Technical Programme
2. Funding the Institute to enable the running of committees and to resource consulting services as needed
EI: Sharing energy knowledge...

Delivering **good practice** and **professionalism**
Current Technical (STAC) Members:

- E.ON
- Statoil
- BP Exploration Operating Company Ltd
- BP Oil UK Ltd
- Shell UK Exploration & Production
- ConocoPhillips
- Phillips 66
- Talisman Energy (UK) Ltd
- ExxonMobil
- BG Group
- Chevron
- EDF
- Valero
- SSE
- Scottish Power
- Centrica
- Kuwait Petroleum Aviation
- Maersk Oil North Sea Ltd
- Murco Petroleum Ltd.
- RWE npower
- Shell UK Oil Products Ltd
- Saudi Aramco
- Total E & P UK plc
- Total UK Ltd
- Nexen
- ENI
- Premier Oil
- WFS
- International Power
- Dong Energy
- Statkraft
- Vattenfall
Working for Industry

Scientific and Technical Advisory Committee (STAC)

- Standard Test Methods
- Hydrocarbon Management Committees
- Distribution & Marketing Committee
- Safety & Integrity Management
- Health Technical Committee
- Environment Management Group

Industry Working Groups & Committees
EI Technical Committees – Developing Good Practice
Technical Guidance for the Energy Industry

Process Safety Committee (PSC)
- Cross sector coverage of safety, human factors, electrical classifications etc

Corrosion Management Committee (CMC)
- Upstream vehicle for Corrosion Engineering and Management Good Practice Guidance
- Recently CMC (and its published Guidance) was cited in the HSE KP4 Interim Report Presentation (November 2012, Aberdeen) as a major contributor to the success of the Industry in delivering on KP4 Corrosion Related Issues

Ageing and Life extension Working Group (ALEWG)
- Technical Guidance development for upstream Industry
- Linked into equivalent downstream activity for cross learning
- and represented on cross-energy industry ALE Forum
Recently Published Guidelines...
...for the Subsea Industry

Guidelines for the management of obsolescence in subsea facilities

These guidelines provide all those with an involvement in subsea systems with guidance on how to manage obsolescence in subsea equipment. They discuss how a clear management policy should be developed to manage the obsolescence lifecycle, assess potential risks and determine the probability of failure whilst alternative components are sought, or modules are redesigned.

The document is structured in two parts:

- Part A: high level management policy and principles for subsea obsolescence, plus the framework for successful obsolescence management processes, useful for senior managers.
- Part B: more detailed guidance for practitioners of obsolescence management, including lifecycle management and strategies, tasks and responsibilities, monitoring, risk assessment, and a review of equipment.

Recently Published Guidelines for the Subsea Industry

Guidelines for the management of integrity of subsea facilities
This guideline provides recommendations to operators and contractors on how to manage system integrity and reliability. It addresses consideration, at the design stage, of those features that will encourage integrity and reliability, and support maintainability, throughout field life and into the decommissioning phase.

Guidelines for the avoidance of vibration induced fatigue failure in process pipework
The revised guidelines aim to reduce the frequency of leaks from process pipework by ensuring their continuing integrity. They provide a comprehensive approach to the ‘through life’ management of pipework vibration-induced fatigue and provide both qualitative and quantitative assessment methods. They capture more experience of their practical application; have improved usability; include updated assessment methodology; include intrusive elements; have an extended scope of small bore connection designs; and, include work published by the HSE.
2nd ed Jan 2008 978–0–85293–463–0
Subsea AVIFF – Avoidance of Vibration Induced Fatigue Failure

Overview

- EI Subsea JIP for avoidance of vibration induced fatigue failure in process piping – Project S1116
- Funding in place via EI Scientific and Technical Committee (STAC)
- Builds on the ‘topsides’ version of the EI Guidelines for vibration induced fatigue of process pipework, but adds new screening methods and guidance on design, simulation and monitoring
- Steering committee includes BP, Chevron, Nexen, Shell, Total, HSE
Subsea AVIFF – Avoidance of Vibration Induced Fatigue Failure

Subsea Experience

- Assessment of subsea systems to vibration-induced fatigue has been largely limited to vortex-induced vibration (VIV) of riser systems and unsupported pipeline spans (i.e. environmental loading).

- Piping vibration due to process excitation has started to become an issue on manifolds and jumpers, in part associated with increasing flowrates.

- Additional problems have been experienced with valves and instrumentation.
Objective

- Produce engineering guidelines for use at the design stage or when changes to existing systems are being contemplated

Emphasis

- For new designs, ‘designing out’ the issue
- For existing equipment, identifying and mitigating the threat

Timeline

- First meeting June 2011
- Draft document issued for comment - end of July 2012
- Incorporation of comments and formal publication - end 2012
Subsea AVIFF

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Subsea AVIFF

Vibration excitation mechanisms included:

- Flow induced turbulence / multiphase flow
- Pulsation: flow induced excitation (deadleg)
- Pulsation: flow induced excitation (rough bore risers/jumpers)
- High frequency acoustic excitation (acoustic fatigue)
- Surge/momentum changes due to valve operation
- Cavitation and flashing
- Vortex induced vibration
Subsea AVIFF

Rough bore flexibles:

- Discrete frequency excitation generated by flow instability / vortex shedding
- Generally confined to ‘dry’ gas systems
- Frequency range: typically up to 300 Hz but can be as high as 1000 Hz

‘Dead leg’ side branch
Generation of vortices in the mouth of the branch which can ‘lock on’ to system acoustic resonances

Flexible riser / jumper (‘singing riser’)
Discrete frequency excitation caused by ‘dry’ gas flow over the internal corrugations
Forward vision:

- Development of better predictive models when detailed vibration analyses are required beyond the screening stage
- Small-scale laboratory testing
- Full-scale laboratory testing
- In-situ measurements
- Correlation to analytical models – smart use of monitoring data and simulation
Invite to Subsea Industry

Are there gaps in current Good Practice Guidance provision for the Subsea Energy Business?

EI can help you to put that Guidance in place
Thank you

Questions now or…later…
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