Mooring Integrity – Approaches Towards in-situ Monitoring and Inspection of Mooring Systems Offshore NW Australia

CALL FOR PROPOSAL

JANUARY 2015
Monitoring & Inspection Methods of Mooring Systems in the North West Shelf of Australia

**Aim**

ITF is seeking proposals from qualified organisations to conduct a survey with the aim to develop more rigorous monitoring and inspection methods of mooring systems in the North West Shelf (NWS) of Australia.

**Justification**

ITF members have explicitly identified a requirement to develop more rigorous monitoring and inspection programmes and techniques to ensure system integrity throughout the life of the mooring facility.

This particular Call is one of three that have been issued simultaneous to the developer community related to mooring integrity. Each of these individual Calls considers a distinct requirement and provides the opportunity for developers to offer a knowledge based solution to the problem with the supportive technology where appropriate. However, whilst each Call is unique it would be appropriate for potential participants to make themselves familiar with the other two Calls. This will help to identify the boundaries of the work and to reinforce the context of each individual Call. It is likely that specific developers will have the core expertise to offer solutions to more than one of the Calls, whilst other developers will have particular capabilities that are uniquely appropriate to a single Call proposal invitation.

The other two mooring integrity calls are:

1. **Mooring Integrity – Investigation of Specific Corrosion and Wear Mechanisms and Trends for Mooring Systems in the NWS of Australia**
2. **Mooring Integrity – Investigation of Mooring System Anomalies Offshore NW Australia**

**Who Should Respond**

The invitation is open to all organisations with the knowledge and experience necessary to conduct such an investigation and to prepare a high quality report on its findings.

**Benefits of Participation**

- Funding: Up to 100% funding for study costs.
- IP Protection: A proven confidential, collaborative and standard contractual process
- Exposure and validated applications for your scientific and technological expertise
- Access to the key global players in the oil and gas sector
How to Participate

Your contact point for this Call for Proposals is Malcolm Stone. To contact Malcolm, please email mooringcallsubmission@itfenergy.com or alternatively call +44 (0) 1224 222 410.

Please contact Malcolm as soon as your interest is confirmed and prior to submitting an Expression of Interest to ITF.

Background to the Challenge

An ITF workshop was held during July 2014 which focused on prioritising the technology challenges associated with Floating Systems in Australia. One of the leading outcomes from this workshop was an interest to explore more rigorous inspection and monitoring methods of mooring systems in the NWS of Australia.

Mooring systems are an integral component of oil and gas floating production systems that play an important role in vessel station keeping. Despite this there are Australian regional and industry wide challenges and trends that suggest more rigorous approaches may be required to monitoring and inspection programmes and techniques to ensure system integrity throughout the facility life.

Regional Challenges

There are a number of existing marine mooring systems used to tether oil and gas floating production facilities to the seabed in offshore North Western Australia. Operating experience from these systems indicate the following region specific challenges:

- Relatively high number of failures for a small population of installed systems
- Relatively large number of disconnectable floating systems employed
- Demanding in service loading due to cyclonic storm and wave / current interactions
- Highly variable strength of calcareous silt / sand sea bed
- Difficulty with anchor installation and achieving design holding capacity in regional calcareous soils.
- Potential for accelerated erosion / corrosion of mooring chains and wires due to the interaction between elevated seawater temperatures and regional microbial organisms.
- Furthermore there is regional interest in application of the following technologies that could drive alternative approaches to monitoring and inspection of mooring systems:
  - Floating LNG vessels that require more complex mooring systems, with a greater resultant demand on integrity due to the increased size and mass of the floating system involved.
  - Increased use of polyester rope moorings with potential for interaction between the rope and the abrasive carbonate soils leading to integrity challenges
  - Use of suction piles and chain mooring attachment with potential risk of chain self burial impacting mooring / suction pile interaction and integrity.
**Industry Challenges**

Common industry challenges include:

- Many existing mooring systems do not continuously monitor mooring lines
- Existing inspection approaches such as remotely operated vessels are unable to inspect sections of mooring lines that are obscured by:
  - marine growth
  - seabed burial
  - corrosion products
  - connection to adjacent chain links
- Existing inspection techniques are unable to adequately gauge, in situ, the extent of corrosive or erosive metal loss due to environmental limitations, the complex geometries involved and access limitations.
- Changing weather patterns are driving more frequent and more intense storm patterns.
- Aging floating systems are increasingly considering life extension as economic field production is prolonged through application of secondary and tertiary recovery mechanisms.
- Operational failures are driving more rigorous design codes and standards

**Inspection and Monitoring Considerations**

An understanding of the failure mechanisms of mooring lines, which include corrosion, erosion, fatigue, defective materials and mechanical overload, that are specific to the type and regional location of the mooring system, can provide important information to focus monitoring and inspection programmes on high risk areas for failure. Furthermore, information on mooring system in service condition, when combined with real time measurement of mooring lines load conditions, can provide data to predict probability of failure and direct mitigative response.

**Proposed Scope of Work**

Given the foregoing there is a potential need to develop regional approaches towards in-situ monitoring and inspection of mooring systems to ensure that appropriate strategies are adopted and tactics employed to effectively manage their life time integrity. The following scope of work broadly outlines an approach to addressing these concerns:

1. Conduct a survey of current mooring systems, failure modes, monitoring and inspection methods and technologies with emphasis on anomalies and features of the Australian Mooring systems.
2. Conduct a gap analysis to identify any shortcomings in current regional approaches to inspection and monitoring of mooring systems including methods for identifying defects in aging mooring systems.
3. Highlight any region specific considerations that may drive alternative approaches to monitoring and inspection of mooring systems.
4. Develop recommendations for the integrity assessment for the mooring systems for identifying the remaining service life or possibility of life extension.
Other proposals addressing one or more of the specific regional challenges and or associated knowledge gaps may be considered on their individual merits and proponents are encouraged to suggest appropriate activities and programmes for consideration by ITF members.

**ITF’s Role & Approach**

The Industry Technology Facilitator (ITF) is a not for profit organisation owned by, and with access to funds from, major oil and gas operating and service companies that comprise its membership. ITF has an impressive track record in delivering finance to help develop new initiatives for oil and gas technologies from early stage joint industry projects (JIPs) through to field trials and commercialisation. Since 1999, ITF has supported over 200 projects and secured over £50 million in funding. ITF’s key objectives are to identify technology needs, foster innovation and facilitate the development and implementation of new technologies.

A fundamental element of ITF’s role as an internationally recognized champion for facilitating research, development and deployment of technology innovation within the upstream oil and gas industry is to engage with key industry sources. ITF uses a proven process, working in collaborative participation with both its Members and industry to identify technology needs and potential solutions.

The ITF process, illustrated below as a step-by-step course of actions, endeavours to bridge the gap between the industry’s large global players and the development community with the ultimate aim of implementing new technology solutions:

**STEP 1 - Understand and Identify Technology Needs**
**STEP 2 - Engage the Development Community / Invite Proposals**
**STEP 3 - Evaluate Proposal Submissions**
**STEP 4 - Secure Funding**
**STEP 5 - Assist the Launch of Joint Industry Projects**
**STEP 6 - Facilitate the Implementation of Technologies**

ITF has contractual confidentiality arrangements with all its Members and will enter into a parallel agreement with all developers submitting proposal applications. Proposals will be submitted to our Members only for the purpose for which they are provided, i.e. assessment for funding support and implementation.

Proposals submitted under this call could be reviewed for financial sponsorship by all ITF Members therefore this is an excellent opportunity to gain a global audience in seeking support for your capabilities. The focus of all ITF themes is to identify technologies which bring clear benefits to sponsors but which require assistance in research, development, and / or field trial.

For details of ITF’s full Portfolio of Members, please visit our Website – www.itfenergy.com

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<td>Call for Proposals Issued</td>
<td>21 January 2015</td>
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<tr>
<td><strong>Deadline for Submission of Expression of Interest</strong></td>
<td>02 March 2015</td>
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<tr>
<td>Initial Feedback to Developers</td>
<td>w/c: 06 April 2015</td>
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<td>Initial Technical Clarification Meeting</td>
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Process for Submitting a Proposal

1. **Register interest with ITF**  
   Register your interest as early as possible by sending an email to Lisa Hutchison mooringcallsubmission@itfenergy.com. In order to progress your submission, ITF will require a Confidentiality Agreement to be in place: early contact will expedite this process. We require an initial discussion prior to you submitting a proposal.

2. **Download & complete the ‘Expression of Interest Form’**  
   This form is available via our website - www.itfenergy.com

3. **Complete the ‘Project Presentation Template’**  
   This template is available via our website - www.itfenergy.com

4. **Email the completed ‘Expression of Interest Form’ and ‘Project Presentation Template’ to ITF**

   Email the completed forms in Microsoft Word format (not PDF format) to Lisa Hutchison mooringcallsubmission@itfenergy.com as soon as possible.

**ITF Contact Information**

If you would like to discuss any matters related to this call or any other issue related to ITF, please contact any of the following people:

- **Malcolm Stone**  
  Senior Technology Analyst  
  e: mooringcallsubmission@itfenergy.com  
  t: +44(0)1224 222410

Other members of the team available for your support:

- **Caitlin Forsyth**  
  Technology & Contracts Coordinator  
  e: c.forsyth@itfenergy.com

**Contact Address for all of the above:**

ITF  
The Enterprise Centre  
Exploration Drive  
Bridge of Don  
Aberdeen  
UK  
AB23 8GX  
Tel:+44 (0)1224 222410 (Switchboard)  
For more information on ITF please visit the ITF Website - www.itfenergy.com