A TOTAL/BV JIP – Call for Participation

M S F

MOORING LINES & COMPONENTS EXPERIENCE RETURN & IMPROVEMENT NEEDS (Draft)*

Mooring Systems Future

Background: *Floating Oil-production systems have mostly their station-keeping obtained by means of mooring systems.*

Over the last few years, engineering evaluations of some mooring components and offshore mooring lines have raised concerns over the current design criteria, material property and fabrication requirements as well as their implications on the structural integrity of components like chains, shackles, H-links tri-plates, cables and cable sockets, etc.

Since mooring lines and their components can be subjected to extreme loading conditions such as those induced by e.g. hurricanes in Gulf of Mexico and in Asia (typhoons), their structural integrity must be assured by demonstrating adequate resistance to both these extreme conditions and the typical operating conditions where fatigue may prevail
In the mean time new grades like R5 (or higher) are now proposed / under development.

Some of the issues may be summarized as follows, based on a series of recent discussions with interested parties:

- The mooring lines and their components have mainly been designed and fabricated until now by continuous evolutions of existing designs and fabrications, and increases of sizes and material performance.
- With continuous increases of sizes and material performance aren't we crossing limits / borders without a complete knowledge of these limits?
- What should be the interesting evolutions of the designs and fabrications to increase the reliability of mooring lines and their components, **during all phases, from the initial development to their end of life** and recycling?
- What would be the corresponding costs of various solutions during these different phases?
- What qualification programs should be set up for each of these phases and for all types of components?
- What methodologies should be applied in case of new designs, or new fabrications?
- Would these programs fulfil the requirements of the existing classification Rules?
- Would these programs require new classification Rules to come into force in the future?
- Where should be placed preferably the investment costs for mooring systems, in design, fabrication, in installation means, in means of surveillance or in easy recovery means?
- Are there needs for easier surveys or maintenance?
- Are there any possible additional requirements (by Oil companies, Regulatory Bodies etc.), or linked to specific areas?
- Are there some particular requirements in terms of fabrication quality in order to ensure the consistency of the qualification?
- How risks should be assessed and reduced ?

To address the above concerns, among others, a joint industry project (JIP) is proposed.

Objectives: The main objective of this proposed JIP is to identify the future needs, existing specifications improvements needs, or new designs to be developed, to identify their most appropriate costs distribution, to develop and validate effective development methods and risks management plans, and to identify qualification needs and procedures with industry-wide consensus.

Technical Approach: Although general procedures are available from various Recommended Practices, Classification Rules, etc., some technical issues unique to mooring components must be adequately addressed to achieve reliable development programs, including:

- Analyses of improvements needs on the basis of the experience return and other JIPs outputs;
- Identification of :
  - upgrade needs of existing specifications;
  - new designs to be developed;
  - new technologies to be acquired;
  - quality schemes to be improved;
  - risks in these developments and building risks management plans;
- Evaluation of costs incidences:
  - New developments costs;
  - New investments costs;
  - Risks management costs;
  - Payback periods
- Proposed action plan

Scope of Work: To achieve the JIP objective stated earlier and addressing the above issues specifically related to mooring lines and their components, the scope of work is envisaged to consist of the following non limitative major tasks subject to JIP participants' approval:

1. **State of the Art:** ***will address mooring Components such : as Steel cables, Fibre Ropes, Lines terminations (sockets..), Shackles, H links, Connectors, Chains, Anchors***

1a - **Design phase and difficulties**

1b - **in service on site:**
- *behaviour*
- *inspectability*
- *anodes wear and tear experience*
- *etc.*

1c - **during fabrication:**
- *most common fabrication incidents*
- *analysis of the incidence on the delivery time and extra costs*
- *insufficient qualification scheme*
- *MBL not obtained*
- *Electrical discontinuity not obtained*
- *etc.*

1d - **during transportation:**
- *example: size of packages*
- *sea fastening needs and difficulties*
- *etc.*

1e - **during installation phase:**
- *analysis of most common incident reports:*
- *damage on mooring lines; kinks etc*
- *shackles forgotten on mooring chains*
- *chain twist during installation*
- *insufficient aft roller diameter on installation vessel*
- *insufficient water greasing of sheathing*
- *actions to be taken for improvement*
- *etc.*

2. **Identification of the existing specifications improvements needs (workshops to be set up).**
3. **Identification of new designs to be developed and new technologies to be acquired (workshops)(BV NI 525).**
4. **Risks management plans for specifications changes and for new developments.**
5. **Improvements of Quality schemes to reduce potential failures:**
   - Examples of issues for mooring wires:
     - *full traceability of resin cubes for socketing*
     - *reproduction in the industrial phase, of sample (laboratory) tested at the MBL (mooring wires)*
     - *electrical insulation needs*
     - *Most common fabrication incidents for each type of component: transparency need / guarantee to the final client:*
       - *wire break during stranding*
       - *wire "complete mesh" during stranding*
       - *wire break during drawing or coating*
       - *zinc coating process out of order and production stop*
       - *Stranding machine out of order: analysis of stranding machine failure risks, analysis of consequences, risks reduction plan*
       - *Break load test not successful*
6. **Incidence on Classification**
7. **Costs analyses based on solutions retained; comparison of solutions;**
8. **Proposed action plans**.

../...

* Version Rev 11 Draft (September 26th, 2018)

Participants:
The JIP is mainly intended for Oil Companies, Manufacturers and Classification Societies.

Project timeline and sponsorship:The JIP will officially start as soon as one Oil company is committed to join the JIP, with a prioritized task details approved by the JIP participants. The JIP Phase 1 is planned to have a 2-years duration with participation fee of **$15 K/year for two years.** (Class Societies & Manufacturers: in kind contribution).

Class Societies & Mooring lines and European Mooring component manufacturers are welcome to participate in-kind in the form of providing their experience /expertise in design & manufacturing processes during workshops organized via internet.

To execute the full JIP Phase 1 program, a minimum of 2 Oil companies will be sought.

Depending on the findings of this first phase and on the satisfaction of the participants, a phase 2 could be proposed with an additional limited budget

Specific developments could be found necessary and proposed by participants, or will be made in separate working groups.

Deliverables: The JIP deliverables will consist of the following:

- Topical reports documenting all detailed technical developments and major findings on completion of in each task
- Proposed Action Plans & Qualification program and their final documentation.

Contacts: For more information, please contact:
Mr. J-P. Sauvage at jean-pierre.sauvage@bureauveritas.com