



Bureau of Safety and Environmental Enforcement

API's 2015 Exploration and Production Winter Standards Meeting

Emerging Technologies Branch
Systems Reliability Section
Evaluations
January 27, 2015

“To promote safety, protect the environment and conserve resources offshore through vigorous regulatory oversight and enforcement.”

BSEE Mission Statement

“To promote safety, protect the environment and conserve resources offshore through vigorous regulatory oversight and enforcement.”

Presentation Overview

- Systems Reliability Section (SRS)
 - Purpose, function
 - Evaluations to date
 - Evaluation findings
 - Future plans

Purpose and Function

- Created at headquarters in February 2013 following the *Deepwater Horizon* tragedy
- Functions
 - Establish meaningful, on-going communication with original equipment manufacturer (OEM)
 - Conduct quality assurance (QA) and quality control (QC) evaluations on manufactured equipment
 - Evaluate “Fitness for Service” capabilities of equipment
- SRS evaluations are different from traditional BSEE 2010 or Panel Investigations which primarily look at regulatory compliance

Evaluations to Date

- Four evaluations since February 2013
 - Connector and Bolt Failures
 - Completed August 2014
 - Seal Assembly and Cement Failures
 - Estimated completion January 2015
 - Two evaluations in progress
 - Wing-valve Assembly
 - HC Connector



Connector and Bolt Failures Evaluation

- Major Issues
 - Material Properties (Hardness, YS, UTS)
 - Coatings
 - QA/QC, Quality Management System (QMS)
- Evaluation identified a global concern affecting
 - ~ 10,982 replacement bolts
 - ~ 361 LMRP connectors

Connector and Bolt Failures Evaluation Cont.

Material Property Concerns

- Inconsistencies across industry standards for material properties requirements related to fasteners (bolts/connectors)
 - Hardness, YS, UTS

Standards with inconsistent material property requirements for subsea operation include:

- API 6A; API 16A; API 16F; API 17A; NACE MR0175; NORSOK-M001
- Fastener Coatings - ASTM B633; ASTM B849; ASTM B850; ASTM F1941; ASTM F1137

Connector and Bolt Failures Evaluation Cont.

● Coatings

- Per the OEM specification, subcontractor relied on the older 1998 edition of ASTM B633 standard, rather than the latest 2007 edition
- Bolts did not receive required post bake electroplating treatment per the latest 2007 edition

● Interpretation of ASTM B633

- Concerns between OEM and industry on the appropriate application for Service Class 2
- What is the appropriate material design selection and application for marine service?

Connector and Bolt Failures Evaluation Cont.

○ QMS

- OEM's QMS qualified/audited only first-tier suppliers
 - OEM QMS did not require qualification and audit of second, third tier subcontractors
 - Neither operator or contractor detected an issue with the sub-tier supplier during their assessment of the OEM
 - Need improved oversight of second and third tier subcontractors (Quality Standards)

Seal Assembly and Cement Failures Evaluation

- Major Issues

- Is Shallow Liner Seal/Cement a single or dual barrier system?

- Shallow Liner Rating Concerns

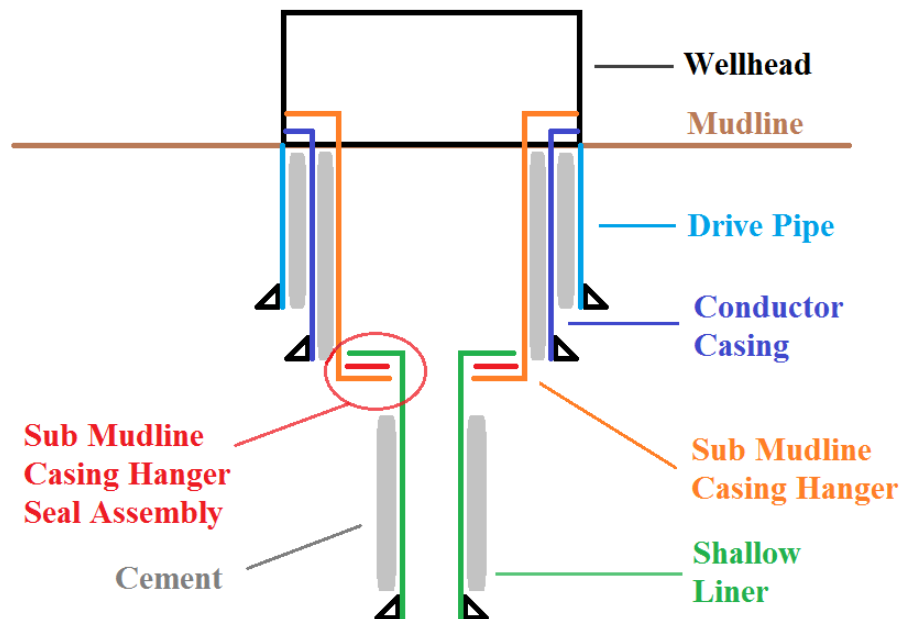
- Temperature

- Gas/Liquid



Seal Assembly and Cement Failures Evaluation

- Is Liner Seal/Cement tested and evaluated as a system?
 - Does the liner seal mask a poor cement job?
 - Is the integrity of the cement behind liner seal truly understood?



Seal Assembly and Cement Failures Evaluation

● Equipment Rating Concerns

● *Temperature Rating*

- Seal Assembly was rated to 75°F but experienced 90°F during operation
- Inconsistencies between operator and OEM understanding of seal's temperature rating

● *Gas vs Liquid Rating*

- Seal design was rated to API 17D first edition
 - No gas qualification was required, yet gas was “seen” in the well

Seal Assembly and Cement Failures Evaluation

● Possible Solutions

- Do existing standards provide adequate design/qualification for seals/cement?
 - API 17D second edition, future API 19LH?
 - Should they be modified? How?
- Should specific design and qualification requirements be included in next edition of current standards?
- Are existing BSEE regulations on testing of liner seals/cement adequate?
 - Should they be modified? How?
- Possible Shallow Liner Research
 - Best cementing practices
 - Engineering design of liner sub mudline seals
 - Possible JIP?

Path Forward

- BSEE to work with industry on developing standards to address the following:
 - Consistent material property requirements for fasteners among standards
 - Material Properties (hardness, YS, UTS)
 - Coatings
 - OEM QMS
 - Seal/Cement Dual Barrier System Testing
 - Improvements in Liner Seal Qualification and Test Requirements
 - Temperature
 - Gas/Liquid

Path Forward Cont.

- Two options available to BSEE to address issues on Connector/Bolt and Seals/Cementing
 - 1) Standards
 - BSEE work with industry to develop new standards and/or ensure consistency on requirements among the standards
 - 2) Regulation
 - BSEE develops internally
- **Preferred option is #1**

Past BSEE/Industry Successes

- A standards group created to evaluate and assess a specific gap
 - API formed a Safe Lifting Group to evaluate lift incidents and provide industry/BSEE/CG with a better understanding of the issue and solutions (e.g. better crane training in RP 2D, better use of lift JSA)
- Industry formed JIP to develop shear testing methodology
 - API/OGP JIP Shear Study
- **There is no reason a similar outcome could not be achieved for today's concerns**

Follow-Up

- BSEE Standards Workshop – May 2015
 - Friday, May 8th, 2015 (OTC Week) (pending)
 - University of Houston (pending)
- **Should today's concerns be discussed?**

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