New Generation of Deepwater BOP Stacks

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Agenda:

• Evolution of Standards
  
  API Standard 53
  RP 17W

• New Equipment & Technology Developments:
  
  Shearing Technology
  Deep Water Control System
  20K BOP System
Blowout Prevention Equipment Systems for Drilling Wells – S53

After April 20th 2010, in response to the Safety Measures Report by The DOI, the Industry acknowledged the need to update/rewrite RP53

Balloted 4 times and finally approved for publication in August, 2010

Commenced rewrite in September, 2010 – target 90 days

Published November 30th, 2012
Major Changes

• RP 53 is now Standard (S) 53
  1st document in API Upstream presented as a Standard

• Scope is for “requirements” as opposed to “information”

• Dominant use of the words “must” and “shall” as opposed to “should” and “may”

• Definition of BOP… added definition of what a BOP “is not”
Certification & Stacks configuration

- All rigs must be independently certified by a 3rd party
- **S53** allows the OEM as an approved 3rd party, meaning Cameron CAN certify its own equipment due to the intimate technical authority of the OEM. (This does not mean Cameron WILL act as 3rd party, it means we CAN)
- **S53** requires all Subsea BOP Stacks to be Class 5 or greater consisting of the following
  - A minimum of one annular preventer
  - A minimum two pipe rams (excluding test rams)
  - A minimum of two sets of shear rams for shearing the drill pipe and tubing in use, of which one shall be capable of sealing
Subsea Deployment, Testing

- S53 calls for testing of ALL emergency control functions at latch up and throughout the drilling program at intervals
- Automatic Mode Function and Deadman functions are required to be tested subsea
- Key Functions ROV operable and
- ROV functions must be demonstrated to perform per normal function control times – i.e. a 30-second function time using the controls must be accomplished in 30 seconds by the ROV
- 5 year maintenance certification is mandatory
In response to the GOM Macondo incident, the offshore oil and gas Industry assembled a Joint Industry Subsea Well Control & Containment Task Force (JITF) to focus on subsea well control preparedness and response options.

The JITF identified five key areas of focus:
- Well containment at the seafloor
- Intervention and containment within the subsea well
- Subsea collection and surface processing and storage
- Continuing R&D
- Relief wells
Evolution of Standards

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New Equipment & Technology Developments:

Shearing Technology

Deep Water Control System

20K BOP System
Development of a “Super Shear” BOP

18-3/4" 15K SSSS BOP

• Increased safety and environmental protection while drilling deeper, more complex wells in harsh environments
• Working pressure of 15,000 psi and tandem booster bonnet configuration
• Evolution from proven technologies to meet requirements beyond what is required in the industry
• Combines multiple features and technologies from existing Cameron BOP models
• Built exclusively for the SSSS BOP, the shear ram features a compound V-shaped blade configuration and is capable of shearing and sealing full wellbore pressure
• Temperature class XX per API 16A
18-3/4” SSSS BOP Shear Ram

• Successful shear of 6-5/8” 50ppf, S-135 HWDP with high pressure test

• Successful shear of 13-3/8” 72ppf, Q-125 casing with high pressure test
Evolution of Standards

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New Equipment & Technology Developments:

Shearing Technology

Deep Water Control System

20K BOP System
Position Sensor Technology

• Shows live movement of piston (<1 second lag time)

• Accuracy test so far reveal that phase two sensor accuracy is .027” +/- .012”

• Full qualification completed at Teledyne. Shock, thermal, and vibration testing
CAMSIP (CAMERON Stack Instrumentation Package)

- CAMSIP provides a data and power infrastructure for sensors fitted to the lower stack and LMRP of new or existing subsea BOP assemblies

- The infrastructure features multiple redundant techniques and access points for powering sensors and reading data

- Innovations include redundant subsea BOP “black box data recorders” which log all BOP operator, control, feedback and sensor information for several weeks of operation and can be recovered by ROV for forensic analysis
• Sensor Interface Boxes
• Wireless Stingers
• ROV accessible Wireless Data and Power units
• ROV-mounted Wireless Data and Power unit
• Conventional ROV data & power hot stabs & receptacles
• Acoustic communication and power units
• Local Data Historians
Evolution of Standards

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New Equipment & Technology Developments:

Shearing Technology

Deep Water Control System

20K BOP System
20K Subsea Stack Development

- Scope includes subsea BOP stack, controls, and drilling riser
- Full qualification to 20,000 psi and 350°F for stack equipment
- Development scheduled qualification completion by end of 2014
- Technology qualification through third party verification
18-3/4” 20K ‘TL’, 8 Cavity Stack Components

Lower Marine Riser Package
Merci

Des questions?