

IOGP/IADC BOP Reliability Database

RAPID-S53

Stands for Reliability and Performance Information
Database for the Well Control Equipment (WCE)
covered under API S53.

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Chairman: RAPID – S53 Oversight Committee

RAPID-S53 Overview

- Online subsea BOP performance reporting database developed by group of seven offshore drilling contractors became operational in 2015.
- Database combined with IOGP/IADC efforts, now in third iteration of Joint Industry Project with 14 contractors, 12 operators, and 3 OEMs.
- Latest phase branded as RAPID-S53 (Reliability & Performance Information Database for Standard 53 well control equipment).
- Over 6000 event reports now in database.
- 700+ users from 29 participating companies accessing database
- Management & organizational support provided by IADC as Project Coordinator.

JIP Participating Companies

Contractors

- Diamond Offshore
- Dolphin Drilling
- Ensco plc
- Maersk Drilling
- Noble Drilling
- Pacific Drilling
- Queiroz Galvão
- Ocean Rig
- Ocyan/Odebrecht
- Rowan Companies
- Seadrill
- Stena Drilling
- Transocean
- Vantage Drilling

Operators

- Anadarko
- BP
- Chevron
- CNOOC/Nexen
- Eni S.p.A
- Equinor
- ExxonMobil
- Hess
- Kosmos Energy
- Petrobras
- Shell
- Total SA

OEMs

- Cameron
- Baker Hughes/GE
- NOV

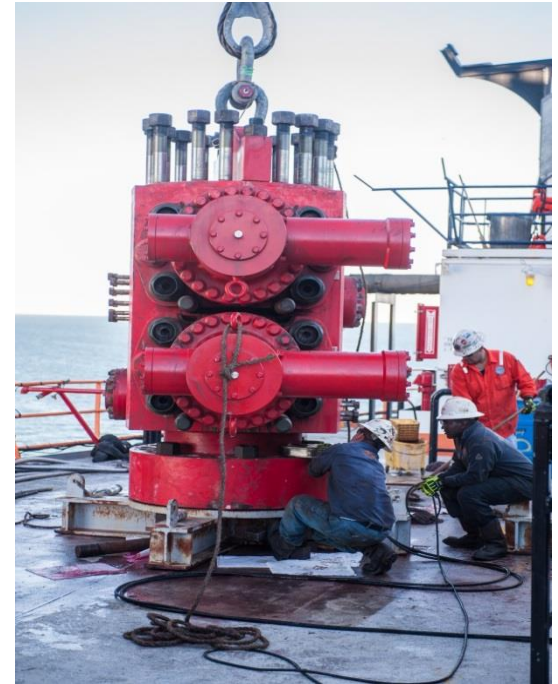
BOP Event Cause Designations

When Root Cause is known:

- Design issue
- Documentation error
- Maintenance error
- Procedural error
- QA/QC manufacturing
- Wear and tear

When Root Cause is not known:

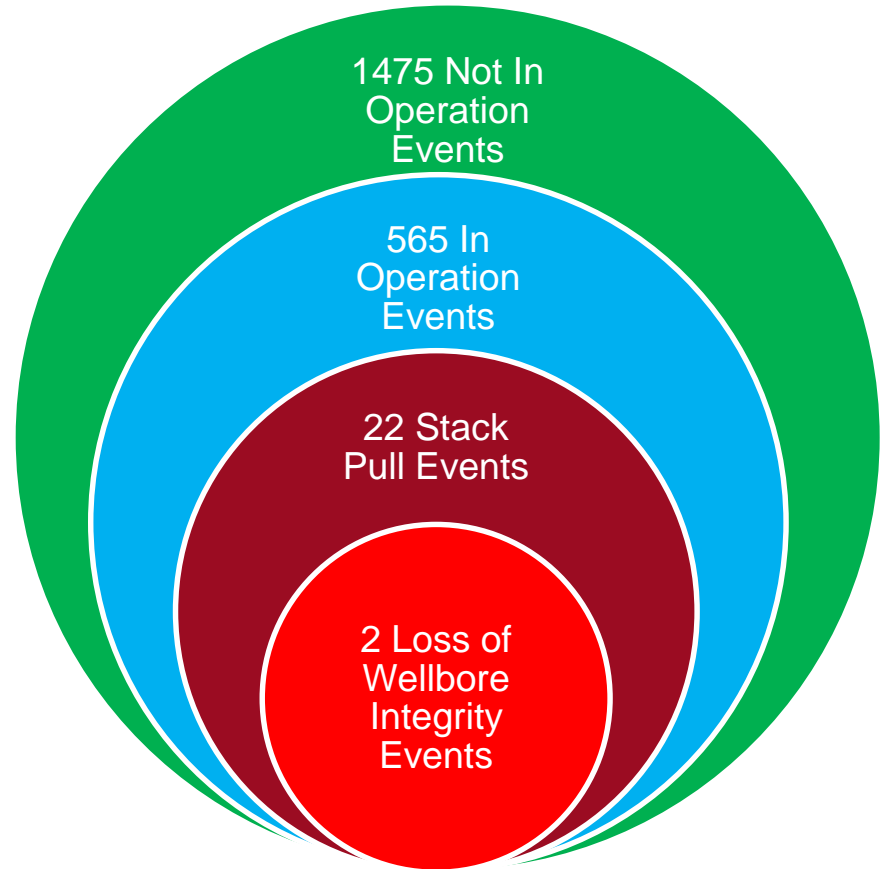
- RCFA required (*always* used when there is a loss of wellbore integrity)
- Assessment pending (*e.g.* used in the case where stack is still subsea)



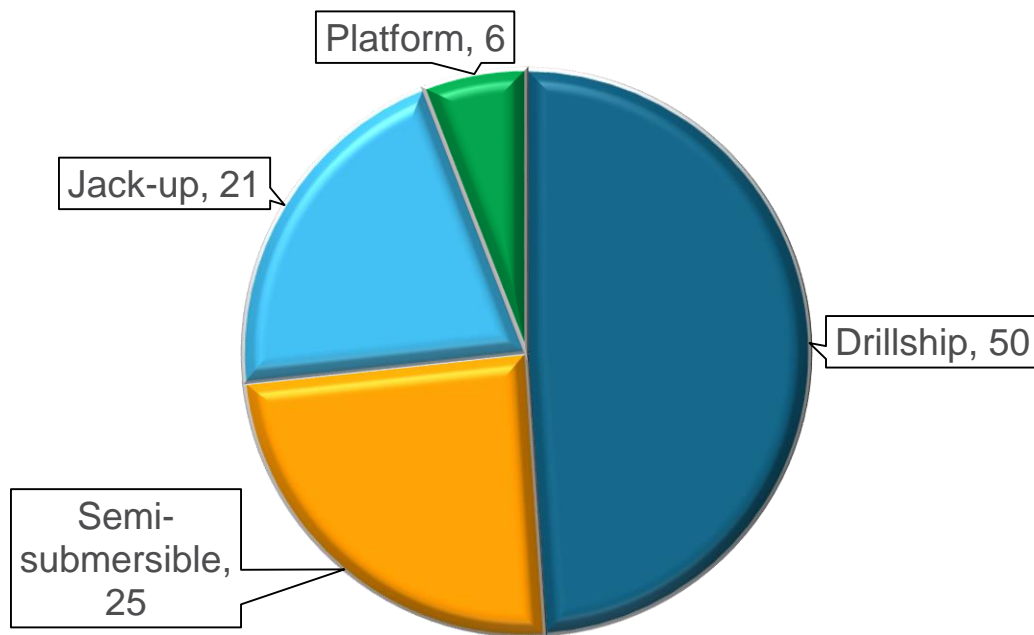
A total of 2040 events were reported by JIP members in 2017.

Of these, 1475 were discovered with the BOP Stack 'Not In Operation'.

This reflects the very positive fact that the bulk of events occurred while equipment was being inspected, maintained and tested *prior* to being put into service.



Rig-Years of Operation by Rig Type - 2017



102 total rig-years

“Typical Rig”*

- 20 WCE events/year
 - 14 Not in Operation
 - 6 BOP in Operation
- 1 in 5 years – Stack pull
- 1 in 50 years – Loss of Wellbore Integrity

**Composite example based on reports received in 2017. BOP types and number of components vary significantly.*

Distribution of 2017 BOP Stack & Control System Component-Years of Operation by Rig Type

Rig Type	2017 Number of rig-years of operation	Number of reportable components per rig	2017 Number of component-years of operation
Dual-stack Drillship	26	4,200	109,200
Single-stack Drillship	24	2,900	69,600
Single-stack Semi-submersible	25	2,500	62,500
Jack-up Rigs	21	490	10,290
Platform Rigs	6	460	2,760
Totals	102		254,350

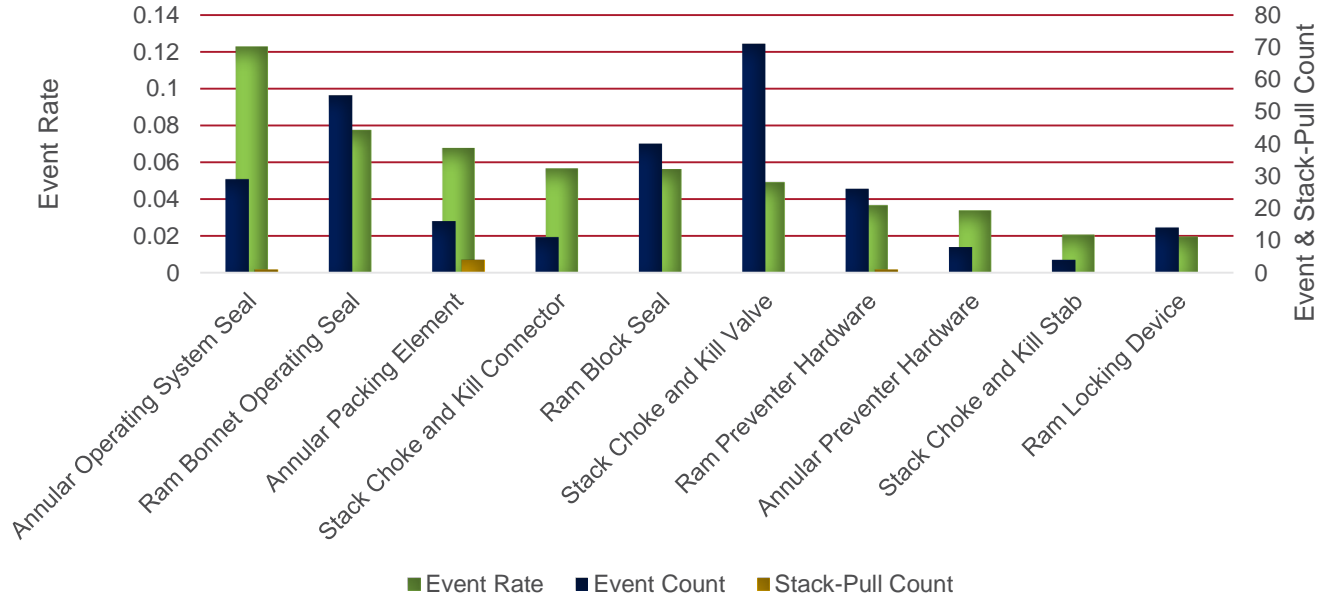
Event Rate as a Metric

Sum of events associated with a component

Event Rate =

Sum of component-years for each component active during period

Highest Ranked BOP Stack Components by Event Rate

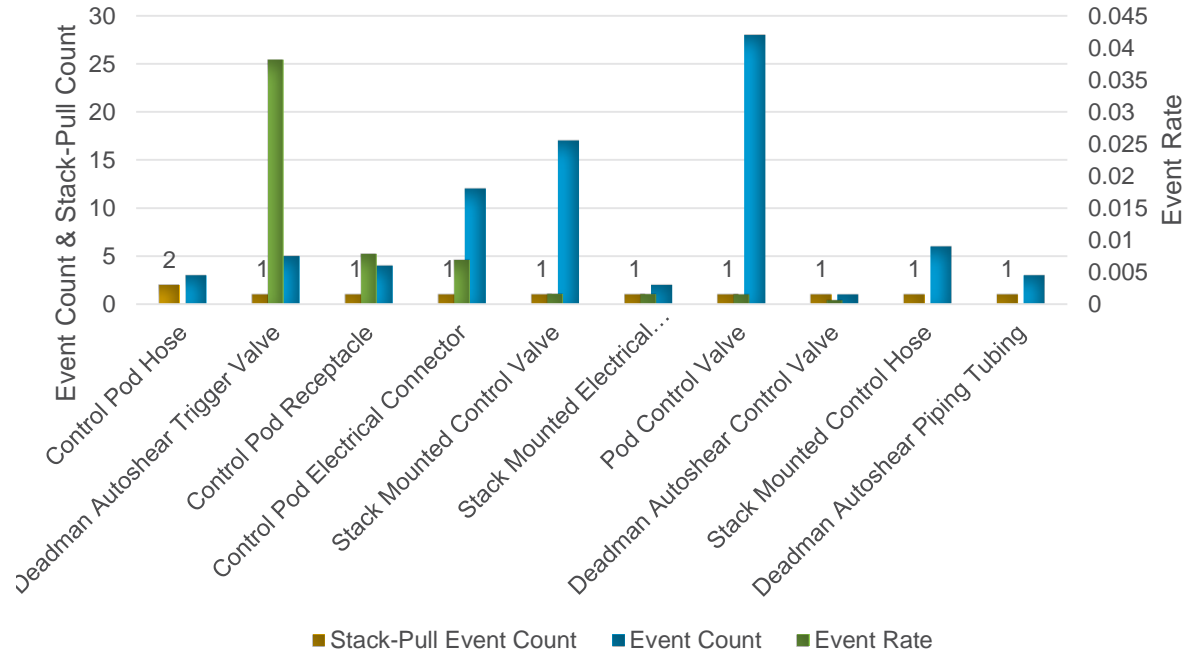


Event Rate as a Metric

Sum of events associated with a component

$$\text{Event Rate} = \frac{\text{Sum of events associated with a component}}{\text{Sum of component-years for each component active during period}}$$

Controls System Related Components with 2017 Stack Pulls



Initiatives in Development

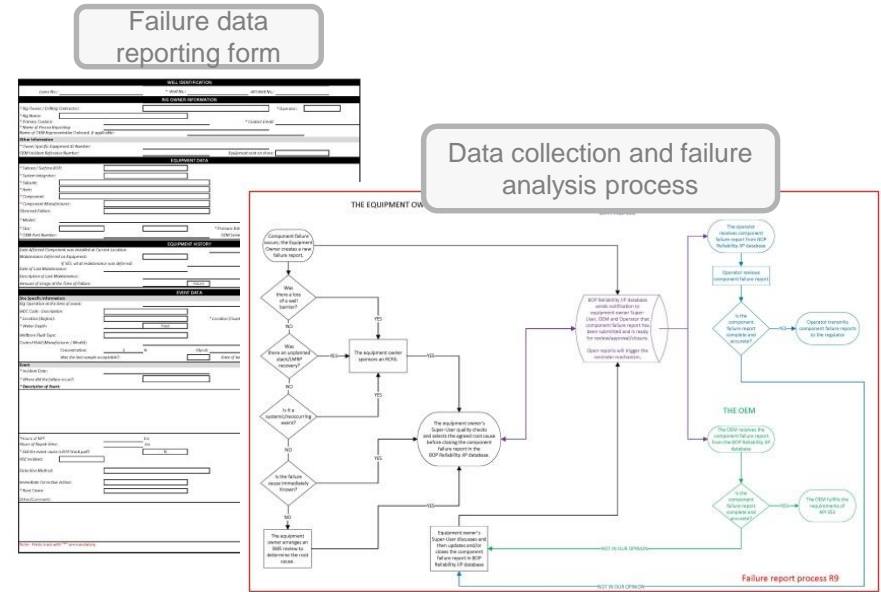
- Applying cycle count data to aid in trend analysis and reliability prediction.
- Currently collating field estimates of hours in service for components where cycle count is more appropriate and cycle counts are not available. This will be replaced by estimated cycle counts for the applicable components.
- When actual cycle count is not known, an algorithm will be used to estimate cycle count using date equipment was put in service and the date of the event.
- The goal is to accumulate enough experience data to eventually predict MTBF for certain components.

Benefits realized by participants

- Monthly event review by Technical Reference Group provides valuable opportunity to share information on events experienced.
- Common issues on similar equipment identified.
- Increased understanding by OEMs of problem areas needing rectification.
- Improved procedures for hoses & fittings reduced leaks and unplanned stack pulls.
- Refined RCFA process.
- Potential problems not previously seen can be anticipated.
- Increased efforts to improve product design for SPM valves, etc.

Working with Regulators to Support Industry Compliance

- Modifications made to database facilitate failure reporting by operators and contractors to assist in compliance with the BSEE Well Control Rule.
- Operators and OEMs both receive failure reports.
- Agreement with BSEE that reports can be forwarded directly to Bureau of Transportation Statistics (BTS) - data repository for BSEE.
- Data reported directly to BTS protected by the Confidential Information Protection and Statistical Efficiency Act (CIPSEA).
- **Now working on data conduit to allow Operators to transmit reports directly to BTS.**



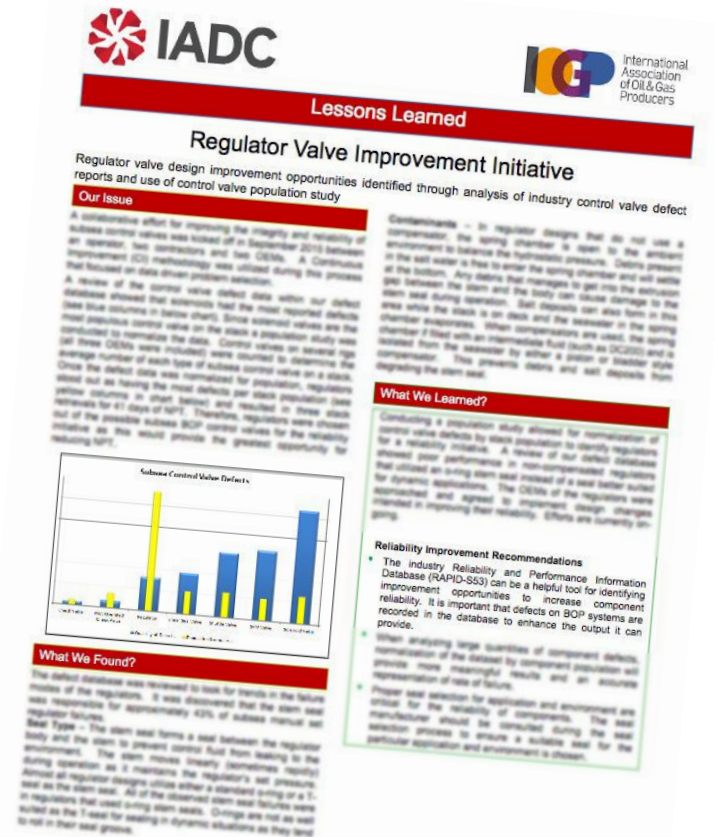
Continuous Improvement

As increased data continues to provide new learnings, these are shared for the benefit of all participants.

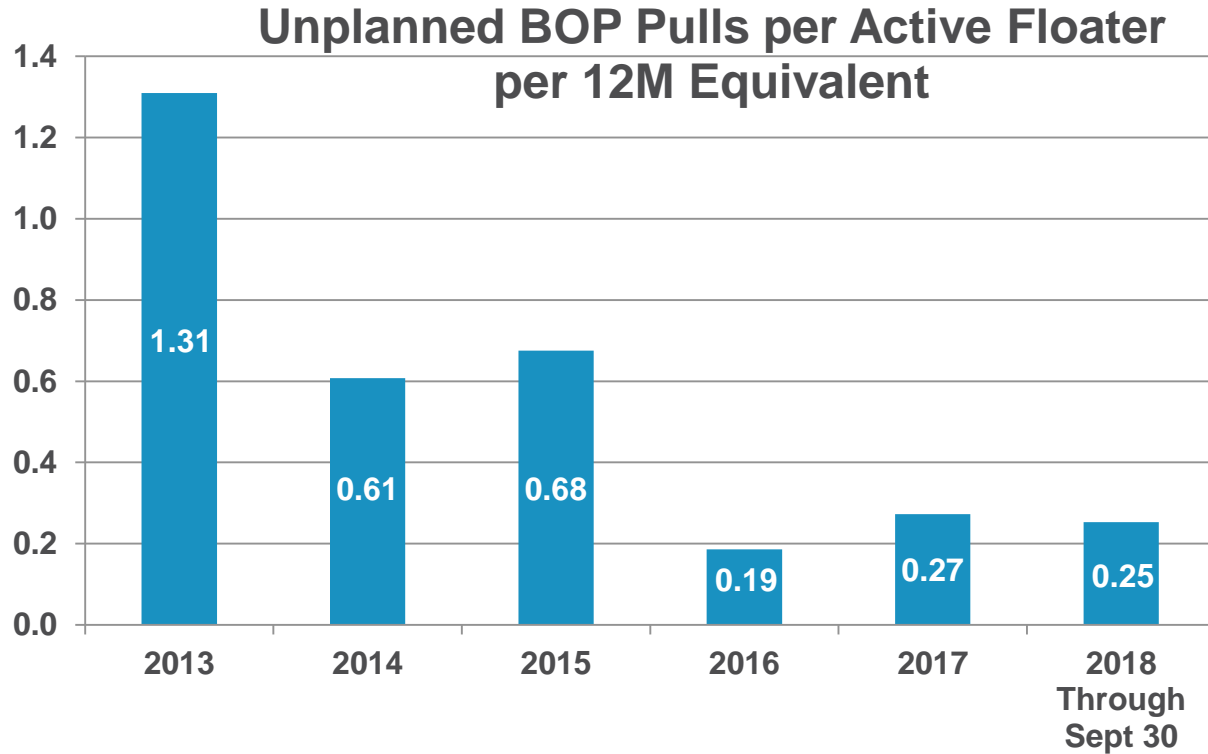
In addition, A number of specific topics have already been shared with the public:

- Regulator Valve Improvement Initiative
- Shuttle Valve Selection for ROV Circuits
- SPM Valve Spool Poppet Identification
- Deadman/Autoshear Timing Circuits
- Improper Subsea Control Valve Design Aspects

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Continuous Improvement



Thank you!

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