Monthly Summary Report September 2017

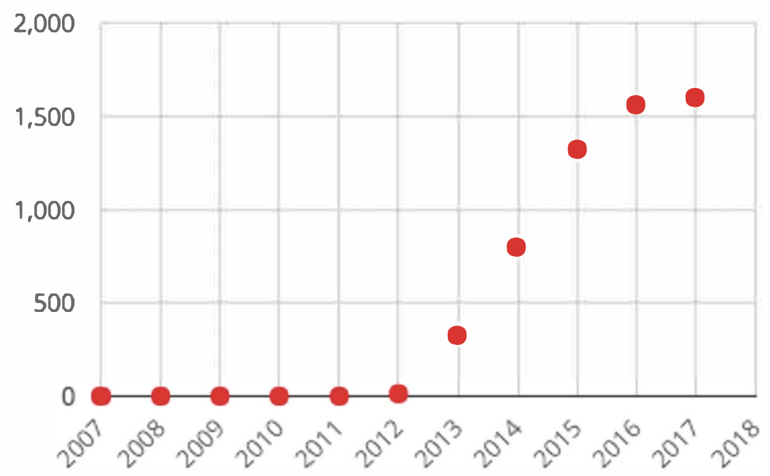
JIP Mission Statement

The mission of the JIP is to advance the safety and efficiency of global drilling operations by promoting improvements in the reliability and performance of Well Control Equipment and related products and services.

IOGP IADC

RAPID-S53 Monthly Summary Report-September 2017

Events Reported by Year



220 - There were149 records, covering 220 component events, approved in September, 2017

1543 - Approved open and closed events *YTD*

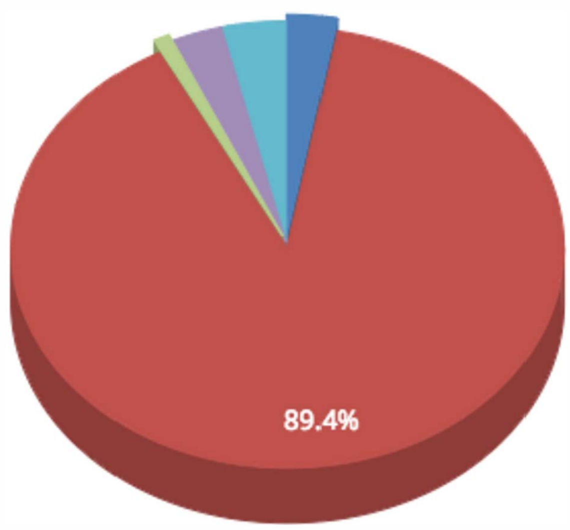
1563 - Approved open and closed events in2016

192 - Approved closed events in September, 2017

28 - Approved open events in September,2017

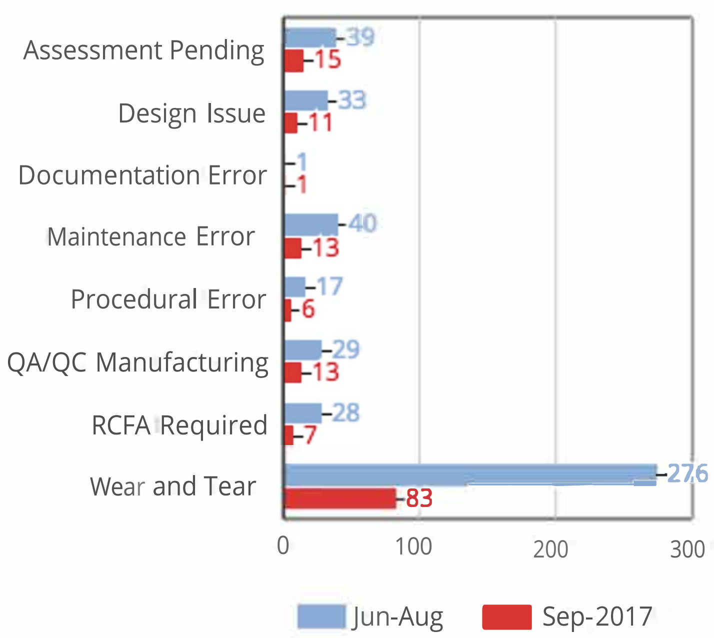
195 - Events in approved open state 120 + days in2017

2017 YTD Regional Distribution



- Africa (40)2 .91%
- Americas (1230)89.39%
- Asia (13)0.94%
- Australia_Oceania (41)2.98%
- Europe (52)3.78%

Event Causes



JIP News

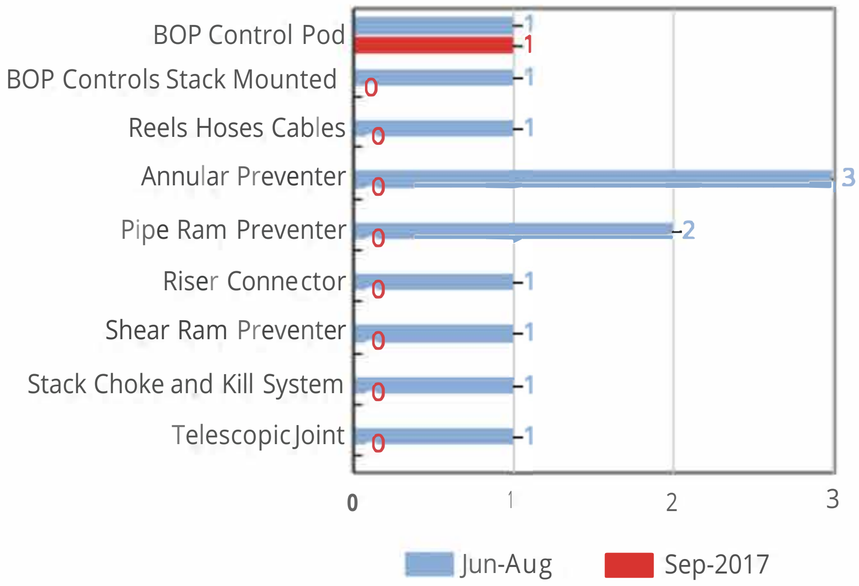
Work has started on the next significant area of database development. This is associated with the collection and use of component population data. The use of population data in the analysis of event record data will allow users to begin to put event records into perspective and move the database closer to providing JIP Participants with real-time information on component reliability.

The collection of population data will be based on analyzing the component counts defined by the rig-specific Well Control Equipment (WCE) Configurations associated with the records contained in the database. Consequently, reliable component population counts will be totally dependent on having WCE Configurations for every rig in the database. The JIP recently issued an e-mail enlisting the help, of all Equipment Owners, in getting the database populated, as quickly as possible, with WCE Configurations for each of the rigs currently contained in the database.

The Technical Reference Group has started formulating the JIP Annual Report for 2017, with the aim of producing the report at the beginning of January 2018, and the ability to utilize the population data is key to producing a quality report.

RCFA Triggers

Unplanned LMRP/Stack Recovery

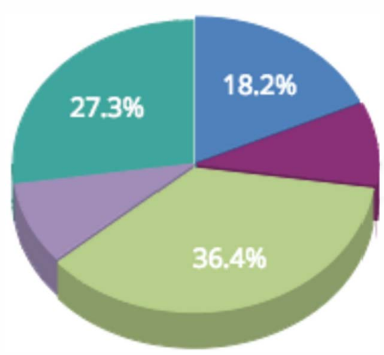


There was one event reported in this category in September 2017:

A ground fault was detected in the control monitoring system as a result of a loss of communications to and from the surface. The stack was pulled and further investigation confirmed short-circuited data lines. The relevant faulty cable was replaced.

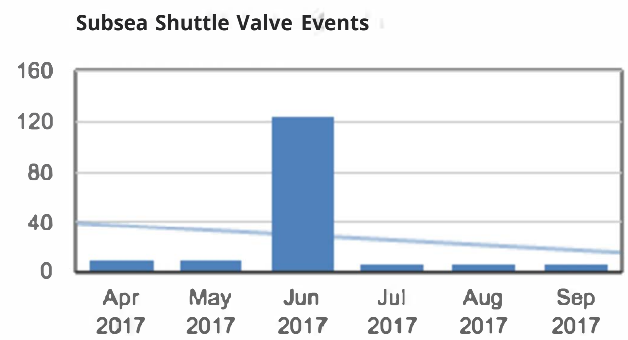
September Well Barrier Component Events

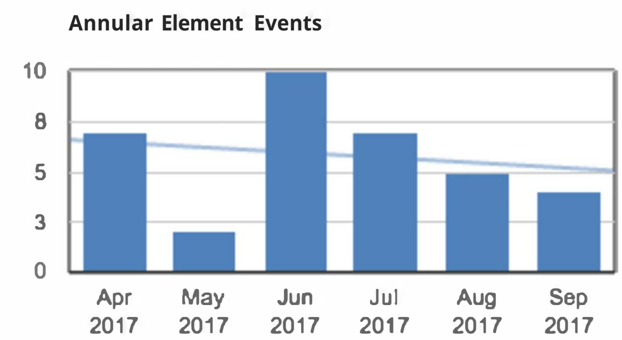
In Operation

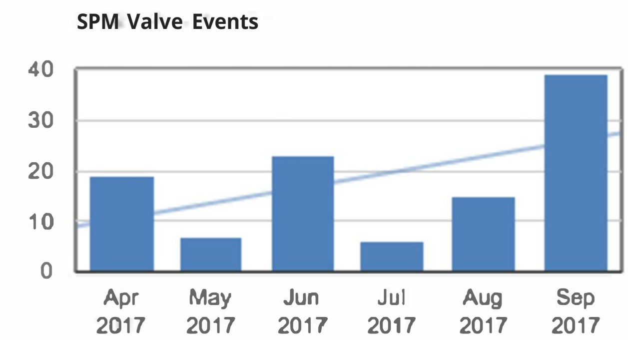


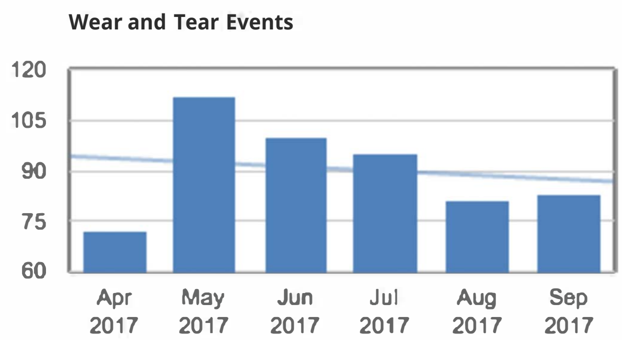
- Annular Preventer 18.18%
- Ram BOP Body 9.09%
- Pipe Ram Preventer 36.36%
- Shear Ram Preventer 9.09%
- Stack Choke and Kill System 27.27%

Reoccurring Events









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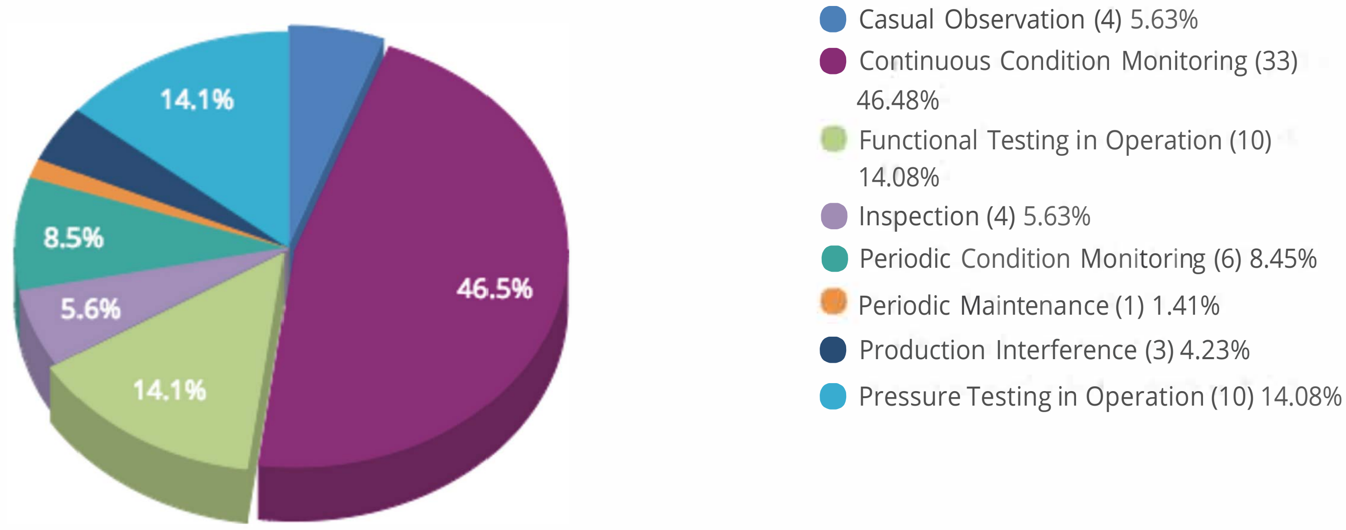
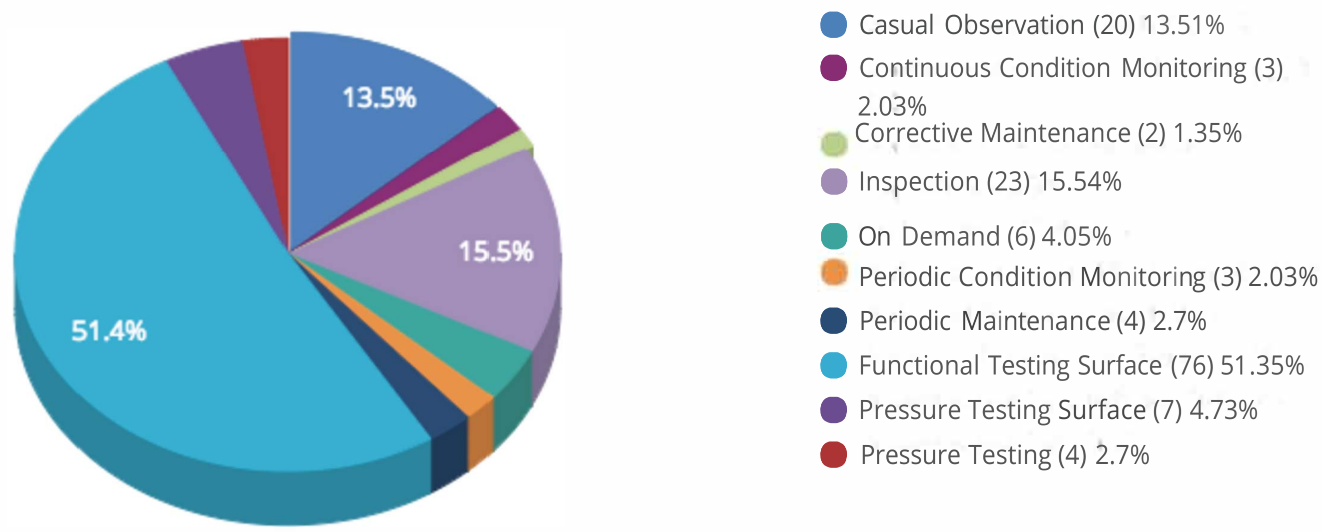
September Detection Methods

In Operation



Not In Operation



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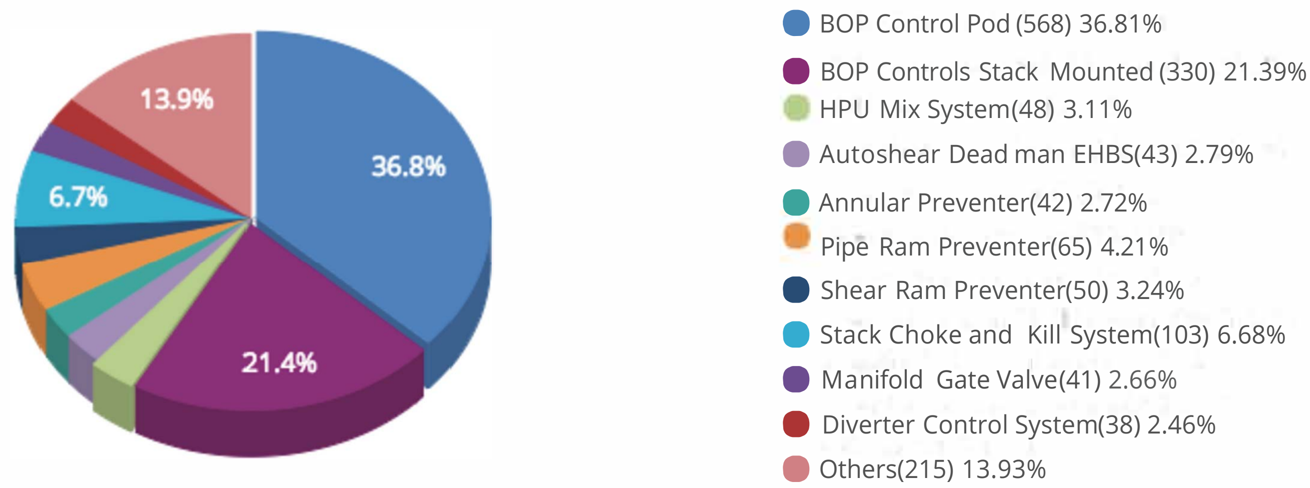
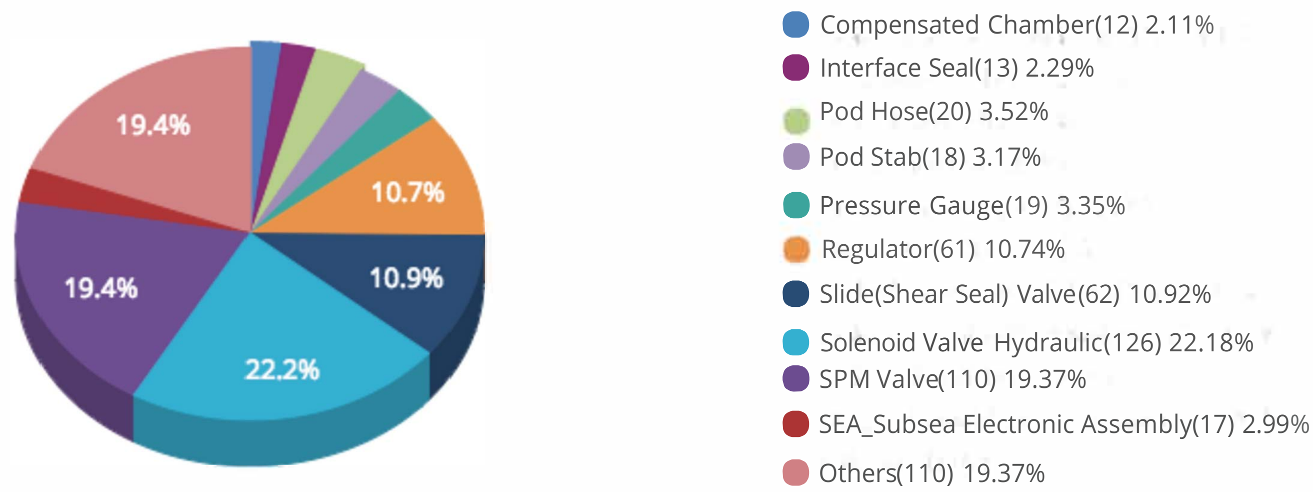
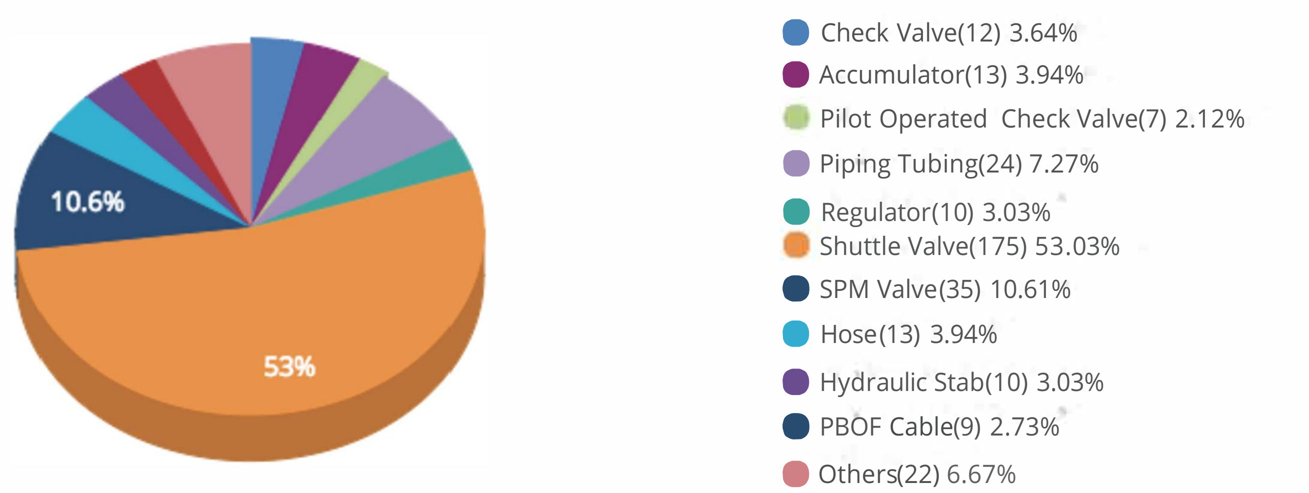
2017 YTD Events



BOP Control Pod



BOP Controls Stack Mounted



Graphs depicting normalization with population Data
Under Construction

RAPID – S53

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

Lessons Learned

Shuttle Valve Selection for ROV Circuits

Non-return shuttle valves designed to accept the variety of pump outputs that could be utilized are required for ROV intervention circuits to operate reliably

Our Issue

ROV intervention is a secondary control system included on subsea BOP stacks to enable operation of critical BOP functions when the primary control system is unavailable.

API Standard 53 requires ROV intervention capability on each shear ram CLOSE, one pipe ram CLOSE, ram locks LOCK and LMRP (Lower Marine Riser Package) connector UNLATCH. API Standard 53 also requires the receptacle to be in compliance with API 17H and that the function meet closing time requirements of the primary control system (45 seconds for rams CLOSE and connector UNLATCH).

In the US federal waters, 30 CFR § 250.734 (a)(4) requires the ROV intervention to also include the OPEN functions for each shear ram, ram locks, one pipe ram and LMRP connector.

The open functions were added to an offshore drillship during the last between well maintenance period. The BOP was landed and latched to the wellhead and Deadman/Autoshear testing was conducted successfully, but a longer than normal closing time was recorded for the Upper Blind Shear Ram (UBSR). The BOP was subsequently retrieved for a leak on the lower annular close chamber.

The BOP was relatched to the wellhead and the Deadman/Autoshear system was tested successfully with the UBSR and Casing Shear Ram OPEN ROV dummy stabs removed. Hydraulic fluid was observed venting from the associated ROV intervention OPEN ports during the test.

The engineered modification (addition of the ROV intervention OPEN functions) did not identify the unanticipated consequence the change could have to the Deadman/Autoshear performance.

What We Found

Shuttle Valve Selection – When the control circuit was upgraded to add ROV open functionality, standard shuttle valves were used instead of the pressure biased shuttle valves. When the Deadman/Autoshear functioned the CSR and BSR closed, the control fluid on the open side was vented through the ROV inlet instead of out the pods. Dummy stabs parked in the ROV buckets reduced the flow of venting fluid which increased the ram closure times. The springs in a pressure biased shuttle valve would have kept the ROV inlet closed and directed venting fluid out through the pods.

Evaluating Risk – When the new ROV panels were added, the contractor failed to conduct a rigorous Management of Change (MOC) process or perform a risk assessment on the effects of the change. A proper MOC would have included a risk assessment with a focus on impact to emergency systems. The risk could have been identified and addressed prior to the upgrade.

Possible Systems/Rigs Affected

All subsea BOP systems that utilize shuttle valves and include a Deadman/ Autoshear system or ROV intervention.

What We Learned

All aspects of a modification should be analyzed before finalizing the change in design.

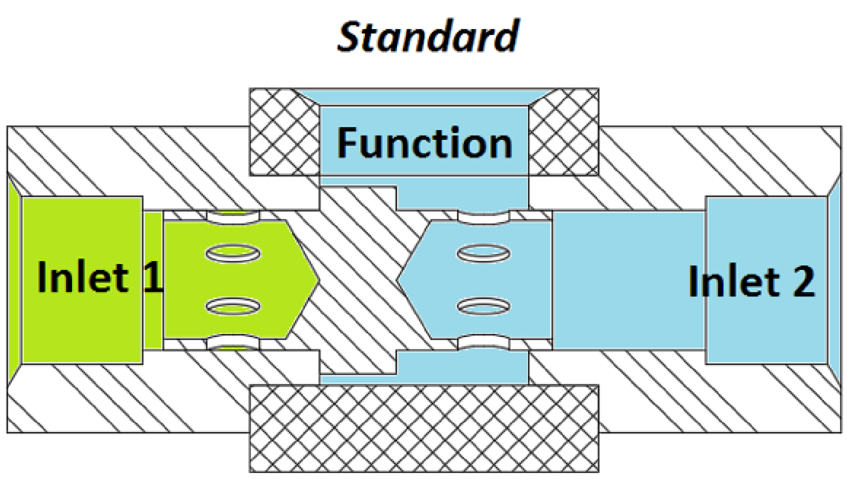
BOP Emergency Control Systems can be unintentionally affected by changes to the Primary or Secondary Control Systems.

Reliability Improvement Recommendations

- Pressure biased shuttle valves should be used for all ROV functions because they are non-interflow type shuttles that prohibit hydraulic returns back to the ROV port. Shuttle stack configuration should not include an interflow type shuttle valve between the ROV inlet and the function.
- We observed the need for educating design and maintenance personnel on the different models of shuttle valves and their different functionality.
- A Management of Change (MOC) process should be used anytime changes are made to the stack equipment or the control system. The MOC process should include a risk assessment to evaluate the effects of the change and should include a focus on the change in risk associated with other systems (including BOP emergency and secondary systems).

Shuttle Valve Design

Shuttle valves are installed to provide the ability for two or more control sources to actuate one function. Typical shuttle valve designs will shift with relatively minimal force to the inlet port that is providing the hydraulic flow/ pressure; and subsequently when venting fluid, do not direct the return flow to a pre-determined inlet port.

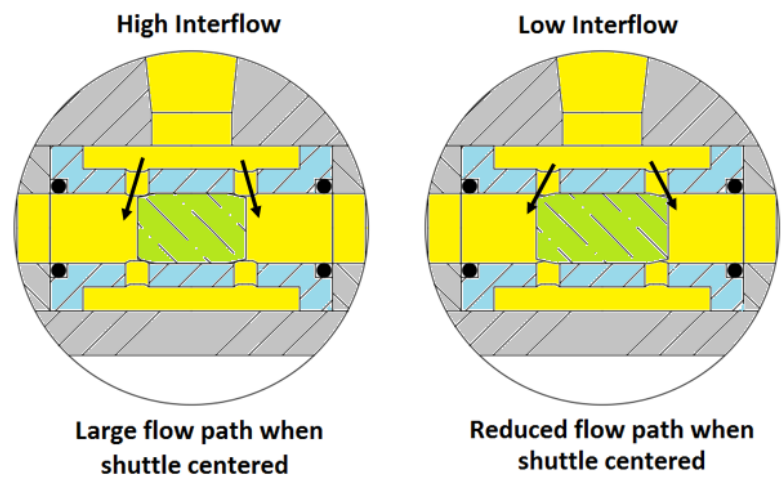


Shuttle valves can be designed with or without interflow. Non-interflow shuttle valves seal both ports off to the function during shifting. If not designed correctly for the application, a non-interflow shuttle has the possibility to close off the function from both return ports. Due to this quality, most shuttle valves have a certain amount of interflow that exists between the two input ports during shifting. The amount of interflow can be designed as either high or low depending on the shuttle and application.

RAPID – S53

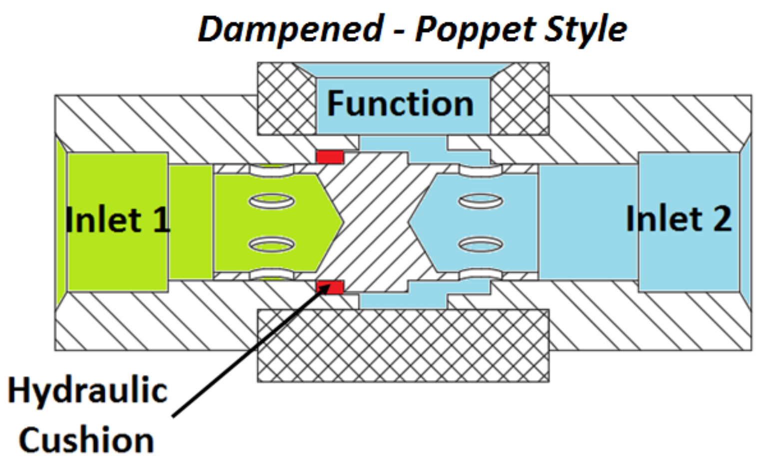
Reliability and Performance Information Database for the Well Control Equipment (WCE) covered under API S53

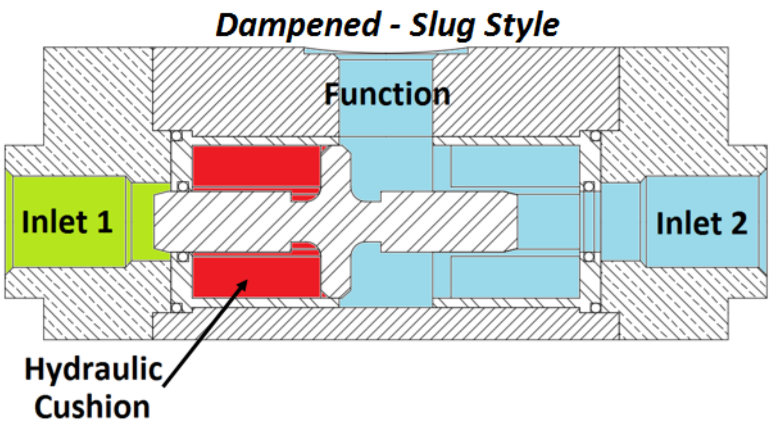
Shuttle Valve Design



There are specialty shuttle valve designs that have been developed to operate with specific characteristics for varying circuit designs and needs.

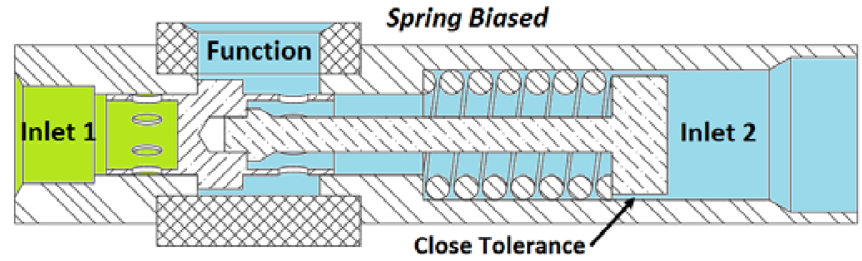
Dampened Shuttle Valves - Created to provide a hydraulic dampening of the shuttle during switch-back and prevent oscillation under extreme service conditions.



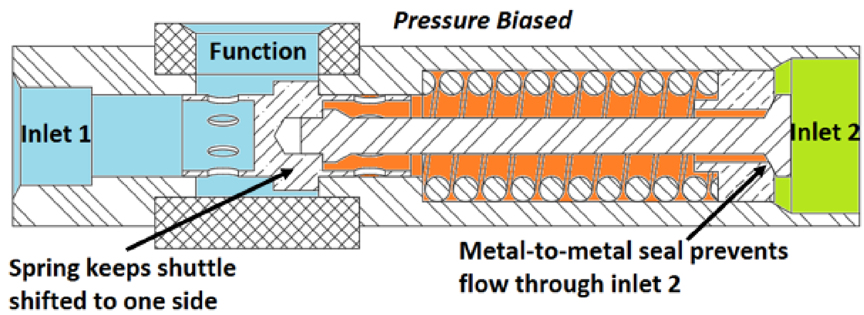


Spring Biased - Designed to prohibit hydraulic returns to specific input sources, i.e. deadman, autoshear, acoustic systems. With a high enough flow rate, the 'close tolerance' between the rod end and housing creates a differential pressure great enough to overcome the spring pressure and shift the shuttle valve.

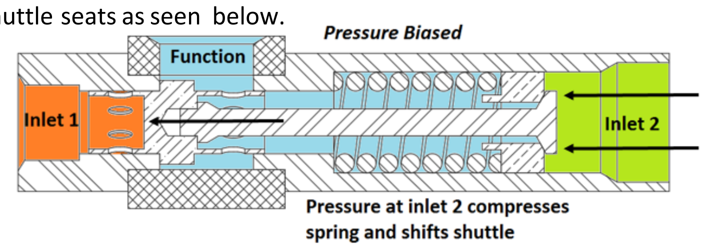
If the high flow rate is not maintained such that the differential pressure between the function and inlet 1 overcomes the spring rate, the shuttle will shift back and allow the function port to vent through Inlet 1. This shuttle is not recommended for ROV applications as a high flow rate is required to shift the shuttle.



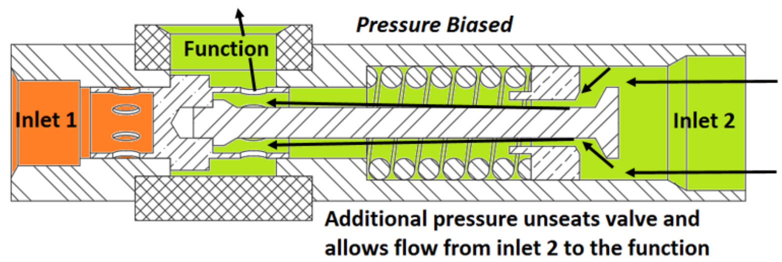
Pressure Biased – Designed to prohibit hydraulic returns to specific input sources, i.e. deadman, autoshear, acoustic systems, ROV. In the absence of flow through inlet 2, the spring keeps the shuttle shifted to block flow/returns to the inlet 2. The valve at the end of the spring also acts to prevent flow.



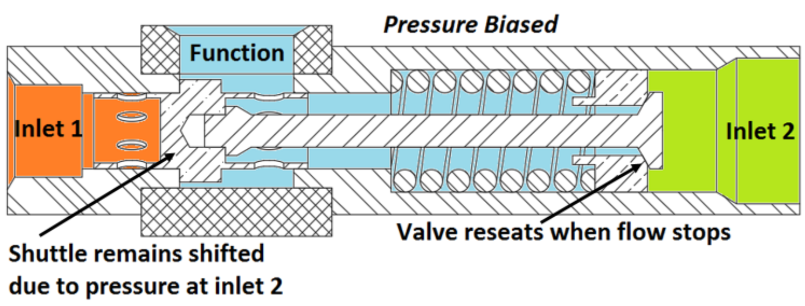
As fluid flows and pressure increases the spring is compressed until the shuttle seats as seen below.



Additional fluid pressure compresses the spring further, unseating valve, and allowing fluid to pass as seen marked by arrow below.



If fluid flow stops or is not continuous, the valve reseats and shuttle remains shifted as long as input pressure is maintained as seen below.



The pressure biased shuttle valve is recommended for use on all ROV functions; and is optional for use on certain special function applications (i.e. HP Shear Ram, Acoustic functions, Autoshear functions) where it is undesirable to have any return fluid flow.

RAPID-S53 is a joint industry project with participation from 15 rig contractors, 12 operators, and 3 original equipment manufacturers supported by the International Association of Drilling Contractors (IADC) and the International Association of Oil and Gas Producers (IOGP). IADC is the project coordinator.