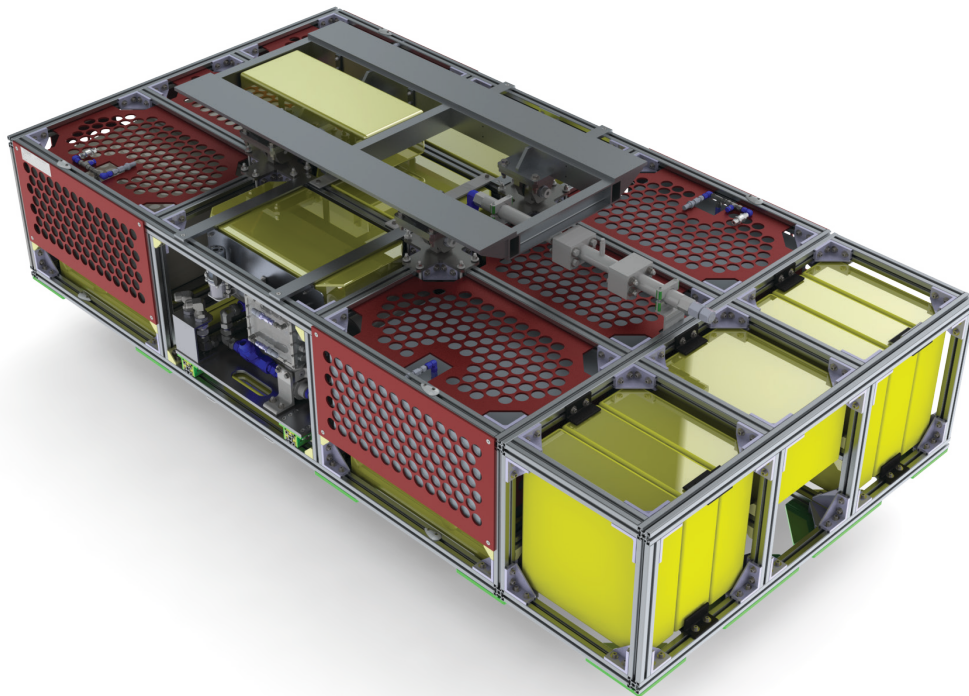


High-Low ROV Skid Completes Rapid Shear of Drill Pipe in Test Operations Offshore Angola

Oceaneering's High-Low ROV BOP Intervention Skid proves effectiveness by shearing a 6 $\frac{5}{8}$ in drill pipe in 44 seconds



Project Overview

A major operator required acceptance testing of the High-Low ROV BOP Intervention Skid to support its operations offshore Angola. This included drill pipe shear testing with the 18 $\frac{3}{4}$ in BOP blind shear rams prior to commencement of an offshore drilling program. The Oceaneering High-Low ROV BOP Intervention Skid was used to successfully cut the 6 $\frac{5}{8}$ in drill pipe and close the 18 $\frac{3}{4}$ in BOP blind shear rams with a 38-gallon volume capacity in 44 seconds, meeting the target time outlined by API S53. The 6 $\frac{5}{8}$ in drill pipe used for the shear test consisted of S-135 material grade with a wall thickness of 0.362 in.

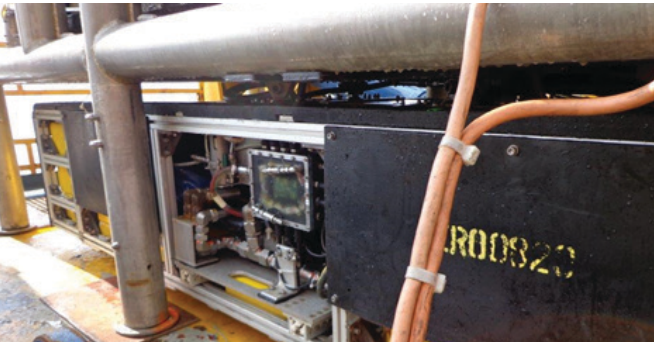
Issues

API S53 2018 section 6.4.13.2 does not dictate the requirement to complete the shearing of drill pipe with function and pressure testing under normal testing activities. However, the client required a drill pipe shear test during the kickoff of the drilling campaign to confirm the capability and readiness of the complete subsea drilling and safety systems.

The Oceaneering Solution

The Oceaneering ROV-mounted, High-Low BOP Intervention Skid is designed to deliver high flow and high pressure for the rapid closure of BOP blind shear rams. The skid is capable of providing up to 80 gpm of flow rate and up to 5000 psi of pressure. Integrated depth-compensated fluid reservoirs provide up to 140 gallons of BOP fluid capacity.

The size and flexibility of the High-Low BOP Intervention Skid enables worldwide air freight shipping and remote incorporation onto ROVs already mobilized in the field. Many ROVs do not have BOP intervention pumping units integrated into the vehicles. Therefore, incorporating a High-Low skid and its ability to be shipped offshore to the ROV for integration delivers advantages when compared to costly demobilization, shipping, and retrofitting of BOP pumping integration units directly into an ROV at a capable shore base.



High-Low Skid Installed on Oceaneering Magnum

Execution Plan

For this campaign, the High-Low BOP Intervention Skid was integrated on an Oceaneering Magnum® work-class ROV outfitted with dual electric motors and 80cc hydraulic pumps. The High-Low skid was received on the rig approximately one week prior to commencing commissioning activities. The ROV skid adapter secured the skid to the ROV and hydraulic and electrical connections were established. The complete installation was completed in six to eight hours during an appropriate window of opportunity. Integration testing of the skid and ROV was performed, including skid function testing to ensure proper integration and system performance prior to subsea system functioning and testing activities. Rig up of the riser system and 18 ¾ in 15K BOP was also completed. The BOP was then installed onto a subsea test stump at approximately 900 msw (3,000 fsw). Various ROV intervention system testing was performed including: blind shear ram (BSR) testing with no pipe in the hole, upper pipe rams (UPR), middle pipe rams (MPR), and lower pipe rams (LPR). Results of the testing completed prior to the pipe shear test are shown in Table 1 below.

Open hole, no pipe	Blind Shear Rams	Upper Pipe Rams	Middle Pipe Rams	Lower Pipe Rams
Capacity (gal)	38	15	15	15
Volume Pumped (gal)	38.6	15.6	16.5	14.1
Closing Time (s)	43	22	20	14
Maximum Pressure (psi)	5000	1500	1500	1500

Table 1: ROV Intervention BOP Testing

After all successful testing of the BOP with no pipe in hole, a shear test cut was performed with the blind shear rams (BSR) with a 6 $\frac{5}{8}$ in drill pipe inside the BOP. The cut pipe material was S-135 material grade and 0.362 in wall thickness. The High-Low skid sheared the pipe in 44 seconds at 1440 psi with a total volume count of 42 gallons.



Sheared Drill Pipe Post Test

Upon completion of the drill pipe shear test, additional BOP testing with the skid was performed including lower marine riser package (LMRP) primary and secondary unlocks, the test stack connector primary and secondary release, and another blind shear ram test with no pipe in the hole. Results are provided in Table 2 below.

Open hole, no pipe	LMRP Primary Unlock	LMRP Secondary Unlock	Primary Stack Release	Secondary Stack Release	Blind Shear Rams
Capacity (gal)	38	15	15	15	38
Volume Pumped (gal)	38.6	9.2	9.8	9.8	-
Closing Time (s)	12	14	20	21	43
Maximum Pressure (psi)	1500	1500	1500	1500	3000

Table 2: ROV Intervention BOP Testing Post Pipe Shear Test

The subsequent drilling campaign was completed successfully, and the High-Low skid was demobilized from the ROV within four hours.

Results

The Oceaneering High-Low skid provided the client with an ROV Emergency Intervention System in compliance with API S53. The ability to ship the skid worldwide on short notice and the requirement for minimal ROV integration time provided an expeditious mobilization and preparation of the ROV system for the drilling campaign in a remote location. The front-end testing, including pipe shearing testing, provided confidence to the client that the emergency safety systems were validated in the field and primed for safe offshore drilling operations.



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