

Expedition 367 South China Sea Rifted Margin A Engineering Report

**Hong Kong to Hong Kong, China
(07 February to 09 April 2017)**

**Steve Midgley, TAMU Operations Superintendent
Bob Aduddell, Operations Engineer**

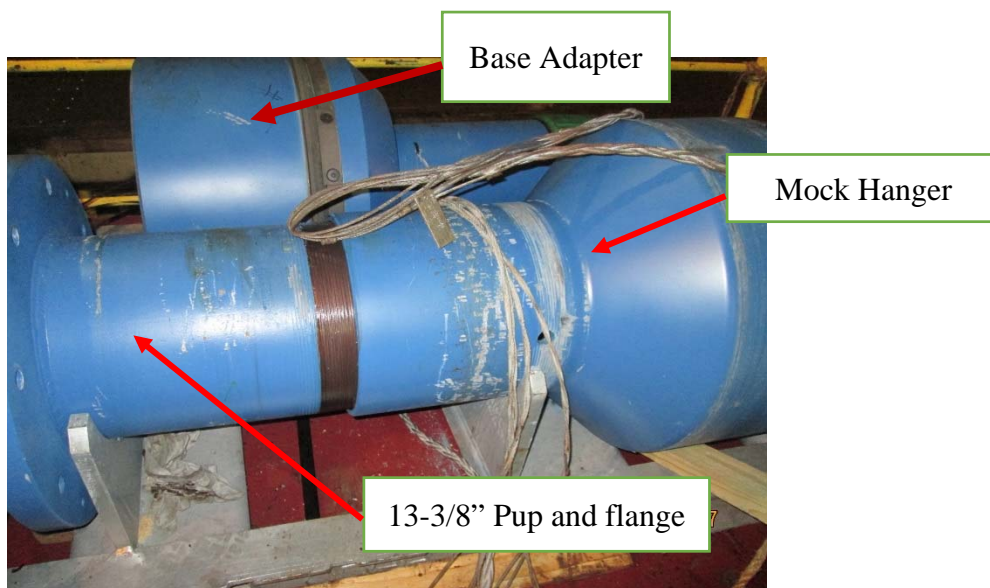


Engineering Overview:

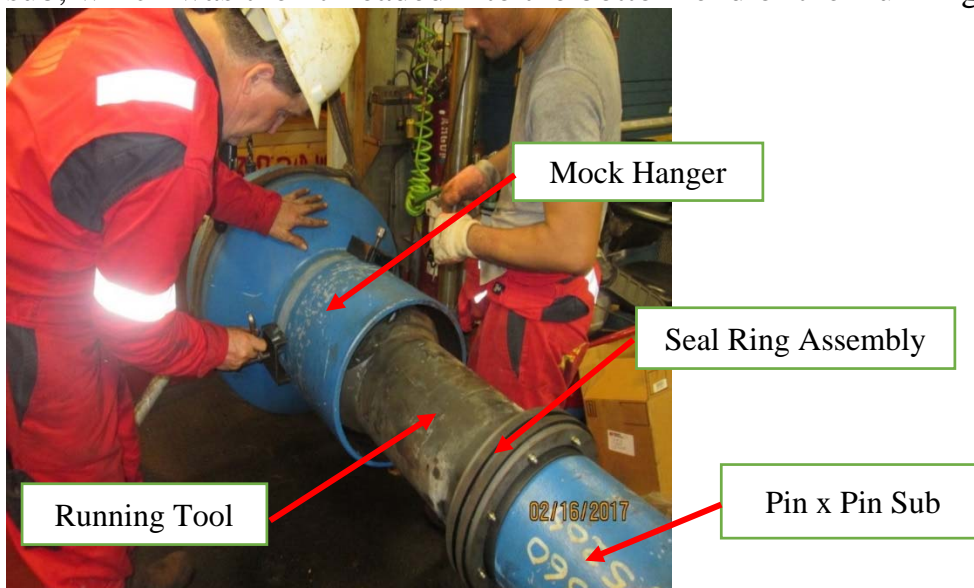
The HRT along with a mud skirt and string of 10-3/4" casing was deployed on Holes U1499B (651 meters of casing) and U1500B (842 meters, a new drill-in record for the JR). The assembly steps and deployment sequence listed below were nearly identical for both deployments, except the time for the 2nd assembly/deployment was approximately half the time for the initial assembly/deployment. An additional funnel was designed and deployed on 1500B as a result of the huge mound of cuttings that accumulated around the original funnel.

HRT Assembly:

The HRT Mock Hanger was delivered in two sections mounted on a custom made frame designed to ship the unit. One section consisted of the Mock Hanger threaded loosely into the threaded the 13-3/8" casing pup which is welded to the Top Flange. The second section was the Base Adapter welded to a 10-3/4" casing pup, both of these were staged on the Core Tech shop roof. The Mock Hanger was removed from the casing pup/top flange and moved into the Core Tech shop for assembly. The casing pup with flange that was removed was firmly bolted to the Base Adapter.



The HRT Running Tool was first mounted in the floor vice, and a Snap Ring and PolyPak seal were installed in the internal diameter. The Mock Hanger was then slipped over the Running Tool and moved into the correct position. The 3 Latch Dogs (assembled with springs) were then inserted through the top of the Running Tool and pulled into the mating grooves in the Mock Hanger using the Latch Dog jigs threaded through the outside of the Mock Hanger. A PolyPak seal was installed on the O.D. of the shifting sleeve, and the sleeve was inserted into the Running Tool from the top end. The sleeve was moved into the correct position inside the Running Tool using the Shifting Tool, and two brass shear pins were installed. The Seal Ring Assembly was put together and installed on the pin x pin sub, which was then threaded into the bottom end of the Running Tool.



Removing the Latch Dog Jigs from the HRT Mock Hanger.

The Latch Dog Jigs were then removed, and pipe plugs were installed in the shear pin holes in the Running Tool, and the Latch Dog holes in the Mock Hanger using Loctite. The assembled Running Tool/Mock Hanger/pin x pin sub was then moved back to the Core Tech Shop roof.



Running Tool Assembled inside Mock Hanger.

Assembly time for the first HRT was a bit less than 4 hours, the assembly time for the second HRT was down to less than 2 hours. The two sections of the HRT Assembly (the Mock Hanger/Running Tool/sub and the Base Adapter/casing pup with flange) were kept staged on the Core Tech roof until it was time to run them.



The HRT in two sections staged on the Core Tech roof.

To assemble the HRT, the two pieces were moved to the rig floor. The two preassembled cross over subs (to get to pipe thread) were mated with the HRT Mock Hanger/Running Tool/double pin sub assembly. Rig Tongs had to be used for the NC-70 connections (top and bottom of the Running Tool). The Base Adapter (with the 13-3/8" pup and flange bolted to it) was then set in the rotary and the Seal Ring Assembly was inserted into the 13-3/8" pup by lowering the Mock Hanger. Grease was used liberally on both the internal surface of the pup and the rubber seal rings. The casing connection was tightened and stitch welded, and the entire HRT assembly was racked back in the derrick.



Assembled HRT in Rotary

Running the HRT:

The 10-3/4" casing was then run. A Texas Pattern shoe was welded onto the lowest joint of casing, and each joint of casing was stitch welded at the top and bottom of the couplings to ensure they would not back off during the drill-in. A total of 651 meters for U1499B, and 842 meters (a new record for IODP for drilled-in casing) for U1500B were assembled and run. The crews averaged 5 joints of casing an hour, including welding. After the entire casing string was run and welded, the HRT assembly was picked up, and the top joint of the casing string was threaded into the 10-3/4" pup section at the bottom of the HRT Base Adapter and stitch welded. The entire HRT assembly was then used to lower the Base adapter and casing through the rotary and set in the landing ring of the mud skirt. You could clearly hear two "clicks" as the snap ring entered the top and then the lower snap ring groove.



Running in the HRT with Base Adapter connected to 10-3/4" Casing String.

After landing the casing in the Landing Ring in the Mud Skirt, the entire string and mud skirt were lifted to verify the Base Adapter was locked into the Landing Ring. The 8 flange bolts were then removed, and the top section of the HRT was lifted back through the rotary to the drill floor.



The HRT top assembly; the Base Adapter and casing are landed in the Mud Skirt.

The drill string (bit, under-reamer, mud motor, collars, etc.) was then run through the HRT and into the casing string as it was made up, with the last connection being the top of the drill string to the Running Tool crossover subs. This was then lowered into the Moon Pool and mated to the Base Adapter. Two tapered guide pins were threaded in the Base Adapter and used to align the HRT flange. Once the flange was aligned with the Base Adapter, the guide pins were removed and the eight 1"-8 bolts (coated with Never-Seize) were then torqued to 680 ft-lbs.



1" Tapered Guide Pin

The two halves of the Re-entry cone were then bolted together and the funnel set down on top of the Mock Hanger by the funnel tabs. Once in place, the funnel was welded around the base, through the plug weld holes, and stitch welded on the inside lip of the funnel.



Putting the Re-Entry Cone together in the Moon Pool.

The entire string was picked up, the Moon Pool doors opened, and the assembly lowered until the drill bit reached the sea floor. The VIT camera was lowered just above the funnel to observe drill-in procedure.



Based on the experience of deploying the two HRT systems, several improvements were designed for the next system:

- The Seal Ring Assembly, while an improvement over the previous design, still allows some bypass. A new Seal Ring was designed using two PolyPaks sealing on the honed interior of the 13-3/8" casing pup/Top Flange piece.
- A latching clamp was designed to be used to cover and protect the Seal Ring while it is being handled on the Rig Floor.
- A new pin x pin x-over sub was designed. The current sub has a 6-5/8" Reg Pin down, which requires two x-over subs to get it to the 5-1/2" FH thread used in 5" drill pipe; it is also 9-1/2" OD which requires tongs to tighten. The new sub ends in a 5-1/2" FH pin and necks down to 7", which allows the use of the Iron Roughneck.
- Oblong cut-outs were added to the Funnel neck to make welding easier. Currently the neck is welded to the Mock Hanger using 1" diameter plug weld holes.
- Threaded holes, 1"-8, were added to the outside of the Mock Hanger. These, along with matching clearance holes in the Funnel barrel, will be used to bolt the funnel to the Mock Hanger, in addition to welding.
- The inside taper of the Base Adapter was modified to ease the passage of the Drill bit.
- It was determined that only two handling bolts and cutouts were needed for the Mock Hanger, so two were eliminated.
- The two 1/2" guide pins were determined to be too small to be useful, and were eliminated. Two 1" guide pins are now used, and are replaced with bolts after the flanges have been mated. These new 1" tapered guide pins need to incorporate hex flats to ease removal; they are currently removed with a pipe wrench which damages the surface of the pins.
- The lifting eyes for the Funnel were moved from the top edge of the funnel to the sides, they can be left in place on the sides, where previously they needed to be cut off from the top before deployment.
- Larger funnel tabs were designed and incorporated into the funnel fabrication, rather than field welding them on board.

Additional Funnel:

A second/additional Free Fall Funnel and stinger assembly was designed. Seafloor settling and the cuttings mound had left the original Funnel on 1500B almost buried, and during the second re-entry following a bit change, cuttings were seen to be falling into the cone. A stinger incorporating a Free Fall Funnel was designed to be stripped over the drill pipe, dropped, and land inside the Mock Hanger. The stinger consists of 55" of 13-3/8" casing, welded to a crossover to 10-3/4", and a short 10-3/4" pup with a Texas Pattern Shoe. There was no 13-3/8" to 10-3/4" crossover on board, so one was manufactured from a 16" x 10-3/4" crossover. The stinger is designed to land inside the HRT at the lowest internal shoulder. A Free Fall Funnel was then welded to the top of the stinger, putting the second funnel at approximately 1.5 meters above the original funnel.



Funnel/stinger in Moon Pool, ready to drop.



Second Funnel, on its way down.

Oil saver

The MDHDS (Motion Decoupled Hydraulic Delivery System) is deployed on the Schlumberger wireline, which must be used through the Top Drive in order to apply pump pressure to actuate the tool. In order to run the wireline through the Top Drive, the wireline has to be cut, threaded through the Top Drive, and then re-headed. The reverse must be done when the MDHDS is retrieved. This double re-heading is a burden on both time (over an hour per re-head) and spare parts. After discussing the options available, the people directly involved with the use of the logging line chose to proceed with the option designed by Kevin Grigar. This design is an adapter that will allow the logging wireline to use the same Oil Saver as the current IODP saver used for the core line, replacing the Cavin's Oil Saver currently used by Schlumberger. Using this adapter will eliminate the need to re-head the wireline when deployed through the Top Drive, saving time and parts.



Cavins Wireline Oil Saver

Other activities:

- Applied Property tag to SIDUS pan and tilt unit of VIT.
- Returned 2 MicroSMART pressure transducers to shore for calibration.
- Supported Core techs with ACAD requirements as needed.
- Supported Operations Superintendent as needed.
- Supported Hikurangi CORK activities as needed.
- Began preparing for Expedition 372 PCS deployments.
- The two T2P tools, pressure testing chamber, pump, and tool boxes were packaged in four protective containers for return shipment via airfreight. Total weight was 496 lbs.
- Returned 2 APCT3 tools for calibration (1858005 & 1858009).
- Returned SETP #1 for calibration.

