From: Burns, Tim A
Sent: Sat Mar 06 03:22:08 2010
To: Nohavitza, Glenn R; Schilling, David A.; Gray, George E
Cc: Sims, David C; Daigle, Keith G
Subject: Maersk Developer Subsea BOP Report
Importance: Normal
Attachments: Subsea BOP Failures Maersk Developer.ZIP

Here is a report forwarded from Statoil summarizing the BOP failures on the Maersk Developer.
This is the only report I have seen to date.
I will copy this into the Tucker (WR 543) server folder.
<<...>>

6030
Exhibit No. _____
Worldwide Court Reporters, Inc.

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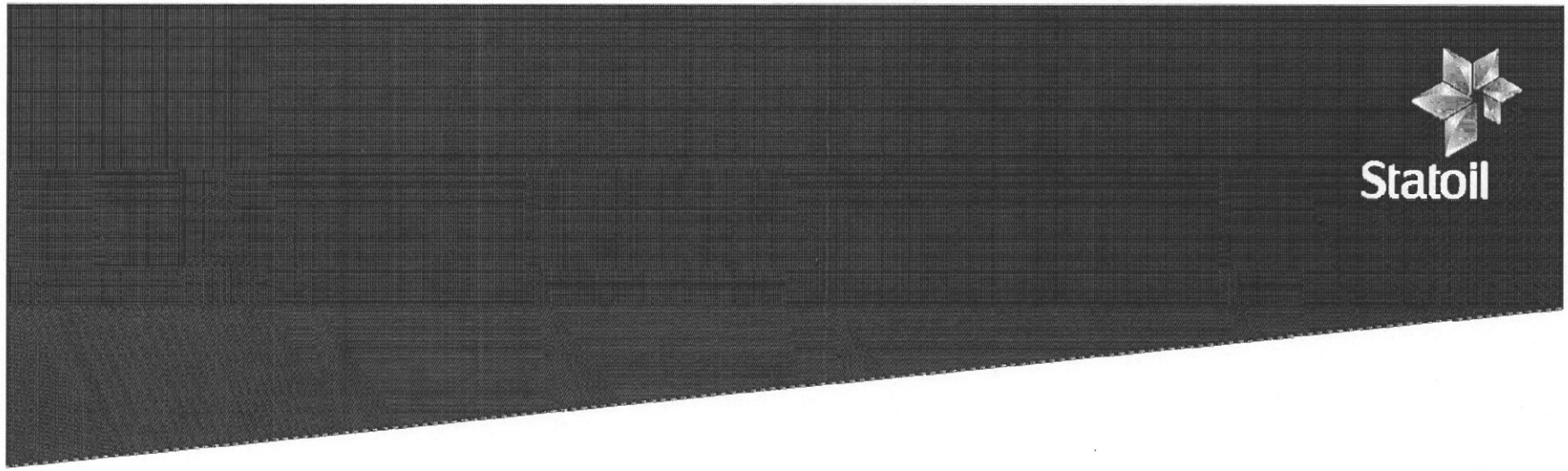
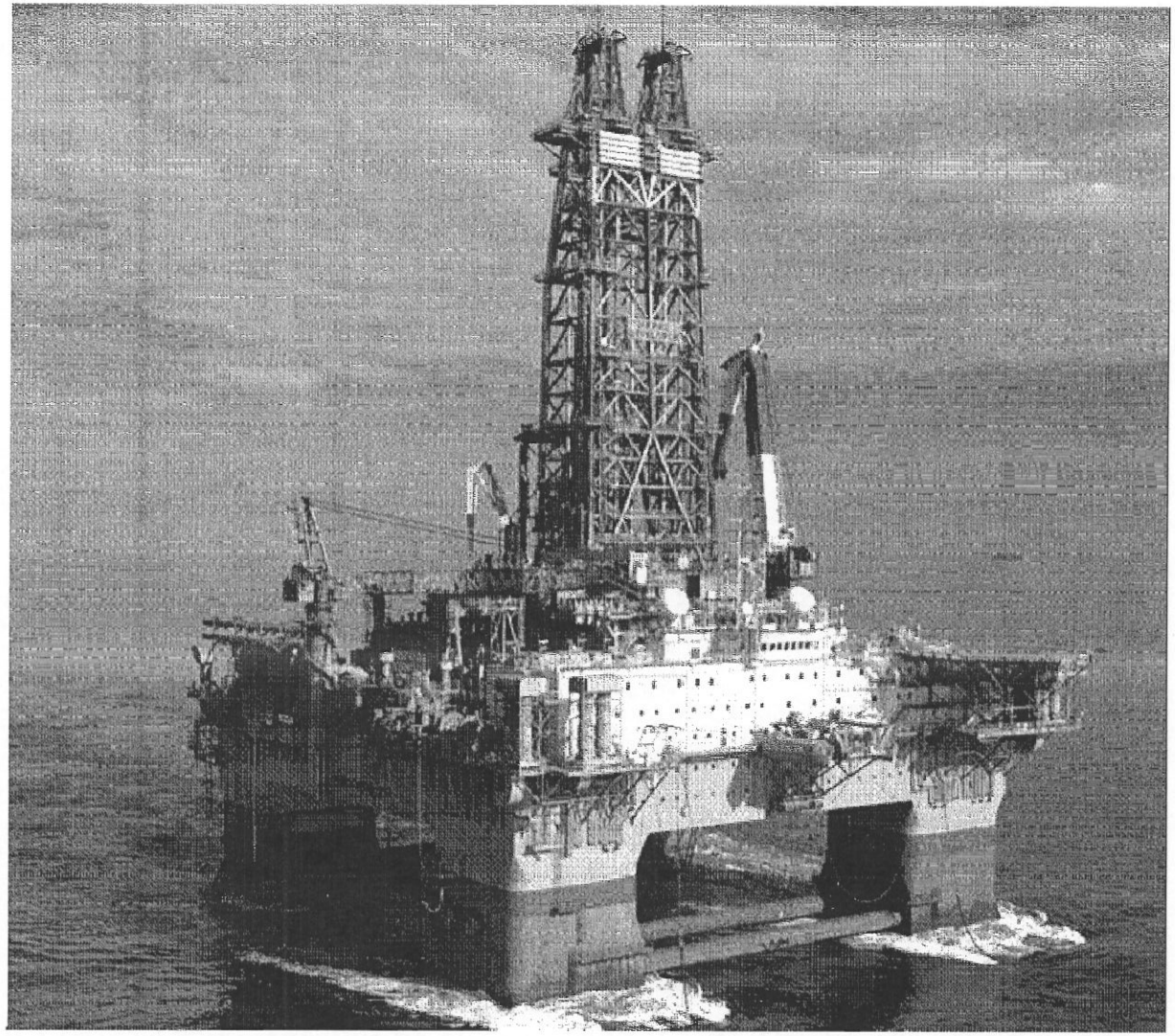


Subsea BOP Failures
Maersk Developer

Statoil Gulf of Mexico Experience Transfer

Classification: Internal



Introduction

- The Maersk Developer commenced contract on 10 September 2009.
- Since that date, it has accrued more than 50 days of downtime related to the BOP.
- Major problems that have required stack pull were: choke stab leaking, electrical short on the BOP control system and cap screw failure on the 22" 3K blind shear ram operators.

Software Quality/Management Control

- EDS (emergency disconnect procedure) was performed to complete commissioning and acceptance.
- 1st attempt found older revision software on the drillers chair panel. This resulted in an incorrect sequence of the EDS.
- Hydril updated the software and a successful EDS was performed.
- Maersk is implementing a software management program to prevent future issues with software applications.

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Choke Retractable Stab

- Successful EDS performed.
- Subsequent pressure testing found leak at the choke side retractable stab.
- With BOP on surface, found damaged seals within stab and found score mark on the lower stack stab.
- All components were replaced and successful tests were achieved.
- Hydril is preparing a report on the failure. It should be available by February 19th.

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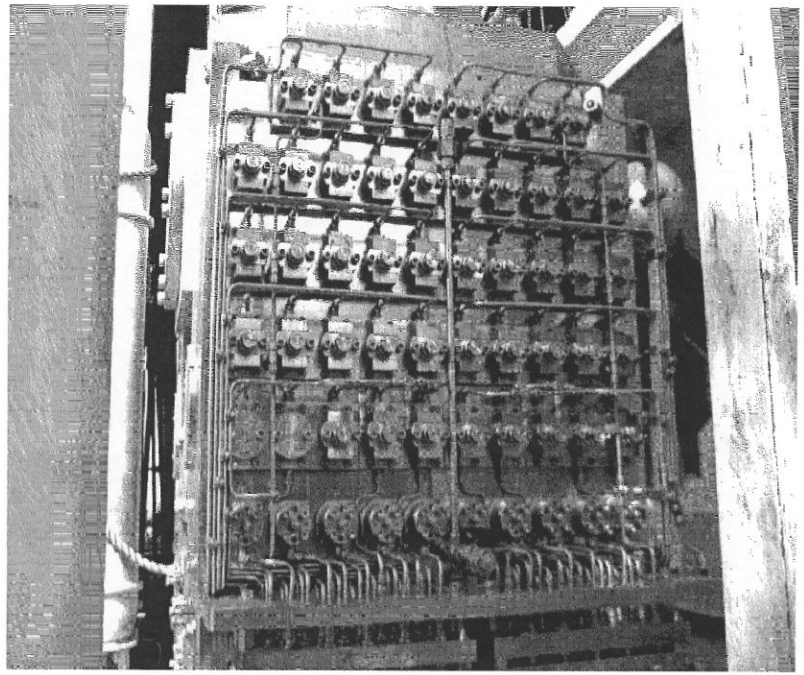
Pressure Transducer Fault

- Erroneous readings were received from the manifold regulator readback and the lower annular pilot transducers on the blue pod and the wellhead connector readback transducer on the yellow pod when running the BOP.
- Errors occurred at approximately 5,000 feet water depth.



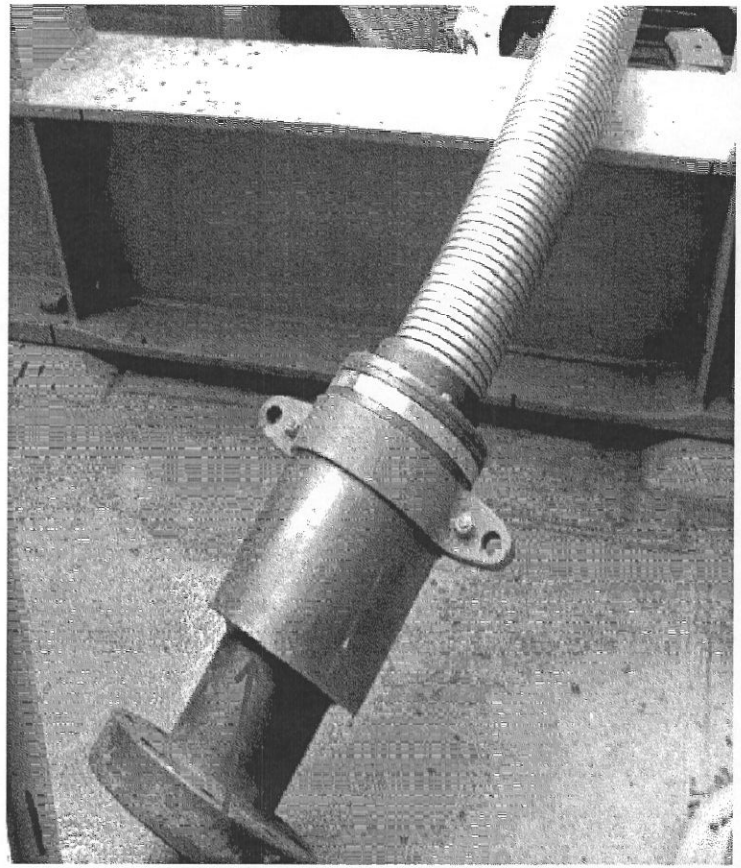
Pressure Transducer Fault

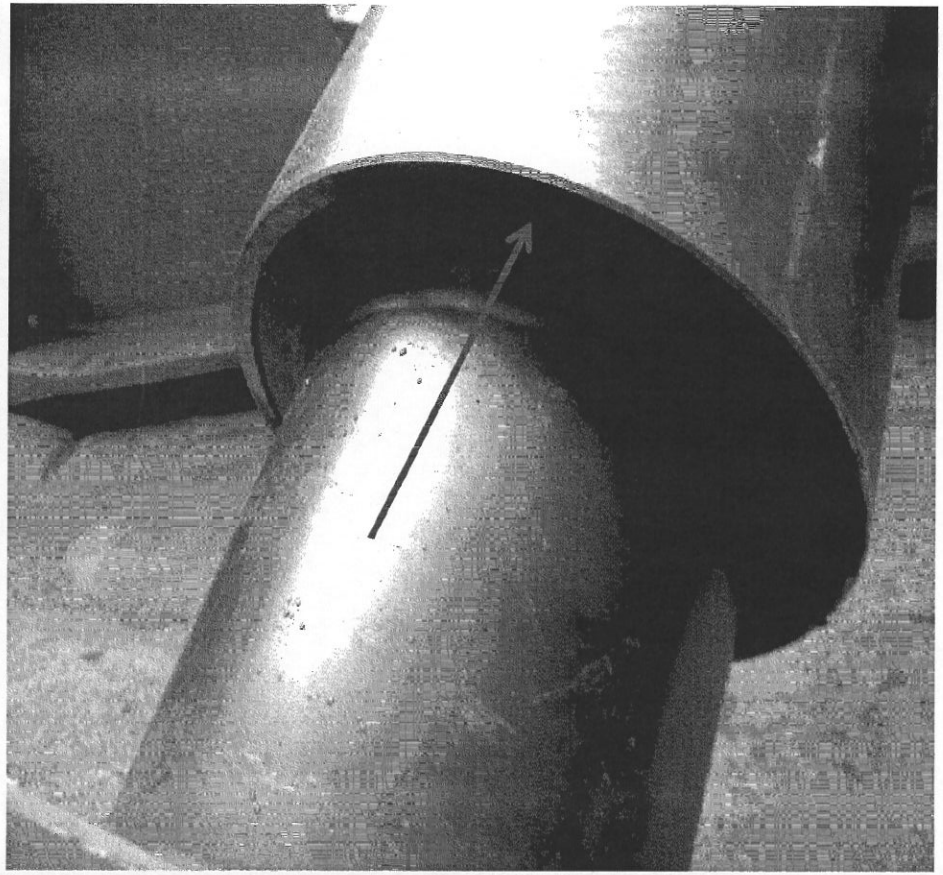
- Transducers were working fine on the surface.
- Troubleshooting subsea found control system working as expected and BOP was not pulled for this reason.
- The next BOP pull, transducer operation returned to normal at approximately 5,000 feet water depth.
- Troubleshooting on surface found no fault and BOP was run again, with same results at depth.
- Next time BOP was on surface, Hydril recommended replacing the harnesses in both of the dialectric chambers.
- One new harness was found to be assembled incorrectly and required field repair prior to installation.
- Harness replacement corrected problem.

LMRP Mounted Coflexip Hose

- While stump testing the BOP stack, found difficulty in testing through the Coflexip hoses to the test valves on the LMRP.
- Leak was located in the choke side Coflexip hose near the end connection at the kick out on the riser adapter.
- Hose was replaced and successful tests were achieved.
- Coflexip hose sent back to manufacturer for investigation

LMRP Choke Coflexip Hose





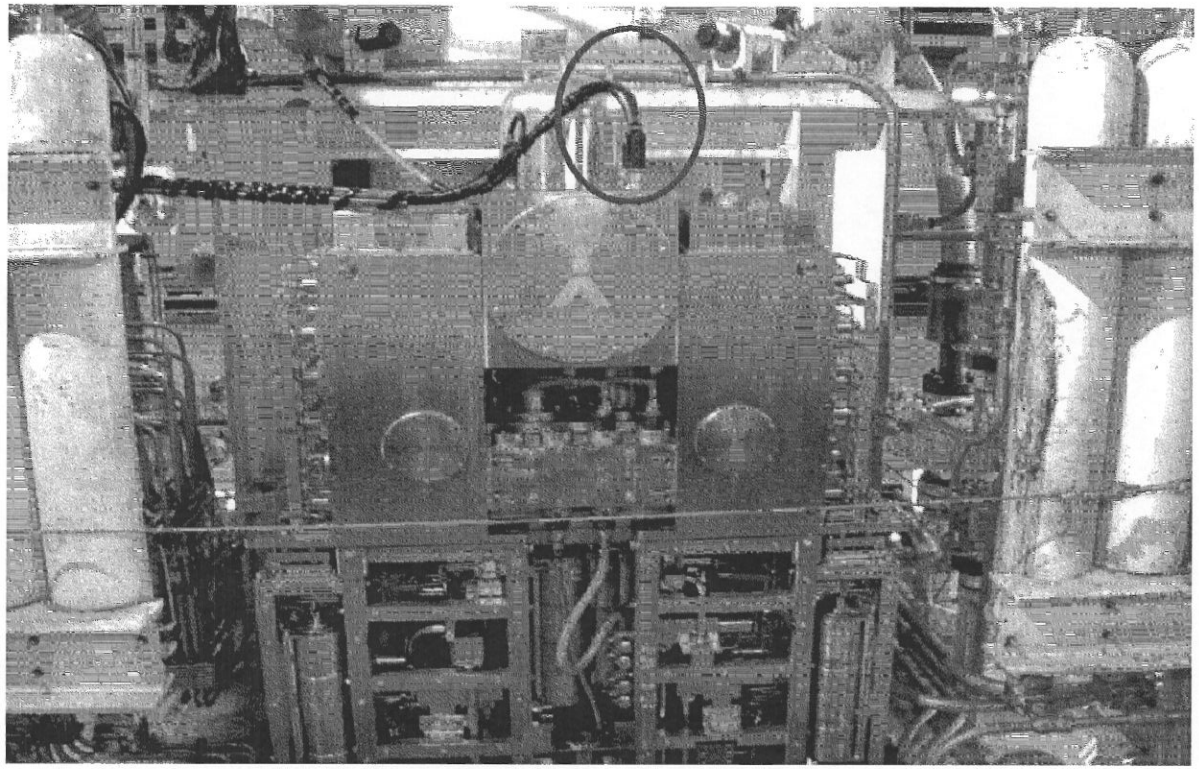
18 ¾" 10K Hydril GX Annular

- Pre-deployment soak testing of the BOP in the drilling mode found BOP control fluid leaking from the seawater check valve in the upper annular.
- Disassembly and inspection found no apparent damage to the seals or sealing areas that would cause this leak.
- Annular operating system sealing areas were polished. Unit was assembled with new rubber goods and successfully tested.

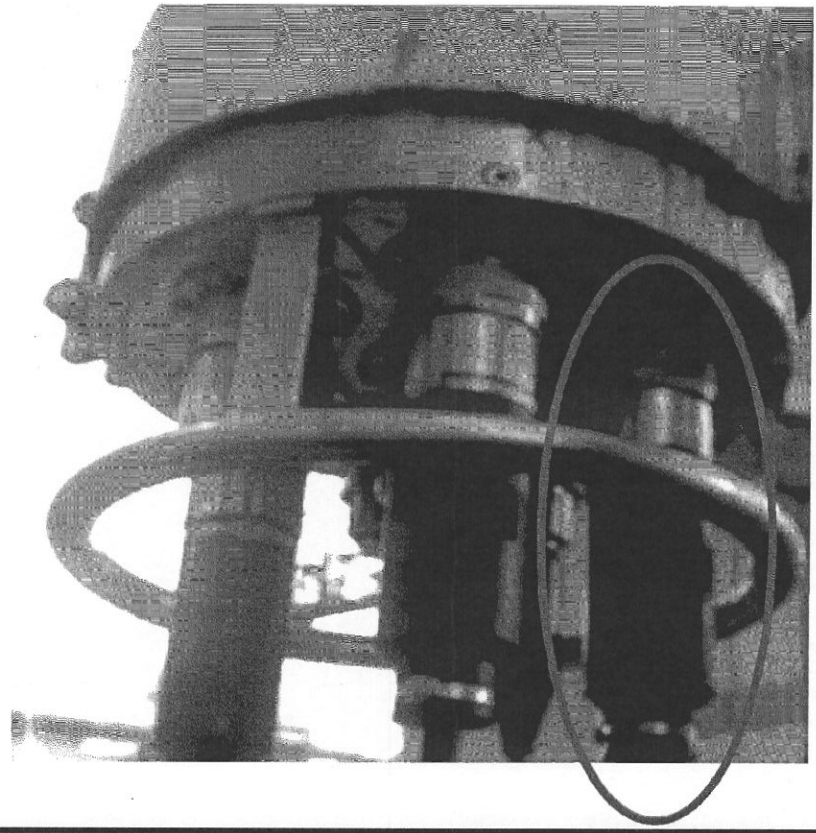
Subsea Power Cable Failure

- While drilling, the circuit breaker for the yellow pod power supply tripped.
- Troubleshooting found a dead short on the yellow MUX power side.
- Pulled BOP stack.
- Investigation found power cable between yellow subsea Field Installable Termination Assembly, FITA, and the yellow pod was damaged due to water ingress.
- Cable was replaced and the system then worked as designed.
- The connector in use is not testable per API 16D.
- Maersk is working with Hydril on a replacement testable connector that meets API specification.
- Subsequent stack pull and inspection of power cables found corrosion on connectors. Cables were replaced before next deployment.

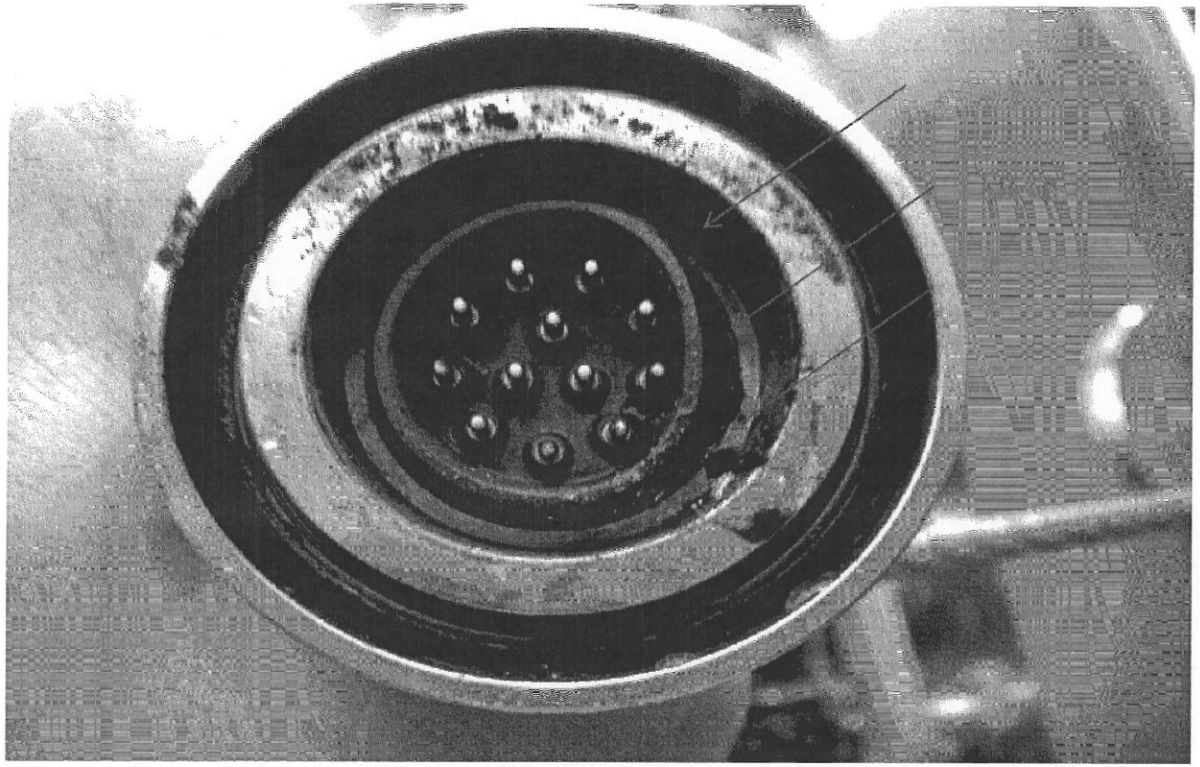
Subsea Power Cable - Yellow Pod



Subsea Power Cable - Yellow FITA



Subsea Power Cable - Damage at FITA End



18 ¾" 10K Hydril GX Annular Failure

- Stump testing BOP prior to deployment.
- Difficulties in achieving wellbore test on the upper annular.
- Found wellbore fluid flowing from the open SPM on the yellow pod.
- Further testing found the leak was intermittent.
- Annular assembly was replaced.
- Annular was sent to Hydril for testing and inspection. No problems were found.

Failsafe Close Assist Circuit Failure

- Several leaks have been encountered with the failsafe close assist circuit.
- Swagelock fittings have failed on two occasions and pressure relief valves have failed.
- No downtime is associated with the failure of this circuit.
- Maersk is working on a solution to prevent this failure in the future. Probable solution is to remove tubing with compression fittings and replace with hard pipe and code 62 flanges

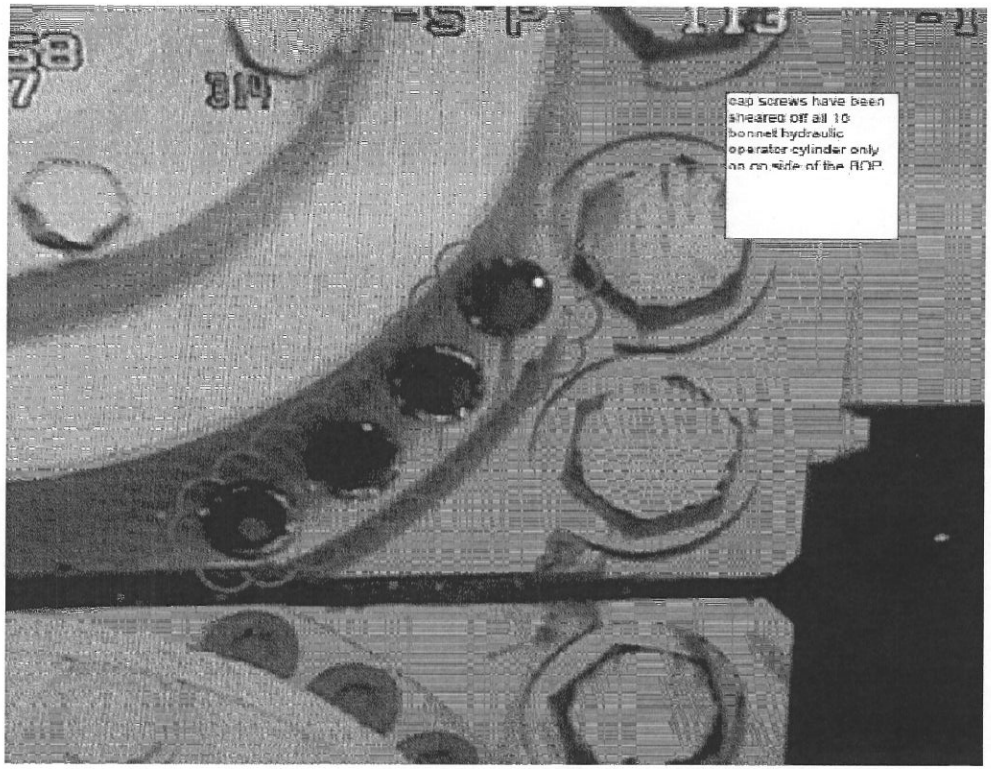
SSTV Test Ram Failure

- While pressure testing the BOP when subsea against the SSTV, a sudden loss of pressure occurred at 6,800 psi.
- Testing was completed with BOP test plug.
- Inspection after the next BOP pull found SSTV ram packers to be damaged.
- Hydril is evaluating this failure.

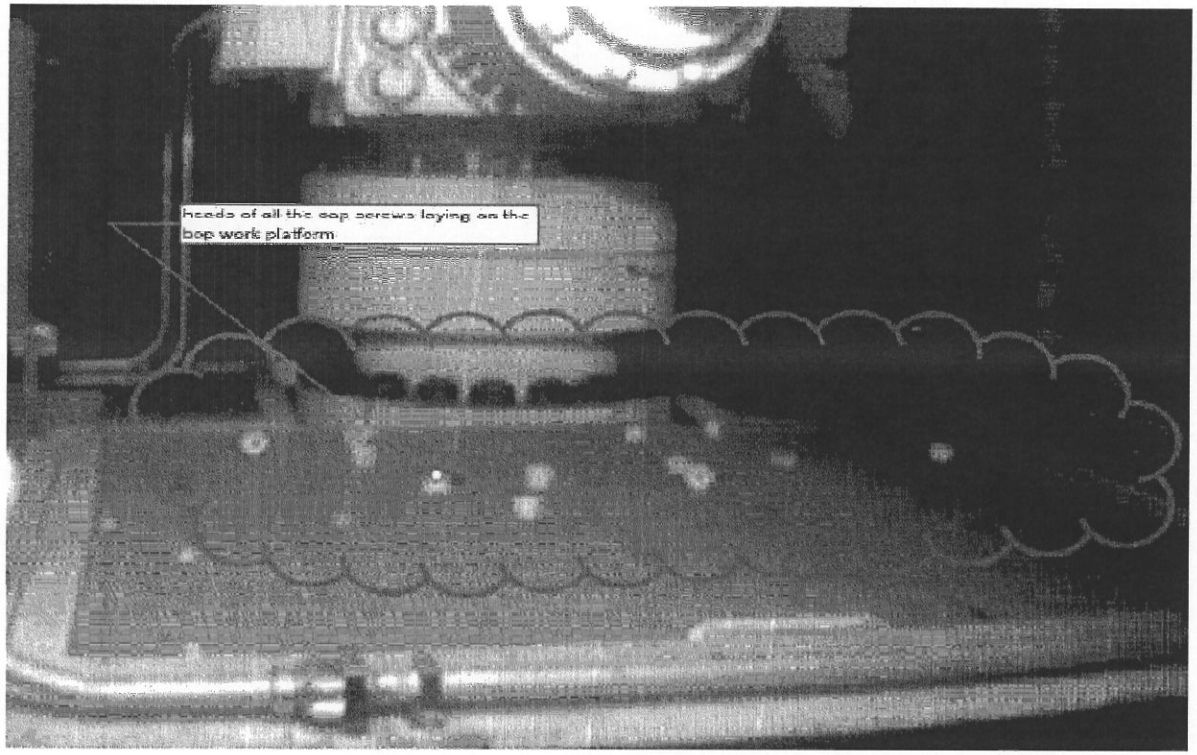
18 ¾" 15K 22" 3K Blind Shear Ram Operator Failure

- Major fluid run away was detected.
- Troubleshooting was conducted by blocking functions and leak was discovered to be coming from the blind shear rams.
- ROV inspection found 16 cap screw heads from the blind shear rams laying on the grating of the BOP work platform.
- Pulled BOP stack.
- Analysis performed by Hydril and Maersk third party determined that the cap screw failures were due to HE (hydrogen embrittlement).
  - **—Cap screws were manufactured of 17-4 PH stainless steel.**
  - **—17-4 Stainless steels are susceptible to hydrogen embrittlement in marine environments**.
- Hydril solution was to replace the cap screws with higher strength Xylan coated 17-4 cap screws as are used in their 22" 4K operators.

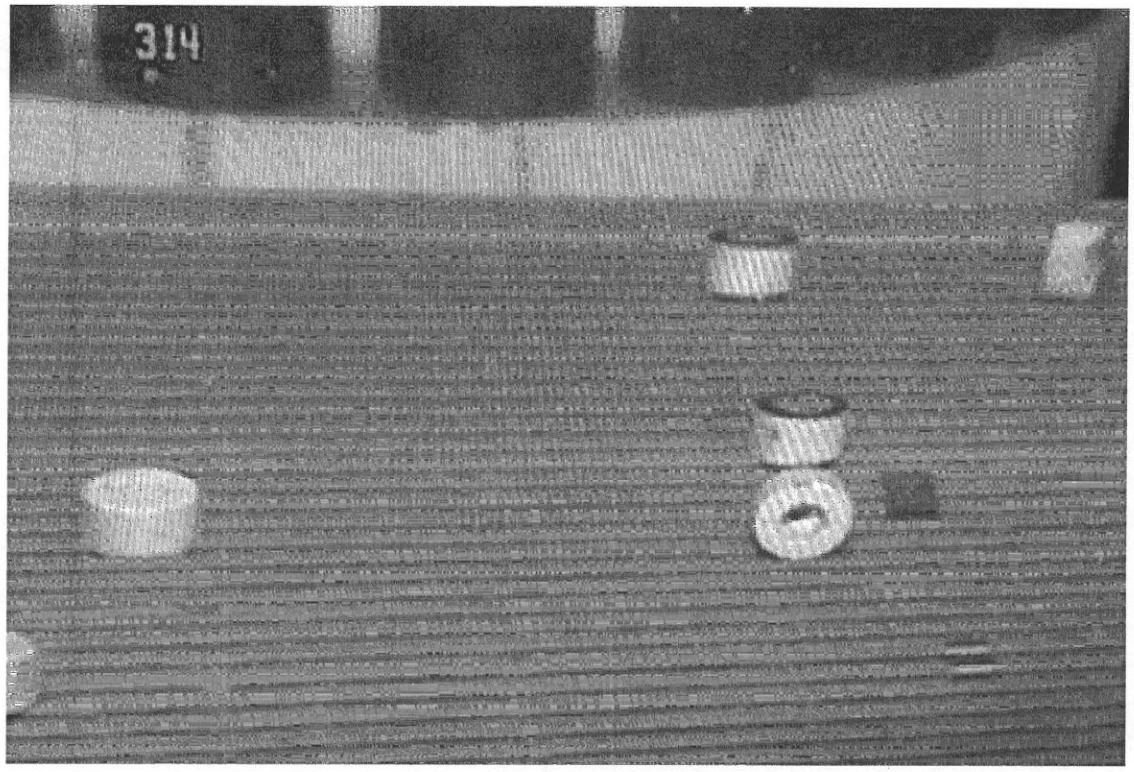
22" 3K Blind Shear Operator with Cap Screw Heads Missing



Cap Screw Heads Laying on Work Platform Grating



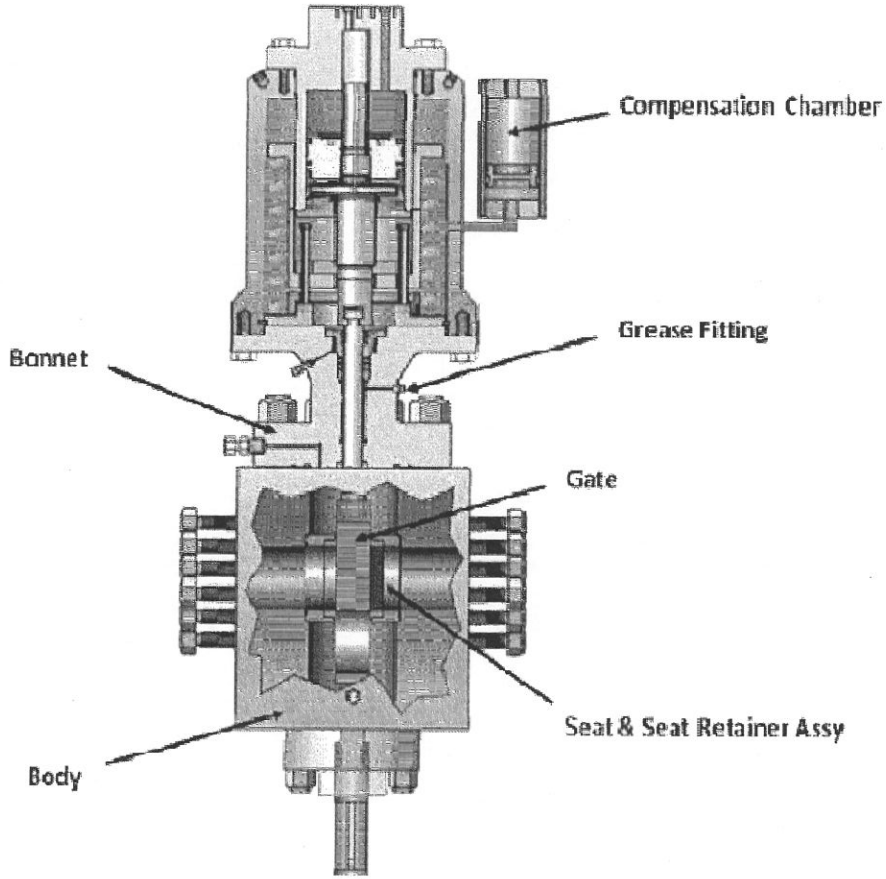
Cap Screw Heads



WOM Subsea Valve Issue

- While troubleshooting a leak when testing the BOP, the outer gas bleed valve was found to be in the half open position with 1,500 psi close pressure applied.
- Multiple functions found the same result.
- Increasing the closing pressure to 2,000 psi closed the valve.
- Technical discussions with WOM, determined that the compensation system was not fully purged (air in the actuator or compensating piston) or the piston in the compensator was fully extended or stuck.
- Operations were continued with increased operating pressure applied.

WOM Hydraulic Gate Valve with Compensating Chamber



CLIP Riser Auxiliary Line Damage

- Pins in the choke and booster lines have been damaged. This was noticed while running the riser during the last riser run. Previous riser runs also identified damaged pins.
- The corrective action is to replace them with pins from other riser on the rig, leaving additional riser with no pins. This is an unacceptable practice and needs to be addressed immediately.
- Maersk is working with Aker to rectify the problem.

Thank you

Experience Transfer

Michael Long
Subsea Consultant
milon@statoil.com, tel: +713-828-3048
www.statoil.com