

UNITED STATES DEPARTMENT OF THE INTERIOR  
MINERALS MANAGEMENT SERVICE  
GULF OF MEXICO REGION  
**ACCIDENT INVESTIGATION REPORT**

1. OCCURRED

DATE: **12-FEB-2006** TIME: **0630** HOURS

2. OPERATOR: **BP Exploration & Production Inc.**

REPRESENTATIVE: **Anne-Renee Laplante**

TELEPHONE: **(713) 666-3977**

3. LEASE: **G14658**

AREA: **MC** LATITUDE:

BLOCK: **822** LONGITUDE:

4. PLATFORM:

RIG NAME **T.O. DISCOVERER ENTERPRISE**

5. ACTIVITY:  EXPLORATION(POE)

DEVELOPMENT/PRODUCTION  
(DOCD/POD)

6. TYPE:  FIRE

EXPLOSION

BLOWOUT

COLLISION

INJURY NO. \_\_\_\_\_

FATALITY NO. \_\_\_\_\_

POLLUTION

OTHER \_\_\_\_\_

7. OPERATION:  PRODUCTION

DRILLING

WORKOVER

COMPLETION

MOTOR VESSEL

PIPELINE SEGMENT NO. \_\_\_\_\_

OTHER \_\_\_\_\_

8. CAUSE:  EQUIPMENT FAILURE

HUMAN ERROR

EXTERNAL DAMAGE

SLIP/TRIP/FALL

WEATHER RELATED

LEAK

UPSET H2O TREATING

OVERBOARD DRILLING FLUID

OTHER improper operation of equip

9. WATER DEPTH: **6271** FT.

10. DISTANCE FROM SHORE: **70** MI.

11. WIND DIRECTION: **NW**

SPEED: **21** M.P.H.

12. CURRENT DIRECTION: **WNW**

SPEED: **5** M.P.H.

13. SEA STATE: **FT.**

16. OPERATOR REPRESENTATIVE/  
SUPERVISOR ON SITE AT TIME OF INCIDENT:

**Dan LeMaire**

CITY: \_\_\_\_\_ STATE: \_\_\_\_\_

TELEPHONE: \_\_\_\_\_

CONTRACTOR: **Transocean Offshore**

CONTRACTOR REPRESENTATIVE/  
SUPERVISOR ON SITE AT TIME OF INCIDENT:

**Joe Donnelly**

CITY: **Scituate** STATE: **MA**

TELEPHONE: **(781) 545-2998**

17. DESCRIBE IN SEQUENCE HOW ACCIDENT HAPPENED:

OPERATIONAL TIME LINE:

13:35 Sub sea engineer notices Blue pod flow meter ticking off 120 gph control fluid  
-Ticking off constant  
-Control fluid flow rate estimated at 120gph  
-Pumps running every 10 mim.  
-Calculated control fluid loss 3257 gal 51.38 days operating at this rate  
-ROV was headed down for riser inspection. Asked them to identify source of leak.  
Approximate 1 hour.  
-Determine leak was coming from blue pod annular regulator.

14:24 ROV observing blue pod.

14:34 Increase/decrease annular regulator to determine whether something could have gotten in between the shear seal and the shear seal plate. Running the regulator through its range will sometimes clear this problem up. This was done twice.  
Increase/decrease between 200/2000 psi with no changes noted.

14:40 Close annular hoping to wash the regulator seal area clean.

14:51 Open the annular.

15:00-15:15 When annular was functioned, drill floor noticed a 2 bbl loss (first indication of possible petroleum free SBM loss). Continue pulling out of hole until next 5 stands fill up. Fill up was 7 bbls over calculated displacement. Shut down and perform flow check (static). Continued to pull out of hole.

15:16 Switch pods from blue to yellow. This operation was performed from the OIM office. Initially no control fluid leaks from yellow pod. Transocean Assistant Rig Manager was notified by OIM. During the phone call with Assistant Rig Manager, yellow pod starting ticking off fluid slowly. Transocean OIM notified the BP Well Site Leader who in turn contacted BP Onshore Operations Team. During conversation, yellow pod flow increases to same as blue pod = 120 gph.

15:22 ROV going back to 500-ft to assist with running in and cleaning the WT-66 drill pipe. At 16:24 - ROV arrives at 500' waiting for pipe to descend to same depth.

16:01 Subsea calls and wants to function annular again. Rig floor calls Subsea and OIM informing them that we have mud losses when annular was functioned. Annular was not functioned further. Flow check well (static).

16:07 Subsea vents annular to allow functioning of regulator (without functioning annular).

16:08 - 16:30 Regulator is functioned up/down several times. Annular vent/open a few times. At this time it was suspected that the open chamber head seal was suspect.

16:30 - 1730 Continue pulling out of hole with RTTS to above BOP stack in order to close upper and lower blind shear rams, suspend well and displace riser.

16:41 ROV is instructed to return to BOP looking for leak in riser while descending.

17:37 ROV arrives and confirms mud losses through annular regulator vent tube.

18:00 Pumps running 400+gph pumping control fluid.

18:15 Shut upper and lower shear rams.

18:30 Rig floor confirms we are losing 1.5 bbls/min petroleum free SBM at this time.

18:34 USCG/NRC report is filed. Reported 21 bbls of petroleum free SBM loss based on current mud pit strap.

18:45 ROV attempts to verify upper shear rams closed by pumping through U/S/R intervention. ROV runs out of fluid for pump (29 gallons). Port ROV jumping with full tank.

19:10 Commence riser displacement from petroleum free SBM to seawater

21:30 Pod supply pressure -2900 psi. Main pilot supply pressure -2690 psi. Trapped 1900 psi below shear rams - confirming shear rams shut.

21:38 Retract choke/kill retractable stabs.

21:39 Pressure/Temperature stab retracted.

21:41 Vent pod select.

21:42 De-energize pod stingers and retract same.

21:47 Unlatch LMRP at a heading of 310 degrees on yellow pod. Lift LMRP string with tensioners and latch up slip joint. Shut down pod hydraulics at this time.

Following riser displacement and disconnect the total petroleum free SBM loss to date is 54 bbls Fifty-eight percent or 31.3 bbls of mud was base synthetic oil.

#### FINDINGS:

##### 1) ANNULAR BOP HISTORY:

July 2003 - New Annuflex BOP Installed on Enterprise

July 2004 - Annuflex Rebuilt with all New Seals

February 2006 - Annuflex Failure - 17 months after Rebuild

##### 2) TRANSOCEAN PREVENTATIVE MAINTENANCE PROGRAM

###### Annular BOP Maintenance Plan:

Milling Operations on Well - Open, remove packing element and inspect BOP for metal cuttings build-up in the body. Replace annular head seal.

Yearly - Wash and inspect the bore. Inspect the packing element. Replace the annular head pressure seal any time the head is removed.

Every 3 Years - Complete disassembly with visual and dimensional checks of all key components. Replace all seals.

Every 5 Years - Perform major overhaul.

SEE ITEM 20 FOR ADDITIONAL INFORMATION

18. LIST THE PROBABLE CAUSE(S) OF ACCIDENT:

Improper operation of equipment.

19. LIST THE CONTRIBUTING CAUSE(S) OF ACCIDENT:

Extended Use of BOP without inspection/maintenance

Debris accumulation behind packing element

Damage to piston by debris

Seal Failure

20. LIST THE ADDITIONAL INFORMATION:

ADDITIONAL INFORMATION FROM ITEM 17

3) HYDRIL RECOMMENDED MAINTENANCE SCHEDULE

EQUIPMENT/COMPONENT	SERVICE INTERVAL & MAINTENANCE OPERATIONS
GX Annuflex BOP -----	Inspect - Between Wells
Packing Unit -----	Pressure Test - As Required Replace - Yearly - Not to exceed 24 months Inspect - Between Wells
Seals -----	Pressure Test - As Required Replace - Yearly - Not to exceed 24 months Inspect - Between Wells
Surge Accumulator -----	Inspect Pre-Charge - As Required

4) METAL DEBRIS IN WELL OPERATIONS

- (a) Jan 2005 - Mill window
- (b) March 2005 - Polish PBR - 35 lbs metal recovered
- (c) April 2005 - 8 lbs metal from string magnets
- (d) October 2005 - Mill window

5) OPERATING PISTON AND OPEN CHAMBER HEAD ARRIVE AT HYDRIL FACILITY IN HOUSTON FOR EVALUATION AND REPAIR

- (a) Debris present behind packing element, between piston and BOP head.
- (b) Piston in up position (location of gouge may indicate that the annular had been closed at one time on small pipe).
- (c) Piston gouged by trapped debris while moving downward.
- (d) Gouge damages and weakens both the BOP head and the Open Chamber Head seals.
- (e) Open Chamber Head seal begins to leak noticeably on Feb 12, 2006. Control fluid is bypassing the head seal and is being discharged through a vent to the sea.
- (f) Troubleshooting begins and the BOP is functioned in attempt to stop the control fluid losses.
- (g) Controls operated from Closed to Block (Vent) creating a syringe effect below the Open Chamber Head. Effect causes BOP head seal to fail exposing Open Chamber Head to wellbore pressure.
- (h) Open Chamber Head deforms under 1700 psi differential pressure load equivalent to almost 2 MM lbs.
- (i) Open Chamber Head seal fails as head is deformed allowing mud from the wellbore to flow into the open chamber and then to the sea through the BOP control system.

6) HYDRIL LABORATORY EXPERIMENT TO EVALUATE POTENTIAL TO DAMAGE THE OPENING CHAMBER HEAD DUE TO THE "SYRINGE EFFECT."

Open Chamber Head Failures Observed

1) Hydril Engineering Bulletin EB04-005 discusses the possibility of differential pressure deforming an Open Chamber Head. Hydril recommended avoiding moving from Closed to Block/Vent to prevent this failure.

Alternatively, the use of a high-flow capacity control flow circuit was recommended to minimize the "syringe effect."

2) Open Chamber Head failures have also resulted from the improper BOP assembly.

21. PROPERTY DAMAGED: NATURE OF DAMAGE:

54 bbls Rheliant drilling fluid @ 58% Loss overboard.  
Synthetic. 31.3 bbls Synthetic.

ESTIMATED AMOUNT (TOTAL): \$6,260

22. RECOMMENDATIONS TO PREVENT RECURRENCE NARRATIVE:

No recommendation to MMS.

MMS New Orleans District concurs with operator's recommendation to prevent recurrence.

Operation - Do not operate the Annular from Closed to Vent to prevent damage to Opening Chamber head and seal.

Control Modifications - Hydril indicates that their control system software could be modified to prevent the operation of the BOP from Closed to Vent. However, the Enterprise uses a Cameron control system - modifications to this system are being investigated now.

Maintenance - Annular BOP Maintenance should be conducted per Transocean Schedule and criteria to reduce wellbore seal wear and damage.

Redesign - Hydril to Evaluate Removal of Opening Chamber Head from the GX 18-3/4" 10K Annuflex BOP Design.

Debris Accumulation - Investigate development of debris collection "pocket" in BOP head and piston scraper to reduce piston damage from wellbore debris and extend component life.

23. POSSIBLE OCS VIOLATIONS RELATED TO ACCIDENT: YES

24. SPECIFY VIOLATIONS DIRECTLY OR INDIRECTLY CONTRIBUTING. NARRATIVE:

30 CFR 250.300 (a); E-100: Is the operator preventing pollution of offshore waters. The well operations being conducted caused approximately 21 bbls of Rheliant drilling fluid to be released into offshore waters.

25. DATE OF ONSITE INVESTIGATION:

13-FEB-2006

26. ONSITE TEAM MEMBERS:

Stephen Lucky /

29. ACCIDENT INVESTIGATION

PANEL FORMED: NO

OCS REPORT:

30. DISTRICT SUPERVISOR:

FPausina for TTrosclair

APPROVED

DATE: 12-APR-2006

# POLLUTION ATTACHMENT

1. VOLUME: GAL 54 BBL  
YARDS LONG X YARDS WIDE

## APPEARANCE:

2. TYPE OF HYDROCARBON RELEASED:  OIL  
 DIESEL  
 CONDENSATE  
 HYDRAULIC  
 NATURAL GAS  
 OTHER Synthetic Base Mud (SBM)
3. SOURCE OF HYDROCARBON RELEASED: **Incorrect size bushing in elevator & seal on chamber head thru BOP control**

4. WERE SAMPLES TAKEN? **NO**

5. WAS CLEANUP EQUIPMENT ACTIVATED? **NO**

- IF SO, TYPE:  SKIMMER  
 CONTAINMENT BOOM  
 ABSORPTION EQUIPMENT  
 DISPERSANTS  
 OTHER \_\_\_\_\_

6. ESTIMATED RECOVERY: 0 GAL BBL

7. RESPONSE TIME: HOURS

8. IS THE POLLUTION IN THE PROXIMITY OF AN ENVIRONMENTALLY SENSITIVE AREA (CLASS I)? **NO**

9. HAS REGION OIL SPILL TASK FORCE BEEN NOTIFIED? **NO**

10. CONTACTED SHORE: **NO** IF YES, WHERE:

11. WERE ANY LIVE ANIMALS OBSERVED NEAR: **NO**

12. WERE ANY OILED OR DEAD ANIMALS OBSERVED NEAR SPILL: **NO**