

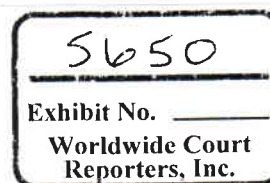


**EAU
INCIDENT INVESTIGATION REPORT**

OER-MGH-09-005

**M.G. HULME, JR.
Well Control Incident – Riser Unloading**

NOT TO BE RELEASED TO CLIENT



Reviewed and Approved by:
ONSHORE USE ONLY

Date: 26 March 2009

Revision #0

EAU INCIDENT INVESTIGATION REPORT**Contents**

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EAU INCIDENT INVESTIGATION REPORT

FACTS RELEVANT TO THE INCIDENT

DATE & TIME OF INCIDENT:		Approximately 07:06 on February 20, 2009							
LOCATION OF INCIDENT:		M.G. HULME, Jr Rig Floor							
TYPE OF INCIDENT; e.g. Personal Injury, Near Hit, Environmental etc		Well Control Incident - Riser Unloading							
INJURED PERSON (IP):		N/A							
JOB DESCRIPTION		N/A							
Hrs on shift	N/A	Days on Rig	N/A	Time in Position	N/A	Time Offshore	N/A	Age	N/A
WITNESS(ES):		Henry Owiriwa –Driller. Felix Eniepamo – Floorman. Collin Dyer – OIM. Kenny Fullerton – Toolpusher							
DAMAGE TO EQUIPMENT:		TDS Motor, Drawworks Brake Bands, Diverter Element, Loss of well							
RIG LOCATION:		LAT 5° 22' 38.91" N LONG 4° 37' 12.94" E OYO 5 - HOR on Block OML 120							
CLIENT:		ENI - NAE							
METEOROLOGICAL CONDITIONS AT TIME OF THE INCIDENT:		WIND: DIRECTION & SPEED		250° @ 8 knts.		BAROMETRIC PRESSURE:		1012 mB	
		VISIBILITY:		10 Miles		AIR TEMPERATURE:		27°C	
		SEA STATE: /SWELL & PERIOD:		Wave Period: 5sec Dir.: 260° Height: 1 ft Swell Dir: 240° Swell Period: 7sec		ROLL/PITCH/HEAVE:		Heave -0.0 Pitch -0.2 Roll 0.2	
		GENERAL MET CONDITIONS: eg FOG or RAIN, CLOUD COVER Clear - Cloud Base 2000ft scattered.							

INVESTIGATION TEAM

NAME	POSITION	COMPANY
Bernard Berjeaud	Performance Assurance Director	Transocean, Paris
Geoffrey Wagner	Performance Manager, EAU	Transocean, Paris
Dave Foster	Senior Engineer - Well Construction	Transocean, Houston
Tony Aston	QHSE Advisor	Transocean, Lagos
Sergio Fazlo	Drilling and Completions Fluids Specialist	ENI, Milan

METHOD & OBJECTIVES OF INVESTIGATION

See Terms of Reference for Transocean investigation in Appendices.

The Client (Eni) is conducting an investigation in accordance with their own procedures. Their initial team has been appointed by the Eni Corporate Office.

DETAILED DESCRIPTION OF INCIDENT / SEQUENCE OF EVENTS

DETAILED DESCRIPTION

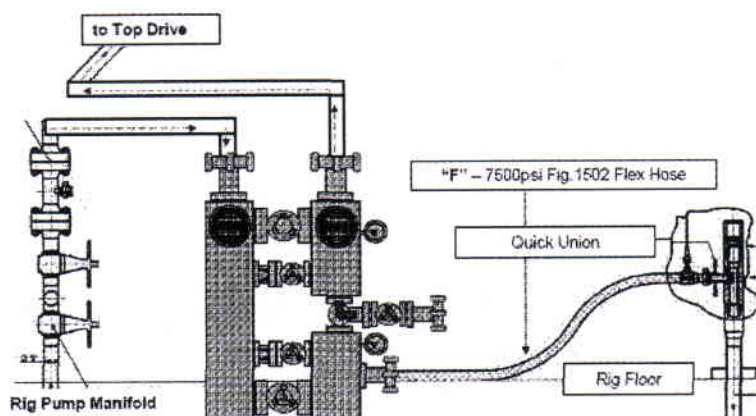
While drilling ahead on Oyo 5 – HOR at a water depth of 303 meters the base line drilling parameters were as follows:

800 gpm (plus 350 gpm when boosting)
60 rpm
5k torque
2-3 tons weight-on-bit
1.2 SG Mud Weight (10ppg)

Mud pump assignment: pumps #1 & #2 on the hole, #3 boosting the riser

The Eni Circulating Device (E-CD) was in use to ensure continuous circulation. E-CD was utilized on this well to maintain hole stability (particularly on deeper near horizontal sections) and was not planned to be used for well control purposes.

Figure 1: E-CD System



The rate of penetration was 30-40m/hr during the early section of drilling and was then controlled and restricted to 20 m/hr. The geological setting in this area includes shale gas and therefore monitoring of background gas levels is important, with an increasing trend in this parameter indicating a possible over-pressure zone.

The standing orders for the night prior to the incident were for the mudloggers to closely monitor total gas and at 5% to inform the driller as well as the control room in order to have a general PA announcement made to have all hot work and smoking suspended. Between midnight and 07:30 hrs there were 3 separate PA's made for suspending hot work due to total gas recorded being above 5% (based on the Bridge logbook).

There were several issues with the gas system between 18:00 hrs the previous evening (Feb 19th) and 07:00 hrs. The first was to switch to the backup gas trap at 19:30 hrs on the 19th. This

EAU INCIDENT INVESTIGATION REPORT

remained in use from then on. In the early morning, around 03:05hrs the primary gas analysis system in the mudlogging unit went down and, during a connection, the engineer switched to the backup system. Just under an hour of reliable time-based gas data and just less than 10 minutes of drilling parameters was lost. Approximately 4 meters of hole was drilled during this time.

On two occasions during the evening the Night Toolpusher expressed concern about the mud weight to the Night Company Man; on the second occasion (at approx. 0300hrs) the Night Company Man woke the Day Company Man and the Geologist who discussed the situation and whether or not it was necessary to weight up. They agreed to continue to drill ahead until 07:30 when they could call town. The Night Toolpusher was not involved in this conversation but was informed of the decision by the Night Company Man.

At approximately 06:00 OIM instructed the Driller to halt all transfers and control all crane movements to ensure accurate active volume measurements.

From 06:05 – 07:00 while drilling ahead on the morning of the incident there was increased torque with increased weight-on-bit to maintain the same ROP and no reduction was observed in the active pit volume for 30 minutes, while drilling down last single; effectively a 5.5 bbl gain.

At 06:15 the Driller observed a washout on a piston on the #1 mud pump (which was on the hole), and called the Toolpusher who asked him to stop drilling and changeover to put the boost pump (#3) on the hole while #1 gets repaired. The pump changeover occurred efficiently, and pumps were offline for only 2-3 minutes.

From 06:25 the driller continued to drill ahead with pumps 2 & 3 on the hole.

From 6:50 to 07:00 there was an increasing total gas trend from 3.8% to 5.5% with several spikes recorded, a PA announcement was made to stop all hot work and smoking.

From 07:00 to 07:06 there was a slight increasing trend on the rig return flow show over a period of 6 minutes (observable only because the riser was not being boosted).

At approximately 07:04 the Shakerman called to alert the Driller that he was taking increased returns at the shakers. The Driller picked up, spaced out, turned off the mud pumps, and turned to close the well in on the upper annular. At this time mud was blowing through the rotary table and the Shakerman was attempting a second call to the Driller. Once the well was closed in on the upper annular the well was observed to continue to flow and the Driller decided to close the lower annular as well.

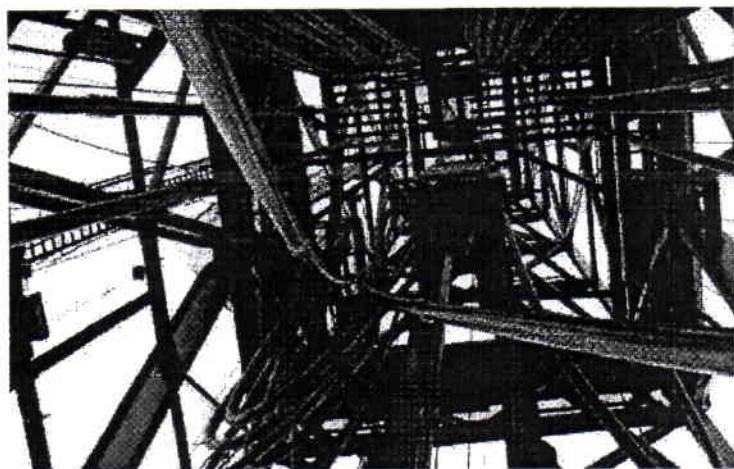
In total approximately 650 barrels of mud was lost, either through the rig floor or to the well, the Diverter element was pushed out of rotary table, and due to the force of the mud exiting fingerboard latches were lifted allowing 2 drillpipe stands to fall across the derrick.

With the well shut in the rig team contacted the office.

Figure 2: Picture of rig floor after incident



Figure 3: Stands across derrick



ACTUAL CONSEQUENCE

- Influx to wellbore
- Unloaded Riser
- Casing shoe broken down
- Partially evacuated wellbore
- Loss of BHA
- Diverter packer dislodged from the housing
- Master bushing pushed through the rotary table
- Outer bushing dislodged from rotary table
- Fingerboard latches lifted and 2 stands fell across the derrick
- Gas entering formation from broken shoe
- Gas bubbling up around the well head and at three points ca. 60 m from the well head in an triangular pattern

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- OBM coming up over the derrick, covering the Derrick, Rigfloor, maindeck
- Environmental release
- Loss of Well
- Financial loss
- Loss of reputation

POTENTIAL CONSEQUENCE

- Minor / Major damage to the rig
- Total loss of rig
- Serious Injury Cases / Fatalities
- Major environmental damage
- Further loss of reputation
- Further loss of value to shareholders
- Possible governmental regulatory repercussions

TIMELINE SUMMARY

<u>Date</u>	<u>Activity</u>
20-Feb-09 From Approx. 0305 to 0415	Geoservice main gas computer malfunction, change over to backup unit. Giving false readings. Pick up off bottom, reciprocate string while circulating. Geoservices corrected backup gas detection unit. (Main Gas Unit still down).
20-Feb-09 Approx. 0600	Shift Handover Report Toolpushers "Expecting 25% Gas around 1294m. Standing instructions to Drillers from Toolpusher Item # 3 "Extra vigilance required during drilling of gas zone @1294m. Inform control room when gas level goes above 5% and stop all transfers. Crane movement may need to be restricted as well"
20-Feb-09 Approx. 0630	Rig has a swab leaking on pump No 1 which is on the string. All pumps are shut down Pump No 1 is isolated and pumps No 2 & No 3 are lined up down the string to continue drilling, this process took less than 5 mins.
20-Feb-09 From Approx. 0706	Well flowed suddenly with mud blowing up through rotary table and over rig. Diverter packer, master and outer bushings dislodged from rotary table. Shut in well on upper then lower annulars.

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SUMMARY OF FINDINGS

The Findings are documented in the TOP-SET format as follows:

- Timeline in detail
- Organization
- People
- Similar Events
- Environment
- Technology

Time Line in Detail

<u>Date</u>	<u>Step</u>	<u>Activity</u>
7-Feb-09	1	Pre-spud meeting held onboard MG Hulme by Client Representative Ronnie Roy. (No attendance record kept)
13-Feb-09	2	Pre-spud meeting held in town during weekly contractor meeting.
18-Feb-09	3	Daily Drilling Instructions from Co-man to Toolpusher Item #20 "Potential hazard - Gas at 1275m TVD msl, 1311m AH.
19-Feb-09	4	Decision was made by Eni to perform a Leak Off Test instead of a Formation Integrity Test, test resulted in 1.4 SG equivalent mud weight.
19-Feb-09 From Approx. 1200 to 0000	5	Mud Weight had been increased from 1.16 SG to 1.2 SG; with SCRs performed at approximately 2300.
20-Feb-09 Approx. 0600	6	Shift Handover Report Toolpushers "Expecting 25% Gas around 1294m.
	7	Standing instructions to Drillers from Toolpusher Item # 3 "Extra vigilance required during drilling of gas zone @1294m. Inform control room when gas level goes above 5% and stop all transfers. Crane movement may need to be restricted as well"
20-Feb-09 Approx. 0000 to 0400	8	Drill with E-CD Stands from 1184m to 1243m. 70rpm, 3-4klbs, 800gpm + 290gpm booster 2570psi, 3-4klbs WOB, String wt - 220klbs up, 222klbs dn, 223klbs rotn. Controlled ROP at
20-Feb-09 From Approx. 0305 to 0415	9	Geoservice main gas computer malfunction, change over to backup unit during connection. Still giving false readings. Pick up off bottom, reciprocate string while circulating. Geoservices corrected backup gas detection unit. (Main Gas Unit still down).
20-Feb-09 From Approx. 0430 to 0700	10	Drilling with E-CD stands from 1243m to 1275m. 70rpm, 3-4klbs, 800gpm + 290gpm booster 2570psi, 3-4klbs WOB, String wt - 220klbs up, 222klbs dn, 223klbs rotn.
20-Feb-09 Approx. 0630	11	Rig has a swab leaking on pump No 1 which is on the well. All pumps are shut down. Pump No 1 is isolated and pumps No 2 & No 3 are lined up down the string to continue drilling, this process took less than 5 mins.

EAU INCIDENT INVESTIGATION REPORT

- | | |
|--|--|
| <p>20-Feb-09
Approx. 0706</p> | <p>12 Call made from Shakerman to Driller to inform of increase flow over the shale shakers.</p> |
| <p>20-Feb-09
From Approx. 0706 to 0800</p> | <p>13 Well flowed suddenly with mud blowing up through rotary table reaching the height of the crown block. Diverter packer element was pushed out of Diverter housing. Shut in well on upper then lower annular.</p> <p>Monitored pressure. SIDpP = 140psi SICP = 990psi Pit Gain = 50bbbls +/- 3mins.</p> <p>2 Drillpipe Stands fell across derrick when fingerboard latches were lifted by mud flow. Contacted Office. Attempt to hang off on Middle Pipe Rams. Unable to raise blocks obstructed by stands across derrick. Cleared stands obstructing blocks.</p> <p>ROV, already in the water, observing sea bed – no flow at sea bed. Attempt to hang off on Middle Pipe Rams (MPR's). Unable to Strip up thru – Open Lower Annular. Still unable to hang off. BHA possibly stuck. Discuss forward plan with office. Start building mud 1.3SG.</p> |
| <p>20-Feb-09
From Approx. 0800 to 1000</p> | <p>14 ROV noted significant increase in gas bubbles coming up around 30" casing at seabed. Discuss with ECR.</p> |
| <p>20-Feb-09
From Approx. 1000 to 1230</p> | <p>15 ROV report seabed flow worsening: Muster and begin implementation of evacuation of non essential personnel.</p> <p>16 Muster and begin implementation of evacuation of non essential personnel. Total Helicopters 5. Total Personnel evacuated 52.</p> <p>Flight #1 – 13 off BJC.
Flight #2 – 10 off BIJ.
Flight #3 – 14 off BJC.
Flight #4 – 08 off BGF.
Flight #5 – 07 off BJC – 2 personnel to rig, ENI Rep and MGH Rig Manager.</p> |
| <p>20-Feb-09
From Approx. 1230 to 1300</p> | <p>17 Circ down DP at 0.4bpm DpP 110 – 500 – 640psi. SICP 1680psi steady. Shut down pump 3.2bbbls pumped. SIDpP reduced to 120psi. Drillers Method – open choke CP 1670 – 1630psi, increase pump rate to 2bpm DpP increased to 3400psi with 2.4bbbls pumped.</p> |
| <p>20-Feb-09
From Approx. 1300 to 1330</p> | <p>18 Shut down pump. Close choke. SIDpP decreased to 3400psi – 140psi in 3 mins. SICP 1630 – 1680psi in 3mins.</p> |
| <p>20-Feb-09
From Approx. 1330 to 1600</p> | <p>19 Discussed with ERC office. Annulus probably packed off. Instructed to mix 1200bbbls to 1.3 SG SOBM for bullheading.</p> |
| <p>20-Feb-09
From Approx. 1600 to 1800</p> | <p>20 As next ERC request. Bled off SICP to Trip Tank. SIDpP 80psi constant SICP 1710 – 1590psi 3mins 4.2bbbl TT. 1590 – 1500psi 3mins Gas. Shut in With (SIW) SICP increased 1500 – 1560psi 5mins. Discussed with ECR office plan to kill well using Volumetric Pump and Bleed procedure.</p> |
| <p>20-Feb-09
From Approx. 1800 to 1930</p> | <p>21 1500bbbls 1.30 SG mud available. Fill riser with 347bbbls of 1.3 SG Mud.</p> |
| <p>20-Feb-09
From Approx. 1930 to 0000</p> | <p>22 Submit volumetric squeeze plan for approval from Transocean. Perform overall risk assessment.</p> |

EAU INCIDENT INVESTIGATION REPORT

Organization

- The well program made no mention of the use of the E-CD continuous circulating system.
- The well program and pre-spud material did not adequately highlight the reasons for using the E-CD system, nor the hazards and mitigations associated with it's use.
- A Task Specific Think Plan (TSTP) was said to be developed for use of the E-CD system but upon investigation the TSTP was not approved and did not adequately quantify the hazards, nor did it discuss the preventative or mitigating controls. The "TSTP" was a procedural list that was supplied from WEI, which was the group operating the E-CD equipment.
- No Task Risk Assessment (TRA) was performed on the task of using the E-CD equipment.
- Management of Change was not adequately addressed and as a result no exemption was proposed for the omission of flow checks during connections.
- Due to the use of the E-CD equipment the Driller did not understand that he could shut the pumps down at any time to flow check the well; adequate communication did not occur.
- Transocean has used the E-CD system on other wells with Eni.
- Well Control training and Well Control manual does not adequately cover the procedures for closing in a well during a blowout situation; also the use of the diverter is not adequately covered.

People

<u>LOCATION</u>	<u>PERSONNEL</u>
Drill Floor	Driller - Henry Owiriwa
	Floorman - Felix Eniepamo
Shaker House	Floorman - Segun Ukana
Pumproom / Pitroom	Derrickman - Samuel Anyahie
Galley	Pumpman - Ojakovo Gabriel
	Floorman - Tunji Olanipekun
	Floorman - Vitalis Amadi
Geoservices Shack	Geoservices - Ayodele Adepoju
Control Room	AD - Michael Ugboaja
OIM Office	OIM - Colin Dyer
	Day Tool Pusher - Kenny Fullerton
OFF TOUR	Night Tool Pusher - Phil Scrimshaw
(working 18:00- 06:00)	Geoservices- Oscar Navarro

- Due to the use of the E-CD equipment the Driller did not understand that he could shut the pumps down at any time to flow check the well as normal.
- There was a Tour change at 06:00 with the Night pusher being relieved but the Driller remaining on Tour from 00:00 to 12:00.
- The Driller was new in the position on the Rig, he has served as a relief Driller on the unit in the past but most recently he was a Driller on a Jackup.
- Day Toolpusher did not go to the rig floor first thing on Tour, he was to head to rig floor to supervise drilling of critical hole section; this was discussed during the morning meetings.
- As stated by Eni the Company Men had a reputation for frivolous calls to the office at night and therefore may have been reluctant to take any action, either to call town at an important point in operations, or to take action themselves to weight up, until within normal business hours.
- Eni has released both the Night Company Man and the Day Company Man; from conversations we understand that this was to occur prior to the incident but was accelerated as a result.

EAU INCIDENT INVESTIGATION REPORT**Similar Events**

- There is a history within the drilling industry of unloading the riser, but there is no prior history of unloaded the riser while using the E-CD system.

Environment

- General weather conditions at the time of the incident- daylight, clear with scattered clouds.
- Vessel motions: Heave: 0.0meter/ Pitch: 0.2 degrees/ Roll: 0.2 degrees.
- As a result of the incident the rig was coated in oil based mud with approximately 650 barrels being lost from the well to either the formation, the rig, or the environment.

Technology

- The use of the E-CD system is a significant change from conventional drilling and this change was not recognized by the rig management.
- The Transocean flow show indicator has had erratic and noisy readings ever since the rig left the shipyard, approximately two years ago, most likely 3 pumps is too much for the 12" flow line and the paddle is at maximum all the time but this is still to be verified.
- Transocean personnel did not utilize the flow show indicator provided by Geoservices.
- The Geoservices flow show indicator was inoperable due to a faulty sensor, failed at 03:30 on the 19th.
- The Geoservices return flow indicator is not a conventional flow show paddle or sensor. It is effectively a PVT pit level sensor as used to measure pit volumes, which has been installed in the mud box and bases flow out on the level of mud in this header box.
- There were several issues with the gas system between 18:00 hrs the previous evening and 7:30 hrs when the well was shut in. The first was to switch to the backup gas trap at 19:30 hrs. This remained in use from then on. In the early morning, around 03:05hrs the primary gas analysis system in the mudlogging unit went down during a connection and the engineer switched to the backup system. Just under an hour of reliable time-based gas data and just under 10 minutes of drilling parameters was lost. Approximately 4 metres of hole drilled during this time.

EAU INCIDENT INVESTIGATION REPORT**CONCLUSIONS**

We have summarized the conclusions of the investigation below, first as a hypothesis of what occurred and then as they relate to each individual involved. At the end of the section is a root cause analysis in the form of a "Why Tree".

Our hypothesis as to the sequence of events is that the gas zone was penetrated earlier than posted on the drillers instructions (but within the error tolerance of the prognosed depth) and before the problem with pump #1. The initial flow from formation occurred when all pumps were shut down for pump #1 problem. It is inconclusive if the influx continued when drilling resumed and ECD may have been sufficient to balance the well again.

As the influx was circulated out of the wellbore the gas came out of solution, expanded, and blew through the rotary table; possibly the reduction in hydrostatic led to increasing underbalance and substantial evacuation of the well.

The next section covers the individual responsibilities, actions, and failings by position as they contributed to the incident and its results.

Driller

- Singly responsible for saving the rig, persons onboard, and containing the incident. Followed shut in procedures and did not run away, shut in the well and stayed in the dog-house regardless of having the window open and being covered in mud during the incident.
- Did not close the diverter with flow in the riser, questionable about how much time he actually had and this was not a point highlighted in the shut-in procedures or well control training.
- Did not recognize that he could perform static flow checks in spite of using the Eni Circulating Device (E-CD).
- Did not perform flow check when all pumps were offline due to self imposed pressure to maintain ECD, in contradiction to an earlier statement.
- Did not recognize the importance of secondary flow show measurement devices such as those from Geoservices.

Day Toolpusher

- Did not recognize the change introduced by the use of the E-CD equipment.
- Did not recognize the importance of secondary flow show measurement devices such as those from Geoservices.
- Did not provide adequate instructions to Driller on use of diverter in shut-in procedures.
- Did not recognize that lack of performing static flow checks requires an exemption to CMS.
- Did not ensure that a TSTP for the use of E-CD equipment was in place prior to use, a TSTP was in development but was not approved nor did it adequately cover any risk mitigation or hazard identification, it was only a set of procedures for performing the connections.
- Not on rig floor for drilling of critical section when there was a relatively inexperienced driller on the brake.

EAU INCIDENT INVESTIGATION REPORT**Night Toolpusher**

- Did not recognize the change introduced by the use of the E-CD equipment..
- Did not recognize that lack of performing static flow checks requires and exemption to CMS.
- Did not recognize the importance of secondary flow show measurement devices such as those from Geoservices.
- Did not provide adequate instructions to Driller on use of diverter in shut-in procedures.
- Did not ensure that a TSTP for the use of E-CD equipment was in place prior to use, a TSTP was in development but was not approved nor did it adequately cover any risk mitigation or hazard identification, it was only a set of procedures for performing the connections.

Offshore Installation Manager (OIM)

- Orderly response to the incident, with proper emergency management.
- Did not recognize the change introduced by the use of the E-CD equipment.
- Did not recognize the importance of secondary flow show measurement devices such as those from Geoservices.
- Did not recognize that lack of performing static flow checks requires and exemption to CMS.
- Did not provide adequate instructions to Driller on use of diverter in shut-in procedures.
- Did not ensure that a TSTP for the use of E-CD equipment was in place prior to use, a TSTP was in development but was not approved nor did it adequately cover any risk mitigation or hazard identification, it was only a set of procedures for performing the connections.
- Did not follow up on ensuring that the Transocean flow show indicator was accurate or addressed after known past problems.
- OIM distracted from daily responsibilities due to ongoing continuous project load.

Rig Manager Performance

- Orderly response to the incident, with proper emergency management.
- Did not challenge Eni on the quality of the pre-spud meeting or the adequacy of the well planning material.
- Did not ensure that a TSTP for the use of E-CD equipment was in place prior to use, a TSTP was in development but was not approved nor did it adequately cover any risk mitigation or hazard identification, it was only a set of procedures for performing the connections.
- Did not ensure Company Management System compliance nor did he ensure that all necessary exemptions to the CMS were in place for the actions occurring on the rig.
- Did not follow up on ensuring that the Transocean flow show indicator was accurate or addressed after known past problems.
- Assigned driller with limited Floater experience without a proper risk assessment.
- Did not challenge the rig team to ensure that all systems necessary to perform critical tasks were operational. (Flow Show)

EAU INCIDENT INVESTIGATION REPORT**Rig Manager Asset**

- Did not challenge the rig team to ensure that all systems necessary to perform critical tasks were operational. (Flow Show)

Transocean Human Resources

- Inadequate specific competency of drillers, need to have a reserve pool of adequate size such that time can be dedicated to development and training.

Transocean Training

- No specific training given for handling a kick in the riser and a lack of explanation about the proper use of the diverter.

Eni Day Company Man

- Did not recognize the drilling hazard nor the differences between Oyo 4 and Oyo 5 thus deciding not to weight up the mud prior to the critical section. Wanted to delay the call until the opening of office hours.
- Did not challenge the rig team to ensure that all systems necessary to perform critical tasks were operational. (Flow Show)
- Did not recognize that lack of performing static flow checks was a significant deviation from conventional drilling and would require additional mitigating controls.
- Did not recognize nor communicate the importance of secondary measurement devices such as those from Geoservices.
- Did not adequately communicate with Geoservices the importance of having critical spare parts available to ensure equipment reliability.

Eni Night Company Man

- Did not recognize the drilling hazard nor the differences between Oyo 4 and Oyo 5 thus deciding not to weight up the mud prior to the critical section, did wake up the Day Company Man and Geologist to discuss potential mud weight increase.
- Did not challenge the rig team to ensure that all systems necessary to perform critical tasks were operational. (Flow Show)
- Did not recognize that lack of performing static flow checks was a significant deviation from conventional drilling and would require additional mitigating controls.
- Did not recognize nor communicate the importance of secondary measurement devices such as those from Geoservices.
- Did not adequately communicate with Geoservices the importance of having critical spare parts available to ensure equipment reliability.

Eni Geologist

- Did not recognize the drilling hazard nor the differences between Oyo 4 and Oyo 5 thus deciding not to weight up the mud prior to the critical section.

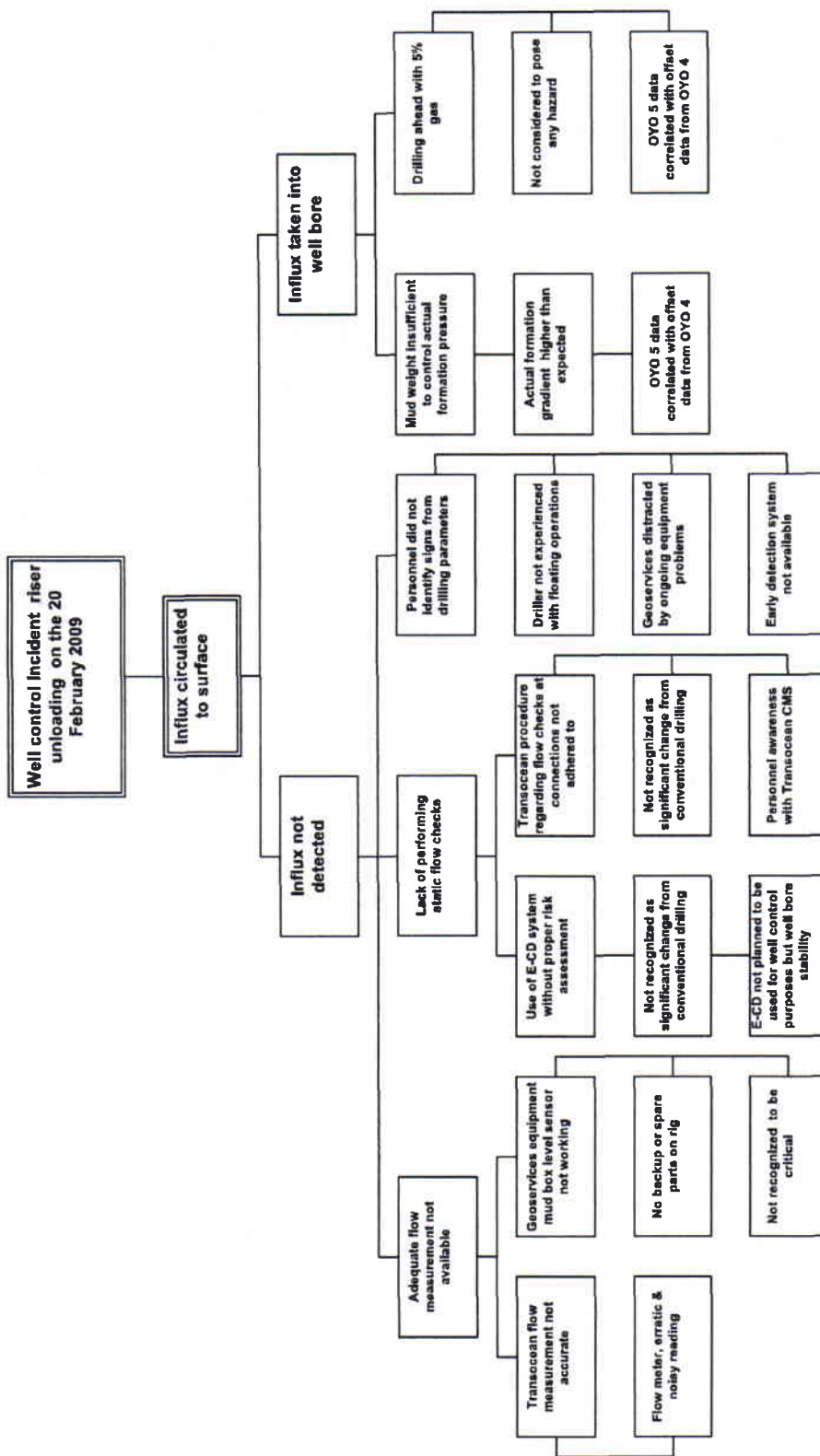
EAU INCIDENT INVESTIGATION REPORT**Eni Onshore**

- Quality of pre-spud meeting was substandard and thus did not identify critical drilling hazards nor the use of E-CD system.
- Well program did not adequately highlight potential drilling hazards.

Geoservices

- Did not have critical spare parts available onboard to ensure equipment reliability.
- Did not recognize the importance of flow measurement and therefore did not move sensor from inactive pits to bring the flow sensor back online.
- Did not have fully redundant gas measuring capability available prior to drilling a critical hole section, backup required software modification prior to use.
- Brought secondary gas analysis unit online with questionable readings.
- Lack of appropriate scrutiny of mud properties and drilling parameters due to ongoing equipment problems, competence of night mud-logger was questioned by Eni.

ROOT CAUSE ANALYSIS





Privileged and confidential document. Prepared in contemplation of litigation.

EAU INCIDENT INVESTIGATION REPORT

CORRECTIVE OPPORTUNITIES				
ITEM	CORRECTIVE OPPORTUNITY	ACTION PLAN	RESPONSIBLE PERSON	CLOSE OUT DATE
1	Significant gas level increases need to be effectively monitored and controlled.	A) Standing orders to be implemented so that flow checks and notifications are performed when gas levels increase by a determined level per unit of time and above a specific total value. B) Old Diverter "bag" to be removed and a new element installed.	MGH RMP	Prior to drilling out of 20" shoe on next well. Prior to drilling out of 20" shoe on next well.
2	Ensure adequate return flow measurement is available to the Driller while drilling.	A) Transocean to perform engineering analysis of flow meter, flow lines, and associated Transocean equipment and perform modifications as required. B) Geoservice to install new flow meter and ensure effectiveness of measurement C) ENI and Transocean to ensure that drilling procedures specify that drilling must cease if there is no accurate return flow measurement	MGH RMA	Prior to drilling out of 20" shoe on next well. Prior to drilling out of 20" shoe on next well.
3	Rig Management should properly use Management of Change procedures to ensure adequate risk assessments are performed for all tasks so that risks are ALARP.	A) Develop and implement adequate TSTP with necessary TRAs for use of E-CD equipment inclusive of performing dynamic flow checks B) Verify Rig Management's understanding of the Management of Change system inclusive of the formal EAU exemption procedures	MGH RMP	Prior to drilling out of 20" shoe on next well. Prior to drilling out of 20" shoe on next well.
4	Improve Rig Management's compliance with Transocean Company Management System as related to Well Control.	A) Verify awareness and compliance with Transocean CMS through review of policies and procedures and completion of verification form B) Self Verification Audit / Division Verification Audit procedure to focus on increasing Well Control knowledge	MGH RMP	Prior to drilling out of 20" shoe on next well.
			EAU, Operations Integrity Mgr	For May SVA Release


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 EAU INCIDENT INVESTIGATION REPORT				
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IMPROVEMENT OPPORTUNITIES				
ITEM	IMPROVEMENT OPPORTUNITY	ACTION PLAN	RESPONSIBLE PERSON	CLOSE OUT DATE
1	Ensure proper communication of all well hazards.	Ensure that for every well effective shorebased and shipboard pre-spud meetings are held ensuring that all hazards are identified and controlled where applicable a "Drill the Well on Paper" exercise should also be performed	MGH RMP	Prior to drilling out of 20" shoe on next well.
2	Drillers who are new to Floater operations should have adequate supervision and training.	A) Ensure any new drillers attend the new driller training course in Aberdeen B) Prior to transferring someone from a Jackup to a Floater in the position of Driller they should first enter the Accelerated Driller Program on a Floater	MGH RMP EAU HR Director	TBD TBD
3	Geoservices should ensure critical equipment is available for use with adequate backups and critical spare parts on site.	A) ENI to discuss with Geoservices management the importance of flow measurement and the necessity to have critical spare parts on site B) Action plan to be developed and implemented to ensure critical equipment is available with adequate backups; inclusive of a minimum list of spare parts to be agreed that will be onboard C) Investigate vibration in Geoservices work area that may be contributing to equipment malfunctions	ENI ENI	Prior to drilling out of 20" shoe on next well. Prior to drilling out of 20" shoe on next well.
4	Evaluate additional instrumentation / presentation of data to increase probability of influx detection.	Evaluate use of "Early Detection System" offered by Geoservices or similar services by comparable companies	MGH RMA ENI	Prior to drilling out of 20" shoe on next well. TBD



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5	Well Control reference material and training should adequately cover the use of the diverter and what to do in the case of the riser unloading.	The Well Control curriculum should be updated to include scenarios such as riser unloading and the proper use of the diverter. The Well Engineering Group should evaluate a change to the Well Control Manual to ensure adequate information is available to users.	Steve Hand	For Next Well Control Manual Revision
6	A conference room which allows for effective communication should be available to conduct pre-tour meetings.	A plan should be developed to provide adequate communication during the pre-tour meetings, this is hindered at present due to the high level of background noise.	MGH RMP	July 2009

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INCIDENT DETAILS UTILISING the THINK PLANNING PROCESS and the FACT FINDING GUIDELINES

Was there a Plan?	Yes Drilling Program and Daily Drilling Program from Company Man. Dated 18 th February 2009.
What was the Plan?	See Attached Daily Drilling Plan the appendix of the report.
Who was Informed about the Plan?	Plan was discussed at Pre Tour Meetings with all Transocean and Service personnel present at meeting.
What equipment/ Materials / Tools were inspected?	Drilling Equipment, E-CD Manifold.
Who Conducted the Inspections?	Driller and Drill Crew – WEI Service Personnel.
What were the findings of the Inspections?	None
What Hazards were identified prior to conducting the Task?	Gas Zone expected @ 1294 mtrs.
Who Identified these hazards?	From previous well drilled OYO 04
Who was Informed of the Hazards?	Mentioned at Pre Tour Meeting and on Toolpushers and Drillers Handovers.
What Control measures were put in place to ensure the job was conducted safely?	Driller to be vigilant – Gas levels had reached 5% + all mud transfers, mixing was stopped and Crane movements restricted – Hot work and smoking was stopped.
Who was responsible for implementing the control measures?	Toolpusher, Driller.
What instructions were given to each person prior to the incident?	As per Pre Tour Meeting
Who gave the instructions?	Toolpusher and Client Representative.
Have the IP and / or other crewmembers received training in conducting the operation?	Yes. Previous Well Drilled using same system and prior to starting using E-CD on this well.
Was equipment being operated at the time of the incident?	Drilling Equipment, Drawworks, TDS, Mud Pumps and E-CD system.
Who was operating the equipment?	Driller and WEI for E-CD Manifold.
Where is the equipment located in association with the incident scene?	On the Drillfloor and Mud Pumproom
What did the witnesses See / Hear / Feel When the Incident occurred?	Mud increase over Shakers, Mud bubbling out of well over Rotary Table and up Derrick.
Where were the Witnesses when the Incident occurred?	See report
What were the conditions of the Work area during the incident?	Good.
What Lighting was provided?	Yes.
What was the availability of Help – Mechanical Services?	Yes.
What barriers (If any) were in place at the time of the incident?	Not Applicable
What lock out / tag out (If any) devices were in place at the time of the incident?	Not Applicable
What work permits were in place at the time of the incident?	Not Applicable
What PPE (and its Condition) was in use by IP at the time of the incident?	Not Applicable
Any other relevant Observations	Not Applicable

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Supporting Evidence, i.e. Statements, Photographs, Drawings, Copies of documentation etc.

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