LOSS OF WELL CONTROL DURING UPPER COMPLETION

Advisory

This Advisory has been issued as a follow-up to the teleconference calls conducted on the 17th and 18th March 2010, which described an incident on one of our rigs when gas entered the riser, evacuating 95bbls of OBM onto the rig floor, and resulting in a loss of 3 bbls of OBM to sea.

This incident resulted in 11.1 days of lost time at a cost of approx £5.2M and significant loss of reputation to Transocean.

General Summary of Investigation

Lower Completion

The lower completion had been installed, the "Well Commissioner" test packer had been set and the Formation Isolation Valve (FIV) had been successfully inflow tested for 5½ hour with a 4,150 psi pressure differential.

Difficulties unseating the test packer resulted in opening the Multi Functioning Circulating Tool (MFCT) above the test packer to allow the trapped test pressure to disperse, 6 turns were worked into the string and 5 k ft lbs of torque applied before the packer finally released. Once unseated, the string was run to depth but held up 3-4ft high and taking 10klbs set down weight. There were indications of a plugged string, so the decision was made to pull 10 stands, after pulling 8 stands wet, the string cleared and the pipe tripped back into the hole and landed off at the planned clean up depth.

During the above operation, it is believed that the FIV valve was mechanically opened (unintentionally) through a combination of debris on top of the valve and tool string movement in close proximity to it.

Well Clean Up

The well was being circulated as per the Well Program. **(ERROR INDUCING CONDITION)**

Standing Instructions to the Driller and a mud pit displacement plan were in place to communicate this.

The well was being displaced to seawater, removing the overbalanced oil-based mud from the well.

The tested FIV was the barrier to prevent the well from flowing. It was believed that the valve could only be opened with the dedicated FIV shifting tool or through a series of pressure cycles. **(ERROR INDUCING CONDITION)**

The drill crew did not consider well control as a realistic event during the well clean up displacement operation as the FIV had been successfully inflow tested. **(ERROR INDUCING CONDITION)**

The final seawater displacement used one suction pit, which was constantly being filled with sea water from the sea chest, with mud returns to the reserve pits, in effect, an open circulating system. **(ERROR INDUCING CONDITION)**

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EXHIBIT # 926

WIT:

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As the volume pumped could not be monitored on the active pit system (seawater added from sea chest) and the returns volume naturally increasing on the PVT, the true displacement could not be monitored. Due to the increasing pit levels, the drill floor PVT alarms were being continually activated until they were disabled by the Driller. **(ERROR INDUCING CONDITION)**

There were indications of an increase in flow out and in the rate of mud returns to the pit room during the displacement, but this coincided with an increase in pump rate, and was not acted upon. **(MISSED OPPORTUNITY)**

The Mud Logger informed the Driller of a gain in the surface mud system and an increase in return flow rate. This was not acted upon by the Driller as a gain in the pit system was expected due to the mud in the well being replaced by sea water and an increase in return flow attributed to the increased pump rate. **(MISSED OPPORTUNITY)**

The Mud Logger did not inform the Client Drilling Supervisor or Toolpusher of the alarm, nor did he contact the Driller again to indicate that the flow show was continuing to rise and had not flattened out. **(MISSED OPPORTUNITY)**

The pit room also experienced issues with mud flowing off the shakers belly pan and onto the shaker house floor. This was interpreted in the pit room as a rig trimming issue and again not acted upon. **(MISSED OPPORTUNITY)**

The Driller used the shaker house camera to view the pit/shaker room area but could not directly see the overflow of the shakers / pits due to the camera's limited pan and tilt option. The overflow was interpreted as a blockage in the lines going from the shakers to the pits. **(MISSED OPPORTUNITY)**

After approximately 10 minutes at the higher pump rate, the pump rate was reduced to assist the pit room to resolve the issues they were experiencing. The Senior Toolpusher entered the Drill Floor just as the riser started to unload. There was a noise heard on the floor and the Driller switched the pumps off. The Senior Toolpusher closed in the well on with the lower annular. The riser continued to unload with mud hitting the underside of the top drive and spraying across the drill floor and to adjacent areas of the rig. With the well shut in on the annular, the drill pipe was spaced out and the middle pipe rams were closed. **(SATISFACTORY RESPONSE)**

The rig went to muster and Transocean / Customer Emergency Response Procedures were initiated as per the Operations Management Plan

The well was circulated to kill mud weight and was 'static' 2¼ days after the event occurred.

Immediate Causes

1. Failure of the down-hole barrier
2. Failure to identify the initial influx
3. Failure to close in the well prior to the influx reaching the BOPs

Root Causes

1. FIV provider lateral learning mechanism weakness (Historical problems with FIV not communicated effectively)
2. Well Clean up Program - Roles and responsibilities inadequate.
3. Lack of clear well control procedures. (Referencing under balance operations)
4. Risk Assessment weakness in planning and execution from well conception phase to execution phase.

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Contributing Factors

1. There was a recommendation from the FIV provider, following a previous incident, to use a bull nose on the end of wash string. This would ensure that the space out string was not directly across the FIV collet section. The use of a bull nose was mentioned at the CWOP, but this was never captured as an action or acted upon. The initial load out had a standard WEG which was only changed when the equipment was checked offshore. Due to delays in the operations, a bull nose could have been supplied. The late change in tools allowed a tool joint, rather than flush pipe, to be positioned at the FIV collet location during the clean up.

2. The well planning did not highlight that the well would be under balance during the clean up operation. There were no hydrostatic step up/down charts to show the expected pressures in the well at the different stages of the well clean up, and specifically when the well went under balance.
   Hydrostatic step down / up charts can also be used as a guide for expected drill pipe pressures during displacement.

3. The Clean up program supplied by the fluids contractor made no differentiation between the well in an overbalanced, under balance or near HPHT state during the well clean up.

Application

The Advisory is applicable to all NRS rigs.

Mandatory Actions to take:

1. **Lack of Well Control preparedness during completion phase – DRILLING MINDSET**

   - No pre-kick sheets for well clean up operations
   - No SCR's taken for the clean up string
   - No well control drills for 10 days (required weekly)
   - No consideration of crew changes and well control drills
   - No means of effectively monitoring volume's pumped and returned.

   Tested barriers can fail and risk awareness and control measures need to be implemented The risk perception of barrier failure was blinkered by the positive inflow test. Standard well control practices must be maintained through the life span of the well. Senior Toolpusher to ensure that the incident is reviewed with each drill crew. Reinforce with Toolpushers and Drillers individually their responsibilities as per well Control Manual Section 1 sub section 3.

   Action – Snr Toolpusher by 18th June 2010

2. **Review well control indicators with pit room staff**
   Ensure all relevant personnel are aware of the importance of early kick detection and that the Driller must be informed immediately.

   Action – Snr Toolpusher by 18th June 2010

3. **Rig Managers Performance to ensure that well programs specify operations that induce under balance conditions in the well bore.**
   Well programs must specify operations where a single mechanical barrier [FIV] is in effect and a warning must be included to raise awareness and to highlight in SID.

   Action – Rig Manager Performance - Next well or 31st July 2010

4. **Implement HQS-OPS-ADV-09**
   Responsible persons identified in HQS OPS-ADV-009 to ensure all relevant personnel are aware of and understand its content.

   OIM/Toolpusher to ensure full compliance with the requirements of HQS-OPS-ADV-009 during next and all subsequent, applicable completion operations.
   Action – Responsible persons identified in HQS-OPS-ADV-009 – 18th June 2010

Rig Specific Corrective Action Plans to be developed, tracked and closed in FOCUS Planning and Tracking Software.

Reference to Management System Documentation:

- HQS-OPS-ADV-009: Monitoring Well Control Integrity of Mechanical Barriers
- Well Control Handbook, HQS-OPS-HB-01, Section 1 (Well Control Procedures and Responsibilities)
- Well Control Handbook, HQS-OPS-HB-01, Section 3, Subsection 1 (Preparation of Equipment and Materials)
- Well Control Handbook, HQS-OPS-HB-01, Section 4, Subsection 2 (Well Control Drills)
- Well Control Handbook, HQS-OPS-HB-01, Section 3, Subsection 9 (Completions & Interventions)

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