**Distribution**

1. John Guide, Deepwater Horizon Wells Team Leader
2. Ian Little, Wells Manager
3. Jonathan Sprague, GoM Wells Engineering Authority
4. Neil Cramond, GoM Marine Authority
5. Central File EPT Drilling, Sunbury

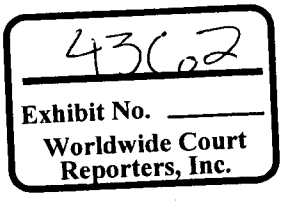
# Deepwater Horizon
# Follow Up Rig Audit, Marine Assurance Audit and Out of Service Period
# September 2009

Prepared by

.....
Kevan Davies,
Rig Auditor
24 September 2009

Approved by

.....
Norman Wong,
Manager, Specialist Technical Support - Rig Audit
30 September 2009



**Executive Summary**

A rig and marine assurance audit was performed on the semi submersible drilling rig Deepwater Horizon. The rig was audited on location at the Kodiak prospect at Mississippi Canyon 7-27. The audit was undertaken by a four man team from 13 to 17 September 2009.

The rig commenced the out of service period on 31 August 2009 to undertake Underwater In Lieu of Dry-dock (UWILD) inspection, DP system upgrades, refurbishment of the forward and aft PRS and replacement of the iron roughneck.

Prior to recommencing operations the rig was subject to a follow up rig and marine assurance audit, and key function testing such as black out recovery, customer acceptance trials concerning DP control system upgrades. Planned checks to verify the functionality of the drill floor anti collision system and reliability of the iron roughneck and PRS could not be performed as on departure from the rig issues with this equipment were still being addressed.

The audit made a number of findings, based on the nature of these findings, i.e. rig floor non operational, and the potential adverse effect on rig emergency preparedness and watertight integrity regarding the marine related issues a recommendation was made to the Wells Team to suspend operations until many have been satisfactorily addressed.

Findings of particular note were the following:

- Closing out of the last audit recommendations had no apparent verification by BP. Consequently a number of the recommendations that Transocean had indicated as closed out had either deteriorated again or not been suitably addressed in the first instance.
- Control of work issues identified specifically with isolation permit process and integrity of mechanical isolations
- Numerous personnel changes had occurred in the eighteen months since our last audit. These were seen at all levels and all disciplines.
- Overdue planned maintenance considered excessive 390 jobs amounting to 3545 man hours. With the recent shift from Empac to RMS II maintenance systems and revised maintenance scheduling the back log does not look as though it will improve
- The aft PRS was non operational, the retract function of the lower arm was defective
- The iron roughneck could not be made to operate from Cyberbase unless the anti collision system was in override

- Top drive guard is not fitted with a safety sling, not only is this an NOV requirement but also a lesson learned from industry incidents, including one on this rig, where the guard had been knocked off due to equipment clash.

- Annual drawworks maintenance routine overdue since February 2009, includes critical checks on the braking system

- Test, middle and upper BOP ram bonnets are original and out with OEM and API five year recommended recertification period.

- The port aft quadrant watertight dampers failed to close when tested

- The starboard aft quadrant bilge and ballast valves, ballast pump and tank sounding system where rendered inoperable due to a process station (PCU 18) card failure

- Three out of four electric bilge pumps were tested, all three failed to achieve suction due to defective priming systems

- Emergency bilge suction check valve integrity checks concluded valves were passing

- Several hydraulic watertight door issues concerning both operability and functionality. Insufficient onboard spares to make repairs

- Just one of the eight seawater cooling pumps was totally defect free. Two of the defective pumps were identified during the previous audit (January 2008) while some of the defective pumps could be operated, four pumps were deemed non operational

**Introduction**

John Guide, Deepwater Horizon Drilling Superintendent, requested the Rig Audit Group to perform a follow up rig and marine assurance audit on the semi-submersible Deepwater Horizon. Customer Acceptance Trials concerning the DP hardware and software mid life upgrade, a black out recovery and DP field arrival trials were also witnessed during mobilisation from the out of service period location to the field.

The follow up rig audit was undertaken whilst on location on DP at Mississippi Canyon 7-27, Kodiak prospect. Operations ongoing during the audit period were focussed on the drill floor where problems with the refurbished aft PRS and new iron roughneck were being worked. Audit focus in addition to the follow up terms of reference was on verifying that equipment which had been replaced, changed or upgraded was operating correctly and reliably.

The audit was undertaken by a four man team from 13 to 17 September 2009.

| | |
|---|---|
| Kevan Davies | Team Leader, Drilling and Technical |
| Gordon Richard | HSE |
| Richard Cox | Marine |
| Barry Hayward | Technical and Marine |

The wells team must review the Audit Report Action Sheet (ARAS) to accept, change or reject the recommendations. If a recommendation is not accepted the reason for the decision should also be documented and filed. Rig Audit Group consider that implementation of all recommendations will; improve safety/environmental performance, comply with industry standards and best practice, and enhance operational integrity.

The marine assurance audit was captured in the Common Marine Inspection Document (CMID) and a CMID Annex (BP requirements for MODUs). Recommendations from the marine assurance audit are included in CMID Annex (BP requirements for MODUs) report. If a recommendation is not accepted the reason for the decision should be documented, filed and the Rig Audit Group informed. All marine recommendations from this report must be tracked and satisfactorily closed out.

This report incorporates the audit findings and recommendations and will be placed on the Rig Audit Share Point site at https://epti.bpglobal.com/sites/RigAudit/default.aspx. The wells team is responsible for completing the audit report action sheets and placing the updated version on the share point site. Further advice on the functioning of the share point site can be obtained from the author of this report.

**Observations**

The main scope of work during the out of service period (OSP) included installation of a refurbished iron roughneck, refurbishment of the forward and aft PRS and, Under Water in Lieu of Dry-dock (UWILD) class survey and update of the DP control system

(software and hardware) with associated Customer Acceptance Trials, black out recovery and field arrival trials. Whilst the DP and UWILD elements of the out of service period generally went well the drill floor work was less successful. Details of the respective work scopes are detailed with in the applicable sections of this report and also the CMID and CMID Annex.

Previous Audit

Protocol for closing out the last audit recommendations needs to be improved, as it was evident that the close out process utilised was with Transocean closing out the recommendations and no apparent verification by BP. Consequently a number of the recommendations that Transocean had indicated as closed out had either deteriorated again or not been suitably addressed in the first instance. In other cases findings were simply rejected, with no formal risk mitigation demonstrated.

Overall expectations with respect to close out of class one and two recommendations were not entirely met and while it is appreciated that a good number of findings had been addressed by hard work and effort there were too many that had not.

Safety

As of 15 September 2009 the rig has gone 2390 days without a Days Away From Work Case which is an excellent achievement, however 15 serious near hits were reported over the last year and a safety stand-down was held prior to starting operations following the out of service period. The START tour process needs to be re-energised to re-enforce safety behaviours and ensure that all work areas are subjected to periodic audit by the Supervisors, who are accompanied by a junior member of the crew therefore providing some good mentoring practice. An annual structured Health and Safety Plan was not in place although a number of safety goals were listed, but these were not commonly known and not widely communicated. The BP HSE Policy posted within the accommodation was dated May 2002; this does not send the right message.

With many new personnel, continuous rigour is required to ensure that there is the expected level of consistency in the application of the risk management tools including Permit to Work and Energy Isolation. Senior personnel and supervisors should focus on continuous improvement in coaching the crews and third party personnel to ensure that the control systems in place are being effectively applied.

It is a requirement that all staff and contractors personnel be knowledgeable of the Drilling and Well Operations Practice and associated Engineering Technical Practices. The audit highlighted that this still needed to be communicated to relevant Transocean personnel on the rig.

Control of Work

Approximately 70% of work was being carried out using THINK plans and Prompt cards but no TSTP. The TSTP which provides the core risk assessment procedure is only used if one is available for the job. It was evident that the extensive TSTP library was not being fully utilised. That said the written THINK plans reviewed were generally of an

acceptable quality and personnel were seen to be actively involved during the THINK Planning process.

Time out for safety was being used and personnel were aware that they had the right and the responsibility to call a time out and stop the job if they felt that this action was required. Data arising from use of the various behavioural based risk management tools was compiled by the RSTC and statistics were reported daily with personnel briefed on results at the various rig meetings. It was noted that approximately 14% of START cards submitted were for unsafe or at risk operations while the remainder were for safe and positive observations. It was also noted that the submission of START cards by Third Party personnel was low.

The BP Golden Rules set out specific requirements for permit to work and energy isolation. This requires a permit to be issued for work on all energy systems. However the Transocean SMS can gave the OIM discretion to determine if a permit to work was an additional requirement when an isolation certificate was issued for maintenance or repair of a system, or component, containing energy. It was understood that an isolation certificate was rarely issued without a permit to work but an example was sighted when only an isolation certificate had been issued for an electrical isolation prior to replacement of the iron roughneck service hose bundle. There needs to be clear alignment between the two requirements, and where there is conflict then the higher level of control should be applied.

Control of work deficiencies identified during the audit concerned the integrity and application of mechanical isolations. In the machinery spaces two permitted jobs, one to replace an air start compressor motor, the other to clean a water maker had resulted in non-isolation of the mechanical systems. An air receiver pressure gauge on the air start compressor was registering 24 bar, despite this the isolation valve although shut had not been locked or tagged. The water maker had been opened up and again although jacket water and seawater inlet and outlet valves were closed neither were locked or tagged. Of more concern, this had not been identified on the isolation certificate. On another occasion the isolation certificate issued for changing out a valve and associated pipe work in the port forward ballast pump room did not have the mechanical lock (padlock) number identified on the certificate hence all control measures had not been recorded. Details such as these should be verified before work commences during the approval stage and further checked during audit.

Other control of work deficiencies also concerned energy isolation, permit to work and improper THINK planning. During overhaul of the aft PRS it developed an incline of approximately 11 feet from the vertical plane when work between shifts was not effectively controlled or risk assessed. The brake mechanism had been removed from the PRS upper carriage and this information was not handed over between shifts. When work resumed on the aft PRS a THINK plan was not undertaken to identify and mitigate the associated hazards. Hence two control of work failings resulted in unplanned movement of the PRS.

ESD fault and inhibit alarm conditions were indicated on the bridge fire and gas panel. The vessel management system operator station was reviewed and unacknowledged communication line faults were noted. On clearing the line faults the ESD fault condition cleared. Further review indicated that active ESD inhibits were in place for the helifoam fire fighting system. These had been in place as a result of testing the helifoam system the previous day and had been in place during the morning's helicopter operations. The Task Specific Think Procedure (TSTP) for helicopter pre-arrival had not included checks to ensure all critical safety systems were operational and clearly poor control of work and management of defeats and bypasses was evident.

Incident Analysis and Prevention

The Incident Report Log was reviewed for the past year and of the twenty seven incidents reported, fourteen related to personal injury of which four were recordable (not DAFWC). The remaining thirteen were for serious near hits. These included two incidents where anchored man-rider winch lines had become snagged during drill-floor operations, one line parted and the other was damaged. Another incident involved the aft PRS veering 11 feet off the vertical plane. Others involved a torque valve failing under pressure and the loss of power/blackout. The remaining serious near hits related to dropped objects. The status of actions arising from these incidents should be periodically monitored by BP to ensure proper close-out; access to the Focus tracking system was not possible during the audit period.

Audit, Assurance and Learning

A Performance Monitoring Audit and Assessment (PMAA) was conducted between 30 June and 3 July 2009 and coincided with the ISM and ISPS audits. The PMAA audit found no areas of non-conformities although a number of improvement actions and corrective actions were recorded. One of these related to the requirement for the rig to adopt the practice of requiring a permit for all isolations that are raised. This was not yet the case.

The maintenance summary in the PMAA highlighted the fact that EMPAC was being utilised onboard. There has since been a change to the RMS II. Personnel were still becoming familiar with the new system and needed to be more knowledgeable in its use e.g. when accessing the DROPS data on the rig floor, there was an issue in locating items found in inspections that had been carried out.

Further assurance is required to demonstrate that the permit to work and energy isolation systems are working as intended and incorporate the rigour that is demanded from such a key element of the Control of Work process. This area needs to be continually monitored by both BP and Transocean.

Training and Competency

The turnover of personnel on the rig has been high over the last two years with personnel either being attracted to other contractors or moved to new builds within the Transocean Fleet. Personnel who have moved on include OIM, Toolpusher, Drillers, and various drilling crew personnel. Within the maintenance department, one Electrical Supervisor

and one Mechanical Supervisor have left in addition to a number of Mechanics and Electricians. The core group of experienced personnel has been shrinking to the point where some consolidation is now required. Any further dilution of experienced personnel may be detrimental to the performance of the rig.

The Transocean Training Matrix was reviewed (updated on 14 September 2009). Most of the percentages given for training required against training completed were high indicating that most personnel onboard were nearing completion of both On the Job Training (OJT) and external training requirements. Training requirements that were mostly unfulfilled related to the Safety Leadership Foundations course (41%) and the Kelvin Top Set incident investigation training (12%). During the audit numerous discussions were held with a cross-section of the crew and most indicated that they were committed to the OJT programme. Environmental and DROPS OJTs had recently been added to the requirements but had not yet been added to the ongoing programme

There was no competence assurance system in place. This was ongoing on other Transocean rigs but personnel interviewed during the audit had little or no knowledge of the competence system. Rig management need to confirm the Transocean requirement to have a competence assurance system in place. There is also a requirement under the BP Drilling and Well Operations Practice for the contractor's safety management system to incorporate systems for training and competency.

Derrick Inspection and Dropped Objects

The derrick was inspected to assess structural condition and effectiveness of dropped object prevention measures. DROPS inspections are carried out in accordance with RMS II maintenance routines and checklists, since our last audit the DROPS inspection process has been supplemented and improved with the addition of detailed picture book covering each derrick fixture and all derrick levels. This was produced following a comprehensive third party derrick survey. A derrick register was in use to control personnel and tool movements in the derrick, however not all information was being recorded e.g. some people were not signing the log to register that they had come down or notified that tools and equipment had been removed.

The derrick was covered in a thick film of drilling mud from the fingerboard level down; this was attributed to the previous drilling operation when setting balanced plugs. The danger being that drain holes in the girts becoming permanently plugged leading to standing water and corrosion. Despite regular derrick DROPS inspections items of trash were recovered during our inspection, clearly the required degree of rigour and vigilance are not being exercised during the rig DROPS inspections. Although secondary retention of derrick fixtures was generally satisfactory some anomalies were identified. Best practice securing methods had not been employed for the CCTV cameras while secondary retention of the flare igniter equipment was best described as suspect. The rig has been operational since 2001 but according to maintenance history files just forty three derrick bolts have been inspected. Given the rig's age all bolts should have been inspected by this time.

Many of the recommendations concerning toe boards and safety slings as per API recommended practices made during our 2008 audit remain outstanding with no action taken. It was also surprising to find the top drive guard not fitted with a safety sling, not only is this an NOV requirement but also a lesson learned from industry incidents, including one on this rig, where the guard had been knocked off due to equipment clash.

Although the third party lifting gear inspection had recently been completed, the majority of derrick fixed and loose lifting gear was incorrectly colour coded. The utility winch turndown sheave for example in the mini derrick was found in poor condition and many of the remote grease nipples for divert sheaves was dry, indicating that greasing was not being performed.

Drilling Equipment

On arrival on the rig work was still ongoing to complete installation of the new iron roughneck and refurbishment of the aft PRS. Problems had been encountered with both projects.

Initially some functions of the iron roughneck did not work; this was traced to a faulty service loop, thought to have been damaged during installation. The service loop was subsequently replaced with a new spare and although all iron roughneck functions were now available the machine could not be indexed and thus could not be operated from the Cyberbase chairs unless ACS release/ignore key switches were operated. Initially it was thought that the problem may be mechanical, a difference in track and encoder gear tooth pitch, but this was eliminated. Fault finding efforts using E-Hawk, NOV's remote software interrogation system, were thwarted as an undetermined issue with the remote access modem could not be resolved. Although every effort was made to achieve iron roughneck operation from Cyberbase and within the control of ACS forward progress had not been made on our departure from the rig.

NOV inspection reports dated August 2006 and May 2007 highlighted that both PRS' had worn pins and bushes, it was highlighted during our last audit in January 2008 that although this work was necessary to improve PRS reliability it had not been completed. Review of the planned PRS work scope against that completed revealed some gaps, basically the planned pin, bush and guide wheel replacements had not been performed on the forward unit, and only the forward tailing arm had been refurbished. The aft PRS had generally been refurbished according to plan with pins, bushes and guide wheels replaced as required. Justification for not completing the work scope on the forward unit was not provided.

During the last well the linear actuator was renewed on the aft PRS, a few days later problems were experienced with the lower arm retract function. The lower arm would not stay fully retracted, and on release of the joystick the arm extends out by approximately 8" putting the aft PRS into ACS initiated stop. A risk assessment was undertaken to allow continued use of the PRS, this was achieved by operators holding the joystick in the retract position when slewing and traversing the PRS. It was thought that this was due to the wear in the various pins and bushes and refurbishment would solve

the issue. However following refurbishment the problem is still prevalent; the problem appears to be attributed to mechanical interference between the primary arm and stabiliser arm. Although the arms have been dimensionally checked, a difficult task in itself with the arm in situ, Transocean had trouble interpreting the required readings as three separate detail design drawings were available each one different to the other. As a separate check the aft stabiliser arm dimensions were compared with the forward PRS stabiliser arm and differences were identified which resulted in the forward arm having greater clearance with the primary arm. Prior to departure from the rig Transocean had decided to remove the aft stabiliser arm and send it ashore for accurate dimensional analysis and possible repair.

As reported during our 2008 audit comprehensive checks to verify proper operation of the anti-collision system (ACS) were still not being periodically undertaken. Clearly lessons learned from the equipment collisions on this rig have not been fully implemented.

Top drive maintenance was reported as up to date with no outstanding issues, it was however noted that it had been omitted from the recent drilling load path inspection and condition of the mud hose was unacceptable.

The annual drawworks maintenance routine was found overdue since February 2009. When queried as to why this critical maintenance routine had not been planned or performed during the out of service period no answer could be provided. This annual maintenance routine includes integrity checks on the drawworks disc braking system including caliper disassembly, MPI of the pins and arms and adjustment checks. When challenged further the Transocean Asset Manager communicated that this maintenance routine, despite being active in RMS II and referenced on the overdue maintenance list, was no longer valid and would be changed to ten or five year frequency hence there was no need to complete it. Given the planned high casing string weights on the forthcoming well and also due to the fact that crack like indications and seized pins are not uncommon findings for this type of drawworks braking system Transocean were requested to conduct the maintenance routine or otherwise provide formal technical justification for not performing it.

According to maintenance history calibration of critical drilling instrumentation remains an area where improvement is required. Despite previous recommendations it could not be demonstrated that all critical digital and analogue drilling instrumentation is being calibrated.

Third party inspection reports of the drilling load path were generally very poor, frequently amounting to little more than a line item on a record of examination sheet. The actual components or areas inspected were seldom reported or indicated and where pictorial representation was provided it did not accurately reflect the equipment installed on the rig. In one instance MPI reports for the derrick feet were requested, these could not be located on the rig, so a call to the third party inspection company resulted in a previous inspection report being faxed to the rig with an additional line item added; "MPI 4 derrick feet – pass". This assurance approach certainly does not provide the required or

expected degree of integrity or rigour. Additionally in many cases such as top drive and PRS the inspection reports did not tally with the procedure outlined in RMS II.

Mud Systems

The pit room, pump room, shaker room and sack store were generally found in a clean and tidy condition with no reported defects. Mud pump crankshaft NDT inspections were in date and reported as defect free. Excessive use of silicon sealant was noted on the mud pump covers; this can result in blocked oil galleries and bearing starvation leading to pump failure. OEM gaskets should be used following future maintenance activity.

Well Control

Following time spent with the Subsea department it was evident that most well control related equipment maintenance is being recorded out with RMS II on separate spreadsheets and in the daily log book.

The upper middle and test ram bonnets are original and therefore out with OEM and API certification requirements. The ST-locks have however been checked. Ram cavity measurements had just been taken but results had not been recorded, it was communicated that all clearances were within recommended specification. The annual NDT inspection of the ram blocks and buttons was last performed during July 2008. All annular and ram seals were replaced during the out of service period. One annular has been in service for three years while the inner and outer piston was replaced on the other during 2008. Since our last visit, all tensioner defects have been addressed by way of new rods and modified packing, the last remaining tensioner hose was replaced during the audit period. There is no one complete spare tensioner in the yard and another currently being overhauled.

The spare POD is not 100% complete being deficient in solenoid valves and the SEM needs to be refurbished by Cameron.

The previously reported "holed" hot line has been renewed but the boost hose is original supply and dated 1999, and clearly out with Transocean's five year replacement policy. Indeed it could not be established by way of maintenance records that high pressure hoses are being maintained in accordance with RMS II requirements. According to maintenance history the choke and kill manifold has not been maintained in accordance with former Transocean maintenance requirements or indeed API recommended practices. Choke manifold valves having been replaced on the basis of failure only, periodic internal choke manifold and valve inspection having not been performed.

Recent third party inspection reports for riser bolts and inserts again were of a poor standard, serial numbers for traceability purposes had not been recorded. The rig now has an onboard riser bolt torque tool calibration unit, but calibration certification for this unit could not be produced. Based on Vetco recommendations riser bolt torque will be reduced from 25,500 ft-lb to 19,250 ft-lb during the next well, this change is based on the

introduction of new lubricant, Moly Paste TS 70 as per the technical bulletin dated June 2009.

Review of the thickness inspection reports for the high pressure piping systems once again highlighted an inferior reporting process. The reports amounted to little more than numbers as the original thickness, corrosion allowance and percentage wear were not specified. In some cases large portions of high pressure pipe work had not been inspected due to access issues and in some cases heavy corrosion was noted but no measurement recorded.

Maintenance Management

Maintenance management system has recently been changed from Transocean's former Empac system to the GSF legacy RMS II system. Although training has been provided for most personnel many were still coming to terms with the operation and features of RMS II. Although former maintenance history has been copied across to RMS II based on conversation and observation it is evident that Transocean has not fully set the rig up for success in terms of maintenance management. Maintenance routines now encompass the former rig specific routines, the generic Transocean Routines and the legacy GSF best practice maintenance routines; it has been left to the rig to decide which routines are required and report those that are not using the change request system. In addition maintenance scheduling has not been well thought out, in many instances and for each discipline some months has more maintenance hours scheduled than available man hours; this will clearly result in increases in overdue maintenance.

A review of the RMS II maintenance management system indicated that there were significant overdue planned maintenance routines in excess of thirty days; these totalled 390 routines which corresponded to 3545 man hours. Many of the jobs were high priority designation and it is unclear why Transocean did not plan some of these for the out of service period.

Whilst it is appreciated that attempts are being made to improve quality of maintenance reporting based on observations during the audit period further effort is still required. All too frequently maintenance history was substandard with missing information and poor quality reports that lacked sufficient detail to convince the reader that the task had actually been performed in accordance with the procedure.

Planned maintenance was inspected for the two deck cranes, knuckle boom crane and riser gantry crane. All scheduled work appeared to be up to date, with no current outstanding corrective maintenance apparent or implied. Additionally deck crane pedestal NDT inspections and boom segment bolts replacements were found in date.

With the excessive overdue maintenance and the recent introduction of more maintenance routines it would appear that the maintenance department is struggling to stay in touch with the planned maintenance schedule.

Software Management

the limit switch frozen in the closed position. This then means the bridge would be unaware of the status of the door as the limit switch always reports closed status. Additionally when reviewing alarm status conditions on the vessel management system a number of doors had had the 100 second alarm timer disabled. This means that if the doors are left open for more than 100 seconds then the audible alarm will not be generated in line with the original requirements.

During the audit period process station PCU18 serving the starboard aft quadrant failed. The PLC card failure meant that it was not possible to operate the starboard aft bilge and ballast valves, ballast pump remotely and the tank sounding system was also rendered inoperable. The defect could not be immediately rectified due to insufficient onboard spares.

During testing of the bilge system three of the four electric bilge pumps failed to take suction, the priming devices being defective. Two emergency bilge suction check valves also failed integrity checks when subject to flow back tests.

Of the eight seawater cooling pumps just one was totally defect free, while four pumps were deemed non-operational others could be operated despite the defects such as severely leaking upper and lower shaft seals. In two cases pump defects had been reported during our previous audit over eighteen months ago.

Power Plant

Engine #1 was overdue, since May 2009, a planned 24,000 hour overhaul. While engine #4 was overdue, since June 2009, a planned 24,000 hour overhaul and 12,000 hour turbo charger replacement. The Maintenance Supervisor cited a lack of manpower as the reason for no progress.

Thruster #2 was non operational during the audit period, problems had been encountered with current imbalance on the variable frequency drive inverter; due to manpower focus on the rig floor issues it had not been investigated. According to the daily maintenance report the rig has requested an extension, to 4Q2010, for the eight year thruster drive maintenance routine; this basically involves systematic disassembly and inspection of each drive with specific part replacement in accordance with OEM recommendations. The request for this extension is currently pending.

Thermographic survey and current injection testing remain outstanding, although the rig now has the thermographic inspection equipment onboard the windows to facilitate inspection have not been made on the various switchboards, drive cubicles and MCC's.

Control of alarms and defeats and bypasses was not well managed, in fact no single person could account for which alarms etc. were overridden or indeed for what reason.

Mechanical Handling

Certification for most of the lifting equipment was sighted with the exception of the proof load test certification for the man riding winches, utility winches, trolley beams and pad

eyes, which could not be produced. Webbing slings were all changed out during February 2009 and all had current certification. The last ABS load tests on the two deck cranes, knuckle boom crane and the riser gantry crane were performed between January 2006 to December 2007 and the last class annual thorough examination was completed in December 2008; with the Cargo Gear Register being endorsed as required.

The last third party lifting equipment annual survey was completed in August 2009, although the final report had not been received it was communicated that defects were limited to a few wire slings. The present lifting gear colour code is yellow, despite this several pad eyes in the mud pit room and most lifting gear in the derrick were still painted green. The loose and fixed lifting gear was spot checked, and all sighted slings, pad eyes and overhead trolley beams were either tagged or marked with their SWL and ID. There is no dedicated store or rigging loft and subsequently the lifting equipment is mainly stowed in the two aft leg columns with no formal control over use.

The port and starboard deck cranes were function tested and limits successfully tested. The safe load indicators were operational on both deck cranes but the LCD screen on the starboard crane was no longer backlit. The port deck crane lower boom segment lattice, right hand brace to chord intersection has an indentation that is presently being monitored. The daily and weekly crane operator's inspection reports were sighted together with lift plans for special lifts undertaken.

The riser gantry crane and knuckle boom crane were both functioned and limits tested satisfactorily. Due to ongoing operations in the moon pool and on the BOP stack, the BOP crane was not tested during the audit period.

All cranes wire rope certification was in order with specified change out dates honoured. The BOP crane main and wires were last changed in October/November 2007 and are shortly due for renewal under Transocean's two year change out policy.

The drill floor and moon pool man riding and utility winches were inspected and function tested. Anomalies noted, which in one instance included failure of the E stop, have been recorded in the ARAS.

Obsolescence Issues

Although obsolescence issues primarily concerning the PRS and iron roughneck control systems were reported during our 2008 audit. No action has been taken to either resolve these issues are otherwise undertake a rig wide study to identify other areas that may be becoming obsolete with potential to have a detrimental effect on equipment availability.

Warehouse

The legacy Transocean warehouse management system had just recently, July 2009, been replaced by the GSF legacy Inventory Control System (ICS) with material requests and purchase orders being placed via the intranet to the server onshore. It was communicated that current stock inventory resides at 3,913,687 USD with a further 1,786,198 USD of

material on order covering 448 purchase orders. Of these purchase orders fifty are for critical spares.

Warehouse personnel were still becoming familiar with ICS and consequently were not fully conversant with all functions. For example, they were unable to produce a full list of critical spare parts on the rig. The store rooms were tidy and parts were binned and tagged. Spot checks of the OEM rubber goods indicated that all rubber goods were correctly sealed and in date.

During the audit period several spares shortages came to light, these included critical systems such as watertight doors, vessel control system (PCU 18), fire and gas detectors and main engine turbo chargers.

**Audit Report Action Sheet (ARAS)**

The observations and recommendations are laid out in tabular format that allows tracking of audit recommendations. The first digit in the numbering system indicates the criticality and by reflection of the criticality, timing for reaction to the findings.

| | |
|---|---|
| Class 1 | These items that do not comply with BP policies or Standards |
| Class 2 | These items are outside API, legislation, Rig Owner policies, have high safety or environmental impact potential. |
| Class 3 | These are items that one would expect to find in place from a combination of competent drilling contractor and competent operator. |
| Class 4 | These are items that can be used by the drilling contractor and/or BP to build on the project, though they are not considered as essential. |

The second digit in the numbering system indicates the functional area the issue is based within.

1. Health, Safety and Safety Management[1]
2. Drilling and Well Control
3. Technical Services
4. Marine[2]
5. Environmental
6. Mechanical Handling

The final digit is the recognition number for that particular section bearing in mind the items are not set out by priority.

Audit Team Advised Completion is based on what was understood as the criticality of the issue in relation to project timing.

The wells team must review the Audit Report Action Sheet (ARAS) to accept, change or reject the recommendations. If a non-marine recommendation is not accepted the reason for the decision should also be documented and filed. Rig Audit Group consider that implementation of all recommendations will; improve safety/environmental performance, comply with industry standards and best practice, and enhance operational integrity.

[1] There is no 3.1 Classification
[2] Recommendations are included in the CMID Annex (BP requirements for MODUs) report

AUDIT REPORT ACTION SHEET

RIG TYPE: Semi-Submersible

RIG NAME: Deepwater Horizon

DATES OF AUDIT: 13 to 17 September 2009

RIG STATUS: Out of Service Period

| REF | OBSERVATION | RECOMMENDATION | AUDIT TEAM ADVISED COMPLETION | ASSET ACCEPTANCE OR CHANGE | ACTUAL COMPLETION DATE | SIGNED OFF BY |
|---|---|---|---|---|---|---|
| *1.1* | ***Health, Safety and Safety Management*** | ***These items do not comply with BP Policies or Standards*** | | | | |
| 1.1.1 | A conflict was noted between the BP Golden Rules on permit to work and Transocean SMS Policy (Section 4.2.2 Sub-section 5.6) OIM's duty to determine if a permit is required in addition to an Isolation Certificate.<br><br>An example of an isolation certificate with no associated permit to work was posted in the auxiliary Driller's cabin for work to replace a service hose bundle on the iron roughneck. | A permit to work must be required for work on energy systems. Transocean to abide by the higher level of control and ensure all energy isolations are under control of the permit to work process.<br><br>Golden Rules of Safety | Immediately | | | |
| 1.1.2 | The isolation certificate issued for changing out a valve and pipe work in the port forward ballast pump room did not include details of the mechanical isolation, e.g. the padlock number. | When completing isolation certificates, checks should be made to ensure that all information is entered. Lock-out/tag-out details should be checked and recorded. Permit to work audits should include the requirement to check both mechanical and electrical isolations and ensure that the details recorded are complete.<br><br>Golden Rules of Safety | Immediately | | | |
| 1.1.3 | There is a requirement for all contract and staff personnel involved in the management and supervision of drilling and well operations for BP to be knowledgeable of the Drilling and Well Operations Practice and associated Engineering Technical Practices. Relevant Transocean personnel were not aware of this requirement. | The Drilling and Well Operations Practice and associated Engineering Technical Practices to be rolled out to relevant Transocean personnel to the point where they are knowledgeable of the contents.<br><br>BP Drilling and Well Operations Practice | Within six months | | | |

AUDIT REPORT ACTION SHEET

RIG TYPE: Semi-Submersible

RIG NAME: Deepwater Horizon

DATES OF AUDIT: 13 to 17 September 2009

RIG STATUS: Out of Service Period

| REF | OBSERVATION | RECOMMENDATION | AUDIT TEAM ADVISED COMPLETION | ASSET ACCEPTANCE OR CHANGE | ACTUAL COMPLETION DATE | SIGNED OFF BY |
|---|---|---|---|---|---|---|
| 1.1.4 | No Competence Assurance system was in place. This differs from other Transocean rigs (e.g. DDIII) where a competency programme is maintained and competency records held. | Transocean should ensure that the competency system used on other rigs is applied to the Deepwater Horizon.<br><br>Drilling and Well Operations Practice | Within four months | | | |
| 1.1.5 | Several instances were mechanical isolations had not been identified or suitable locked and tagged out. Examples include discharge valve on air start compressor #4 during motor replacement and failure to lock out / tag out the jacket water and seawater inlet and outlet valves during disassembly of water maker #5. | Mechanical isolations to be considered for each job involving energy isolation. An effective system of tag and locks to be employed and details included on the Isolation Certificate.<br><br>Golden Rules of Safety | Immediately | | | |
| 1.1.6 | The rigour concerning close out of the previous audit findings has generally been unsatisfactory. There has been little sign of BP involvement evident and consequently many of the recommendations reported as closed out could not be adequately demonstrated to the audit team during this visit. | BP involvement required in closing out of audit recommendations. If a recommendation is rejected than formal risk mitigation to be documented.<br><br>Six Point Plan | Immediately | | | |

AUDIT REPORT ACTION SHEET

RIG TYPE: Semi-Submersible

RIG NAME: Deepwater Horizon

DATES OF AUDIT: 13 to 17 September 2009

RIG STATUS: Out of Service Period

| REF | OBSERVATION | RECOMMENDATION | AUDIT TEAM ADVISED COMPLETION | ASSET ACCEPTANCE OR CHANGE | ACTUAL COMPLETION DATE | SIGNED OFF BY |
|---|---|---|---|---|---|---|
| ***1.2*** | ***Drilling and Well Control*** | ***These items do not comply with BP Policies or Standards*** | | | | |
| 1.2.1 | The test, middle and upper pipe ram BOP bonnets are original. They have not been subject to OEM inspection and recertification in accordance with API and OEM requirements. Transocean propose a change out plan commencing in 2010 for completion in 2011. | Expedite overhaul of the test, middle and upper pipe ram bonnets which are original and have significantly surpassed the recommended recertification period. Otherwise expedite replacements.<br><br>Drilling and Well Operations Practice | By end of 2009 | | | |

AUDIT REPORT ACTION SHEET

RIG TYPE: Semi-Submersible

RIG NAME: Deepwater Horizon

DATES OF AUDIT: 13 to 17 September 2009

RIG STATUS: Out of Service Period

| REF | OBSERVATION | RECOMMENDATION | AUDIT TEAM ADVISED COMPLETION | ASSET ACCEPTANCE OR CHANGE | ACTUAL COMPLETION DATE | SIGNED OFF BY |
|---|---|---|---|---|---|---|
| *1.3* | ***Technical Services*** | ***These items do not comply with BP Policies or Standards*** | | | | |
| 1.3.1 | With the exception of the DP control system a comprehensive software management system for critical software such as the BOP control system, ballast control system and vessel management system could not be demonstrated. | Target to be set for completion of auditable software management system. Software verification schedule to be risk based i.e. most critical software to be checked/backed up first. System to be subject to periodic audit in line with Transocean Advisory Notice.<br><br>Drilling and Well Operations Practice | Within three months | | | |
| 1.3.2 | No formal means in place to communicate overdue critical maintenance or defective equipment to the BP Well Site Leaders. | Weekly maintenance report to be updated / modified to include all equipment defects and all overdue planned and corrective maintenance. Report to be submitted to the BP Well Site Leader on a weekly basis.<br><br>Drilling and Well Operations Practice | Within one week | | | |

AUDIT REPORT ACTION SHEET

RIG TYPE: Semi-Submersible

RIG NAME: Deepwater Horizon

DATES OF AUDIT: 13 to 17 September 2009

RIG STATUS: Out of Service Period

| REF | OBSERVATION | RECOMMENDATION | AUDIT TEAM ADVISED COMPLETION | ASSET ACCEPTANCE OR CHANGE | ACTUAL COMPLETION DATE | SIGNED OFF BY |
|---|---|---|---|---|---|---|
| ***1.6*** | ***Mechanical Handling*** | ***These items do not comply with BP Policies or Standards*** | | | | |
| 1.6.1 | The E Stop on the forward moon pool man ridding winch is non operational. | E Stop on the forward moon pool man ridding winch to be made operational.<br><br>Golden Rules of Safety | Prior to next use | | | |
| 1.6.2 | The proof load test certification for the man riding winches, utility winches, trolley beams and pad eyes were not available for inspection during the rig audit period. | Ensure that the current proof load test certification for the man riding winches, utility winches, trolley beams and pad eyes are available on the rig for inspection. Should these be unavailable proof load testing to be carried out by competent person.<br><br>Golden Rules of Safety | Within one month | | | |

AUDIT REPORT ACTION SHEET

RIG TYPE: Semi-Submersible

RIG NAME: Deepwater Horizon

DATES OF AUDIT: 13 to 17 September 2009

RIG STATUS: Out of Service Period

| REF | OBSERVATION | RECOMMENDATION | AUDIT TEAM ADVISED COMPLETION | ASSET ACCEPTANCE OR CHANGE | ACTUAL COMPLETION DATE | SIGNED OFF BY |
|---|---|---|---|---|---|---|
| ***2.1*** | ***Health, Safety and Safety Management*** | ***These items are outside API, legislation, Rig Owner policies, have high safety or environmental impact potential.*** | | | | |
| 2.1.1 | The coupling guard on the Mathey wire line unit is inadequate and the coupling guard on main engine #2 pre-lube oil pump was missing. Both couplings are exposed. | Modify coupling guard on Mathey wire line unit such that rotating equipment is enclosed.<br><br>Coupling guard on main engine #2 pre-lube oil pump to be installed. | Prior to use<br><br>Immediately | | | |
| 2.1.2 | Potential fall through hazard identified at the crown access platform of the mini derrick in way of the fast line. | Extend handrails at the crown access platform of the mini derrick in way of the fast line to remove potential fall through hazard. | Within two months | | | |
| 2.1.3 | BP HSE Policy posted in the accommodation is dated May 2002. | Most recent version of BP HSE Policy to be made available and posted on the relevant HSE notice boards. | Within one month | | | |
| 2.1.4 | Although some general safety goals were in place, no structured annual Health and Safety Plan with measureable actions, completion dates and accountable persons was sighted. | An annual Health and Safety Plan should be put in place to formally manage ongoing HSE initiatives. The plan should have clear measureable targets with defined accountabilities. | Within three months | | | |
| 2.1.5 | Only two of the twenty-eight people requiring the Kelvin Top Set one day training course have been trained. | Outstanding one day Kelvin Top Set training to be completed in accordance with the training matrix requirements. | Within three months | | | |

AUDIT REPORT ACTION SHEET

RIG TYPE: Semi-Submersible

RIG NAME: Deepwater Horizon

DATES OF AUDIT: 13 to 17 September 2009

RIG STATUS: Out of Service Period

| REF | OBSERVATION | RECOMMENDATION | AUDIT TEAM ADVISED COMPLETION | ASSET ACCEPTANCE OR CHANGE | ACTUAL COMPLETION DATE | SIGNED OFF BY |
|---|---|---|---|---|---|---|
| 2.1.6 | The FOCUS improvement system was being used to track the status of actions arising from incidents. It was not possible during the audit, to ascertain the actual status of the actions arising from each report. | In conjunction with those actions recorded within the BP Traction system, BP should monitor the status of actions held on the Transocean Focus system which relate to incidents that have occurred on the Deepwater Horizon. | Within one month | | | |
| 2.1.7 | On completion of a job that requires a TSTP, an after action review should be completed. This was not always being done. | Ensure that on completion of all jobs that require a TSTP, an after action review is completed in accordance with the procedure. | Immediately | | | |
| 2.1.8 | Condition of some chemical pallets in the sack store was suspect. Some had sustained mechanical damage due to forklift truck damage. Consequently a number of pallets were splintered while others were tilting. | To avoid injury to personnel forklift drivers should ensure that they take care when handling wooden chemical pallets. This should be discussed and recorded during Think Plans. | Immediately | | | |
| 2.1.9 | The lighting inside the starboard-aft stairwell from the main deck to the lower deck was insufficient. | Improve the lighting inside the starboard-aft stairwell from the main deck to the lower deck | Within two months | | | |
| 2.1.10 | The safety notice board did not contain up to date minutes of safety meetings. There was some information available from the DROPS Steering Committee Meetings but no recent safety meeting minutes were posted. | Ensure that relevant up to date information is posted on the safety notice board which covers all ongoing safety issues on the rig. | Within one week | | | |

AUDIT REPORT ACTION SHEET

RIG TYPE: Semi-Submersible

RIG NAME: Deepwater Horizon

DATES OF AUDIT: 13 to 17 September 2009

RIG STATUS: Out of Service Period

| REF | OBSERVATION | RECOMMENDATION | AUDIT TEAM ADVISED COMPLETION | ASSET ACCEPTANCE OR CHANGE | ACTUAL COMPLETION DATE | SIGNED OFF BY |
|---|---|---|---|---|---|---|
| 2.1.11 | An ESD fault was registered on the fire and gas panel located on the bridge, further investigation revealed that the helifoam system had been inhibited thereby preventing operation during a helicopter operations. This inhibit had been missed from system tests the previous day. | The TSTP for conducting helicopter pre-arrival checks to be reviewed to ensure that all critical systems are fully functional. The written THINK Plan should include these checks. | Immediately | | | |
| 2.1.12 | In the shale shaker area, some items of PPE and hand tools had been left lying around e.g. face visor left next to shaker #8 and stilson wrench lying on the walkway. | All PPE to be stored in the PPE locker when not in use and personnel to be reminded that on completion of work, all hand-tools should be properly stored. | Immediately | | | |
| 2.1.13 | The TSTP for working on mud pumps did not adequately address the manual handling aspects involved in moving heavy equipment e.g. mud pump fluid end modules and piston liners. | Review TSTP to ensure that manual handling aspects are included and that personnel consider manual handling hazards in the THINK planning process. | Within one month | | | |
| 2.1.14 | MSDS information was not available in the mud mixing area. Some information was posted on the notice board in this area but this was not considered adequate. | Provide MSDS information at worksites where potentially hazardous materials may be stored and/or used. | Within one month | | | |
| 2.1.15 | The number of START cards submitted by third party and BP personnel was low. None had been submitted for the previous week. | Remind all personnel, including third party and BP personnel, on the rig to be fully engaged in the START card system and people reminded of their duty to use the behavioural tools available. | Immediately | | | |

AUDIT REPORT ACTION SHEET

RIG TYPE: Semi-Submersible

RIG NAME: Deepwater Horizon

DATES OF AUDIT: 13 to 17 September 2009

RIG STATUS: Out of Service Period

| REF | OBSERVATION | RECOMMENDATION | AUDIT TEAM ADVISED COMPLETION | ASSET ACCEPTANCE OR CHANGE | ACTUAL COMPLETION DATE | SIGNED OFF BY |
|---|---|---|---|---|---|---|
| 2.1.16 | Fall hazards were noted in the port forward and starboard forward ballast pump rooms, where valve change out had resulted in gaps with no handrail protection. | Fall hazards presented by the gaps in the port forward and starboard forward ballast pump rooms to be addressed. | Within one week. | | | |
| 2.1.17 | Additional OJT (DROPS and Environmental) had recently been added to the list that had to be completed by onboard personnel. These had not yet been implemented. | A timescale to be established for implementing the DROPS and Environmental OJT. | Within two months | | | |
| 2.1.18 | One of the hospital alarms was tested. Although a signal was activated on the bridge, there was no acknowledgement to the Medic that it had been received. | All four alarms in the hospital to be checked and personnel responsible for acknowledging the alarms made clear on their duty to respond immediately. | Within one week. | | | |

AUDIT REPORT ACTION SHEET

RIG TYPE: Semi-Submersible

RIG NAME: Deepwater Horizon

DATES OF AUDIT: 13 to 17 September 2009

RIG STATUS: Out of Service Period

| REF | OBSERVATION | RECOMMENDATION | AUDIT TEAM ADVISED COMPLETION | ASSET ACCEPTANCE OR CHANGE | ACTUAL COMPLETION DATE | SIGNED OFF BY |
|---|---|---|---|---|---|---|
| ***2.2*** | ***Drilling and Well Control*** | ***These items are outside API, legislation, Rig Owner policies, have high safety or environmental impact potential.*** | | | | |
| 2.2.1 | The BOP control unit triplex pump pressure relief valve was last recalibrated during August 2007. It is subsequently now overdue the 2 year recertification period as per API recommended practice. | BOP control unit triplex pump pressure relief valve to be recalibrated. | Within two months | | | |
| 2.2.2 | Derrick gates/hatches were not fitted with safety lanyards. | Derrick gates/hatches to be provided with adequate means of secondary retention. | Within monthly derrick inspection cycle. | | | |
| 2.2.3 | Toe boards are not installed at the edges of a number of derrick walkways. Areas include at the crown in way of the block and fast line, at the fingerboard level at the dead line grating penetration, in way of the aft PRS control cabinets and at the access walkway in way of the forward PRS bridge. | Toe boards to be provided on open sided floors, platforms, walkways in accordance with API RP 54 | At next between wells period | | | |
| 2.2.4 | The crown bumper timbers are not equipped with safety slings in accordance with API recommended practice. | Safety slings to be installed on the crown bumper timbers in accordance with API RP 54 | Within two months | | | |
| 2.2.5 | Items of trash were recovered/identified during the derrick inspection. These included fixings, split pins, loose cable band, plastic from drill line, grating clamps and wire. | Full sweep of derrick to be conducted, all trash and loose items to be removed. Extra vigilance required by rig crews during derrick inspections. | Within one week | | | |

AUDIT REPORT ACTION SHEET

RIG TYPE: Semi-Submersible

RIG NAME: Deepwater Horizon

DATES OF AUDIT: 13 to 17 September 2009

RIG STATUS: Out of Service Period

| REF | OBSERVATION | RECOMMENDATION | AUDIT TEAM ADVISED COMPLETION | ASSET ACCEPTANCE OR CHANGE | ACTUAL COMPLETION DATE | SIGNED OFF BY |
|---|---|---|---|---|---|---|
| 2.2.6 | Numerous loose and detached grating clamps were identified and retrieved during the derrick inspection. Loose grating clamps prevailed on the derrick hatches while the detached clamps were found mainly at the crown platform. | Survey all derrick grating clamps. Loose items to be secured and missing/detached items to be replaced. | Within monthly derrick inspection cycle. | | | |
| 2.2.7 | Secondary retention arrangements for the crown mounted flare igniter were suspect, not all equipment was adequately secured. | Review and address as required secondary retention arrangements fro the crown mounted flare igniter. | Within monthly derrick inspection cycle. | | | |
| 2.2.8 | The high pressure mud hose was found in unacceptable condition. The outer casing was damaged, due to abrasion with the top drive service loop, and several layers including the steel belt construction were worn through. | High pressure mud hose to be replaced. | Before start of drilling operations | | | |
| 2.2.9 | According to maintenance history choke manifold valves have not been opened up for periodic inspection and overhaul in line with API recommended practice. Consequently only valves failing to meet pressure test requirements have been inspected. | In accordance with API recommended practice choke manifold to be opened up and fully inspected over a four year cycle. All valves to be removed for inspection and repairs to be documented. | At next between wells period | | | |
| 2.2.10 | One of the BOP high pressure boost hoses has been in service since December 1999. The hose is in poor fabric condition and has not been maintained in accordance with Transocean yearly or 5 – yearly maintenance requirements. It was communicated that delivery date for a replacement hose was March 2010. | Replace out of certification BOP high pressure boost hose. Transocean maintain a 5 – year thorough hose inspection / replacement philosophy. | Before start of drilling operations | | | |

AUDIT REPORT ACTION SHEET

RIG TYPE: Semi-Submersible

RIG NAME: Deepwater Horizon

DATES OF AUDIT: 13 to 17 September 2009

RIG STATUS: Out of Service Period

| REF | OBSERVATION | RECOMMENDATION | AUDIT TEAM ADVISED COMPLETION | ASSET ACCEPTANCE OR CHANGE | ACTUAL COMPLETION DATE | SIGNED OFF BY |
|---|---|---|---|---|---|---|
| 2.2.11 | The annual maintenance routine for the drawworks was overdue since February 2009. This routine includes disassembly and MPI of the drawworks caliper pins and arms. | Annual maintenance routine for the drawworks to be undertaken. Maintenance routine to be performed in full including disassembly and MPI of the brake caliper, pins and arms. Any deviation from the maintenance system requirements to be subject to formal written technical justification. | Before start of drilling operations | | | |
| 2.2.12 | Annual maintenance routine requires pressure testing of each high pressure hose, choke and kill, and mud hoses for example. Review of the associated history files indicated that visual inspection only had been performed. | Annual maintenance requirements for high pressure hoses to be fulfilled. Pressure testing in accordance with table attached to the maintenance procedure to be undertaken. | Within four months | | | |
| 2.2.13 | The standard of third party NDT inspection reports was woefully inadequate and at best poor. The reports presented for inspection contained insufficient detail of the actual components or areas inspected. | Transocean to communicate clear terms of reference to third party NDT inspection company. Quality of NDT inspection reports to be significantly improved to reflect the actual components and areas inspected. | Prior to further NDT inspection work | | | |
| 2.2.14 | Calibration certificate for the riser bolt torque wrench calibration equipment could not be provided. | Valid calibration certificate to be available onboard for the riser bolt torque wrench calibration equipment. | Within one month | | | |
| 2.2.15 | Review of the most recent (September 2009) drilling load path NDT inspection reports indicated that the following items were not inspected; travelling block, top drive, crown block and the master bushing and insert. | Missed items from drilling load path inspection to be subject to MPI. | Within two months | | | |

AUDIT REPORT ACTION SHEET

RIG TYPE: Semi-Submersible

RIG NAME: Deepwater Horizon

DATES OF AUDIT: 13 to 17 September 2009

RIG STATUS: Out of Service Period

| REF | OBSERVATION | RECOMMENDATION | AUDIT TEAM ADVISED COMPLETION | ASSET ACCEPTANCE OR CHANGE | ACTUAL COMPLETION DATE | SIGNED OFF BY |
|---|---|---|---|---|---|---|
| 2.2.16 | The five year derrick inspection maintenance routine requires MPI of the derrick feet. This could not be demonstrated by way of onboard MPI reports. The third party inspection company were contacted and faxed through a revised MPI report. Review of the report submitted indicated that an existing report, one that was available onboard the rig, had simply been modified with the addition derrick feet. This approach to reporting key structural inspections lacks necessary integrity and level of assurance required. | Transocean to communicate clear terms of reference to third party NDT inspection company. Quality of NDT inspection reports to be significantly improved to reflect the actual components and areas inspected. Modifying existing MPI reports with additional line items to suit customer requests is unacceptable. | Immediately | | | |
| 2.2.17 | The recently installed iron roughneck cannot be operated from Cyberbase unless ACS ignore/release override key switches are activated. | Iron roughneck to be made operational from Cyberbase with ACS active. | Before start of drilling operations | | | |
| 2.2.18 | The aft PRS has been operated under a permanent risk assessment as the lower arm will not stay retracted. Although just refurbished the problem has not been eradicated. | Investigate and rectify the retract problem concerning the lower arm of the aft PRS. | Before start of drilling operations | | | |
| 2.2.19 | Calibration of critical analogue and digital drilling instrumentation such as the dead weight indicator, well control related pressure gauges, top drive, and iron roughneck torque could not be demonstrated. | Calibration of critical analogue and digital drilling instrumentation to be undertaken and inspection reports maintained onboard. | Within six months | | | |

AUDIT REPORT ACTION SHEET

RIG TYPE: Semi-Submersible

RIG NAME: Deepwater Horizon

DATES OF AUDIT: 13 to 17 September 2009

RIG STATUS: Out of Service Period

| REF | OBSERVATION | RECOMMENDATION | AUDIT TEAM ADVISED COMPLETION | ASSET ACCEPTANCE OR CHANGE | ACTUAL COMPLETION DATE | SIGNED OFF BY |
|---|---|---|---|---|---|---|
| 2.2.20 | Although previously requested comprehensive derrick bolt inspection reports could not be provided. A third party MPI report was produced with a line item stating UT inspection of 43 derrick bolts. | Given the age of the derrick comprehensive (100%) derrick bolt inspection to be undertaken. Derrick bolts to be inspected for security, corrosion and elongation. | Within six months | | | |
| 2.2.21 | The top drive guard although previously ripped off during a collision with the PRS and also recommended by NOV is not fitted with a safety sling. | Top drive guard to be fitted with a suitable safety sling. | Before start of drilling operations | | | |
| 2.2.22 | A derrick register was in use however not all information was being recorded e.g. some people were not signing the log to register that they had come down from the derrick and notified that tools and equipment had been taken down. | Drilling Supervisors to ensure strict enforcement of the derrick register, i.e. all personnel accessing the derrick sign out once they have completed the work and register that all tools and equipment taken up have been brought down. | Immediately | | | |

AUDIT REPORT ACTION SHEET

RIG TYPE: Semi-Submersible

RIG NAME: Deepwater Horizon

DATES OF AUDIT: 13 to 17 September 2009

RIG STATUS: Out of Service Period

| REF | OBSERVATION | RECOMMENDATION | AUDIT TEAM ADVISED COMPLETION | ASSET ACCEPTANCE OR CHANGE | ACTUAL COMPLETION DATE | SIGNED OFF BY |
|---|---|---|---|---|---|---|
| ***2.3*** | ***Technical Services*** | ***These items are outside API, legislation, Rig Owner policies, have high safety or environmental impact potential.*** | | | | |
| 2.3.1 | A formal system to manage alarm inhibits and control of defeats and bypasses was not in place for vessel management system, drilling control system and related PLC's etc. | Formal management system to be implemented for alarm inhibits and control of defeats and bypasses. | Within one month | | | |
| 2.3.2 | Although not widespread it was evident that maintenance routines were still being closed out although the maintenance tasks were not being performed. E.g. 30 day top drive dolly. | The practice of closing incomplete maintenance work orders must cease. Maintenance Supervisor to produce standing instructions to communicate expectations. | Immediately | | | |
| 2.3.3 | Although previously reported quality of maintenance history reporting remains below par across all disciplines. In many cases history was deficient in content describing the work carried out and it was frequently not possible to determine if the required maintenance tasks had been performed. | Maintenance Supervisor to produce standing instructions to effectively communicate expectation for improved maintenance history reporting | Immediately | | | |
| 2.3.4 | The vast majority of mud pump covers had been installed using silicon sealant. This can plug internal oil ways and galleries leading to bearing oil starvation and failure. | Practice of sealing mud pump covers with silicon sealant to cease. OEM gaskets to be used only. | During future inspections | | | |
| 2.3.5 | Overdue maintenance in excess of 30 days was considered excessive totalling 390 jobs and 3545 man hours. Many of the overdue maintenance routines were high priority. | Communicate forward plan for reducing current high levels of overdue critical maintenance. | Within one week | | | |

AUDIT REPORT ACTION SHEET

RIG TYPE: Semi-Submersible

RIG NAME: Deepwater Horizon

DATES OF AUDIT: 13 to 17 September 2009

RIG STATUS: Out of Service Period

| REF | OBSERVATION | RECOMMENDATION | AUDIT TEAM ADVISED COMPLETION | ASSET ACCEPTANCE OR CHANGE | ACTUAL COMPLETION DATE | SIGNED OFF BY |
|---|---|---|---|---|---|---|
| 2.3.6 | Thruster T2 motor has low insulation resistance reading, circa 1MOhm. | Investigate and rectify low insulation resistance of thruster T2 motor. | Within one month | | | |

AUDIT REPORT ACTION SHEET

RIG TYPE: Semi-Submersible

RIG NAME: Deepwater Horizon

DATES OF AUDIT: 13 to 17 September 2009

RIG STATUS: Out of Service Period

| REF | OBSERVATION | RECOMMENDATION | AUDIT TEAM ADVISED COMPLETION | ASSET ACCEPTANCE OR CHANGE | ACTUAL COMPLETION DATE | SIGNED OFF BY |
|---|---|---|---|---|---|---|
| ***2.6*** | ***Mechanical Handling*** | ***These items are outside API, legislation, Rig Owner policies, have high safety or environmental impact potential.*** | | | | |
| 2.6.1 | The two year maintenance requirement to remove the derrick sheaves and snatch blocks for thorough inspection is not being rigorously applied. It could not be demonstrated when all sheaves were last removed from the derrick. For example the utility winch turn down sheave mounted under the crown of the mini derrick was heavily corroded | Derrick sheaves and snatch blocks to be removed from the derrick for disassembly and thorough inspection. Maintenance history to be updated with details of inspections. | Within two months | | | |
| 2.6.2 | None of the pad eyes, safety slings and sheaves within the derrick was colour coded in accordance with the current lifting gear colour code. This is out with Transocean policy. | Ensure loose lifting equipment installed in the derrick is subject to third party inspection and colour coded in accordance with the current lifting gear colour code. | Within three months | | | |
| 2.6.3 | The large crown mounted wireline turn down sheave is not provided with secondary retention arranged to catch the load. Inspection records to demonstrate that the sheave had been subject to periodic maintenance and inspection were not available. | Install secondary retention wire sling arranged to catch load on the wireline turn down sheave otherwise implement formal pre use inspection routine. | Within two months | | | |
| 2.6.4 | There was no SWL visible on the forklift truck. | Mark the SWL on the forklift truck so that it is clearly visible. | Within one week | | | |
| 2.6.5 | There was no SWL visible on the forward drill floor man riding winch. | Mark the SWL on the forward drill floor man riding winch so that it is clearly visible. | Within one week | | | |

AUDIT REPORT ACTION SHEET

RIG TYPE: Semi-Submersible

RIG NAME: Deepwater Horizon

DATES OF AUDIT: 13 to 17 September 2009

RIG STATUS: Out of Service Period

| REF | OBSERVATION | RECOMMENDATION | AUDIT TEAM ADVISED COMPLETION | ASSET ACCEPTANCE OR CHANGE | ACTUAL COMPLETION DATE | SIGNED OFF BY |
|---|---|---|---|---|---|---|
| 2.6.6 | The man riding winch wire certificates indicate that their wires have been in service for over 2 years which is outside Transocean's policy. Visual inspection of the wires indicated that they are still externally in satisfactory condition. | Man riding winch wires to be changed out at 2 year frequency in line with Transocean policy. | Within one month | | | |
| 2.6.7 | Both deck crane main block hooks are of the spring latch type. Transocean requirements specify positive locking latch type to be fitted. | In accordance with Transocean policy replace the spring latch type main block hooks on both deck cranes, to the positive latch type. | Within one month | | | |
| 2.6.8 | The safe load indicator on the starboard Liebherr deck crane has faulty back lit LCD screen. A temporary light has been installed so that the readings and alarm signal can be seen at night. | Replace the faulty back lit LCD screen on the safe load indicator on the starboard deck crane | Within one month | | | |
| 2.6.9 | There was no SWL visible on the port aft drill floor utility winch. | Mark the SWL on the aft drill floor utility winch so that it is clearly visible. | Within one week | | | |

AUDIT REPORT ACTION SHEET

RIG TYPE: Semi-Submersible

RIG NAME: Deepwater Horizon

DATES OF AUDIT: 13 to 17 September 2009

RIG STATUS: Out of Service Period

| REF | OBSERVATION | RECOMMENDATION | AUDIT TEAM ADVISED COMPLETION | ASSET ACCEPTANCE OR CHANGE | ACTUAL COMPLETION DATE | SIGNED OFF BY |
|---|---|---|---|---|---|---|
| *3.2* | ***Drilling and Well Control*** | ***These are items that one would expect to find in place from a combination of competent drilling contractor and competent operator*** | | | | |
| 3.2.1 | Best practice regarding secondary retention of derrick mounted CCTV cameras was not in place. Only one barrier had been applied to the camera casing, the pan and tilt head was not provided with secondary retention. | Best practice for secondary retention to be applied to the derrick mounted CCTV cameras. Camera casing, pan, and tilt head to be provided with independent means of secondary retention as per the DROPS handbook. | Within monthly derrick inspection cycle | | | |
| 3.2.2 | MPI of the crown support beams could not be provided. | Provide documentary evidence to support MPI of the crown support beams. Otherwise mobilise competent third party to perform MPI of same. | Within one month | | | |
| 3.2.3 | No inspection documentation available to show MPI of the Ezy Torque has been performed. | Provide documentary evidence to support MPI of the Ezy Torque. Otherwise mobilise third party inspection company to perform the work. | Within one month | | | |
| 3.2.4 | Two anti-collision system (ACS) checklists have been produced. One of the lists contains just a few clash scenarios and is performed prior to each trip. The other is a comprehensive check of all clash scenarios which is not periodically performed. | Update RMS II to include scheduling for regular testing of the comprehensive ACS checklist. | Within two months | | | |
| 3.2.5 | The catwalk machine belt is worn and has some broken links at the join. | Repair / replace worn catwalk machine belt. | Within two months | | | |

AUDIT REPORT ACTION SHEET

RIG TYPE: Semi-Submersible

RIG NAME: Deepwater Horizon

DATES OF AUDIT: 13 to 17 September 2009

RIG STATUS: Out of Service Period

| REF | OBSERVATION | RECOMMENDATION | AUDIT TEAM ADVISED COMPLETION | ASSET ACCEPTANCE OR CHANGE | ACTUAL COMPLETION DATE | SIGNED OFF BY |
|---|---|---|---|---|---|---|
| 3.2.6 | UT thickness inspection reports for high pressure piping were generally poor. The report did not include original thickness, percentage diminution and some isometrics were missing. Consequently the reports amounted to little more than numbers thus the actual pipe work condition could not be established. | Transocean expectations regarding content of the UT thickness inspection reports to be communicated to the third party. Reports to include original thickness, percentage diminution and all isometrics. Pipe work assessment to determine condition to be made. | Within four months | | | |
| 3.2.7 | The aft finger board CCTV camera foundation bolts have been short bolted, in addition they are not provided with means of locking device. | Replace the foundation bolts in the aft finger board CCTV camera and ensure that a suitable locking device is in place. | Within monthly derrick inspection cycle. | | | |
| 3.2.8 | Two of the three hang off line pull back winches have unacceptably loose winch handles. On closer inspection it is evident that the tack weld between the handle and drive shaft has failed. | Replace defective hang off line pull back winches which have loose winch handles. | Within two months | | | |
| 3.2.9 | The top drive service loops were found in poor condition, the outer sheathing had significant mechanical damage due to abrasion with the mud hose. | Make necessary repairs to the outer sheathing of the top drive service loop and install protective spiral wrap. | Within two months | | | |
| 3.2.10 | Much of the well control maintenance was either recorded in the Subsea Engineers daily log book or on various spreadsheets. The level of well control related maintenance history recorded in RMS II was minimal by comparison. | Well control related planned and corrective maintenance to be recorded in RMS II. This simplifies searching for maintenance history and inspection records. | Immediately | | | |
| 3.2.11 | Derrick CCTV camera #5 is currently defective. | Repair/replace defective CCTV camera #5. | Within one month | | | |

AUDIT REPORT ACTION SHEET

RIG TYPE: Semi-Submersible

RIG NAME: Deepwater Horizon

DATES OF AUDIT: 13 to 17 September 2009

RIG STATUS: Out of Service Period

| REF | OBSERVATION | RECOMMENDATION | AUDIT TEAM ADVISED COMPLETION | ASSET ACCEPTANCE OR CHANGE | ACTUAL COMPLETION DATE | SIGNED OFF BY |
|---|---|---|---|---|---|---|
| 3.2.12 | Maintenance notes for the 5 year overhaul of the deadline anchor consisted of cut and paste of the maintenance procedure, no additional comments were added. It was therefore not possible to determine what work was actually performed or indeed if the intent of the maintenance procedure was met. NOV inspection report could not be located on the rig. | Provide documentary evidence that deadline anchor 5 year overhaul was conducted in line with the maintenance procedure. This includes disassembly of the main pivot bearing. | Within two months | | | |
| 3.2.13 | According to maintenance history and NDT inspection reports inspection of the crown block and travelling block is not being conducted in line with the 365 day maintenance procedures. Results of the wobble test were not recorded and MPI was not conducted in accordance with task 4 of the procedure. | Ensure all points identified on the 365 day crown and travelling block maintenance routines are performed in accordance with the procedure tasks and clearly documented. | Within two months | | | |
| 3.2.14 | Current riser bolt and insert inspection reports were inadequate. The reports did not list the serial numbers of the individual bolts and inserts inspected. | For traceability purposes riser bolt and insert inspection reports to list the serial numbers of the units inspected. | At next inspection | | | |
| 3.2.15 | The aft window in the Assistant Driller's cabin is badly cracked. Due to this there is very limited vision of the pipe conveyor and surrounding area. | Change out the badly cracked aft window in the Assistant Driller's cabin. | Within three months | | | |
| 3.2.16 | The rotary table has been non operational for approaching four years. Spares availability is cited as the reason for this. | Expedite rotary table spares and return unit to operational condition as per contract requirements. | Within two months | | | |

AUDIT REPORT ACTION SHEET

RIG TYPE: Semi-Submersible

RIG NAME: Deepwater Horizon

DATES OF AUDIT: 13 to 17 September 2009

RIG STATUS: Out of Service Period

| REF | OBSERVATION | RECOMMENDATION | AUDIT TEAM ADVISED COMPLETION | ASSET ACCEPTANCE OR CHANGE | ACTUAL COMPLETION DATE | SIGNED OFF BY |
|---|---|---|---|---|---|---|
| 3.2.17 | When questioned about DROPS inspections drill crews stated that inspections were made in accordance with the maintenance routines generated in RMS II. However drilling personnel including the Toolpusher were not yet sufficiently knowledgeable in how to interrogate the system to demonstrate the routines and history. | Address the lack of knowledge by training relevant rig floor personnel in the use of RMS II2 and ensure that all non-conformances identified by the DROPS inspection programme are being managed effectively within RMS II. | Within two months | | | |
| 3.2.18 | Areas of high pressure system pipe work are not being inspected, lack of access being cited. In some cases, e.g. kill line, heavy corrosion is noted but no thickness measurements are recorded. | Ensure high pressure pipe work systems are fully inspected during UT thickness checks. Proper planning to provide access to entire systems to be in place. | Prior to next annual UT inspection | | | |
| 3.2.19 | Housekeeping under the catwalk machine belt is unacceptable with excessive trash accumulation evident. | Items of trash to be removed from under the catwalk machine belt, specifically nearest the rig floor | Within one week | | | |

AUDIT REPORT ACTION SHEET

RIG TYPE: Semi-Submersible

RIG NAME: Deepwater Horizon

DATES OF AUDIT: 13 to 17 September 2009

RIG STATUS: Out of Service Period

| REF | OBSERVATION | RECOMMENDATION | AUDIT TEAM ADVISED COMPLETION | ASSET ACCEPTANCE OR CHANGE | ACTUAL COMPLETION DATE | SIGNED OFF BY |
|---|---|---|---|---|---|---|
| ***3.3*** | ***Technical Services*** | ***These are items that one would expect to find in place from a combination of competent drilling contractor and competent operator*** | | | | |
| 3.3.1 | There is no maintenance routine for the servicing of the main engine hydraulic overhaul tools and pumps.<br><br>BP lessons learned indicate a need to carry out regular maintenance of this equipment and the replacement of the pressure seals as per OEM maintenance routine dictates. | Update RMS II to include maintenance routines for servicing of the main engine hydraulic overhaul tools and pumps, as per OEM requirements. | Within three months | | | |
| 3.3.2 | Current injection tests of the main breakers have not been performed. It is usual that this is done during the 5-year SPS. | Provide update on status/requirements regarding current injection testing of main breakers. | Within four months | | | |
| 3.3.3 | It could not be demonstrated that the high voltage test gear is periodically calibrated. | High voltage test gear to be periodically calibrated. | Within three months | | | |
| 3.3.4 | All rig air regulators installed in the derrick at fingerboard control cubicles etc. had severe air leaks due to various defects. | Renew all defective derrick mounted rig air regulators. | Within one month | | | |
| 3.3.5 | The driller's cabin fire and gas panel had numerous alarm conditions displayed. These included; fire alarm active, fault ESD active, fault fire and gas active and fire and gas override active. The Driller and Assistant Driller on tour were unaware of the fault conditions. | Investigate and rectify various fault conditions displayed on the driller's cabin fire and gas panel. This panel is a slave from the main panel located on the bridge. | Within one week | | | |

AUDIT REPORT ACTION SHEET

RIG TYPE: Semi-Submersible

RIG NAME: Deepwater Horizon

DATES OF AUDIT: 13 to 17 September 2009

RIG STATUS: Out of Service Period

| REF | OBSERVATION | RECOMMENDATION | AUDIT TEAM ADVISED COMPLETION | ASSET ACCEPTANCE OR CHANGE | ACTUAL COMPLETION DATE | SIGNED OFF BY |
|---|---|---|---|---|---|---|
| 3.3.6 | It was communicated that since the maintenance system has been changed from Empac to RMS II maintenance routines now consist of existing rig specific, existing Transocean generic and ex GSF best practice routines. It has been left with the rig to determine those that are applicable. Non applicable routines have to be sifted out using the change request system. The current philosophy is too onerous on rig resources. | Transocean to confirm that the correct maintenance routines for the Deepwater Horizon have been loaded into RMS II. | Within four months | | | |
| 3.3.7 | Change over from Empac to RMS II maintenance systems has resulted in poor distribution of the maintenance routines. For example mechanic's routines amount to 1476.5 hours in January 2010, The ET has been assigned 244 hours for July 2010, the electrician has been assigned 3878.5 hours for January 2010; the marine department has been assigned 4265 hours for September 2009, etc for other disciplines. In some cases maintenance man hours exceed actual available man hours. | Review maintenance routines to evenly distribute throughout the year to ease maintenance burden on resources. | Within four months | | | |
| 3.3.8 | The integral monitor on the port side drilling UPS is defective. | Replace defective monitor on the port side drilling UPS. | Within four months | | | |
| 3.3.9 | Main engine #1 is currently out of service pending delivery and installation of a common rail type fuel pump. | Expedite and install fuel pump to main engine #1. | Within two weeks | | | |

AUDIT REPORT ACTION SHEET

RIG TYPE: Semi-Submersible

RIG NAME: Deepwater Horizon

DATES OF AUDIT: 13 to 17 September 2009

RIG STATUS: Out of Service Period

| REF | OBSERVATION | RECOMMENDATION | AUDIT TEAM ADVISED COMPLETION | ASSET ACCEPTANCE OR CHANGE | ACTUAL COMPLETION DATE | SIGNED OFF BY |
|---|---|---|---|---|---|---|
| 3.3.10 | The daily maintenance report did not accurately reflect outstanding planned or corrective maintenance or defect equipment. The BP Well Site Leaders were unaware of many of the equipment defects highlighted during the audit period. | Daily maintenance report to be updated / modified to include all equipment defects. Report to be submitted to the BP Well Site Leader on a weekly basis. | Within one week | | | |
| 3.3.11 | The air conditioning unit installed in the port deck crane cabin cab is non operational. The cabin is therefore uncomfortable. | Port deck crane operators cabin air conditioning unit to be repaired / replaced. | Within one month | | | |
| 3.3.12 | The E-Hawk system giving NOV remote drilling control system diagnostic access was defective. Consequently remote troubleshooting of the iron roughneck/ACS problems could not be performed. | E-Hawk system giving NOV remote access to the drilling control system to be made operational. | Within one month | | | |
| 3.3.13 | Thermographic inspection of the switchboards and electrical switchgear has not been performed since the rig entered service in 2000. | Undertake thermographic inspection of switchboards and MCC to locate and eradicate any potential hot spots to prevent electrical failures. | Within four months | | | |
| 3.3.14 | A formal process to demonstrate that defects noted during third party NDT inspections had been closed out was not in place. | Formal tracking process demonstrating close out of defects noted during third party NDT inspections to be implemented. | Within three months | | | |

AUDIT REPORT ACTION SHEET

RIG TYPE: Semi-Submersible

RIG NAME: Deepwater Horizon

DATES OF AUDIT: 13 to 17 September 2009

RIG STATUS: Out of Service Period

| REF | OBSERVATION | RECOMMENDATION | AUDIT TEAM ADVISED COMPLETION | ASSET ACCEPTANCE OR CHANGE | ACTUAL COMPLETION DATE | SIGNED OFF BY |
|---|---|---|---|---|---|---|
| ***3.6*** | ***Mechanical Handling*** | ***These are items that one would expect to find in place from a combination of competent drilling contractor and competent operator*** | | | | |
| 3.6.1 | Many of the remote grease nipples for the derrick mounted divert sheaves are dry indicating that this equipment is not being lubricated. | Ensure derrick mounted divert sheaves are greased in accordance with derrick maintenance routines. | Within one month | | | |
| 3.6.2 | It could not be verified that the rotary table bushing pullers and the rotary bowl pullers used on the drill floor were certified for use. | Provide current lifting certification for the rotary bushing pullers and the rotary bowl pullers used on the drill floor and colour code each item. | Within one month | | | |
| 3.6.3 | Several pad eyes in the mud pit room are still painted in last years lifting gear colour code, green. Potentially indicating that they were not inspected during the recent third party lifting gear inspection. | Green colour coded padeyes in the mud pit room to be inspected by competent person and colour coded yellow in line with the current lifting gear colour code. | Within one month | | | |
| 3.6.4 | The operators cab windscreen wipers are either non functional or have missing wiper blades on the port and starboard deck cranes, knuckle boom crane and riser gantry crane. | All windscreen wipers to be fully operational on the port and starboard deck cranes, knuckle boom crane and riser gantry crane. | Within two months | | | |
| 3.6.5 | The starboard side moon pool utility winch control lever was seized and hence the winch was non operational. | Starboard side moon pool utility winch to be made operational. | Within one month | | | |

AUDIT REPORT ACTION SHEET

RIG TYPE: Semi-Submersible

RIG NAME: Deepwater Horizon

DATES OF AUDIT: 13 to 17 September 2009

RIG STATUS: Out of Service Period

| REF | OBSERVATION | RECOMMENDATION | AUDIT TEAM ADVISED COMPLETION | ASSET ACCEPTANCE OR CHANGE | ACTUAL COMPLETION DATE | SIGNED OFF BY |
|---|---|---|---|---|---|---|
| 3.6.6 | The riser gantry crane CCTV monitor is not working. | CCTV monitor on riser gantry crane to be made operational. | Within one month | | | |
| 3.6.7 | The rope guard on the port aft moon pool utility winch is broken. | Repair the broken rope guard on the port aft moon pool utility winch. | Within one month | | | |
| 3.6.8 | There is no emergency lowering instructions posted on the aft drill floor man riding winch. | Emergency lowering instruction to be posted at the aft drill floor man riding winch. | Prior to use | | | |

AUDIT REPORT ACTION SHEET

RIG TYPE: Semi-Submersible

RIG NAME: Deepwater Horizon

DATES OF AUDIT: 13 to 17 September 2009

RIG STATUS: Out of Service Period

| REF | OBSERVATION | RECOMMENDATION | AUDIT TEAM ADVISED COMPLETION | ASSET ACCEPTANCE OR CHANGE | ACTUAL COMPLETION DATE | SIGNED OFF BY |
|---|---|---|---|---|---|---|
| ***4.1*** | ***Health, Safety and Safety Management*** | ***These are items that can be used by the drilling contractor and/or BP to build on the project, though they are not considered as essential*** | | | | |
| 4.1.1 | Completion of the HSE OJT was required for all Transocean personnel. Long term third party personnel were not included in the process. The OJT covers permit to work and use of the various risk management tools. It would provide an effective means of ensuring that long term third party personnel were fully trained and conversant with the rig SMS. | Consider using the HSE OJT process as a training tool for all long term third party personnel on the rig. | Within three months | | | |

AUDIT REPORT ACTION SHEET

RIG TYPE: Semi-Submersible

RIG NAME: Deepwater Horizon

DATES OF AUDIT: 13 to 17 September 2009

RIG STATUS: Out of Service Period

| REF | OBSERVATION | RECOMMENDATION | AUDIT TEAM ADVISED COMPLETION | ASSET ACCEPTANCE OR CHANGE | ACTUAL COMPLETION DATE | SIGNED OFF BY |
|---|---|---|---|---|---|---|
| ***4.2*** | ***Drilling and Well Control*** | ***These are items that can be used by the drilling contractor and/or BP to build on the project, though they are not considered as essential.*** | | | | |
| 4.2.1 | Dolly rail spreader beam at the monkey board has sustained significant mechanical damage, and is bent and deformed as a result. | Plan to change out damaged dolly rail spreader beam at the monkey board level of the derrick. Derrick builders' procedures and specifications to be followed. | Within six months | | | |
| 4.2.2 | During UT inspection of the choke pipeline significant corrosion was recorded in way of the moon pool. | Corrosion on choke line in the moon pool area to be addressed. | Within one year | | | |
| 4.2.3 | Localised surface and deep corrosion identified on the crown support beams and crown block/fast line pedestals. | Address corrosion on the crown support beams and crown block/fast line pedestals. | Within six months | | | |
| 4.2.4 | Completion of the HSE OJT was required for all Transocean personnel. Long term third party personnel were not included in the process. The OJT covers permit to work and use of the various risk management tools. It would provide an effective means of ensuring that long term third party personnel were fully trained and conversant with the rig SMS. | Consider using the HSE OJT process as a training tool for all long term third party personnel on the rig. | Within six months | | | |
| 4.2.5 | The derrick specifically from the fingerboard level down was coated in a thick film of mud, a few inches deep in some places. | Deep cleaning, pressure washing, of the derrick to be undertaken. | At next between wells period | | | |

AUDIT REPORT ACTION SHEET

RIG TYPE: Semi-Submersible

RIG NAME: Deepwater Horizon

DATES OF AUDIT: 13 to 17 September 2009

RIG STATUS: Out of Service Period

| REF | OBSERVATION | RECOMMENDATION | AUDIT TEAM ADVISED COMPLETION | ASSET ACCEPTANCE OR CHANGE | ACTUAL COMPLETION DATE | SIGNED OFF BY |
|---|---|---|---|---|---|---|
| ***4.3*** | ***Technical Services*** | ***These are items that can be used by the drilling contractor and/or BP to build on the project, though they are not considered as essential.*** | | | | |
| 4.3.1 | Siemens has phased out the SIMATIC 5 product range, which is used on the PRS and iron roughneck. | Address obsolescence issues, update PRS and iron roughneck PLC's from SIMATIC 5 to SIMATIC 7 product range which is supported by Siemens. | Within one year | | | |
| 4.3.2 | No long term planning was evident with respect to potential equipment and system obsolescence issues. | Undertake a systematic review of rig systems and equipment to identify and address obsolescence issues. | Within one year | | | |
| 4.3.3 | A number of critical systems, watertight doors, seawater cooling systems, fire and gas detectors, etc. were either defective or non operational due to lack of onboard spares. | Spares philosophy regarding critical spares inventory to be reviewed to ensure equipment uptime and availability. | Within one year | | | |

AUDIT REPORT ACTION SHEET

RIG TYPE: Semi-Submersible

RIG NAME: Deepwater Horizon

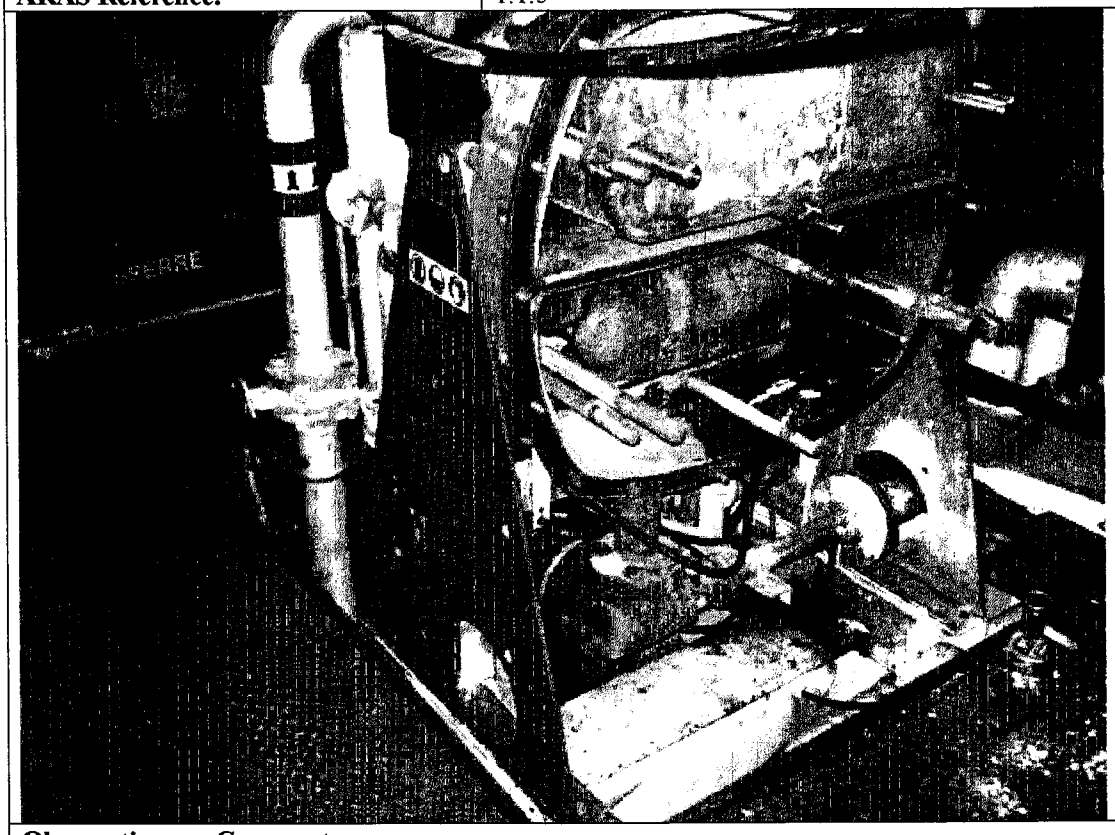
DATES OF AUDIT: 13 to 17 September 2009

RIG STATUS: Out of Service Period

| REF | OBSERVATION | RECOMMENDATION | AUDIT TEAM ADVISED COMPLETION | ASSET ACCEPTANCE OR CHANGE | ACTUAL COMPLETION DATE | SIGNED OFF BY |
|---|---|---|---|---|---|---|
| *4.6* | ***Mechanical Handling*** | ***These are items that can be used by the drilling contractor and/or BP to build on the project, though they are not considered as essential.*** | | | | |
| 4.6.1 | The starboard crane boom is showing signs of damaged paint work and light corrosion where the vertical boom lattice chords meet the boom main chords. | Address the light corrosion and damaged paint work on the starboard crane boom where the vertical boom lattice chords meet the boom main cords. | Within one year | | | |
| 4.6.2 | There is no central rigging store area where all items of loose rigging equipment can be stored out of the weather, maintained and signed out. This leads to a situation where loose rigging equipment is stored at various areas of the rig without control and potentially proper inspection/maintenance. | Locate all loose lifting equipment to an enclosed centralised storage area. Adopt a register for signing out and in equipment and also its location such that control can be exercised. | Within six months | | | |

**Photographs**

| | |
|---|---|
| **Rig Name:** | Deepwater Horizon |
| **Date:** | September 2009 |
| **ARAS Reference:** | 1.1.5 |



**Observations or Comments:**

Maintenance on watermaker #5, note the front of the unit is opened up but none of the jacket water or seawater valves have been locked or tagged shut.

| | |
|---|---|
| **Rig Name:** | Deepwater Horizon |
| **Date:** | September 2009 |
| **ARAS Reference:** | 2.2.5 |

**Observations or Comments:**

Trash and loose items recovered from the derrick. The rig crew had made a derrick inspection the shift before our inspection was performed.

| | |
|---|---|
| **Rig Name:** | Deepwater Horizon |
| **Date:** | September 2009 |
| **ARAS Reference:** | 2.2.8 |

**Observations or Comments:**

Poor condition of mud hose and top drive service loops

**Appendix A**

**Blackout Recovery and DP System Upgrade**
**Customer Acceptance Trials**

**Executive Summary**

Two black out tests were conducted with the first test considered a fail. There was a difficulty experienced in re-establishing engines to the 11 kV switchboard A. Engine 3 started and then failed while engine 2 was lagging in start timing. For this test it took nearly 14 minutes to re-establish all thrusters to the DP. The failure of engine 3 to start should be investigated to understand the mitigations to put in place to prevent a reoccurrence of this delay in successful black start recovery.

On repeating the test the restart of all the thrusters was achieved in less than 2 minutes. This was considered a successful test but did identify that engine 6 settings were blocked from starting for this test. The reason for the blocking was unclear as a request was made that the power system configuration settings be set up for normal drilling mode. On reviewing the Redundancy and Criticality Assessment (RCA) module on the Vessel Management System the documentation is unclear as to its function. In changing status from DP 3 mode to DP 1 mode the thrusters were deselected from the DP which was unexpected. The control modes of the RCA should be fully investigated and understood such that staff is aware of the implications to both the DP and vessel management system of this module.

As part of the out of service period a DP upgrade was implemented. This involved both hardware and software upgrades. As a result of this upgrade a customer acceptance test was conducted. The port HIPAP requires fault finding as this was not available. There were other minor findings which are being investigated. The rig also carried out a full set of field arrival DP trials. Test found some non-functional thruster emergency stop buttons and these deficiencies are to be addressed. The stability of the thruster 2 at start up appeared to have reliability issues and this reliability in start up should be further investigated.

Environmental Conditions
Heading set at $136^0$
Current $256^0$ by 0.56 knots
Wind $172^0$ by 3.4 knots

**DP Blackout Testing**

The rig had planned a black out to ensure the system was fully functional and the rig and equipment could restart thrusters in an approximate time of 1 minute 40 seconds from loss of power to reinstatement of thrusters into the DP.

A number of prerequisites were set to ensure that the recovery process was successfully demonstrated. This included synchronisation of clocks, data logger functional, power system configured for normal drilling operations etc.

At the time of the black out, engine 1 was out of service due to diesel mounted fuel pump being inoperative. Engine 6 was warmed for the test but it was then found that problems were apparent with the air start valve for this engine; this required a strip down. A discussion took place regarding two diesel generators being out of service and it was felt that the test should be suspended until all diesel generators with the exclusion of engine 1 were available. One 2500 kVA transformer incomer breaker has a fault condition regarding recharging of the breaker (Tag 237056). Additionally one azimuth pump for the thruster 2 is reported as non-functional. The azimuth circuit uses two pumps normally with one in stand-by.

**First Black out Recovery Test**

Observations

Environmental Conditions
Heading: $000^0$
Wind: $080^0$ by 14 knots
K current: $090^0$ by 0.7 knots
Position Loss: 13m

The test protocol required that engine 4 be stopped using fuel rack failure mode. In essence this meant that for the test that engine 4 was unavailable in the black start recovery process.

Engine 1 was out of service with an engine driven fuel pump failure. For the test this left only engine 2, 3, 5 and 6 available.

The test proved unsuccessful. Although start commands were issued and the high voltage bus opened splitting the system one half of the bus had no generators connected. As no generators were connected to one bus this allowed only four thrusters to be started. It appeared that the rig suffered a partial black out on high voltage board A. Thrusters 6, 7, 8 and 2 were unable to start in line with the black start recovery. It was also noted that little operator intervention was undertaken even when only four thrusters came on line. The rig, based on the environment and the fact that four thrusters were available, was able to stabilise the set point position.

On interrogating the vessel management system logger the engine start commands for engine 3 (bus A) and engine 6 (bus B) were reported in two seconds, while for engine 5 it was 10 seconds and engine 2 it was 16 seconds. It can be understood why the start signal is not issued simultaneously for two engines connected to the same high voltage bus but it is not clear why there is a lag in start command for engine 2 (bus A). This could have been issued at 10 seconds corresponding with engine 5 (bus B). It is also unclear why engine 2 lagged in connecting to bus A. Engine 3 was connected at 23 seconds after the event while engine 2 did not connect until 42 seconds.

Two alarms occurred after 35 seconds relating to engine 3, fuel inlet pressure and HT cooling water circuit inlet water pressure low. Engine 3 circuit breaker tripped leaving the bus B with no engines on line at 40 seconds. Engine 2 then connected 2 seconds after this time. It is assumed that the engine 3 shut down was as a result of these two alarm conditions.

Thruster load reduction through the drives was demonstrated via the ABB frequency input monitoring. Successful opening and closing of high voltage breakers situated at switchboard 2 and 5 were demonstrated

The first four thrusters were on and enabled in 1 minute forty eight seconds, thruster 1, thruster 3, thruster 4 and thruster 5. The timing for the start up and enable to DP of the last four thrusters was significantly longer with the eight thrusters being available to the DP at 13 minutes 57 seconds. The last thruster being thruster 7. It is of note that a time out occurred at 42 seconds on the lead hydraulic pumps for this thruster but this is assumed to be as a result of the loss of switchboard 3.

| Event Time | Time | Event Activity |
|---|---|---|
| 9:42:13 | | Black out detected |
| 9:42:15 | 0:00:02 | Thrusters transfer to local control alarm, force reduction alarms |
| 9:42:15 | 0:00:02 | Start Engine 3, Bus A |
| 9:42:15 | 0:00:02 | Start Engine 6, Bus B |
| 9:42:23 | 0:00:10 | Start Engine 5, Bus B |
| 9:42:29 | 0:00:16 | Start Engine 2, Bus A |
| 9:42:35 | 0:00:22 | Engine 6 Connected Bus B |
| 9:42:36 | 0:00:23 | DG 3 Connected Bus A |
| 9:42:42 | 0:00:29 | UPS 11 Main failure, UPS 13 Back up failure |
| 9:42:45 | 0:00:32 | UPS 9 Main failure, |
| 9:42:47 | 0:00:34 | DG 3 HT Cooling Water low Pressure alarm |
| 9:42:47 | 0:00:34 | DG 3 Fuel oil inlet pressure low |
| 9:42:47 | 0:00:34 | DG 5 Connected to Bus B |
| 9:42:53 | 0:00:40 | DG 3 Circuit Breaker CB3-4 trips |
| 9:42:54 | 0:00:41 | Switchboard 4 Black out relay de-energised |
| 9:42:54 | 0:00:41 | Switchboard 3 Black out relay de-energised |
| 9:42:54 | 0:00:41 | Switchboard 2 Black out relay de-energised |
| 9:42:55 | 0:00:42 | DG2 Connected Bus A |
| 9:42:54 | 0:00:41 | Switchboard 2 Black out relay de-energised |
| 9:43:25 | 0:01:12 | UPS 10 Main Failure |
| 9:43:40 | 0:01:27 | UPS 14 port HIPAP failure |
| 9:43:38 | 0:01:25 | Thruster 1 successfully started |
| 9:43:45 | 0:01:32 | Thruster 3 successfully started |
| 9:43:45 | 0:01:32 | Thruster 4 successfully started |
| 9:43:46 | 0:01:33 | Thruster 1 enabled |
| 9:43:48 | 0:01:35 | Thruster 3 enabled |
| 9:43:49 | 0:01:36 | Thruster 4 enabled |
| 9:43:51 | 0:01:38 | Thruster 5 successfully started |
| 9:43:57 | 0:01:44 | Thruster 5 enabled |
| 9:45:01 | 0:02:48 | SWBD 2 11kV breaker closes |
| 9:45:01 | 0:02:48 | SWBD 5 11kV breaker closes |
| 9:48:42 | 0:06:29 | Thruster 8 enabled |
| 9:49:49 | 0:07:36 | Thruster 6 enabled |
| 9:49:58 | 0:07:45 | Thruster 2 enabled |
| 9:56:10 | 0:13:57 | Thruster 7 enabled |

**Second Black out Recovery Test**

Observations

Environmental Conditions
Heading: $015^0$
Wind: $120^0$ by 13 knots
K current: $072^0$ by 0.77 knots
Position Loss: 27m

Engine 6 did not start during this test. The vessel management system indicated that the unit was not in stand-by and it is assumed that this is the reason for not starting. It is unclear why this engine was in this mode as it was made clear at the start of the test that the power system should be configured for normal drilling mode.

The rig is fitted with a Redundancy and Criticality System (RCA). This provides on-line fault monitoring which is used to monitor and alert the operator of any deviations identified in the operating mode selected. The system monitors on-line equipment and also applicable stand-by equipment status. The system Functional Design Specification (FDS) identifies that mode blocking is in use.

During testing it was noted that on switching mode selection from DP 1 to DP 3 this caused the thruster enable signals and all thrusters to drop out from the DP. The rig crew were unclear on this functionality and it is clear that further investigation into this system is required. It was also noted on the matrices contained within the FDS that perquisites are required for the minimum number of generators on line.

| Event Time | Time | Event Activity |
|---|---|---|
| 14:12:16 | | DG 6 Not Standby (Check Aux) |
| 14:12:17 | | UPS 13 Back up failure |
| 14:12:17 | | Black out detected on all Switch boards |
| 14:12:18 | 0:00:00 | Thrusters transfer to local control alarm, force reduction alarms |
| 14:12:18 | 0:00:00 | Start Engine 2 |
| 14:12:19 | 0:00:01 | Start Engine 5 |
| 14:12:21 | 0:00:03 | Thrusters not ready alarm |
| 14:12:23 | 0:00:05 | Thrusters unexpected stop alarm |
| 14:12:28 | 0:00:10 | Start Engine 3 |
| 14:12:28 | 0:00:10 | Insufficient thrust in surge and sway |
| 14:12:32 | 0:00:14 | DG 5 run rated |
| 14:12:33 | 0:00:15 | UPS 14 port HIPAP failure |
| 14:12:38 | 0:00:20 | DG 2 run rated |
| 14:12:39 | 0:00:21 | DG 2 connected |
| 14:12:40 | 0:00:22 | DG 5 connected |
| 14:12:49 | 0:00:31 | UPS 9, 10 mains failure |
| 14:13:04 | 0:00:46 | Position out of limits 5.4,5.0 |
| 14:13:11 | 0:00:53 | DG 3 Connected |

| | | |
|---|---|---|
| 14:13:41 | 0:01:23 | Switchboard 2 11 kV high voltage breaker closes |
| 14:13:41 | 0:01:23 | Switchboard 5 11 kV high voltage breaker closes |
| 14:13:42 | 0:01:24 | Thruster started |
| 14:13:44 | 0:01:26 | Thruster 1 enabled |
| 14:13:45 | 0:01:27 | UPS 13 Back up failure |
| 14:13:46 | 0:01:28 | Thruster 8 started |
| 14:13:48 | 0:01:30 | Thruster 8 enabled, UPS 10 main failure |
| 14:13:50 | 0:01:32 | UPS 14 port HIPAP failure, UPS 10 failure |
| 14:13:50 | 0:01:32 | Thruster 7 started |
| 14:13:50 | 0:01:32 | Thruster 4 started |
| 14:13:51 | 0:01:33 | Thruster 5 started |
| 14:13:52 | 0:01:34 | Thruster 4 enabled |
| 14:13:53 | 0:01:35 | Thruster 5 enabled |
| 14:13:53 | 0:01:35 | Thruster 6 started |
| 14:13:54 | 0:01:36 | Thruster 7 enabled |
| 14:13:54 | 0:01:36 | Thruster 6 enabled |
| 14:13:55 | 0:01:37 | Thruster 2 started |
| 14:14:01 | 0:01:43 | Thruster 2 enabled |
| 14:14:01 | 0:01:43 | PMS Step 4 bus A |
| 14:14:03 | 0:01:45 | Thruster 3 enabled |
| 14:14:03 | 0:01:45 | Thruster 3 started |

**Conclusion**

The test protocol and the status of the non-functional engine 1 allowed for four of the engines to be used for the black start recovery process. The first black start recovery procedure was considered to have not achieved the objective of the recovery process. As a result the black start recovery test was conducted a second time. In this case the rig successfully restarted the thrusters and enabled the thrusters in the DP in 1 minute 45 seconds. During this test, engine 6 was inhibited from recovery sequence leaving only three engines to participate in the process. Further investigation is needed why engine 3 started on the first black start test and then failed. It is also of note that given that the automatic recovery process was expected to be within 2 minutes that manual intervention was not undertaken sooner during the first recovery process to improve recovery time.

The Reliability Criticality Assessment (RCA) system fitted on this rig appears not to be fully documented as to operation and cause and effects. The screen shots for the RCA Processor Unit and RCA Sub System modules were not populated. This tool should be fully investigated particularly with regards to the control modes and operational inputs it has exhibited. Changing modes indicates that the thrusters are deselected from the DP which is considered a risk area when using this system.

**DP Upgrade**

The rig has just undergone a mid life upgrade with hardware and software changes to the DP system. This has included a replacement of the DPS 200 units with a DPS 232. DGPS 3 has been replaced with a multifix unit. The HIPAP system has been upgraded with two APOS 11 processors and the SBC 400H computers have been replaced. A new Seatex MRU 5 has been fitted (replacement for VRS #3). The Cos 200 processors have been replaced with MP7900 systems while SDP Logger and DP simulator have been replaced. Additionally Gyros #1 and #3 have been replaced with laser gyros.

Customer Acceptance Trials Testing
To demonstrate that the equipment was fully integrated and functional a Kongsberg supplied Customer Acceptance Trials (CAT) programme was conducted. This was witnessed by the onboard marine team and representatives from Transocean onshore support. The CAT was based on the software upgrade Project SDP 6280 (SW version 6.2.2). Reference is made to CAT document 1117443 revision D, dated 10 September 2009.

Cabling management within the cabinets was clustered with cabling relating to the fibre optic converters poorly managed. Cable tidying within the cabinets containing the OS processors (MP7900) should be reviewed and improved as necessary. During the time of the CAT communications could not be established between DGPS 4 and the back up DP controller. The port HIPAP was not available for use as fault finding was ongoing.

A summary of the functional testing was undertaken based on the following test programme:

Functional Checks
Lamp test carried out on OS stations and no defects noted

Positional Stability Tests
Positioning accuracy undertaken in the fore and aft direction, moves forward and astern.
Maximum overshoot noted as 1.6 m (after 40m ahead move).

Thrusters 1, 4, 5, 6, 7 and 8 in use and medium gain selected. References HPR 2, DGPS 1, 2 and 3. DGPS 4 (Seatex 232 used as independent reference)

Position reference accuracy in athwartships.
High gain selected for these moves.
Overshoot noted with maximum value of 0.6m

Heading rotation was undertaken with regards to reference systems. Reference systems are all selected. Demodulators monitored for interruption. No defects or blind sectors noted.

The raw data was observed during the turn. Standard Deviation (SD) for DGPS was found not greater than 0.5 m with GPS 1 being used as reference system. DGPS 2 was monitored and was giving an SD of 0.2m. The LBL array (using four transponders) had an SD of 2.5m. DGPS 3 has SD of 0.6m and DGPS 4 SD of 0.5m

Positional stability reasonable when rotation undertaken. No obvious blind sectors noted during rotation. GPS 3 was found less stable than other DGPS but was within tolerance.

Heading test were conducted with up to 30 degrees/minute rotational speed. Heading deviation found to be a maximum of 0.8 degrees with 0.6m in deviation in position.

Computer and Reference System Redundancy Tests Undertaken

- Comp A DPS 01
- Comp B DPS 11
- Comp C DPS 21

Each controller was failed and then reset. Failed master controller and transfer found to be successful. Reference sensor input to DP individually failed and appropriate alarms observed.

- VRS 3 not ready
- Gyro 1 not ready
- Gyro 2 not ready
- Gyro 3 not ready
- Wind sensor 2 not ready

DGPS 4 input to back up DP was found non functional at this time. This input error was later rectified such that DGPS 4 telegram data is received by the DP back up system.

Consequence Analysis System
Reduced the number of thrusters in selected in the DP down to thrusters 4 and 8. This caused 'Thrust critical if Switchboard 6 lost'

Reduced the number of engines down to engine 5 running only. Consequence alarm 'Thrust critical if switchboard 5 lost.' was generated.

With two generators on line with 8 MW load, (approx 65% of bus load) the bus critical alarm was to be simulated. The consequence system is set up such that it reads at the switchboard level only and assumes bus tie open. Hence unable to simulate the generation of the bus critical alarm.

Black out Prevention Test
Using joystick simulated high sudden demand. The high load with joystick caused the following alarms:

Demand Reduced on Bus A, (4758, 11900, 7088)
PMS Step 4 Bus A
SA4 Force Reduction Alarms

Simulation undertaken with reduced number of thrusters. Thrusters enabled to DP 1, 4 and 5.

Autopilot and Auto Track Testing
Autopilot/auto track testing was undertaken as per the CAT procedure. No deficiencies were noted.

**Field Arrival Trials**

As part of the test programme in addition to the CAT a full set of field arrival tests was undertaken. These are usually undertaken in a managed programme after each well such that over the year a full set of trials has been completed. (Reference Document DP Field Arrival Trials revision 01).

Environmental Conditions
Heading set at 130
Current 165 by 0.76 knots
Wind 158 by 12 knots

Key data was extracted and analysed from the rig response to both model control and drift off tests. A model control test was undertaken for duration of 10 minutes and the results were noted:

| | |
|---|---|
| Max speed | 0.08 knots |
| Average speed | 0.06 knots |
| Drift distance | 19.37 m |

Table Model Control Test Results
Additionally a Drift off test was conducted. There were poor records as to the results of previous drift tests and the test was conducted with test criteria based on Op Doc 20 which is referenced in the Field arrival trials.

| | |
|---|---|
| Max speed | 0.30 knots |
| Average speed | 0.22 knots |
| Drift distance | 68.35 m |

*Table drift off test results*

A drift off simulation was carried out on the DP system and then compared to the actual results achieved from the drift off test. Directionality appeared accurate.

Environmental Conditions
Heading set at 136
Current 256 by 0.56 knots
Wind 172 by 3.4 knots

| Time Stamp | Drift Programme | Actual Results |
|---|---|---|
| 2 minutes 34 seconds | 10m drift | 9m drift |
| 3 minutes 53 seconds | 20m drift | 16.5m drift |
| 5 minutes 01 seconds | 30m drift | 24m drift |

*Table drift off results, calculated versus actual drift off results*