NanTroSEIZE

Expedition 319

Wireline End of Well Report

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Wireline Operation
C0009A Well Specifications

Client: Japan Agency for Marine-Earth Science and Technology
Well name: C0009A
Site: NT2-11B
Field: Nankai-Kumano
Location: Philippine Sea
Country: Japan
Logging Date: 13-25 July 2009
Drilling contractor: Mantle Quest Japan (MQJ)
Rig: CHIKYU Drill Ship
Permanent Datum: Mean Sea Level
Permanent Datum Elevation: 0 m
Depth Reference: Driller’s Depth
Drilling measured from: Drill Floor, 28.3m above Mean Sea Level
Water depth: 2054 m MSL
Mud Type: KCl-NaCl Polymer
Wireline service center: Nagaoka, Japan
Wireline logging unit: OSU-ME# 4308
Service Order number: AVDO-00003 & AVDO-00004

Services Provided

Run1: EMS-HRLA-TLD-CNLS-GR-SP
Run2: FMI-HNGS-EMS-Sonic Scanner-PPC-GR
Run3: MDT Dual Packer & Single probe
Run4: Junk Basket (8-1/4" gauge ring)
Run5: Walkaway VSP with VSI-16
  Circular VSP with VSI-16
  Zero Offset VSP with VSI-16
Riser Well Wireline Rig Up Procedure
Wireline Rig Up Instructions with Passive Wave Motion Compensator for CHIKYU
The wireline compensation equipment is normally supplied, maintained and installed by the rig crew.
Rig Procedure

1. Rig up compensating link to top drive.

2. Rig up compensating sheave wheel.
**Rig Procedure**

3. Rig up long bails with extensions if necessary.

4. Connect compensating line to riser assembly.
5. Pass compensating line through compensating sheave wheel.

6. Rig up shear link.
Wireline Procedure

1. Bypass Active Heave Compensator.

2. Rig up 1st sheave wheel.
Wireline Procedure

3. Rig up lower sheave wheel.

4. Rig up upper sheave wheel.
Wireline Procedure

5. Make up tools.
Log Quality Analysis
Anomalous neutron porosity in soft formation:

Introduction

Schlumberger provides several porosity tools which use different tool configurations and acquisition logics to approach the answer from various points of view. The top priority of the wireline logging is to acquire the best quality data with the existing wellsite/borehole conditions, efficiently and safely. This is all executed taking into consideration the environmental requirements and processing logics for each tool to optimize the parameters applied. The wireline wellsite software (Maxis OP) is designed for data acquisition at the wellsite and has its processing limitations. Therefore the logging software only has processing capabilities to correct for basic borehole environmental situations. For the most part these environmental corrections work well in ideal borehole conditions.

In the case of C0009A, however, the preliminary wellsite processing performed by the logging software was not sufficient to correct for the environmental effects. The details outlined in this report will explain the variables associated with the data acquisition and overall outcome.

Neutron porosity

The Highly integrated Gamma ray Neutron Sonde (HGNS) provides traditional Compensated Neutron Log (CNL) data by bombarding the surrounding formation with neutrons. The amount of neutrons reflected back are counted to compute the hydrogen index, revealing the neutron porosity. The count acquisition, however, is affected by mud, mud cake, mud filtrate, invasion diameter, temperature, borehole pressure, high density materials, high capture cross section materials (salinity), clay minerals and other environmental variables.

The major factors affecting the neutron data of this well are as follows:

- Soft formation (unexpected fluid distribution)
- High salinity mud (signal absorption at borehole and invasion zone = low S/N ratio)
- Rough tool movement (curve mismatching and unexpected stand-off)
- Corkscrew-like borehole geometry (unexpected stand-off with high salinity mud)
- Clay mineral presence

The irregular far counts yielded peaks in the N/F ratio (Near to Far count rate ratio) calculation on the field log. To improve the data, PrePlus (DCS software) can be used with depth matched curves to apply optimal environmental corrections.
Improvements:

Processing yielded lower values and spikes in most sections. The figure above is the comparison Raw TNPH (Green) with processed TNPH (Red). The mismatches of peaks are caused by depth shift. To further improve, integrated caliper data should be used after depth matching.

Unfortunately, however, the intervals with significantly low far counts could not be improved. Porosity interpretation is recommended.
Anomalous HRLA resistivity readings in 12-1/4” hole size:

Resistivity

The HRLA (High Resolution Laterolog Array) is the newest of the Schlumberger laterolog tools and provides one of the most reliable resistivity measurements within the resistivity family. Applied borehole corrections are oftentimes not sufficient for resistivity tools to correct for the negative effects due to invasion and formation boundary effects. The HRLA features 5 arrays with different “depths of investigation (DOI)”, respectively, to generate a more complete resistivity model compared to the former, dual laterolog measurement.

A concern was raised about the array resistivities separation in this well as shown below:

It can be observed that RXOZ is reading much lower than the HRLA which shows a separation as different DOI (shallower DOI array has lower resistivity). This is a typical conductive invasion profile in ideal borehole conditions. One quick way to confirm the quality of the measurement of the HRLA is to run the inversion without using RXOZ as input and to let the inversion algorithm compute RXO from the HRLA resistivities. We normally expect the inversion to give a value of RXO quite close to the RXOZ measured.
Figure below displays the result of such inversion in a good borehole zone and the match between the two RXO values are very good, confirming the validity of the HRLA measurements.

Inversion result solving for RXO and RT in a good borehole zone

Last track: RXO from inversion in green, RXOZ measured in black
Figure below displays the result of inversion in a washed out borehole zone. Clearly the match is very poor, but here this is the RXOZ measured which is affected by the poor pad contact and reading mainly mud.

Inversion result solving for RXO and RT in a washed out borehole zone

Last track: RXO from inversion in green, RXOZ measured in black
Figure below displays the cross plot of measured RXOZ versus RXO from inversion. The color coding is performed using the hole size. Whenever the hole is in good shape, RXOZ measures well, showing good agreement between the two values, confirming the quality of the HRLA measurement.

Cross plot of RXOZ measured versus RXO from inversion

WL logging software and PrePlus can provide a 1D formation model (formation model without bed boundary and unique diameter of invasion over the interval) with a ramp (slope) invasion profile. Unfortunately, however, this model is insufficient in cases where the formation does not feature a homogenous lithology. MIRTH was then used, allowing the processing of the HRLA data using a 2D formation model (formation model with bed boundaries and unique diameter of invasion for each bed) with ramp profile.

The HRLA needs to be run parallel to the borehole due the fact that current is sent symmetrically. If the tool is not parallel, the compensation on the borehole corrections will not be the same and the processing inversion will not work properly. As detailed in this report, the separation is only due to the mud filtrate invasion.

Improvements:

Through processing, proper separations in deeper, rugose intervals were created. In conclusion, the shallow laterolog measurements were affected by the lower resistivity mud and large borehole size (stand-off).
Failure Analysis
Failures Analysis on C0009A Well

**Client:** Japan Agency for Marine-Earth Science and Technology  
**Well name:** C0009A  
**Site:** NT2-11B  
**Field:** Nankai-Kumano  
**Location:** Philippine Sea  
**Country:** Japan  
**Logging Date:** 13-25 July 2009  
**Drilling contractor:** Mantle Quest Japan (MQJ)  
**Rig:** Chikyu Drill Ship  
**Permanent Datum:** Mean Sea Level  
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**Depth Reference:** Driller’s Depth  
**Drilling measured from:** Drill Floor, 28.3m above Mean Sea Level  
**Water depth:** 2054 m MSL  
**Mud Type:** KCl-NaCl Polymer  
**Wireline service center:** Nagaoka, Japan  
**Wireline logging unit:** OSU-ME# 4308  
**Service Order number:** AVDO-00003 & AVDO-00004

**Incident #1**  
Unit’s oscillating motor broken while logging

**Sequence of Events:**

12-Jul-2009:

During the openhole logging Run2: FMI-HNGS-EMS-MSIP-PPC-GR inside the casing, the unit oscillation suddenly stopped working. Found that the oscillation motor was physically broken due to over shear force on the motor tensile bolts.

Replaced the tensile bolts and grinded the metal obstruction which is on the oscillating track. Continued and completed the job.

![Fig. 1 Broken Oscillating motor](image-url)
Fig. 2 Disassembly & Trouble Shooting

Fig. 3 Broken Tensile Bolt

Fig. 4 Assembly of the oscillating motor

Fig. 5 After reinstallation

Failure investigation and analysis:

Failed Component: Oscillating motor
Immediate Cause: The tensile bolt was sheared apart due to excess force on tensile bolts while unit was moving.
Root Cause: The excess force on the tensile bolts was created when the oscillation motor hit the metal obstruction on the unit wheel track.
Prevention: Avoid any obstruction around the unit wheel track.
**Incident #2**
Cable crossing over each other while logging

**Sequence of Events:**

12-Jul-2009:

During the openhole logging Run2: FMI-HNGS-EMS-MSIP-PPC-GR inside the casing, found the cable crossed on each other. Stopped the winch and secured the wireline cable on the rotary table with T-Bar. Slacked and re-spooled cable and continued the job.

![Fig. 7 Cable Crossing on each other](image1)
![Fig. 9 Secured wireline cable with T-Bar](image2)

**Failure investigation and analysis:**

<table>
<thead>
<tr>
<th>Failed Component:</th>
<th>Crossed cable while run in hole</th>
</tr>
</thead>
<tbody>
<tr>
<td>Immediate Cause:</td>
<td>High tension on wireline cable cause winch shutdown</td>
</tr>
<tr>
<td>Root Cause:</td>
<td>The cable spooling distance from wireline unit to Active Heave Compensator (AHC) is not far enough to spool cable properly while tension is applied on cable.</td>
</tr>
<tr>
<td>Prevention:</td>
<td>Bypass the AHC sheave wheel by passing the wireline cable from winch direct to 1st upper sheave, hanging on the rig pad eye, and continued the operation. Modify the arm extension to spooling arm to avoid its touching the cable drum.</td>
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</tbody>
</table>

![Fig. 10 Wireline Unit set up on Chikyu](image3)

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**Fig. 7 Cable Crossing on each other**
**Fig.9 Secured wireline cable with T-Bar**

**Fig. 10 Wireline Unit set up on Chikyu**
Incident #3

A. Tool failure on VSI tools
B. Poor data on shuttle 9 and 10 (VSI-16)
C. Broken 3 VSI anchoring arms

Sequence of Events:

24-Jul-2009:

05:00 am: The VSI-20 toolstring was successfully rigged up, upon which, tool checks at surface showed a fault in shuttle 8. The decision was then made with the witness to continue the job as the data can be interpolated from adjacent shuttles.

07:30 am: Run in hole with the VSI-20 as per agreement with client.

10:00 am: Once the first checkshot depth of 2100mMD at the top shuttle was reached, the tool was anchored. Tool anchored correctly until shuttle numbers 10, 11 and 12. Note that the tool anchors from bottom to top. At this point a current spike was observed on AC Aux (power supply used to open the calipers) and tool communication on VSI was lost.

Upon reattempting to power up the tools, it was noticed that the amount of current flowing was significantly lower than the nominal 350mA observed to power up the VSI tool. Overall tool telemetry and Gamma Ray tools powered up correctly, however, indicating a possible failure in the VSPC (VSI Power Cartridge).

10:45 am: Upon consulting the client, the decision was made to pull out of hole and troubleshoot the situation. The emergency disanchor procedure was then performed to free the tool and tools were brought back to surface.

12:00 pm: Once back at surface the VSCC and VSPC were replaced with the backup versions. It was soon discovered that this did not fix the problem and that there was another failed component downhole. The VSI shuttles and bridles were then removed, one by one, from top to bottom in an effort to determine the problem tool.

15:40 pm: It was discovered that bridle 14 (7th from the bottom) was causing a short in the system and was thus removed with its associated shuttle. Shutles and bridles were then rigged back up into the toolstring, 4 at a time, upon which the toolstring was powered up and checked each time to reduce the risk of residual failure. The decision was then made with the client to run 16 shuttles (VSI-16) as opposed to the original configuration of 20.

16:30 pm: Performed VSI-16 tool check on surface with, all tools and shuttles passing the evaluation test.

17:10 pm: Run in hole with the VSI-16 as per agreement with client.

18:15 pm: Once the first checkshot depth of 2085.7 MD at the top shuttle was reached, the tool was anchored and checkshot data was acquired successfully. Tool was completely disanchored and continued to run down to the bottom.

19:30 pm: Performed GR correlation and ran down to the bottom.

19:50 pm: Once the first walkaway station depth of 2980 MD at the top shuttle was reached, the tool was anchored. Tool functions correctly apart from shuttle 10 which shows a larger caliper reading than the other tools, indicating a problem with the caliper. A decision was made with the client, however, to continue the survey.
20:15 pm: Walkaway S-N line and Circular Walkaway surveys were continued and completed.

25-Jul-2009:

11:45 am: Zero-offset guns were deployed into the sea and performed air fill up. SLB engineer was informed to standby while rig crew fixes the rig compensator’s shear link.

15:55 pm: Resume the operation, Gun tuning was performed successfully.

16:10 pm: Start zero-offset survey. Upon finishing the first station survey, tool was completely disanchored and moved to the second station. During the second station survey, it was noticed that the acquired data from shuttle 9 (VSI-16) was invalid as was shuttle 10.

16:20 pm: The decision was made to continue the remaining zero-offset survey with the top 8 shuttles (other shuttles remaining acquiring) with client. Continued and completed zero-offset survey.

19:15 pm: Started pulling tools out of hole and back to surface. Once at surface, 3 shuttles (shuttle 9, 10 and 12) were found missing the end of the anchoring arm.

- Shuttle 9 and 10 are assumed to have lost their arm sections during the walkaway and zero-offset survey (as noted earlier)
- Shuttle 12 is assumed to have lost its anchoring arm while pulling out of the hole after the last station of zero offset VSP since the shuttle were anchored normally and acquired data were valid until last station.

26-Jul-2009:

01:30 am: Finished rigging down wireline equipment.

Remark: The total lost time for entire seismic operation is 7.5 hours as per agreement upon “Seismic Operation Review meeting on 5th Aug 2009” at CDEX office. (Appendix A.)
Failure Investigation and Analysis:

Incident A: VSPC (Power Cartridge)

Failed Component: Short circuit on power resistor R2
Immediate Cause: High current on VSPC104 board caused resistor R2 to short.
Root Cause: Case history from internal knowledge database (InTouch) confirms that this is due to a short in either the VSIS (shuttle) or the VSII (bride).
Prevention: Ensure that proper maintenance is performed, including full rebuild of bride if necessary.

Incident A: VSII (Intershuttle cable)

Failed Component: Feed thru burnt on line 5 in lower head
Immediate Cause: The analysis of the SKK found a crack of about 180deg where the o-ring sits, conclusion the electric arc is due to this crack.
Root Cause: 1. Imperfection during manufacturing cause the part is bending.
2. Over-torque when assembled the bulk head.
3. Rough handling (shock/vibration).
Prevention: 1. Visual inspection of the feed thru before assembling to ensure no damaged parts.
2. No over-torque to be applied while tightening the bulk head

Remark: Insulation check in salt water performed on all bridles during job preparation
Incident B and C: Poor data on shuttle No. 9 and 10 due to anchoring arm broken

VSI Arm was designed with a weak point at “A” that it is intended to release the VSI in case of the arm got stuck inside the well. However, this time failure, the fractured part was not occurred at the point “A”, but around the point “B”. The weak point “A” will work when the force in F1 direction is applied to the arm, but will not work for F2 direction. The fact that the point “B” is another weak point was confirmed based on Simulation by applying 100Kgf (maximum force during VSI anchoring) to the constructed model. The stress concentration occurs at the point where the fracture occurs (around point “B”).
As at this time failure, the fracture occurred at weak point “B”, not in point “A”, it can be considered that force that cause such fracture happens under F2 direction. This is supported by the analysis of Fracture direction of the investigated surface which is interpreted from a series of SEM (scanning electron microscopy) result on several fracture sections.

Failed component: Caliper Arm
Immediate cause:
1. F2 direction high force applied at weak point B on caliper arm connection.
2. Poor acquisition data on shuttle No. 9 and 10 due to the GAC sensor was not fully coupled to wellbore by broken arm.

Root cause:
SEM observation of fracture surface at the product center revealed that there was upward force on the weak point on the caliper arm. This upward forced could be induced when heave compensator operation that could have induce a yo-yo movement.

Prevention:
1. Visual inspection to ensure no damaged/cracked parts.
2. Tool anchoring against to casing while performing tool check on surface.
3. Use large hole kit (extended arm) to mitigate unintended upward force on the arm by decreasing the angle arm against to the casing.
VSIS (shuttle): Shuttle No. 8 (VSI-20) did not pass the evaluation test

Failed component: Tool Evaluation tests not passing at surface
Status: Problem could not be reproduced at base
Immediate cause: Shuttle No. 8 (VSI-20) did not pass the evaluation test
Root cause: Electronic intermittence problem
Prevention: Tool quality check for electrical section
Tool Maintenance and Preparation:

VSI power supply cartridge (VSPC) and VSI controller cartridge (VSCC) were performed Q-check and Operation check once tools arrived to Nagaoka base.

VSI Shuttles (VSIS) were performed Electrical check, Mechanical check and Operation check once tools arrived to Nagaoka base.

VSI-20 performed operation check at Nagaoka Base

VSI Bridles (VSII) were performed Continuity check, Insulation check in salt water, Mechanical check and Operation check once tools arrived to Nagaoka base.

VSI bridles were performed anti-corrosion

VSI bridles were ready to be mobilized

Surface Equipments were performed function test and operation check once equipments arrived to Nagaoka base.

Surface equipment were full serviced and operation checked