HALLIBURTON

Sperry Drilling Services

SPERRY DRILLING SERVICES, M/LWD SERVICE

EQUIPMENT DAMAGE REPORT

For

Nexus Energy Ltd.

Ocean Patriot

Culverin-1

2nd February 2006

Submitted by:
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HALLIBURTON

1. Service Interrupt: Telemetry Ceased from Pulser

DATE	2nd January 2006
JOB NUMBER	AU-FE-0003951414
RIG	Ocean Patriot
WELL NAME	Culverin-1
LWD RUN NUMBER	500
EQUIPMENT TYPE AND SERIAL NUMBER	Mark 8 Solar Pulser (8351)
NPT (Hrs)	12

REPORTED PROBLEM

At 22:00 while reaming down to the bottom of the 12¼" hole at 3571 mMDRT after a bit change, pulse signals from the 8" LWD tool-string ceased. This occurred after the tool had successfully pulsed during a shallow pulse test when all data from the tool-string was transmitted to surface. Standard procedures were followed to attempt to re-start the tool, which included cycling the mud pumps several times to perform a mode-switch (hardware reset of the HCIM down-hole processor). This proved unsuccessful in re-starting the tool and the assembly was tripped out of the hole.

RIG SITE INSPECTION

Once on surface, the pulser assembly was torn down for inspection and testing. The pulser failed the post-run electrical resistance test.

Analysis of the recorded vibration log form the Drill-string Dynamics Sensor (DDS), showed that during the trip in, the tool-string received several high peak lateral shocks (see log for run 500).

The pulser was returned to the Canning Vale R&M facility for inspection.

LEVEL 1 R&M FACILITY INSPECTION (Canning Vale)

On incoming inspection, the pulser failed the electrical coils resistance tests, showing A(C,D,E)= 33ohms, B(C,D,E)= 448ohms. It was also noted that the balance piston on the pulser top-end assembly was pushed 13 mm past the desired set point position.

The pulser was returned to the Singapore Level 2 R&M facility to ascertain what caused insulation breakdown and balance piston damage and to be repaired.

LEVEL 2 R&M FACILITY INSPECTION (Singapore)

The pulser was checked and it was found that the internal oil was slightly greyish in colour which could possibly have caused low insulation of the generator coils. In addition, the magnet plate was found to be pitted. On checking the electrical resistance of the generator coils, the Tech confirmed the out of specification coil resistance readings. The pump filter was found to be broken and this would have caused the poppet retraction failure.

All other internal components were found to be good in condition.

ROOT CAUSES

For additional input as to the root cause of this failure, advice was sought from a senior pulser R&M technician based in Tewkesbury, England, John Wilkins. His comments were as follows:

"Pump filters only fail for two reasons and it is important to determine which one you have.

1) When they are full up with debris the pressure balance is lost and they collapse. This is shown by a squashed mesh and a break from the top hat that is ragged.
2) The top hat part becomes detached from the mesh under high shock and vibration conditions. This is shown by a clean break at the welded joint.

It is also important to determine if possible what the contamination to the oil is. Slightly greyish oil is normally a clue to drilling mud getting in but darker oil is caused be wear from vibration.

On this one it is difficult to make a judgement but you may want to put this one down to the vibration and / or shock."

Analysis of the type of damage seen on the pump filter showed that the "top hat" section came detached from the mesh and showed a clean break at the welded joint. This is indicative of vibration damage. (See Appendix photographs of broken filter compared to new filter).

FINAL RESOLUTION

The pulser was damaged due to the high shocks suffered by the LWD pulser during the reaming to bottom.

2. Service Interrupt: Telemetry Stopped After High Vibration

DATE	6th January 2006
JOB NUMBER	AU-FE-0003951414
RIG	Ocean Patriot
WELL NAME	Culverin-1
LWD RUN NUMBER	600
EQUIPMENT TYPE AND SERIAL NUMBER	LWD Tool-string DM90089207XH1RGV8
NPT (Hrs)	0

REPORTED PROBLEM

During the drilling of the 12¼" hole section between 3751 mMDRT and 3714 mMDRT, extreme vibration was observed both real-time and later on in the recorded data. After a connection at 3714 mMDRT, when the pumps were brought up no pulses were detected from the LWD tool. A mode-swtich was carried out and the pumps were cycled several times in an effort to restart the tool, but this proved unsuccessful.

It was decided by Nexus to continue drilling to TD without LWD.

RIG SITE INSPECTION

When the tool came to surface once the well had reached TD, the engineers were unable to communicate with it through the HCIM (down-hole processor). The tool-string was laid out on deck and a further unsuccessful attempt was made to communicate with the tool. The tool's main battery was changed out and the engineers were then able to recover the recorded data from the tools memory.

In addition to the problems with the LWD tool, it was noticed that considerable damage had been done to the near-bit stabiliser run below the LWD in the drill-string. (See photograph).

LEVEL 1 R&M FACILITY INSPECTION (Dampier)

The high vibrated tool was Confidence Tested and downloaded upon arrival at the Dampier R&M. The LWD technician found that all parameters failed on HCIM read report. The HCIM processor board showed damage due to high vibration and had to be replaced. The recorded EWR and DDS data files were successfully recovered from the sensors themselves and sent to the Perth office.

LEVEL 1 R&M FACILITY INSPECTION (Canning Vale)

Pulser (8483) was received into Canning Vale after being involved in high vibration failure with 96.16 circulating hours. It passed the poppet extension/retraction tests and also the electrical coil resistance test. The Top End balance piston was found to be almost fully pushed in, which indicated to the technician that there had been a possible oil leak through the Top End during the run.

The Pulser was tested on the 1000lb running rig and pulsed fine, with good voltage and current readings observed.

Due to the extreme vibration experienced by the tool, which the pulser was involved in, the pulser was sent to Singapore for complete strip-down and rebuild.

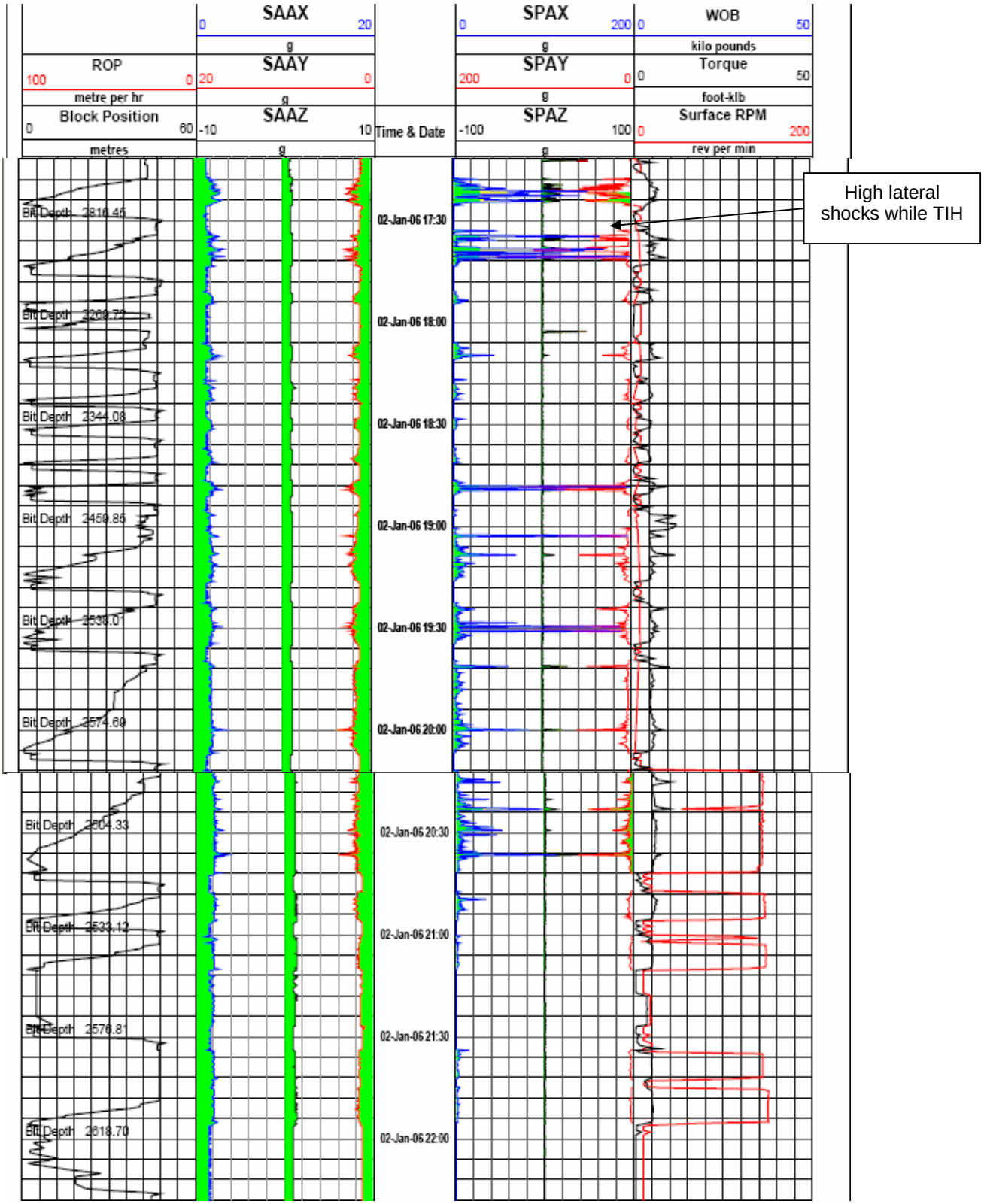
ROOT CAUSES

Analysis of the recorded Drill-string Dynamics Sensor (DDS) vibration log indicated that extreme and almost continuous vibration occurred during the bit run. This was responsible for damaging the pulser assembly and the main logging string components.

FINAL RESOLUTION

More attention to BHA design and configuration might well have alleviated the amount and intensity of the vibration. The wear seen on the near-bit stabiliser is indicative of BHA whirl. It is recommended that the BHA Whirl program within the *Planit* software package used by Sperry Drilling Directional Driller's, be run for each BHA to analyse its behaviour with respect to whirl and vibration mechanisms.

APPENDIX



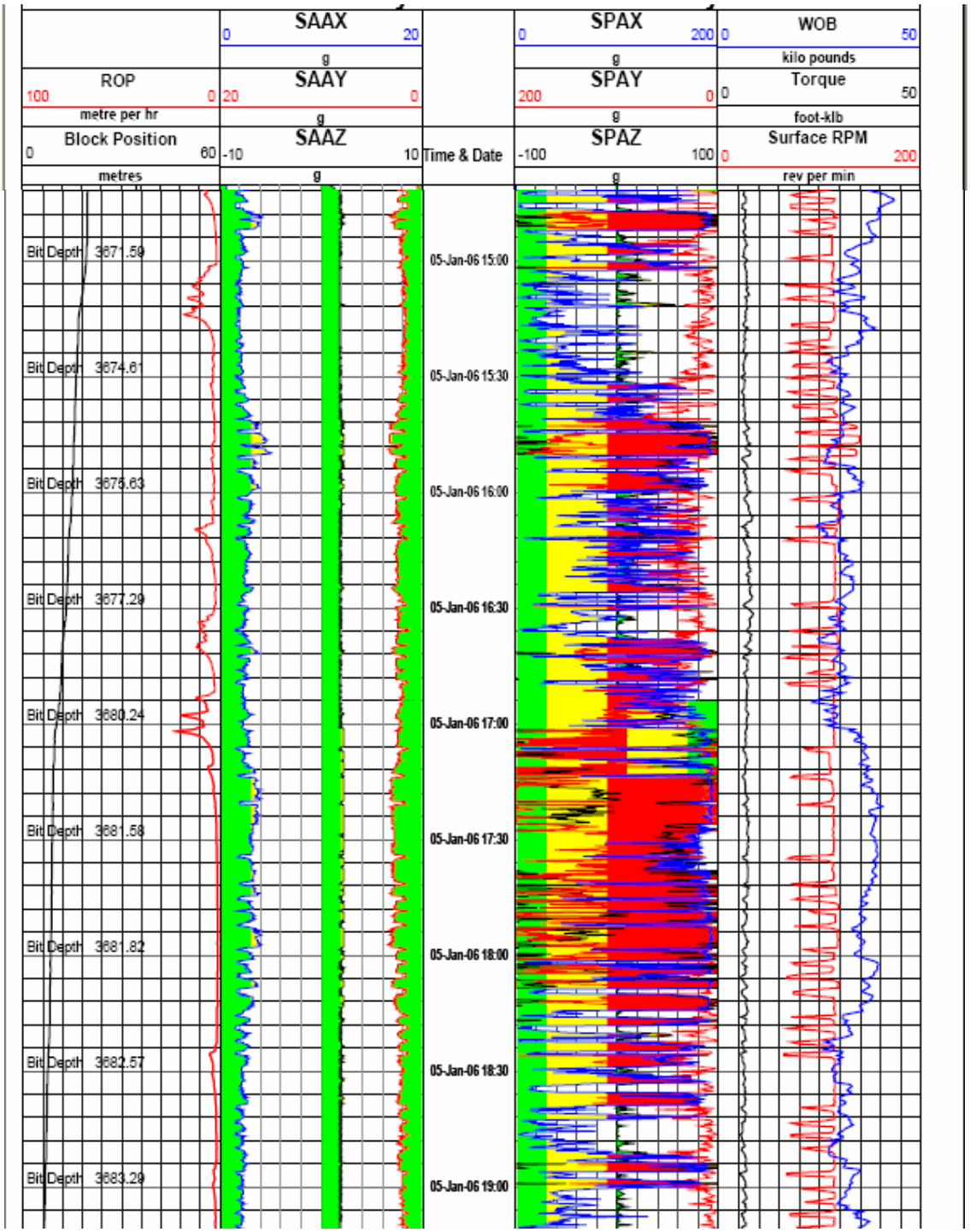
Time-based Vibration Log, Run 500

Comparison of pump filter from pulser 8351 and new filter

Close-up of damaged filter, showing clean break of “top hat” section from filter body

Close-up of an undamaged new pump filter for comparison

Photograph illustrating lop-sided wear on NB Stabiliser, run 600



Extract from Run 600 Vibration log.