

Successful Field Trials of Proprietary Triple Combo LWD Complete Technology Stack for Directional and Horizontal Drilling BHA

Wolverine Oilfield Technologies and Remote Measurement Systems Limited have successfully completed the field tests of their proprietary 4 3/4" Triple Combo LWD suite in Catoosa, OK, USA.

Overview

In September 2020, Wolverine Oilfield Technologies and Remote Measurement Systems Limited successfully field tested their proprietary 4 3/4" Triple Combo LWD suite.

During the field test Wolverine Oilfield Technologies deployed a bottom-hole assembly (BHA) including a triple-combo LWD suite, PDD sensors, and high-speed MWD (from bottom to top):

- GR – Natural Gamma Ray
- PDD – Pressure During Drilling
- MFPWR® – Multi-Frequency Propagation Wave Resistivity
- LNDC – Neutron / Density
- Neutrino™ Ultra High Speed Telemetry

The Neutrino™ MWD was run to transmit LWD data. All log data including 16 bins (sectors) density image and 3D ultra-sound caliper was transmitted at 6 bits/sec in real time.

Primary and backup strings were run in drilling mode for repeatability comparison. The Triple Combo Wireline by a major wireline provider was run afterwards to prove 100% repeatability and a complete match between LWD and Wireline data.

By successfully field-testing the triple combo LWD suite, rotary steerable system and ultra-high speed MWD, NewTech Services Holding Limited through its research, development and manufacturing subsidiaries, Wolverine Oilfield Technologies and Remote Measurement Systems Limited, confirms the availability of its complete proprietary technology stack for drilling directional and horizontal wells.

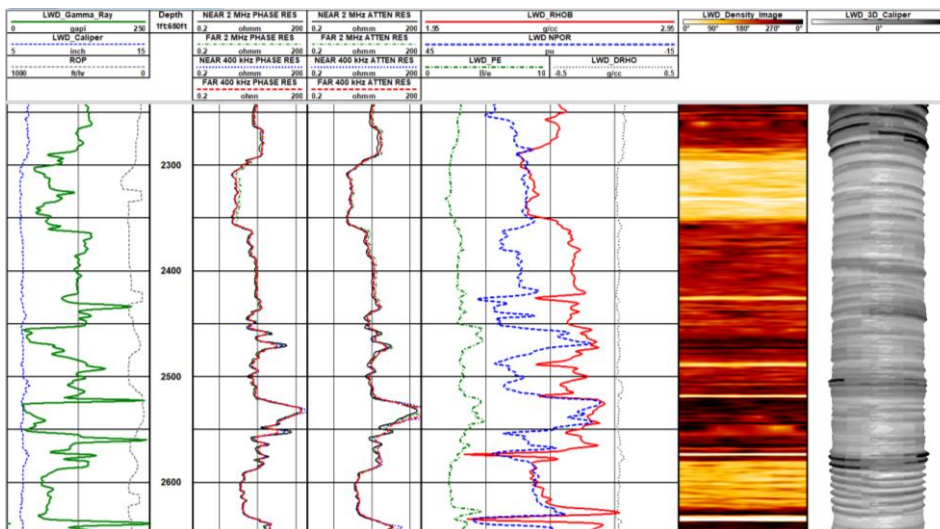


Fig. 1. LWD Qualification Logs.

CHALLENGE

- Accurate formation evaluation by Triple Combo LWD
 - Neutron Density / Acoustic Caliper
 - Resistivity
 - Natural Gamma Ray
- Data transmission rates of large data volumes from complex LWD assemblies through Neutrino™ High Speed Telemetry System
- Triple Combo LWD suite pilot series design qualification to prepare for commercial field tests

SOLUTION

- LNDC - Litho Neutron Density Caliper
- MFPWR® – Multi-Frequency Propagation Wave Resistivity
- Neutrino™ Ultra High Speed Telemetry & Gamma Ray
- PDD Sensor – Pressure During Drilling

RESULTS

Triple Combo LWD & Wireline Repeatability Comparison

- 100% repeatability
- Complete LWD & Wireline data match

MWD Data Transmission

- Large LWD data volumes at 6 bits/sec in real time

Triple Combo LWD Qualification for Commercial Field Tests

- Qualified

Wolverine Oilfield Technologies and Remote Measurement Systems Limited are subsidiaries of NewTech Services Holding Limited, an international oilfield services company founded in 2009. NewTech Services Holding Limited develops technology and expertise within 4 Business Divisions: Drilling Services, Completion Systems, Integrated Project Management and Capital Equipment. NewTech Services Holding Limited supplies technology products and services to the oil and gas exploration and production industry in Russia and CIS, Europe, Middle East, North and South America. Wolverine Oilfield Technologies designs and manufactures innovative drilling technology products such as MWD/LWD/RSS. Remote Measurement Systems Limited designs and manufactures innovative drilling technology products such as MWD/LWD.

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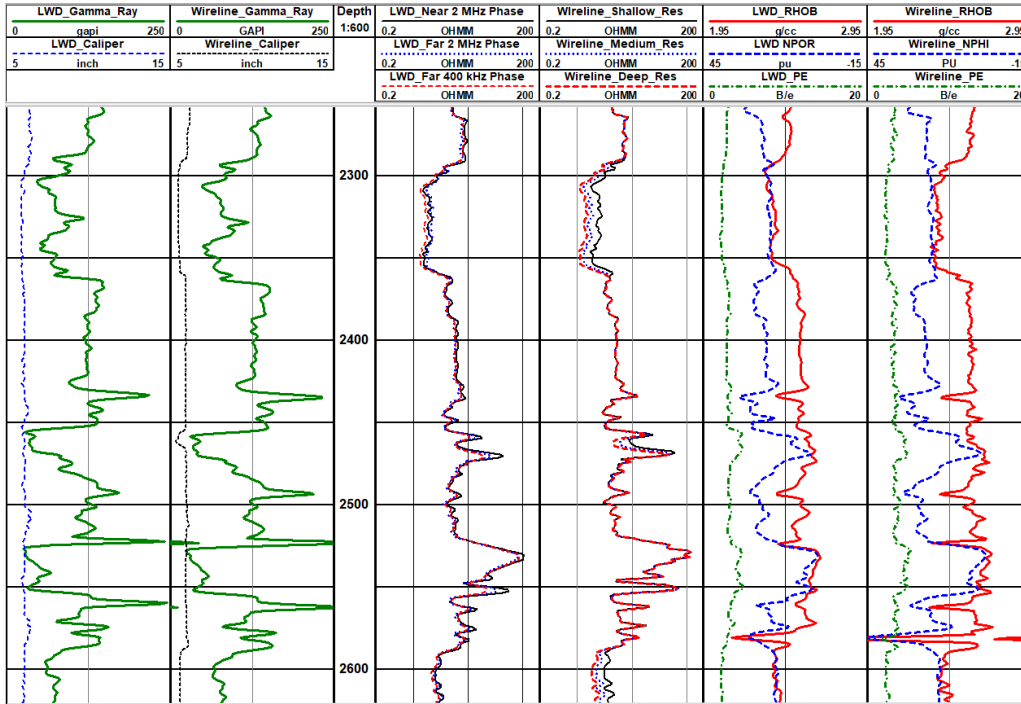


Fig. 2. LWD vs Wireline Triple Combo Comparison.

**Designed and manufactured by
Wolverine Oilfield
Technologies**

- Neutrino™ Ultra High Speed Telemetry & Gamma Ray
- Litho Neutron Density Caliper LWD
- QuantumDB™ Logging Analytics Platform

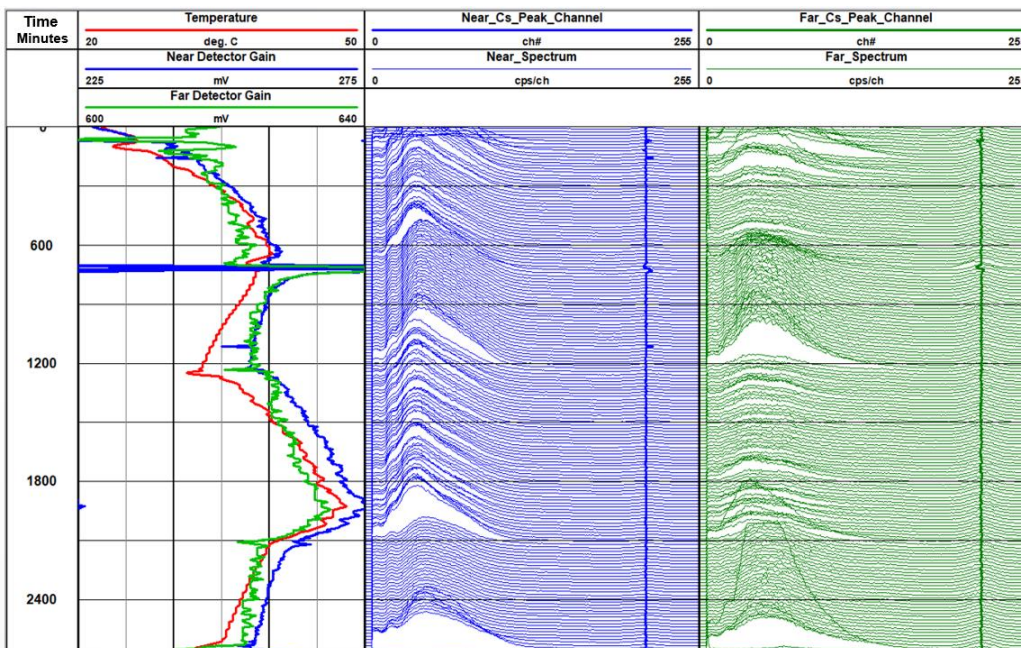


Fig. 3. Spectral Density Quality Control Plot.

**Designed and manufactured by
Remote Measurement Systems
Limited**

- MFPWR® – Multi-Frequency Propagation Wave Resistivity
- Pressure During Drilling Sensors