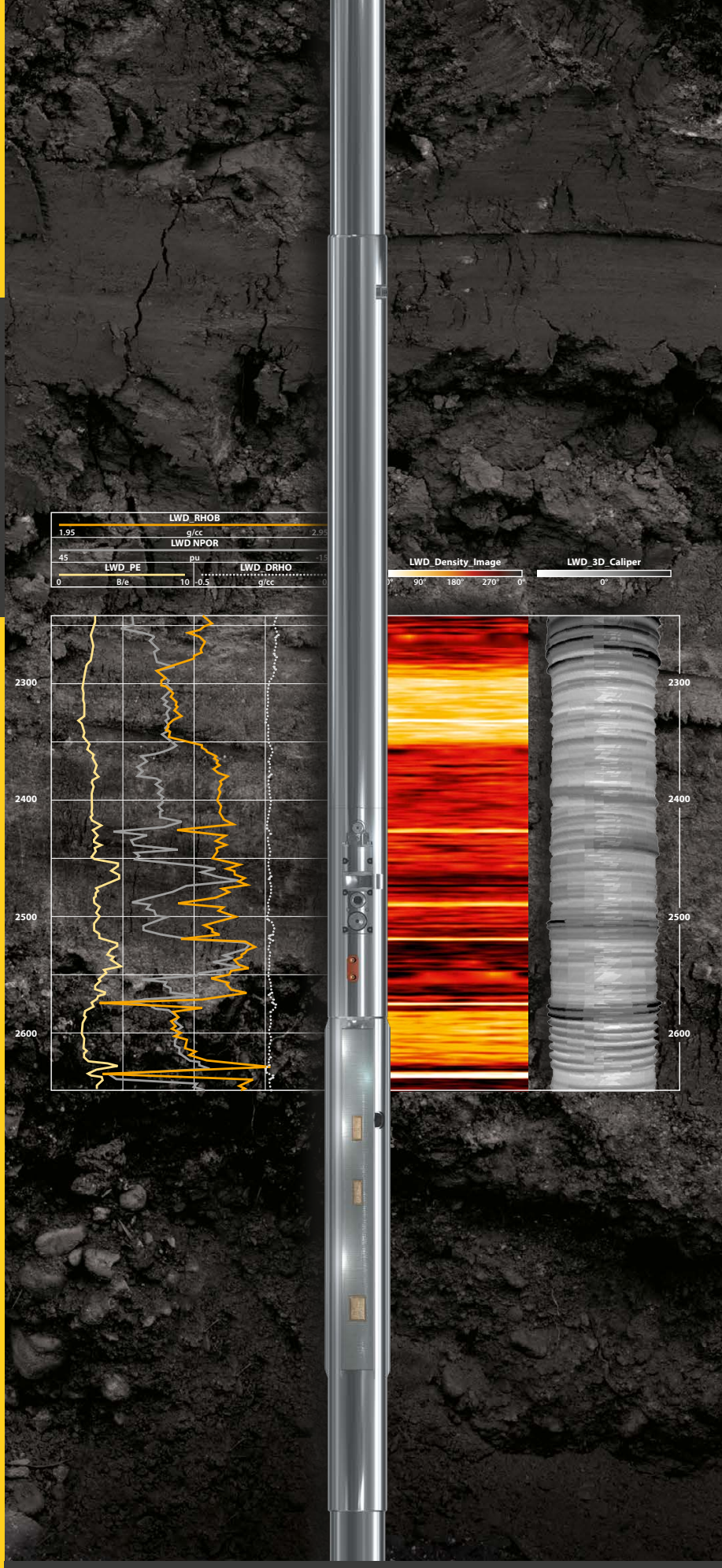
Wolverine
Oilfield Technologies

LNDC

LITHO NEUTRON DENSITY CALIPER

The LNDC (Litho Neutron Density Caliper) tool provides formation density, neutron porosity, Pe, and ultrasonic caliper measurements while drilling.

Azimuthal acquisition provides real-time and recorded borehole image logs for geosteering and evaluation of formation dip and geologic structure, as well as a 3-D borehole caliper to monitor wellbore stability. Combining the LNDC with our LWD gamma ray and propagation resistivity sensors provides an LWD "triple-combo" logging service for optimal wellbore placement and evaluation of reservoir lithology, porosity, fluid type, and oil/water/gas saturation.



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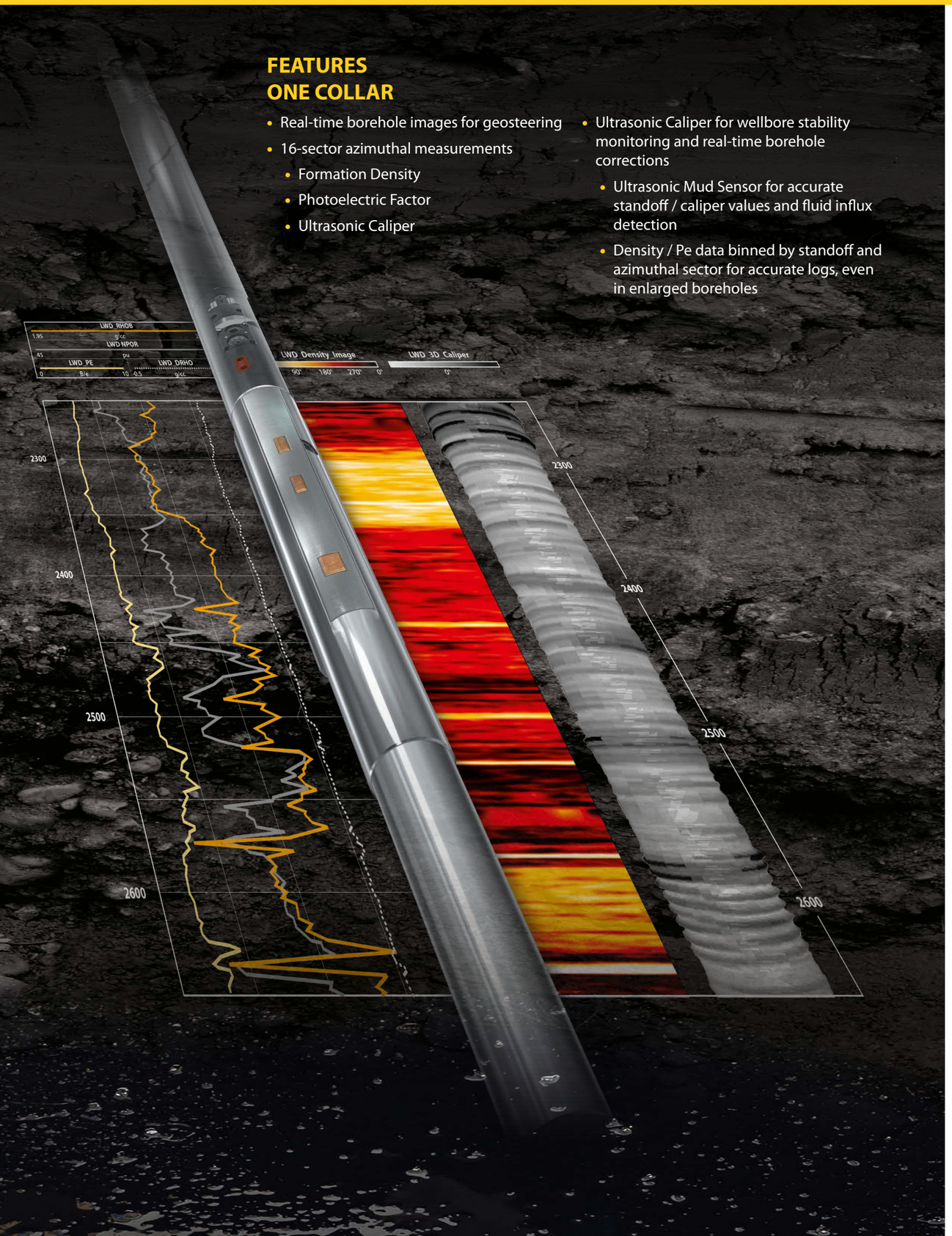
BETTER INFORMED DECISIONS

FEATURES
ONE COLLAR

- Real-time borehole images for geosteering
- 16-sector azimuthal measurements
  - Formation Density
  - Photoelectric Factor
  - Ultrasonic Caliper
- Ultrasonic Caliper for wellbore stability monitoring and real-time borehole corrections
  - Ultrasonic Mud Sensor for accurate standoff / caliper values and fluid influx detection
  - Density / Pe data binned by standoff and azimuthal sector for accurate logs, even in enlarged boreholes



FORMATION CHARACTERIZATION WHILE DRILLING

LITHO-DENSITY / NEUTRON POROSITY / CALIPER

TECHNICAL SPECIFICATIONS	
Tool Size, in	4 3/4" [121 mm]
Collar Length, ft	13.5' [4 m]

NEUTRON POROSITY MEASUREMENT	
Detectors	He-3 detectors [near and far spacings]
Operating Range	0 – 100% porosity
Porosity Accuracy	+/- 0.5 p.u. under 10 p.u.; +/- 5% from 10-40 p.u.
Porosity Repeatability	+/- 1 p.u. at 20 p.u. at 180 ft/hr [55 m/hr], 6" [0.15 m] samples

DENSITY MEASUREMENT	
Detectors	256-channel, gain-stabilized, NaI scintillators [near and far spacing]
Operating Range	1.5-3.1 g/cc
Density Accuracy	+/- 0.015 g/cc
Density Repeatability	+/- 0.01 g/cc at 2.2 g/cc at 180 ft/hr [55 m/hr], 6" [0.15 m] samples
Standoff Binning	0.1 inch [2.5 mm] increments from 0 to 0.8 inches [0 – 20 mm] using in-line ultrasonic standoff measurement
Azimuthal Binning	16-sectors referenced to North or High-Side

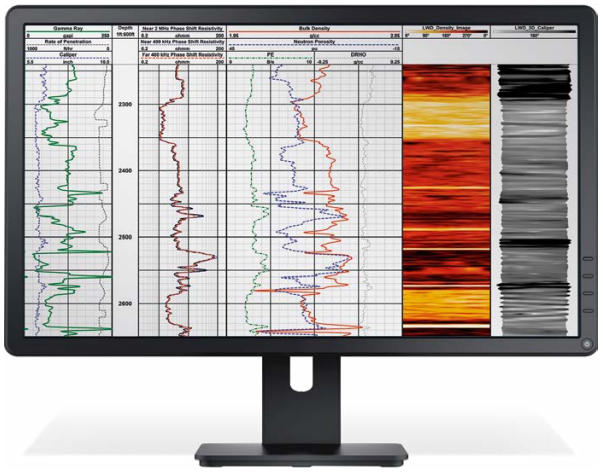
PEF MEASUREMENT	
Operating Range	1-7 B/e
PEF Accuracy	+/- 0.25 B/e
PEF Repeatability	+/- 0.25 B/e at 3 B/e at 180 ft/hr [55 m/hr], 6" [0.15 m] samples
Standoff Binning: Measurement	0.1 inch [2.5 mm] increments from 0 to 0.8 inches [0 – 20 mm] using in-line ultrasonic standoff
Azimuthal Binning	16-sectors referenced to North or High-Side

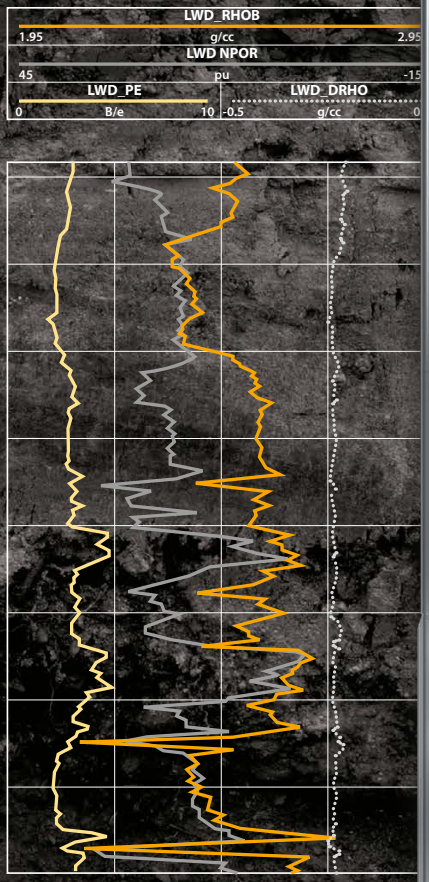
CALIPER/STANDOFF MEASUREMENT	
Mud Sensor	Independent measurement of ultrasonic velocity in mud
Operating Range	0 – 2.0" [0 – 50.8 mm] of standoff
Standoff Accuracy	+/- 0.1" [+/- 2.5 mm]
Azimuthal Binning	16-sectors referenced to North or High-Side

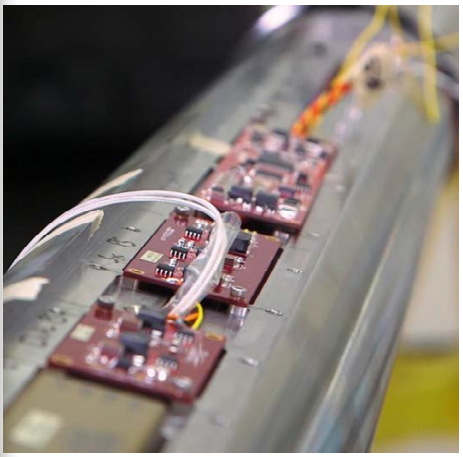
Imperial UOM [Metric UOM]

HIGH-QUALITY FORMATION EVALUATION

When run in combination with a resistivity tool and gamma ray as an LWD "triple-combo" logging service, it provides a comprehensive array of measurements to determine formation lithology and fluids.







Wolverine Oilfield Technologies is a subsidiary 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 is a subsidiary of NewTech Services Holding Limited specializing in drilling technology products such as MWD/LWD/RSS.

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