

iDNSC

Imaging density neutron standoff caliper service

APPLICATIONS

- Formation evaluation and petrophysical analysis, including HPHT environments
- Bed boundary detection
- Geosteering and well placement
- Structural and stratigraphic dip analysis

BENEFITS

- Real-time 4-, 8-, or 16-sector images of compensated density, photoelectric index (PE), and standoff
- Memory images with up to 64 sectors
- Survey-quality directional measurement
- Borehole shape log and borehole breakout analysis
- Dynamic processing for less standoff effect on density and neutron data even in enlarged boreholes

DENSITY FEATURES

- Rugged scintillation detectors for accurate formation density measurement and PE
- Computed measurement quality factors

NEUTRON POROSITY FEATURES

- Californium-252 source
- Three detectors for enhanced analysis (4 $\frac{3}{4}$ -in system)

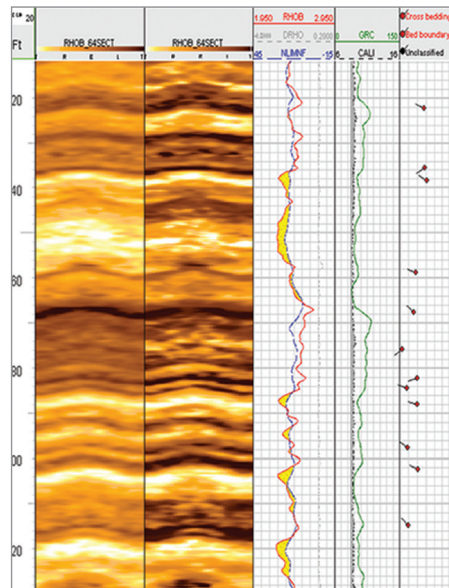
STANDOFF AND CALIPER FEATURES

- Two ultrasonic transducers aligned with density-neutron detectors for accurate processing
- Rugged ultrasonic pitch-catch transducers

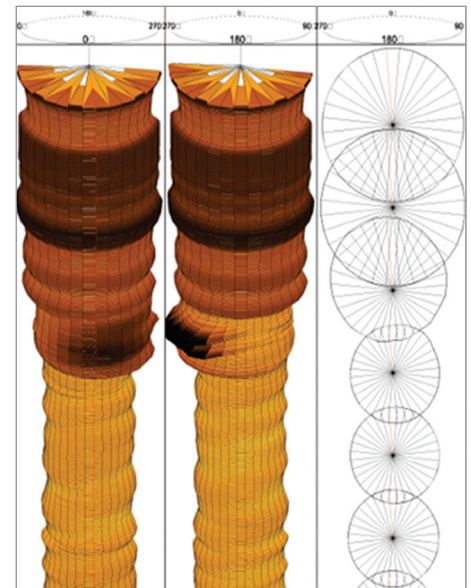
The iDNSC* imaging density neutron standoff caliper service provides a bulk density image along with traditional bulk density, neutron porosity, and PE data in water- or oil-base muds. Two ultrasonic transducers acquire tool-standoff and borehole caliper measurements and can also be used for environmental corrections for the neutron porosity data. A standoff weighting technique gives preference to the data that are acquired with the least standoff to ensure the best possible quality—even where hole conditions are less than ideal.

The iDNSC service generates an image for geosteering applications in which the contrast in the formation density and PE of adjacent beds will result in the characteristic smile and frown sinusoids on the image log. This function enables calculation of formation bed dips and clearly indicates the direction the geologic structure is being traversed. With this visualization, the engineer can determine whether the drilling assembly should be steered upward or downward to remain in the zone of interest. Image data obtained from the ultrasonic standoff transducers can be used to produce 3D views of the borehole shape for evaluation of hole quality and wellbore stability and for use as input for geomechanical analysis.

The iDNSC service can be configured for the SURVIVOR* HPHT service to operate in drilling environments with temperatures to 350 degF [175 degC] and pressures to 25,000 psi [172.4] MPa.



Density image.



3D Caliper image.

Tool Specifications

Nominal tool OD, in [mm]	4¾ [121]	6¾ [171.5]
Hole size, in [mm]	5¾ to 7¾ [149 to 200]	8½ to 9¾ [216 to 251]
Tool length, ft [m]	19.6 [6]	19.8 [6]
Battery length, ft [m]	15.5 [5]	15.5 [5]
Flow range, galUS/min [m³/min]	0 to 375 [0 to 1]	0 to 750 [0 to 3]
Pressure drop in water, psi [kPa]		
At 750 galUS/min	n/a	250 [1,724]
At 500 galUS/min	n/a	85 [586]
At 375 galUS/min	65 [448]	50 [345]
At 250 galUS/min	29 [200]	n/a
At 100 galUS/min	6 [41]	n/a

Density Sensor Specifications

Measurement type and detector type	Gamma-gamma, NaI scintillation			
Source isotope	Cesium-137			
Source activity, GBq	63			
Measurement	Range	Accuracy	Repeatability[†]	Vertical Resolution[‡], in [mm]
Density, g/cm ³	1.0 to 3.1	±0.02	±0.01	15 [381]
Density porosity [§] , %	0 to 100	±0.9	±0.7	15 [381]
Photoelectric index, Pe	0 to 6	±0.25	±0.25	3 [76]
Maximum standoff, in [mm]	1 [25]			
Samples per second	100			
Accumulation interval, s	2 to 60			

Neutron Porosity Specifications

Measurement type and detector type	Neutron-neutron/helium-3			
Source isotope	Californium-252			
Source activity, GBq	0.6			
Measurement	Range	Accuracy	Repeatability^{††}	Vertical Resolution[‡], in [mm]
Neutron porosity [§] , %	0 to 100	±1.5	±0.9	22 [559]
Maximum standoff, in [mm]	3 [76]			
Accumulation interval, s	2 to 60			

Standoff and Caliper Specifications

Measurement type and detector type	Ultrasonic, piezoelectric		
Number of transducers	2		
Samples per second	100		
Measurement	Water-Base Mud	Oil-Base Mud	
Mud weight range, lbm/galUS [g/cm ³]	8.3 to 18 [1 to 2]	8 to 14 [0.9 to 1]	
Max. standoff in 10 lbm/galUS, in [mm]	3 [76]	2.5 [63.5]	
Max. standoff in 14 lbm/galUS, in [mm]	2.5 [63.5]	2 [50]	
Max. standoff in 18 lbm/galUS, in [mm]	1.5 [38]	n/a	
Standoff accuracy, in [mm]	±0.1 [2.5]		
Caliper accuracy ^{††} , in [mm]	±0.15 [4]		

Environmental specifications

Max. vibration, g_n [m/s ²]	20 [200] (G_{rms} random, 5 to 1,000 Hz)
Max. shock, g_n [m/s ²]	500 [5,000]
Max. temperature, degF [degC]	302 [150], 350 [175] ^{§§}
Max. working pressure, psi [MPa]	25,000 [172]
Mud sand content, %	1

[†] At 2.4 g/cm³, Pe of 5, and logging speed of 90 ft/h.

[‡] With minimal filtering.

[§] Not true porosity.

^{††} At 30% and logging speed of 90 ft/h.

^{†††} Accuracy of caliper function varies with speed of sound in drilling fluid.

^{§§} Standard tool configuration 32–302 degF [0–150 degC], optional SURVIVOR HPHT service rating 32–350 degF [0–175 degC].