Optimize wellbore placement with advanced downhole measurements

AccuSteer® Measurement While Drilling (M/LWD) Suite

NABORS
Nabors’ AccuSteer® Measurement While Drilling (M/LWD) Suite is a premier dynamics evaluation MWD system for performance drilling with integrated advanced geosteering measurements.

**ACCUSTEER® M/LWD SUITE**

AccuSteer™ is a collar based M/LWD system designed specifically for the unconventional market. It encompasses all of the measurements necessary to address the needs of directional drilling, drilling efficiency, and geosteering in a 30’ package—shortest in the industry. Through utilization of the latest technology and design techniques, we created a system that brings advanced measurements to the land market in an economical package.

**ACCUSTEER® SYSTEM FEATURES**

- Utilizes the latest technology to reduced circuit board count and eliminate connectors
- Geosteering measurements located as close to the bit as possible
- All measurements are recorded at high frequency, all the time
- Flex section incorporated to reduce stress on connections in high doglegs and allow for maximum mud motor build rates
- Compression mounted inside collar to better handle shock and vibration
- Proprietary electronics mounting to mitigate shock and vibration
- Capable of operating at 175°C (347°F) temperatures at 100 G’s shock / vibration levels

**ACCUSTEER® SYSTEM MEASUREMENTS**

- Directional Measurements
  - Standard Survey
  - 6 Axis Vector Survey
  - Gravity and Magnetic Toolface
- Near Bit Continuous Inclination
- Azimuthal Gamma
  - 16 Sector Azimuthal Gamma Image
  - API Gamma Ray
- Drilling Dynamics (50Hz)
  - Weight On Bit
  - Torque On Bit
  - Bending Moment
  - Instantaneous Dogleg Severity
- Downhole RPM (500Hz)
  - Max/Min/Avg RPM
  - Stick Slip Index
- Pressure While Drilling (17Hz)
  - Annulus and Bore Pressure
  - Downhole Differential Pressure
  - Equivalent Circulating Density (ECD)
  - Equivalent Static Density (ESD)
- Shock and Vibration (1000Hz)
  - Axial and Lateral–Peak, RMS, Average
- Propagation Resistivity
  - Frequencies - 2Mhz, 400kHz, 152kHz
  - Spacings - 48”, 28”, 18”
  - Phase Shift and Attenuation
  - 16 Independent Resistivity Curves

**BENEFITS**

- Downhole Differential Pressure brings visibility to true mud motor operating condition
- Increase sliding efficiency with downhole Weight on Bit measurements
- Hi-Resolution Azimuthal Gamma Imaging can be used to identify faults and fractures for optimizing completions
- Downhole Dynamics measurements can be utilized for more accurate MSE calculation
- Identify abnormal pressure and pack off conditions with Annulus and Bore Pressure
- Instantaneous Dogleg Severity reveals tortuosity not captured by surveys
- Near Bit Continuous Inclination provides constant awareness of wellbore trajectory
- Azimuthal Gamma Imaging enhances geosteering confidence
- Identify drilling inefficiencies with downhole Shock, Vibration, Stick Slip and RPM measurements
- Collar mount design makes for quick BHA makeup and reduced HSE risk

**SMART TELEMETRY**

AccuSteer® system incorporates a telemetry switching scheme to maximize bandwidth use during rotating and sliding operations. This eliminates toolfaces while rotating when they are not needed to maximize log quality without sacrificing steerability while sliding.

**RIGLINE 24/7**

- Remote directional drilling and MWD operations:
  - Infrastructure capable to perform multiple directional & MWD jobs
  - DD, MWD and drillers trained on remote directional drilling
- Supporting NDS operations with
  - QA/QC of sensor data and reports to ensure consistent and reliable reporting
  - 24/7 support for troubleshooting
  - Standard escalation process to include SMEs, engineers etc. to support field staff
  - As required, technicians/support staff dispatched to ensure fast response
AccuSteer™ M/LWD System Specifications

Sensor Accuracy

- Inclination ± 0.1° (Range: 0-180°)
- Azimuth ± 0.5° (Range: 0-360°)
- Toolface ± 0.1° (Range: 0-360°)

Continuous Inclination

- ± 2° (0°-5°)
- ± 1° (5°-8°)
- ± .5° (8°-13°)
- ± .1° (greater than 13°)

Gamma ray ± 2% (Range: 0°C-150°C); ± 5% (150°C-175°C) ±0.1°

Azimuthal Gamma

Dual Azimuthal Focused Scintillation Detectors
16 Bin Processed Image
9:1 Front/Back Shield Ratio

Dynamics

- Weight on Bit: 1.6% max error
- Torque on Bit: 0.9% max error
- Bending Moment: 0.9% max error

Pressure

- Annulus Pressure ± 0.2% (range 0-20,000 psi)
- Bore Pressure ± 0.2% (range 0-20,000 psi)

Signal Transmission

Positive Mud Pulse and EM

Collar Size

- 4.75 in. OD
- 6.75 in. OD

Flow Ranges

- 4.75 in.: 150-325 gpm
- 6.75 in.: 300-850 gpm

Sand Content

< 1% by volume

LCM Tolerance

25-40 lbs/bbl fine, 30-50 lbs/bbl medium or coarse (well mixed)

Battery Life

500+ hours

Onboard Memory

2GB

Operating Temperature

175°C (347°F)

Maximum Pressure

20,000 psi

Dog Leg Capability

Max Dogleg Rotating @ 30 RPM Max Dogleg Sliding

Collar Size

- 4.75
- 6.75

Stabilized BHA

- 12°/100ft
- 10°/100ft
- 17°/100ft
- 15°/100ft

Slick BHA

- 15°/100ft
- 13°/100ft
- 20°/100ft
- 18°/100ft

Slick with Flex NMDC BHA

- 17°/100ft
- 15°/100ft
- 22°/100ft
- 20°/100ft

Max. Vibrations, g

20 (rms, random, 15-1,000 Hz)

Max. Shock, g

500

Propagation Resistivity Option

Spacing: 48-, 28-, 18 in.
Frequencies: 2MHz, 400kHz, 152kHz
Why choose Nabors’ AccuSteer® M/LWD Measurement Suite over the competition?

- **Improve Wellbore Placement**
  - Azimuthal Gamma
  - Propagation Resistivity
  - Near Bit Continuous Inclination

- **Enhance Drilling Program**
  - Annulus and Bore Pressure
  - Stick Slip
  - Shock and Vibration
  - Downhole Dynamics Package

- **Better Characterize the Target Zone**
  - Identify like lithology
  - Identify faults and fractures
  - Reduce TVD error with Continuous Inclination

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**Enhance your operations**

Nabors offers an integrated suite of performance products and services that work with the AccuSteer™ system, including ROCKit®, PILOT™ and REVict® systems to maximize efficiency.