NEW GYRO DRILLING TECHNOLOGY DELIVERS ACCURATE AZIMUTH AND REAL TIME QUALITY

AUTHORS
Gyrodata Inc.
- John Weston, SPE
- Adrián Ledroz, SPE
- Roger Ekseth, SPE

PUBLICATION
- Society of Petroleum Engineers
- International Association of Drilling Contractors
- SPE/IADC 168052

INDUSTRY CHALLENGE + OBJECTIVE
Drillers must have access to real-time 3D orientation and positional data of both the drill bit and drilled section of the well under construction in real time so they can steer the bit safely toward the drilling target and avoid collisions with adjacent wells. A 2014 technical paper (IADC/SPE 168052) describes an all-attitude gyro-while-drilling (GWD) tool created in response to the increased demand for a reduction in the uncertainty of wellbore placement to minimize drilling risks and potential liabilities. The technical paper includes several case studies that illustrate the performance capability of the GWD system over a range of well trajectories and at different latitudes.

TECHNOLOGY + SERVICE SOLUTION
- The technical paper describes many innovative technological advances that allowed the all-attitude GWD system to become a reality, including:
  - A gyroscope that was designed specifically for a down hole drilling environment;
  - A system mechanism to control gyro biases;
  - A signal processing technique called Continuous Adaptive Processing that estimates the g-sensitive bias errors at each gyrocompass station; and
  - A more robust quality control scheme.
- The high-angle GWD system is well suited to handle any wellbore placement needs, including high-inclination kick-offs, in-fill drilling, relief wells and the provision of improved accuracy in east-west wells.
- Because of the improved reliability of GWD survey data, operators and drillers are able to have more confidence that the survey is representative of the true wellbore trajectory.
- With the memory multishot capability that is available, reliable high-accuracy surveys can be generated on the trip out of the well, from total depth to surface, verifying both MWD and GWD performance. This eliminated the need for separate and rig-time dependent gyroscopic surveys.

RESULT + VALUE DELIVERED
- The all-attitude GWD system allows survey accuracy and reliability goals to be achieved in real time in a cost-effective manner.
- The major operational benefits are:
  - Reduced azimuth uncertainty at high inclination and east/west directions.
  - Enhanced performance at high latitudes.
  - Gross error detection capability at all attitudes.
  - Provision of definitive survey data using out-run multishot capability.
- Field data confirmed the successful operation of the GWD system for horizontal applications, regardless of the wellbore direction.