

# ACCURACY IMPROVES WHEN GYROSCOPIC SURVEYS ARE COMBINED WITH MAGNETIC SURVEYS

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## ▶ PUBLICATION

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## INDUSTRY CHALLENGE + OBJECTIVE

Traditional downhole survey systems have not always provided acceptable position calculation, which can cause the incorrect placements of wells. The accurate placement of wellbores is vital for maximizing oil production while avoiding collisions with existing wells.

The use of advanced solid-state gyroscopic sensors has now become a viable option for high-accuracy wellbore placement. The simultaneous application of multiple survey tools, which are largely made possible due to the attributes of solid-state gyroscopic sensors, has clear benefits in terms of enhanced well placement, reliability and the detection of gross errors in the survey process. Gyrodata's technical papers (SPE-194130) examines how new gyroscopic survey tools for wellbore surveying and real-time wellbore placement can be used.

## TECHNOLOGY + SERVICE SOLUTION

- Recent developments of Coriolis vibratory gyros (CVG) have resulted in sensors capable of achieving a level of performance comparable to, or better than, that achievable using the best mechanical gyros used in oilfield applications.
- CVG gyro surveys may be used effectively as a reference allowing MWD magnetic survey errors to be estimated and corrected; either post-drilling or in real-time during drilling operations.
- This paper discusses a process that uses estimates of the MWD magnetometer readings generated using gyro readings of azimuth combined with declination information and knowledge of the Earth's total magnetic field and dip angle. In addition, tool inclination and tool face angle derived from the system accelerometer readings are required.
- This process is designed to generate estimates of the errors in total field, declination and dip, along with estimates of the axial interference, magnetometer biases and scale factor errors. While magnetometer scale factor errors are usually small, the lateral scale factor terms are included to take account of the effects of magnetic mud.

## RESULT + VALUE DELIVERED

- The application of advanced solid-state gyroscope technology, and the resulting improvement in survey accuracy, is causing the wellbore survey community to re-assess wellbore placement methods and how to make the best use of data provided by both gyroscopic and magnetic tools.
- The new gyroscopic tool used in conjunction with magnetic survey methods to achieve high-accuracy surveys offers an efficient and cost-effective approach.
- A key feature of the method described is a reliable quality control for advanced magnetic modelling (in-field referencing), or a viable alternative for its replacement.