



TECH TO BUSINESS

CONTACT: ipm@innovatecalgary.com • 403.284.6400

Inertial Navigation for Directional Downhole Drilling

TECH ID #: 331.24

Background

Inventors at the University of Calgary have developed a method for dynamically re-aligning an Inertial Measurement Unit (IMU) used for directional downhole drilling. IMUs are state-of-the-art devices for providing directional information and are widely used in ground, air, space and sea navigation. However, IMUs typically suffer from accumulated error and require sophisticated alignment techniques to operate effectively. For directional downhole drilling, these techniques are severely limiting due to dynamic vibrations, high temperature gradients, and lack of space for maneuvering underground. The present technology overcomes these limitations by dynamically re-aligning the IMU to compensate for the accumulated error. This technology provides improved accuracy over conventional magnetometer-based navigation systems in a low-power, miniaturized device that is easily adaptable to current drilling assemblies.

Directional drilling involves exploring non-vertical wells. To accomplish this, the operator must constantly be aware of the direction of the drilling assembly, which is normally multiple feet below ground. Current navigation methods downhole involve the use of magnetometers. However, technological limitations in the magnetic equipment and error due to magnetic anomalies in the subsurface greatly reduce the precision of this method. The preferred choice for navigation is the IMUs widely used for ground, air, space and sea. The present technology provides a low-power, miniaturized device integrated with an IMU to provide dynamic re-alignment in less than 2 minutes.

Areas of Application

- Navigation in any directional drilling application

Competitive Advantages

- Accuracy in inclination and azimuth angles at multiple orders of magnitude higher than current technologies
- Alignment in less than 2 minutes
- Low-power
- Miniaturized assembly easily adaptable to current drilling assemblies



Stage of Development

- Prototype completed
- Miniaturization and field testing required

Intellectual Property Status

- [US 7,823,661](#) - Issued
- [CA 2,636,564](#) - Pending

Publications

- [Int. J. "Information Technologies and Knowledge" 2008 2:147–56](#)
- [IEEE Trans. on IM 2007 Oct;56\(5\):1935–45](#)
- [IEEE Trans. on IM 2007 Oct;56\(5\):1946–54](#)
- [IEEE Trans. on IM 2005 Oct;54\(5\):1997–2006](#)