

Downhole geophysics sensors for reverse circulation drilling in iron ore

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Measurement While Drilling (MWD) and Logging While Drilling (LWD) tools acquire geophysical and operational data from directly behind the bit during drilling operations. This data can be transmitted back to surface to allow real-time geosteering, target confirmation, drilling optimization and geophysical evaluation of the resource body.

Traditionally, MWD and LWD tools have only been integrated into mud rotary drilling systems. Although mud rotary drilling is standard in the oil and gas industry, Reverse Circulation (RC) drilling is more prevalent in the iron ore mining industry due to faster penetration rates, lower costs and the ability to obtain clean, on-depth formation samples.

Due to the high shock environment and minimal space available for instrumentation, no MWD or LWD tools compatible with RC drilling are available. Instead, the iron ore industry relies on assays of cuttings and post-drilling wireline logs to obtain geophysical and borehole information. These logs include natural gamma, gyro survey, dual density, sonic, image, borehole magnetic resonance, magnetic susceptibility, resistivity, caliper and downhole spectroscopy.

A joint venture between Wallis Drilling and Qteq was formed to develop tools to acquire this data while drilling. This has resulted in drillMAX, the world's first MWD tool for use in RC drilling. Coupled with drillHUB, a rig-based sensor system, this tool enables drillers and remotely operating geologists to make real-time decisions about depth and target penetration. The basic data (natural gamma and gyro survey) replaces the need for standard wireline tools, and with some additional processing, geophysics answers such as rock hardness can be calculated.