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Core Lab

Friction Lubricity Evaluation Monitor LEM-4100 Datasheet

Drilling & Stimulation Properties

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Lubricity Evaluation Monitor LEM-4100



Lubricity Evaluation Monitors are designed for the static or dynamic testing of drilling fluids or muds and lubricants at atmospheric and reservoir conditions. Excessive torque and drag can have many adverse effects during the drilling process. To optimize the drilling process, various drilling mud and lubricant combinations need to be evaluated. This series of instruments is designed to allow the end user to measure the mud lubricity or friction coefficients between a simulated tool joint and a well bore surface under simulated reservoir conditions. The instruments are designed to test reservoir core samples as well as various drill pipes or casing materials. From this information, the user can recommend proper mud systems, determine optimum lubricant concentrations, develop new lubricant additives, predict drill string loads, minimize torque and drag, and improve drill string design techniques. From this information, the end user will be able to optimize the drilling process to reduce the overall drilling costs.

Instrument Operation

The series of LEM instruments all operate in a similar fashion. A test sample of sandstone, limestone, quartz glass, ceramic, field core, or casing is installed into the sample holder within the mud test cell. A carbon steel bob, which simulates the drill stem or tool joint, is inserted into the mud test cell. With the bob rotating at the desired test speed, a constant load is applied to the test sample, forcing the test sample up against the rotating bob. The torque on the rotating bob and axial load are both measured and recorded. From this information, the torque as a function of the friction or axial load can be determined. These measurements can be performed as a function of pressure and temperature. Chemical additives can then be blended into the drilling fluid to evaluate the change in the friction factors.



A fluid leak-off test can be performed with certain models and a filter cake can be deposited on the test sample under static or dynamic conditions. The drilling fluid can be either static or re-circulating, depending upon the instrument. Once the filter cake has been deposited, the load can be applied and the friction values can be determined in the presence of the filter cake buildup. A differential sticking test can also be performed where after the filter cake has been deposited, the load is applied and then the simulated drill bite is rotated. The torque required to move the simulated drill bit is measured.

The load being applied to the test sample in the LEM-2000 is a direct measurement by weights. The load being applied under pressure with the LEM-3000 and 4000 series is measured with an electronic load cell. The movement of the test sample is measured with a linear transducer so the rate of wear on the sample can be determined. Pressures are measured with electronic pressure transducers and temperatures are measured with thermocouples. The computer control software for the Model LEM- 4100, SmartLub™, controls the instrument and collects all of the data.