

Improved Management of Lost Circulation and Kicks with Micro Motion® Meters

BENEFITS

- Enhanced safety through improved lost circulation detection and kick detection
- Reduced non-productive time
- Lowered operating costs

PROCESS

Oilfield Services – Drilling Fluids Management – Lost Circulation/Kick Detection

During the drilling process, drilling fluid (mud) is taken from the storage pit, pumped down the drill string, and then returned to the surface for treatment and re-use. The drilling fluid has many functions, such as cooling the drill bit, flushing out drilling cuttings, stabilizing the well bore, and ensuring that the mud weight is within the target downhole pressure margins.

During drilling operations, it is possible to experience lost circulation and/or a kick. Lost circulation occurs when the drill encounters natural fissures, fractures, or caverns, and drilling fluid is lost into these newly-available spaces. Kick is the opposite problem: while drilling, pockets of formation fluids (e.g., oil, water, gas) are encountered that flow into the drilling fluid. One method of monitoring for these conditions is to compare the downhole and return flow rates of the drilling fluid. When the downhole flow rate is higher than the return flow rate, it is an indication of lost circulation. When the return flow rate is higher than the downhole flow rate, it can be an indication of kick. The operator can then take appropriate actions to control the drilling process.

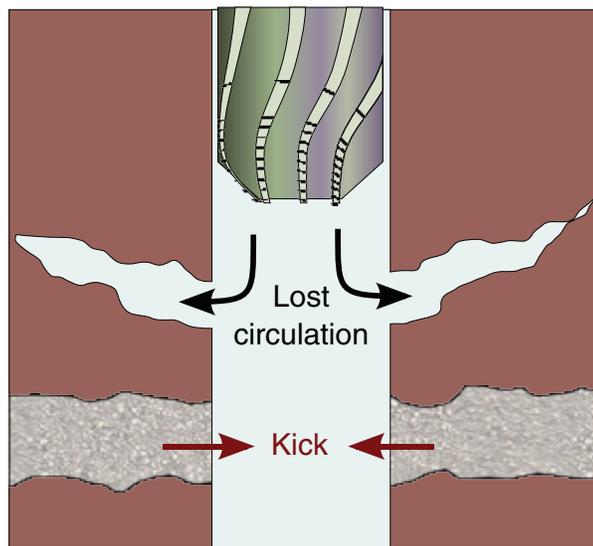
CHALLENGE

The conventional method of measuring downhole flow rate on a rotary rig utilizes the per-stroke pumping capacity of the drilling fluid pump and a stroke counter. Because no direct flow measurement was being made, there was no accounting for reduced flow rates due to pump wear, entrained air in the mud, or changing viscosity of the mud.



Micro Motion meters provide continuous, instantaneous flow measurement under challenging conditions.

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Return flow rate was often determined by measuring the level of drilling fluid in the mud pit or by installing paddle-wheel meters in the return line. The ability to detect small differences between the downhole and return flow rate can be hampered by the limited accuracy, sensitivity, and reliability of these two methods.

As a result of these factors, one operating company decided to use alternate flow measurement technology on the rotary rig.

SOLUTION

The alternative technology involved installing a Micro Motion Coriolis meter on the suction side of the mud pump to measure actual downhole flow rate. A second meter was placed prior to the shaker to measure the return flow rate.

The Micro Motion meters can handle all types of fluids, including dense slurries that contain sand and drilling cuttings. The meters' performance is sustainable in applications involving changing fluid properties (e.g., density, viscosity) and high flow-rate turndowns. Micro Motion meters have no moving parts to wear out or break down, so the meters provide reliable, sustained measurement performance with a reduced need for maintenance.

With more accurate, continuous, and reliable volume measurement of the drilling fluid, the driller can detect lost circulation and kick events earlier than normal. Early recognition of these events is expected to lead to:

- Increased safety due to better handling of well control problems.
- Reduced non-productive time due to lower maintenance requirements and instantaneous measurement.
- Reduced operational costs by minimizing the loss of expensive drilling fluids.

The continuous flow measurement of the downhole rate provides the added capability to recognize mud pump operational problems.

