Micro Motion® Coriolis Meters Increase Safety in Managed Pressure Drilling

BENEFITS
• Improved drilling efficiency and well stability with tighter control of BHP
• Increased safety through the early detection of kicks and lost circulation
• Reduced cost and non-productive time by avoiding critical well control events

PROCESS
Oil field services; drilling fluids; managed pressure drilling
Managed Pressure Drilling (MPD) is a new drilling process that allows greater, more precise control of the Bottom Hole Pressure (BHP) in a well bore. This is typically achieved through a closed, pressurized fluid system in which flow rate, mud density, and back pressure on the fluid returns (choke manifold) are used to set and control the BHP under both static and dynamic conditions.
Managing the BHP accurately within a narrow window or margin helps to mitigate the risk of critical drilling events and improves drilling performance and well control.
In managed pressure drilling, flow rate measurements are used to mitigate potential well control risks through:
1 Early kick detection, which involves detecting, as early as possible, the influx of fluids from permeable or fractured formations into the wellbore.
2 Detection of lost circulation, which involves detecting the loss of drilling fluid from the wellbore into permeable or fractured formations.
Eliminating or minimizing drilling fluid influx and losses reduces costs, improves safety, increases wellbore stability, and decreases formation damage. Increasing stability and decreasing damage enables oil companies to drill difficult and or otherwise impossible-to-reach targets with less cost.

Conditions that caused over 30% of non-productive time were eliminated.

For more information:
www.micromotion.com
CHALLENGE

One company has addressed these challenges by incorporating direct return flow measurements into an automated pressure control system. At Balance is an MPD company that provides Automated Pressure Drilling™ (APD) services to maintain constant BHP and flow rate measurement is an integral part of those services.

An important component of constant BHP control service is accurate flow rate measurement during all phases of drilling. Meter integrity is critical to achieving continuously accurate flow rate measurement.

Measuring circulation rates around the clock enables At Balance to maintain the correct flow for constant BHP under all conditions, and to detect kicks and lost circulation events earlier than conventional methods allow.

In MPD operations, the drilling fluid is continuously circulated through the choke manifold and the flow meter. The At Balance control system contains proprietary software that monitors the flow in and out of the well to detect any variations in the two. If the flow-out is higher than flow-in, then fluid is being gained. If flow-out is lower than flow-in, then mud is being lost. The former indicates a potential kick while the latter indicates lost circulation.

SOLUTION

Micro Motion® CMF400 and CMFHC3 Coriolis meters have proven to be up to the task of performing in the harsh conditions associated with MPD applications. The key advantages of Coriolis technology in measuring fluid returns are:

- Meter reliability which ensures uninterrupted measurement.
- Compatibility with a wide range of fluids with dynamically changing properties (e.g., slurries and suspended materials) without correcting for secondary effects (density, viscosity).
- Accurate and sensitive over a wide turndown which improves early detection of kick and lost circulation
- Superior flow measurement performance under entrained gas conditions

Micro Motion’s Oil Field Service application specialist has also been instrumental in providing field support and application engineering knowledge specific to the measurement of drilling fluids with Coriolis technology.

Utilizing the At Balance APD services and continuous flow rate measurement has enabled operators in the Gulf of Mexico (GOM) to eliminate the conditions that led to the loss of two previous wells at a cost of over $20 million, and the conditions that have historically caused over 30% of non-productive time incidents (e.g., lost circulation, kicks, stuck pipes).

Elsewhere, these services have been used to significantly reduce mud density, raise flow rates, and improve drilling conditions which allowed operators to reduce mud costs, lost circulation, and non-productive drilling time spent trying to keep the well clean.