FLAG
Fluid Loss and Gain Detection Service
## The FLAG service

Gain detected with the FLAG service  
Driller informed  
Well closed  

5 min

## Flow paddle

Gain detected by standard measurement  
Driller informed  
Control with derrickman  
Flow check  
Well closed  

10-15 min

### Fluid Loss and Gain Detection Service

**500 L/min kick → 10 min = 5 m³ [30 bbl] influx**
Rapid system response

Quick and reliable detection of fluid influx or loss in the well is crucial, especially when drilling a slimhole or when drilling under high-pressure, high-temperature (HPHT) conditions. The FLAG* fluid loss and gain detection service, delivered by Geoservices engineers, detects gains and losses 5 to 10 minutes faster than conventional systems. This provides significantly earlier warning of any abnormalities, thus allowing more time for remedial action. In addition, this automated early kick detection system gives a valuable advantage during drilling operations by accurately indicating influx or loss at very low volumes and by reducing the number of false alarms that require time-consuming flow checks.

System requirements

- Drilling parameters (standpipe pressure, hook height, weight on hook, pump strokes)
- Schlumberger acquisition system
- Coriolis flow sensor

From 13:40:48 onwards, mud losses into the formation were increasing every time the pumps were turned on, as indicated by the FLAG service. Injection of lost circulation material (LCM) successfully stopped the losses. The differential flow-out provided rapid confirmation.
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<td>Improved well safety</td>
<td>Coriolis flowmeter</td>
<td>Rapid kick and loss detection</td>
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<td>Reduced NPT</td>
<td>Reliable differential flow-out corrected for heave, flowline effect, and reciprocation</td>
<td>Wellbore ballooning characterization</td>
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<td>Lower environmental risk</td>
<td>True assessment of flow from the wellbore</td>
<td>Drilling fluid displacement monitoring</td>
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<td>Accurate monitoring under various operating conditions: drilling, circulating, making a pipe connection, tripping, or cementing</td>
<td>Cement displacement and free fall monitoring</td>
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<td>User-friendly visual displays, alarms, and quality control</td>
<td>Pump efficiency measurement</td>
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<td>Suitable for deepwater, HPHT, slimhole, and conventional wells on any type of rig</td>
<td>Tripping and casing run monitoring</td>
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<td>Dedicated support technician for supervision of design, installation, and commissioning</td>
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<td>Stand-alone capability</td>
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Accurate differential flow-out under various operating conditions

The FLAG service is calibrated for the rig circulating system to compute the theoretical return flow from the well in real time. The streamlined interface minimizes user dependence. A Coriolis flowmeter† installed in the return flowline continuously measures the actual return flow. By comparing the measured and theoretical values, the FLAG service can detect an influx or loss almost as soon as it occurs, even under conditions that may make detection difficult by conventional means. Monitoring losses and gains in the flowline instead of the mud pit ensures faster detection and gives a true picture of downhole conditions, unaffected by surface actions such as addition of chemicals to the mud pit or mud transfers.

The algorithm is accurate under a number of operating conditions such as drilling, tripping, circulating, and cementing. The system automatically compensates for mud compressibility and disturbances that could mask the true flow, such as pipe movement or heave on a floating rig. Transitional flow regimes, like those created by starting or stopping of the pumps, can also be accommodated.

In addition to visual and audible alarms activated by preset thresholds, computed and measured data and the alarm status are continually displayed in log format on the Geoservices monitors. When used as part of the Thema* drilling operations support and analysis service, depth-and time-based data from the FLAG service and a number of other sensors are used to display decision-ready information on drilling performance and safety via customizable screens in real time.

† An electromagnetic flowmeter is used when space constraints do not permit installation of a Coriolis flowmeter and a water-based mud is in use.
Fluid influx or loss is a potential hazard that can lead to loss of control of a well, with potential loss of life and property, and damage to the environment. As deepwater and other increasingly complex drilling programs multiply, the magnitude of the possible risks continues to grow. The FLAG service aims to meet these challenges with an essential early warning system that is highly sensitive to fluctuations but intelligent enough to help prevent false alarms, making it an ideal primary well control device.
The FLAG service delivered by Geoservices engineers can detect an influx or loss in the well significantly faster than sensors monitoring the mud pits.