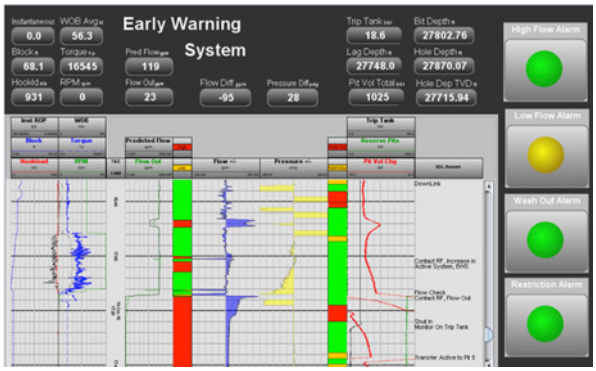
# DrillFact® Early Warning System Service

## MONITORS POTENTIAL INFLUX TO REDUCE DRILLING RISK

### OVERVIEW

Early detection of potential well control situations is crucial while drilling, especially in deep water, high-pressure/high-temperature (HP/HT), and slim-hole environments where influx volume needs to be minimized in order to avoid exacerbating already complex drilling conditions. The DrillFact® Early Warning System (EWS) service from Halliburton Sperry Drilling monitors the actual and calculated measurements for both flow and pressure to detect unpredicted changes in the flow system and to provide alerts relating to the changes. The service enables early detection of fluid influxes, mud losses, washouts, and restrictions in the system, as well as hole breathing/ ballooning effects. By detecting abnormal conditions, operators can quickly mitigate any issues to reduce drilling risks.

The EWS service is a fully integrated system that includes the Connection Flow Monitor (CFM) service from Halliburton Sperry Drilling to provide accurate flow measurements while pumps are on or off. When pumps are on, the service uses a highly accurate sensor for obtaining direct flow-out measurements.




These measurements are then combined with real-time calculations that account for vessel and pipe movements to provide the most accurate flow-out measurements.

The DrillFact EWS service uses flow-in measurements in order to determine a calculated standpipe pressure to compare to the measured standpipe pressure. When pumps are off, the service automatically switches monitoring and alarms to the CFM service. The CFM system compares the profile of the returns (both flow-out and pit gain) to either a standard profile developed under controlled conditions or to a recent average. The CFM system's accuracy is increased when a standard profile is updated as new connections are made.

### EWS SYSTEM REQUIREMENTS

Coriolis meter or electromagnetic flow meters are the preferred sensors.

*A Coriolis flow meter and flow diversion.*

### FEATURES

- Advanced software monitors flow and pressure measurements
- EWS service provides pumps-on and pumps-off monitoring
- Intelligent alarms help minimize false warnings
- Direct and accurate flow measurement ensures early event detection algorithms to:
  - Remove noise from pulsating flow of pumps and/or electrical fluctuations
  - Account for flow variations caused by pipe and/or vessel movement
  - Account for delays observed in the flow-out measurement from the mud system's rheology characteristics
- Alarm tools can be made available in the mud logging unit, on the rig floor, or anywhere on the rig

### BENEFITS

**Drill to Produce**

- Identify conditions that may affect wellbore conditions later

**Reduce Well Time**

- Reduce well and wellbore damage with early detection and mitigation
- Improve rig and well safety with rapid responses to potential issues
- Decrease non-productive time by reducing well control events

Intelligent alarms minimize false warnings by using a weighted averages methodology. By comparing calculated to actual values, the service can determine if unpredicted changes are significant and then provide the appropriate response. Alarms for the EWS service can be set using default parameters that are customized to reflect the operation or to match customer requirements. Engineers can update the alarms, as needed, by analyzing the current situation and determining how a volume would affect a well, given the hole and pipe configuration.

The EWS service is seamlessly integrated with the InSite® database system, allowing data and alarms to be available anywhere a client needs. The advanced InSite software provides calculations and graphical displays, including the alarm indicators.


*CFM monitoring screen*

For more information, contact your local Halliburton representative or visit us on the web at www.halliburton.com



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