CLEAR
Hole cleaning and wellbore risk reduction service
The CLEAR* hole cleaning and wellbore risk reduction service, delivered by Geoservices, a Schlumberger company, monitors hole cleaning effectiveness and wellbore stability, providing real-time data to help the drilling team continually improve drilling performance and reduce NPT. By comparing measured and theoretical volumes, the service provides early detection of inadequate hole cleaning and of excess returns caused by wellbore instability (caving) or damage.
Applications

- Extended-reach drilling and highly deviated wells
- Horizontal and multilateral wells
- Deepwater wells

Benefits

- Increase safety by monitoring wellbore stability with drilling practices based on cuttings flowmeter measurements and indicators
- Drill faster by ensuring good wellbore cleaning and condition
- Reduce NPT and stuck pipe risk by optimizing monitoring, analysis, and hole cleaning recommendations
- Optimize pill program and identify best practices for future wells

Features

- Digital measurements for improved cuttings evaluation accuracy
- Real-time dashboard with a simple, intuitive interface
- One-click report generation
- Transparency in data delivery
- Automatic alarm to signal when operational integrity of the equipment is compromised
Multiple sensors and digital signals

The CLEAR service has a cuttings flowmeter (CFM) and weighing tray, located at the end of each shale shaker, positioned to catch cuttings as they fall off the screen. The tray is locked in position for a fixed interval as determined by Geoservices and the customer. Cuttings accumulate on the tray and are weighed with strain gauges.

Digital outputs are sent to the acquisition system, which performs the computations. At the end of the adjustable preset period, the tray swings down and discharges the wet cuttings. The tray then returns to a horizontal position for the next measurement. The pneumatically controlled device is powered by the rig air supply, and the equipment does not obstruct access to the shale shakers.

The CLEAR service is compliant with the European Union’s Atmosphères Explosives (ATEX) directive as well as rated by the European Conformance (CE) and by the International Electrotechnical Commission Explosive Scheme (IECEx).

Real-time data dashboard

The comprehensive, real-time cuttings flow information provided by the CLEAR service is integrated with drilling parameters, cuttings geology, drilling fluid properties, and MLWD data. These results are visually displayed through the CLEAR service dashboard accessible online whenever and wherever it’s needed—at the rigsite or at remote offices for analysis by well construction engineers. The accessibility and ease-of-use of the dashboard allows the drilling team to more efficiently assess hole cleaning effectiveness and to minimize wellbore instability risks.
Flexible service delivery

Advanced services are available in addition to the CLEAR service dashboard and CFM equipment, providing next-level analysis through expert-level interpretation and evaluation of hole cleaning, lessons learned, and best practices for future use. Automated solutions improve data integrity and quality control as well as reduce the workforce required on the rig. With multiple service delivery options, the CLEAR service provides the flexibility to choose which services and deliverables are most appropriate for the operation.

Mud-effect correction

Because the coating of mud on cuttings can vary considerably, a correction factor called the equivalent dry cuttings ratio (EDCR) is applied to account for this variation. The wet cuttings weight is thus converted into an equivalent volume of dry cuttings, which can be compared with the theoretical volume of formation drilled at any time.

The CLEAR service measures and records the following data:
- cumulative wet weight of cuttings falling from the shakers
- cumulative dry weight of cuttings
- measured dry cuttings volume
- theoretical dry cuttings volume
- measured cuttings flow rate (dry flow)
- theoretical cuttings flow rate (nominal flow) based on ROP
- volume excess or deficit
- percentage of cuttings recovery.
Optimized hole cleaning and pill strategy helps improve drilling performance and minimize risk, Southeast Asia

**Operator Saves 16 Rig Hours and USD 194,000 Using CLEAR Service**

**Optimize hole cleaning strategy, minimize risk and expenditures**

During a three-well ERD operation in Southeast Asia, an operator wanted to measure and optimize its hole cleaning strategy to mitigate risk when drilling 12¼-in × 13½-in sections. The primary challenge was to deliver a long horizontal section at 70° with average departure greater than 5,000 ft [1,524 m] while minimizing the number of bit runs, avoiding overloading the annulus with cuttings, and maintaining wellbore stability.

ERD has proven to be an efficient solution in reservoirs with restricted production, reducing wellsite footprint and minimizing environmental effects while dramatically improving reservoir drainage at reduced cost. However, using this method to drill horizontal wells requires advanced technology that can accurately describe downhole conditions to identify the causes of harmful vibrations, BHA damage, poor performance, and inadequate hole cleaning.

**Use CLEAR service to maintain wellbore stability**

The CLEAR hole cleaning and wellbore risk reduction service was used by the operator to monitor cuttings removal from the hole and to analyze the efficiency of the hole cleaning strategy. The weight of cuttings reaching the surface is continuously measured and analyzed as they come off the shale shakers. By comparing measured and theoretical volumes, the service provides early detection of inadequate hole cleaning and of excess returns caused by wellbore instability (caving) or formation damage.

Information provided by the CLEAR service showed that the drilling fluid rheology was ineffective and, because of insufficient hole cleaning, the well was degrading further. Acting on this information, the drilling team adjusted the approach by raising the low-end fluid rheology, improving hole cleaning and avoiding the need for unplanned circulation.
Improved drilling performance, saved time and expenditures

Using the CLEAR service, the hole cleaning and pill strategy was successfully optimized. The frequency of the pills used was decreased without detrimental effect on the hole cleaning, improving the net ROP and decreasing hidden time spent on mud treatment.

Through correlation and systematic benchmarking on the impact of cutting lifting of the pills, the size, frequency, and type of pills used were revised according to the data to optimize efficiency and control time dedicated for a secondary hole cleaning. These results decreased the invisible lost time. High-viscosity pills were maintained for the larger-OD slant hole, and tandem pills were assessed and measured as having optimal performance in smaller ODs.

The solution led to an overall improvement in drilling performance. The average time spent per stand for circulating and pumping pills decreased by 11 minutes compared with previous wellbores. Due to a more systematic approach, the operator saved 16 hours of rig time and USD 194,000 in direct costs.
Integrated Drilling Approach Achieves Single-Run Lateral, Saving 2.5 Days and USD 148,000 off AFE

**Achieve quality hole cleaning, minimize connection time**
When drilling the remote Shaybah oil field of southeastern Saudi Arabia, an operator wanted to drill a lateral section in one run with quality hole cleaning and minimized connection time. This required the operator to reduce flat time incurred through stuck pipe incidents, circulating bottom up timing, and wiper trips as well as maximize ROP and footage, which are usually limited by wellbore cleaning challenges.

**Develop integrated solution**
Schlumberger engineers recommended an integrated solution that included advanced cuttings surveillance, mud monitoring, and a robust rotary steerable system. The team suggested combining the PowerDrive Orbit RSS with the ShortPulse* integrated MWD platform because they would provide the directional control necessary to drill the lateral section in one run. The fully rotating PowerDrive Orbit RSS reduces drag, improves ROP, decreases the risk of sticking, and achieves superior hole cleaning.

In addition, the CLEAR service was used to monitor hole cleaning effectiveness and wellbore instability. Using the cuttings flowmeter, the service continuously weighs, measures, and analyzes cuttings reaching the surface. By comparing measured and theoretical volumes, the CLEAR service provides early detection of inadequate hole cleaning and excess returns caused by wellbore instability (caving) or damage. A Schlumberger mud specialist provided support to the mud engineer on the rig, ensuring that the mud system was in good condition during drilling.
Achieved drilling objectives, set new records

Using the integrated solution, the operator was able to steer the well trajectory into the reservoir zone with low tortuosity and increased ROP. The section was drilled 2.46 days ahead of plan with minimal stick/slip, shock, and vibration. The operator achieved optimal hole cleaning with cumulative cutting recovery of 84.4% and with 51% reduction of cumulative pills volume.

Additionally, a new field record for drilling a 6 1/8-in section with a stand-alone RSS was achieved—this operation’s average ROP was 91.3 ft/h, and previous jobs’ average was 72.3 ft/h. Footage increased to 1,978 ft/d compared with the previous record, 1,409 ft/d. The operator also reduced connection time by 60% toward the end of run and saved USD 148,000, or 32%, off AFE.

Compared to previous jobs, average ROP increased to 91 ft/h from 72 ft/h and average footage increased to 1,978 ft/d from 1,409 ft/d.
Find out more online at slb.com/CLEAR

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