Today’s industry challenges are impacting drilling success and overall system cost. Operators are faced with:

- Higher efficiency wellbores resulting in fewer required wells for reservoir drainage. Fewer wells spaced much farther apart means less offset data for pre-drill risk identification;
- Recognition that traditional pre-drill models are obsolete upon spudding a well due to geology and geomechanics changes from offset to new well;
- Increasingly complex reservoir drilling targets requiring more in depth knowledge;
- Unknown, but expected governmental regulatory requirements dictating some level of real-time data usage; and
- Continued pressure on existing in-house resources, which will only become more so with activity increases and increasing regulatory requirements.

As less and less offset well data are available, the quality of associated pre-drill models is being compromised at a time when it is needed most. The best option for offsetting these shortcomings is to use all drilling data generated during the well construction process to update models, allowing for the ability to forecast and mitigate potential problems on the fly.

**Working in real time**

Schlumberger has invested heavily to develop real-time capabilities, primarily for providing performance assurance during wellsite operations. Significantly reduced downtime, increased efficiency, and new levels of consistency in field operations are the result of implementing real-time operation support centers (OSC) across the globe. Additional benefits have been seen in accelerating field personnel competency through real-time coaching and mentoring, along with improved communications across all stakeholders.

The company is placing emphasis on using real-time capabilities to enhance the overall value derived from services. Recognizing operators may not have the resources to perform detailed drilling planning and real-time drilling data analysis in a consistent and high-value way, Schlumberger is using its well construction domain expertise to assist in the real-time “heavy lifting” for customers.

Integrated within a mature performance assurance infrastructure, domain expertise from across the drilling spectrum is gathered to create a premier drilling technical community. Working together with customers, these teams of experts assist in planning and upfront design of the wells drilled and also monitor and support wellsite operations in real time. Using enhanced value workflows, these teams use all of the static and streaming drilling data to model and predict potential risks to deliver up-to-date, advice/recommendations. The result is a high-value impact on an operator’s decision making process.
Optimizing wellbore mechanical conditions through remote monitoring of torque and drag

Challenging mechanical conditions and poor mud inhibition resulted in the need for a sidetrack on the Brava project in the Marlim field in the presalt Campos Basin offshore Brazil. Requirements for this sidetrack included completing the 2,150 m (7,054 ft), 30° 17 ½-in. section with water-base mud. As part of the drilling planning recommendations, an operations support engineer (OSE) was assigned to monitor the drilling mechanics conditions and make recommendations as needed.

While drilling at 2,370 m (7,776 ft), the real-time OSE recognized a change in the real-time drag measurements compared to the pre-drill mechanical earth model baseline and suggested increasing the mud weight. The mud weight was increased from 10.3 pounds per gallon (ppg) to 10.7 ppg, and the observed drag returned to the normal trend.

At 3,450 m (11,319 ft), the observed drag changed again from the expected trend, and the OSE recommended pumping a cleaning pill followed by a 10-stand short trip. The recommended actions were performed, and drilling conditions returned to normal. Before finishing the section, the OSE suggested that the mud weight be increased to 10.9 ppg and the fan readings on the mud rheology be increased.

When the section was completed, a short trip to the casing shoe was performed, demonstrating the well was in optimum mechanical condition, after which casing was run in the hole with no issues.

Real-time remote monitoring brings value in tight anticollision situation

An operator in Malaysia faced a difficult anticollision challenge in an 18 ½-in. hole section in a well that was near three other offset wells in an area that was known for poor build response.

For safety purposes, the plan had to be designed with tight tolerance no-go lines, and the Schlumberger OSC team was called to assist in 24-hr remote real-time monitoring, allowing the directional driller to remain more engaged on the rig floor and reducing the time required for projections and steering decisions.

During the execution, it was not possible to bring the angle to vertical, and the OSE projected that a hard tolerance line might be crossed. The operator stopped operations to re-plan the well with a new inclination. Drilling continued with both the rig and OSC teams continuously monitoring the ROP, magnetic interference in the surveys, and shocks and vibrations until the section was successfully completed.

Early washout detection saves a potential twist-off

In a case in the Middle East, the OSE noticed a drop in turbine rotation (turbine RPM) for both the measurement while drilling and rotary steerable tools while drilling 8 ½ in. section although standpipe pressure (SPPA) continued to increase.

The OSE intervened directly by informing the crew, operations team, drilling engineer, and the operator of these developments. The drop in turbine RPM suggested a washout in the string, but the contradictory increase in SPPA created doubt across the operator organization and service company field team.

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Because this trend had been observed before, the OSE was convinced of the existence of a washout above the tools or related to the surface equipment. Following the recommendation of the OSE, the crew checked surface system and mud parameters with data quality, noise, and other aspects accounted for and discounted. Mud weight had been gradually increasing, so mud mixing was stopped so the actual trend of SPPA could be monitored. The increasing trend continued even after stopping the mud weight increase.

Various charts and logs were prepared and sent to the operator to communicate the situation. The correlation between the flow and turbine RPM at various mud weights was discussed with field and client team.

In the end, the data told the story; this was without a doubt a washout situation with up to 150 GPM not passing through the tools. The operator decided to pull out of the hole. A washout was found in the portable ball circulating sub, a situation that was resolved, preventing a potential twist off.