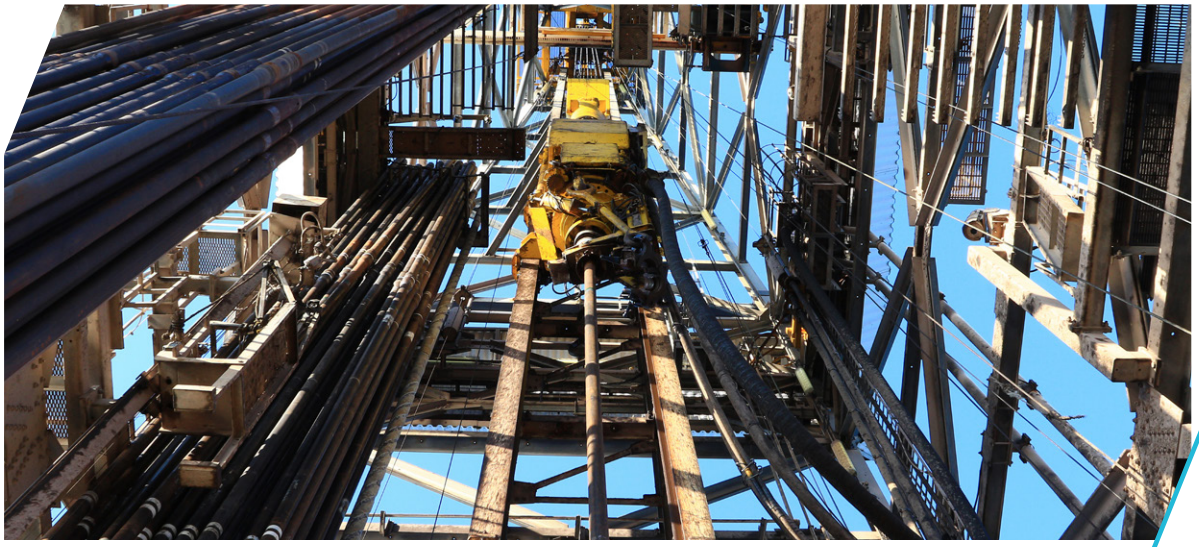
Drilling Engineering Services

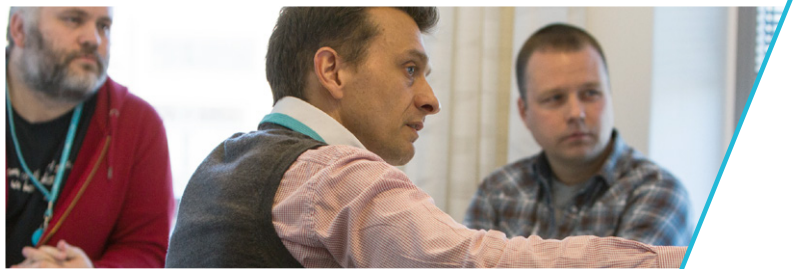
DRILLING ENGINEERING SERVICES LOOK-AHEAD AWARENESS

ENTER >>

Sekal

IDENTIFY AND AVOID **POTENTIAL DRILLING ISSUES**





Successful drilling requires effective control of the rig, a sound understanding of engineering principles, clearly defined drilling objectives and an experienced team ready to implement the well plan. Methods and practices may vary, but the ultimate goal is always to deliver a safely drilled, minimum-cost well that satisfies exploration or production requirements.

The success of drilling operations is influenced by factors such as geology, drilling equipment, temperature, pressure, casing limitations and hole size. Effective well planning and plan validation help to reduce the risk and uncertainty in these factors and prepare the team for any issues they might encounter while drilling.

Sekal models reveal much of what may happen in the wellbore and our drilling optimization service uses this insight to help reduce operational uncertainty and risk. Our approach makes it possible to optimize drilling and tripping tasks in tight margin conditions or in situations where downhole pressure fluctuations are critical to wellbore stability.

The forward-looking simulations that Sekal offers can be used to predict drilling problems and to assess the likely effects of remedial options. During real-time monitoring, operators can take a real-time snapshot of the well configuration and current mechanical and hydraulic profiles into the simulation tool from our DrillScene® software.

This unique characterization of real-time conditions removes the uncertainty in the assumptions made during conventional simulations. The drilling team can use this approach to perform look-ahead and “what-if” simulations to evaluate parameter settings and consider changes if there are indications of deteriorating downhole conditions.

SEKAL DRILLING ENGINEERING SERVICES
HELP REDUCE RISK AND ELIMINATE INVISIBLE LOST TIME DURING DRILLING OPERATIONS BY APPLYING PRE-OPERATION AND LOOK-AHEAD WELL SIMULATIONS.

BETTER PLANNING REDUCES RISK AND ELIMINATES INVISIBLE LOST TIME

Sekal Drilling Engineering Services help reduce risk and eliminate invisible lost time during drilling operations by applying pre-operation and look-ahead well simulations.

Our advanced dynamic modeling methods can accurately characterize wellbore conditions and capture the combined, complex dynamic effects that occur during transient conditions such as temperature evolution, pump start-ups, flow changes, string accelerations, and gel breaking. The Drilling Engineering Services team applies this understanding to verify and tune drilling parameters, improve drilling plans, increase the efficiency of critical operations, and help control well costs.

The Sekal Drilling Engineering Services team delivers:

- Transient, dynamic models that outperform conventional planning software.
- High-quality simulations for realistic performance optimization.
- Forward-looking pump start-up in narrow mud weight windows or wells with stability issues.
- Clear understanding of cuttings transport for optimized hole-cleaning.
- Optimized tripping speeds based on dynamic surge and swab simulations.
- Downhole tool conversions in situations where pressure spikes can cause well damage.
- Unique cuttings modeling, that accounts for transient phenomena during drilling such as connections, RPM, flow and ROP changes.
- String weight verification to run casing/liner and estimate hook load and buckling resistance.

ADVANCED SIMULATIONS

Sekal software creates realistic, dynamic downhole pressure simulations, plus hole-cleaning and temperature evolutions. The drilling team can use this information to optimize drilling parameters and operate safely close to upper and lower limits.

Our unique cuttings transport simulation makes it easy to define optimum hole-cleaning parameters. These detailed simulations cover cuttings bed generation and estimated bed height, cuttings bed location and movement along the wellbore, local changes to flow patterns across the bed, and cuttings bed erosion/removal.

Simulating flow, RPM and ROP scenarios reveals the optimum drilling parameters, making it possible to eliminate wiper trips when conditions are good.

Combining our cuttings transport simulations with DrillScene software enables friction monitoring and the development of an effective hole-cleaning strategy.

SEKAL SOFTWARE CREATES REALISTIC, DYNAMIC DOWNHOLE PRESSURE SIMULATIONS, PLUS HOLE-CLEANING AND TEMPERATURE EVOLUTIONS. THE DRILLING TEAM CAN USE THIS INFORMATION TO OPTIMIZE DRILLING PARAMETERS AND OPERATE SAFELY CLOSE TO UPPER AND LOWER LIMITS.

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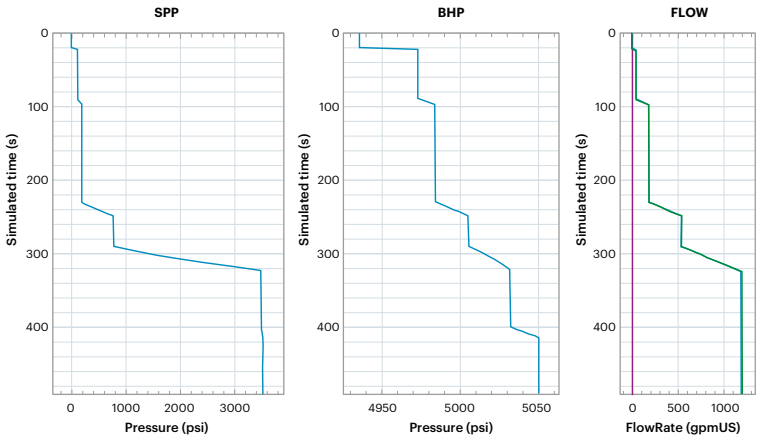
OUR UNIQUE TRANSIENT CUTTING TRANSPORT MODEL DEFINES OPTIMUM HOLE-CLEANING PARAMETERS, WHICH ARE VITAL IN COMPLEX AND EXTENDED REACH WELLS

PREDICT PROBLEMS, REDUCE RISK

Our forward-looking simulations can be used to predict drilling problems and to assess the likely effects of remedial options. During real-time monitoring, DrillScene can provide a snapshot of the downhole conditions and mud properties to forecast hole cleaning, ECD, and temperature changes for the next depth/time interval.

The effects of alternative actions to improve current downhole conditions or optimize drilling/tripping operations can be simulated. For example, Sekal can conduct simulations that predict dynamic pressure pulses when flow is restricted, pressure builds up, and when compressed fluid is released during tool conversions.



/ The figure above clearly shows the characteristic steady state pressure calculations for each increase in flow rate. The model uses a fixed temperature profile (in this case the geothermal gradient) and makes no consideration of pipe filling, pump acceleration, gel breaking, temperature changes, fluid compressibility and/or transient conditions when changing flow rates.

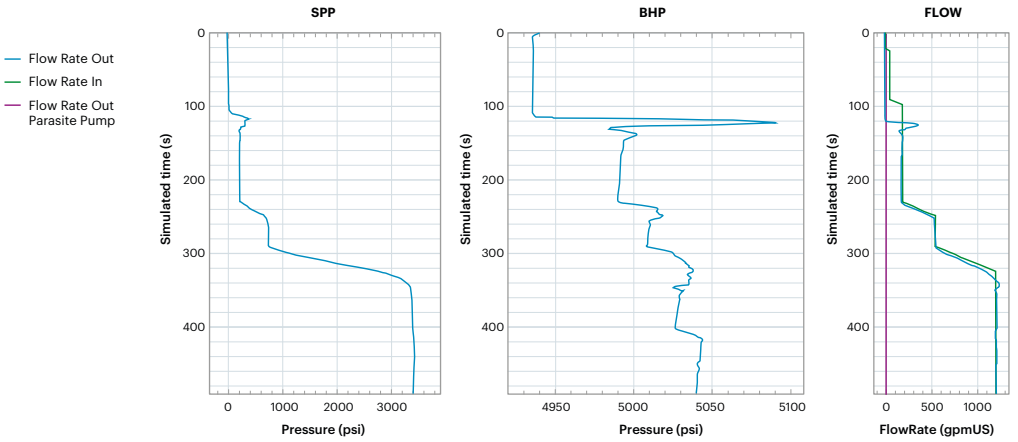
OVERCOMING WELLBORE INSTABILITY IN A NORTH SEA FIELD

The first borehole in a six-well North Sea drilling program encountered severe stability problems: excessive circulation failed to clean the 12¼-in sections, which caused liner run problems, while pack-off and hole collapse resulted in a 6-in rather than 8½-in reservoir section hole.

Sekal conducted a post-well analysis and prepared pre-well and look-ahead simulations for the next well in the campaign. This approach, which combined Sekal Drilling Engineering Services and DrillScene real-time forecasting and trend analysis software, delivered a new pump start-up procedure and modified drilling parameter settings.

These changes helped to ensure that the second well was cleaned to TD with no liner run problems, pack-off or hole collapse. The initial well plan was for 110 days, but drilling operations were completed to the planned hole size in just in 61 days (P10).

THE SEKAL SOPHISTICATED AND DYNAMIC SIMULATOR SHOWS THE DIFFERENCE BETWEEN A CONVENTIONAL STEADY STATE PUMP STARTUP AND A DYNAMIC STARTUP.



/ In this figure, the Sekal dynamic simulator is used. This simulator uses coupled geomechanical, hydraulic and geothermal models. The transient simulator shows the signature, dynamic gel breaking BHP pressure peak at pump startup. The Flow graph shows the peak when the return flow starts to appear at surface. With this information the DES consultant can assist and advise when operating in narrow mud weight windows and when designing pump startup and tripping speed parameters.

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IMPROVING THE OPTIONS FOR CUTTINGS TRANSPORT IN DEVIATED WELLS

A deviated exploration well with a challenging trajectory and multiple targets encountered severe problems during POOH operations on the 12¼-in section. These problems led to a stuck pipe situation inside the intermediate casing string. Sekal post-well analysis highlighted the root cause of the issue: inadequate cuttings transport performance. Our detailed drilling and planning validation study indicated the deficiencies in the operational plan.

Sekal Drilling Engineering Services used a transient cuttings transport model to review the parameters used to drill the lateral well. The results highlighted severe cuttings transport issues in two higher inclination areas of the wellbore (a). Analysis showed that the operational envelope for remedial action was limited in terms of rig capacity and fluid optimization. Extended periods of circulation and backreaming had little or no effect in eroding the large cuttings beds (b and c).

A plan validation analysis conducted by Sekal Drilling Engineering Services would have enabled the operator to optimize the drilling program in terms of drillstring and trajectory design prior to the operational phase.

This would have overcome the rig limitations and left scope for further adjustment to drilling parameter settings.

The operator used the recommendations from this review to adjust drill pipe selection and trajectory. Additional fine-tuning of the drilling parameter settings was conducted during the operation with support from Sekal Drilling Engineering Services.

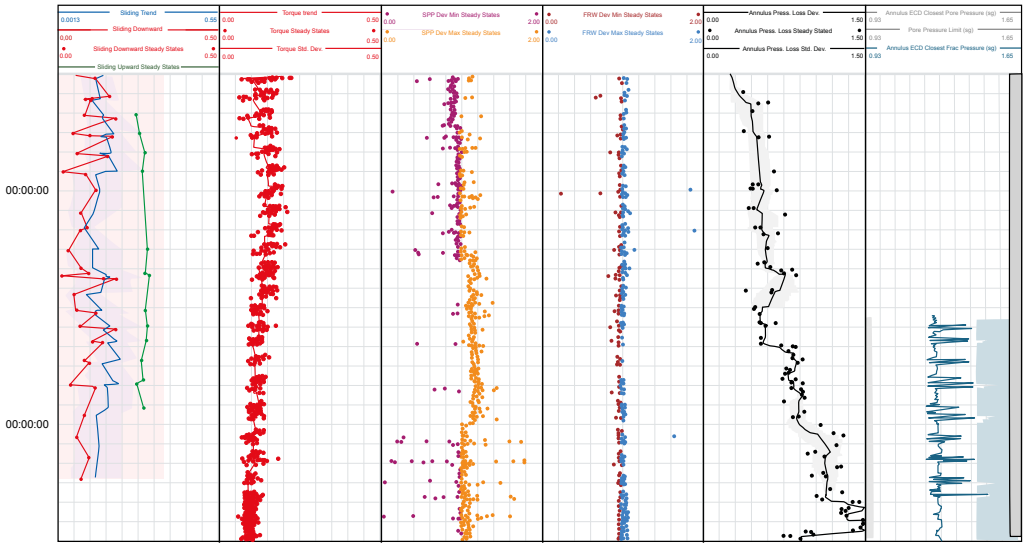

Fig b/ Long-term trend of increasing Annulus Pressure Loss (over 48 hours) due to poor cuttings transport.

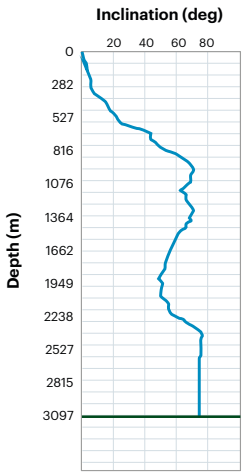

Fig a/ Well trajectory

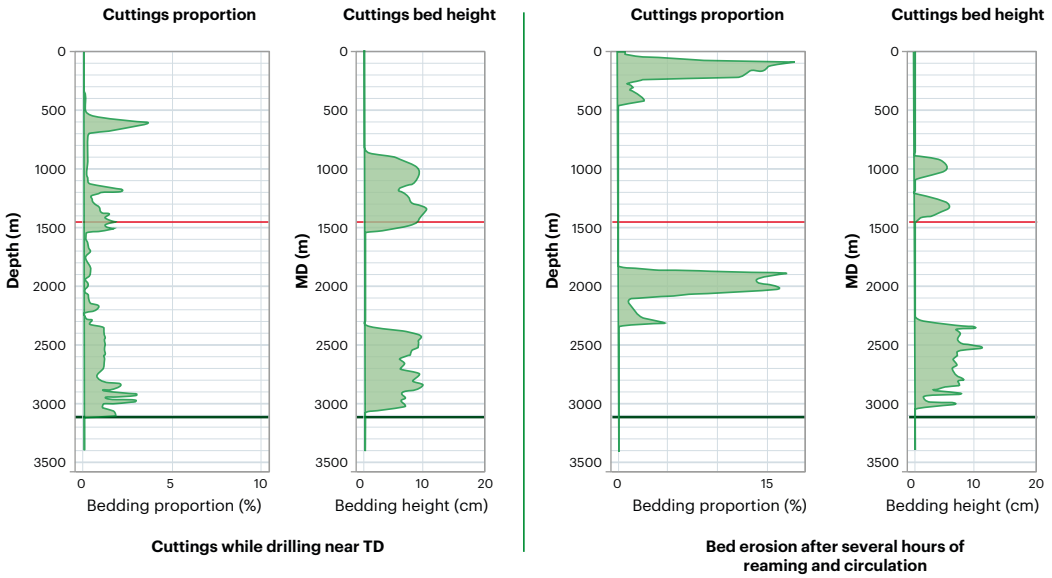

Fig c/ Calculator after several hours reaming at TD

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THE POWER OF DYNAMIC MODELING

Sekal technology is based on three tightly coupled real-time dynamic models – **hydraulic, mechanical and thermodynamic** – that simulate wellbore condition and characterize improvement or deterioration during drilling. These models continuously assess drilling performance, borehole conditions, and associated risks based on real-time symptom detection.

Our products offer real-time modeling of key drilling variables such as hook load, surface torque, cuttings transport, pit volumes, standpipe pressure and dynamic ECD. They also calculate fluid temperature and density evolution, mechanical and hydraulic friction in the wellbore, all of which highlight changing hole conditions and potential problems.

Sekal AS is an international technology company offering uniquely powerful software systems and expertise for real-time dynamic monitoring and integrated drilling process automation in the oil and gas industry. We help clients to control drilling activities from their operations centers. We also drive down costs and reduce risk exposure through automation and by moving personnel from the rig site to the office.

Our aim is to be recognized as an industry leader, setting the standard for real-time monitoring and automation of drilling operations and shaping the future of drilling technology.

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