EXEBENUS
SPOTTER

Optimize ROP in real time and increase drilling and operational efficiency

Rate of penetration is a major contributor to drilling time and costs. The Exebenus Spotter™ Real-Time ROP Optimization agent uses multi-parameter machine learning to advise and help crews make informed decisions that will improve drilling speed and efficiency.

RATE OF PENETRATION IS A MAJOR FACTOR IN CONTROLLING DRILLING COSTS

In general, optimizing the rate of penetration (ROP) in drilling is achieved by adjusting the weight on bit (WOB), RPM and fluid flow. The allowed ranges for these parameters are typically obtained prior to the operation using complex, time consuming simulation models.

Simulation models depend on the input of configuration parameters that cannot be predetermined accurately. In addition, there are many uncontrollable factors such as bit dulling, vibration, buckling and variable formation strengths, all of which need to be considered when trying to optimize ROP. Consequently, the ability to plan and make effective drilling adjustments to enhance ROP is largely dependent on the experience of the rig crew.

MACHINE LEARNING OFFERS BETTER, MORE RELIABLE ADVICE IN REAL TIME

The Exebenus Spotter RealTime ROP Optimization agent is unique in its ability to decipher the relationships between controllable and uncontrollable drilling parameters. Using machine learning, the agent provides parameter recommendations for the drilling crew in real time. No complex mathematical models and hard-to-get configuration data are required. Just plug the agent into your WITSML data stream and be amazed at the output.

Machine learning is the perfect tool for the job of interpreting and seeing the relationships between multiple parameters. The Exebenus ROP optimization agent adapts to well formations, mud flow, BHA and bit type, and identifies combinations of factors and changes to parameters that may not be obvious to the human operator relying on traditional routines.

The real-time advice provided by the Exebenus ROP optimizer has been shown in field operations to increase ROP and reduce drilling time significantly.

EXCEPTIONAL BENEFITS

> Real-time multi-parameter optimization

> Completely plug-and-play and out-of-the-box solution

> 10-30% improved ROP overall

> Connects to any WITSML stream

> Parameter boundaries settings are flexible and changeable

> No pre-training of models required

> Reduces risk of human error

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REAL-TIME ROP
OPTIMIZATION AGENT

ROP is optimal when WOB, RPM and Mudflow recommendations are followed
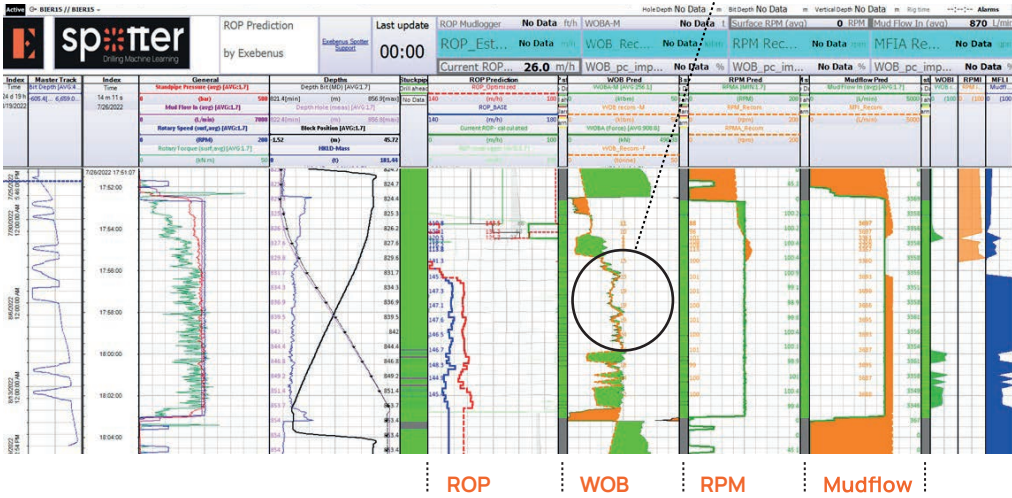
Exebenus Spotter calculates the optimized ROP and the ROP baseline. When the two logs coincide, ROP is optimal. If they do not coincide, the WOB, RPM and mud flow recommendations shown (in orange) are used to further optimize ROP. In this operation, the rig crew optimized in two steps as seen by the ROP jump at 5668 m depth.

ROP   WOB   RPM   Mudflow

⌐ Optimized ROP   ⌐ Current ROP   ■ Recommended increase   ■ Recommended decrease

OUT-OF-THE-BOX SOLUTION

Exebenus ROP Optimization agent is an out-of-the-box solution, adaptable to any field or well type using standard WITSML setups and familiar WITSML viewers. Because it adapts to well formations, BHA, bit type and mud flow, the solution reduces the risk of human error by removing the need for manual configuration. The agents provide additional logs to be visualized in the WITSML showing recommended RPM, WOB and mud flow to obtain the optimal ROP. As the recommended parameters are implemented, the agent updates in real time, reflects the new situation, and continues to give advice.

ROP Optimization	
Well trajectory	0-90 deg*
Operation types	Drilling
Hole sizes	8.5" – 17.5"
Bit type	PVC, roller cone, diamond bit
Depth range	0 – 6000 m*
Formation type	Sandstone, clay, limestone, shale

Data Input / output	
Input	Output
Bit depth	ROP Base line
Hole depth	Optimized ROP
Surface RPM	Recommended RPM
Surface torque	Recommended WOB
Weight-on-bit	Recommended mud flow
Standpipe pressure	
Mud flow rate in – volumetric flow rate	
Mud density in	

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