EXEBENUS
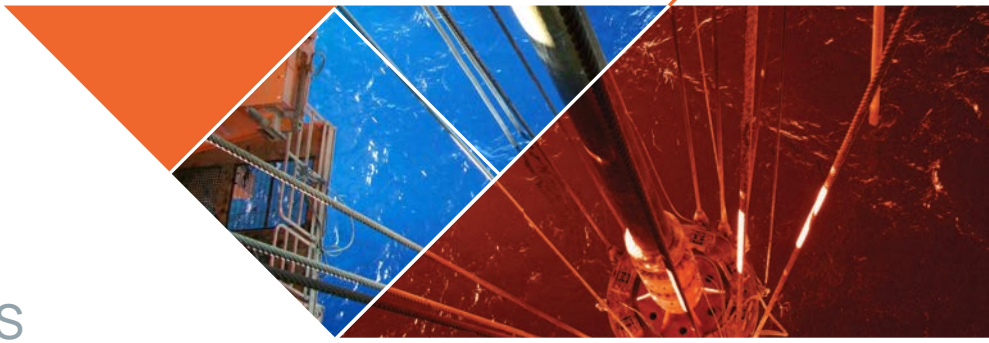## SPOTTER

STUCK PIPE AGENTS

Increase productive time with real-time predictions of high-risk conditions

Making informed decisions requires clear, moment-to-moment awareness of the situation downhole. Exebenus Spotter™ stuck pipe machine learning agents use data available in all well operations to signal trends that can lead to stuck pipe events.

STUCK PIPE A KEY COST DRIVER

Stuck pipe costs the industry hundreds of millions of dollars in non-productive time (NPT) annually. The problem occurs in all types of well operations, from tripping and reaming to steady drilling.

PREDICT AND PREEMPT HIGH-RISK CONDITIONS

Exebenus Spotter stuck pipe agents predict, in real time, high-risk conditions such as pressure differentials, hole cleaning conditions and mechanical sticking issues that, without intervention, typically result in stuck pipe situations. Exposing these hazardous conditions early gives your rig crew time to mitigate the situation and ensure uninterrupted safe operations.

EXCEPTIONAL BENEFITS

> Out-of-the-box solution

> 1,5 - 24 h predictive awareness

> Plug and play with existing WITSML viewer

> Identifying the reason for stuck pipe

> 96% success rate in drilling risks prevention

> No pre-training of models required
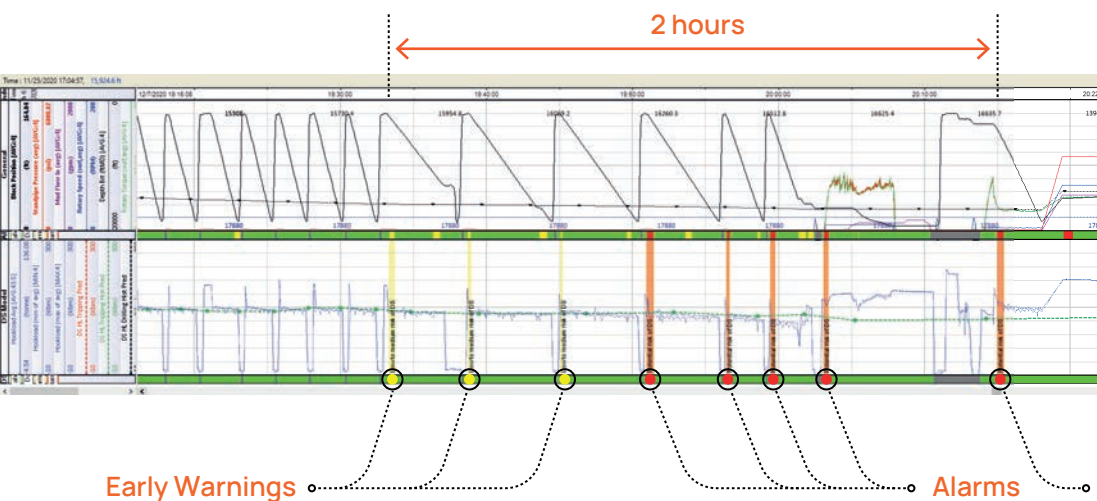
2 hours

The differential sticking agent provided three warnings (yellow) before issuing an alarm (red). The first warning was given 2 hours before the pipe got stuck.

Early Warnings   Alarms   Stuck Pipe

PLUG AND PLAY DEPLOYMENT

Exebenus Spotter agents have been run on some 200 wells of various types located in different basins and regions around the world. Our machine learning agents are an out-of-the-box solution. They are supplied in one package, but work independently to solve a variety of stuck pipe scenarios. The agents consume real-time or historical WITSML data and provide log curve (WITSML data) output. To minimize user training, they integrate with existing real-time WITSML viewers and operation center workflows to monitor, analyze and advise your rig crew. Limited configuration data makes Exebenus Spotter perfect for monitoring large drilling fleets.

SMART USE OF REAL-TIME DATA

To create easily understandable and trustworthy predictions, the machine learning agents use parameters that are familiar to engineers and have easy-to-read color coding and text information. As the agents provide predictions, their analysis is presented in the monitoring display as trends, warnings and alarms related to the predicted problem.

The sensitivity level of each agent's warning and alarm setting is configurable to provide engineers with the best possible risk awareness. An agent's predictive time depends on the nature of the operation, the sensitivity configuration, and the type of look-ahead signs that exist. A typical setup gives the engineer three warnings prior to raising the alarm.

In addition to the Exebenus Spotter stuck pipe agents, the software issues alarms when data is missing or the connection to the rig is lost.
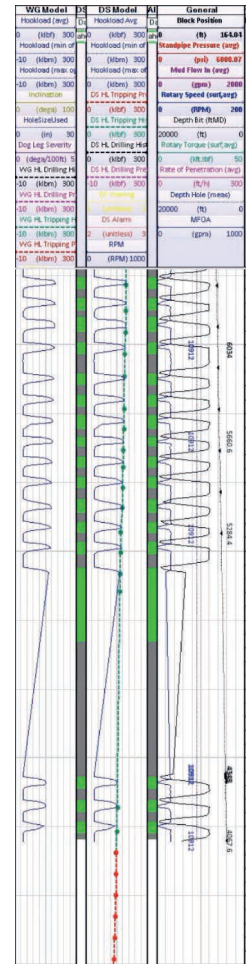
Data gaps occur during operations for various reasons. Exebenus Spotter agents are developed to handle such situations

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Differential sticking

Mechanical sticking

Hole cleaning

Predictive time

Up to **24** hours ahead

Input data

Time, bit depth, hole depth, hookload, flow rate, RPM, block position

Time, bit depth, hole depth, hookload, flow rate, RPM, block position, trajectory

Time, bit depth, hole depth, hookload, flow rate, RPM, trajectory, mud density in, rate of penetration, stand-pipe pressure

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THE POWER OF EXEBENUS SPOTTER AGENTS

Exebenus Spotter agents are a cloud-based, stand-alone software as a service (SaaS) solution. The agents can be hosted on a public cloud (e.g. Microsoft Azure), installed on your corporate cloud or on your premises.

The agents are designed based on our deep understanding of drilling and completions operations and the associated data.

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