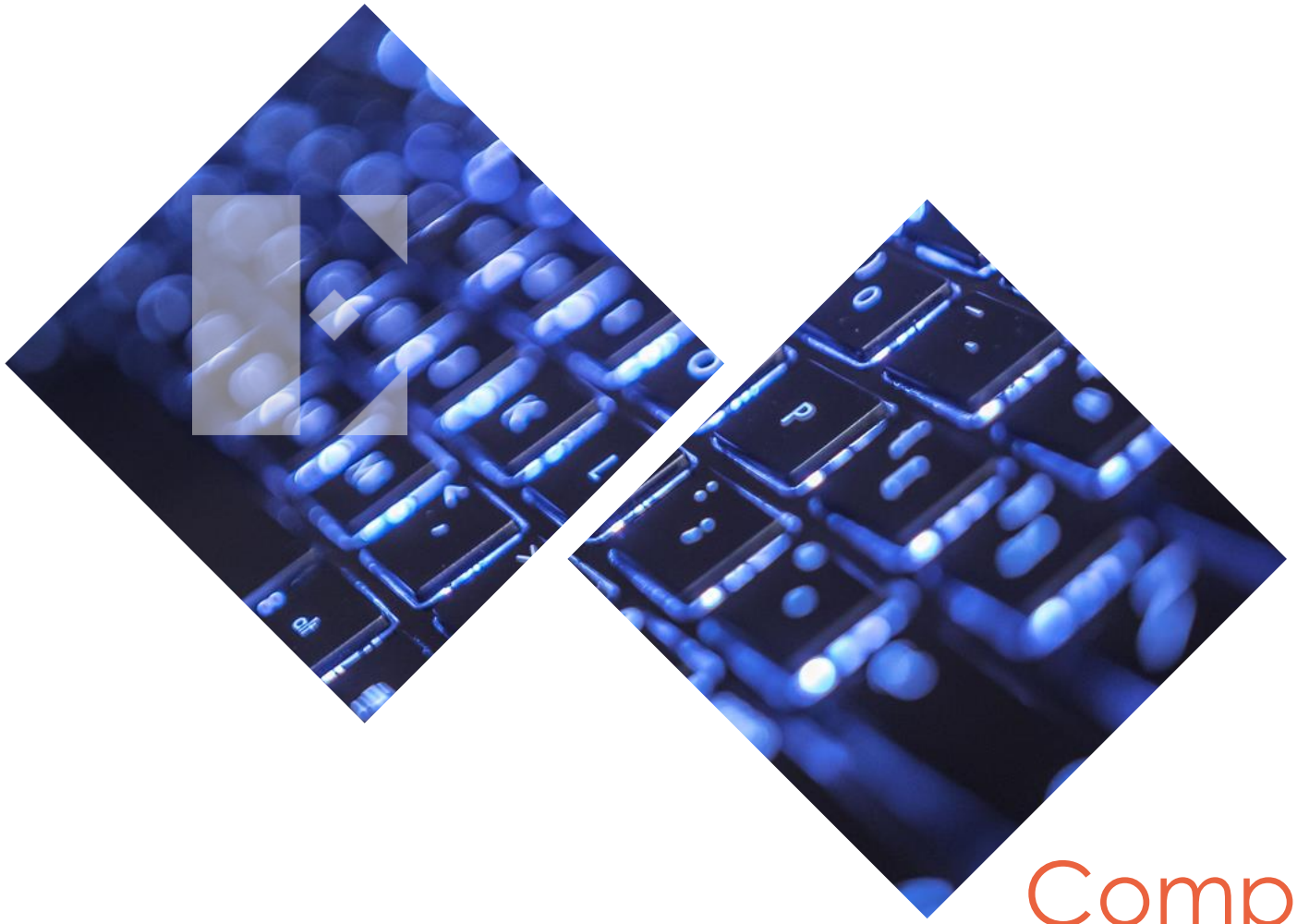
EXEBENUS

EXEBENUS PULSE®

CASE STUDIES

31 May 2021



Compare and contrast operations to learn and improve next operation

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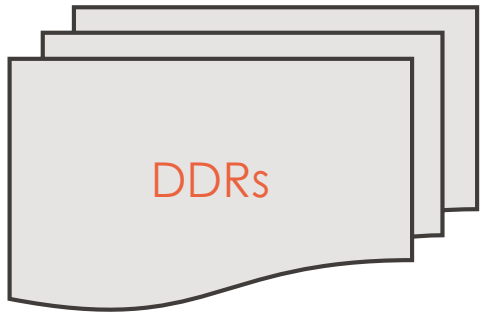
Example
Multiple documents and multiple entries

PLANNER

Perforate 9-7/8" Liner at +/- 5,720' MD on TCP
P/U TCP Assembly
TIH w/ TCP to 5,720
Correlate Guns on depth
P/U Flow Head / Test to 5,000 psi
Establish circulation



SID

Operations

1.

Perforate 9-7/8" Liner at+/- 5,720' MD

A. Hold JSA to cover running TCP assembly. Document on IADC.

B. M/U TCP gun assembly for B lower perforation.

- Flow check well prior to TIH.
- 60 fpm max trip speed.

C. Place TCP gun on depth at +/- 5,720' MD (5,825' DPM) and mark pipe.

- Apply right hand rotation and set Champ Packer with 20K weight down. Mark pipe with packer set position.
- Confirm top valve on flow head is closed. Insert Drop Bar into 15' pup on top of flow head.
- Make up surface flow control head and surface lines.
- Close annular and ensure lower valve on flow head is open. Apply 300psi to annulus. Slowly strip up to open packer bypass. When pressure bleeds to zero, bypass is open. Mark pipe with Bypass Open position.
- Pressure test flow head and surface lines.
  - Close lower valve on flow head and pressure test surface lines to 5,000 psi for 5 minutes.
    - Acceptance criteria is 2.5% pressure loss over 5 minutes with a decreasing pressure loss trend.
  - Bleed off pressure and open lower valve on flow head.

D. Establish circulation and record pressures at the following rates as a baseline:

- 1 bpm_____ psi
- 2 bpm _____ psi
- 3 bpm _____ psi
- 4 bpm _____ psi

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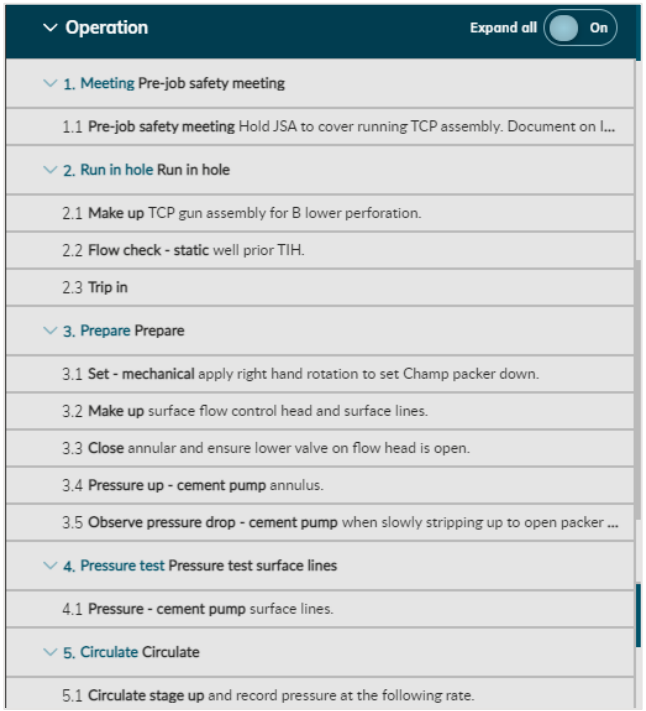

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Example
Lack of consistency

RIG TEAM A

Operational risks
- Alternations of plans.
- Focus on ECD
- Hole cleaning/washouts
- Well control
- Stuck pipe

HSE risks:
- Respect barriers/Red zone on drill floor.
- Work on two levels is not allowed if any risk of falling objects to lower level.
- Ensure good communication between all involved parties.
- Use of manual tools, slips, dog collar etc.

RIG TEAM B

Major risks
- Tool failure
- OBM spill to sea, OBM cutting handling & weather
- Hole instability
- Getting stuck/hanging up at shoe
- Packoff
- Stringers &vibrations
- Losses

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Example

Best practice

1 PROCEDURE

Condition the LSOBM prior to pumping displacement. Circulate minimum 1,5 x BU at as high rate as possible with max 120 bar SPP. (Simulations indicate 1000 – 1500 lpm)

2 PROCEDURE

- Condition LSOBM prior to pumping displacement.
  - Circulate min. 1.5 x BU at **750 lpm**.
  - **Max rotation 40 rpm**.

3 PROCEDURE

- Condition LSOBM prior to pumping displacement.
  - Circulate min. 1.5 x BU at **750 lpm**.
  -

The example is taken from a lower completion run that had to be re-run 3 times in 1 week due to a fish in the hole.

ACTUAL

Rig Circulated with 1100 lpm/100 bar thus optimum circulation rate would be about 1500 lpm.

LOST TIME

Loss of rig time:	45 min
Potential loss of rig time:	2 hours

ADDITIONAL RISK

Rig crew loose confidence in procedure operational constraints

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Example
The value of tagging

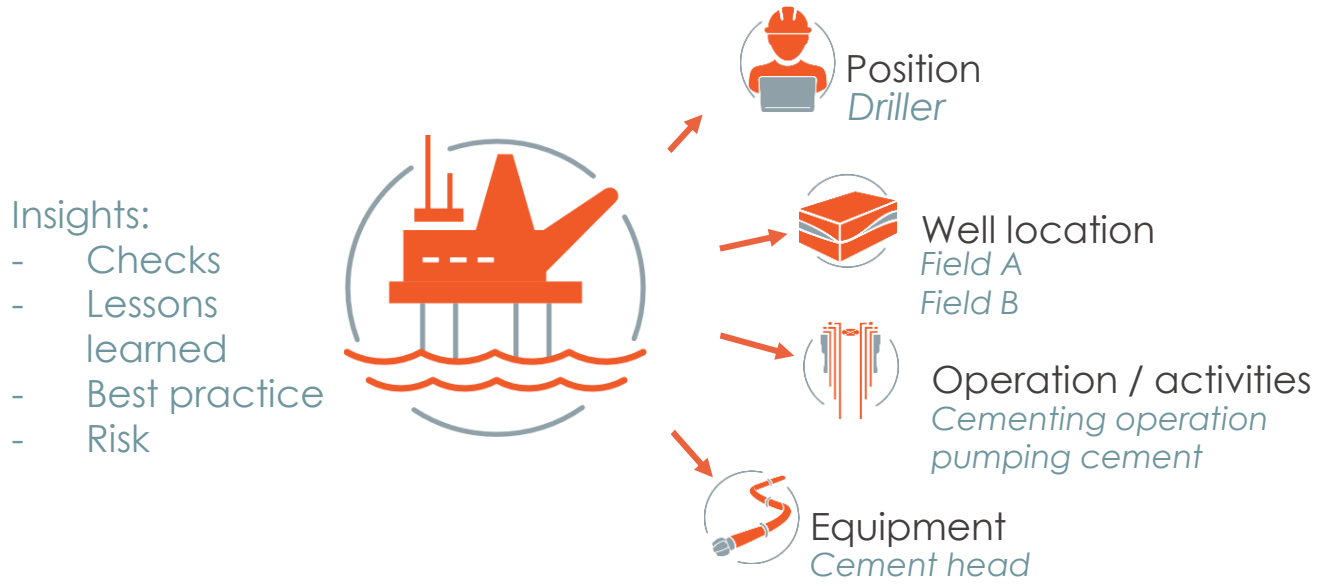
How would the same operation change… if you chose a different equipment supplier … same operation on a different rig?

Equipment related

- Activities: ~ **60%**
- Checks: ~ **40%**
- Risks: ~ **27%**

Activities related

- Checks: ~**50%**
- Risks: ~ **8%**



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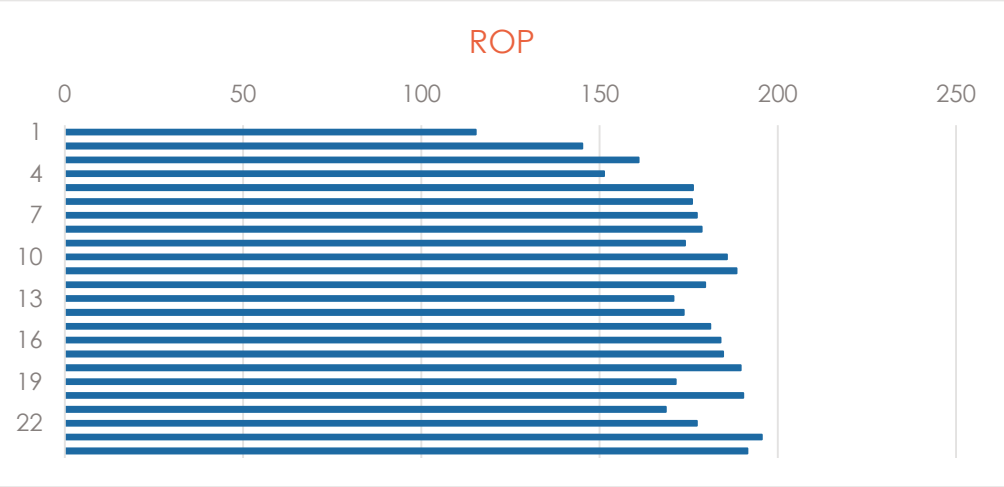
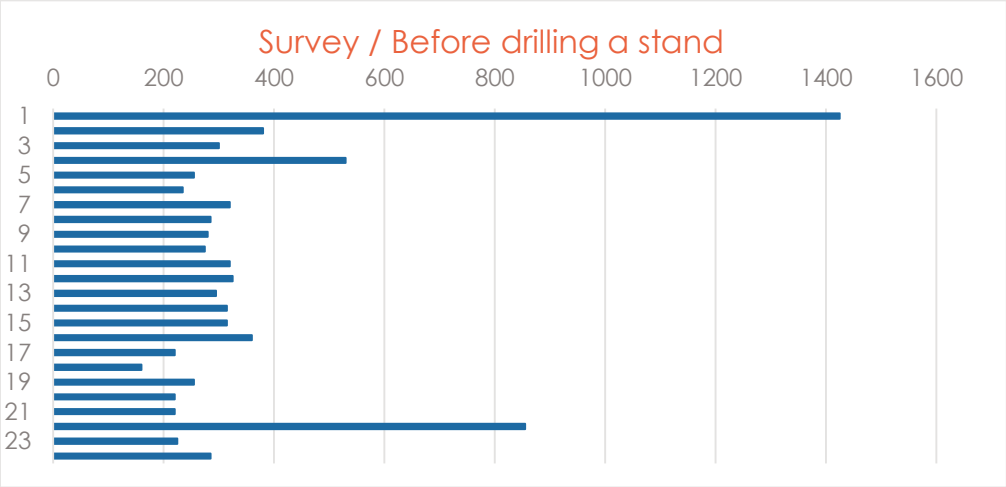
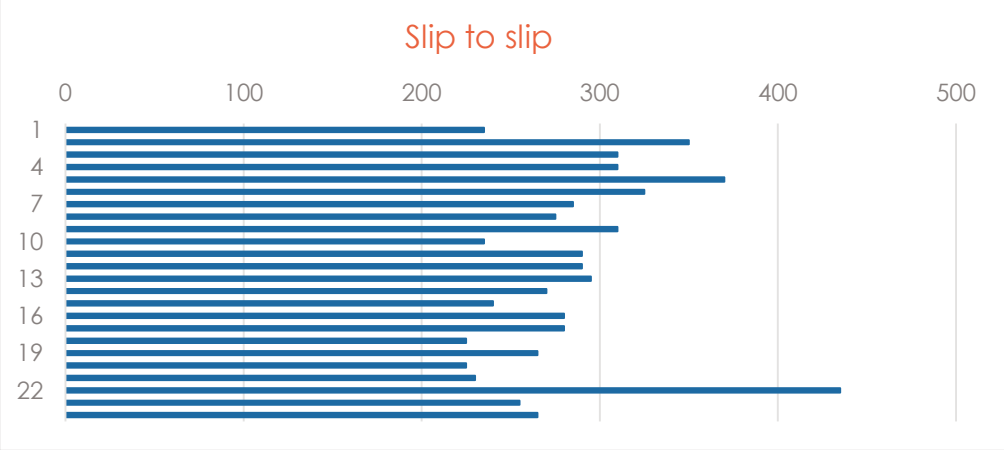
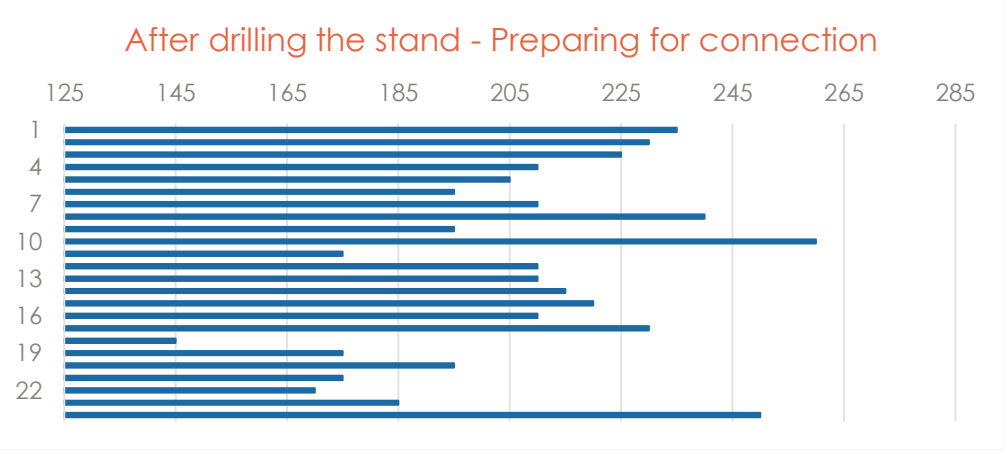
Example
Drilling Invisible Lost Time (time vs stand #)









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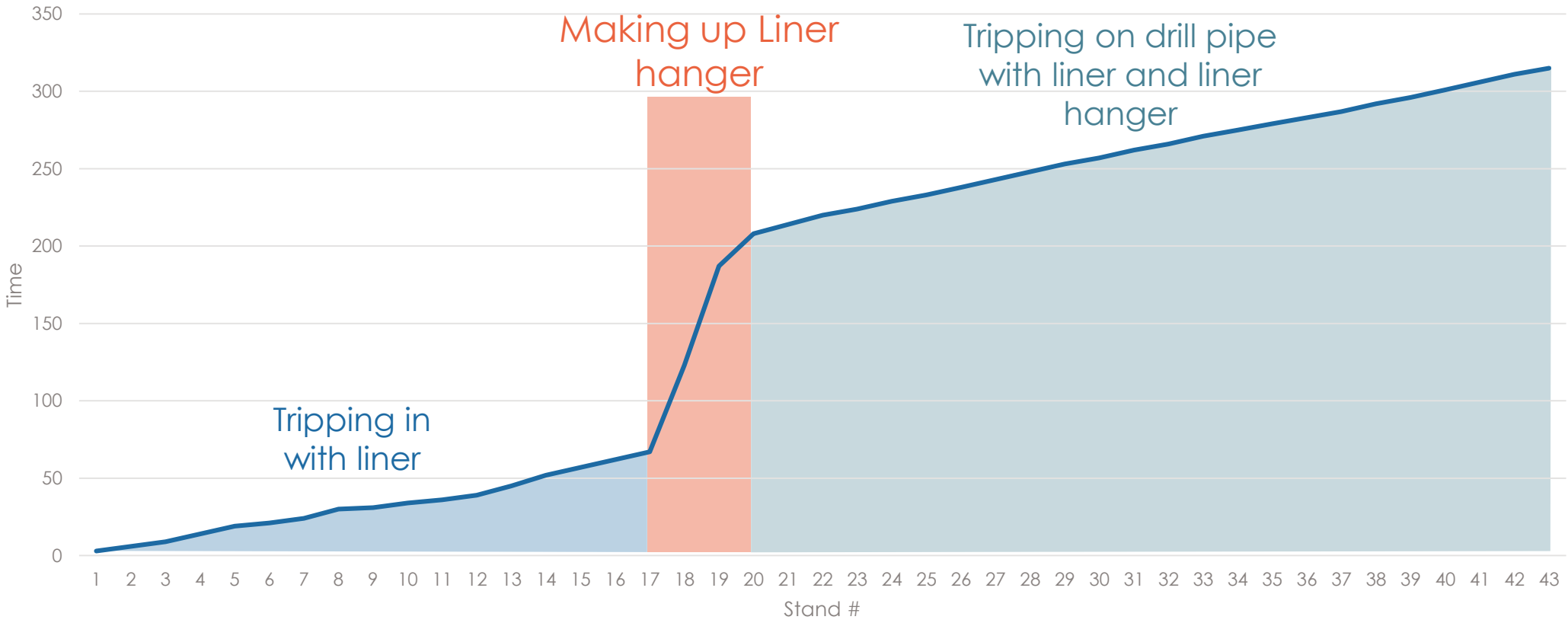
Example
Running Liner Invisible Lost Time (stand # vs time)



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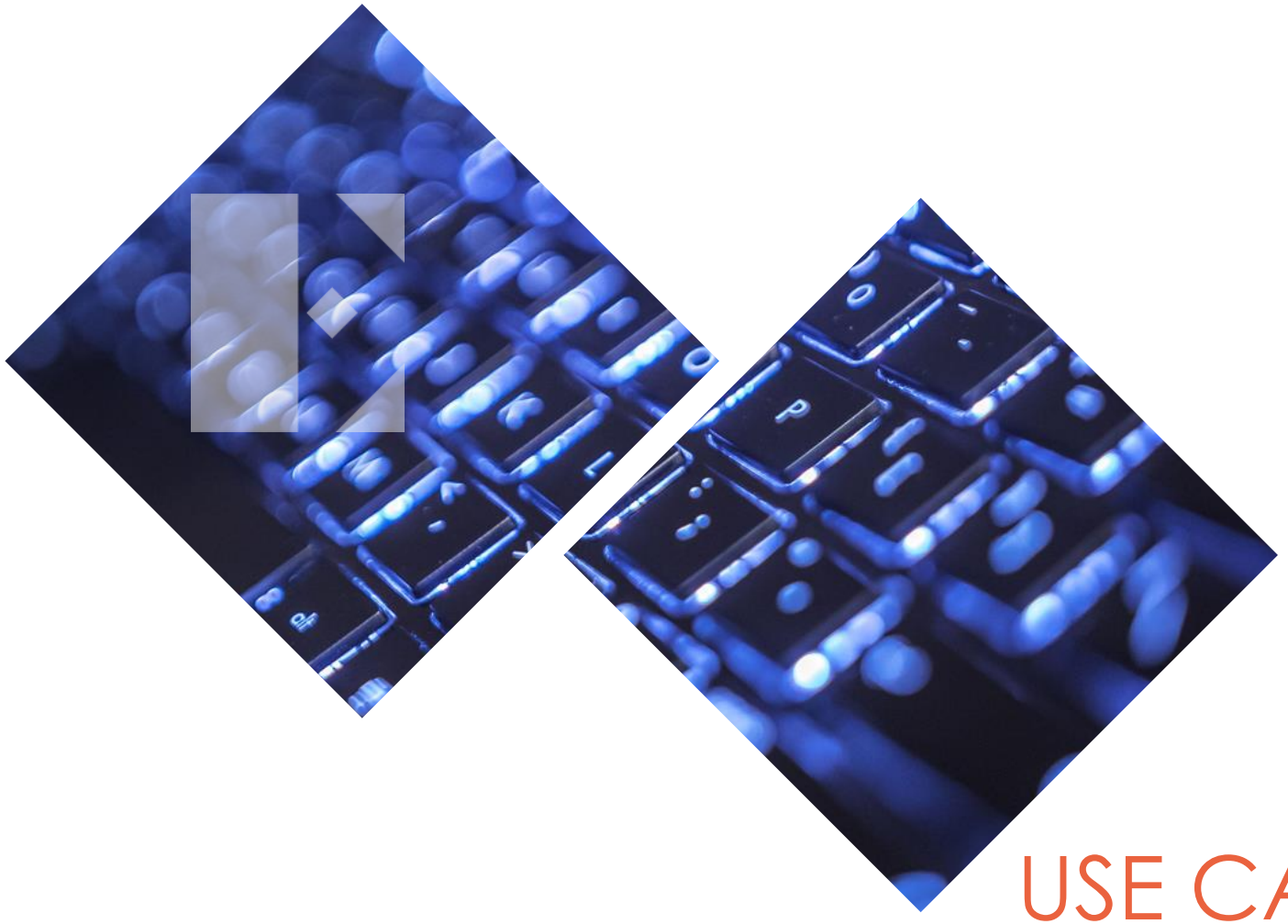
EXEBENUS CURRENT ML™

USE CASES



USE CASES

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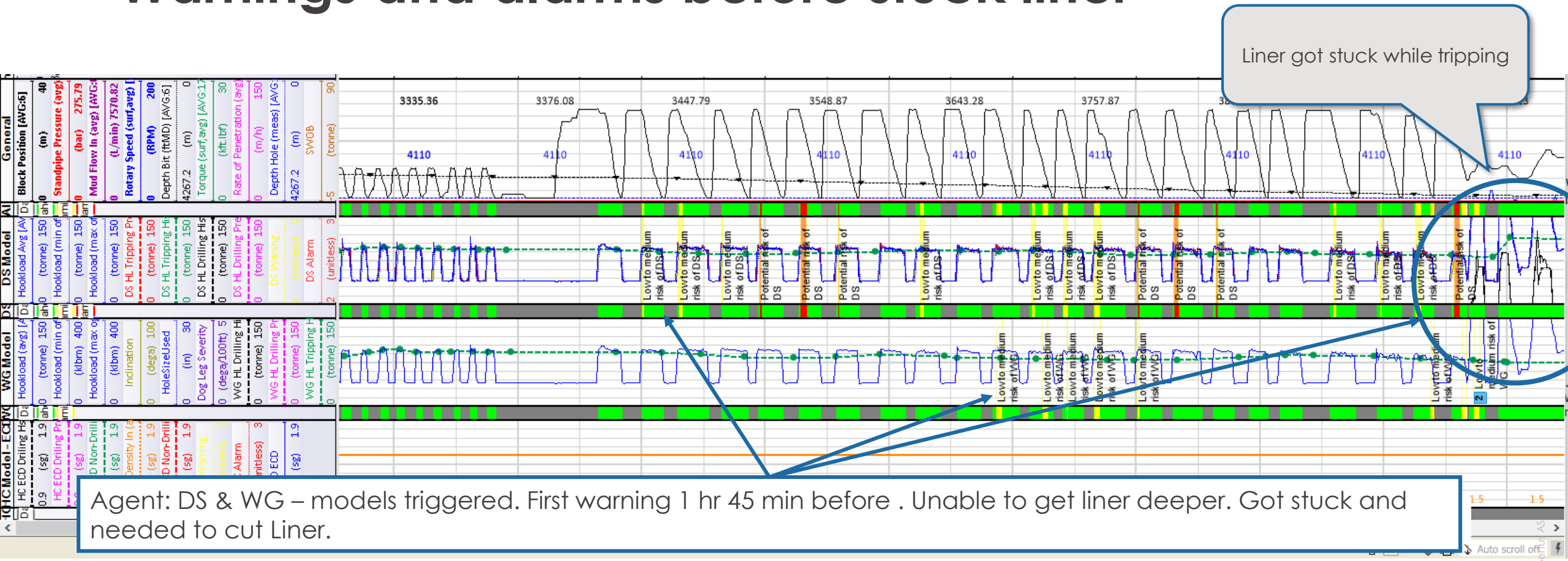
Case 1
Warnings and alarms before stuck liner



Agent: DS & WG – models triggered. First warning 1 hr 45 min before . Unable to get liner deeper. Got stuck and needed to cut Liner.

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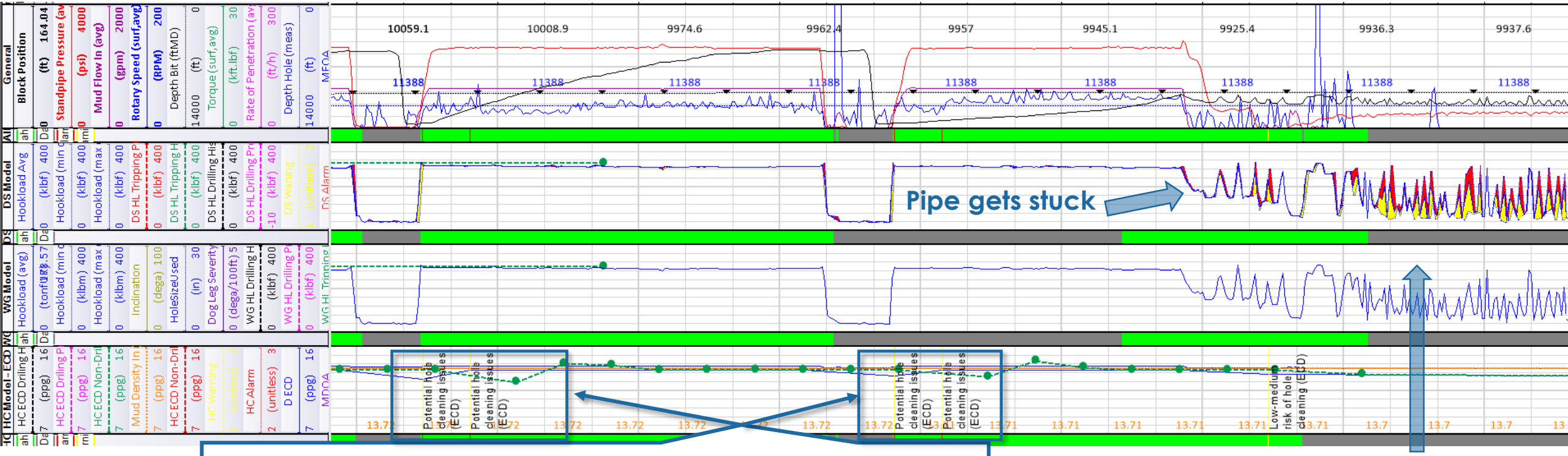
Case 2
Stuck pipe reported as pack-off



Agent triggered: Hole Cleaning (HC) agent. Provides "Potential Hole Cleaning Issues (ECD)" warnings prior to the stuck pipe – 1 h 15 mins & 1 h 10 mins ahead, followed by further warnings 30 & 25 mins ahead.

Working string & jarring

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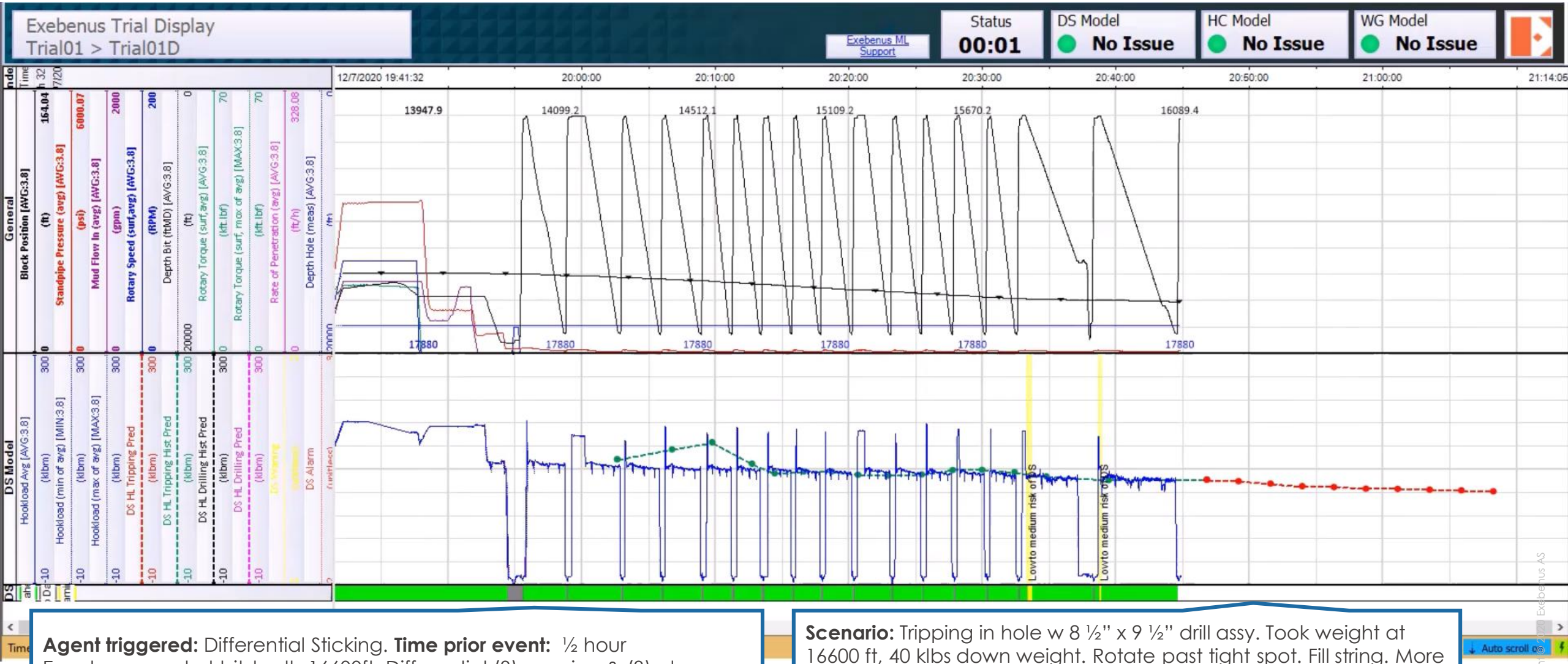
Case 3

TIH 8 ½"x 9 ½"Drill assembly, multiple DS warning/alarms prior tight spots



Agent triggered: Differential Sticking. **Time prior event:** ½ hour
Event occurred at bitdepth 16600ft. Differential (3) warning & (3) alarms triggered before tight spot

Scenario: Tripping in hole w 8 ½" x 9 ½" drill assy. Took weight at 16600 ft, 40 klbs down weight. Rotate past tight spot. Fill string. More tight spots further down. Managed to work pipe to 17892 ft. Jarring and pipe eventually stuck. Liner shoe at 16056 ft.

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Customer engagement levels

Demo
The purpose of a live demo is to show case and discuss some of the key capabilities of Exebenus Current ML agents in interaction with you.

01

Trial
With a minimum risk, cost and exposure we trial Exebenus Current ML agents using your historical WITSML data.

02

Pilot
Perform live tests on processes and capabilities of Exebenus Current ML agents on your own live data. We will provide introduction training for selected users.

03

Implementation
During a few weeks Exebenus Current ML Agents is setup and integrated with your company's standards and processes.

04

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EXEBENUS

Thank you!

Mats Hermansen
mats@exebenus.com

Shuhei (Sean) Oda
shuhei.oda@sumitomo.com

Siddharth Setia
siddharth.setia@sumitomo.com

Live Pulse
EXEBENUS
SUBSCRIBE TO OUR PODCAST

www.exebenus.com