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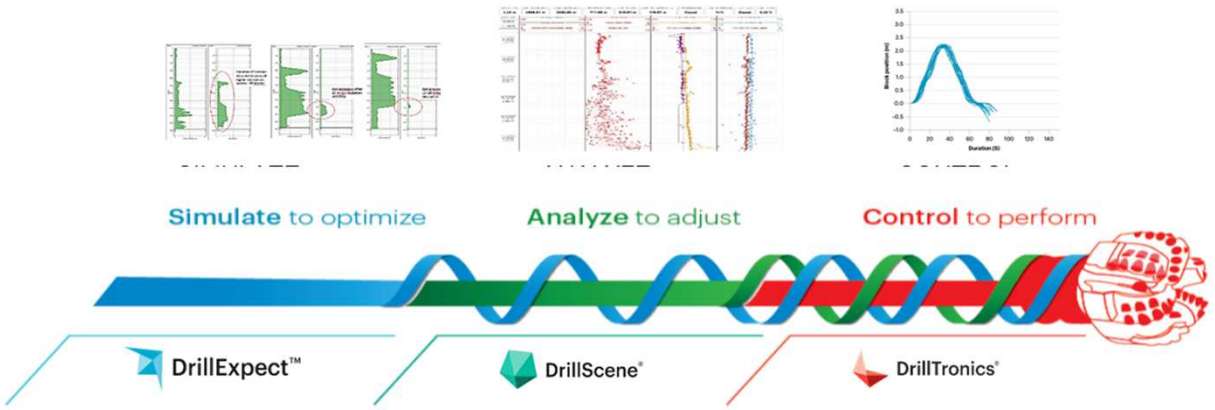

REAL-TIME DRILLING OPTIMIZATION

DRIVING DRILLING EXCELLENCE

Who are using our solutions?

(close to 400 wells)

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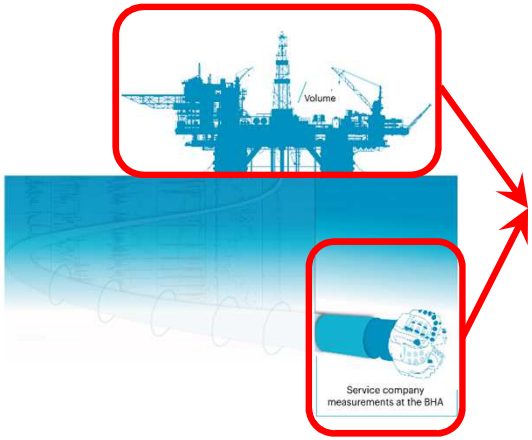
Traditional/Conventional Drilling Operation

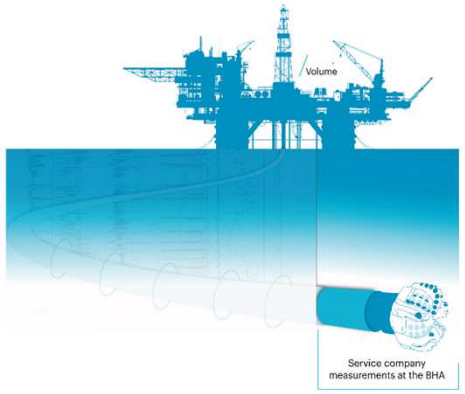


Data Aggregation

Reacting and reviewing when incidents have taken place

•Performing cause analysis

Need for continual re-calculation of static models



Reactive Drilling Optimisation

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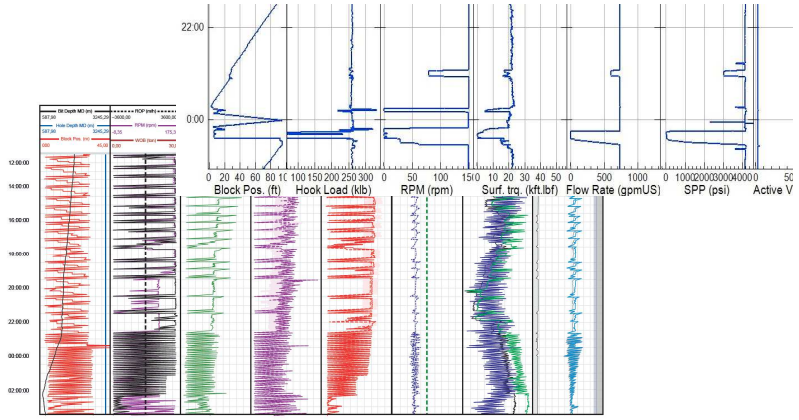
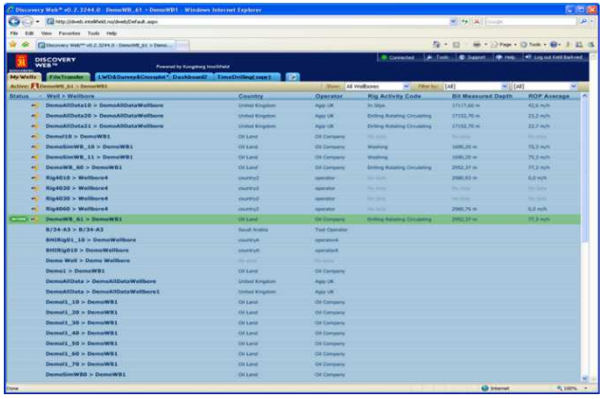
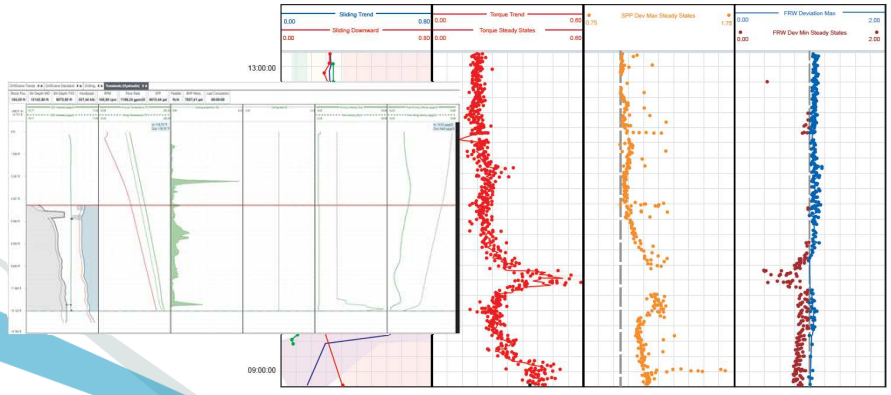
Scalability and flexibility to monitor multiple operations

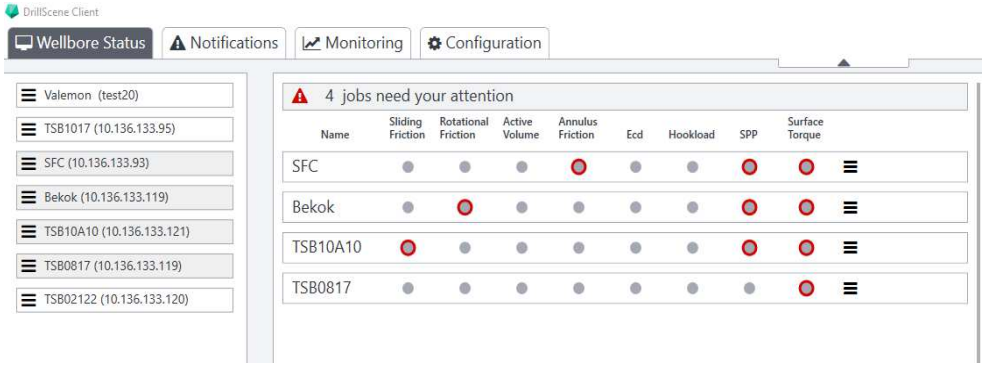


Traditional





DrillScene



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SIGNIFICANT REDUCTION IN TECHNICAL SIDETRACKS USING SEKAL SOLUTIONS

Historical Statistics from NPD 2013 – 2016:

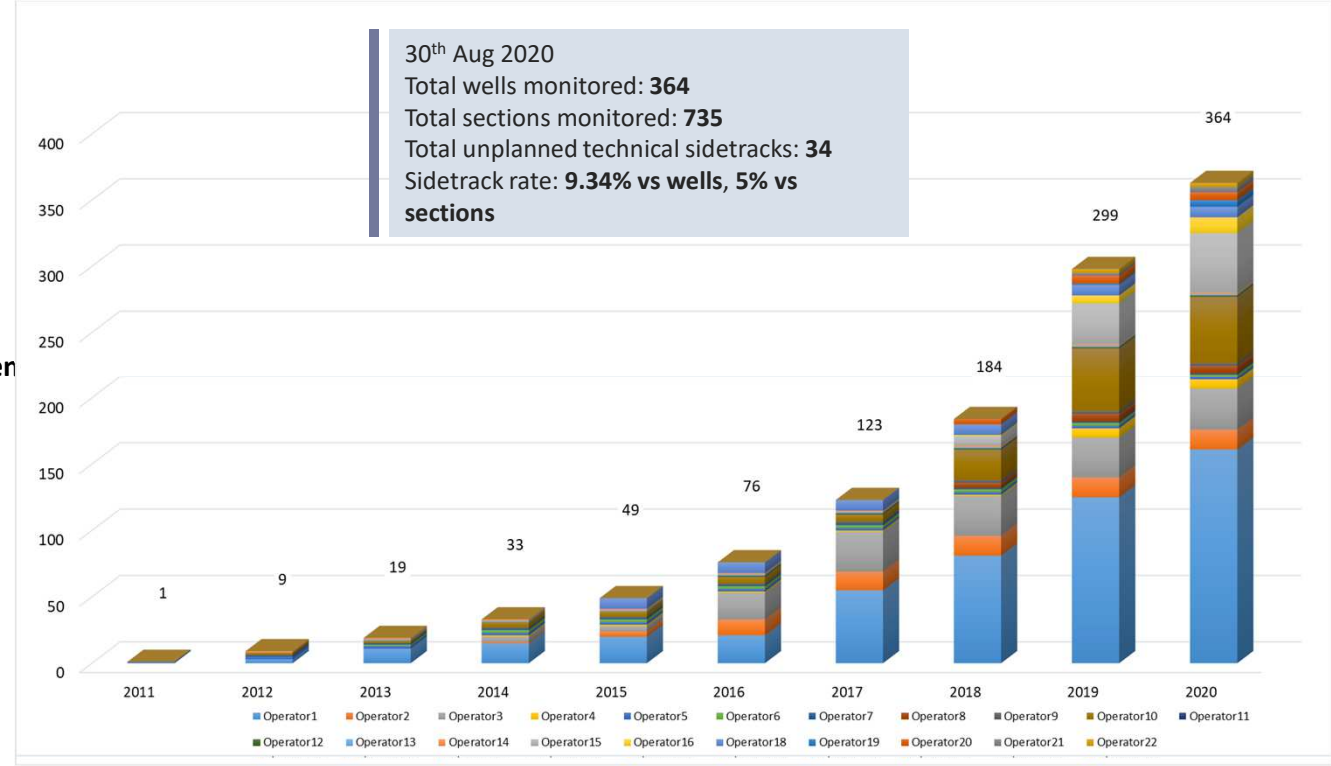
- 176 sidetracks on 558 development wells (31.5%)

Historical Statistics from Operator 2013 – 2015:

- 90 sidetracks on 280 wells (32%)
- Cost of sidetracks: > USD $220 Million/year

Significant Reduction in Technical Sidetracks when using Sekal's DrillScene technology:

- 34 technical sidetracks in 364 wells = 9.34 %
- Statistically, 82 technical sidetracks were avoided
- Average value USD $7.5 Million/sidetrack



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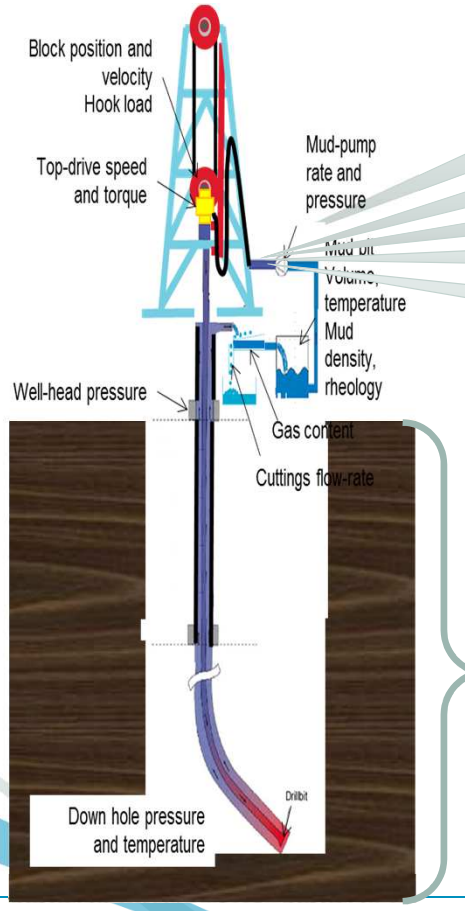
Real-time Drilling Optimisation - Methodology



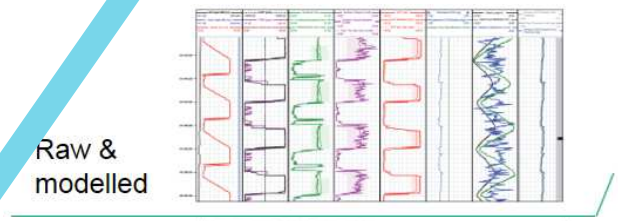
Real-time Data

- Sensor data
- LWD/MWD
- PWD
- Mudlogging
- Sample data

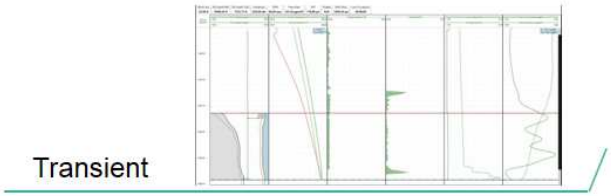
Configuration Data

- Well Profile
- Casing Design
- BHA Design
- Pore Pressure
- Fracture Pressure

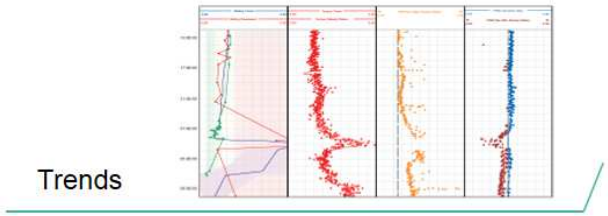
RT Data Drive & Govern the model in Real-time



Compare RT data with modelled Output



Develop Transient Plots for Wellbore Condition



Plot the deviation when RT data deviate from Modelled O/P

Software HMI

WITSML export

Notifications

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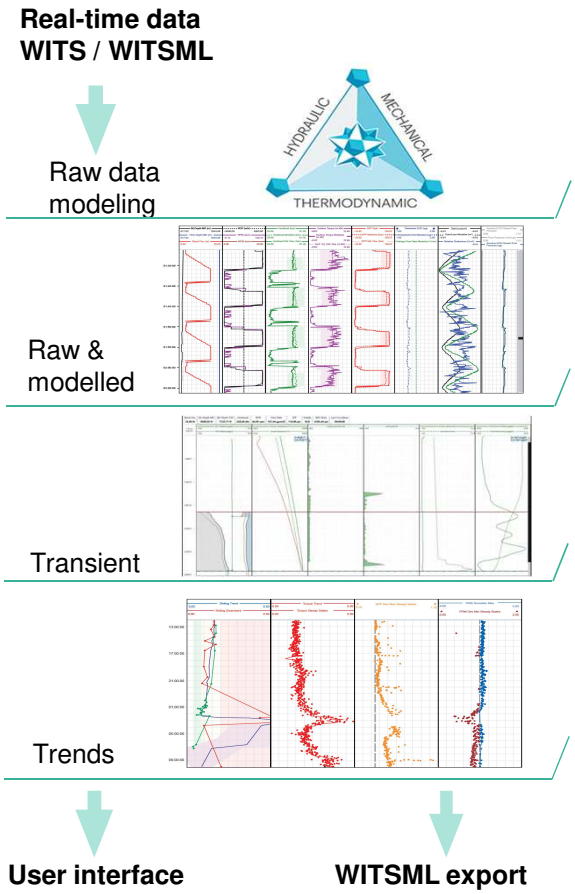
Real-time Drilling Optimisation - Methodology



Monitoring and trend analysis with real-time dynamic models

/ Delivers real-time transient simulations of:
- Cuttings transport, bed generation & erosion
- Downhole ECD, surge and swab along entire wellbore
- Automated drilling / tripping roadmaps

/ What-if analysis:
- Validate the decided action on the current state of operation before it get implemented
- Leads to eliminating ILT
- Optimise Operation

/ Look-ahead:
- Perform actions in futuristic horizon to see what will happen if continue current state of operation
- Ensure reduction in operational and/or technical NPT
- Make informed decisions

Supports proactive drilling decisions

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Drilling Optimisation

Specialised form of **Risk Management** achieved by;

- **Minimise the unplanned events**
- **Improvise the Drilling Efficiency**

Scope for Drilling Optimisation

- ✓ Anticipate and Prevent issues leading to NPT and hazard
- ✓ Identify & Avoid ILT issues
- ✓ Maintain Wellbore Integrity
- ✓ Enhance Operational Safety
- ✓ Increase Drilling Efficiency
- ✓ Identify operation anomalies

Why Sekal?

- ✓ Monitoring & manage
  - ECD along the length of wellbore
  - Cutting generation & transport
  - Real Time Transient Hybrid Models
    - Torque & Drag, Hydraulics, Thermodynamics
- ✓ Online Drilling Simulator – connected real time
- ✓ Optimize drilling and tripping speed
- ✓ Achieve Drilling Automation by Drill Tronics

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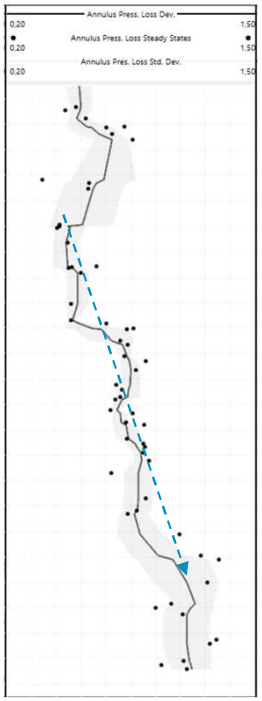
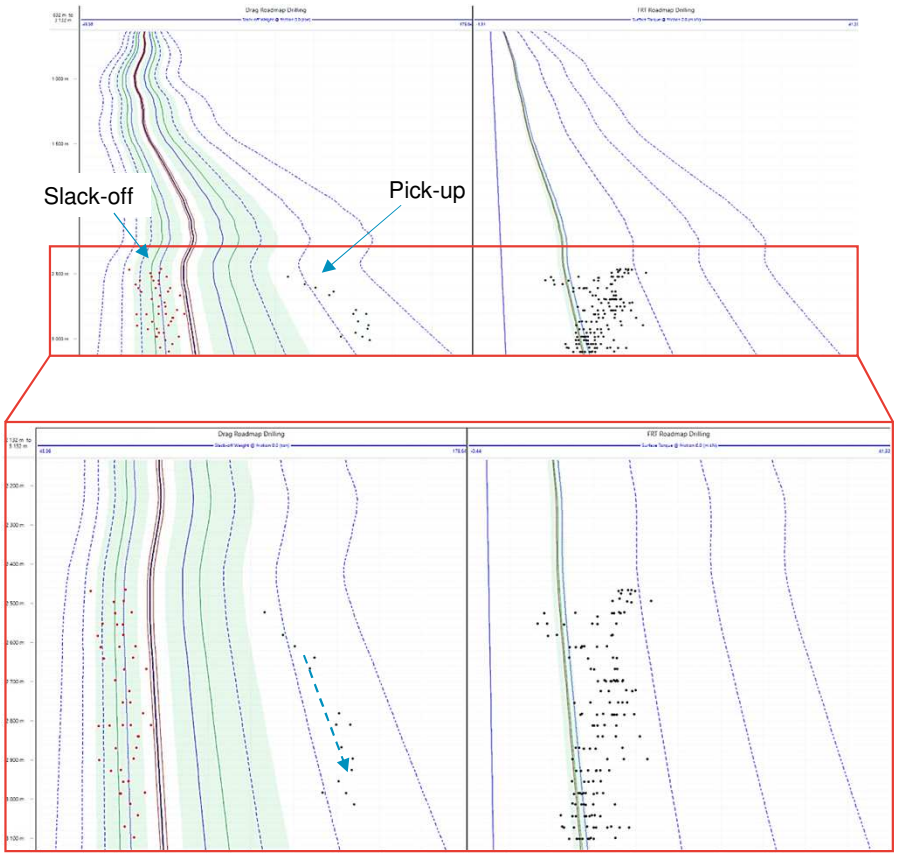
Real-time Drilling Optimisation – Look Ahead

Dynamic Roadmaps

- ✓ The system automatically detects pick-up, slack-off, FRW and FRT during steady conditions for roadmapping
- ✓ Considers current conditions, mud properties and updated trajectory
- ✓ The roadmaps preserve history and visualize trends
  - ❑ Drilling roadmaps
    - Hookload, torque, FRW
  - ❑ Tripping roadmaps



Increasing annulus pressure loss deviation



The auto-generated roadmap shows increasing upward drag while drilling

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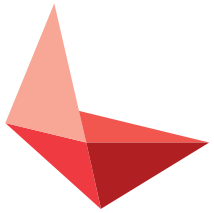

DrillTronics®

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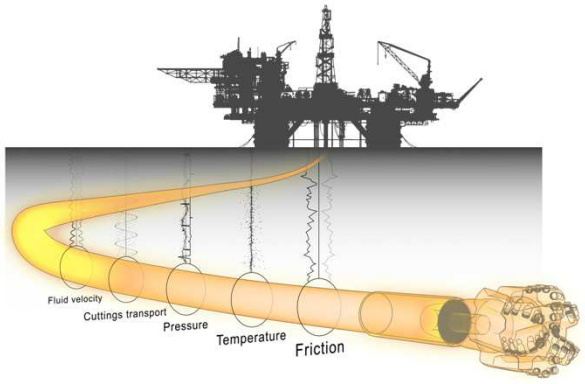
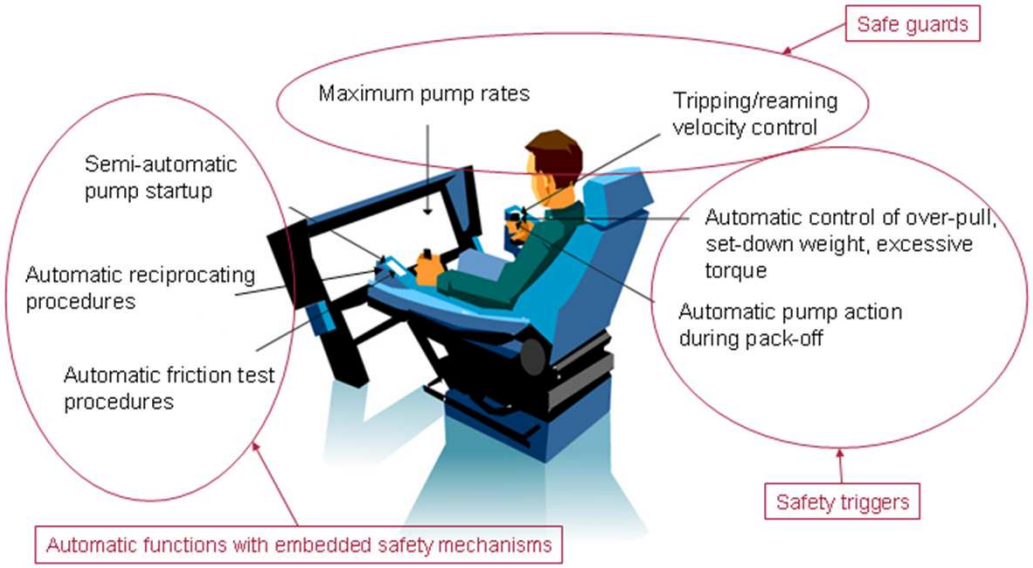
Automation by DrillTronic

The primary focus for a DrillTronics installation is to enhance drilling operations, **Reduce Risk** and **Maximize Productive Time** during drilling.

- Calculating the safe operating windows in real time – Safe Guards
- Then applying these windows to the Drilling Control – Safety Triggers
- Automatic Functions
  - Automatic start of mud pump
  - Automatic tripping
  - Automatic reciprocation
  - Automatic friction tests





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DrillTronics – Installed and in use on multiple rigs

Rigs	DT, SAT comp.	Integrated with	Comments
Statfjord C 	October 2014	NOV - Cyberbase	Equinor; 7 wells, 22 sections as part of PoC.
T.O Enabler 	April 2017	MHWirth DEAL	Equinor; 5 wells Barents Sea as PoC for floaters.
West Mira 	Nov 2019	MHWirth DEAL	Wintershall; 3 Wells, in use 90% drilling time.
T.O Equinox 	March 2020	MHWirth DEAL	Equinor; continuously in use, 6 wells from startup
T.O Encourage 	Nov 2019	MHWirth DEAL	Equinor; 2 wells.
T.O Endurance 	July 2020	MHWirth DEAL	Equinor; ready to start.
T.O Spitsbergen 	Jan. 2020	MHWirth DEAL	Equinor; continuously in use, 5 wells from start up
Mariner PDQ 	Awaiting access	MHWirth DEAL	Equinor; platform delayed, waiting access for SAT
Johan Sverdrup 	Project started	NOV - NOVOS	Equinor; Start-up in operations Autumn 2020

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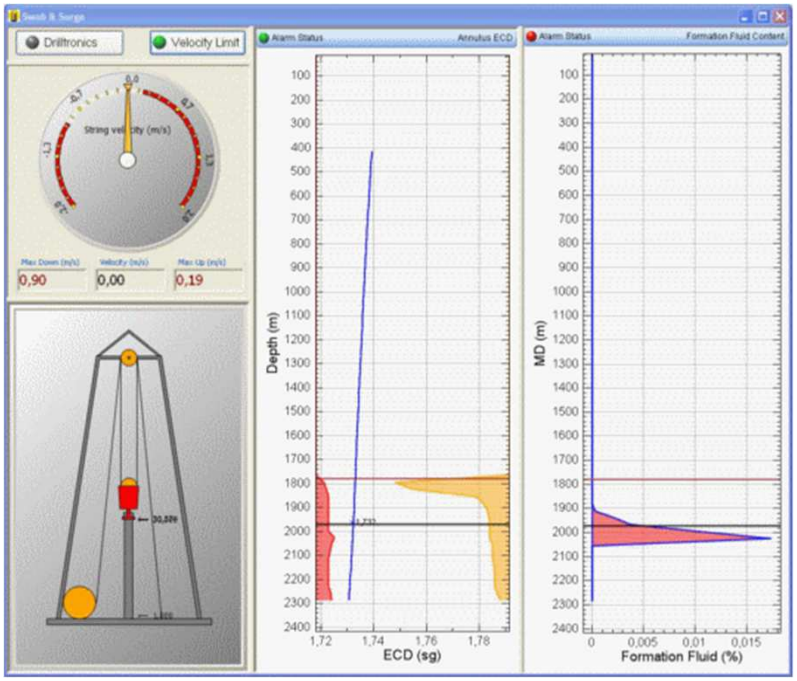
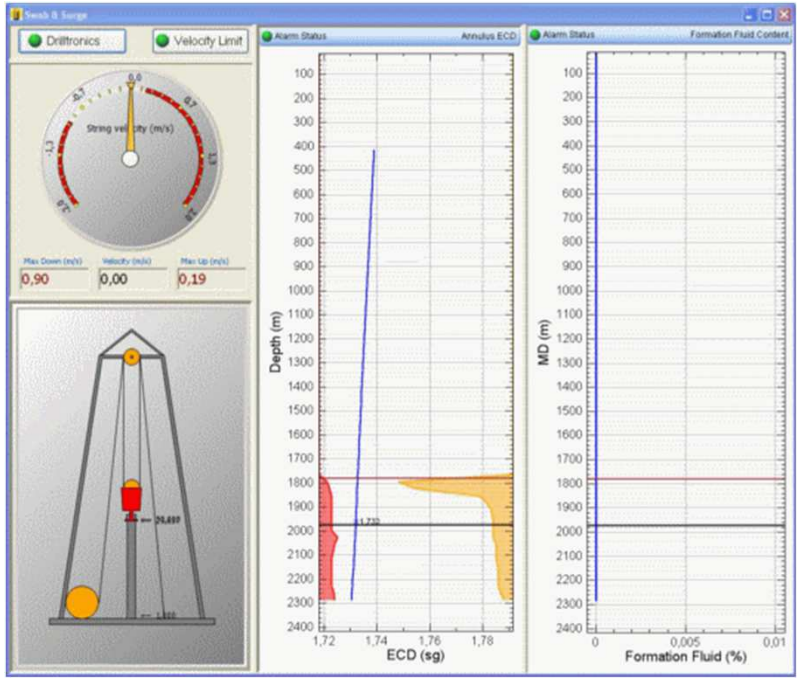
Tripping (POOH) by DrillTronics



Without DrillTronics



With DrillTronics

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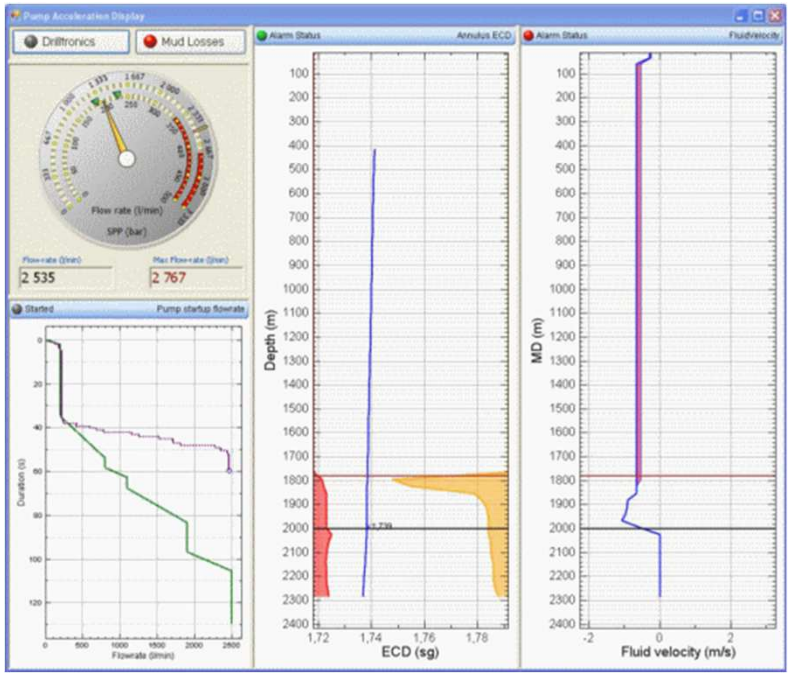
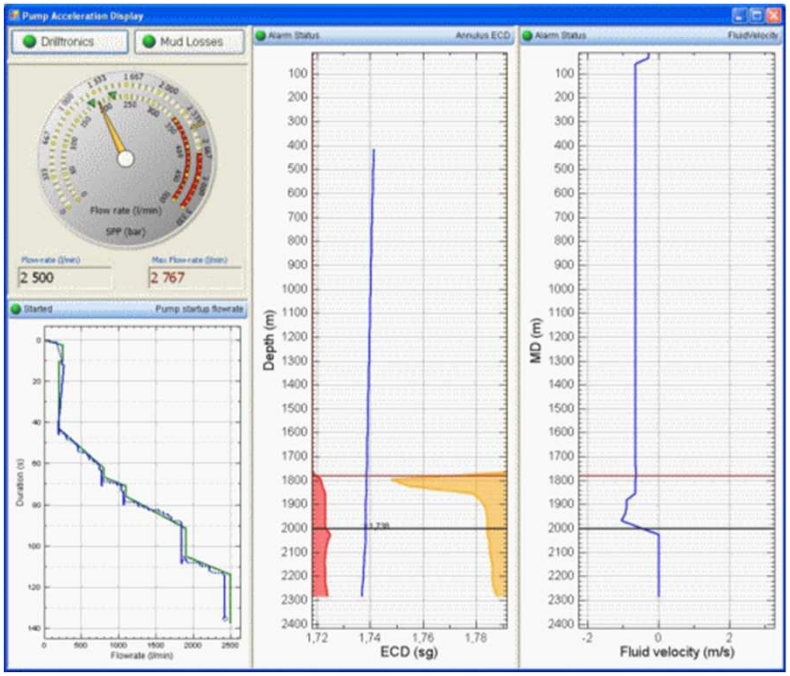
Pump start up by DrillTronics



Without DrillTronics



With DrillTronics

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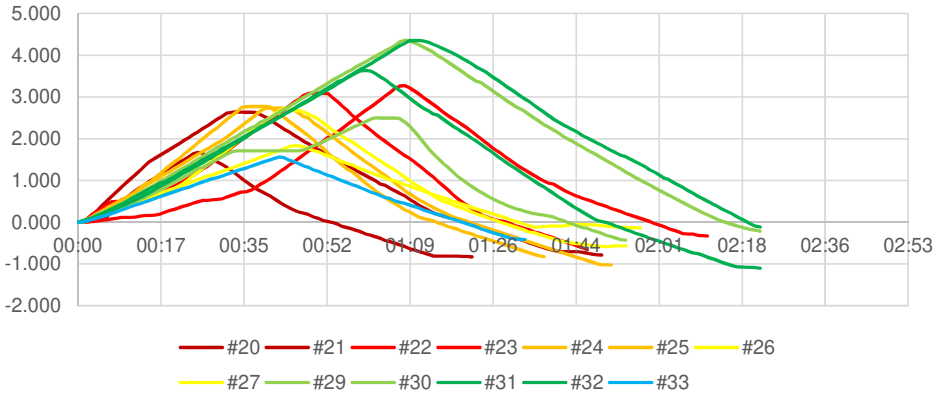
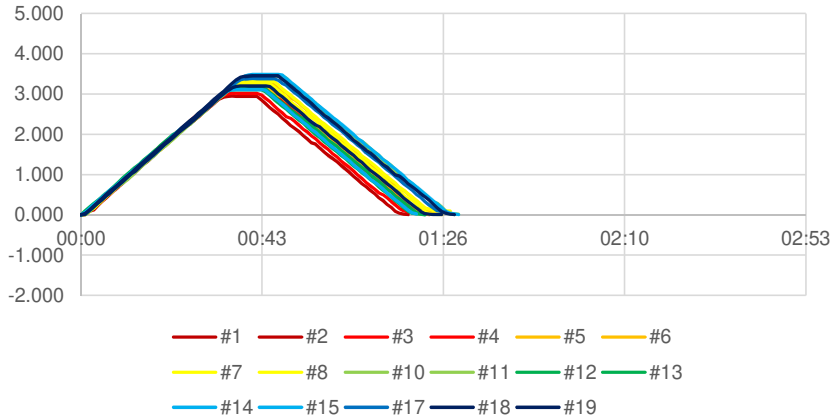
Friction test – Example





Automatic Mud Pump Start – Example

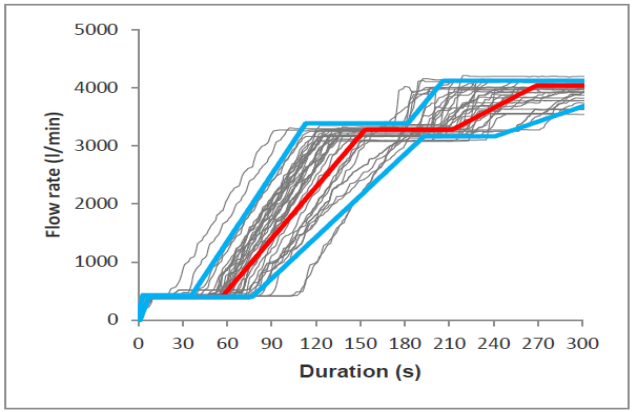


Figure 21 Profiles of standard pump start-ups in 17 ½" sections

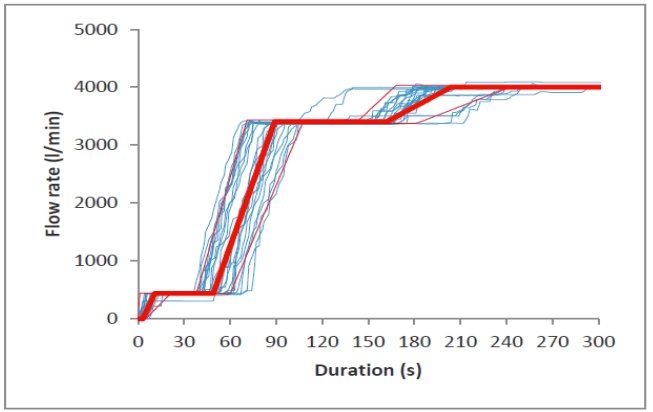


Figure 22 Profiles of Automated pump start-ups in 17 ½" sections

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