DRILLING AUTOMATION using DIGITAL TWIN technology

Analyze & Control to Perform

DrillTronics®

Knowledge Forum – AOG 2019

13th March 2019

Preface – Why Drilling Automation?

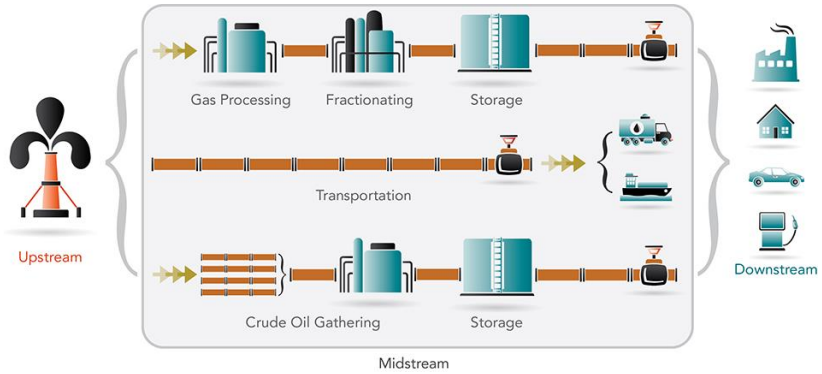
Rising demands

(explore deep resources)

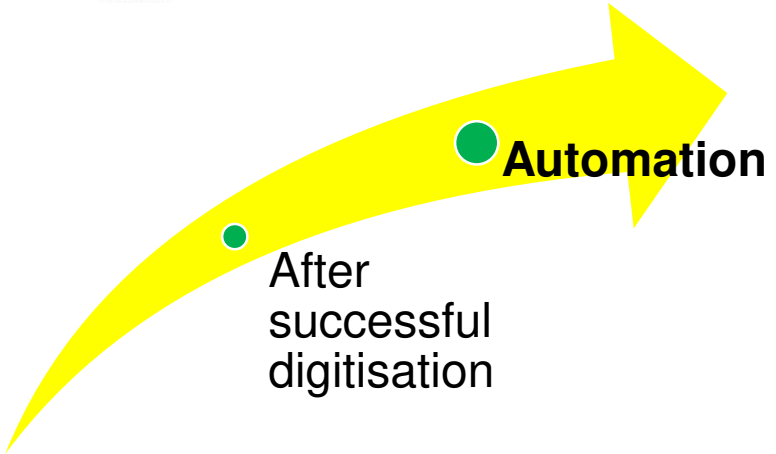
Constant fluctuation in Oil Price

Focus :

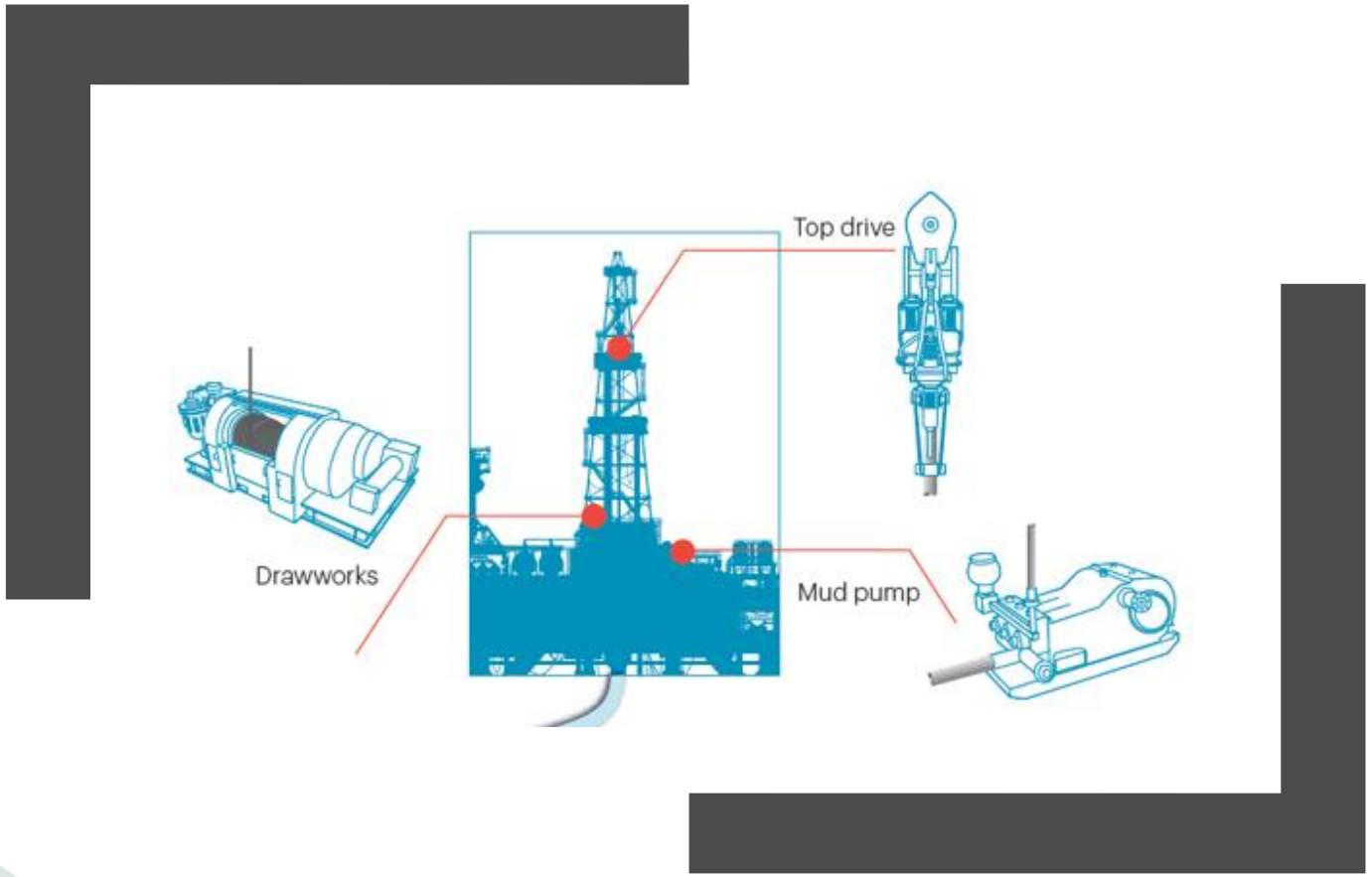
- Reducing Non-productive time
- Increasing Efficiency
- Safer operation



Way forward :



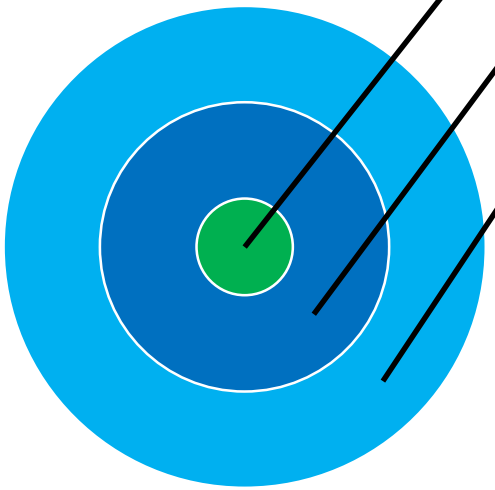
Drilling Automation – Status quo



Today's Drilling Control Systems are directly operated by the driller.

- No account of comprehensive well situation
- Relies on driller competence to stop and react correctly

Drilling Automation – Concept



Safety

Predictable

Efficient

Wellbore Condition

DrillTronics®

Digital Twin Technology

Safety Limits

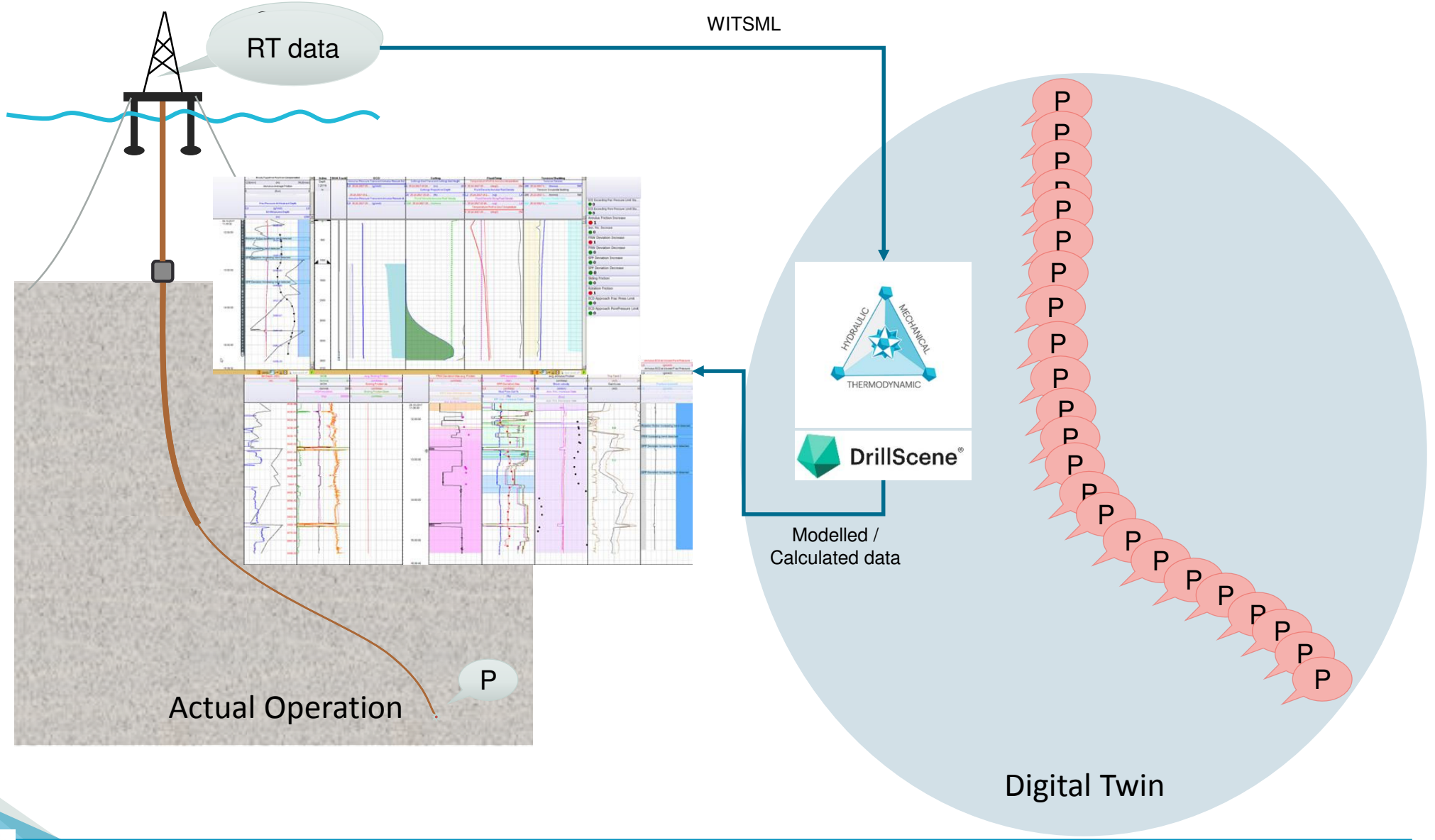
Deviations

ML & AI

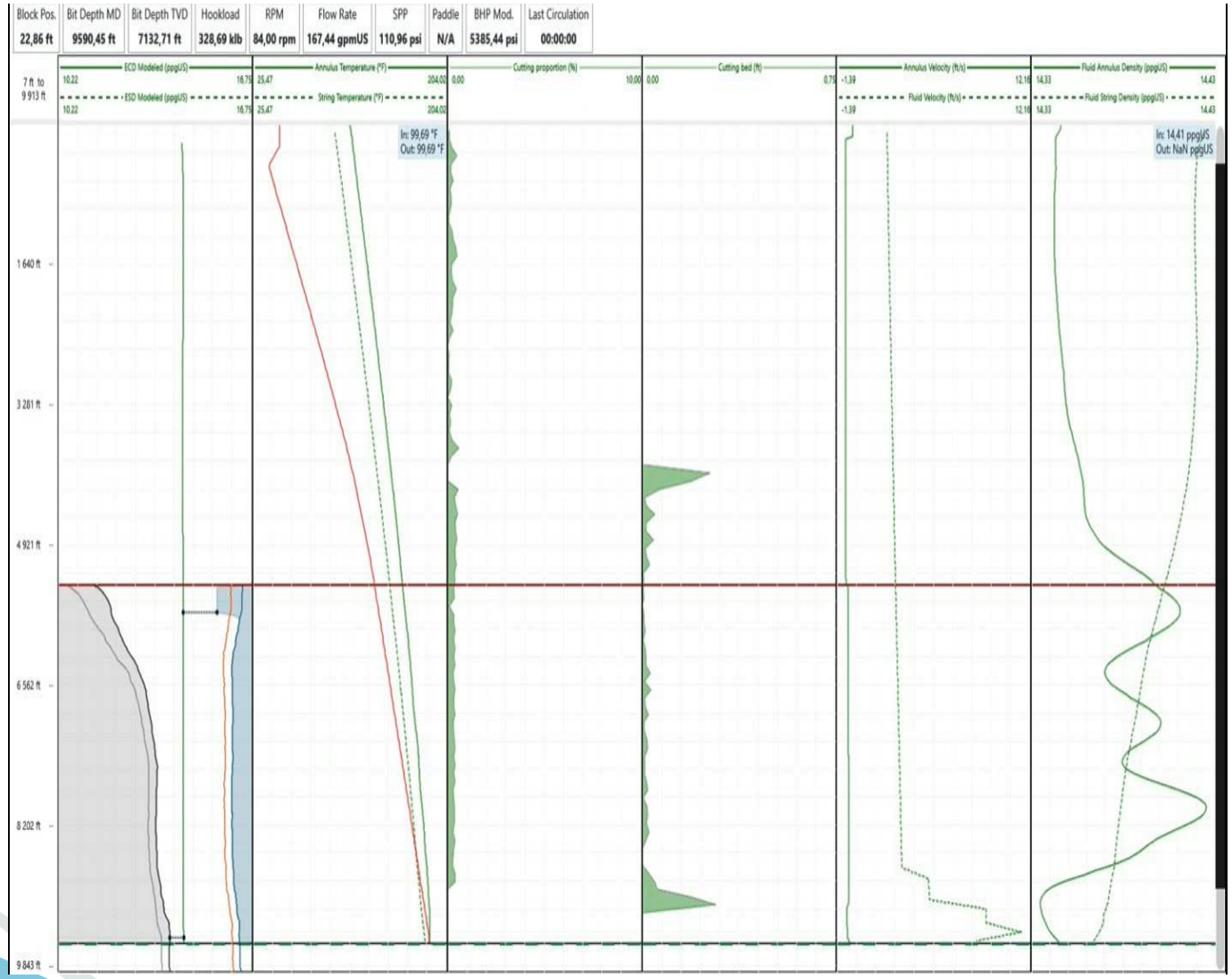
Safety Triggers

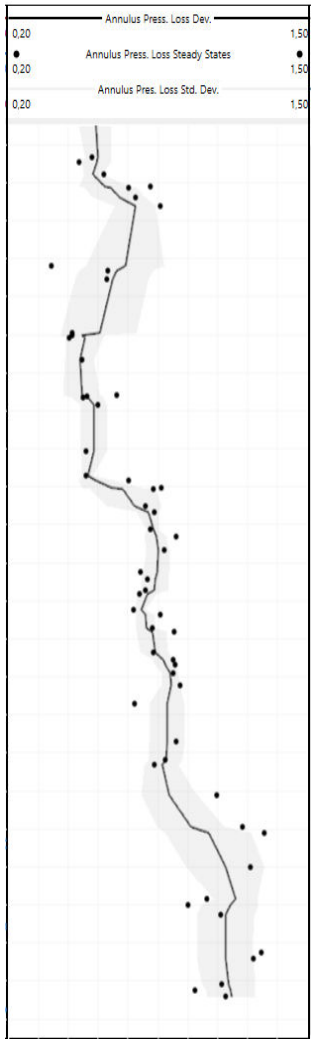
Safe Automated Sequencing

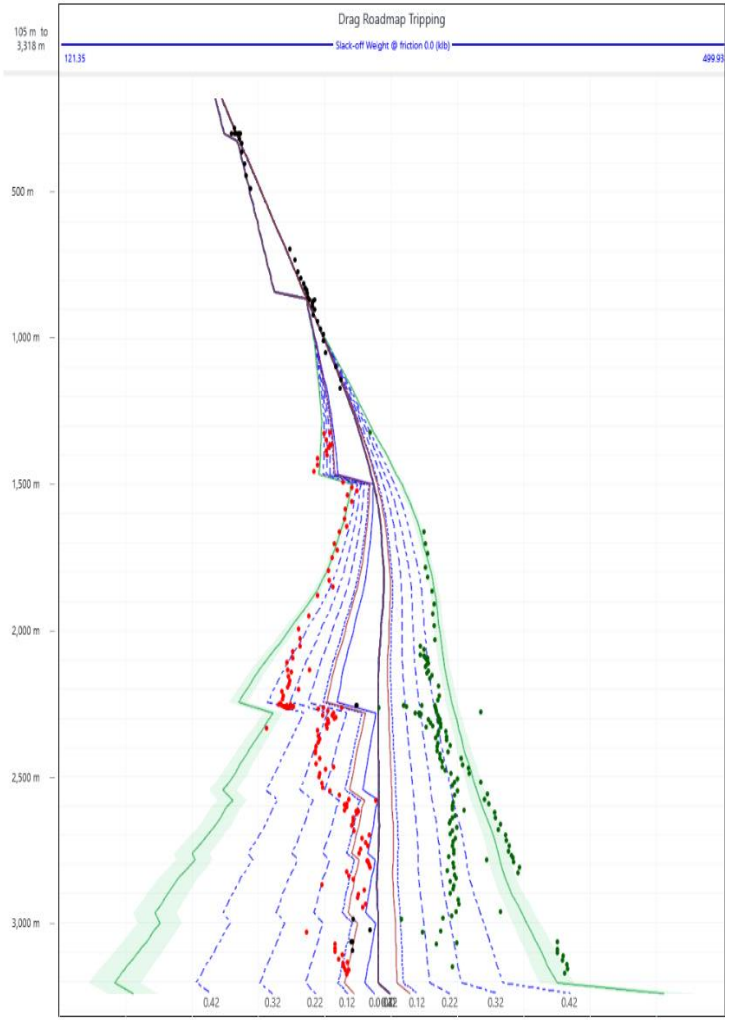
Drilling Automation – Digital Twin



Drilling Automation – DrillScene® – Generate Safety limits





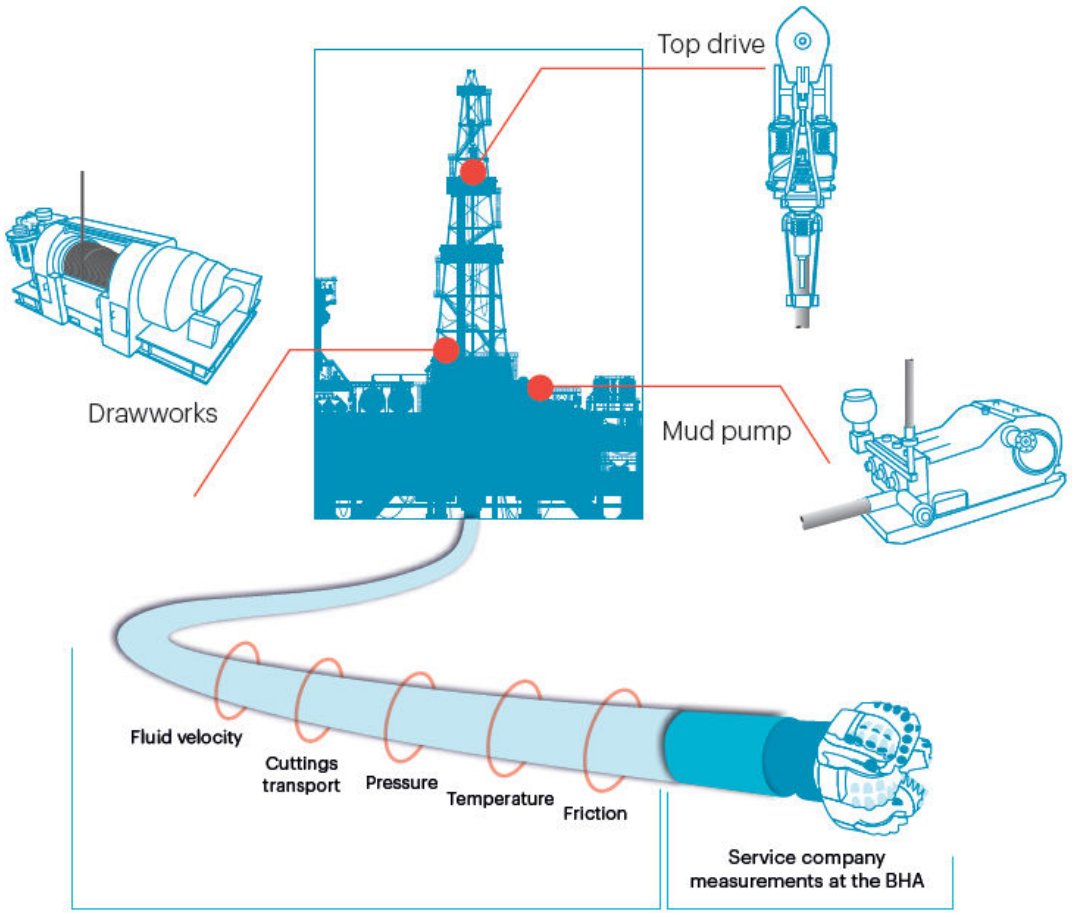


DrillTronics® - Drilling Automation Software

- ✓ Fully integrated with the DCS
- ✓ Operated from the Drilling Control System into which it is embedded
- ✓ Enable or Disable by Driller
- ✓ Controls the drilling machinery
- ✓ Objective is to:
  - / Prevent incidents
  - / Optimize drilling operations

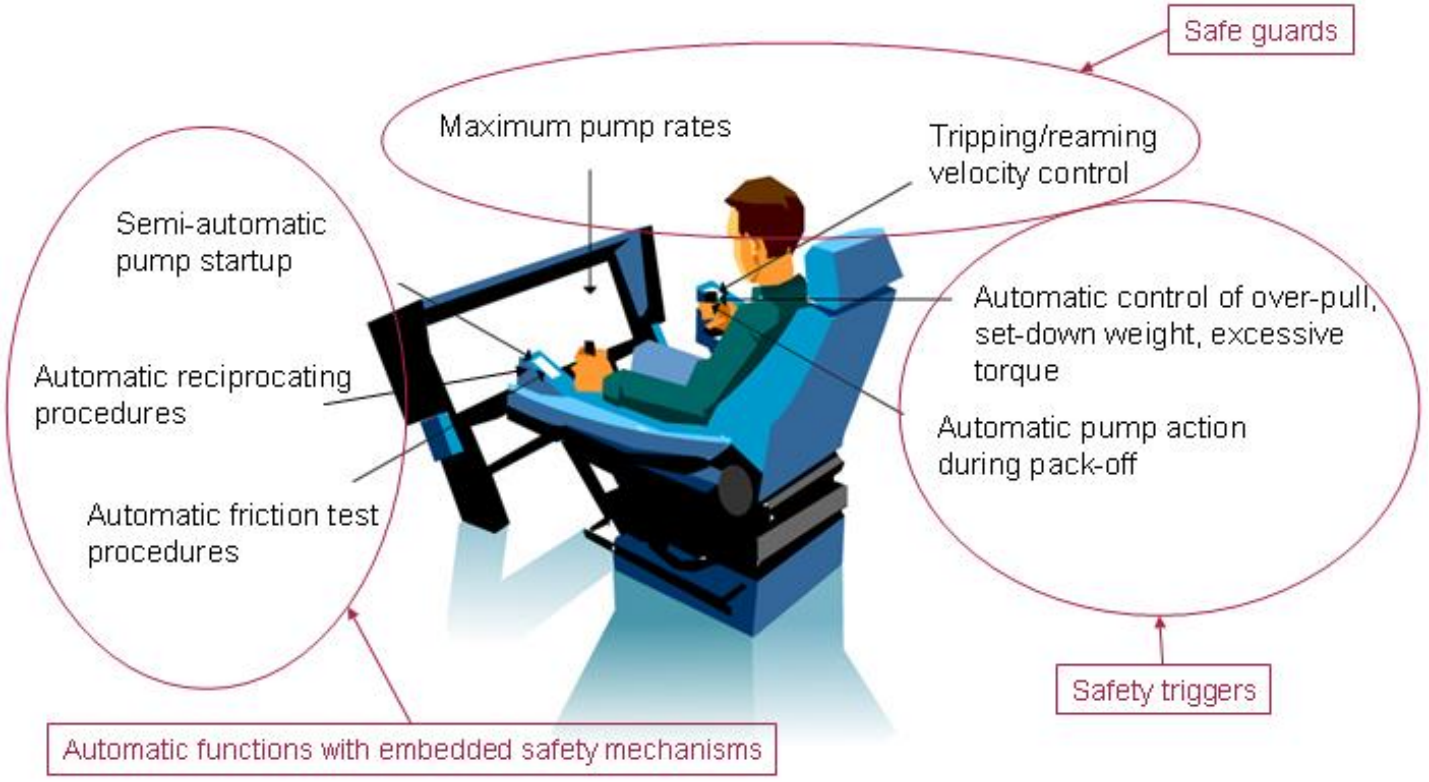
Reads well conditions and operates the drilling machinery based on the downhole understanding of wellbore conditions.

- Automation capability performs smart tasks improving process efficiency.
- Delivers higher levels of repeatability and consistency across crew.
- Minimizes the risks of inadequate safety margins or damage to the well.

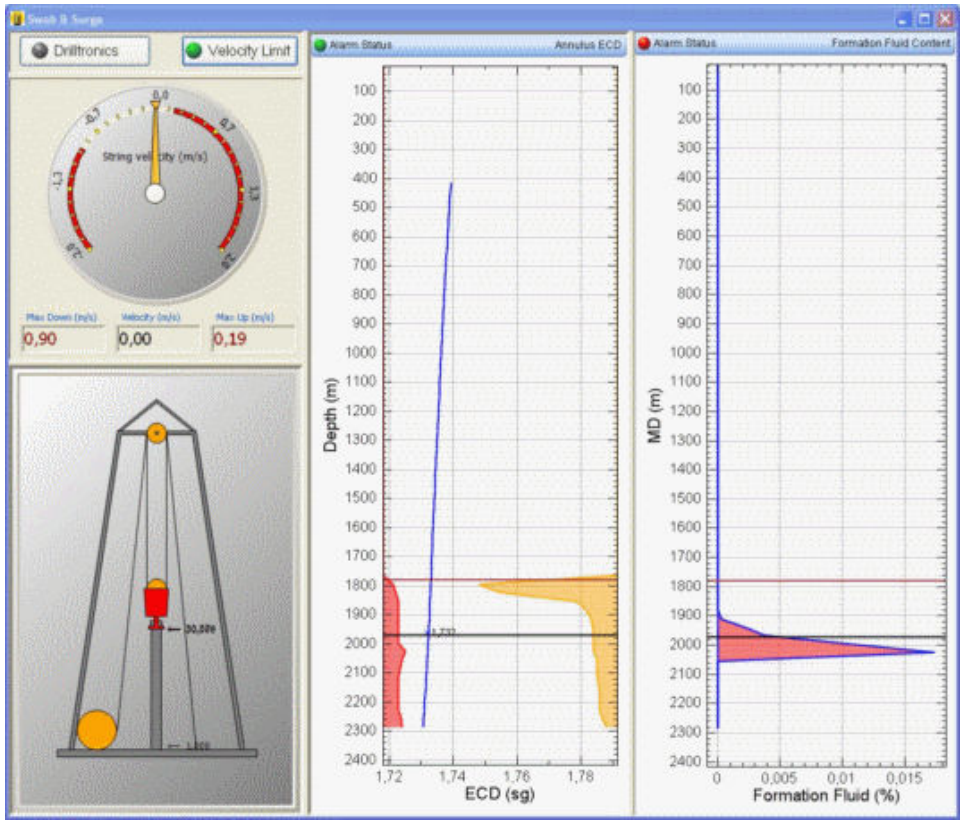


DrillTronics® - Drilling Automation Software

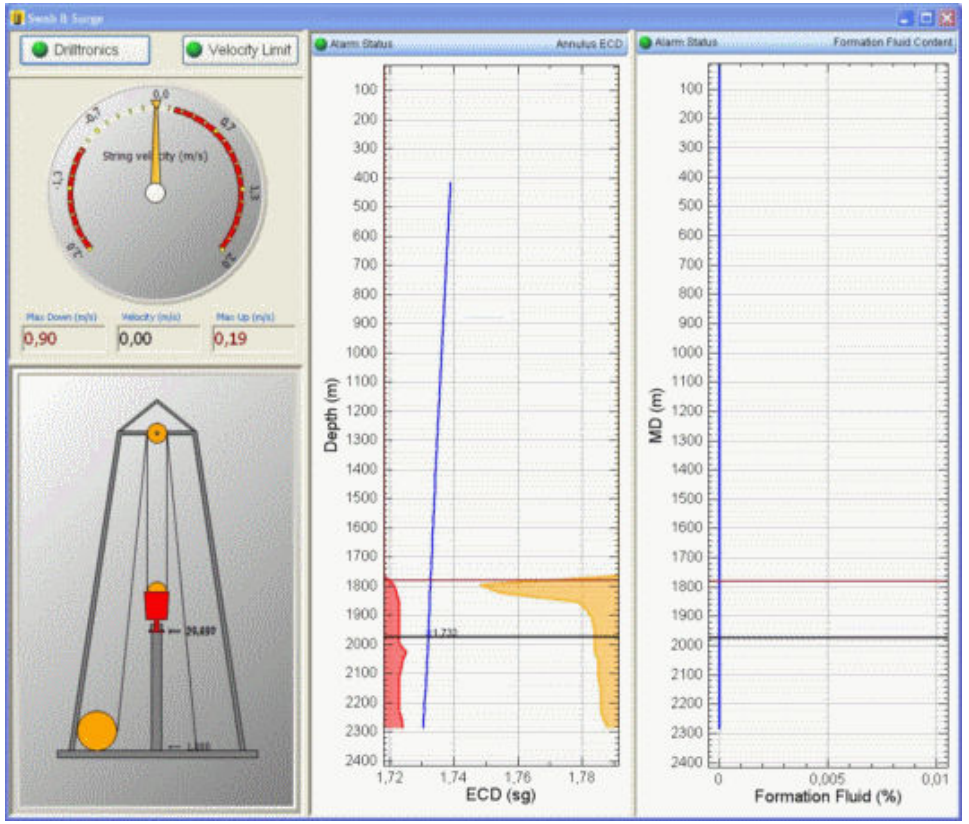
- Calculating the safe operating windows in real time – Safe Guards
- Then applying these windows to the Drilling Control – Safety Triggers
- Automatic Functions
  - Automatic start/stop of mud pump
  - Automatic tripping
  - Automatic reciprocation
  - Automatic friction tests



Tripping (POOH) safeguarding – DrillTronics®

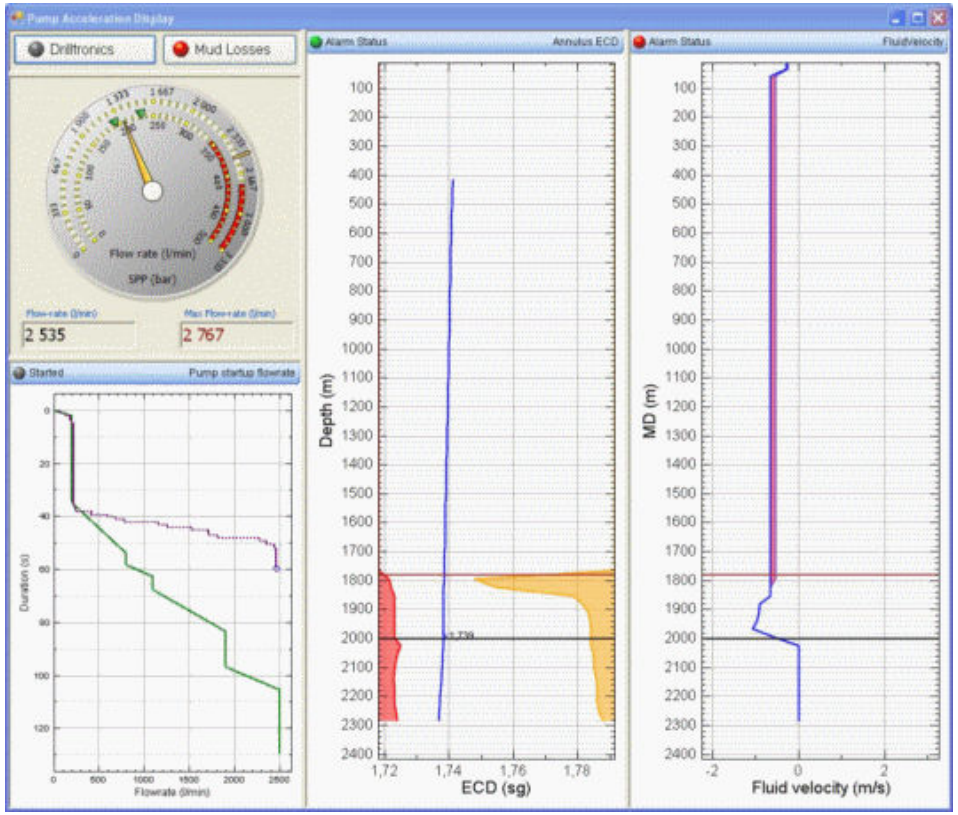


Without DrillTronics

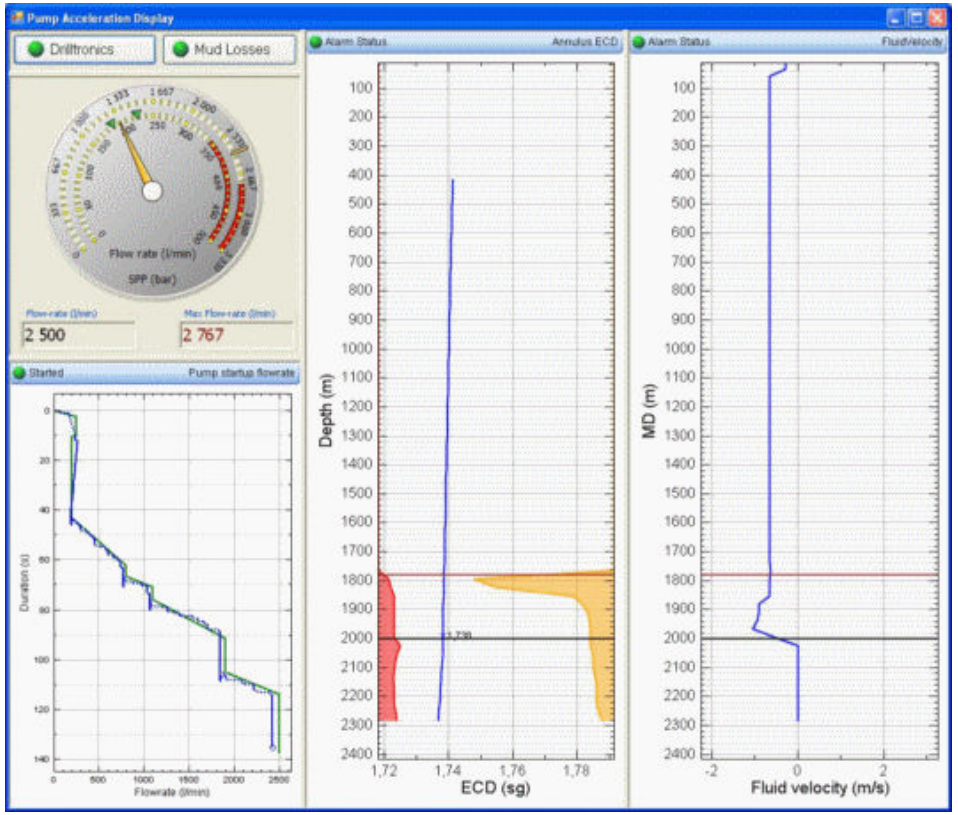


With DrillTronics

Pump start up safeguarding – DrillTronics®

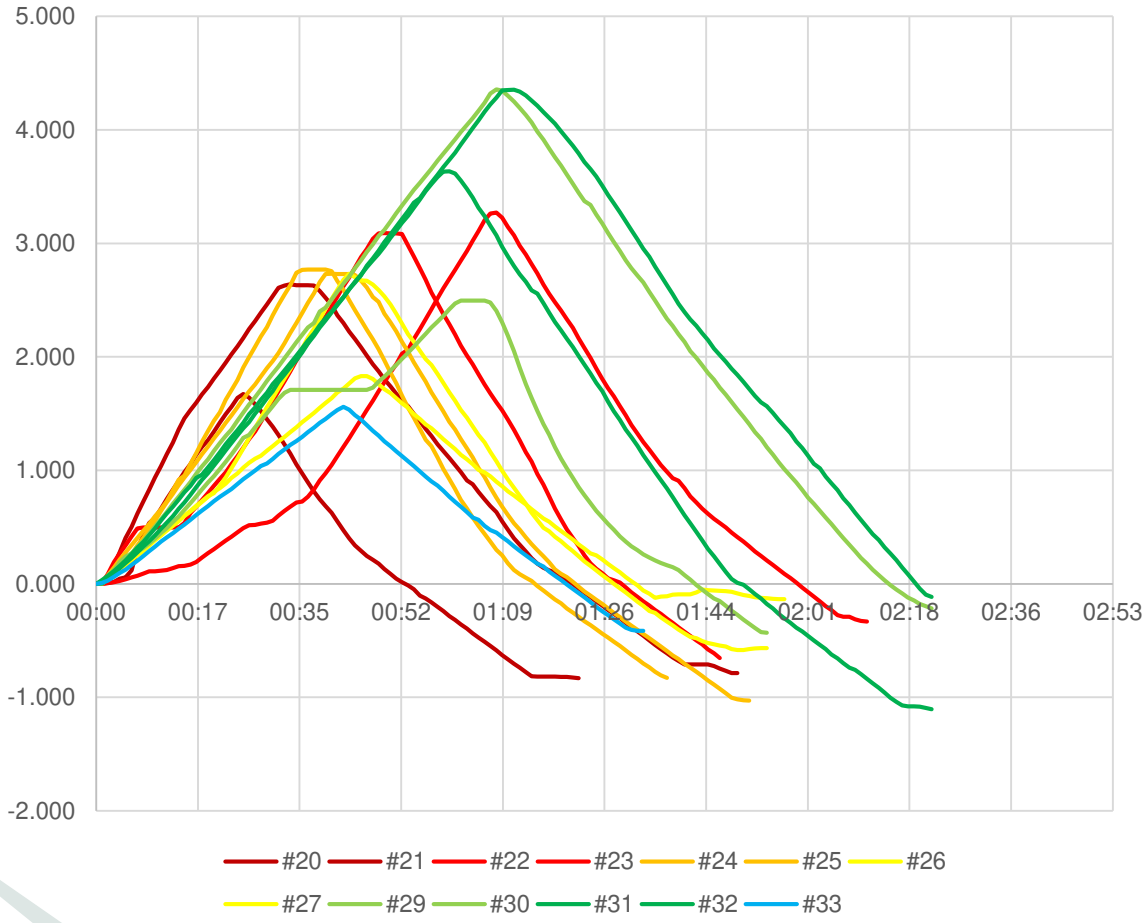


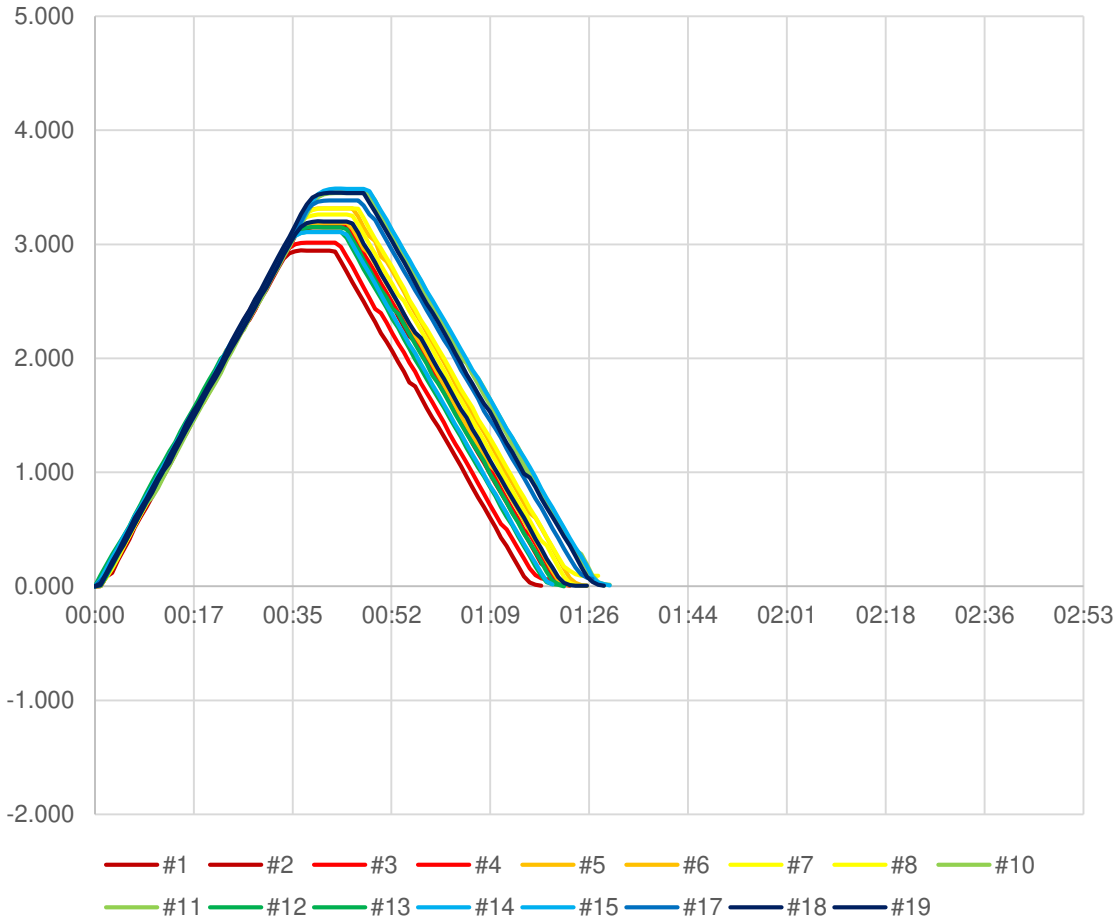
Without DrillTronics



With DrillTronics

Friction test Automatic Sequencing– DrillTronics®





Automatic Mud Pump Start Automatic Sequencing – DrillTronics®

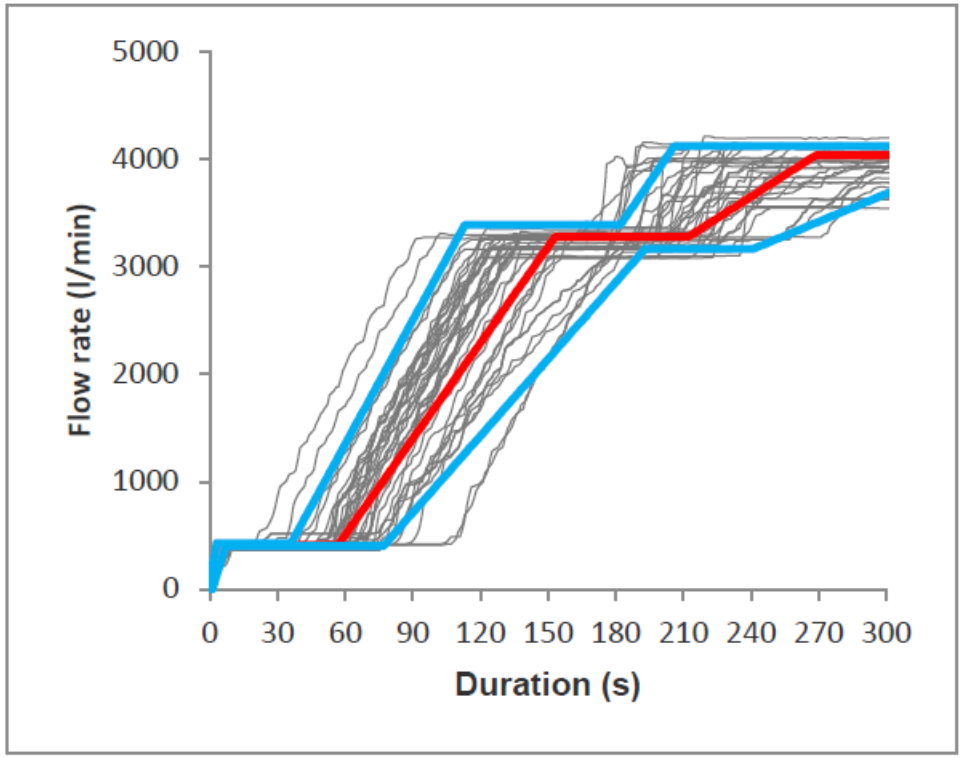


Figure 21 Profiles of standard pump start-ups in 17 ½" sections

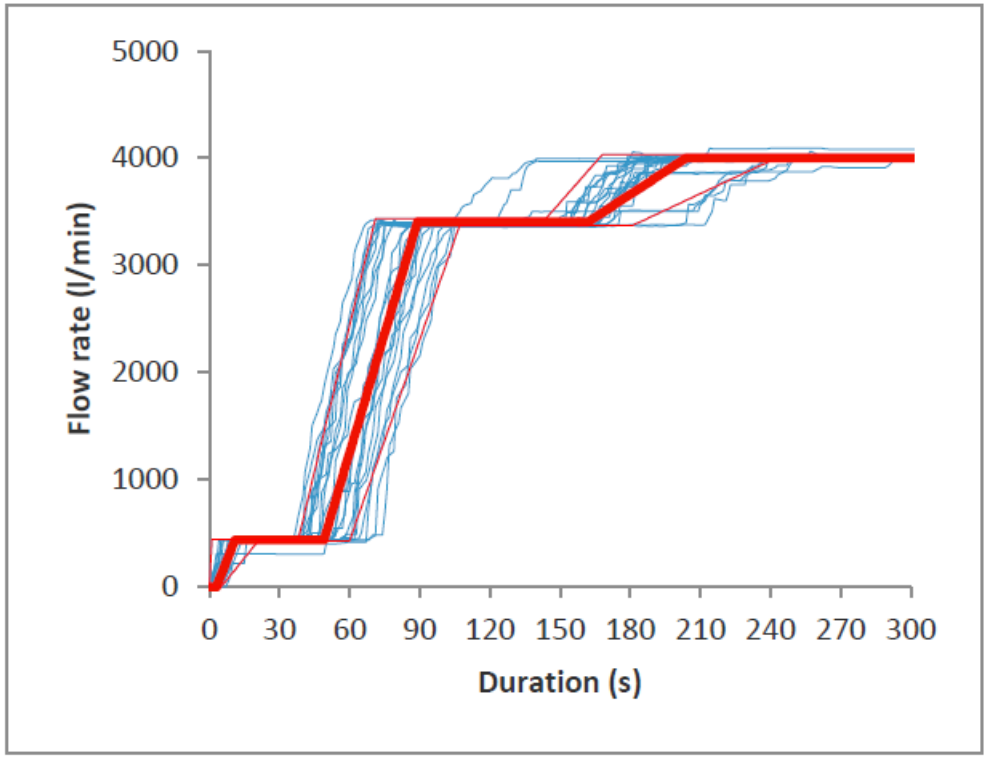


Figure 22 Profiles of Automated pump start-ups in 17 ½" sections

DrillTronics® - Adaptation

The First Use Report (Equinor) indicated increased efficiency (up to 12%) and operational consistency across all crews.

Equinor awarded Sekal the second license summer 2016

Equinor awarded Sekal third license April 2017 for the Semi-Submersible Songa Enabler and in January 2019 for the remaining 3 Transocean cat D rigs.

Equinor awarded Sekal the forth license October 2018 for the Mariner field in UK

Wintershall awarded Sekal the fifth license December 2018 for the SeaDrill Semi-sub West-Mira

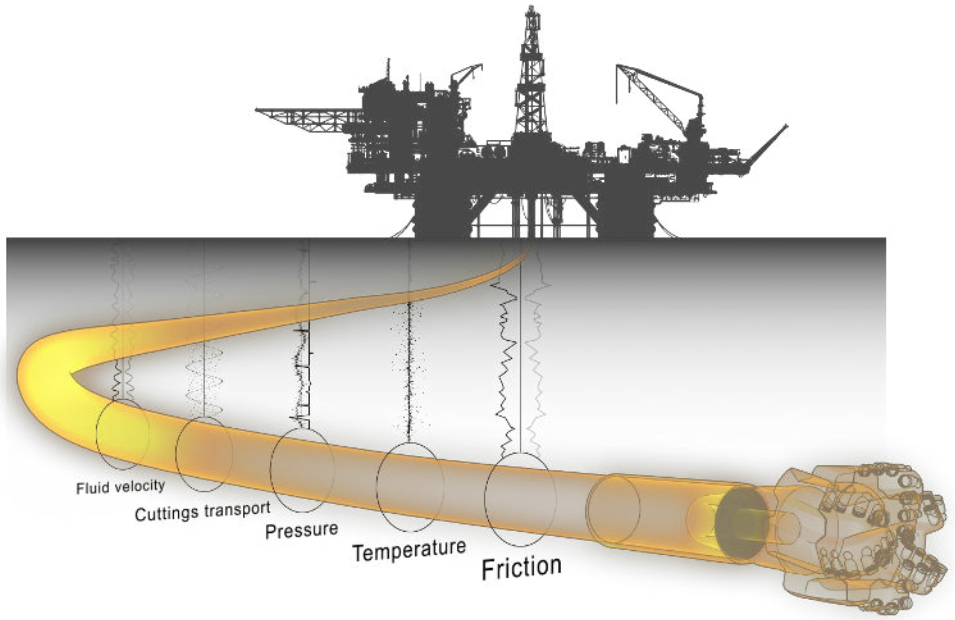
Transocean awarded Sekal the 9th license January 2019 for the Transocean Semi-sub Transocean Spitsbergen

DrillTronics® - Digital Twin Technology based Drilling Automation Software

Combining the capability of Digital Twin technology & Adaptive automation results in Automated Drilling Control (ADC) to give ultimate client valve by making drilling operation;

- ✓Safer
- ✓More consistent
- ✓Optimized & efficient
- ✓Predictable

DrillTronics®



Optimises the reaction of drilling machinery inline with the dynamic and changing downhole conditions

