



# PressPro RT

Real-time application to manage  
downhole hydraulics

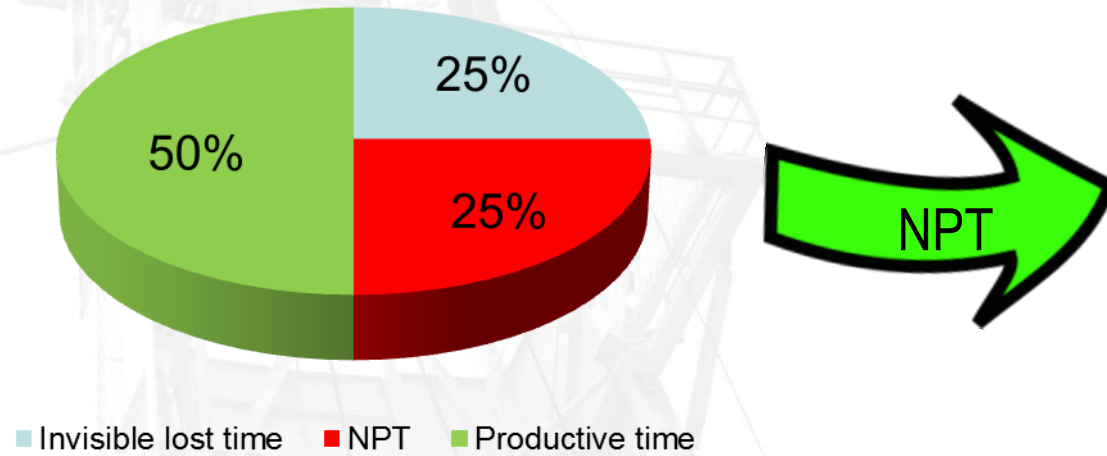
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# Challenges

In any drilling operation the goal is minimize the NPT and complete drilling wells below technical limits



- Rig failures
- Wellbore instability
- Stuck-pipe events
- Well Control
- Lost Circulation
- Others

In addition to this, as technology is being improved (new equipment, tools, drilling fluids), wells are becoming more challenging (deeper, hotter, longer) and not all operations are covered. Depending on the rig used, the total cost of the well can increase significantly when one of event listed above is faced

# Issues while drilling

PWD failure

$$2 \text{ days} * \$300,000/\text{day} = \$600,000$$

Lost circulation issues while drilling

$$500 \text{ bbl} * \$300/\text{bbl} = \$150,000$$

Time controlling mud losses

$$1.5 \text{ days} * \$300,000/\text{day} = \$450,000$$

Wellbore instability (back reaming – conforming well)

$$1 \text{ day} * \$300,000/\text{day} = \$300,000$$

Running casing mud losses

$$500 \text{ bbl} * \$300/\text{bbl} = \$150,000$$

Re-running logs

\$10,000

Overhead costs

$$4.5 \text{ days} * \$5000 = \$22,500$$

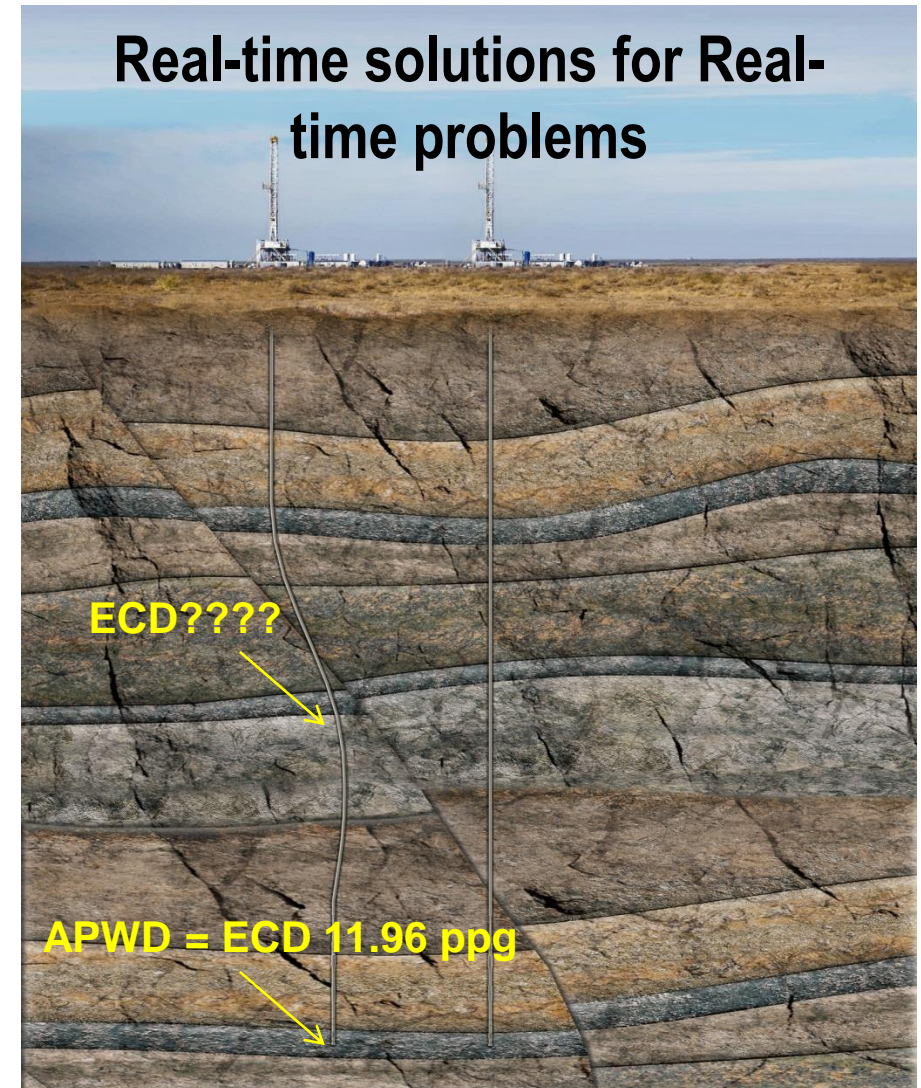
Total cost of NPT

**\$1,680,250**



# What is PressPro RT?

- PressPro RT is a real-time hydraulics modeling and monitoring service that calculates downhole hydraulics using:
  - Surface and downhole measured data
  - Tripping data
  - Pressure and temperature effects on density and rheology.
- PressPro RT is a Real-Time version of the benchmark hydraulics algorithms that are the foundation of Virtual Hydraulics. And it's intended to help operators to reduce non-productive time and improve drilling performance
- PressPro RT complements and enhances the PWD tool, providing a complete profile from surface to TD not just at the tool location, the software shows “what should be” while the PWD shows “what is”



# PressPro RT applications



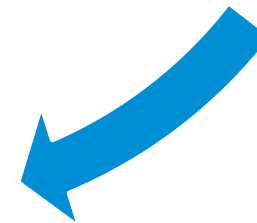
High-temperature wells



Narrow Drilling Windows



Uncertainty FG/PP



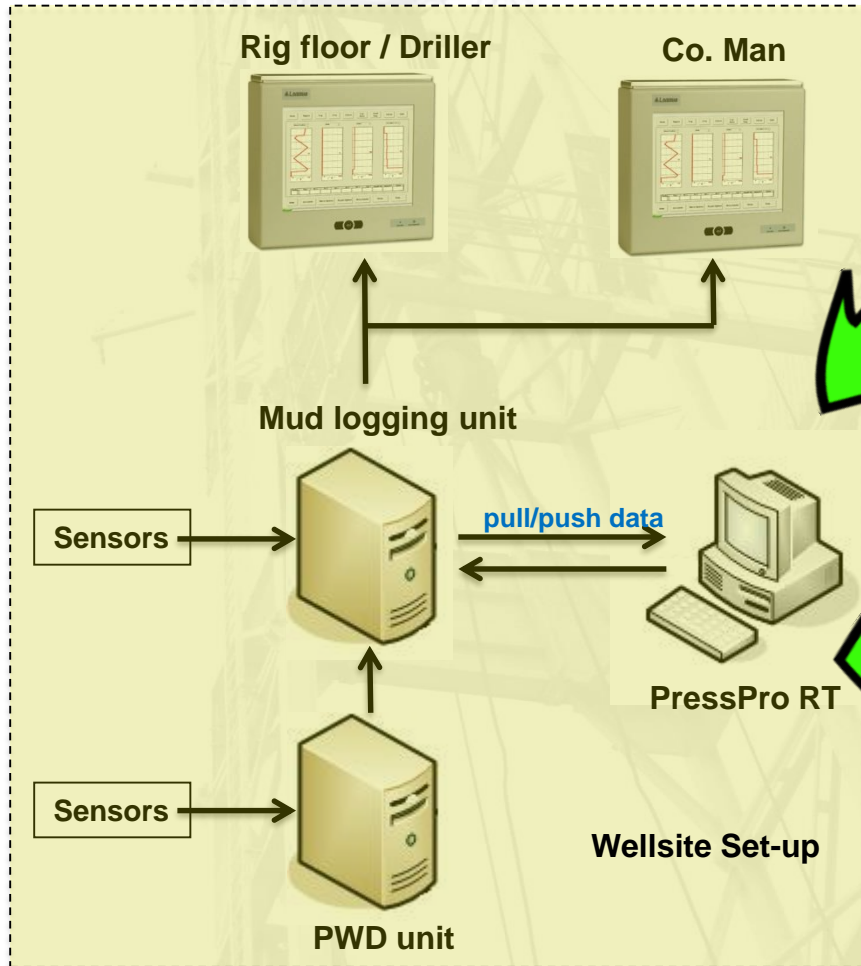
Losses while running casing / pipe



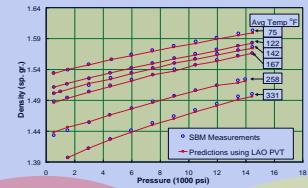
Hole Cleaning Issue



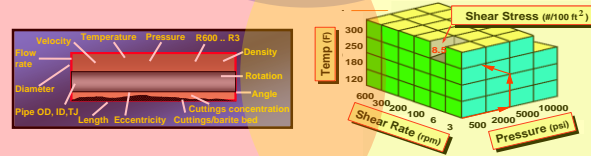
# How does it work?



T-P effect on density



T-P effect on rheology



Well is small pieces

- Real-Time ECD/ESDs
- Real-Time Calculated Pump Pressure
- Real-Time Hole Cleaning / Cut Conc
- Real-Time Surge/Swab ECDs

Can ...

... I run PPRT from my office?

... I run at the rigsite?

... The Driller/CoMan see it?

... I watch it at home?

... I run it remotely?

**YES**

# Value Proposition

PressPro RT improves drilling and tripping efficiency and performance by avoiding and or reducing NPT in critical wells and optimizes operations safely

- ❑ Prevents/minimizes lost circulation by early detection of issues
- ❑ Optimizes tripping performance
- ❑ Complements and enhances PWD data
- ❑ Fills-in PWD gaps (high-temp, tool failure, not available)
- ❑ Helps to identify possible hole cleaning issues
- ❑ Reduce the NPT related to hydraulic problems
  - ❑ Improper hydraulics
  - ❑ Breaking circulation / Barite Sag
  - ❑ Mud Losses while running casing/pipe
  - ❑ Differential sticking & Pack-off issues



# Table for risks and solutions

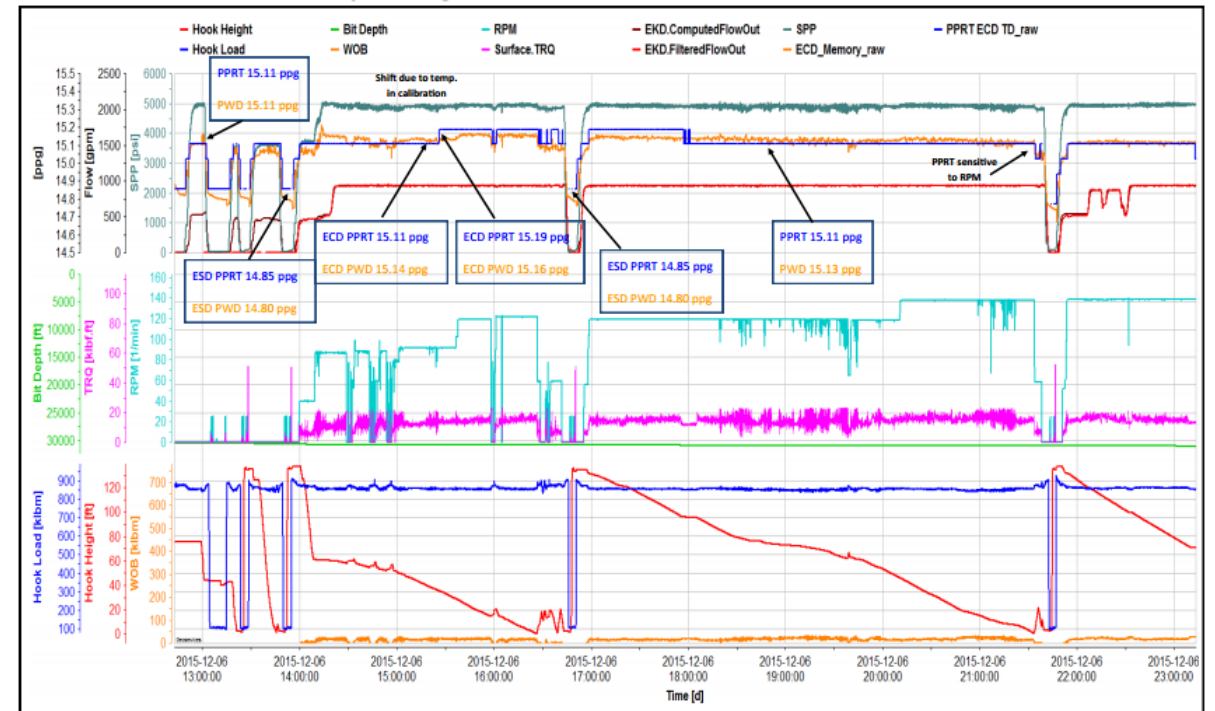
Risks	Opportunities	Differentiator
<ul style="list-style-type: none"> <li>• Wellbore Instability</li> <li>• Downhole Losses</li> <li>• High ECD</li> <li>• Hole Cleaning</li> <li>• High temperatures</li> <li>• Tool failures</li> <li>• Uncertainty PP/FG</li> </ul>	<ul style="list-style-type: none"> <li>• It's a partner of PWD while drilling and complements while tripping</li> <li>• Monitor hole cleaning in real-time, compare against PWD and SPP to detect pack-off</li> <li>• Surge/Swab ECD's while running casing, control of tripping speed to avoid fracturing/swabbing the well</li> <li>• Unlike PWD, no temperature dependency</li> <li>• Stage up safely – breaking circulations expressed as ECD / Pressures</li> </ul>	<ul style="list-style-type: none"> <li>• Monitor up to 10 points of the open hole section, all times</li> <li>• Continuous ESD readings not just at connections</li> <li>• Manage your tripping velocity as you POOH/RIH don't wait for memory data</li> <li>• Get breaking circulation pressures and ECD, even with low flow rate</li> <li>• Monitor hole cleaning as drilling parameters change</li> <li>• Predict downhole ESD and temperatures after long static times</li> </ul>

# PressPro RT deliverables

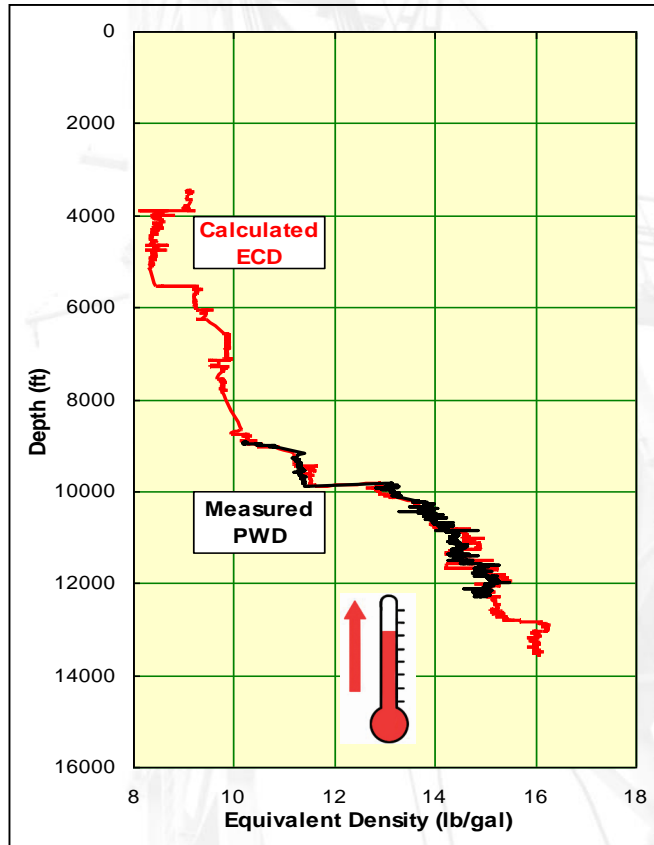
Continuous ESD/ECD measurements

## PressPro RT provides continuous ECDs measurements in several scenarios

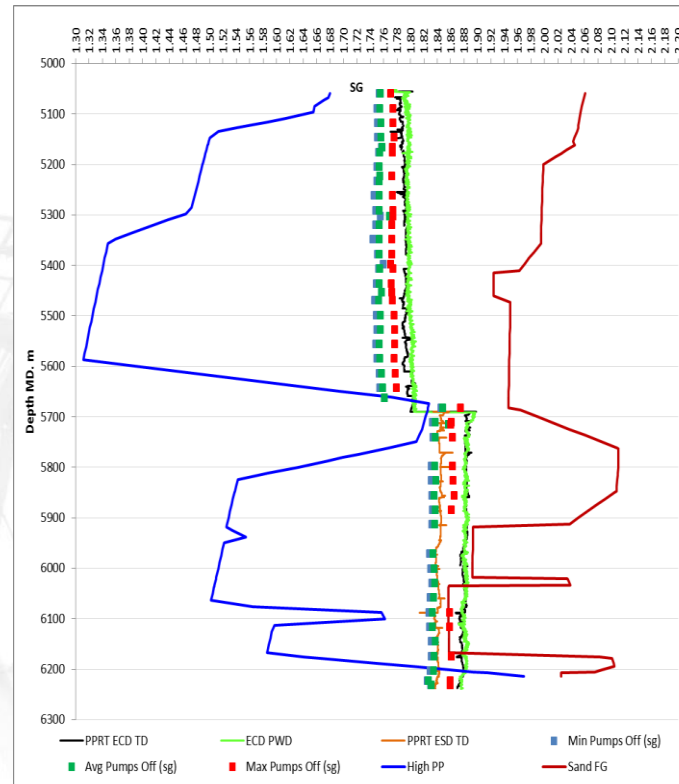
- Cutting down mud weight, as it provides continuous ESD
- Excessive temperature cases
- ECDs at any point of the well
- ESDs not just at DP connections
- When the PWD tool fails
- Breaking circulation pressures
- Mud displacements
- MPD Operations (surface BOP)



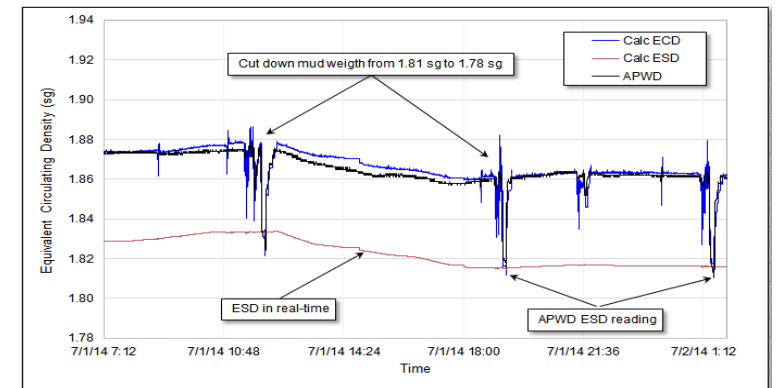
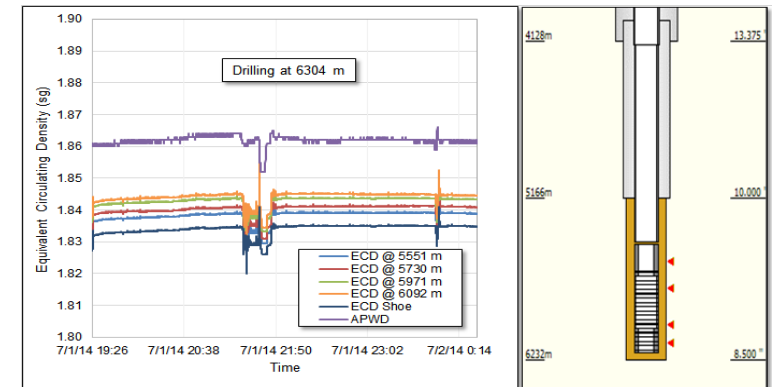
# PressPro RT deliverables



PWD stop working due to excessive temperature or failure?



Compare against PWD figures



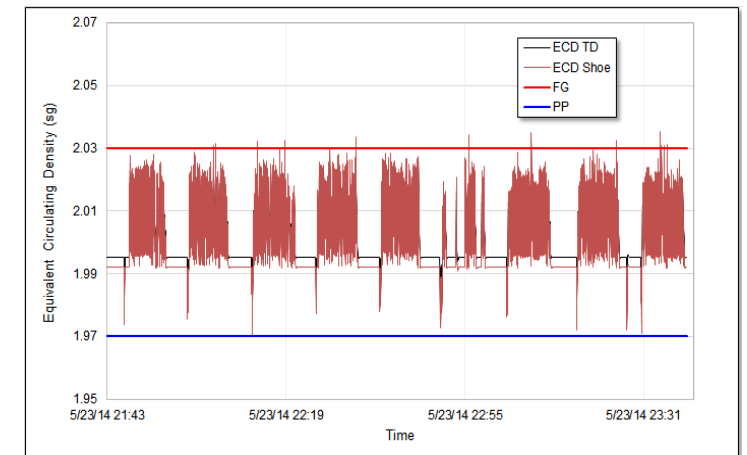
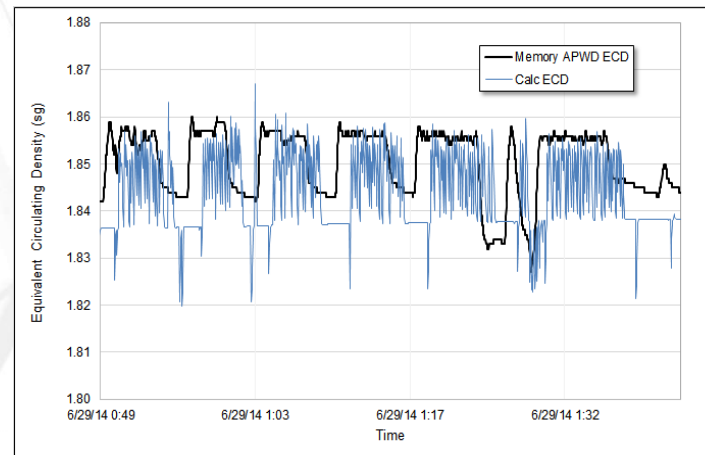
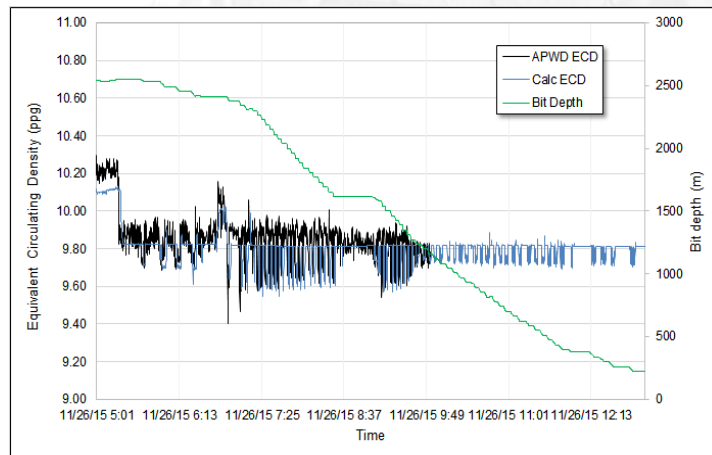
Monitor different points of the wellbore  
Continuous ESD measurements

# PressPro RT deliverables

Swab/Surge ECD at all times (running pipe or casing)

The drilling performance is improved while drilling with the PWD tool, but in other cases there is an opportunity to improve the tripping performance

- In tight drilling windows a small change in the tripping velocity can make a big difference: induce losses or kick
- The PWD memory data is available once the tools are at surface
- PressPro RT calculates surge/swab ECDs at any time, no need to wait to recover the memory data
- In casing running operations can be vital as the “customer” is not blind, there’s information to take decision in real time
- Acceleration is more critical than velocity while running pipe/casing



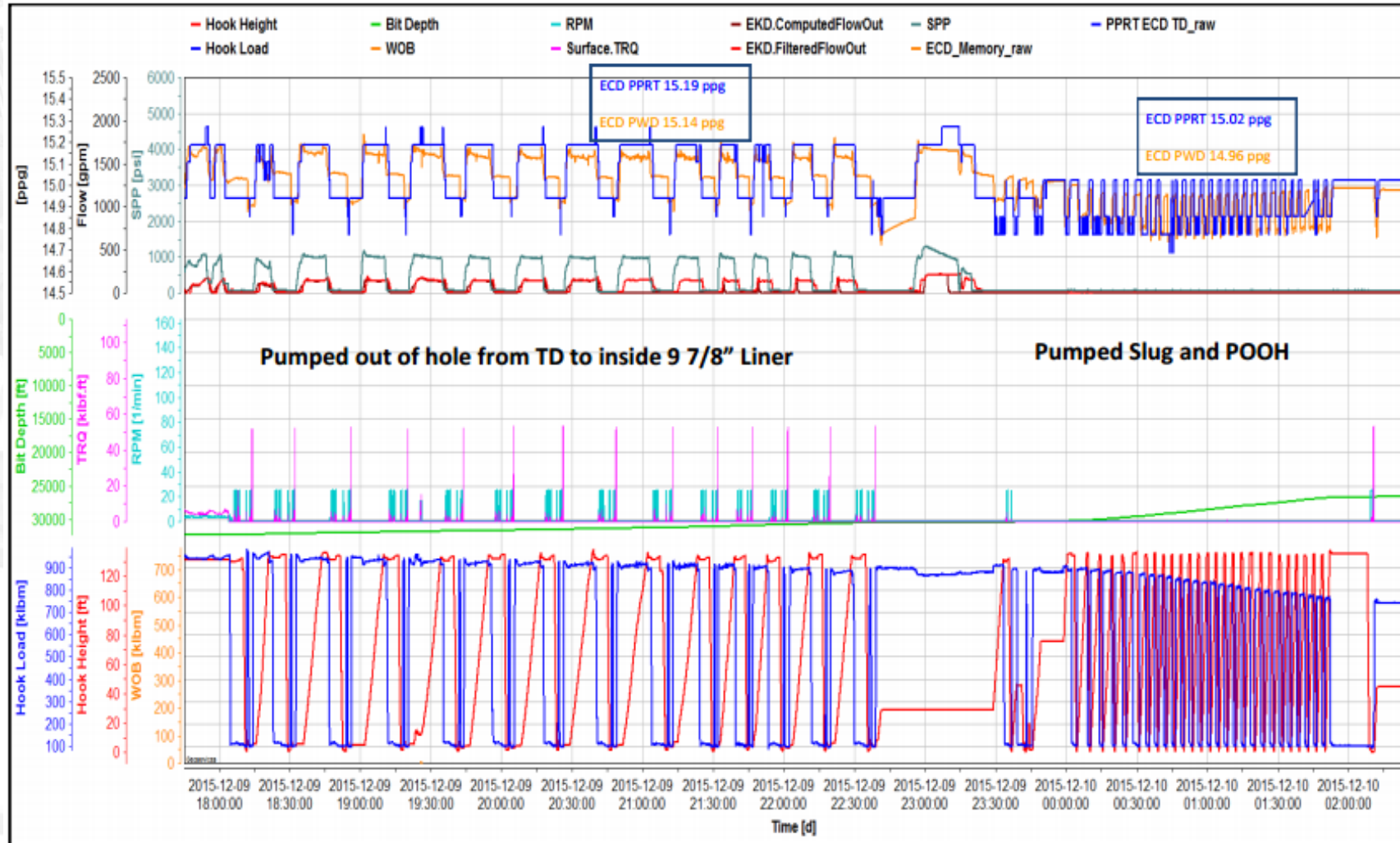
TECHNOLOGY RELIABILITY EFFICIENCY INTEGRATION

Schlumberger-Private

**Mi SWACO**  
A Schlumberger Company

# PressPro RT deliverables

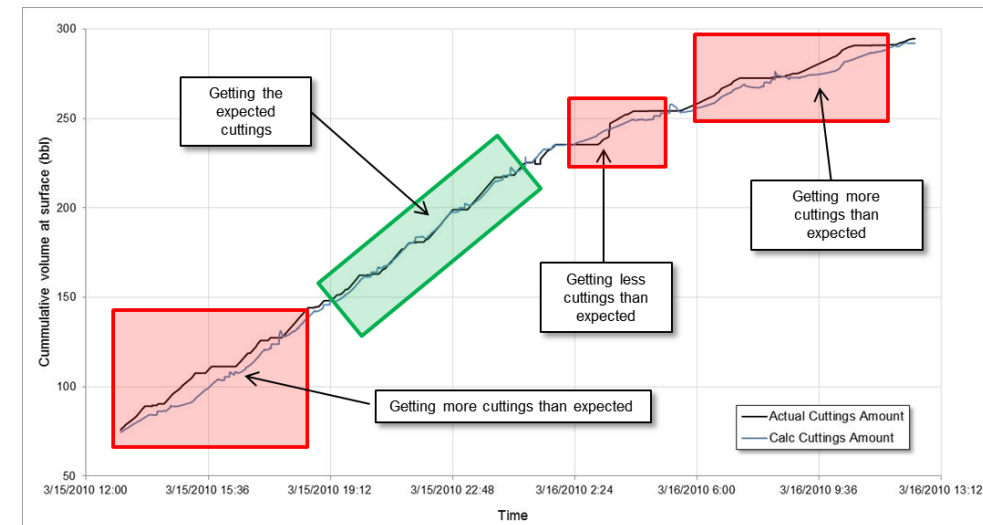
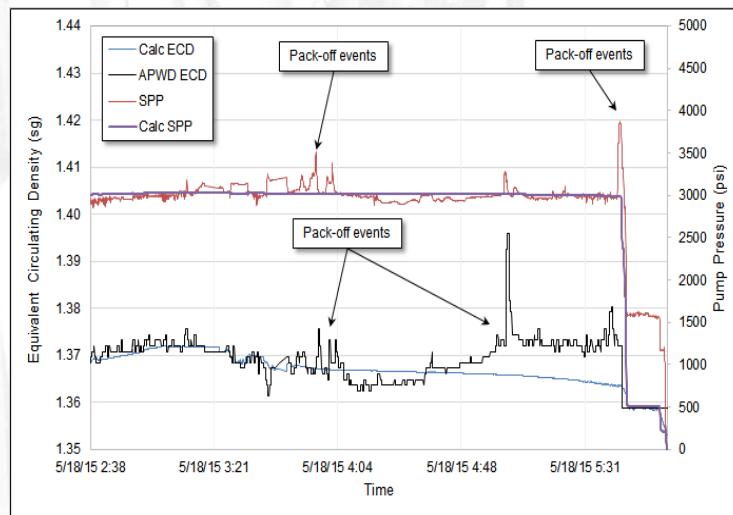
Swab/Surge ECD at all times (running pipe or casing)



# PressPro RT deliverables

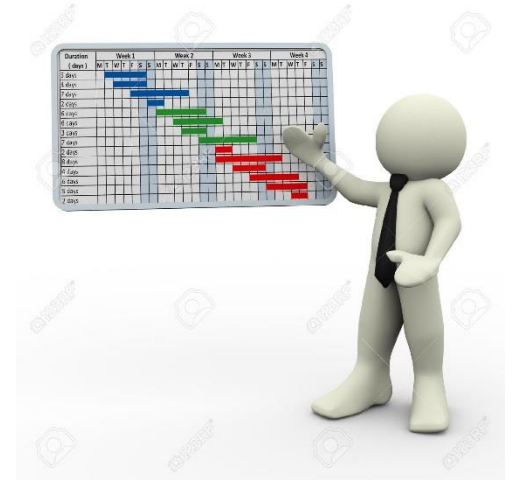
## Hole Cleaning

- ❑ The hole cleaning issues (pack-off events) can lead in serious NPT (red money), even a side track if the pipe can't get free
- ❑ Proper cuttings transport can help to improve the hydraulics, but it is not easy to model using conventional hole cleaning models
- ❑ By combining analytical and fuzzy logic techniques and experimental data, PressPro RT uses transfer functions to create continuous and dynamically curves, the software predicts if the hole is being cleaned or not, based on the actual drilling parameters



# Conclusions

- The challenges in the actual operations makes the RT hydraulic applications important for managing downhole hydraulics and helping operators further achieve the technical limits
- Even though several improvements in hydraulics modeling have been done during the past years, more work is still needed
- Real-time hydraulics have become necessary to fill-in the gaps left by the PWD tools, and PressPro RT complements and enhances the data, thus facilitating decision making, providing the customer with a complete overview and allowing pertinent changes in on-going operations to reduce the NPT
- PressPro RT has demonstrated an excellent correlation with the compared PWD and has been compared with the PWD memory log following trips in/out of the hole. Confidence in PressPro's ability to control swab and surge pressures is then increased, helping the customer achieve significant saving in rig time, mud losses, and services



# Contact Information

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