

Downhole Broadband Solutions

Optimize your drilling performance
and decision-making through
real-time downhole dynamics
measurements

Turn the lights on downhole

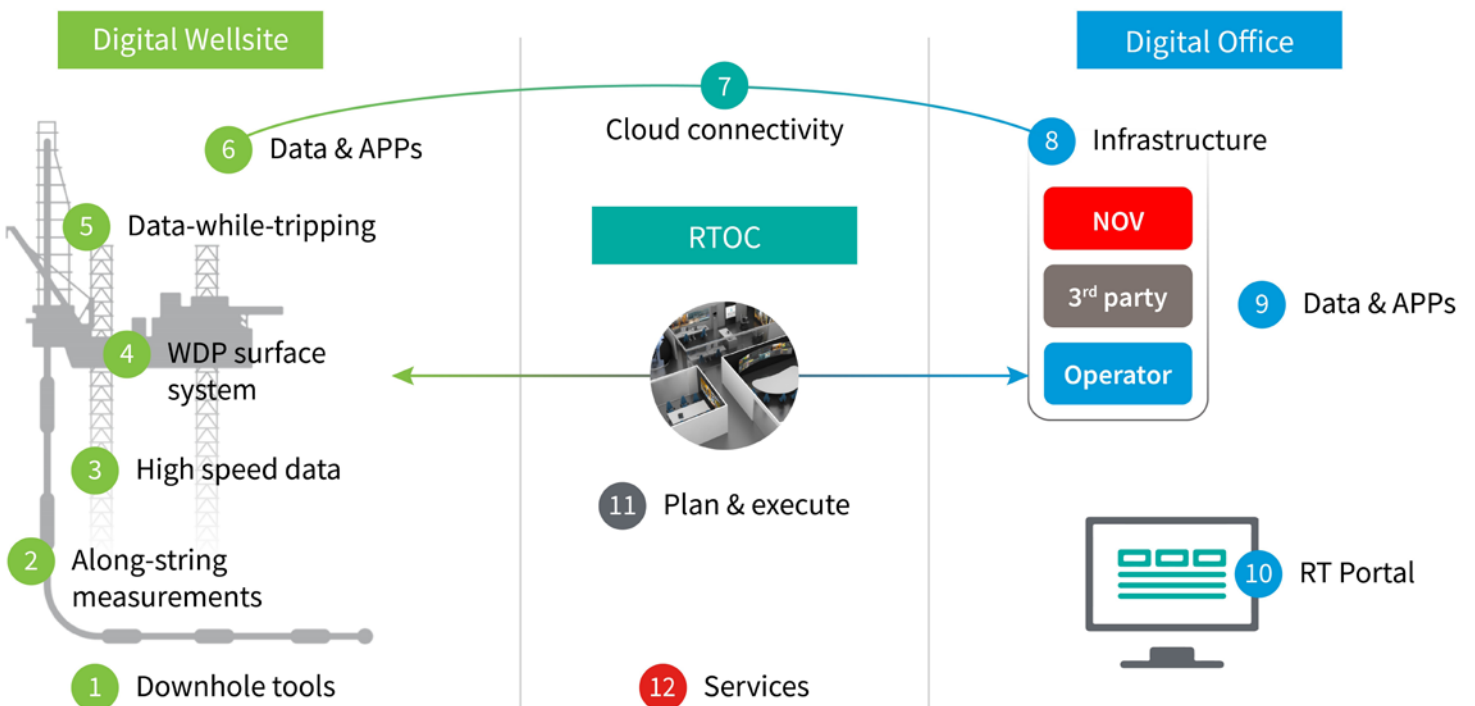
M/D Totco | NOV

The critical link between you and your downhole performance

When every second counts, real-time downhole measurements and accurate data allow you to safely drill to your technical limits while avoiding costly nonproductive time. With key insights that allow you to quickly augment your drilling approach in response to downhole dynamics, you can mitigate events such as stuck pipe or additional circulating hours that can damage equipment.

Our M/D Totco™ downhole broadband solutions rely on accurate BlackStream™ downhole sensors and IntelliServ™ wired drill pipe (WDP) to acquire high-speed, downhole dynamics measurements that support a suite of applications, viewers, and controls focused on optimizing your drilling performance. Using a closed-loop digital platform and high-speed telemetry, the system creates a bidirectional link to real-time drillstring dynamics and pressure measurements along the wellbore.

- Agnostic and work with multiple operating systems, allowing you to tie into high-speed, downhole data into control systems and subsequently optimize or automate your drilling processes.
- Data management and remote support to both the rigsites and your global operational centers, turning downhole data into actionable insight and recommendations that help you drill faster and more efficiently while achieving consistent, safe operations.
- Sends and receives data transmissions up to 10,000 times faster than conventional methods, supporting decision-making based on real-time measured data versus models and simulations.



A dynamic optimization platform built on powerful technologies

Our BlackStream series of collar-based dynamics measurement tools work in concert with our IntelliServ wired drillstring to improve telemetry times and deliver high-frequency downhole data. The BlackStream enhanced measurement system (EMS) tool provides real-time measurements of both drilling dynamics and wellbore quality. With the addition of our BlackStream along-string measurement (ASM) tool, the total dynamic environment of the drillstring can be evaluated as it relates to temperature, annular and bore pressure, rotational velocity, and three-axis vibration. Both tools can be run simultaneously in flexible configurations in multiple placements.

Using an inductive coil embedded in the drill pipe, the IntelliServ network provides instantaneous data transfer from our BlackStream tools to surface. The network utilizes links along the drillstring to provide an optimal signal, while data and tool commands are securely transferred to and from local and remote users via a network controller and surface cabling. When used together, these technologies deliver downhole data-driven solutions in a matter of seconds, optimizing multiple aspects of your well construction operations.

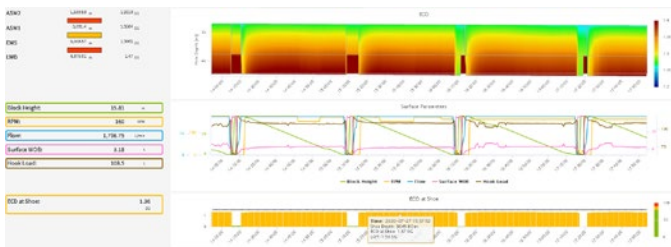
The real power of WDP lies in its ability to enable more effective integration of downhole dynamics measurement tools like ASM and EMS systems, providing a better understanding of downhole optimization, hole cleaning, and wellbore stability. WDP effectively turns the lights on downhole, not only in regard to BHA measurements with standard mud-pulse telemetry, but with multiple measurement tools placed along the string. The acquired data from all tools can be visualized in different drilling performance applications for parameter optimization and improved insight.

**An upgrade ability to incorporate high speed measurement-while-drilling (MWD), including Gamma.*



Digital applications - Drilling performance and downhole insight

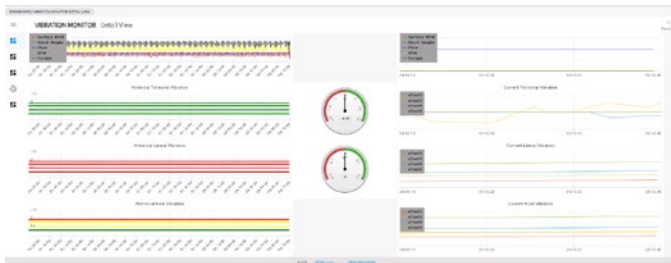
The downhole broadband solutions system acquires and transmits real-time downhole measurements at multiple positions along the drillstring, including internal and annular pressure, temperature, rotation, three-axis vibration, downhole weight on bit, and downhole torque on bit. The acquired data enables software applications to improve your situational decision-making and enhance the implementation of your drilling program. M/D Totco digital applications can be installed on the drilling control network (DCN) platform and the NOVOST™ reflexive drilling system, where your drilling optimization program can be driven by surface data or with input from downhole sensors through WDP, including BlackStream ASM, BlackStream MWD, and BlackStream EMS.



Downhole Fluid Monitoring

Identify and mitigate areas with increased ECD pressure

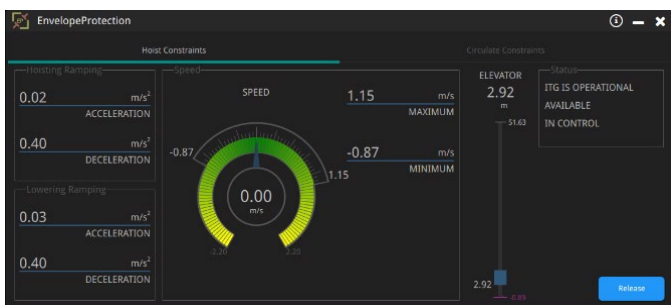
- Uses heatmap to visualize ASM data for downhole annular pressure
- Aids in understanding the values relative to the appropriate FIT/LOT (formation integrity test/leakoff test)
- Provides an enhanced wellbore and drilling condition understanding
- Reduces operational risk and maximizing hole cleaning performance



Downhole Vibration Monitoring

Measure the impact of surface parameter changes on drilling dynamics

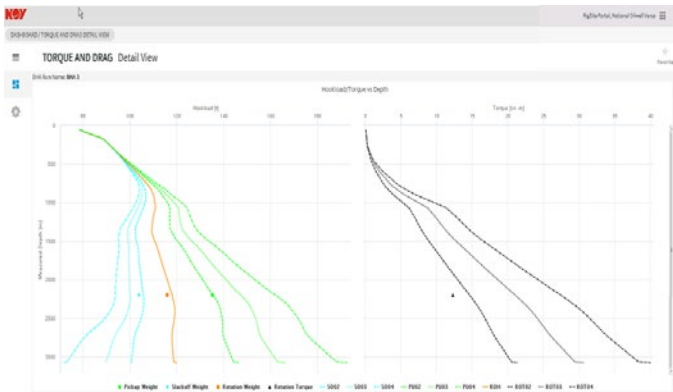
- Visualizes ASM and EMS dynamics data and can identify both the severity and location of drillstring dysfunction
- Plots torsional, lateral, and axial vibrations against surface parameters to put information back into real-time context
- Quick-acting gauges provide immediate feedback on changes, allowing adjustments in surface drilling parameters that can mitigate or reduce potentially damaging downhole dynamics



Envelope Protection

Maintain well control through pump rates and tripping speeds

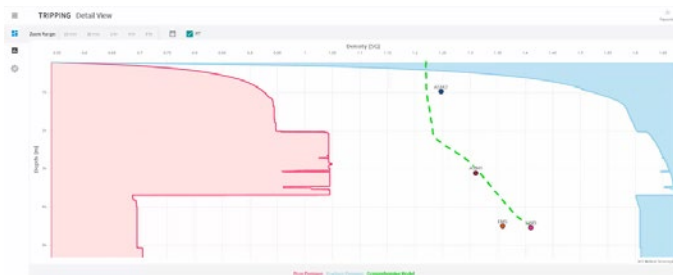
- Data from viewers and comprehensive model fed directly from native application to control system
- Prevents hoist acceleration and pump ramping speeds from exceeding set limits
- Ensures fracture and pore pressure limits are not exceeded while allowing for safe and controlled tripping operation



Torque and Drag viewer

Minimize risk in tight spots while tripping out or running casing

- Consistent and reliable downhole friction monitoring
- Early identification of wellbore-related issues
- Automatically records torque and drag measurements as per friction tests performed by the NOVOS system
- Alarms notify of deviation from simulations and models



Tripping viewer and Downhole Swab and Surge

Apply safe pump rates and tripping speeds while staying within the envelope

- Helps determine safe pump rates and tripping speeds without exceeding well limitations
- Plots downhole measured and predicted along-string pressure data
- Real-time and modelled data verify pressure conditions
- Allows communications with downhole components while drillstring is hanging off top drive elevator
- Mitigates risk in real time, allowing tripping to be performed in safe and optimized manner



Industry recognition

Papers

- Improved drilling operations with Wired Drill Pipe and Along-String Measurements – Learnings and highlights from multiple North Sea deployments – SPE-204029-MS
Authors: Equinor, NOV
- Annular pressure management - Benefits from using Along-String Measurements in real-time while tripping – SPE-204019-MS
Authors: NOV, Equinor
- Data While Tripping (DWT) – Keeping the light on downhole – SPE-202398-MS
Authors: NOV
- First Wired Drill Pipe deployment in Adriatic Sea – SPE-197833-MS
Authors: ENI, Lundin Norway, NOV
- Experience from drilling a horizontal well in a naturally fractured and karstified carbonate reservoir in the Barents Sea using a CML MPD system – SPE-194545-MS
Authors: Lundin Norway, Enhanced Drilling
- Performance impact of downhole data from Wired Drill Pipe and downhole sensors – SPE-194093-MS
Authors: Occidental Petroleum Corporation
- Delivering Drilling Automation II – Novel automation platform and Wired Drill Pipe deployed on Arctic drilling operations – SPE-1915746-MS
Authors: BP, NOV
- The use of Wired Drill Pipe technology in a complex drilling environment, increased drilling efficiency and reduced well times – SPE-178863-MS
Authors: Total E&P, NOV, BHGE
- Implementation of Wired Drill Pipe saved multiple days per well, by addressing performance limiters, increasing drilling efficiency – SPE-178798-MS
Authors: NOV, EON E&P
- Interval Density Analysis From a Distributed Absolute Pressure Array– SPE-206021-MS
Authors: NOV

Articles

- World Oil – Capturing real-time data during drilling and tripping operations improves efficiency and well placement (March 2021)
Authors: NOV
- Offshore Engineer – Eyes along the string (January 2018)
Authors: NOV, Statoil (Equinor)
- IADC Drilling Contractor – Along-string measurements enable critical decisions, understanding of open, cased hole on structurally complex Norwegian North Sea field (July/August 2016)
Authors: NOV
- InnovOil – Optimization: The need to eVolve (July 2016)
Authors: NOV
- Offshore Engineer – Visualizing downhole data (November 2015)
Authors: NOV

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