

## Combined Real-Time Mechanical Specific Energy (MSE) at Bit with Torque and Drag Detection for Improved Drilling Efficiency

NRG@Bit is a service which provides customers the ability to drill wells with improved efficiency. The NRG@Bit software package utilizes high-quality surface logging data to plot MSE at bit and Torque and Drag curves for analysis while drilling. Drilling efficiency is analyzed in real-time against the benchmark KPI's established during the pre-drill simulation, quickly highlighting areas for improvement.



## Benefits

- Real-time MSE at bit, Torque & Drag, Neutral Point Position tracking
- Optimize pressure magnitude from surface to the bit
- Optimize parameters to changing drilling trends
- Reduce overall non productive time (NPT) on-site
- Determine the energy spent at the bit for optimal drilling performance
- Optimize bit selection and BHA design
- Optimize casing running operations

## Challenges and Solutions

Energy which is spent in drilling a hole is not completely transferred to the bit to cut away rock. A portion of the energy is lost due to friction between the drillstring and borehole wall. The Neutral Point, the point at which the tension and compression forces meet in the BHA, needs to remain in the BHA to avoid a failure in the drill pipe.

Torque and drag generated during drilling operations can cause serious damage to BHA and is usually analyzed post-drilling, limiting its usefulness.

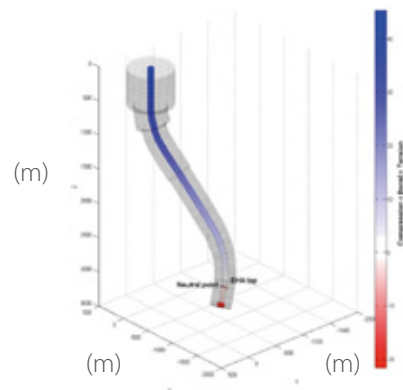
NRG@Bit provides MSE at bit, Neutral Point position tracking, and Torque & Drag information in real-time, allowing continuous improvements to drilling efficiency and preventing catastrophic failures.

Constant feedback from real-time data helps refine the pre-drill model to obtain weight on bit, mud flow rate, and RPM.

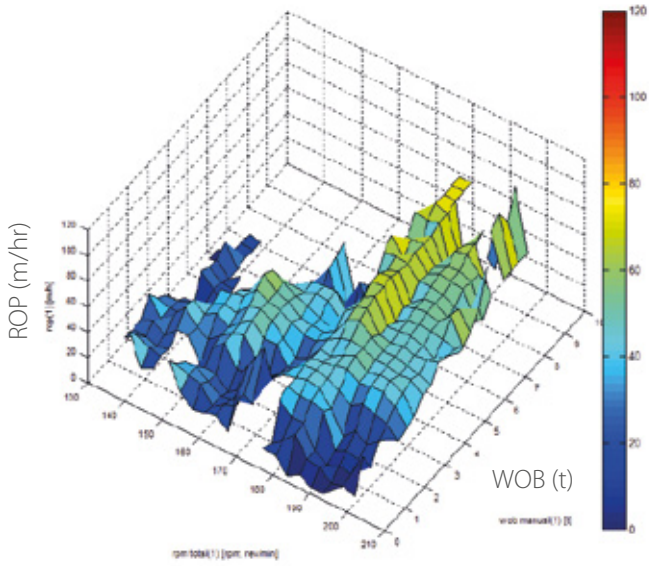
## Applications

NRG@Bit's ability to predict and correct the drilling efficiency trends in real-time makes it a valuable tool to be used on all types of land and offshore projects.

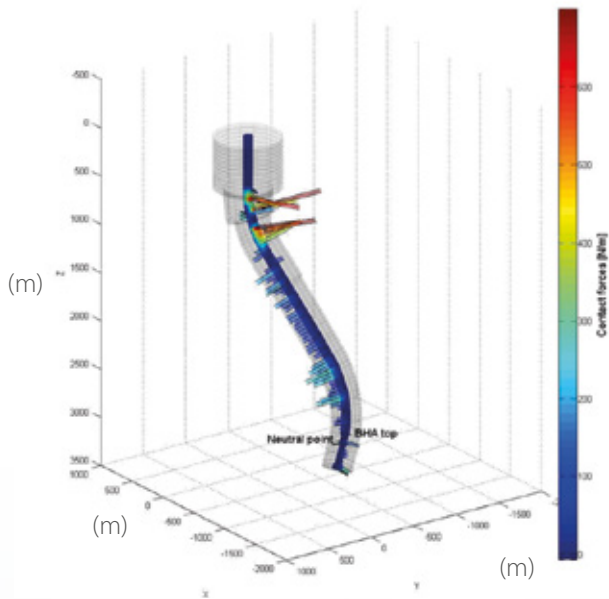
Reducing torque and drag greatly improves drilling efficiency and prolongs the life of the lower BHA, while providing improved cost benefits with increased depth.



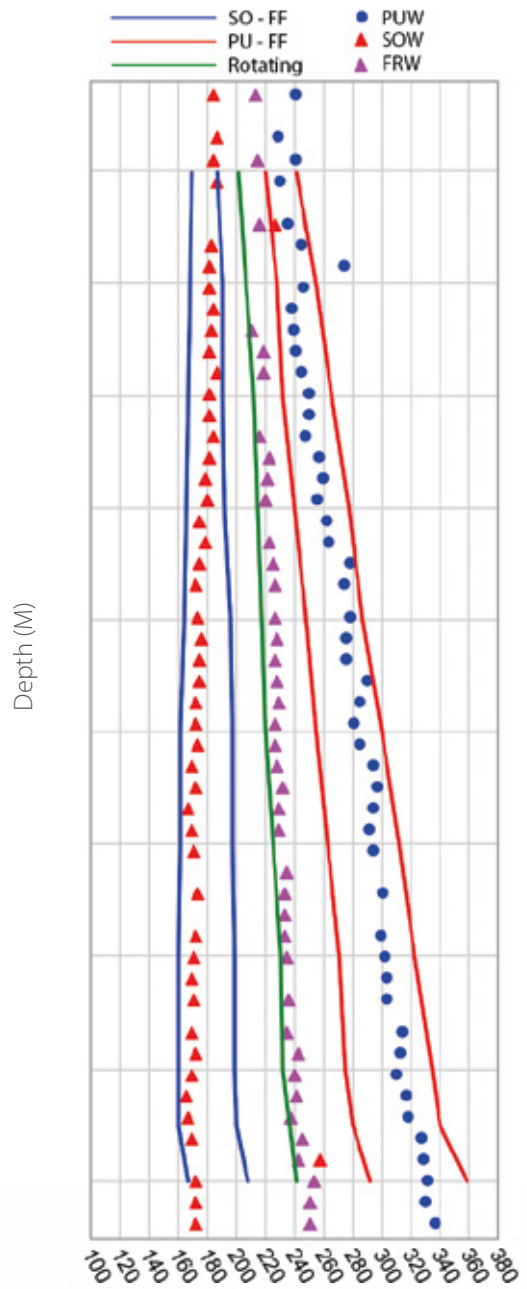
Dynamic Neutral Point Detection



RPM Total (rev/min)



RPM Total (rev/min)



Torque & Drag

Visual outputs from NRG@Bit assist in the analysis of MSE and Torque and Drag effects on drilling performance. By combining field measurements of pick-up and slack-off data with robust torque & drag they can provide an increased understanding of the drilling behaviour in the borehole environment.

With real-time torque & drag detection it can help track contact forces and location of neutral point during the entire drilling process. The drilling engineer will benefit by being able to detect and alleviate issues related to borehole cleaning and BHA hanging before they present a larger problem affecting NPT.

MSE is commonly used in industry but only NRG@Bit takes into account the energy spent directly at the bit and all the energy lost along the entire drill string while drilling.