CASE HISTORY

Independent Operator Drilling in West Texas with Diesel OBM Improves Drilling Efficiency by Using Tribex™ ERD Additive in Extended Reach Lateral (ERD)

Well Summary

An independent operator in the Permian Basin was experiencing high downhole torque values while drilling ERD laterals. The costly direct and indirect impact to the operator was a reduction in drilling efficiency, a reduction in lateral length associated to rig limiting torque, increased rates of tool failure associated with downhole vibrations, and progressive costs associated with liquid lubricants. An evaluation was made comparing Tribex™ ERD Additive performance in an ERD application. Drilling efficiency and optimization was reached with Tribex™ ERD Additive by allowing the operator to get more weight to the bit with less torque, achieve higher RPM's with less torque, gain more GPM through the BHA with less average differential pressure, and have similar ROP levels with a reduced differential pressure profile.

Well Outline

Interval Length: +/- 10,000 ft.
Well MD: +/- 21,000 ft.
Well TVD: +/- 10,000 ft.
Hole Diameter: 8.75 inches with RSS Assembly

Objective

Evaluate Tribex™ ERD Additive in downhole conditions vs Offset Well performance with liquid lubricant. Metrics observed: Torque (kft-lb), Mechanical Specific Energy (MSE), and Differential Pressure (psi).

CHALLENGES

- High torque values exceeding limitation of rig equipment
- High drag on trips
- Large torque variation (tortuosity)
- Progressive tool repair costs and failure

SOLUTION

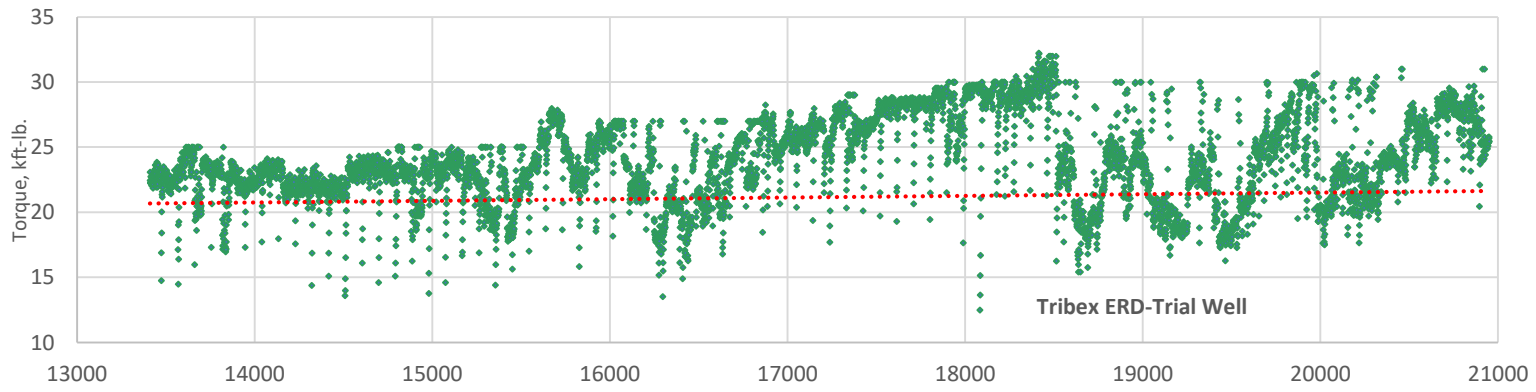
- Tribex ERD Additive- 3 ppb

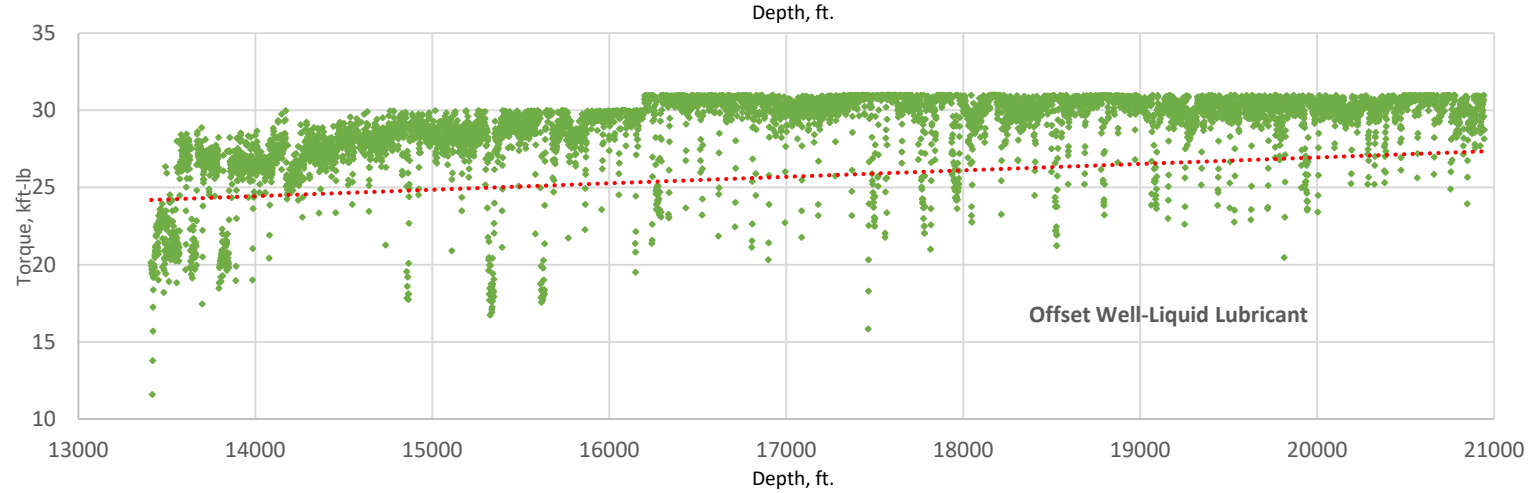
RESULTS

- Higher WOB/RPM with less torque
- More GPM through with less differential pressure
- Similar ROP with less differential pressure

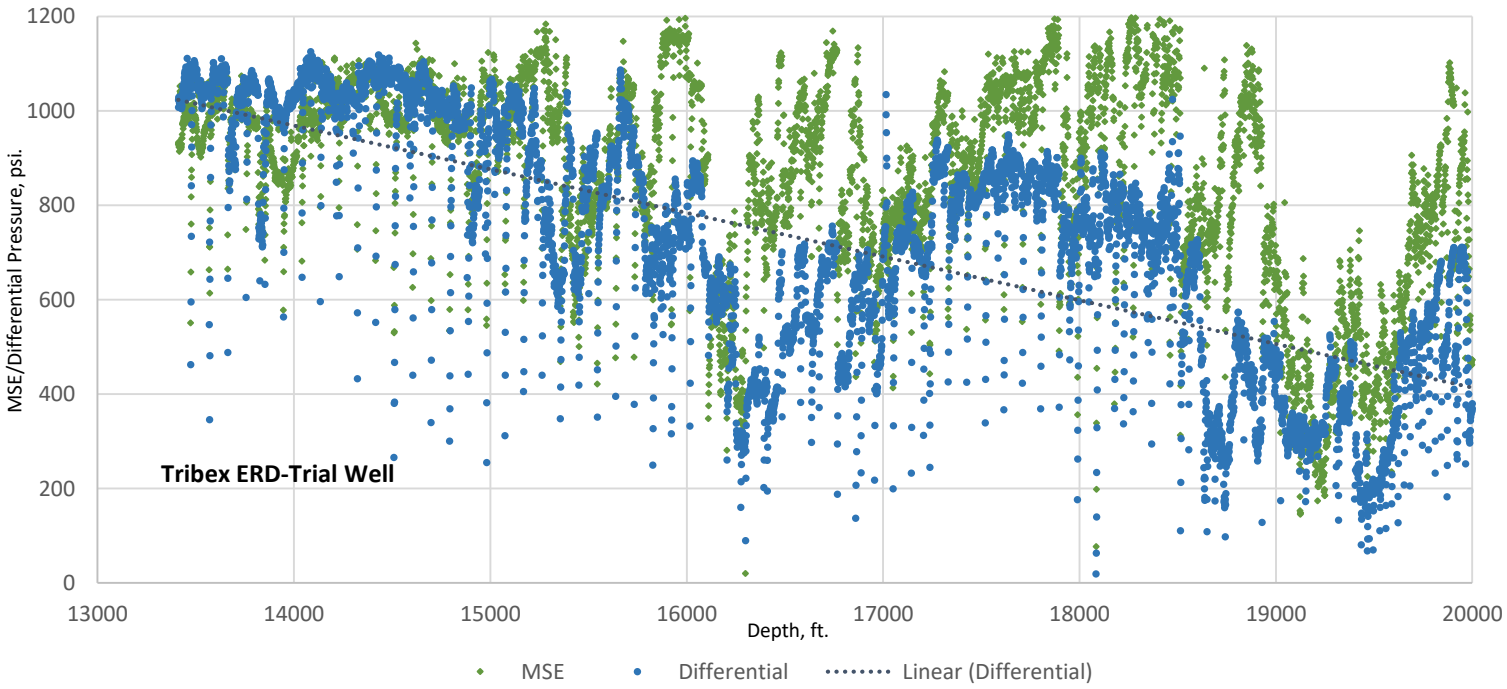
MUD TYPE

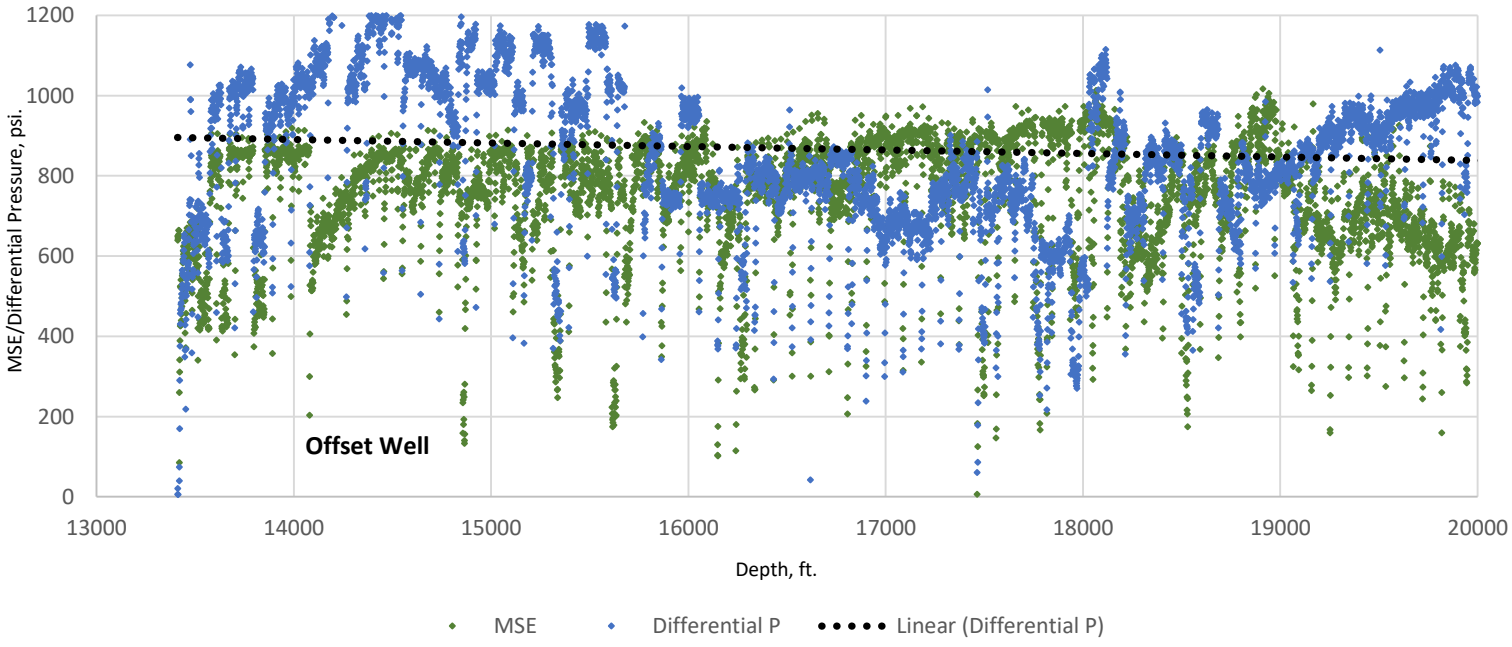
- 80:20 Diesel OBM





Tribex ERD Additive continued





Tribex ERD Additive continued

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Mechanical Specific Energy (MSE) Explained

MSE is defined as the energy required to remove a unit volume of rock (Teale 1965). The MSE unit value can be used to determine drilling optimization trends and efficiency. Reference IADC/SPE -178842, Pore Pressure Estimation Using Mechanical Specific Energy and Drilling Efficiency. It is important to understand that although complex methods of drilling evaluation have evolved, the fundamental MSE model remains significant as an overall qualitative tool to identify drilling optimization trends. See below MSE Equation and inputs.

Mechanical Specific Energy (MSE)

Energy required to destroy a unit volume of rock.

$$MSE = \frac{480 \times T \times RPM}{d_{bit}^{\,2} \times ROP} + \frac{4 \times WOB}{\pi d_{bit}^{\,2}}$$

Teale (1965)

T	Torque, ft.lb
WOB	weight on bit, lbf
ROP	rate of penetration, ft/hr
RPM	revolutions per minute, min^{-1}
d_{bit}	Bit diameter, in
MSE	mechanical specific energy, **psi**

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