BitLife

Reducing the Uncertainty of Bit Trip Timing

GEOLOG's **BitLife** real-time bit wear monitoring service applies a patent pending method to detect, compare and assess cuttings character, alkenes - the unsaturated hydrocarbons generated artificially by drilling fluid cracking, and drilling parameter responses such as torque and rate of penetration, to indicate the condition of the bit and its remaining drilling efficiency. Software provides objective commercial guidance for optimal timing of bit trips.

GEOLOG SURFACE LOGGING

Benefits

- Operational and economic indicators for when to pull the bit
- Validates appropriate bit selection for the formation being drilled
- Avoid invisible Non-Productive Time (NPT) through unnecessarily slow ROP
- Avoid Non-Productive Time (NPT) by preventing junk or under-gauge hole
- Real-time bit condition indication, remaining bit life estimation, and probable drilling efficiency

Challenges and Solutions

Understanding when a bit is nearing its end of life due to wear compared to a decrease in performance due to lithology change or other drilling dysfunction such as balling can be a major challenge, especially when the time to round-trip for a bit change can have a significant impact on well construction costs.

GEOLOG's BitLife service provides decision-makers with timely information about bit condition based on alkenes generated by excessive friction from a worn bit. Increased alkenes, associated with low Rate of Penetration (ROP) and metamorphosed cuttings, is indicative of potential bit wear. This unique methodology provides a clear and concise indicator of the nearing end of effective bit life. It is a low cost real-time surface solution that helps ensure drilling operations and well delivery are as efficient and cost effective as possible.

Applications

BitLife works with Oil Based Muds (OBM), Synthetic Based Muds (SBM) and Water based muds that have hydrocarbon-based additives where thermal cracking of the drilling fluid hydrocarbon components can occur. This service is available for both offshore and onshore operations and can be run in any standard GEOLOG surface logging cabin.

Case History

$15M USD saved using BitLife service

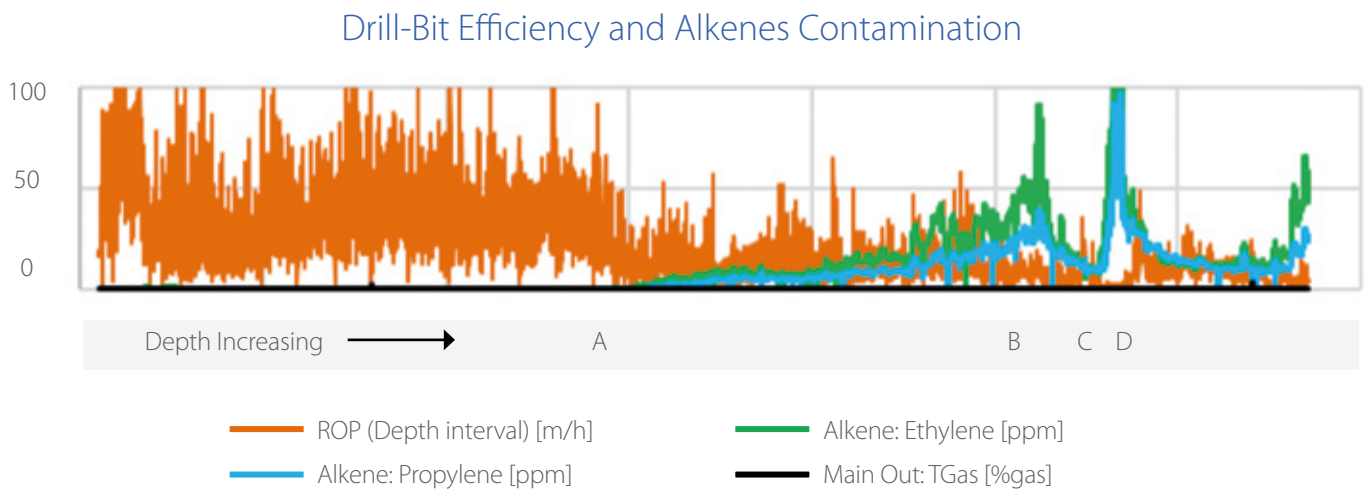

Figure 1. Drill Bit Efficiency plot highlighting ROP and detectable Alkenes. "Drill-Bit-Metamorphism" effect was observed starting at point A. Alkenes continue to increase until point B, indicating the ideal time to perform a bit trip. An additional increase in Alkenes occurs at point C, correlating to extremely low ROP before performing the bit trip. Point D marks the start of the new bit, which demonstrated extreme wear very quickly due to junk left in the hole.

BEFORE

AFTER

Figure 2. PDC bit shown before and after drill bit metamorphism. Bit on the right, note the center has completely broken off and the bit is under gauge. Metal left down hole can result in additional NPT for fishing operations, circulation to clear debris and damage to subsequent bits.

In this deep-water exploration well the operator faced problems with very slow ROP. Uncertainty about the exact causes could not be determined without performing a bit trip, a costly affair taking approximately five days round trip on a deep water drillship.

When the BitLife service was deployed a direct correlation between Alkene contaminates and lower ROP can be seen starting at point A (Figure 1). A further drop in ROP occurred when Alkene production increased substantially at point B (Figure 1). This would be the ideal moment to perform a bit trip since it corresponded to lower ROP. Drilling operations elected to continue on despite the information pointing to a worn bit. As a result further drilling occurred until the ROP dropped to 0.6m/hr at point C for several hours before a final decision to pull out of the hole at point D. The worn bit was shown to have significant damage confirming the interpretation and warnings from the BitLife service.

Subsequently on the same well, drilling operations placed greater emphasis on the feedback from the BitLife service and was able to save $15M USD in drilling costs by avoiding extremely slow drilling, preventing junk retrieval runs and prevented invisible NPT from reaming out under-gauge hole sections.