Rapid Iterative Discovery Analysis to Prove Bit Failure Hypothesis

OIL & GAS

In all companies, regardless of industry, time is money. For the Oil and Gas Industry, this could not be truer. Waiting a few hours to begin drilling or waiting to replace a drill bit represents millions in annual revenue lost—a cost no company can afford.

Hard Rock Formations or Something Else?

Dwight Eisenhower famously stated that "plans are useless, but planning is indispensable." The complexities that are always present in drilling oil wells mean that operations almost never go as smoothly as planned. Equipment failure and unpredictable subsurface characteristics, to name a few, are common sources of operational delay, and—as is always the case—time is money.

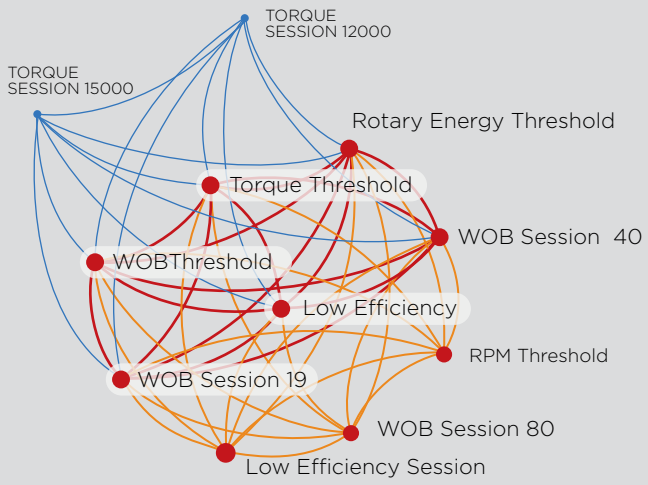
Eliminating drill bit failure represents a savings of $18 million annually.

For one large operator, drill bit failures were becoming commonplace in one of their US land regions. The typical well plan was to drill a horizontal section of approximately 5000 feet in a single bit run. In some cases, that goal was achieved, but in many others, unexplained bit failures forced multiple unplanned bit trips. The added non-productive time resulted in significant extra cost.

These bit failures puzzled engineers, who saw no clear pattern emerge in how or when bit damage would occur. In the hundreds of wells drilled, many combinations of operating procedures had been tried without any improvement, and some engineers accepted bit failures as simply the result of hard rock formations being drilled. However, a smaller group decided that the team should not simply accept these bit failures as an inevitable inconvenience. Rather, they decided to work to understand the 'how' and the 'why' of this issue:

- Is the assumption that hard formations are to blame valid?
- Why is there no clear pattern present in the data of when the failures occur?
- How can we create a method for preparing for these types of events?

Drill Bit Failures



By mapping drill bit testing in one of their U.S. oil fields, engineers for this Teradata customer were able to develop hypotheses on why drill bit failures were occurring. Through data analysis, it was determined that weight on bit (WOB) threshold was not, in fact, the primary reason for bit failure. Rather, drill bit failure was attributed to low efficiency drilling, and this presented an opportunity for engineers to develop more efficient drilling practices.

Determining Why Failures Occur

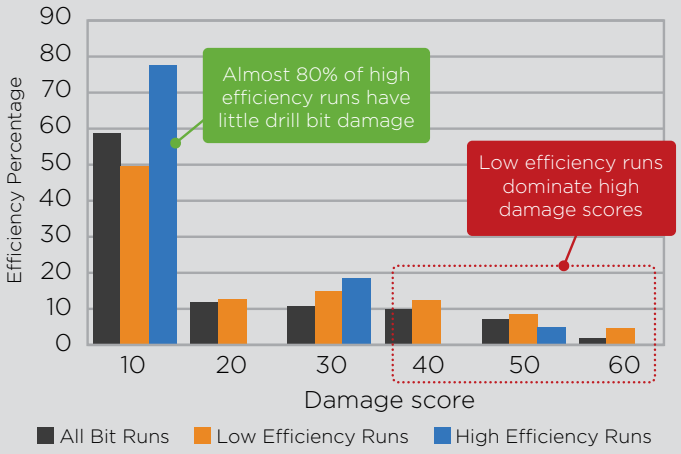
By partnering with Teradata, engineers developed a plan to understand this issue. First, by collecting all existing data and getting a holistic view of the information, engineers were able to quickly test and explore hypotheses on why drill bit failures were happening, as well as forming action steps to prevent them happening at such a frequent rate.

The insights for this project were derived from the analysis of:

- Surface and downhole drilling data
- Metadata relating to well and drill string configuration
- Bit damage severity and profile
- Well position and trajectory
- Petrophysical information

Next, engineers needed to determine the feasibility of implementing a proactive bit failure detection system. This had business-wide benefits that included a cost savings in worn bits, reduction of downtime in replacing bits, and lowered risk of fishing due to catastrophic failure.

Compare Bit Damage Scores and Efficiency



Achieving more Efficient Drilling

A highly collaborative process of analytic discovery determined that Drilling Efficiency was the leading contributing factor in bit damage. Engineers used Teradata Aster along with all available data to examine energy efficiency during drilling operations with respect to the environment, including drag, friction and rock hardness. Additionally, they used Path Analysis, Correlation, and other modules to evaluate trigger events, sequences, conditions, or system combinations to avoid or promote.

By utilizing Teradata Aster, engineers were able to look for and identify patterns that have led to better informed operational decision making, leading to an increase in drilling efficiency to avoid catastrophic bit damage.

More Efficient Development Drilling

Eliminating this issue in drill bit failure represents an $18 million per year savings—but that is just the start. The operator has identified multiple use cases with potential to generate similar value by focusing on an analytic-centered process, and simply using existing data to their advantage.

This demonstrates a central Teradata philosophy: If you manage data once and manage it well, you can reuse it elsewhere and often.

For this customer, knowing more certainly helped them to do more—and it all starts with having a holistic view of the operations through data. When you know more, you can do more.

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