Relative Bearing Tool Used to Determine Optimum Perforating Configuration

Objectives

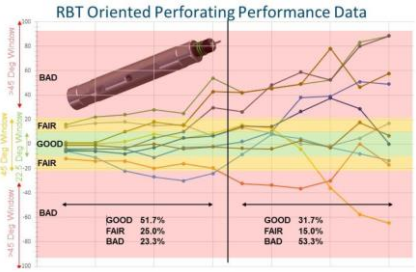
- A Customer was completing wells with oriented perforating guns using eccentered weight bars for alignment. The results from similar wells where shot orientations were determined after the wells were completed, showed that the alignment accuracy to the preferred direction was poor.

Our Approach

- To evaluate the effectiveness of different hardware and configurations and determine the results in real-time, the customer chose the Weatherford relative bearing tool (RBT). The RBT is a plug & play, ballistically rated, relative bearing service. It uses an arrangement of triaxial accelerometers to determine tool high side and borehole inclination. It outputs these measurements in real-time, allowing gun orientations to be plotted and changes to the gun configuration evaluated for effectiveness.
- Over the course of 900-gun initiations on one customer pad, cluster accuracy was found to have a dependence on initial alignment tolerance and to the order in which a gun was fired. Earlier clusters in a stage had better accuracy than later clusters and gun assemblies with better initial alignment, remained better aligned overall.
- Evaluation of the data in real-time showed that the base configuration resulted in only 27% of shots being fired within a 60 Degree window to the desired direction. Changes to the configuration on location resulted in an immediate 50% improvement to the base case setup for subsequent stages.

Value to Customer

- The Weatherford relative bearing tool allowed the customer to make operational changes that quickly impacted the performance of their oriented perforating operations.
- The plug and play nature of the relative bearing tool meant that it could be deployed and operationally ready in minutes with minimal training required on how to operate the service.
- Service integration allowed selection of additional sensors for operational assurance, including head tension/compression, pressure, and temperature.



Comparison of perforation accuracy achieved with and without the relative bearing tool.

LOCATION
North America

PRODUCTS/SERVICES
- Relative bearing tool

