

DRILL2FRAC TECH UPDATE

DEPLETED FRACTURE IDENTIFICATION



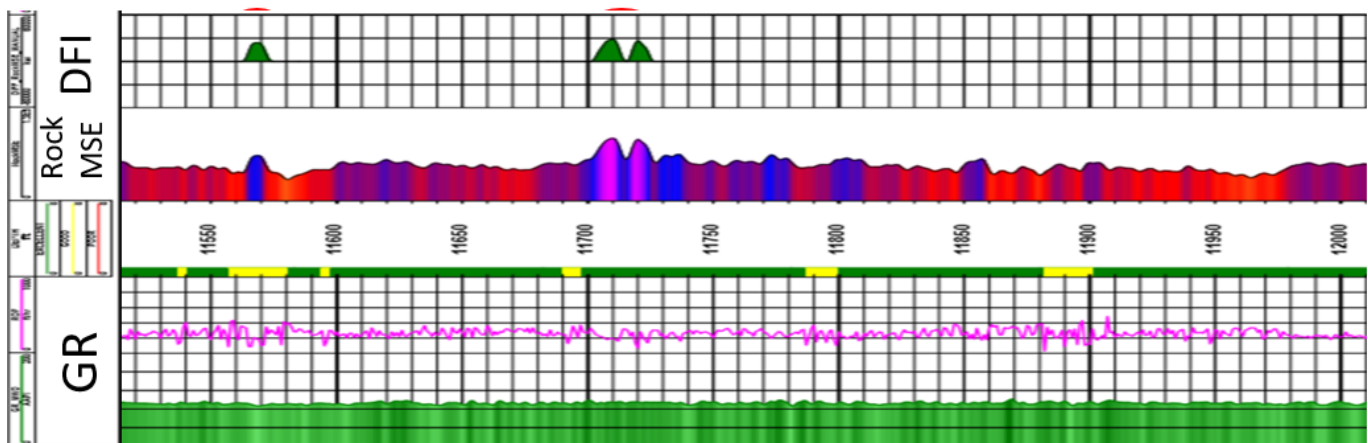
AN INNOVATIVE APPROACH TO UNDERSTANDING FRACTURE INTERACTIONS

After having created several hundred OmniLog profiles, which map rock hardness and heterogeneity using common drilling data, Drill2Frac engineers noticed that child wells often have a different RockMSE signature than parent wells with no offsets. It soon became apparent that these unique signatures were likely caused by depleted fractures that were created during the stimulation of the parent well. After significant research, Drill2Frac created a methodology to isolate and map these signatures. The result is a fracture map along the wellbore which allows operators to evaluate a number of different options to control fracture interactions such as avoiding directly perforating the fractures, using diverters, or changing the pump schedule.

Identify and Mitigate Parent-Child Fracture Interactions

BACKED BY FUNDAMENTAL ENGINEERING PRINCIPLES

Since the early days of drilling, engineers have known that the differential pressure between the reservoir and drilling mud can significantly affect the ROP and as a result, the mechanical specific energy (MSE) (Vidrine et al SPE 1859). Consequently, it is more difficult to drill through an interval that has been locally depleted due to a parent well fracture. Based on this fundamental principle, the depleted fracture identification (DFI) method uses machine learning along with a proprietary workflow to identify these unique RockMSE signatures that are consistent with these depleted fractures.



APPLICATIONS

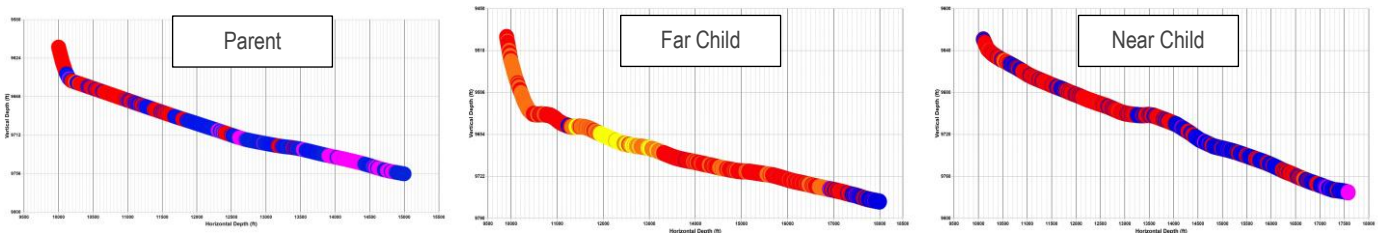
Identification of parent fractures in child wells using the DFI method can give multiple insights to an operator including:

- Avoiding fracture hits
- Understanding cluster efficiency
- Insights in well spacing

CASE STUDY

To prove the validity of the DFI Methodology, a trial was conducted in the Point Pleasant (Utica) formation in Ohio. Two child wells were drilled next to a parent well that has been producing for greater than two-years.

FUTURE WORK
Current work is ongoing to attempt to quantify the amount of depletion around each fracture identified, in terms of both the lateral extent, and the amount of pressure depletion. This data may eventually be used to help model reservoir properties such as permeability and porosity.



Anomalies Identified

While no anomalies were identified in the parent well, multiple were identified in the child wells. Many of these anomalies were consistent across both child wells which is a strong indication that these are indeed fractures from the parent well.

Qualify Fractures

Fractures are qualified using a number of different approaches. For example, the azimuth of the fracture pairs not only is located across from the parent well, but also matches up with the local maximum stress direction.

