Using Near Wellbore Acoustic Imaging to Complement Fracture Interpretation from Borehole Image Logs

Jon Roberts[1], Jarret Borell[1], and Ning Zhang[1]

[1]Devon Energy

ABSTRACT

Comprehension of the local and regional natural fracture system can be an important part of understanding multiple aspects of a play including hydrocarbon migration, hydraulic stimulation, and production. Borehole image logs (resistivity or ultrasonic) are often the primary tool for fracture characterization in a wellbore when core is not available. Natural fracture characterization using borehole image logs is often challenged by environmental effects such as drilling overbalanced or drilling in an area with a high horizontal stress regime. Comparison of image logs to core has shown these situations can cause enhancement of the natural fractures or create induced fractures along the borehole wall that completely overprint the natural fractures. Differentiation of natural from induced fractures becomes complicated in these situations, especially in vertical wells. Additional factors that make fracture characterization difficult from image logs include limited borehole coverage, poor image quality, and images obtained in oil based mud.

Core is always the best way to help decipher the nature of some of the more ambiguous events seen on the image log, however core is not always acquired and it is rarely available over the entire drilled interval. This is where near wellbore acoustic imaging can help with our understanding of natural fractures. Near wellbore acoustic imaging uses reflected compressional or shear waves to image acoustic impedance contrasts in the formation. The orientation of these impedance contrasts events is then used to interpret the cause of the reflection. Combining the image of these reflections along with the image log we are able to make a combined interpretation that improves our understanding of the fracture system in the formation.

Examples of this integrated interpretation approach will be reviewed. This will include: using the near wellbore acoustic imaging to identify fractured intervals in formations where image logs are dominated by drilling induced fractures, confirming ambiguous fractures, and identifying the larger significant fractures in a lateral well.

10:00 Production Revival of the Oklahoma City South Wilcox Sand Unit, Oklahoma City Field, Oklahoma and Cleveland Counties, Oklahoma - Jim Tull, Stephens & Johnson Operating Co.

The Wilcox Sand of the Oklahoma City Field has produced well over 540 MMBO and 820 BCFG since its discovery on March 26, 1930 by Indian Territory Illuminating Oil Company's No. 1 Mary Sudik. Of this 540 MMBO, over 60 MMBO has been recovered at the southeast end of the field from the Oklahoma City South Wilcox Sand Unit. After being largely abandoned in 1984, save for one well, the Unit has seen a revival in production in recent years from the recompletion, re-entry and drilling of 33 producing and injection wells. Updating the old geological work by incorporating new interpretation and modern logs has driven the redevelopment of the Unit. At the early stages of this redevelopment, new engineering thought and a modern approach to drilling, completion and production techniques enabled the company to re-

establish production. Some of this new production is in areas of the Unit that have not produced since the 1940's. This revival of production has resulted in an incremental recovery of 2.0 MMBO and 1.5 BCF to date, and incremental future recoverable reserves of 4.1 MMBO and .9 BCFG. Presented here will be an overview of the development, current reservoir conditions, Unit production history and reserves, lessons learned and challenges to drilling in a major metropolitan area.