

## **The Integration of Rock Physics Applications with Seismic and Well Log Data: A New Workflow for Frack Design Optimization and Sweet Spotting in the Jafurah Basin, Saudi Arabia**

**Yazeed K. Altowairqi<sup>1</sup>, Ivan Leyva<sup>1</sup>, Zhou F Duan<sup>1</sup>, ALi Sultan<sup>1</sup>, Saad J. Shehri<sup>1</sup>, and Ahmed Mubarak<sup>1</sup>**

<sup>1</sup>EMERGING UNCONVENTIONAL ASSETS DEPT, Saudi Aramco, Al-dhahran, Saudi Arabia.

### **ABSTRACT**

**ABSTRACT** In recent times, the use of rock physics applications in unconventional resources has proven beneficial in the characterization of these complex reservoirs. In addition to providing geoscientists and engineers with a common basis for dialogue and communication, rock physics application bridges the gap between field measurements – such as logs and seismic – and detailed reservoir property characterization. In doing so, reservoir sweet spots – for optimum frackability and well performance – are identified. This study illustrates the ability to predict reservoir properties of a carbonate source rock in the Jafurah Basin of Saudi Arabia, by using Lambda-Rho and Mu-Rho data extracted from AVO inversion and well logs. A tailored Closure Stress Scalar (CSS) and Brittleness Index (BI) were developed for this highly anisotropic and organic-rich carbonate mudstone. This study shows a new integrated workflow that carefully evaluates frack designs, and provides insights on the chance of success of different stimulation techniques and practices based on the reservoir's properties. This workflow was applied to several representative horizontal wells in the basin. The outcome of the analysis guided stage and cluster selection while in hydraulic fracture operations, which increased operational efficiency and minimized screen-outs and frack initiation issues. In doing so, optimized frack designs are predicted the enhanced yield recovery of the stimulated wells. In addition to hydraulic fracture operational support, the workflow has been integrated with microseismic data to provide a better understanding of fracture propagation behavior, and the proper calculation of Stimulated Reservoir Volume (SRV) during hydraulic fracture stimulation. Such integration has proven this workflow to be a powerful tool in supporting frack operation while guiding the prospecting strategy in this emerging unconventional basin.