

## **The Role of Pre-Stack Inversion in Unconventional Plays**

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### **ABSTRACT**

Unconventional reservoirs, such as shale, pose a great challenge due to their very low permeability. Production is achieved by hydraulic stimulation to induce fracture networks. The success of a frac job depends on several key factors. One of these elements is the geomechanical properties of the shale; in other words, how brittle or ductile the shale is. Brittle shale accommodates strain by breaking or fracturing and so increases its permeability by generating dilatant fractures. Ductile shale, on the other hand, has the ability to absorb more energy and so tends to heal or close up the induced fractures and undergo plastic deformation without increasing its permeability.

The objective of this study is to utilize geophysical analysis to predict optimum locations for hydraulic stimulation. Amplitude variation with offset (AVO) inversion constrained by rock physics is an invaluable and critical tool in predicting the geomechanical properties of a shale gas interval in Saudi Arabia. Results of AVO inversion yield attribute volumes of Poisson's ratio, Young's modulus and Lamé's parameters of incompressibility and rigidity. These attributes are combined to yield geobodies that map sweet spots within the shale gas reservoir.