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Seismic reservoir characterization of Utica-Point Pleasant shale – a case study

Satinder Chopra[†], Ritesh Kumar Sharma[†], Hossein Nemati[+] and James Keay[+]
[†]Arcis Seismic Solutions, TGS, Calgary; [+]TGS, Houston

Summary

Utica shale is one of the major source rocks in Ohio and extends across much of eastern US. Its organic richness, high content of calcite, and development of extensive organic porosity makes it a perfect unconventional play and has gained attention of oil and gas industry. The primary target zone in the Utica includes Utica, Point Pleasant, and Trenton intervals. In the present study, we attempt to identify the sweet-spots within the Point-Pleasant interval using 3D seismic data, available well data, and other relevant data. This has been done by way of organic richness and brittleness estimation in the rock intervals. The brittleness has been derived using rock-physics parameters such as Young's modulus and Poisson's ratio. Deterministic simultaneous inversion along with neural network approach have been followed in order to compute rock-physics parameters and density using seismic data. The consistency of sweet spots identified based on the seismic data with the available production data emphasize the integration of seismic data with all other relevant data.

We find that the Point Pleasant formation does not seem to follow the commonly followed variation in terms of low Poisson's ratio and high Young's modulus for brittle pockets. Instead, by restricting the values of Poisson's ratio and examining the variation of Young's modulus, we were able to determine the brittleness behavior within the Point Pleasant interval. Combining the brittleness behavior with the organic richness determined through the density content, we were able to pick sweet spots in the Point Pleasant interval which matches the production data.

Through this case study, we emphasize the integration of 3D surface seismic data with all other relevant data so as to accurately characterize the Point Pleasant formation.