GeoConvention 2014
FOCUS
adapt
refine
sustain

Unconventional reservoir characterization using conventional tools

Ritesh K. Sharma and Satinder Chopra*
Arcis Seismic Solutions, TGS, Calgary, Canada

Shale resources characterization has gained attention in the last decade or so, after the Mississippian Barnett shale was successfully developed with the application of hydraulic fracing and horizontal drilling. In order to characterize the shale gas formations, identification of sweet spots are required. Intervals that exhibit high brittleness and high TOC can be considered as sweet spots. For locating such spots in the shale gas reservoir, we propose an integrated work flow in which well data as well as seismic data are used.

We begin with the generation of different attributes from the well-log curves. Then, using the cross-plots of these attributes we try and identify the hydrocarbon bearing shale zones. Once this analysis is done at the well locations, pre-stack seismic data analysis is picked up for computing appropriate attributes. After generating angle gathers from the conditioned offset gathers, Fatti's approximation to the Zoeppritz equations can be used to compute *P*-reflectivity, *S*-reflectivity, and density which depends on the quality of input data as well as the presence of long offsets. Due to the band-limited nature of the acquired seismic data, any attribute extracted from it will also be band-limited, and so will have a limited resolution. While shale formations may be thick, some high TOC shale units may be thin. So, it is desirable to enhance the resolution of the seismic data. An appropriate way of doing it is the thin-bed reflectivity inversion. Further, the output of thin-bed inversion is considered as input for the model based inversion to compute P-impedance, S-impedance and density, which can be used to compute other relevant attributes, such as the $\lambda\rho$, $\mu\rho$ and V_P/V_S. These are used to measure the pore space properties and get information about the rock skeleton. Young's modulus can be treated as brittleness indicators and Poisson's ratio as TOC indicator. We also compare results to those obtained by an existing workflow described elsewhere (Rickman et al., 2008).

The Montney play, one of the active natural gas plays in the North America, was considered for the implementation of proposed workflow. It was noticed that the Upper Montney shows the characteristics of a source rock and seismically derived attributes can be used to characterize it. On comparison, the derived attributes using the proposed workflow are seen to delineate the Montney Formation better than the existing workflow.