



# geoconvention

Calgary • Canada • May 7-11

# 2018

## A novel workflow for predicting TOC in the Utica play

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Utica is one of the major source rocks in Ohio and extends across much of Pennsylvania, West Virginia and into Quebec, Canada. The Utica is a stacked play that consists of the Utica formation and the underlying Point Pleasant formation. The geologic characteristics of these two formations such as thickness, maturation, depth, organic richness, etc., are favorable for the accumulation and production of hydrocarbons. Considering its importance, a 3D seismic data was acquired to characterize the Utica play in eastern Ohio. Identification of sweet spots, which represent the most favorable drilling targets, is the main goal for any shale resource characterization. Generally, such sweet spots can be picked up as those pockets in the target formation that exhibit high total organic carbon (TOC) content, high porosity as well as high brittleness. This can also be achieved using well-log data or core analysis. However, such analyses are possible at well locations, which are sparse and random. But, as our goal is to characterize the Utica play, not vertically but laterally, so that sweet spots over different pockets could be detected, we turn to seismic data. Any approach adopted for providing information about TOC, porosity and brittleness using seismic data could be useful for the delineation of sweet spots in a lateral sense. As density is an important attribute in the prediction of TOC and porosity in the Utica shale, its estimation is desired so as to identify the porous and organic rich zones. Additionally, density plays an important role in predicting brittleness when Young's modulus is an indicator.

To identify the organic rich zones for the Utica play, an innovative workflow will be demonstrated, which makes use of probabilistic neural network approach to predict density, and uses core data analysis to transform it into a TOC volume.

Examination of the derived TOC volume showed that the upper part of the Point-Pleasant interval exhibits higher TOC content than the lower part. A reasonable match of available production data with the organic rich zones has lent confidence in the analysis of TOC prediction.