Identification of gas-bearing layers using pre-stack seismic processing

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Summary: This work used the data set of Penobscot region to detect gas-bearing layers using amplitude versus offset (AVO) analysis. AVO processing is complicated based on Zoeppritz equation therefore Shuey approximation was used for reservoir characterization. Least square solution was applied to calculate AVO attributes (R_p & G) in crossline 1153. Researches showed that the value of AVO attributes should be negative in gas-bearing layers. The calculated sections of R_p and G in crossline 1153 indicated that there is a gas-bearing layer in time range of 2000 to 2020 ms which it is matched with drilling well of L30.

Keywords: Gas-bearing layer, seismic processing, AVO, Shuey approximation.

Introduction: Nowadays, seismic processing is one of the important techniques for exploration of hydrocarbon zones. Seismic processing is performed in the forms of pre-stack and post-stack data. This research applies pre-stack seismic data of Penobscot region to characterize the reservoir. The log information of wells L30 and B41 is used to validate the results of seismic processing.

Methodology and Approaches: Amplitude versus offset processing (AVO) is a main technique that it uses pre-stack data to estimate elastic parameters of a reservoir. There are various approximations in AVO analysis. This work use Shuey approximation to detect the gas-bearing layers. Shuey equation has two main parameters (R_p & G) that if they are calculated, it will be possible to identify the gas-bearing layers. Different researches showed that gas-bearing layers can be highlighted with negative R_p and G.

Results and Conclusions: The least square solution was used to calculate parameters of Shuey approximation. Rp and G sections was measured in crossline 1153 and multiplied with each other. Positive values of obtained section shows the gas-bearing layer. Information of well L30 which was drilled in crossline 1153 showed that there is a gas-bearing layer in time range of 2000 to 2036 ms. The results of AVO could detect the target in time range of 2000 to 2020 ms. It means that Shuey approximation could highlight gas-bearing layers.

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