Seismic Reservoir Characterization of Middle Marrat Formation Using Broadband Seismic Data Lead to Drilling Success from North Kuwait

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ABSTRACT

Seismic reservoir characterization were carried out targeting Middle Marrat formation for the exploration prospects using newly acquired broadband seismic full azimuth data set in North Kuwait. The receiver and source line spacing is 200m, receiver station interval 25m.x25m. bin size is 12.5m.x 12.5m., nominal foldage 900 and with aspect ratio of 1. The study area covers around 3000 sq.km and the objective of this study is to quantify the porosity targeting Middle Marrat Formation and to identify the 'sweet spots' to evaluate the prospects. The Marrat formation is divisible into three subdivisions namely lower, middle and upper Marrat and it unconformable overlies Minjur formation and upper contact with Dharuma formation. Many wells from the adjoining fields are producing from the Middle Marrat shows its dominantly porous limestone in middle and basal part and in addition to dolomitic limestone in top of Middle Marrat formation. The broadband data set used in this study allowed improved absolute impedance prediction from the seismic reservoir characterization. Before carrying out this study, we also have done the comparative study between broadband and conventional data sets for the pilot area of 50 sq.km. The results from the broadband data set delivered superior results when compared to conventional data set. The broadband seismic data set exhibit the frequency band varying from 2.8-78 Hz. and the conventional exhibits 8 to 62 Hz. This broader bandwidth has significantly enhanced the seismic interpretation and improved the resolution of inversion results. The acoustic impedance volumes generated shows a good quality of agreement with the well impedance. Later the porosity volume generated using the relation between well p-impedance and porosity logs. From the mean porosity attribute maps, identified three porous zones within the Middle Marrat Formation separated by anhydrite. Later, the inversion results integrated with other G&G data sets and planned for few wells targeting Middle Marrat Formation. Out of which, one well was drilled very recently and successful in producing from the Middle Marrat Formation as predicted from the inversion results and other attributes. This study has resulted in identification of locations targeting the carbonate reservoir Middle Marrat Formation and the results of the seismic reservoir characterization will help in further optimizing the well planning in these prospects of the study area