

Prediction of sonic log using gr, phie and resistivity log in the shaly reservoir of Meyal field, Potwar Plateau Punjab Pakistan

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Abstract

The aim of this work is to synthesize the Sonic log (DT log) using Gamma Ray (GR), Porosity (PHIE) and Resistivity Log (LLD) in the shaly reservoir of Meyal Field. The Meyal oil field lies in the southeastern part of Potwar sub basin that forms part of Himalayan Foreland Fold and Thrust Belt (Tahirkheli 1979; Farah et al. 1984; Duroy et al. 1989; Kazmi and Jan 1997), and is located in the zone of highly deformed and imbricate thrust sheet called the North Potwar Deformed Zone (Lillie et al. 1987). The thickness of the Eocene carbonate reservoir is 66 meters. Our main theme is to establish DT log for the shaly reservoir. For this we have used the Wyllie time averaging equation to calculate the value of travel time at each depth point and principal of log interpretation using GR, PHIE and LLD logs. We have used two approaches to generate DT log. In first approach, volume of shale and effective porosity values are computed by using GR and NPHI curve to synthesize the DT log whereas, in second approach deep resistivity curve (LLD) is used to synthesize the DT log. For this, we have used well MEYAL-1 and picked only the reservoir zone which is Chorgali Formation. The trend of the calculated DT log is the same to that of original DT log for the same depth range. Later to confirm our calculated DT log, a synthetic seismogram is generated using calculated DT log and density log (RHOB). The resultant synthetic seismogram is displayed on a well Meyal-01 over a strike seismic line S97-MYL-12 and it almost matches the seismic signatures. The synthesized DT log can be used for seismic to well calibration, seismic inversion and formation evaluation. The cross plots of calculated DT log and original DT for both methods are quite satisfying as well. A set of formulas are also devised that can be effectively used for prediction of DT log using GR, PHIE and LLD logs only, particularly where DT log is not recorded. These formulas can also be used in any hydrocarbon prone field by using the input parameters of that field.