

## **Integrated Seismic Interpretation, 2D Modeling and Petrophysical Analysis of Missa Keswal Area with Special Emphasis on Gassmann Fluid Substitutions Based on AVO Modeling**

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### **Abstract**

The Seismic Interpretation of Missa Keswal area was carried out based on generalized stratigraphic sequence of Potwar Basin, which shows pop-up anticlinal structures bounded by the thrust faults. Selected seismic attributes have also been computed to confirm the interpretation in terms of the petroleum system.

The well calibrated seismic velocity model has been generated for true depth imaging. The 2D forward seismic modeling has been carried out for further velocity model validation. Time, velocity and depth contours as well as 3D surfaces of the horizons of interest, have been rendered to understand the spatial geometry of the structures. Synthetic seismogram and petrophysical logs have been correlated with the seismic depth sections to confirm the marked horizons at the well points. Crustal shortening analysis of the depth sections has been carried, which confirms a compression regime favorable for hydrocarbon accumulation.

The Rock physics parameters such as porosity, density,  $V_p$ - $V_s$  ratio and Poisson's ratio have been computed through inversion of the velocity model. These parameters have been applied to Gassmann fluid substitution for modeling and various fluid scenarios at the given reservoir conditions. The resulting hydrocarbon saturated reservoir velocities have been used in Amplitude versus Offset/Angle (AVO/AVA) modeling to generate synthetic seismic gathers which show an increase in amplitude at far offsets, thus confirming the existence of an oil and gas reservoir.