# Reservoir Characterization and Modeling of the Karst Network in the Bassein Pay of Neelam Field, Mumbai Offshore Basin, India

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## Abstract

Neelam field is one of the most prominent oil field in Mumbai Offshore Basin producing from Karstified and fractured limestone since 1994. Late Eocene age Karst and collapse features were observed in cores extracted from Bassein Limestone in wells of this field. The occurrence of karst was corroborated by heavy mud losses encountered during drilling and seismic attributes. The karstification led to high water cut and poor oil recovery. The seismic evidence of Karst features is characterized by anomalous zones in seismic attributes. Karst features such as solution channels, conduits/fractures and the reservoir architecture have been detected with seismic attributes, such as, dip, curvature, amplitude and P-impedance. The attributes vis-a-vis different karst litho-facies indicated precise karst network. This led to frame a Property Model, by which, distribution of different types of carbonate facies can be conceptualized. The property model was prepared integrating seismic attributes and lithofacies, derived from core & cutting and log data. The sequential indicator simulation (SIS) has been used to generate 3D reservoir rock type model constrained with log and impedance data and to be populated throughout the volume. The organization of karst network in 3D volume is assessed from the integration of model properties and reservoir dynamic data. Four distinct Lithofacies i.e. (i) Intense Karst, (ii) Chalky texture Limestone, (iii) Massive Limestone with minor fractures and (iv) massive country rock has been identified. Subsequently, performance of different wells, falling within these facies, has been analyzed. It has been observed that the wells drilled in alternating layers of less karstified and non karstified zone

are better oil and gas producers. The Property Modeling integrated with seismic attribute and structural mapping analysis has helped to identify suitable locations and sidetrack geometry required for development drilling in Neelam field, by selecting zones devoid of faults, fractures, karstified zones and the high water cut areas. The property model and the 3D probe through karst volume may be effective input for GCM simulation and optimal placement of infill locations