

Understanding the complex nature of oil occurrence within Deccan basalt in Padra field, Cambay Basin, India

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Abstract

The Padra field in Cambay Basin is on commercial production from the Deccan trap for nearly two decades, but still the hydrocarbon occurrence within the trap is not fully understood. The problem is further compounded by the facts that electrologs are not diagnostic to pinpoint the oil bearing intervals within the trap and the results of production logging is not handy in most of the cases. This paper is an attempt towards understanding the complex nature of oil occurrence within Deccan trap.

In the present work results of Landsat, outcrop, core, laboratory, electrolog, production logging (PLT), production performance and seismic studies have been integrated to explain hydrocarbon distribution pattern within the trap. Greater emphasis has been laid on understanding the development of reservoir properties in multi-flow Deccan basalt.

The study brings out that fractures have limited role in storage of hydrocarbons as majority of them are healed by secondary minerals as suggested by core data. Fractures, however, have played a key role in facilitating weathering in the top part of each flow unit. Moderately altered trap in each flow unit and intertrappeans are the main producing intervals within the trap as confirmed by PLT and production data. The study also reveals that due to the presence of a number of porous zones between the successive flows, the Deccan trap can act as multi-layer system like sedimentary sequence.

In the Padra field, the NE-SW trending transverse faults appear to control hydrocarbon distribution in the trap as majority of the oil wells are located very close to these faults. They are the likely fairways of migration.

The envisaged geological model proposes NE-SW / ENE-WSW trending transverse faults as migration pathways. Weathered and/or fractured flow units and intertrappeans beds situated in favourable entrapment conditions and in communication to these faults are the likely locales of hydrocarbon accumulation in the Padra area. This model explains the dry and wet wells in trap in the area to a greater extent. The proposed model can be a guiding path for future trap exploration in the South Cambay Basin.