SPE-193336-MS

Demarcating Sweet Spots in Cambay Shale by Integrating Rock Eval Pyrolysis, Geomechanics and Seismic Data

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Abstract

Unconventional shale oil/gas has been envisaged as one of the most promising resources of India. India is having enormous untapped shale oil/gas potential of 96 TCF risked technically recoverable shale gas and 3.8 billion barrel risked technically recoverable shale oil. But, its development is still nascent and not very much conducive due to insufficient data availability and limited exploration and exploitation activities. The present study is an attempt to minimize the existing data gap and providing useful information pertaining to shale geochemistry, sweet spots delineation, geomechanics and fracability. Shale has an important feature of acting as both source as well as reservoir for hydrocarbon generation, expulsion and accumulation. Demarcating sweet spots are helpful in identifying these prospective hydrocarbons bearing zones in shales and hence in locating favorable drilling targets. High content of organic matter, kerogen richness, clay content, shale geomechanics are the key parameters that affect sweet spots distribution in shale and so the generation of hydrocarbons. In the present work, a link from the hydrocarbon enriched zones (i.e. Sweet Spots) of Cambay Basin to its seismic attributes has been created and parameters like - thermal maturity, organic richness, kerogen typing, shale geomechanics, fracability and brittleness index of Cambay Shale are experimentally determined using characterization techniques - Rock Eval Pyrolysis, FTIR and Geomechanical Analysis. Sweet spots were identified in the deeper formation of Cambay Basin. The shale is thermally mature, organically rich and have good potential of hydrocarbon generation. However, from the fracability point of view, the selected section is geomechanically weak and may be unfavourable for advance stimulation.

Introduction

India has enormous untapped shale oil/gas potential of 96 TCF risked technically recoverable shale gas and 3.8 billion barrel risked technically recoverable shale oil (EIA, 2013). Despite having significant resource potential, shale oil/gas commercial discoveries in India are not much encouraging as compared to USA and Australia. According to preliminary analysis basins - Cambay, Krishna Godavari, Cauvery and Damodar are the most prospective and promising shale basins of India (Sain et al. 2014; Rao 2011). Other basins - Vindhyan, Cauvery, Assam-Arakan, Gondwana etc. have also shown some shale potential but are immature at this stage (Rao 2011; EIA 2013). So, it is important to exploit these potential shale resources by managing