AAPG Datapages/Search and Discovery Article #90315 ©2017 Asia Pacific Region GTW, Oil and Gas Resources of India: Exploration and Production Opportunities and Challenges, Mumbai, India, 6-7 December, 2017

Lower Late Miocene Development And Exploration Opportunity In Ravva Field

Arnab Ghosh[1], Uday Shankar Mishra[1], Harshvardhan[1], Shashank Singh[1], K Kaladhar Sharma[1], and Prakash Bajpai[1]

[1]Cairn India, India

ABSTRACT

Ravva field is located in the offshore Godavari Basin in shallow waters of the Bay of Bengal, east coast of India. The field was discovered in 1987 and production commenced from March 1993. The field maintained a plateau rate of 50 kbopd for over 8 years and is currently in a decline phase, producing about 16 kbopd. The main producing intervals are the prolific Middle Miocene (MM) sands deposited in a shoreface environment with an associated distributary channel system. A few wells have intersected relatively thin sands in the Lower Late Miocene (LLM) interval stratigraphically above the MM sands. The LLM interval is a thick dominantly marine shale sequence with isolated thin sand bodies, deposited in a transgressive phase. The thin sands are difficult to correlate between wells and cannot be mapped by conventional methods in the PSTM seismic data as they are below seismic resolution. Attribute maps from Continuous Wavelet Transform and Enhanced Restricted Gradient (ERG) volumes have been successful in providing insight into depositional environment of these sands. Linear trends exhibited by these attributes are suggestive of a deep marine channel system deposited in a slope environment.

Initial resource estimates based on area from the attribute maps and average thickness from well data implied small, sub-commercial accumulations. After exploiting the MM sands, the thin LLM sands were put on production. Material balance estimates revealed these pools to be significantly larger than initially predicted requiring additional wells for optimal exploitation. This led to two challenges; firstly, enhanced discrimination of the thin LLM sands and secondly, a realistic in-place volumes calculation method, both required to support development well planning. Hydrocarbon bearing sands are sensitive to Amplitude Versus Offset (AVO) response in Ravva field. A Fluid Factor (FF) seismic volume was generated and calibrated with all known oil and gas accumulations. Using the FF volume, geobodies corresponding to LLM pools were extracted. In-place volumes were calculated showing a significantly improved match to material balance estimates. This approach also helped in generating constrained depth structure maps for individual pools to optimize placement of development wells. FF volume geobody detection has certain drawbacks in that the method only captures hydrocarbon filled sands as water wet sands are not illuminated. In addition, extracted sands represent a composite response inclusive of interbedded shales because of resolution issue. To mitigate these issues, a robust conceptual geological model was prepared to validate the depositional patterns and distribution of the extracted sand bodies The genetic elements identified in seismic and validated by the conceptual model are broadly categorized as channel margin accretionary bodies, locally ponded channel fills and lateral splays marginal to mud filled channels. The workflow has additionally identified several high potential, near-field exploration leads within the LLM sequence with derisked hydrocarbon fluid fill. The methodology adopted for identification of strati-structural pools has enhanced the evaluation and derisking of near-field opportunities. Detailed evaluation of the LLM sands has opened up new areas of interest in Ravva field which may not only arrest the production decline but may rejuvenate the field production to new levels.