

Diagenetic Model of Bassein Formation of Mumbai Offshore Basin: A framework for future exploration in carbonates

observed that an impedance range of 7500 to 8500 matches with a porosity range of 28-26% (Zone I) and 8500 to 10,500 with 26-18% (Zones III & IV). The Zone II with its complexities shows an impedance range of 10,500 to 12,000 corresponding to an average porosity of 18-12%. Values between 12,000 to 13,000 correspond to 12-8% average porosity and areas of porosity destruction show Impedance values higher than 13,000 with 6-8% average porosity.

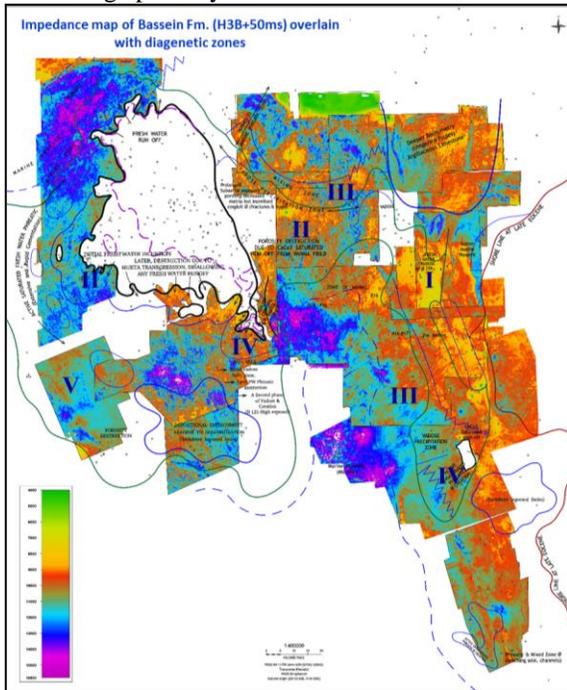


Figure 6: Impedance slice (H3B+ 50ms window) of Bassein Formation overlain with diagenetic zones

Play Dynamics of the Bassein Formation: To best evaluate the remaining potential in the Bassein Play, different aspects of the Play, like structure, reservoir quality and pool limits have been brought together (Figure 7) on a single map. A cursory examination shows that the major fields of Mumbai Offshore with Bassein as the Primary exploitable Play mostly occur along the Zone I and III trends. Till date all commercial accumulations in Bassein in this trend are exclusively structural. Zone IV, which is restricted around Heera and B-121 fields, is the other

area to hold commercial pools in structural entrapments of Bassein Formation

The accumulations in Zone II (Mukta, smaller pools in SW Mumbai High, and Well-C in B-192 area) are therefore the most intriguing since clear demarcation of porosity types cannot be done in this set-up.

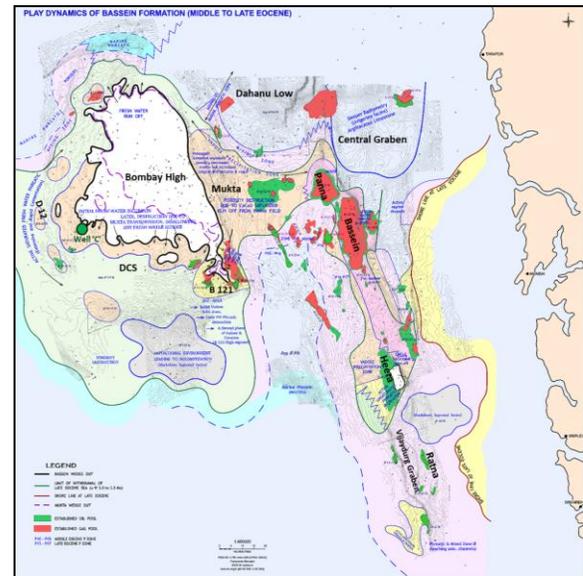


Figure 7: Play dynamics of Bassein Formation

With both constructive and destructive diagenesis at play, identifying locales with highest probability of reservoir development in Zone II depends on understanding each phase more clearly. The advantage in looking for pools in this diagenetic zone, lies in the possibility of stratigraphic entrapment as seen in Well-C of B-192 area (Figure 8). In this case, oil in Bassein Formation appears as a porosity pod, without structural advantage playing any role.

It stands to reason that future exploration potential in the Bassein Play lies in delineation of porosity pods within Zone II in stratigraphic/ strati-structural entrapment situations.

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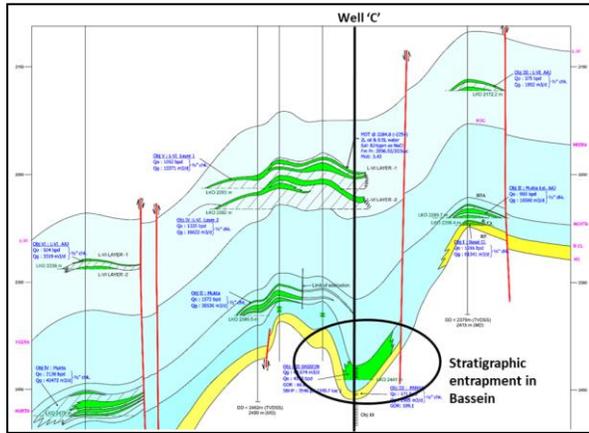


Figure 8. Geological section showing stratigraphic entrapment condition at Well C.

Conclusion

- The Bassein Formation which is a Second Order Passive Margin sequence, had its reservoir properties bequeathed to it by the Sequence boundary CII40.
- The complex relationship between the diachronous nature of the Middle-Late Eocene unconformity, tectonic upheavals during the period and their combined influence on the kind of porosity generated/ destroyed resulted in well-defined zones of porosities.
- Five most prevalent Diagenetic zones which were mapped earlier have been corroborated through Detrending of petrophysical data from 50 wells. Constructive and Destructive diagenetic trends deduced from GR and PIGN data, fitted the identified zones.
- Similarly, Impedance studies across multiple 3D volumes substantiate the presence of distinct girdles of porosity.
- Since the heydays of big discoveries in structural entrapments with ideal reservoirs is long gone, teasing out the more subtle traps within this Play is the present challenge. The Zone II of porosity creation as well as destruction in possibly multiple cycles, holds the most promise in this regard.

References

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Acknowledgment

The authors are deeply indebted to Shri K.Vasudevan, GGM-Basin Manager (Mumbai-ONGC) for providing guidance through every step of the way. No words are enough to pay our sincere gratitude towards the drawing officers who have been working hard to bring the maps and plates to life, Shri J.A.D'souza (Manager, M&DO), and Shri Shirish Chavan (Manager, M&DO) for their irreplaceable efforts in preparing all the relevant figures.