

PaperID AU467

Author Bharat Kumar , ONGC Ltd , India

Co-Authors C. Moatoshi Ao, Abhay Nand Yadav, Bharat Kumar and Firoze Dotiwala.

## **Bokabil Reservoir Sand Modelling in Nambar- Khoraghat West Area, Assam and Assam Arakan Basin, India**

### **Abstract**

Bokabil is a (Early to Late Miocene age) is major play in Upper Assam Shelf South. Exploration of Bokabil play is a challenge in the area as reservoir in Bokabil play is a channel sand and is not reflected apparently in the seismic data. A simple work flow has been evolved in the study which enable to model the reservoir sand in Bokabil in Nambar area for effective exploration of Bokabil play. The work flow consists of well pick correlation, seismic to well tie, horizon correlation close to potential levels, mapping, seismic attribute extraction and property modeling in petrel platform. The present study has divided the Bokabil unit into three system tracts (LST, TST and HST) for modeling. Each system tract contains number of pays. Pay sands within LST and TST have been modeled as channel sand in a tidal set up with the help of seismic data and well data. The approach which has been followed in the study may be very useful to other area wherever study is being carried out for field growth and play extension of Bokabil play. In the present study two potential areas, one in south and another in north of main producing area, have been identified for future exploration of Bokabil play in the study area.

### **Introduction**

Bokabil Formation (Early to Late Miocene age) is an important play in upper Assam shelf south, part of a fore land basin overprint on passive margin basin in the eastern margin of India (Fig-1). It accounts for 55% of established inplace volume in the upper Assam shelf south as on date and continues to play a major role in adding new inplace volume in upper Assam shelf south since it became a proved play.

However, exploration of Bokabil play is highly tricky as the reservoir in the Bokabil formation is channel sand and is not reflected as the channel in seismic data. Therefore, prediction of the extension of the channel beyond the well is very difficult.

The present study is an endeavor to bring out reservoir sand model within Bokabil play through the integration of laboratory study, well log, seismic attribute and property modeling for effective exploration in Bokabil play.

The Nambar-Khoraghat west area has been selected as type area for modelling the reservoir sands within Bokabil as the Nambar is a producing field from multiple channel sands in Bokabil.

Fig-1 Study Area

### **Work Flow**

A simple work flow (Fig-2) has been followed in the study. First, well picks correlation corresponding to top of pays followed by seismic to well tie has been undertaken. Horizon correlation at the top of pay has been made. Subsurface map at the top of pay has been generated. RMS amplitude corresponding to pays has been extracted. Sand thickness of each pay has been estimated with the help of well data. Then isolith map has been prepared in the orientation of RMS anomaly. Then the channel has been propagated to the other area through the property modeling.

### **Present Study**

#### **Sequence Stratigraphic Framework**

The present study divides the Bokabil Formation into three system tracts, LST, TST and HST (Fig-3).

### Fig-3 Sequence Stratigraphic Framework of Bokabil

MFS has been identified on the basis bathymetric curve in Nambar-1. Bokabil has accumulations at two levels. The older level accumulation is from Nambar area and has 5 pays namely N-50, N-40, N-30, N-20, N-10. The younger level accumulation is from Khoraghat West area and has 3 pays namely K-10, K-20, K-30. The older level accumulation is in oil phase whereas the younger level accumulation is in oil and gas phase.

Pays have been placed in the sequence stratigraphic framework. LST covers N-20, N-30, N-40, N-50 pay sands while N-10 is in TST. K-10 & K-20 are in early HST whereas K-30 is in late HST (Fig-4). As per petrographic study. LST is an arenaceous (lithic and feldspathic arenite) unit followed by argillaceous unit represented by TST and then again an arenaceous representing HST. HST has been divided into two system tract, early HST dominated by argillaceous facies and late HST dominated by arenaceous facies. These system tracts are the future targets of exploration in the area (Pahari.S et. al. 2011)

While LST is a transitional to marginal marine deposits in a tidal set up, HST is a transitional to shallow inner shelf deposits in a coastal -shelf ridge depositional setup. Sedimentary structure (ripple laminated) and ichnoassemblage indicate Bokabil sediments were deposited under lower intertidal to sub tidal set up (Singh, M et. al. 2010).

### Reservoir Sand Model

In the present study sand model for LST sands and TST sands have been prepared.

RMS amplitude map corresponding to N-40 pay in LST in Nambar area indicates the anomaly is linear in nature and oriented in NE-SW direction Fig-5A). Sand isolith map in the Nambar is following the same trend (Fig-5B). The same trend has been utilized for property modeling of LST sands. The facies map of pay sand indicates that they are oriented in NE direction in Nambar area where as it is oriented in NS direction in Khoraghat west area (Fig-5C).

Northern Producing area

Main Producing area

RMS amplitude map corresponding to N-10 pay in TST in Nambar area indicates the anomaly is linear in nature and oriented in NE-SW direction (Fig-6A). Sand isolith map in the Nambar is following the same trend (Fig-6B). The same trend has been utilized for property modeling of TST sands. The facies map of pay sand indicates that they are oriented in NE direction in Nambar area.

The present study envisages a channel model for reservoir sand in Bokabil. The model has brought two potential areas similar to main Nambar producing area for future exploration. Locations are being firmed up for exploring the remaining potential around the Nambar field.

Northern Producing area

## Conclusions

Bokabil sand modeling is possible on the basis of available seismic, well and lab data. Bokabil Formation is divided into three system tracts, LST, TSP and HST. All system tracts are hydrocarbon pays and are having potential for future exploration. LST and TST are having oil accumulation in the area where as the HST is having mainly Oil and Gas accumulation. The present study envisages channel model for the reservoir sands in Bokabil. The study has brought out potential channel similar to main Nambar producing channel which need exploration attention. The approach which has been followed in the study may be useful while studying the adjacent area.

## Acknowledgement

Authors express their gratitude and are highly indebted to ONGC management for providing opportunity to write this technical paper. Authors are highly thankful to RGL, Sivasagar for lab input.

## References

- Pahari.S, Singh,Harvir, Prasad,I.V.S.V. and Singh, R.R.,2011, Petroleum Systems of Upper Assam Shelf, India. KDMIPE, ONGC, Dehradun-248195,
- Singh, M. Chandra, KundaL P., and Kushwaha, R.A.S., 2010, Ichnology of Bhuban and Bokabil Formations, Oligocene-Miocene Deposits of Manipur Western Hill, Northeast India, Journal Geological Society of India Vol.76, December 2010, pp.573-586