9th Biennial International Conference
& Exposition on Petroleum Geophysics

"HYDERABAD 2012"

P-170

Flow Unit Characterization in a Fluvial Sedimentary Environment from High- Resolution Image Facies Analysis: An Integrated Approach Using Advanced Logs

Somenath Kar, Dr. S.S. Negi**, Saswati Chanda**, Koushik Sikdar*, Dipanka Behari Roy*, Indrajit Basu**

Summary

In the present study an integrated approach has been taken from Borehole Image to characterize different high resolution sedimentary facies along the borehole. This different high resolution geological facies then calibrated with the petrophysical data for characterizing different flow unit along the borehole. This study will help for cataloging different geological facies for estimation of permeability profiling which can further help in completion optimization and production enhancement.

Keywords*: Geology, Clastic Fluvial Environment, Flow Unit*

Introduction

The Miocene clastic sediments in the Kharsang field are among the most prolific hydrocarbon reservoirs in northeastern India. These sediments were deposited in continental to transitional environments, where the entire sedimentation process was controlled by regional tectonics. Identifying the best reservoir in terms of its flowing capacity along the borehole is quite challenging in this kind of tectonically controlled fluvial environment.

Methodology

The present study introduces an innovative methodology in Kharsang field by means of borehole images, dips, cores, and wireline openhole logs from vertical wells to determine the sand body geometries, which in turn provide better control in defining the depositional setting from a single well data. Detailed sedimentological analysis was performed using the image log with other available datasets. The paleoflow indicators were examined and subsequently modeled at different scales to bolster the sedimentological interpretation. The integration of the image log analysis with the core data and openhole logs facilitated insight into the sedimentary sub-environments for the individual sand units. Flow units were predicted based on the high-resolution sedimentary sequence and its association. However, effective porosity and permeability derived from the advanced petrophysical analysis were used for robust flow unit determination. The porosity and permeability-based flow units showed an excellent match with the image-based flow units, which validated the latest approach for recognizing the flow units.

Result and Discussion

This workflow depicts an interdisciplinary methodology to identify the sand dispersal pattern in fluvial environment. By identifying the sand dispersal pattern in a meandering system, reservoir quality of sand is understood and their flowing capacity has been estimated.

In the current study cross bedding modeling, Core-Image integrated data helped to understand the morphological pattern of cross bedding which are of mainly angular and tangential type. This angular and tangential cross bedding and the grain size information from core data indicates towards the high energy condition prevailed during deposition.

In the next step, the high resolution facies analysis is done which reveals the vertical succession of different

**Schlumberger Asia Services Ltd., **GeoEnpro Petroleum Ltd*
Somenath Kar, Schlumberger Asia Services Ltd, skar@slb.com

sedimentary facies assemblage along the well. The facies assemblage varies from Channel Sand, Point Bar Sand, and Channel Levee Sand to Overbank Sand. The relative distribution of sandy units across the different sub-environment within a meandering system gives a very good idea about the expected variation in reservoir quality.

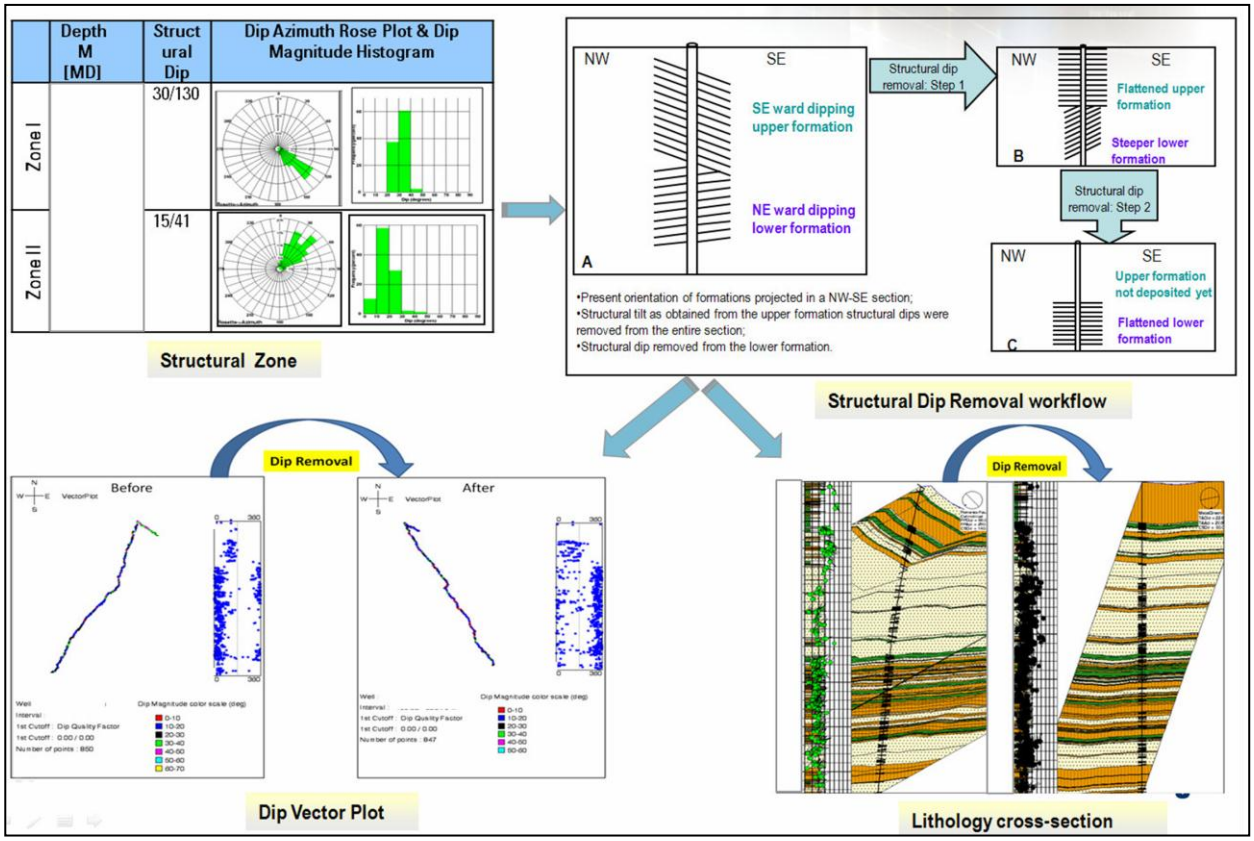
Once the reservoir quality of different sand body is understood, a fair idea about the flowing capacity from different sandy unit can be established integrating with petrophysical analysis. In this approach the hole section has been divided into good, moderate and poor flow unit based on their facies assemblage within fluvial meandering system. This flow unit characterization result can be immensely helpful for optimizing reservoir development strategy with integration of other petrophysical analysis.

This approach depicts an unique methodology to characterize different flow units according to their reservoir properties within a single well. Identified flow unit based on the facies assemblage and sand body distribution will lead to best candidate selection for lateral well placement.

The established flow units can further be utilized for segmented completion and thus production enhancement from borehole.

Conclusion

- The enhanced workflow developed will convey significant impact on field development, providing a strong technical geological support for defining the accurate completion strategy.
- Identification of best flow unit interms of reservoir quality will help in proper candidate selection for lateral well placement.
- Also, understanding the sand dispersal pattern will help in future well planning.
- This high resolution sedimentological and structural study wills also help in upscaling the existing model based on available seis-mic and well data.



Figurer 1: Structural Dip Removal Process

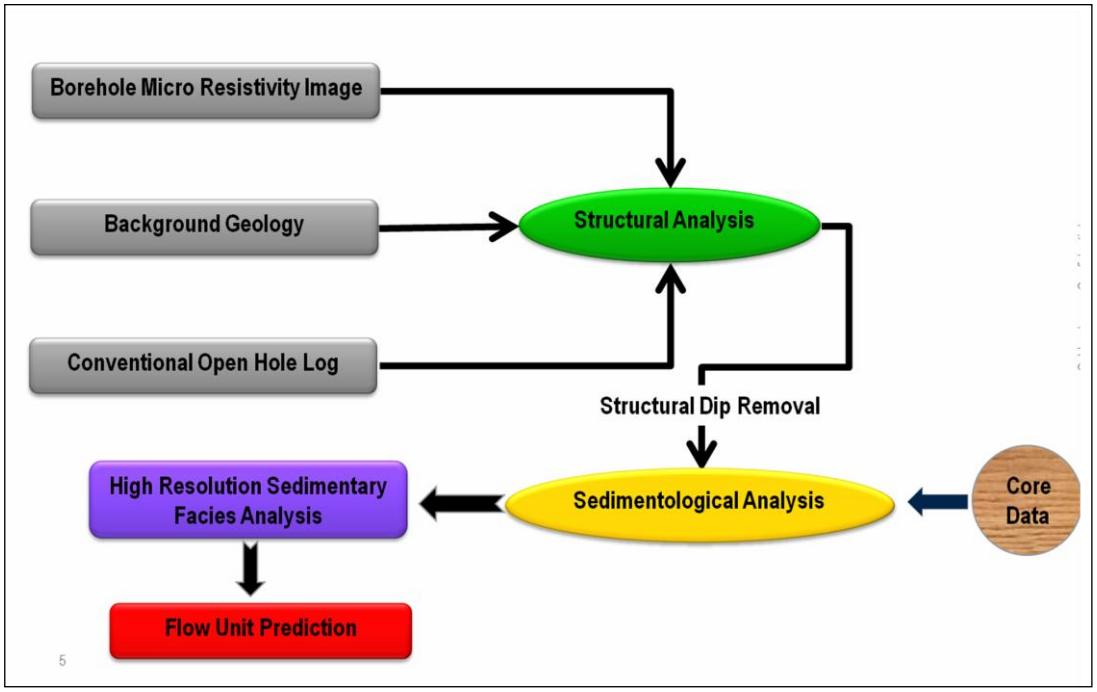
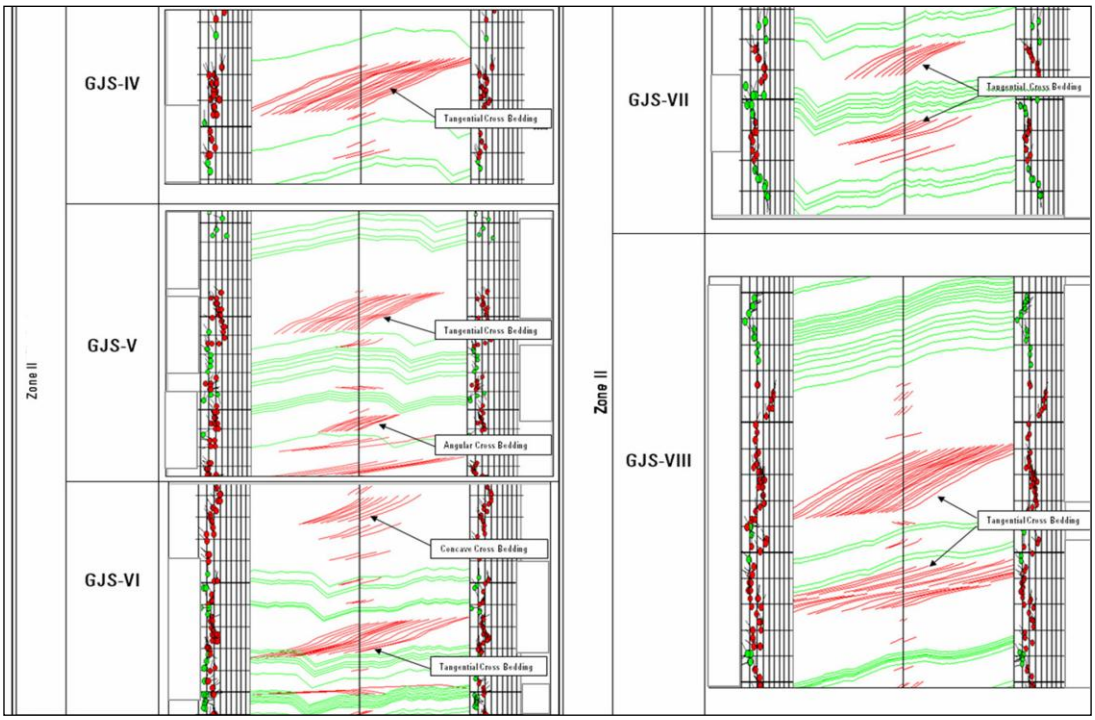
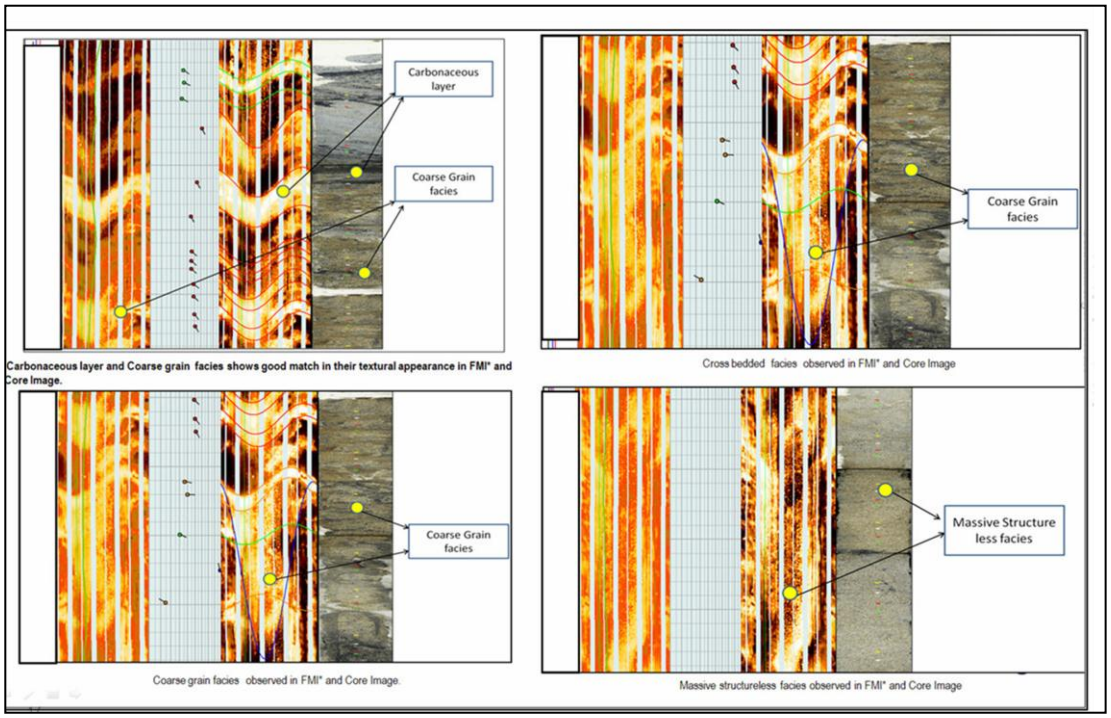


Figure 2: Workflow



Figurer 3: Cross Beddding Modeling



Figurer 4: Core-Image Calibration

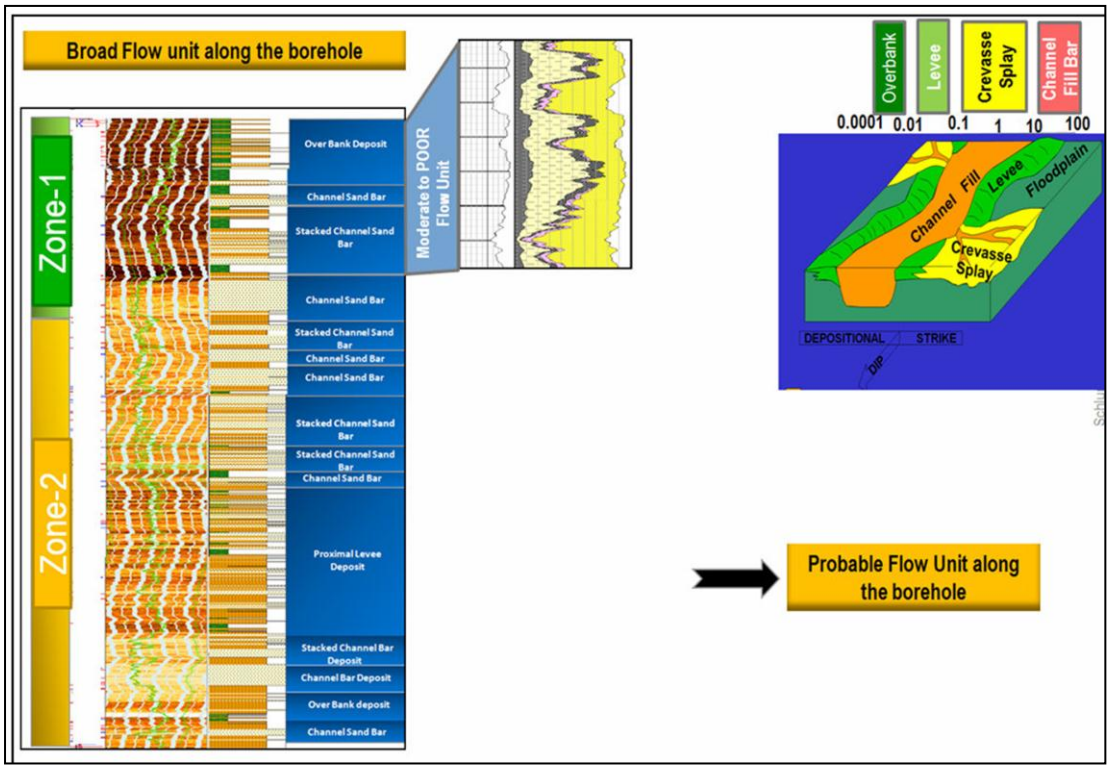


Figure 5: Flow Unit Characterization

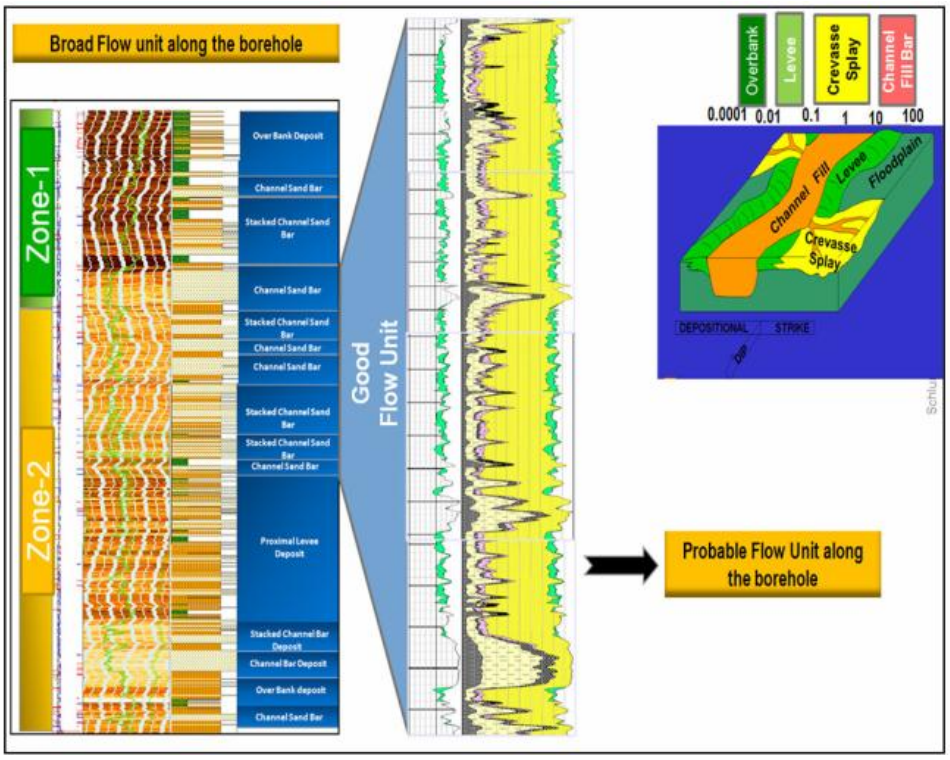


Figure 6: Flow Unit Characterization