APPLICATION OF BOREHOLE IMAGE LOGS IN ESTABLISHING FACIES ARCHITECTURE; CONCEPTUAL DEPOSITIONAL MODEL AND SEQUENCE STRATIGRAPHIC FRAMEWORK FOR PAB SANDSTONE (SUI FIELD) PAKISTAN

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ABSTRACT

The Sui Field lies in the Sulaiman Fold Belt (SFB) and has been producing previously from Eocene Carbonates which were the primary play. However, with the field now in its depletion phase, the Pab Sandstone is being analyzed and evaluated as a secondary play. The Pab Sandstone could be very deceptive due to high variation in facies from Sulaiman Fold Belt (SFB) to Kirthar Fold Belt (KFB). An attempt has been made in this paper to critically evaluate Pab Sandstone potential in Sui Field and further develop an understanding about depositional setting of Pab Sandstone.

The main objectives of this paper is to interpret facies, develop conceptual model and to establish the sequence stratigraphic framework for the Pab Sandstone by integrating borehole image log available for Sui-92(U), core data available for Sui-90(P) and Sui-91(P) and one seismic dip line 1975_SW_D.

In this study, the working methodology followed for facies interpretation and depositional analysis includes Paleogeographic reviews, facies interpretation on the basis of FMI* (Image data), extrapolation of facies to the available five wells on Pab level, establish the facies architecture and vertical succession, integrate core, seismic and analogues, develop the conceptual depositional models, one out of them then can establish the facies models for different units. Therefore, the zonnation scheme was established on the basis of log characteristic and channel stacking pattern.

Therefore, on the basis of log characteristics and channel stacking pattern facies are divided into zones.

Accordingly, the scheme could identify three main zones for the logged interval of Pab Sandstone; Upper and Lower Pab zones as Single-stacked channels, and the Middle Pab zone as Multi-stacked channels. Four main facies have been interpreted that include channel sands, point bars, channel lags and background floodplain deposits.

The logged interval for Pab Sandstone was divided into two possible sequences. Sequence-1 starting from bottom is a Lowstand Systems Tract (LST) representing basin ward shift of fluvial facies. It is followed by a Transgressive Systems Tract (TST) which resulted in the deposition of isolated transgressive back stepping fluvial facies of Unit-3. The TST is caped here by a laterally extensive flooding event which may be interpreted to represent the Maximum Flooding Surface (MFS). The Transgressive Systems Tract (TST) then gives way to a Highstand Systems Tract

(HST) which due to limited accommodation space led to the deposition of Multi-stacked / amalgamated fluvial channels of Unit-2.

The HST here may be overlain by a sequence boundary but no conclusive evidence on Image logs has been found to establish this as a sequence boundary. The HST is then followed by Transgressive Systems Tract (TST) of sequence 2 (Unit-1) which similarly shows isolated back stepping fluvial facies. Facie models for different sequences were generated which were calibrated with the channel stacking and lateral amalgamation of fluvial channels expected in the different units.

An attempt has been made in this paper to apply the working methodology adopted to further develop an understanding about the connectivity of high sinuosity fluvial channels of Pab Sandstone. This working methodology may also be used as a standard template for studies regarding Image based facies interpretation and development of sequence stratigraphic framework for fluvial systems.

The integration of multidiscipline data in this study ranging from Image-based data to seismic provides a key to critically examine Pab sandstone and other fluvial plays in the area to develop their hydrocarbon potential. Further, integrating such conceptual based models into 3D static models (as done in this study) will help us to better delineate reservoir uncertainties for Pab sandstone and other fluvial plays in the area.

However, channel connectivity remains the biggest uncertainty. Therefore it is recommended to acquire high resolution 3D seismic to give a better insight about the fluvial systems.