

Reservoir evaluation of the Early Jurassic Datta Formation at Chanda Oil Field, Kohat Basin and adjoining Surghar Range, North Western Pakistan

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Abstract

The early Jurassic Datta Formation at Chanda Oil Field, Kohat Basin and adjoining Surghar Range has been studied in detail for facies analysis, diagenetic fabric, and petrophysical studies. These studies are important in order to determine the nature and timing of depositional and diagenetic processes which control the distribution of porosity and permeability and to measure reservoir rock potential. Twenty rock samples were collected from Chichali Nala Section, Surghar Range, Pakistan. A total of 4 Lithofacies (DFL-1 to DFL-4) and 4 Microfacies (MDF-1 to MDF-4) have been recognized.

The identified Lithofacies are, Thick, cross bedded sandstone lithofacies (DFL-1), Interbedded shale and sandstone lithofacies (DFL-2), Carbonaceous shale and coal lithofacies (DFL-3), Laterite lithofacies (DFL-4) and identified microfacies are, Dolomite Mudstone (MDF-1), Siliciclastic Spicules rich Bioclastic Mudstone (MDF-2), Peloidal Bioclastic Packstone Microfacies (MDF-3), Bioclastic Ooidal Peloidal Grainstone Microfacies (MDF-4). Based on paleoecology, sedimentary structures and facies type the Datta Formation is suggested to be deposited in prograding deltaic to inner to middle ramp depositional environment. Diagenetic features encountered are dolomitization, micritization, cementation, neomorphism, stylolites, and fracturing.

Measured plug porosities from selected samples of Datta Formation from the study area ranges from 1.57 to 11.54 with an average porosity of 5.96 % while measured permeability ranges from 0.000 to 8.64 MD with an average permeability is 1.70 mD. The petrophysical analysis shows that in the Chanda deep-01, the calculated total porosity and effective porosity of Datta formation is 2.72% and 2.22% respectively while in In Chanda-01, the calculated total porosity and effective porosity of Datta formation is 2.24% and 1.75% respectively. The best reservoir quality is present in the middle and upper part of the Datta Formation. The Datta Formation beds in the study area are thick enough with suitable porosity and permeability values, which could be good targets for hydrocarbon exploration in future.