

SEDIMENTOLOGICAL STUDY AND RESERVOIR CHARACTERIZATION OF KINGRIALI FORMATION EXPOSED IN ZALUCH NALA, WESTERN SALT RANGE, PUNJAB, PAKISTAN

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Abstract

Well-exposed Kingriali Formation of late Triassic age has been studied in details at Zaluch Nala section, western Salt Range, Pakistan. Extensive fieldwork was conducted to investigate sedimentological features and diagenetic events on outcrop level and used well logs data for its impact on the reservoir characterization of Kingriali Formation. 36 representative samples were collected from 76m thick sequence to delineate microfacies for the interpretation of paleo-depositional environment of the Kingriali Formation. Petrographic studies show that the studied formation is composed of three main microfacies, i.e. mudstone, packstone and boundstone. Furthermore, these microfacies are divided into sub-microfacies including fenestral mudstone and bioclastic mudstone sub-microfacies, fenestral ooidal packstone and peloidal packstone sub-microfacies. Petrographic study revealed that the dolostone of Kingriali Formation is of secondary nature for which the precursor limestone was deposited on intertidal to subtidal and inner shelf restricted marine environment. Stoichiometric study explains that dolomite of Kingriali Formation seldom displays any significant variation in crystal ordering. Reservoir characterization was carried out by using visual porosity in the field, diagenetic alteration during petrographic study, SEM analysis and petrophysical analysis. Visual porosity ranging from 1.8 to 10% was determined with the help of Image J software. Diagenetic processes involved in reservoir modification were dissolution, dolomitization, micritization, compaction, neomorphism and cementation. Diagenetic events like dissolution, dolomitization and mechanical compaction showed positive affect on the reservoir character of the target formation, while the chemical compaction, micritization, neomorphism and cementation played a negative role by decreasing the reservoir potential of Kingriali Formation. 3-D microporosity in the form of vugs, fractures, inter and intracrystalline pores spaces were observed out through Scanning Electron Microscopy. Petrophysical analysis suggested an average effective porosity upto 8% and average sonic porosity ranges from 8 and 12% for Kingriali Formation in Isakhel-01 and Chonai-01 wells respectively, which falls in the range of a good reservoir. However, due to low Laterolog Deep (LLD) value at different depth and the absence of cross over between neutron and density porosity, the Kingriali Formation may not be recommended as hydrocarbon reservoir.