

SEDIMENTOLOGY AND BIOSEQUENCE STRATIGRAPHIC MODELLING OF THE KAWAGARH FORMATION IN THE NIZAMPUR AND MARGALLA HILLS RANGE, NW PAKISTAN: IMPLICATION FOR HYDROCARBON RESERVOIR CHARACTERIZATION

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Abstract

The Kawagarh Formation has been studied in detail for carbonate microfacies, depositional environment, bio-sequence stratigraphy and reservoir characterization from two stratigraphic sections i.e. Khwari Khwar Section from Nizampur Basin and Khanpur Dam Section from Margalla Hills Range and Tolanj-01 well. Two main microfacies were identified i.e. mudstone and wackestone. The environment of deposition interpreted on the basis of microfacies for the Kawagarh Formation is proximal to distal outer ramp setting. The biostratigraphic biozones identified in the Kawagarh Formation in Khwari Khwar Section are *Dicarinella asymetrica*, *Globotruncanita elevata* and *Globotruncana ventricosa* biozones while in Khanpur Dam Section are *Dicarinella asymetrica*, *Globotruncana ventricosa* and *Globotruncanita calcarata* biozones. Based on planktonic foraminifera biostratigraphy the Kawagarh Formation represent Santonian to Campanian age in Khwari Khwar Section and Santonian to Maastrichtian age in Khanpur Dam Section. The deposition of the Kawagarh Formation occur as a result of transgressive cycle with magnitude of age ranging from 87 to 76 m.y in Khwari Khwar Section and 87 to 74 m.y in Khanpur Dam Section. The Kawagarh Formation is also modified by various diagenetic features including micritization, dolomitization, microfractures, stylolitization, dissolution, neomorphism, spar-filled fractures and cementation representing meteoric and marine phreatic with mixing zone and burial diagenetic environments. Fracturing, dolomitization and dissolution are the diagenetic processes enhancing the porosity while compaction, micritization and neomorphism reducing the porosity. The total visual porosity of the Kawagarh Formation estimated by Image J software is 1.6% and 2.2% in Khwari Khwar and Khanpur Dam sections respectively. The minerals present in the Kawagarh Formation are mainly calcite and dolomite with minor amount of quartz, aragonite, kaolinite and muscovite. The dominant porosity types recognized are intercrystalline/interparticle, intracrystalline/intraparticle, vuggy and fracture porosity in surface data while vuggy and intercrystalline porosity in subsurface data. The petrophysical parameters of the Kawagarh Formation calculated are water saturation (67%), volume of shale (14%), average porosity (3%), effective porosity (2%) and hydrocarbon saturation (33%) in Tolanj-01 well. However, due to low LLD value at different depths and the absence of cross over between neutron and density porosity Kawagarh Formation may not be recommended as hydrocarbon reservoir around study area.