

**Microfacies analysis and depositional modeling, diagenesis, reservoir characterization and sequence stratigraphy of Chiltan Formation, Mughalkot Section, Sulaiman ranges, F.R. Dera Ismail Khan, Pakistan.**

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Detailed sedimentological analyses of the Chiltan formation have been accomplished from Sulaiman Ranges, Mughal kot section, Middle Indus Basin, Pakistan. The Chiltan Formation is thin to thick bedded and can be distinguished in the field into oolitic limestone, micritic beds and shelly limestone containing brachiopods, gastropods, echinoids, miliolids and other foraminifers. We have discriminated six different microfacies that can be divided into bioclastic ooidal peloidal grainstone facies, spicules bearing peloidal ooidal grainstone facies, ooidal peloidal intraclastic grainstone facies, mudstone-wackstone facies, miliolids bearing intraclastic peloidal grainstone facies and bioclastic peloidal grainstone facies..The Chiltan Formation has been deposited on a carbonate barrier inlet system (shelf) as it mainly consist of pure limestone facies. The bioclastic peloidal grainstone microfacie (CH F1) has been deposited in the lagoonal tidal inlets and the mudstone microfacie (CH F4) has been deposited in the supratidal environment. Miliolids bearing intraclastic peloidal grainstone (CH F5) has been deposited in the washover fan and spicules bearing peloidal ooidal grainstone facies (CH F2) has been deposited in the carbonate shoals. The ooidal peloidal Intraclastic grainstone facies (CH F3) has been deposited in the foreshore and bioclastic intraclastic peloidal grainstone facies (CH F6) has been deposited in the nearshore zone. The diagenetic fabric of the facies shows an initial shallow marine phase of microbial activities and early marine cementation followed by shallow burial which is characterized by pore-filling cements, which in turn, is followed by deep burial diagenesis. After deep burial phase the shelf was uplifted to a meteoric diagenesis. Based on thin section porosity evolution and permeability analysis, the Chiltan Formation is considered to be a poor quality reservoir rock.

Sequence startigraphic analysis of the Chiltan Formation reveals it to be a composite transgressive systems tract which in turn consists of third order systems tracts. Long term and Short term Sea level fluctuations have been documented in the Chiltan Formation that shows a close match with global eustacy.