# Impacts of Lithological Variation on Over-Pressuring: a Unique Example from Middle Indus Basin

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## Abstract

Excessive pore pressure above the normal hydrostatic pressure gradient is found globally in a wide range of play types in most sedimentary basins, and is a peculiar feature of deep and ultra-deep reservoirs [1]. Such over-pressuring may results from tectonic stresses generated by plate movements. However, in many basins, the presence of unusual fluid pressure regimes may be associated either with hydrocarbon generation and charging, compaction disequilibrium due to rapid sedimentation, or dewatering of compressible sediments, such as shales.

Petroleum generation and its charging into permeable reservoirs is generally thought to be the predominant source for creating abnormally high pressures in the reservoirs; however, other geological mechanisms such as the alteration of clay mineralogy may also control the movement of pore-fluids and hydrocarbons within sedimentary basins. Globally, about 50-60% of the abnormally high-pressured regimes exist in the foreland fold-and-thrust belts, while 15-20% of the over-pressured regions are associated with the basins developed at passive margins [2].

This paper will take the readers through such an analogy of over-pressuring observed in the Middle Indus Basin, Pakistan. The study area lies in OMV Operated Mubarak Exploration Licence, where couple of drilled wells for the same prospect exhibited hydro-dynamically ~1000 psi over-pressured reservoir in comparison with the surrounding wells drilled for the same reservoir within an access of 15 km radius. The scope of work demonstrates how over-pressuring phenomenon can be attributed to the dewatering of clay mineralogy and stratigraphic compartmentalization rather than charging of hydrocarbons, in passive margin settings, with the help of available G&G data. One of the key points of this research is that the risk of over-pressuring due to any mechanism other than tectonic uplift or charging should also be considered before drilling high-pressure, high-temperature (HPHT) prospects.