Velocity for Pore Pressure Prediction Modeling and Risk Assessment

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Abstract

Predictions of pore pressure using seismic velocity (V_p) before drilling and sonic slowness (Δt) while and after drilling are vital for the entire prospect's economic appraisal. The subsurface geological progress, from deposition, compaction to entrapment greatly impacts the pore pressure partitions. In fluvial and deltaic marine environment velocity, as a porosity index, drifts as a consequence of these partitions. The contemporary velocity – pore pressure transformation models are lacking this relationship, especially in the so called normally pressured section.

The supposition that the section above the top of geopressure is normally pressured can lead to an unrealistic pressure profile. It also can have a domino effect on drilling challenges such as shallow water flow and the flow-kill-loss of circulation cycles. It is controversial to consider the shallow section as normally pressured and at the same time extract a compaction trend to be used for the deeper over-pressure section. Moreover, it leads to a misfit between the predicted and the real time measured values in the over-pressured formations.

The purpose of this study is to establish the velocity – pore pressure modeling alliance above the top of geopressure and consequently apply the correct algorithm's calculation in the deeper over-pressured section.

The appropriate interval velocity – depth profile can shed light on the subsurface seal competency in a prospect. Moreover, defining the different pressure subsurface zones from velocity can help in assessing some of the petrophysical attributes ahead of the drill bit.