

### **Pore Pressure Prediction in Challenging Areas - Reducing Uncertainty by Understanding Rock Behaviour**

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In extensional Tertiary deltaic systems where compaction disequilibrium is the main source of overpressure generation, porosity/effective stress relationships can be utilised to predict pore pressures. These techniques rely on measurement of abnormally high porosities in shales at depth, referenced to those expected in a normally compacting sequence.

These approaches tend to underestimate pore pressure in situations where cementation occurs, where temperatures (>100-120oC), deep fluid expansion mechanisms (e.g. gas generation) are present or chemical compaction (porosity no longer related exclusively to effective stress) occurs. Also, in carbonate lithologies pore pressure prediction using effective stress/porosity relationships is invalid and therefore other approaches are required. In areas where there is increased tectonic stress, pore pressures will be underestimated if vertical stress loading is assumed the primary source of overpressure generation. Pressures in reservoirs/sands and shales also may be out-of-equilibrium, depending on sequence net/gross and lateral extent. Finally, sub-salt is problematic for several reasons, including the definition of a normal compaction curve.

Therefore, a series of "non-standard" approaches are presented based on world-wide experiences, whereby mechanisms of overpressure generation are identified and quantified in shales e.g. using velocity/density cross-plots, carbonate pressure prediction is discussed and facies controls on pressure build-up and retention are detailed e.g. laterally-drained reservoirs. Also, understanding of rock properties adds confidence to pressure prediction in areas of limited data. By first using standard techniques related to vertical stress, then using these non-standard approaches allows more robust geological pressure models to be constructed.