Pore Pressure Profiles in Deep Water Environments: Case Studies from around the World

Stephen A. O'Connor and Richard E. Swarbrick
GeoPressure Technology Limited
Stockton Road, Durham, DH1 3UZ, England

Deep water sandstone reservoirs are commonly enveloped in shales. Pore pressure profiles are based on direct measurements in the reservoirs and porosity and shale property-based estimation in the non-reservoir section. Profiles from clastic sequences of deep marine shales with associated, thin reservoirs, reveal overburden/lithostatic parallel increase of pressure beneath a fluid retention depth (near top overpressure). The depth to the fluid retention depth is controlled by clay content: many deep water shales have high clay content, explaining shallow onset of overpressure but adding shallow water flows as a drilling hazard in this environment. Thick reservoir sections reveal local hydrostaticparallel profiles creating variable transition zones into adjacent shales. At temperatures greater than about 100oC, however, there is a tendency for pressure profiles to converge with the overburden/lithostat, creating narrower drilling margins and more likelihood of seal breach. Lithostatic parallel profiles can be used locally for pore pressure prediction, as long as reservoirs are not able to gain access to and drain laterally/vertically to surface, and remain at temperatures less than about 100oC. Care must also be taken where there is large reservoir structural relief, whereby lateral transfer may enhance crestal pressures. Pressures in many deep water reservoirs can be used to assess risk failure, particularly for stratigraphic traps. Examples will be used from Nile Delta, Gulf of Mexico, SE Asia and West African basins.