Lateral Drainage in the Jeanne D'Arc and Flemish Pass Basins, East Canada

Stephen O'Connor (soconnor@ikonscience.com), Sam Green, Richard Swarbrick and Richard Lahann, Ikon GeoPressure, Mountjoy Research Centre, Stockton Road, Durham, DH13UZ, UK

In wells in the Jeanne d'Arc Basin (e.g. Fortune G-57) mud-weights used to drill wells start low and increase rapidly, in order to handle deep reservoirs (Lower Hibernia, Fortune Bay and Jeanne d'Arc) with overpressures up to 6400 psi. In detail it is found that reservoir horizons shallower than the Base Tertiary Unconformity are normally pressured Between the Top Lower Hibernia and the Base Tertiary Unconformity overpressures are highly variable, ranging from normally pressured up to 3000 psi overpressure, often at the same depth/stratigraphic level. Such variable overpressure distribution has proved to be problematic in drilling programs, as evidenced by kicks taken in these horizons, reflecting unexpectedly high pressures. Understanding the proper framework for pore pressure prediction is therefore essential.

Shale-based pore pressure prediction has established that in many wells shale pressures are significantly higher than found in associated pressures taken in both clastic and carbonate reservoirs in the Jeanne d'Arc Basin. Similarly in the Flemish Pass Basin, pressure regressions (deeper reservoirs with less overpressure in reservoir than shales above) are observed. These observations from both basins suggest that some porous horizons have lost pressure relative to their associated shales – this phenomenon is called "lateral drainage". However, in some places the shales and reservoirs are at approximately the same pressures. These variations in overpressure at the same levels in different areas are related to the presence or absence of stratigraphic/structural isolation. The lateral drainage is associated with the dewatering of deep, overpressured shales into reservoirs of high lateral extent with flow focused towards leak points in the basins.

The recognition of these draining reservoirs has profound implications for the petroleum system in East Canada. These types of reservoirs are not restricted to offshore Canada, however, but found world-wide. They are associated with enhanced seal potential allowing longer than usual hydrocarbon columns to accumulate, as well as hydrodynamic aquifers, with implications for non-structurally controlled hydrocarbon distributions.