Regional Reservoir Quality Trends in Mesozoic Sandstone Reservoirs of the North Atlantic Margin Basins of Eastern Canada and South-Western Ireland

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ABSTRACT

Late Jurassic and Early Cretaceous sandstones form major exploration targets across the North Atlantic Margin basins of Eastern Canada and South-West Ireland. Although there have been world-class discoveries offshore Newfoundland in the Late Jurassic Jeanne d'Arc Formation and Lower Cretaceous Hibernia and Ben Nevis Formations, large tracts of the margin remain relatively under-explored, so there is an industry imperative to gain increased knowledge regarding factors controlling reservoir quality in these basins. Our approach to this regional reservoir evaluation was to extract maximum geological value from a large archive of legacy rock samples (core, SWCs and cuttings) that has been created by multiple exploration and appraisal drilling campaigns in these North Atlantic basins. Detailed petrographic descriptions have been performed on over 500 thin sections describing detrital and authigenic mineralogy, the degree of compaction and characterisation of pore systems. Reservoir quality has been assessed by combining this observational data with an extensive legacy database of core analysis data. The objective of the study was to evaluate the regional distribution of reservoir quality taking into consideration sedimentary facies, sediment provenance, burial pressures and temperatures. The data evaluation process was facilitated by use of high resolution digital scanning of thin sections. Late Jurassic sandstones range from unconsolidated to strongly cemented, in part controlled by structural topography and also by overpressure, which appears to play a role in preserving reservoir quality in some basins. Quartz and carbonate cements are often a strong control on reservoir quality in both the Late Jurassic and Early Cretaceous. In the Flemish Basin the presence of fluvially-reworked carbonate clasts influences the distribution of nodular carbonate cements and encourages chemical compaction at greater burial depths. In the Lower Cretaceous sandstones of the Jeanne d'Arc Basin common in situ bioclasts and presence of bioturbation are important factors influencing reservoir quality trends within shoreline facies. Unusual pyrite and sphalerite mineralization was noted in some wells, which can be linked to the presence of fracture systems seen in core.