

Influence of Late Jurassic Structural Inversion on Deposition of Gotnia Sequences at South and Southwest Kuwait

Muhsen Almutairi, Sawsan Bader Alfaraj

Kuwait Oil Kompany

Abstract

Late Jurassic Gotnia Formation of Kuwait deposited in intra shelf Gotnia Basin is considered contemporaneous to Arab Formation of Saudi Arabia, the prolific hydrocarbon producing platform carbonate deposits. Hith Formation, deposited over Arab and Gotnia formations is correlatable over large area of Arabian Shelf and indicate an extensive common depositional setting at that time. The recent hydrocarbon flow from Gotnia and Hith sequences in North Kuwait brought the carbonate layers within anhydrites of these formations under active exploration focus. Depositional environment of both Arab and Gotnia formations represent regressive transition, carbonate to anhydrite and anhydrite to salt respectively. Integrated structural analysis showed thick early Gotnia sequences at southwest and south Kuwait which thins towards northeast. Conversely, late Gotnia sequence thins gradually southwest and its absence further south implies emergence of this area following mild structural inversion associated with Rimthan reactivation, the arch separated Arabian Basin and Gotnia Basin during Late Jurassic. Regional seismic and well correlations indicate presence of four Gotnia evaporitic sequences in south and southwest matching the four units of Arab Formation. Towards northeast of Kuwait only three sequences are developed indicating availability of more accommodation space at southwest and south created either by interior sag or by eastern uplift during early stages of Gotnia sediment deposition. Fourth sequence, the earliest deposited evaporite unit thins towards northeast and onlaps unconformably onto older Najmah Formation. However, the three younger sequences of Gotnia occur throughout Kuwait. Thicknesses of salt units are much higher than anhydrites indicating probably long periods of basin isolation during late regressive periods combined with subsidence and seawater seepage. The deposition of overlaying anhydrites and intervening carbonate layers are associated with transgressive and early regressive periods. Thicknesses of anhydrite units and associated carbonate layers in older sequences are significantly high in south and southeast parts. At the same time, Gotnia youngest cycle appear not deposited in this area due to structural inversion. Accurate modelling of reservoir facies associated with mild crests separating brain lagoons in ramp setting is critical for exploration success.