Characterization of Naturally Fractured Igneous Basement Reservoir, Bach Ho Field, Offshore Vietnam

Warren, John Keith[1], Trinh Xuan Cuong[2] (1) Universiti Brunei Darussalam, Bandar Seri Begawan, Brunei (2) Petrovietnam, Hanoi, Vietnam

A combination of outcrop analogs, core, conventional and image logs, and seismic shows that fractures and alteration networks associated with faulting and uplift largely control reservoir quality. This is true not only in the immediate vicinity of the main faults but across the whole field. Bach Ho Field is unusual in that the reservoir matrix is largely made up of acid igneous lithologies (mostly granites and granodiorites). A major NE-SW Late Oligocene reverse fault crosscuts the field generating approximately 2000m of displacement. In the more productive parts of the more productive parts of the Bach Ho basement high the fault has placed a block of brittle granitic rock atop easily compacted fine-grained Eocene sediments. Igneous basement in Bach Ho field is divided vertically into three zones (A-C): the two lower zones (below 3800-3900m), which are sub-economic, are more weakly deformed, while the upper zone, which constitutes the reservoir is strongly altered by various fractures that encompass tectonic, stress release, exfoliation and contraction styles.

Faults and brecciated zones contribute considerably to both pore volume and rock permeability in the reservoir intervals that constitute the upper zone of the Bach Ho basement block, as they create an enhanced secondary porosity system with effective porosities mostly from 3-5% and occasionally up to 20%. Other factors influencing reservoir quality include surface-related weathering of the uppermost part of this exhumed basement block prior to its Eocene reburial, ongoing hydrothermal leaching, variable amounts of authigenic precipitates in fracture networks, and early oil migration.