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Generation and Migration of CO_2 in the Bahi Sandstone Reservoir within the Ennaga Sub Basin, Sirte Basin, Libya

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Abstract : This work presents a study of carbon dioxide generation and migration in the Bahi sandstone reservoir over the EPSA 120/136 (conc 72), En Naga Sub Basin, Sirte Basin, Libya. The Lower Cretaceous Bahi Sandstone is the result of deposition that occurred between the start of the Cretaceous rifting that formed the area's Horsts, Grabens, and Cenomanian marine transgression. Bahi sediments were derived mainly from those Nubian sediments exposed on the structurally higher blocks, transported short distances into newly forming depocenters such as the En Naga Sub-basin, and were deposited by continental processes over the Sirte Unconformity (pre-Late Cretaceous surface). Bahi Sandstone facies are recognized in the En Naga Sub-basin within different lithofacies distributed over this sub-base. One of the two lithofacies recognized in the Bahi is a very fine to very coarse, subangular to angular, pebbly, and occasionally conglomeratic quartz sandstone, which is commonly described as being compacted but friable. This sandstone may contain pyrite, minor kaolinite. This facies was encountered at 11,042 feet in F1-72 well and at 9,233 feet in L1-72. Good, reservoir quality sandstones are associated with paleotopographic highs within the sub-basin and around its margins where winnowing and/or deflationary processes occurred. The second Bahi Lithofacies is a thinly bedded sequence dominated by shales and siltstones with subordinate sandstones and carbonates. The sandstones become more abundant with depth. This facies was encountered at 12,580 feet in P1 -72 and at 11,850 feet in G1a -72. This argillaceous sequence is likely the Bahi sandstone's lateral facies equivalent deposited in paleotopographic lows, which received finer grained material. The Bahi sandstones are generally described as a good reservoir rock, which after prolific production tests for the drilled wells that makes Bahi sandstones the principal reservoir rocks for CO_2 where large volumes of CO_2 gas have been discovered in the Bahi Formation on and near EPSA 120/136, (conc 72). CO_2 occurs in this area as a result of the igneous activity of the Al Harouge Al Aswad complex. Igneous extrusive have been pierced in the subsurface and are exposed at the surface. Bahi CO_2 prospectivity is thought to be excellent in the central to western areas of EPSA 120/136 (CONC 72), where there are better reservoir quality sandstones associated with Paleostructural highs. Condensate and gas prospectivity increases to the east as the CO_2 prospectivity decreases with distance away from the Al Haruj Al Aswad igneous complex. To date, it has not been possible to accurately determine the volume of these strategically valuable reserves, although there are positive indications that they are very large. Three main structures (Barrut I, En Naga A, and En Naga O) are thought to be prospective for the lower Cretaceous Bahi sandstone development. These leads are the most attractive on EPSA 120/136 for the deep potential.

Keywords : En Naga Sub Basin, Al Harouge Al Aswad’s Igneous Complex, carbon dioxide generation and migration in the Bahi sandstone reservoir, lower cretaceous Bahi sandstone
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