Sidi El Kilani Oil Field from Kairouan Basin, Central Eastern Tunisia: Structural Evolution, Impact on Trap Formation and Reservoir Development

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Abstract

The Sidi El Kilani oil field represents the only one discovery in the Kairouan basin. The main target was the upper cretaceous Abiod chalky naturally fractured reservoir (NFR). The field is a very complex structure compartmentalized by the NW-SE Sidi El Kilani fault system. It is interpreted as complex flower structure along a strike slip corridor injected locally by Triassic salt diapir. It divided the field into an eastern and western compartments. Seismic observations and interpretation allowed to identify main tectonic events and highlight different kinematics of structures in response to stress axis. These later have controlled sedimentation at several times.During Cretaceous, except a small inversion that gave a low amplitude fold on reactivated normal faults at the Santonian Aleg level, a clear syn-sedimentary normal activity was dominant. It is outlined by spectacular thickness variation along NE-SW and NW-SE trending structural lineaments.At the onset of the late Miocene compression, the maximum shortening axis is oriented NW-SE, and a senestral shear was dominant. It allowed the development of a negative flower structure to the north and positive flower structure to the south. Respectively, a continuous normal faulting with very low angle to conformable Messinian discontinuity northward and inverted faults associated with Messinian angular unconformity southward. In fact, a NW-SE drag fold was formed in western compartment however the inversion of inherited NE-SW syn-sedimentary fault gave an Atlassic fold in eastern compartment. It is marked by a clear truncation of the underlying Oligocene sediments and the presence of top-laps at reflector terminations. It indicates post Tortonian truncation.During early Quaternary tectonic inversion, the maximum shortening axis is oriented NNW-SSE to sensibly N-S, and a dextral shear was dominant. It gave a positive flower structure to the north with inverted normal faults into reverse and negative flower structure to the south with predominance of normal faults affecting Plio-Quaternary sediments. This event has accentuated previous structures witnessed by the folding of the Messinian unconformity.In which concern reservoir development, the most contributors in production are open stylolites. Those fractures are the result of stress axis permutation and post compression relaxation. In addition, fluid circulations in relation with salt diapir have enhanced locally the reservoir by dolomitization and leaching phenomenon.