

Tectono-Sedimentary Evolution and Development of the Chotts Basin (Tunisia): A Multi-disciplinary and Integrated Approach to Evaluate Hydrocarbon Prospectivity

Ahmed Nasri¹, Joseph English², Sondes Ouahchi¹, Martin Van Rees³, and Aymen Guizani¹

¹Mazarine Energy Tunisia, TUNIS, Tunisia

²Mazarine Energy, Dublin, Ireland

³Mazarine Energy, The Hague, Netherlands

Abstract

The Chotts Basin constitutes the eastern extension of the Benoud-Melrhir Trough, and is an E-W elongated basin covering an area of over 15,000 km² in central Tunisia. The basin is bounded to the south by the Talemzane-Bou Nemcha arch, to the north by the South Atlasic wrench and to the east by Jeffara Basin. This depression was filled by a complex Paleozoic and Mesozoic sedimentary column with a total thickness of over 5000m. Although exploration activities began in the fifties and a number of oil and gas discoveries had been made (Sabria, Franig, Baguel, Tarfa), the basin remained relatively underexplored. Mazarine Energy Tunisia (MET), an E&P company currently operating two large exploration blocks (Zaafrane and Douiret) in the Chotts Basin, drilled two back-to-back exploration wells in 2015. These two wells discovered oil in the Ordovician (Jeffara and El Atchane reservoirs) adjacent to the nearby Sabria field and also confirmed the presence of oil in a Triassic reservoir (TAGI) in one of the wells. In 2018, MET drilled a third exploration well targeting a large undrilled structural closure and discovered - for the first time in this basin - a new pay zone in the Silurian reservoir (Acacus equivalent). Following these successful exploration campaigns, two exploitation concessions (Ghrib and Sidi Marzouk) have been granted from Tunisian authorities in 2016 and 2021 respectively. Following the 100% rate of exploration success (3 wells, 3 discoveries), with discoveries in four different stratigraphic horizons, MET initiated a further exploration program consisting of several multi-disciplinary studies under an integrated approach to unlock the prospectivity of the area. A key component of this follow-up exploration effort was the acquisition of a large (934 km²) 3D seismic survey in 2019. This presentation covers the main geological insights derived from the exploration work program to date including: (1) Basin structural evolution and basement configuration based on the interpretation of seismic and other geophysical data; (2) Dry hole analysis of historical wells in the area and associated well-based studies; (3) Updated stratigraphic interpretation for the area based on the integration of chemostratigraphic, palynological and provenance studies; (4) Integrated geochemical study to constrain source rock quality, maturity, and oil-oil and oil-source correlations; (5) advanced quantitative geophysical studies (AVO & Inversion) applied on different reservoir targets to identify high-graded sweet spots for further evaluation ahead of the next drilling phase.