

## **Structural Styles of Jurassic Carbonate Play in Southwestern Amu Darya and Western Afghan Tajik Basins, Northern Afghanistan Region**

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### **Abstract**

In 2014, Dragon Oil, headquartered in Dubai, UAE, and Turkish Petroleum Corp. (TPAO), based in Ankara, Turkiye, formed a joint venture to conduct hydrocarbon exploration activities in the Sanduqli and Mazar-I Sharif blocks, located in Amu Darya Basin and Afghan Tajik Basin. These basins, spanning from Western Turkmenistan (Caspian Region) to Northern Afghanistan and Southern Kyrgyzstan, have proven to be highly prolific in hydrocarbon resources. These regions boast nearly 400 fields, with reservoir intervals ranging from Jurassic to Tertiary.

As part of these exploration efforts, the joint venture conducted an Airborne Magnetic Survey over the two blocks in 2015 to delineate basin geometry and limitations. Subsequently, 1235 km of 2D seismic data was acquired (705 km in Sanduqli block and 530 km in Mazar-I Sharif block) to identify the structural play and prospective hydrocarbon areas within both blocks.

A comprehensive review of regional geology, well data, interpretation of Gravity and Magnetic data, 2D seismic data, and basin modeling studies in the Amu Darya and Afghan-Tajik basins confirmed the structural styles of pre-Jurassic stratigraphy is different than late Jurassic stratigraphy due to the presence of thick salt sedimentation (Late Jurassic-Gaurdak Formation). During Late Jurassic to Quaternary, structural configuration is defined as thin skin deformation that is linked with Late Miocene to recent compression tectonics and salt evacuation. Major structural traps in the Cretaceous to Tertiary sections formed on the detachment surface linked to these salt evacuations. The pre-salt structural styles is complicated due to the multiple phases of tectonic movement.

Upon the interpretation, integration and analysis of all available data, significant plays and prospects were identified in the Sanduqli and Mazar-I Sharif blocks. The plays and prospects are mainly trapped in the Late Jurassic and older sequences due to the effective thick salt layering in the Late Jurassic. The structural styles in the Late Jurassic carbonate known as Kugitang carbonates and the older Early-Middle Jurassic source rocks, are characterized by a fault-bounded three-way structural closures making it a highly desirable prospective target for hydrocarbon accumulations. The focus lies on the Late Jurassic carbonate reservoir at depths exceeding 5500 meters. The prospectivity of the younger Cretaceous and Tertiary sequences will be positive in areas where salt layering have been evacuated or thin enabling the migration of hydrocarbon from the Jurassic source beneath.

Further validation comes from the review of data from regional fields and the existence of producing fields, from the Jurassic shallow marine carbonates. Drilling and testing of the compression related 3-way structural closures in the Sanduqli and Mazar-I Sharif blocks will validate targeting deeper reservoir in the Amu Darya and Afghan- Tajik basins should ii be successful.

Keyword: Amu Darya basin, Afghan-Tajik Basin, Jurassic carbonate Prospect, Structural style