

Sedimentology of Early Aptian Reservoir of Dunga Field, Mangyshlak Basin, Kazakhstan

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Maersk, and partners Oman Oil and Partex, are actively developing the Dunga field, located 50 km north of the city of Aktau, on the Kazakh coast of the Caspian Sea. Oil and gas occur at a number of stratigraphic levels on the Dunga anticline, but development activity to date has focused on early Aptian sandstones.

The Dunga subsurface database includes 358 km² of 3D seismic, logs from 69 Soviet and partnership wells, and 226 meters of Aptian core. Characteristics of the Dunga deposits observed in core include: mud, silt and very fine-grained sand; organization of sand deposits into centimetre- to decimetre-scale beds, with muddy interbeds, which occasionally amalgamate into meter-scale sand intervals, where the best reservoir is located; pervasive soft-sediment deformation; common hummocky cross stratification; and frequent syneresis cracks.

The trace fossil assemblage is variable in diversity, size and abundance. Cores immediately below and above the reservoir display a relatively diverse assemblage that includes abundant *Phycosiphon*, *Planolites*, *Helminthopsis*, *Chondrites*, *Zoophycus* and *Teichichnus*. In contrast, the intervening reservoir section shows a restricted trace fossil assemblage, with common *Planolites* and *Phycosiphon*, as well as frequent cryptic bioturbation. Traces in the reservoir section are stunted, and reflect a stressed environment with large salinity variations and high sediment input.

Paleogeographic interpretations during the Aptian place the Dunga area within a broad embayed shelf, distant from large mountains. Analysis of the core data, and integration with log and 3D seismic data, suggests that the reservoir was deposited in a distal prodeltaic setting, on a storm-dominated shelf. Interpreted sediment transport processes included both hypopycnal and hyperpycnal flows downdip of the delta, as well as seaward return flows. Much of the sediment was subsequently reworked by shelf currents.

Aptian sandstones are immature ferroan calcite-cemented lithic arkoses, with moderate intergranular porosity (arithmetic mean = 16%). Horizontal permeability is low, with a geometric mean of approximately 1 mD. Cements are generally pervasive in originally higher-quality sandstones, but less extensive in bioturbated sandstones, indicating that burrowing helped preserve original porosity.

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