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El Furrial Field Tar-Mat in Venezuela

El Furrial field, in the Eastern Venezuelan Basin, is a giant reservoir of light-medium gravity oil producing 380 MBOPD from Tertiary and Cretaceous sandstones. During the delineation stage, a tar-mat layer was detected at the base of the reservoir with depths between -14772 and -15550 feet. After 14 years of exploitation in this field and in neighboring fields, 28 wells have reached a tar-mat layer of heavy and extra-heavy oil, with less than 168API, more than 15 kilometers of lateral extension and a thickness of 200-400 feet.

Eight cores have penetrated the tar-mat section and a detailed geochemical study has been undertaken. The tar-mat layer is characterized by a notorious increase on the measured content of asphaltene (25%) in the bitumen extracts, which is not vertically constant. Organic petrography shows a preferential location of the asphaltene phase adhered to the inner part of the pores, on the quartz grains. This results in an underevaluation of the porosity and permeability in the core-plugs. However, as in other tar-mats in the world, the El Furrial tar-mat, occurs in good-reservoir quality sands.

Special geochemical analyses and biomarker fingerprints suggest a combination of mechanisms to explain its origin, including the existence of an earlier biodegraded crude oil emplaced in the structure.

Because of its great thickness and lateral extension, the El Furrial tar-mat is probably the largest in the world and further scientific studies should be performed in order to evaluate the technology for recovery.