

**AAPG HEDBERG CONFERENCE**  
*“Paleozoic and Triassic Petroleum Systems in North Africa”*  
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**Tin Fouyé Tabankort (TFT) Ordovician  
Field case development**

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The TFT field includes an oil pool and a gas-cap, and is located 1000 Km Southeast of Algiers. Production of the oil reservoir was initiated by Sonatrach in 1967. The production reached an average rate of 85000 bbl/d ten years later. The accelerated depletion made it necessary to schedule a peripheral water injection in 1980 in order to maintain the reservoir pressure. This water injection along with a reduction in production allowed to slow the depletion and to maintain the oil production rate at an average of 60000 bbl/d for 16 years. This has resulted in a recovery factor of 31% of the original oil in place. An improvement of the water injection is planned to increase the final oil recovery.

The gas-cap being a large anticlinorium, was discovered in 1960. In 1996 a contract was signed between Sonatrach, Total and Repsol to develop the gas-cap under a shared operating agreement. A one billion US dollar development plan was drawn up, providing for recompletion of old wells, drilling new wells (vertical and horizontal), stimulation, the construction of the plant and of the surface network in a first phase, the implementation of compression and additional drilling is called for a second phase. The first phase was completed in 1999.

Buried at 2000m, the TFT gas-cap, whose volume is about 300 Gscm (10 Tcf), extends over a large surface area (1800 km<sup>2</sup>). The richness of the gas is low (GOR around 4400 v/v, CGR = 30 stb/million scf). The properties of the sandstone reservoir are poor and the first wells exhibited a minimal productivity.

An effort by a geosciences team co-ordinated by the shared operating agreement was devoted to describing the sedimentology, the diagenesis and natural fracturing and to reviewing the log interpretation. It resulted in the construction of a geological model from which a dynamic model was derived. The productivity of the wells was improved by hydraulic fracturing. Horizontal producers were drilled in the areas with a small stand-off from the aquifer.

Production started in March 1999 and the full capacity of the plant (20 Mscm/d) was reached in November. At the end of 2001 production totalled 17 Gscm of dry gas, 2.2 Mt of LPG and 2.6 Mt of condensate from 47 wells. The recovery at the end of the twenty-year life span of the contract is estimated at one billion boe.

The studies aiming at optimising the second phase have been launched using the geoscience tools. The objective is to maintain gas sales without detrimentally impacting liquid recovery. Therefore, to balance depletion, the development will be directed towards the western part of the field, which was left aside during the first phase because of poor rock characteristics and of the distance from the gathering center. Appraisal drilling is ongoing there and a 3D seismic will be acquired.