

Onshore Exploration in the Miocene of Morocco

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The Rharb Basin of Northern Morocco has had a long history of exploration since the first well in 1890. Surface oil seeps led to the early discovery of small oilfields and with the onset of 2D seismic technology, additional small gas fields were found. However, the delineation of productive drillable targets has proven difficult until the application of modern 3D technology was employed. Circle Oil signed for the contiguous Sebou and Oulad N'zala concessions, which contained three old gas fields, in 2006. 3D seismic was acquired over the winter of 2007-2008 and the first well drilled in September, with production start-up soon afterwards in November 2008. Since that time a further 10 wells have been drilled in two drilling campaigns of 2008-2009 and 2010-2011. The success has been remarkable with 10 of the 11 wells successfully testing gas from thinly bedded Miocene sands.

The Miocene succession of the Rharb was deposited in a marine foreland basin over the subsiding Rif thrust belt, commonly known as the Nappe. This "Supra- Nappe" section has been divided into eight units using sequence stratigraphic principles, tying seismic interpretation to well log character. Although the sands are generally thinly bedded, they are of good reservoir quality and where gas charged, yield a large negative amplitude anomaly, which is very distinctive on 3D seismic. The gas is trapped in combination structural-stratigraphic pinchouts, with sealing provided by co-eval marls and shales. Drill depths are from 700-2000m, with the majority of production from about 1000m.

Further understanding of the regional "Supra Nappe" geology will be forthcoming from the new 3D seismic programme being shot over the summer of 2011 covering another 120 sq km of the Circle Oil permit areas.