

## **Petronas' F38.1 discovery well: a remarkable cost saving and very efficient operational experience**

**MOHAMAD KADIR<sup>1</sup> AND ABDULLAH ADLI ZAKARIA<sup>2</sup>**

<sup>1</sup>Carigali-Triton Operating Company, 16<sup>th</sup> Floor Rohas Perkasa  
8 Jalan Perak, 50778 Kuala Lumpur

<sup>2</sup>PETRONAS Research & Scientific Services Sdn. Bhd.  
Lots 3288 & 3289, Kawasan Institusi Bangi  
43000 Kajang, Selangor

F38 structure is a pinnacle-typed carbonate built-up on the Central Luconia Platform in a water depth of 95 m. It is located about 160 km north of Bintulu and 120 km west of Miri, Sarawak (Fig. 1). The nearest discovered gas fields of F38 are B11 and Cili Padi, located about 17 km northeast and 23 km west respectively. The F38 structure is within 15 km to the existing gas pipeline offshore Sarawak, Malaysia.

F38.1 well was drilled as a vertical exploration well in the open acreage block SK310 by semi sub rig, Hakuryu-III which used a slim-hole well design and the method enabled PETRONAS to significantly reduce both drilling time and cost by about 20% (Fig. 2). The well was spudded on the 7th February 2001 and reached at its final total depth (TD) on the 25th February 2001. The objectives of this well were to test the gas potential in the reefal carbonate build-up in the Central Luconia Province, offshore Sarawak.

The Top Carbonate was penetrated at 2,515 mRKB and the well was drilled to its final TD in carbonate at 3,000 mRKB without encountering any operational problems or abnormal pressure. The top target and final TD were shallower by 42 m and 17 m respectively from prognosis. This is contributed by the fact that the actual velocities in the F38.1 are faster than predicted.

The well encountered about 436 m (as high as Cili Padi) gas column (down to the GWC) in the Mid-Miocene Cycle IV carbonate with a total net pay of 310 m, average porosity of 17% and average water saturation of 20% (Fig. 3). The results indicate an additional 136 m of gas column from expectation, making the degree of hydrocarbon fill in F38 is approximately 80% (the highest structural fill so far in Central Luconia Province).

The pressure data demonstrated that the gas accumulation was in one system with the Gas-Water-Contact at 2,951 mRKB. During drilling in the target zone, high gas readings and resistivity up to 2,000 ohm were recorded.

Two production tests were conducted in the carbonate reservoir to confirm the fluid type, evaluate the well deliverability and obtain the reservoir data (Fig. 4). The cumulative flow using 1" choke was 50.5 MMscf/d of gas and 224 bbl/d of hydrocarbon liquid (condensate) with API gravity of 32 degree and with some amount of inert gas.

A significant amount of gas reserves was confirmed from the F38 Carbonate.

The well was plugged and abandoned on 14th March 2001 and had taken about 36 days (vs 44 AFE days) to complete the full drilling operations at a total cost of approximately RM18.2 million with two production tests (vs RM21.9 million AFE cost with one production test). Overall, the F38.1 gas discovery well drilling operations saved PETRONAS almost 20% of the original budget and time. But most importantly the results of the well have upgraded the hydrocarbon prospectively in the open acreage Block SK310, Offshore Sarawak.