Petroleum Geology Conference and Exhibition 2008
14th – 15th January 2008 • Kuala Lumpur Convention Center, Kuala Lumpur, Malaysia

Poster 23

INTEGRATED FRACTURE EVALUATION OF A MALAYSIAN BASEMENT WELL DRILLED WITH THE OIL-BASED MUD

EDNA MALIM[1], SAIFON DAUNGKAEW[1], STEVE HANSEN[1], AUNG THAN OO[1], RIASAT HUSSAIN[1], SIMON CHRISTIAN KURNIAWAN[2], ZAIRUL ASRAH ZULKEFLI[2]

[1]Schlumberger
[2]PETRONAS Carigali Sdn. Bhd.

Hydrocarbons discovered in the naturally fractured basement reservoir around the Malay basin are being explored for additional reserves for the Malaysian oil and gas industry. The fractured basement reservoirs are much more difficult and expensive to evaluate when compared to a conventional reservoir due to its challenging environment. Many new technology tools are target s for such reservoirs. However, the optimized formation evaluation program is required to obtain as much reservoir information to enable an estimation of the most prospective hydrocarbon bearing intervals in this reservoir. This information is essential for field development decision in fractured basement reservoirs.

This paper presents the challenges and results of the formation evaluation program in the fractured basement reservoir in Malaysia. This particular well example is a highly-deviated well drilled with oilbased mud (OBM) as it was believed that the borehole wall failures, formation damage and fracture damage which occurred in previous wells was due to being drilled with a water-based mud (WBM). Current image-based fracture evaluation techniques were developed for water-based mud systems. However, a comparatively limited fracture analysis can still be done with the Dual Oil-base MicroImager (OBMI2) in oil-based muds.

There are inherent limitations that prevent interpreters from performing a full fracture analysis beyond fracture identification, orientation and fracture density quantification in OBMs. OBM makes differentiating between open and closed/healed fractures impossible as both appear as resistive events although one is filled with the OBM and the latter with resistive cement. This in turn prevents the calculation of fracture aperture and fracture porosity. This uncertainty can be fulfilled by combining the borehole image results with dual packer wireline formation tester (WFT), Sonic Scanner reflection imaging and Stoneley data.

The borehole image was crucial in selecting testing zones for the dual packer WFT, and in turn the WFT results were especially helpful in determining whether fractures within a certain zone were open or healed (productive or not). Reservoir

parameters and fluid sampling were obtained using the WFT. In addition, the combination of the borehole image and Stoneley was an important factor in reducing uncertainties. The Stoneley fracture analysis is intended to detect open fractures with significant fluid flow in/out of them. Also Borehole Acoustic Reflection Survey imaging delivers highresolution acoustic images around the wellbore to identify sub-seismic inter beds, faults or fractures far beyond the resolution obtained from any seismic surveys. Using a combination of data from all of these disciplines, the uncertainties of fracture analysis in OBM can be lessened and the resulting integrated solution giving significant value to the characterization of complex fractured reservoir.