

Optimization of Formation Evaluation by Integration of Advanced Surface Fluid Logging and Downhole Tools in Difficult Geological Settings

Mazwan B. M. Ali¹, Hasbulnallah M. Razali¹, Nur Hasnidar Bt Zulkifli¹, Fatin Hamimi Azhar¹, Mark Alexander Samung¹, Rahimah Halim¹, Taufiq Yaakob¹, M. Amin Nizar B.C.A. Razak¹, Anna Lebohang Sempe¹, Ivan Fornasier², Andrea Di Daniel², Simon Botelho², Gokarna Khanal², Elias K. Mathew², Rajeswary Kandasamy², Thierry Chabernaud², and Mohd Ramziemran Abdul Rahman²

¹Petronas Carigali Sdn Bhd

²Schlumberger (adidaniel@slb.com)

Abstract

The scope of this paper is to illustrate the successful application of the Advanced Surface Fluid Logging (ASFL) analysis in the X-1 well drilled in shallow waters, offshore Malaysia. The unexplored Block X, located next to the producing fault block on the East flank of the M structure, was proposed for appraisal based on the seismic data interpretation, strongly suggesting continuation of good reservoir quality from the adjacent block. However, uncertainty with regard to the fluid distribution, contacts and connectivity in the targeted stacked reservoirs was still a serious concern. The formation evaluation program for downhole logging was severely impacted by the limited available budget. Pressure tests program was based on logging while drilling evaluation and run in wash out mode. A limited number of downhole samples were planned, which, considering the multilayered nature of the reservoir, were considered insufficient to achieve a full understanding of the targeted reservoirs. Further challenge was the expected borehole instability and the need to reduce the residence time of the downhole tools in the hole.

During the wireline operations, serious borehole instability problems were encountered and, prevented the collection of the planned downhole samples, thus drastically reducing the amount of crucial formation evaluation data. The ASFL dataset remained therefore the only information available about the fluid nature and composition and secured vital reservoir data for the initial formation evaluation study of the appraised block.