Ceramah Teknik (Technical Talk)

D.N.H. Lee, D. Baxendale & Edmund Huang : Geological Modelling and Reservoir Simulation of a Petroleum Field in Malaysia

Laporan (Report)

The geological presentation by D.N.H. Lee, D. Baxendale & Edmund Huang of Shell was held on the 4th of May 1992 at the Department of Geology, University of Malaya.

Abstrak (Abstract)

The work was based on a field situated offshore south west Sabah which was discovered in 1972, and came on stream in 1975. The field produced at an average rate of 47,700 stb/d with a GOR of 1200 scf/stb, and a watercut of 21% during 1988. One of the main reservoirs in the field is the M reservoir, which contains 90 MMstb of the field's 428 expected ultimate recovery. The current drilling campaign has highlighted the need to develop a detailed geological model.

The M reservoir consists of five main lithofacies comprising of stacked, coarsening upward, prograding sandstone sequences, deposited in a storm/wave influenced upper to lower shoreface and inner shelf environment. Detailed reservoir rock characterization was performed based on all the available core data. Having determined the core lithofacies classification, the next step was to identify the different facies in the non-cored wells. This involved adjusting the core depths to the log depths, and calibrating core defined lithofacies to the log responses. A petrophysical program called CLASS, developed by KSEPL[1] was used to automate this procedure. The program analyses the log response of the core defined lithofacies and establishes a learning set. The learning set is the statistical description of the place and orientation of a cluster of data points for a certain lithofacies in a n-dimensional cross-plot, where n is the number of input logs used in the classification. The learning set is then used to derive the facies classification for the uncored wells. This statistical classification technique was applied to 61 wells in order to derive a field wide lithofacies correlation.

Two east-west cross-sectional panels formed the basis of the input into the 2D simulation work, with each lithofacies layer treated as a unique reservoir simulation layer, resulting in a total of 76 simulation layers for one model, and 85 for the other. Application of dynamic pseudo relative permeability and capillary pressure functions proved that the resulting reservoir performance could be duplicated using only 8 simulation layers.

Finally, a full field model was built based on the 2D models, and a comparison was made between the conventional layer cake modelling and the lithofacies formulation. The two geological formulations resulted in significant differences in permeability distributions, which would lead to different performance predictions. This was due to the lithofacies model incorporating the inherent heterogeneity of the formations.

[1] ICEPE Users Manual, Part 6:1: *Petrophysics*, EP 89-0014, SIPM (1989)

D.N.H. Lee D. Baxendale Edmund Huang

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