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Importance of geological parameters to reservoir simulation — a case study

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Reservoir simulation is a tool to predict future reservoir performance under various "what if" conditions, and reservoir performance is conditioned by a factor which is only predictable and details of this factor would remain unknown even after the end of the life of a field. Poor assessment of its characteristics would lead to a disastrous conclusion. This factor is geological. To illustrate this point, a reservoir simulation study was performed on an oil field situated in the offshore area of Sarawak. Two specific objectives of the study on a field that has been in production for 11 years, were:

i)   to quantify the remaining oil reserves, and
ii)   to optimise production through development of good reservoir management strategies.

In the study, a special emphasis was given to obtained a good set of geological parameters which were necessary as input into the simulation, and these include:

a)   development of geological structure of the field which was generated through integration of seismic and well data,

b)   development of stratigraphic setting of the various correctable units using both the seismic and well data, and

c)   examination of cores for reservoir textures in terms of pore geometry and connectivity and porosity, and for reservoir internal sedimentary structures which may influence fluid flow.

Seismic data were used to map the field and to assist in predicting the reservoir continuity between wells. These parameters lead to the development of 2D geological model and individual 3D reservoir model. The 11 year production history was used to calibrate and validate the simulation results, from which the full field model was used to predict the remaining oil reserves and field production performances.

The result of the study was exciting from two points; it enabled planners to exploit the field optimally, and what is even more important is that it indicated the importance of the good geological input into the reservoir simulator.