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

Geology Paper 8

A GEOCELLULAR MODELING APPROACH TO CHARACTERIZATION OF FLUVIAL STACKED RESERVOIRS – NORTHERN FIELDS, BLOCK PM-3 CAA, MALAY BASIN

Robert Chatwin

Talisman (Malaysia) Ltd.
rchatwin@talisman-energy.com

3D geocellular modeling is becoming commonplace in today's sub-surface workflows. This short paper outlines, with examples, an approach to modeling reservoir morphology from seismic data and limited well information in the pre-development phase of a project.

Emphasis is focused on the methods used to integrate seismic attribute information and well data in to the static reservoir model and how Petrel™ is used to assess uncertainties associated with the static and dynamic input parameters. The study also aims to review the geological factors that may effect the flow regime within the reservoirs and ultimately the recoverable reserves.

Reservoirs in the Northern Fields consist of a series of fluvial to deltaic sandstones (figure 1) that vary greatly in lateral extent and thickness. Exploration and appraisal wells drilled to date have encountered over 120 reservoirs in 6 separate accumulations. Seismic data over the upper reservoir sections are of high quality but imaging degrades with depth resulting in a lack of confidence in mapping out reservoir aerial extent. In general, reservoirs are closely stacked on top of each other and all are below the seismic tuning thickness. These factors, coupled with the lack of production information, make estimation of reservoir geomorphology and dynamic behavior challenging.

In the first part of the study, methods are proposed that show it is possible to employ different seismic integration methods during geocellular modelling to help characterize the extent and internal architecture of the reservoirs. In some reservoirs, for example, there is a strong relationship between the seismic amplitude response and the gross sand thickness even below the seismic tuning thickness. A simple decision tree (figure 2) is used to determine the appropriate seismic integration to geocellular modeling methodology.

The second part of the study looks at an example workflow from interpretation through to reservoir simulation. Methods are proposed to streamline the modeling process and evaluate all levels of both static (volumetric) and dynamic uncertainty. Emphasis is focused on facies distribution and connectivity in particular.

Results show that perturbing the seed number in probabilistic facies modeling has a dramatic effect on the in-place volumes and dynamic behavior of the reservoir at this stage in development due to the lack of well control. Moreover, the geocellular modeling workflow coupled with the uncertainty modeling highlights the dangers of running with just one "p50" simulation case when planning the optimal depletion strategy.

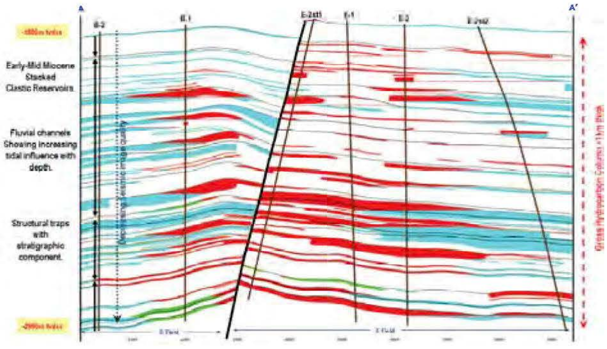

Figure 1: Stratagraphic cross section through Bunga Orkid and East Bunga Orkid.

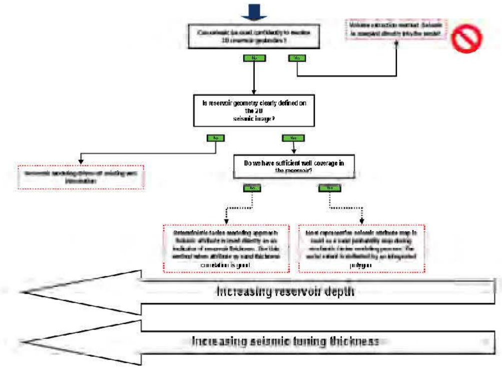

Figure 2: Seismic integration decision tree for geocellular modeling.