POROSITY MAPS DERIVED FROM SEISMIC DATA

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The Mermaid field located in South Sumatra is an anticlinal structure with production coming from sand reservoirs. A few wells, sparsely located, have been drilled on the structure; some become producers and some do not. The reservoir rocks are of the Snow Formation, which was deposited in the Middle Miocene to Late Miocene in marine to deltaic environments. Depth of reservoir sands ranges from 500 m to 1500 m. The reservoir sands are thin, varying from less than 2 m to 20 m, discontinuous and interbedded in shales. Some layers are characterized by strong gamma ray response, most probably containing glauconitic sands. Development drilling is faced with the challenge of finding thick, porous sands that could be productive.

As part of reservoir characterization efforts, porosity maps were generated from acoustic impedance sections that had been inverted from seismic traces. Although three vintages of seismic data were available, only those shot in 1985 were good enough and used for the inversion. Data quality is fair to good with dominant frequency of approximately 30 Hz. Based on velocity data in the area, the estimated vertical resolution of the seismic is no finer than 25 m. Consequently, to characterize reservoir detailed interval zonation strategy, through mappings of multiple horizons, was adopted. The horizons were tied to well controls through intensive used of synthetic seismograms.

The well-known, transit time porosity relation, modified slightly to account for the shale volumes, was used to derive porosity from interval velocity computed from the impedance sections for each zone. Shale volumes were estimated from gamma ray responses at the sparse well controls, and interpolated and extrapolated throughout. Grid operations in the software used have facilitated the interpolation and extrapolation.

Initial results indicated porosity values that oscillated with depth. However, after the porosity values were corrected for the oscillation, they showed good agreement with those derived from well log data. Overlays of the porosity maps and net sand and structure maps would be used to evaluate the future drilling sites.