

Pemodelan Geologi Reservoir Karbonat Dengan Pendekatan Rock Typing, dan Impedansi Akustik: Studi Kasus Cekungan Jawa Timur Utara = Geological Modeling of Carbonate Reservoir Using Rock Typing and Acoustic Impedance: Case Study North East Java Basin

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Abstrak

Keberadaan minyak dan gas bumi di daerah penelitian telah dibuktikan oleh empat (4) sumur yang dibor pada CD Karbonat Formasi Ngimbang. Rata-rata ketebalan karbonat berkisar antara 60 - 140 meter dengan kemampuan aliran sumur terbukti sangat bagus, dicerminkan dengan hasil tes sumuran (DST). CD Karbonat dibagi enam (6) zona aliran dengan ketebalan tiap zona berkisar antara 4 - 40 meter. Tiap zona dipisahkan oleh shale yang tipis atau pun karbonat yang ketat.

Analisa detil core termasuk porositas, permeabilitas dan fasies dilakukan pada dua sumur. Hasil analisa menunjukkan tidak terdapat hubungan antara lithofasies dengan porositas dan permeabilitas, sehingga pemodelan geologi berdasarkan pengelompokan lithofasies dari data core sulit untuk dilakukan.

Kemudian pemodelan geologi dilakukan dengan melakukan perhitungan rock type secara petrofisika menggunakan persamaan Windland R35 dengan menggabungkan informasi yang diperoleh dari data core. Ketebalan zonasi reservoir berada di bawah resolusi seismik, sehingga analisa post stack 3d seismik yaitu analisa impedansi akustik tidak bisa membedakan zona-zona reservoir yang diidentifikasi dari sumur.

Dalam tesis ini, data seismik hanya digunakan untuk pemetaan struktur dan tren karakter reservoir secara kualitatif untuk interval CD Karbonat secara keseluruhan. Untuk memetakan flow unit dari masing masing zona reservoir dalam model geologi, akan dilakukan secara statistik.

.....The presences of oil and gas in the North East Java Sea Basin, North of Madura Island, Indonesia, have been proven by four (4) wells drilled into the Early Oligocene CD Carbonate of the Ngimbang Formation. This formation was deposited within carbonate platform setting. The average gross thickness of carbonate ranges between 60 - 143 meters with very good deliverability of 450 - 4,449 BOPD recorded from DST's. The reservoir comprises of six (6) zones with thickness of each zone ranges between 4 - 40 meters. Each zone is separated by either thin shale or tight carbonate. Reservoir rock types identification is an essential component in the reservoir characterization process. Rock typing together with acoustic impedance analysis from post stack 3D seismic data was carried out on carbonate reservoir. The results of the analysis were used as input for the geological model. Detailed core analysis data covering core porosity, core permeability, and core lithofacies were done on Salemba-B and Salemba-C wells. The data from both wells then used for rock typing calibration for other wells which do not have any conventional core data i.e. Cibubur-A and Salemba-A wells. Facies analysis from the core showed that no clear relation between core lithofacies with the poro-perm. Therefore the lithofacies based geological model from core was difficult to be performed. Rock type identification was calculated using Windland R35 equation which has been calibrated with core data. The productive zones were difficult to differentiate using acoustic impedance analysis due to the thickness of reservoir zonation is less than seismic resolution. Seismic data was only used to map the structure and qualitative gross reservoir characteristic. The geostatistical method was used to distribute the productive zone laterally

identified from petrophysical analysis. The geological model produced was used to delineate the productive zones for field development.