

ABSTRAK

ANALISIS AVO, INVERSI DAN *NEURAL NETWORK* UNTUK KARAKTERISASI RESERVOAR *EARLY MIOCENE* LAPANGAN *OFFSHORE* AL-FITRA

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Keberadaan anomali amplitudo (*brighspot*) pada penampang seismik bisa menjadi salah satu indikator kehadiran hidrokarbon pada suatu reservoir. Namun, banyak kondisi-kondisi lain yang dapat memberikan efek *brightspot*, seperti sisipan tipis batubara, rekah-rekah, lapisan garam, konglomerat, turbidit, ataupun efek *tuning* dari lapisan tipis. Karena itu, diperlukan analisis amplitudo terhadap *offset* (AVO) agar meningkatkan kepercayaan terhadap kemungkinan kehadiran hidrokarbon terutama gas di reservoir lapangan ini. Dalam penelitian ini dilakukan analisis AVO untuk mengidentifikasi kelas anomali AVO, inversi dan transformasi Lambda-Mu-Rho agar reservoir dapat terdeleniasi lebih jelas, serta penerapan *Neural Network* untuk memprediksi distribusi nilai porositas dan saturasi air pada zona reservoir batupasir Belumai. Dari penelitian ini, diketahui bahwa zona reservoir batupasir Belumai pada sumur AW-1, AW-2, AW-3, dan AW-4 tergolong sebagai anomali batupasir kelas IV, dengan nilai impedansi yang lebih rendah dibandingkan batuan penutupnya, *intercept* bernilai negatif, *gradient* bernilai positif serta berada di kuadran II pada *crossplot intercept & gradient*. Berdasarkan hasil inversi, zona reservoir batupasir dapat terpisahkan dengan karbonat dan serpih, ditandai dengan nilai AI rendah 7800-9100 ((m/s)*(g/cc)), nilai SI rendah 4400-5200 ((m/s)*(g/cc)), nilai Mu-Rho rendah 16-22 ((GPa)*(g/cc)), serta nilai Lambda-Rho yang juga rendah 22.5-25.5 ((GPa)*(g/cc)) menunjukkan batuan *porous* berasosiasi fluida gas. Sedangkan berdasarkan hasil prediksi *neural network* PNN dengan nilai korelasi *porosity* = 0.97 dan *water saturation* = 0.98, reservoir di lapangan Al-Fitra memiliki nilai porositas 15-25% dan nilai saturasi air 15-35%. Dan *slice map* pada volume AI, SI, LMR, *porosity* dan *water saturation*, sebaran reservoir batupasir gas di bagian selatan terpetakan dengan jelas yang berorientasi NW-SE serta ditemukan juga 2 zona potensi sebagai reservoir batupasir gas dan perlu dievaluasi lebih lanjut.

Kata Kunci: AVO, Inversi Seismik, Lambda-Mu-Rho (LMR), *Neural Network*.

ABSTRACT

AVO ANALYSIS, INVERSION AND NEURAL NETWORK FOR CHARACTERIZATION OF EARLY MIOCENE RESERVOIR ON OFFSHORE AL-FITRA FIELD

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The existence of anomalous amplitude (brightspot) on the seismic section may be an indication of hydrocarbon presence in a reservoir. However, many other conditions can also give brightspot effect, such as a thin insert of coal, fractured rock, a layer of salt, conglomerate, turbidite, or tuning effect of thin layers. Therefore, it is necessary to analyse amplitude variation with offset (AVO) in order to increase confidence in possibility of hydrocarbon presence, especially gas in the reservoir of this field. In this research, AVO analysis is to identify the class of AVO anomalies, application of inversion and Lambda-Mu-Rho transformation so that the reservoir can be well delineated, and application of Neural Network is to predict the distribution of porosity and water saturation in sandstone reservoir at Belumai level. From this research, it is known that Belumai sandstone reservoir on well AW-1, AW-2, AW-3, and AW-4 are classified as class IV anomaly, which identified by impedance value is lower than the overlying rock, intercept value is negative, gradient value is positive and plotted in quadrant II at intercept and gradient crossplot. Based on the inversion results, sandstone reservoir zones can be separated with carbonate and shale, characterized by a low AI value 7800-9100 ((m/s)*(g/cc)), low value of SI 4400-5200 ((m/s)*(g/cc)), the value of Mu-Rho is relatively low 16-22 ((GPa)*(g/cc)), as well as the value of Lambda-Rho is also relatively low 22.5-25.5 ((GPa)*(g/cc)) that indicate a porous rock with gas associated. While, PNN neural network prediction obtains correlation value of porosity = 0.97 and water saturation = 0.98, reservoir in the Al-Fitra field has porosity of 15-25% and water saturation 15-35%. And based on slice map results on volume of AI, SI, LMR, porosity and water saturation, the distribution of sandstone reservoir in southern part of Al-Fitra field is clearly delineated, which has NW-SE orientation and also found two potential zones which are considered as sandstone reservoir and need to be evaluated further.

Keywords: AVO, Seismic Inversion, Lambda-Mu-Rho (LMR), Neural Network.