

# Penerapan inversi seismik impedansi akustik dan deep learning dalam karakterisasi reservoir formasi upper cibulakan, lapangan z, Cipunegara Sub-Basin, North-West Java basin = Acoustic impedance inversion and deep learning application for reservoir characterization in upper cibulakan formation, z field, Cipunegara Sub-Basin, North-West Java basin

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## Abstrak

Lapangan Z yang berlokasi di Sub-cekungan Cipunegara merupakan salah satu lapangan penghasil gas dengan reservoir berlitologi karbonat platform dan karbonat reef. Berdasarkan 7 data sumur dan data seismik 3D PSTM, sumur A1, A3, G1, W1, C18, C19, dan C26 menunjukkan bahwa zona interest dalam penelitian ini yaitu layer F menunjukkan kedalaman dan karakteristik yang berbeda. Selanjutnya, berdasarkan data sumur yang tersedia akan dilaksanakan analisa petrofisika yang bertujuan untuk mengkarakterisasi reservoir berdasarkan properti batuan, seperti porositas, densitas, saturasi air, kecepatan batuan ( $V_p$  dan  $V_s$ ) dan sebagainya. Dalam ketiadaan data  $V_s$ , nilai  $V_s$  tersebut akan didapat dengan dilakukannya proses deep learning. Setelah data  $V_s$  didapatkan, dilaksanakan analisa sensitivitas melalui crossplot yang bertujuan untuk mencari parameter yang sensitive terhadap perubahan litologi. Hasil didapat parameter AI cukup sensitive sehingga dipakai untuk proses inversi. Inversi dalam penelitian ini adalah jenis model based. Berdasarkan peta persebaran AI hasil inversi, lapisan F dengan litologi karbonat ditandai dengan warna hijau sampai kuning-jingga dengan nilai cut-off 6800 ( $(m*s)/(g/cc)$ ). Selanjutnya akan dilaksanakan proses validasi hasil inversi AI menggunakan deep learning sebagai pendekatan yang berbeda. Hasil deep learning menunjukkan nilai validasi yang cukup baik. Hal ini dapat disimpulkan bahwa inversi AI dan deep learning dapat dipakai sebagai inovasi yang baik untuk proses karakterisasi reservoir.

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Field Z, located in the Cipunegara Sub-basin, is one of the gas-producing fields with carbonate platform and carbonate reef reservoirs. Based on 7 wells data and 3D PSTM seismic data, A1, A3, G1, W1, C18, C19, and C26 wells show that the zone of interest in this study named the F layer shows different depths and characteristics. Furthermore, based on available well data, will be carried out a petrophysical analysis that aims to characterize the reservoir based on rock properties, such as porosity, density, water saturation, rock velocity ( $V_p$  and  $V_s$ ), and so on. In the absence of data  $V_s$ , the value of  $V_s$  will be obtained by doing a deep learning process. After the  $V_s$  data is obtained, a sensitivity analysis is carried out through a cross plot that aims to find parameters that are sensitive to changes in lithology. The result shows that the AI parameter is quite sensitive, so that Acoustic Impedance or AI is used for the inversion process. Inversion in this research is a model-based type. Based on the AI distribution map of inversion results, the F layer with carbonate lithology is marked in green to yellow-orange with a cut-off value of 6800 ( $(m*s)/(g/cc)$ ). Furthermore, the AI inversion result will be validated using deep learning as a different approach than usual. The deep learning results shows a good validation score. It can be concluded that AI inversion and deep learning can be used as good innovations for reservoir characterization processes.