Naturally Fractured Basement Reservoir Potential Quantification from Fracture Model and Petrophysical Analysis by Leveraging Geostatistics and Seismic Interpretation: A Case Study in Jabung Block, South Sumatra Basin

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Abstract

Northeast Betara (NEB) field is the biggest producing gas field of Tertiary sediment reservoir in Jabung Block, South Sumatra Basin. Mesozoic basement exploration has been anticipated by regional explorationists for more than a decade. Two deviated-basement-well have drilled the same granite lithology in 2013 to 2015, but surprisingly they showed different results. NEB Base-1 have gas and condensate discoveries, NEB Base-2, on the other hand, where is located 5.7 kilometers away from NEB Base-1, do not have any hydrocarbon in the basement section. Absence of conventional core data challenges this study to maximize the utilization of well and 3D seismic data. This paper applies the fracture model and petrophysical method including integrating the subsurface datasets to estimate fractured basement reservoir reserves. Fracture model was created by using Gaussian Random Function Simulation which incorporates multi-attributes aided by Artificial Neural Network and interpreted well data to show potential fractured zones. Combination of petrophysical method, well-test and image log analysis was also performed to calculate reservoir porosity and permeability. The result shows that edge-detection and ant-tracking attributes are able to give the distribution of high-intensity fractured zone. It also shows that the deeper the well, the less conductive fractures exist. The fractures dip-azimuth have the mean magnitude of >500 which major orientation towards Southeast direction. The fracture porosity and permeability consecutively ranges from 0.24% to 18.82% and 1.7 x 10-7 to 2.44 mD. The optimum porosity and permeability values can be then used to calculate reserves in order to give reliable results.