

Reservoir Characterization and Modeling of Bekasap Formation for Waterflood Optimization and Field Development, Case Study Pungut Field, Central Sumatra

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Pungut Field is located in the CPI Rokan block, Central Sumatra Basin, approximately 60km northwest of Pekanbaru, Indonesia. The field was discovered in 1951 and to date 38 wells have been drilled. Oil is contained in the Miocene-age reservoirs of the Bekasap and Bangko Formations. Declining reservoir pressure prompted an evaluation focusing on waterflood potential. This paper/poster discusses the modeling methodology used to better understand facies distribution in the Bekasap reservoirs. This distribution controls reservoir heterogeneity and thus connectivity; an understanding of which is critical to the development of a successful waterflood.

A facies-based geocellular model was constructed using conventional cores, 3-D seismic data, and petrophysical properties derived from wireline logs. Facies were modeled with MBSIS and porosity and permeability populations were co-simulated for each facies using cloud transform with sequential gaussian simulation. This model was then moved into a 3-D simulator which also incorporated pressure transient analysis and injectivity test data. Various scenarios were then simulated seeking the optimal waterflood design. Compartmentalization of reservoir zones occurs in some areas of the field and oil saturation is not uniformly distributed and the simulation predicted non-uniform fluids movement. Therefore, injection/producer well pairs were selected as the best design. This method also proved the most cost effective alternative.

By integrating static and dynamic data into a geocellular model, applying simulation for scenario planning, and utilizing 3-D visualization our multidisciplinary team was able to develop various alternative scenarios for waterflooding Pungut field. The project is ongoing, but results to date have been good. Ultimate oil recovery is expected to increase by 3.5% and field life may be extended as long as ten years.