Petrophysical Property Estimation for Miocene Ngrayong Sandstone, Using Integrated Core-Log Analysis; A Case Study in Building Reservoir Geomodel Using Limited Data, Kawengan Field, Indonesia

Vena F. Eveline [1], Bob W. Adibrata [2], and Syamsu Yudha [3]
[1]Enhanced Oil Recovery, PT Pertamina EP, Jakarta, Indonesia.
[2]Exploration, PT Pertamina EP, Jakarta, Indonesia.
[3]Region Jawa, PT Pertamina EP, Cirebon, Indonesia.

A petrophysical study is performed to Miocene Ngrayong Sandstone Reservoir of Kawengan Field as part of reservoir characterization study to construct a reservoir geomodel. The objective of the study is to acquire reliable estimation for reservoir properties. The Ngrayong reservoir is approximately 100 m thick consists of several stacks of sandstone, deposited on near-shore to shoreface environment. The reservoir has been produced since 1926, with cumulative production 99 MMBO. Data collection is limited. Among 174 wells, 98 wells were drilled before 1950, 40 wells between 1950-1960, and 36 wells in 1990's up to recently, whereas only the latter have complete set of log. Data updating had acquired including 3D seismic, 4D microgravity, and coring.

Limited data is a challenge to define reservoir property approximation techniques that could depict the reservoir unit reliably. The paper outlines procedures that are applied to estimate reservoir properties for all wells that will distribute laterally for modeling reservoir afterward.

The procedure begins with building a petrophysical calculation model calibrated to cores, logs and geological facies of key wells with complete standard well logs. Lithology type of the model is developed based on sedimentology analysis from cores and well log responses that conclude the sandstone reservoir lithological component as quartz sandstone alternate with bioclastic limestone, silt and shale. Fluid volume is calibrated to core derived properties, capillary pressure, and production data. The model is used to calculate mineralogy/lithology and fluid volumes and petrophysical properties of the key wells. The result then is matched to core properties and production data. Next steps are performing calculation for other wells that have complete standard well logs with the petrophysical calculation model, followed by property estimation for old wells that have very limited well logs using neural network after careful selection of logs used to estimate. Calculation result is then calibrated and matched to production data.

Accurate properties estimation for every well is important before were utilized to construct reservoir geomodel. The applied estimation procedures above give a reliable reservoir property profile of Ngrayong Sandstone Reservoir including wells with limited logs. Integrated core-log, sedimentology and production data analysis, and careful selection of property estimation discriminator are proved essential.