ABSTRACT

Geologic models provide the best tool to accurately estimate field volumes, to visualize the geology of the field and its flow units, and to provide input to dynamic simulation. However, using the same data, geologic models can use a number of different workflows that all produce the desired carbonate depositional and diagenetic processes and ultimately flow units. For Banyu Urip Field in East Java, Indonesia, Mobil Cepu Ltd has studied different methods to produce a model from a very simple approach to more complicated approaches.

Construction of the Banyu Urip models takes into account the unique technical challenges of characterizing diagenetically altered, carbonate build-ups, as well as what questions need to be addressed by the business unit. Reservoir quality zones (RQZs) are the basic building blocks of models in Cepu Block and are a combination of deposition and diagenesis and are defined from well log data and position within the carbonate platform. For this case study of the Banyu Urip Field, RQZs include the Platform Interior, Lower Platform Interior, Tight Rind, and Drowning Phase. In the Banyu Urip reservoir model, the RQZs are created deterministically, using surfaces and polygons. Using a simple, statistical modeling workflow, porosity is derived from well log histograms and distributed probabilistically within the RQZs. A more detailed modeling approach distributes reservoir rock types (RRTs) within the RQZs. These RRTs are based on pore-scale observations, core analysis, and well log character. When using this methodology in the Banyu Urip reservoir model, RRTs are populated within RQ zones, using variograms determined by vertical and lateral trends. This modeling methodology has been tested, but at this stage in the field life yields similar results to the simpler modeling method and would add some complexity to updates during drilling. However, Mobil Cepu Ltd expects that the more detailed modeling approach may better characterize the field during the production phase of field development, when more well logs and production data become available.

INTRODUCTION

Geologic models are used for a number of purposes including visualization of data and concepts, oil and gas volume calculations, well planning, production forecast from simulation, and production optimization. However, the same level of model detail is not necessarily required for all purposes. For example, oil volume calculations require porosity and water saturation but not a detailed analysis of permeability. The amount of data in a field will also influence what type of geologic model can be built. Newly discovered fields with limited well and core data lend themselves to relatively simple geologic models; whereas, mature fields with 10’s to 100’s of wells, core data, and production history likely require detailed geologic models in order to honor all of the data. The business purpose and available geologic data often drive the level of detail and content of the model being built.

The on-shore, Banyu Urip Field is an Oligo-Miocene carbonate platform on Cepu Block in the East Java Basin (Figure 1). The field was discovered in 2001 by Mobil Cepu Ltd. and contains both oil and natural gas. Five appraisal wells have been drilled into the carbonate reservoir, and Mobil Cepu Ltd. will soon drill a series of development wells for oil production. Geologic models play a key role in understanding the distribution of resource in the field and providing initial estimates of production rates. Although many papers discuss geologic modeling in mature carbonate fields (Hollis et al., 2010; Gomes et al.,