3D Geocellular Modeling of a Naturally Fractured Carbonate in the Song Hong Basin, Vietnam

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Building geocellular models in fractured reservoirs is a very challenging task which involves not only capturing the matrix properties but also the distribution of different kind of fractures and their properties in the reservoir. The problem becomes even more complex when limited information is available especially in new discoveries. This paper presents in detail the modeling methodology applied in a recently discovered field in the northeastern edge of the Song Hong Basin, offshore Vietnam. Only two wells have been drilled: the first well, after four side tracks due to drilling difficulties in the overlying Oligocene shales, penetrated oil bearing Pre-Tertiary carbonates. As a result of the drill bit dropping 3 m at the top of the Carbonate, and the well experiencing losses, the well was able to proceed with a well test that produced a natural flow of 4,858 bbls/d of 39° API oil. The second exploration well was drilled on the Eastern side of the field penetrating 400 m section of Pre-Tertiary carbonates with a production test in natural flow rate of 3,401 bbls/d of oil after acidizing.

The methodology used included: 1. Generation of a structural and stratigraphic framework where six cases were considered to capture the time to depth conversion uncertainty and the probable internal bedding of the carbonate; 2. Three cases of total porosity modeling where variogram uncertainty was included, and 3. Discrete fracture network generation and fracture properties calculation (porosity, permeability and shape factor). A neural network was generated using relative acoustic impedance, distance to faults and curvature analysis. It was supervised by intensity log from FMI to predict areas of high probability of occurrence of continuous open fractures. Finally, a nested workflow was designed to capture the uncertainties and to select P10 P50 y P90 volumes. 3D fracture properties and 2D fracture properties maps were provided for future numerical flow simulation to understand the behavior of the reservoir and assist in placement of future development wells.