Impact of Earth Model Workflow and Up-scaling on Fluid Flow Response Reservoir Modeling in Mature Fields

W. Scott Meddaugh, Chevron Energy Technology Company, 1500 Louisiana, Houston, TX 77002, phone: 832-854-6724, ScottMeddaugh@chevron.com

Scoping studies suggest that simple workflows that use essential stratigraphic and geological constraints capture overall reservoir fluid flow response as well as complex workflows that use detailed stratigraphic and facies constraints. Thus, considerable time and cost saving may be realized during initial model building and updating if simple, but appropriate, workflows are used.

The reservoirs studied include a Permian-age carbonate reservoir in New Mexico, a Middle Cretaceous sandstone reservoir in Kuwait, an Eocene-age shallow water clastic reservoir in Venezuela, and an Upper Miocene deepwater clastic reservoir in California. 2D cross sectional models of the deepwater clastic reservoir showed that cumulative production and water breakthrough times were essentially the same if two major stratigraphic picks or 12 detailed internal stratigraphic picks were used as constraints. 3D streamline simulation was used to demonstrate that adding two facies and seven rock type constraints had little impact on recovery factors for the carbonate reservoir scoping project. Likewise, a complex workflow for the shallow water clastic data set constrained by eight facies and 16 stratigraphic picks yielded the same reservoir response as a simple, two facies, four major stratigraphic picks constrained workflow. These studies suggest that for reservoirs with moderate to high net to gross (>30-40%) or with small differences in the porosity vs. permeability trends of facies/rock types that simple workflows are adequate.

Vertical up-scaling by factors commonly used for full field simulation has little impact on fluid flow response. However, areal up-scaling significantly alters the fluid flow characteristics and warrants additional study.