What-If Scenarios for Reservoir Management Teams
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Integrating information and assessing uncertainty are two dominant trends in reservoir geomodeling. In the midst of this development, geostatistical methods have emerged as very useful tools. However, in some quarters, the strength of their appeal has shifted the focus away from important factors for estimating oil recovery efficiency. The purpose of this talk is to present case studies which suggest the need for a broader and more balanced approach. Here the emphasis is on providing reservoir management teams with the flexibility to explore the interplay of geological features and recovery in various "what if" scenarios.

CASE STUDIES

Uncertainty in a fixed geomodel with fixed wells: Twelve interdisciplinary teams report significant differences in recovery efficiency for the same reservoir model, same wells, and same total water injected over 10 years. The uncertainty stems from which wells are used as injectors, which are producers, and the relative injection rates.

Sweep efficiency in fluvial reservoirs: A wide range of oil recoveries is shown as a function of both well pattern (i.e. five spot, line drive) and as a function of assumptions concerning geological features (i.e. channels and lithofacies) that may act as impediments to flow.

Model resolution: The shape of the contacted zone for injection into a five-spot pattern is shown for the cases of 1, 16, 50, and 248 layer models which depend on exactly the same input data.

Demonstration of the use of geostatistics: A seismic attribute, "energy half time", is co-kriged in an area of the reservoir in which there is little well control. Comparisons of waterflood results are made as a function of the methods used to estimate permeability and porosity.

Flowbodies: A structurally complicated and seemingly heterogeneous reservoir flows like a homogeneous reservoir. Analyzing reservoir connectivity, prior to running flow simulations, indicates the absence of significant barriers to flow.

Biographical Sketch

Dr. Daniel J. O'Meara Jr., is the Director of the Institute for Reservoir Characterization at the University of Oklahoma. He has more than seventeen years of oil industry experience, including ten years with Shell Oil and Royal Dutch Shell and three years with BP Exploration. He is an international consultant, as well as the creator and developer of StrataSim, a reservoir characterization software product of Landmark Graphics. His career mixes industry with academia and research with applications.

Dr. O'Meara has managed interdisciplinary teams both in industry and academia. The Institute for Reservoir Characterization that he directs offers a program of research and education, encompassing geology, geophysics, geostatistics, petrophysics, and petroleum engineering. His current research interests are in the areas of geomodeling, flow simulation, and upscaling.

Dr. O'Meara has been awarded three patents for inventions involving the measurement of relative permeability and capillary pressure. He holds a B.S. degree from the University of Rochester and M.A. and Ph.D. degrees from Princeton University. ∎