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Preserving Geology in Reservoir Modeling:
A Practical Application of Stochastic Modeling in
Heterogeneous Reservoirs

Reservoir characterization is a difficult task, particularly with limited well data. For example, modeling a field with good vertical resolution can present a problem if there are few wells, even with a 3D seismic survey. This does not necessarily change the demand for immediate detailed information because of imposed deadlines for field development, limited time-windows of rig availability, seasonal constraints, or foreign government requirements. In the face of imposed deadlines, it is common to find the geologic model poorly constructed or even bypassed in lieu of a petrophysical model, the primary input to a reservoir simulator. Many pitfalls lie in a hasty approach, and resulting models are often less than satisfactory and the cause of a potentially costly mistake.

Key to modeling sparse data is the judicious use of geostatistics, blending both qualitative and quantitative information. For example, quantitative information from wells can be used to supply vertical detail while seismic data and/or conceptual geologic models can supply information about horizontal continuity, geologic trends, or sequence stratigraphic constraints. The result is a detailed 3D computer model that can be used for constructing reservoir fluid flow studies and a plan for development. While integrating the geological detail into the model takes time, it is more efficient and less costly than running a corrected second model. In this presentation, different methodologies are demonstrated from actual case histories.

Biographical Sketch

Jeffrey M. Yarus was born in 1951 in Cleveland, Ohio. In 1969, he began his formal studies in geology at the College of Wooster in Ohio. During his junior year, Yarus was awarded an opportunity to study geology at the University of Durham, England.

Upon completion of this special program, he returned to Wooster and received his B.A. degree with honors in 1973. In September of that year, Yarus began his graduate studies at Michigan State University under the supervision of Dr. Robert Ehrlich. At Michigan State, Yarus first developed his interest in computer mapping and numerical and statistical analysis. Yarus followed Ehrlich to the Univ. of South Carolina, finished his M.S. degree, and continued through the Ph.D. program in geology. In 1977, Yarus joined Amoco Production Company in New Orleans, Louisiana, as a production geologist for the Gulf Coast Region. In 1980, he left Amoco and moved to Denver where he worked for eight years as an independent, prospecting a variety of domestic basins in the Rockies, mid-continent, and the Appalachian regions. In 1988, Yarus was hired by Marathon Oil Company's Petroleum Technology Center as a senior mathematical geologist. He played a major role there in instituting desktop computer mapping and geostatistical technology, and provided training and consulting in this area for the entire company. Yarus left Marathon Oil in 1994 and joined GeoGraphix, Inc. as manager of customer services. In 1996, he joined GEOMATH, Inc. as the manager of reservoir characterization. Yarus has written a variety of papers and taught courses on computer mapping and applied statistical methods. His professional contributions are many, and include the AAPG edited volume *Stochastic Modeling and Geostatistics: Principles, Methods, and Case Studies.* Today, he works for Smedvig Technologies, Inc. in Houston, where he is the manager of advanced reservoir characterization, support and services.

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