Stochastic Modeling and Geostatistics; Workflows for Overcoming Practical Problems in Common Geological Producing Environments

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The application of geostatistical modeling techniques for describing petroleum reservoirs has grown from relative obscurity to common practice over the past decade. Computing power, coupled with software commercialization, has contributed to the growth of the technology form its original 2D mining applications, to a rich suite of 3D methods for modeling geologic facies and distributing rock properties. Methodologies now include simulation techniques that strive to reproduce variability and provide measures of uncertainty through the construction of multiple equal-probable realizations. A single realization can accurately describe the heterogeneous character associated with many petroleum reservoirs, and be passed directly to multiphase fluid flow simulators for engineering assessment. Multiple realizations can be compared with one another in order to measure uncertainty and be summarized to provide input for risk analysis and probability mapping.

This paper examines a variety of common problems in applying stochastic models to real reservoirs. Case studies from deep water clastics, tidal deltas, braid plains, incised valleys, and other depositional environments are reviewed each expressing a different kind of practical problem to overcome.

Facies boundary conditions, non-stationarity, integration of multiple depositional environments, and integration of seismic attribute data, are some of the issues that will be addressed. Workflows describing the process needed to solve these problems are presented.