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3-D GEOGRAPHIC INFORMATION SYSTEMS AT FIELD AND REGIONAL SCALES

Typical use of geographic information system (GIS) technology in hydrocarbon exploration and production has been in two dimensions at a regional scale. This has confined principal application to regional mapping and accessing data over a large area. GIS technology development, availability of data in electronic forms and upgraded power of desktop computers over the last five years have facilitated application of 2-D GIS to field and reservoir-level problems and led to three-dimensional GIS.

Completion-level production data, well tests and surveys allow construction of detailed 3-D models of even complex fields. These support 2-D and 3-D mapping of reservoir performance and characteristics. They also provide 3-D visualization of rock and fluid properties within and between reservoirs and of well performance in. Adding stratigraphic tops allows the vertical division of the model by geologic age and by reservoir environments of deposition.

As differentiated from standard visualization technology, 3-D GIS can be easily queried for feature attributes and spatial operations can be performed (e.g., proximity and intersection). Most importantly, it allows the application of 2-D GIS functionality to the 3-D environment, avoiding many of the problems that arise in collapsing 3-D geologic features into 2-D.

The development of high-power video cards for personal computers has catalyzed the application of 3-D GIS to petroleum problems. Faster data management and rendering capabilities within 3-D GIS systems have only recently allowed expansion of field-level models to the regional scale. Examples are from the Gulf of Mexico. However, the principles and tools developed are applicable generally.