

Dr. Wayne Narr,
ChevronTexaco Energy Technology Company, San Ramon

***Understanding and Predicting Fractures at Tengiz – A Giant,
Naturally Fractured Reservoir in the Caspian Basin of Kazakhstan***

Tengiz oil field in Kazakhstan produces from an isolated limestone platform (areal extent 160 km²) of Devonian and Carboniferous age. The build-up consists of a flat platform surrounded by an elevated rim demarking transition to the slope. Natural fractures impact producibility of the rim and flank.

Fracture characterization has two primary objectives: - A consistent, qualitative, geological conceptual model. - A quantitative model for fluid-flow simulation.

Most Tengiz fractures formed syndepositionally, related to compaction and gravitational collapse of the laterally expanding Tengiz carbonate platform. The Tengiz fractures strike parallel to the depositional margin and are in greatest abundance in the outermost platform and slope. The Permian Capitan shelf margin, Guadalupe Mountains, New Mexico, contains analogs for these fracture styles.

Fracture characterization for a flow-simulation model involves progressing from discrete fractures to effective-medium flow properties for cells. Fracture data come primarily from image logs and core. Discrete fractures are converted to fracture density logs. We use neural-net software for modeling spatial distribution of fracture properties. Various distributed properties (matrix porosity, facies, etc.) determine spatial distribution of fracture density. The approach is similar to non-linear multiple regression; the input parameters predict the output distribution. The choice of distributed properties is based on geologic knowledge.

The final step combines fracture density, geometry, and matrix permeability to compute permeability tensors for grid cells using a boundary-element model that combines the interacting effects of fracture- and matrix-flow.

Biography

Dr. Wayne Narr is currently employed as a geologist at ChevronTexaco Energy Technology Company in San Ramon, CA. His primary area of expertise is structural geology, and recently his work has focused strongly on natural fracture systems. Previous jobs include exploration for Chevron Overseas Petroleum Co., and both exploration and research positions at Gulf Oil Corporation. He earned degrees in geology from Princeton University (Ph.D., 1990), University of Toronto (M.Sc., 1978), and Pennsylvania State University (B.S., 1976).