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Next Generation Integrated Natural Fracture Reservoir Prediction and Modeling Tools

Advanced Resources International and the Department of Energy (DE-AC26-99FT40688) are developing an integrated suite of tools and techniques to serve as the next generation technology for the projection and modeling of low permeability fractured reservoirs. The objectives of this project are to lower exploration risk and improve recoveries from naturally fractured reservoirs. The suite incorporates geologic and reservoir engineering tools designed around principals of geomechanics, discrete natural fracture generation, and numerical simulation into a Windows™ based program. The suite facilitates integration of the geologic setting, seismic fault data, discrete natural fracture simulation and production data into an integrated reservoir model.

The system uses a multi-phase approach to construct a numerically simulated reservoir model. The first phase uses the geologic and seismic information to develop a geomechanical model of the exploration area predicting stress distribution in the subsurface. The second phase combines the predicted stress field results with statistics derived from outcrop studies, borehole imagery, analogs and failure criteria to produce a stochastic, discrete natural fracture model of the reservoir. The third phase integrates the statistical fracture description with the predicted stress conditions and applies a transform to produce input parameters for a dual permeability numerical simulation model. The process yields a reservoir model which provides data for optimal well locations, production forecasting and economic projection.

Field studies in Colorado and Wyoming performed as part of the development phase of this program are encouraging. Refinement is an ongoing process and the system will be ready for field demonstration starting in 2003.