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Exploration for Fault-Related Fractured Reservoirs

Fractured reservoirs associated with faults produce oil and gas throughout the world. They occur in carbonates, clastics, and crystalline rocks. Recent examples include Monte Alpi and Tempa Rosa in Italy (carbonate), Bach Ho in Vietnam (granite), and several Trenton-Black River Fields in the Northeastern USA (carbonate). This kind of fractured reservoir is quite variable in opportunity, from small volumes of hydrocarbons up to 400+ MBO. The key to these reservoirs, which often occur in low-porosity matrix rocks, lies in the inhomogeneous distribution of fracture intensity. These fracture systems are inherently variable in nature along strike and with depth. The essentials to predicting optimum well locations lie in depicting and predicting the areas along the fault trends that are most fractured and have the best reservoir communication and drainage. Predictions are based on rock mechanics principles and a detailed understanding of the geometry of the fault surfaces in 3-D. In addition, depiction can come from well-selected seismic attributes designed to highlight highly fractured volumes of rock. In particular, attributes associated with coherency and amplitude have proved to be very useful.

Experience tells us that target zones of high fracture intensity associated with faults are often only a few hundred feet in width but have high fracture intensity and permeability draining large

volumes of low-porosity matrix storage. Properly selected, wells in fractured reservoirs associated with faults can drain large volumes of hydrocarbons and require few wells to obtain the accessible volumes.

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Exploration philosophy and technological approaches will be discussed using recent examples from Venezuela, Italy, Vietnam, Appalachians, and the Rockies. ■

Biographical Sketch

DR. RONALD A. NELSON has worked the majority of his 29-year professional career with Amoco and BP Amoco. Since 2001, he has been the principal investigator for

Broken N Consulting in Simonton, Texas. His expertise lies in structural geology, rock mechanics, and fractured reservoir evaluation and management. His knowledge in these subjects is recognized worldwide. Ron has worked on some 85 fractured reservoirs and an equal number of fractured reservoir exploration plays. He has been an AAPG Distinguished Lecturer twice, SPE Distinguished Author, and author of two editions of a textbook titled *Geologic Analysis of Naturally Fractured Reservoirs*. He is a past-president of HGS, and a past-vice president of AAPG.

