

## **Integrated Transition Zone Analysis**

### **In a Supercritical CO<sub>2</sub>-water Carbonate Reservoir System**

In a high-permeability formation, transition zone can be detected only in a few feet of interval. Contrary in a low-permeability reservoir, the height of transition zone extends hundreds of feet. Hence, a large transition zone interval could have a sizeable portion of volumetric calculation. The research work is mainly driven by transition zone modeling in a supercritical CO<sub>2</sub>-water thick carbonate reservoir system. The research will use core, log, and production data from a CO<sub>2</sub> reservoir, the McElmo field-Montezuma County-Colorado.

The identified challenges are; wettability alteration modeling, rock typing, CO<sub>2</sub> phase identification and density estimation, and the non-equilibrium hydrostatic condition. The research will also address the utilization of resistivity data to predict capillary pressure and wettability alteration. Overall, the research will be directed toward an integrated approach and development of procedures to overcome petrophysical challenges in a supercritical CO<sub>2</sub>-water carbonate reservoir system.

The objectives of the research are as follows;

- To evaluate the applicability of Leverett J-function in the supercritical CO<sub>2</sub>-water capillary pressure-transition zone modeling. To develop or define the best approach for an integrated transition zone analysis considering the IFT and wettability alteration. The integration involves core analysis (experiments), log analysis and well testing/production data analysis. The experimental work use porous plate method.
- To develop method to quantify wettability alteration in a supercritical CO<sub>2</sub>-water carbonate reservoir system. This works includes the contact angle variation and IFT modeling.
- To investigate and develop methods for predicting scanning curve of drainage and imbibition
- To develop or improve analytical methods for capillary pressure and relative permeability prediction based on resistivity logs.

The research objectives will be refined or adjusted to the work progress and experiments results.