Zama Acid Gas EOR, CO_2 Sequestration, and Monitoring Project

Steven A. Smith,[1] James A. Sorensen,[1] Edward N. Steadman,[1]
John A. Harju,[1] W.A. (Bill) Jackson,[2] and Doug Nimchuk[2]

[1]Energy & Environmental Research Center (EERC)
15 North 23rd Street, Stop 9018, Grand Forks, ND 58202-9018

[2]Apache Canada, Ltd.

Abstract

Since December 2006, a stream of acid gas has been injected into a Devonian pinnacle reef structure at Apache Canada Ltd.'s Zama oil field in northwestern Alberta, Canada. The injection has been conducted at an average rate of 480 thousand cubic feet (25 tons) of acid gas per day, resulting in approximately 150 million cubic feet (8000 tons) of CO_2 injected to date As part of the U.S. Department of Energy National Energy Technology Laboratory's Regional Carbon Sequestration Partnership Program, the Plains CO_2 Reduction (PCOR) Partnership is managing a comprehensive monitoring, mitigation, and verification (MMV) plan that includes a variety of efforts focused on examining the effects that high concentrations of H_2S (30% or greater) can have on carbon sequestration operations and enhanced oil recovery (EOR). The activities at Zama are providing insight regarding sink integrity (i.e., seal degradation), hydrogeological flow regimes, geochemical reactions, and geomechanical properties of this system. Results to date show the cap rock is competent and will withstand injection pressures above that of the regulatory standard and that fluid migration, in the case of leakage, will take place on a geological time frame over hundreds of thousands of years. Knowledge gained from this project is widely applicable to acid gas disposal sites in North America and can be translated to worldwide operations as sour hydrocarbons are increasingly produced.