

MODELING AND SIMULATION OF ACID GAS INJECTION FOR ENHANCED OIL RECOVERY AND LONG-TERM STORAGE IN ZAMA PINNACLE REEFS

Panqing Gao, Charles D. Gorecki, Jason R. Braunberger, Scott C. Ayash
Edward N. Steadman, and John A. Harju

Energy & Environmental Research Center
University of North Dakota
15 North 23rd Street, Stop 9018
Grand Forks, North Dakota 58202-9018

ABSTRACT

One of the PCOR Partnership's key demonstration activities is working with Apache Canada on the Zama Acid Gas Project. Apache is currently injecting acid gas (CO_2 and H_2S) into six pinnacle reefs in the Zama Field in northwestern Alberta, Canada. In addition, there are more than 600 carbonate pinnacle reefs in the Zama Field, with documented estimates of original oil in place exceeding 1 million barrels each. This project aims to better understand the injection and long-term storage of acid gas and the EOR potential in the active acid gas injection pinnacles and to better understand and predict the EOR and storage potential in the Zama Field and other pinnacles worldwide.

A rigorous methodology of characterizing the six pinnacle reservoirs with the aim of better understanding the potential for acid gas injection for EOR and CO_2 storage potential was developed. A detailed fluid model was constructed that accounted for the effects of H_2S and gas liberation on minimum miscibility pressure. Reservoir simulation models were constructed to investigate optimization of EOR potential and estimate CO_2 storage capacity under various scenarios. The models were history-matched, and several predictive scenarios were run, focusing on both oil recovery and CO_2 storage.

These efforts show promise to successfully conduct tertiary oil recovery at pinnacle reefs of the Zama area and store greenhouse gas in pinnacle structures. Furthermore, the research demonstrates a robust evaluation methodology for similar projects in pinnacle reefs and demonstrates the global potential for these types of reservoirs for EOR and CO_2 storage.

Acknowledgments

This material is based on work supported by the U.S. Department of Energy National Energy Technology Laboratory under Award No. DE-FC26-05NT42592.

This work was also submitted to the 2014 Carbon Storage R&D Project Review Meeting which will be held August 12–14, 2014, in Pittsburgh, Pennsylvania.