MODELING OF ACID GAS INJECTION FOR ENHANCED OIL RECOVERY AND LONG-TERM STORAGE IN DEVONIAN-AGED 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, ND 58202-9018

ABSTRACT

As part of the PCOR Partnership Program, the Energy & Environmental Research Center has conducted activities to validate the use of carbon capture and storage to reduce anthropogenic CO_2 emissions to the atmosphere. One of the PCOR Partnership's key demonstration projects has been 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 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. Geocellular models were then constructed for several of the pinnacle reefs so that reservoir simulation could be performed to investigate optimization of EOR potential and estimate CO_2 storage capacity under various scenarios. A detailed fluid model was constructed that accounted for the effects of H_2S and gas liberation on minimum miscibility pressure. The models were history-matched with historic data, and several predictive simulation scenarios were run, focusing on both oil recovery and CO_2 storage.

These additional Zama pool characterization efforts show promise to successfully 1) conduct tertiary oil recovery at pinnacle reefs of the Zama area and 2) 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.

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