SAND2000-1495C

MULTIPHASE FLOW AND CAVERN ABANDONMENT IN SALT

Brian Ehgartner & Vince Tidwell
Sandia National Laboratories*
Albuquerque, NM 87185-0706

ABSTRACT

Although the depositional environment of salt is generally wet, many salt deposits (particularly domal salts) contain interstitial gas. It is hypothesized that the long-term state of an initially liquid filled cavern in gassy salt will be gas filled. With the interest in using caverns for waste disposal, the long-term state of a cavern must be known. This raises such questions as: Under what conditions will gas migrate into a salt cavern and alternatively, under what conditions will liquids imbibe into the salt? Over what time scales do these processes operate and what is the equilibrium state of a salt cavern?

To answer these questions, an understanding of the processes governing two-phase flow in salt is needed. Here, we consider the long-term performance of salt caverns by way of a survey of pertinent literature followed by a brief review of first principles. To support these efforts a suite of simple laboratory experiments were conducted. In these experiments concurrent flow of gas and brine were investigated with the aid of light-transmission imaging, which allowed direct visualization of the flow of brine through thin slabs of salt.

Multiphase flow visualization experiments were conducted on both slightly damaged and intact salt core to provide data on two-phase flow in salt over a range of permeabilities and porosities. The fact that two-phase flow was measured over relatively short time scales and small pressure gradients suggests that the mechanism of gas intrusion into a cavern and subsequent displacement of cavern fluid into the salt is possible. Further study is needed to better quantify the multiphase flow properties relevant to cavern abandonment issues in salt.

---

* Work supported by U.S. Department of Energy, National Petroleum Technology Office, Tulsa, OK. Sandia is a multiprogram laboratory operated by Sandia Corporation, a Lockheed Martin Company, for the United States Department of Energy under Contract DE-AC04-94AL85000. Paper prepared for Fall Solution Mining Research Institute meeting, October 2000.