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SOLUTION MINING CHARACTERISTICS OF U.S. STRATEGIC PETROLEUM RESERVE OIL DRAWDOWN

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Abstract

The U.S. Strategic Petroleum Reserve (SPR) drew down about 30.6 MMB of its crude oil inventory in summer, 2011, as part of an International Energy Agency coordinated release to mitigate global crude oil supply disruptions. This activity provided a useful opportunity to evaluate the impacts of fresh water injection on salt cavern shapes, with particular focus on leaching during oil displacement, a condition that was never rigorously validated with the current SPR solution mining code SANSMIC. Sonar surveys of the affected caverns were compared for pre- and post-drawdown conditions and analyzed against raw water injection data and simulated with SANSMIC. Moreover, fluid density, temperature, and sound speed were measured with wireline during the drawdown and leach processes in order to observe fluid properties in the leach zones. The SANSMIC modeling for final cavern axisymmetric shape agreed very well with the post-drawdown sonar surveys. Some directional features such as salt falls and preferential leach were not predicted, as those are not addressed in the SANSMIC model. It appears that SANSMIC provides adequate predictions of cavern shape changes due to fresh water addition during crude oil drawdowns to inform decisions on cavern selection to maintain preferred cavern shapes. Follow-up sonar surveys were then useful for determining if and where preferential growth was observed so that the new cavern geometry baseline was established.

Key words: Cavern Dissolution Modeling, Caverns for Liquid Storage, Computer Modeling, Strategic Petroleum Reserves.