ANALYSIS OF MULTIPLE SALT CAVERN INTERACTION THROUGH 3D NUMERICAL SIMULATION

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ABSTRACT

Multiple solution mined salt caverns are often developed and distributed throughout the volume of large salt domes. Sometimes the spacing of such caverns is relatively close, with separation distances between caverns only on the order of two or three times the scale of the larger cavern diameter. The solution mining and liquid and gas storage industries have established general guidelines related to safe separation distances to reduce interaction effects, and to reduce risks for cavern communication and damage. These have been historically developed by considering the deformation and stresses surrounding single caverns of similar size, and how such effects dissipate in the radial direction. In real world practice, however, salt cavern sizes and shapes and depths can vary quite widely across a dome. There is no uniform symmetry in such situations, and analysis of interaction effects requires a full three dimensional model simulation. This paper describes the geomechanical interaction between multiple salt caverns of varying size used for liquid and gas storage, including the distribution of deformation and stresses. We present three dimensional geomechanical simulation models for several real field examples to illustrate such interaction effects.