

## GEOMECHANICAL PERFORMANCE OF THE SALT CAVERNS IN A LONG TERM STABILITY ANALYSIS

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### Abstract

Stability analysis of salt caverns is performed to predict their performance in the specific geological and mining conditions as well as to understand the effect of the cavern shape and size on the stability conditions. Complex geological and mining conditions and stress state around the caverns are simulated in numerical modeling. Moreover, different shapes, boundary conditions, and material properties can be projected in numerical simulations. Stability analysis of salt caverns is usually performed at the two stages of cavern site construction: designing and after excavation. Numerical simulations are performed for different periods related to the time of cavern site operation. A shape of caverns is idealized at the designing stage and rarely complies with a real shape obtained after the final cavern excavation. Consequently, it is recommended to repeat the numerical stability analysis for a real cavern shape after the final cavern leaching. In this paper, we compare results of long term stability analysis for the same caverns in a completion (immediately after leaching) and operation stage (after 9.5 years). A comparison was made between standard parameters obtained as a result of numerical modeling: strength/stress ratio, total strain, displacements, and von Mises stress. Analyzed caverns are located in the Mechelinki salt deposit that is a bedded salt deposit characterized by a simple geological structure. However, there are some differences in the geomechanical performance of each storage cavern. These differences result mainly from an irregular shape of excavated caverns connected with a petrological diversity of the surrounding rocks. The geomechanical performance of each cavern at a designing and final stage was compared. The results of this analysis can be useful in future works connected with the designing and construction of the cavern site.

**Keywords:** geomechanical performance of caverns, stability analysis, designed and real cavern shape, long term analysis