# Some New Aspects in Modelling of Salt Cavern Behaviour and Safety Analysis

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## Introduction

Geotechnical proofs of safety for underground systems in saliniferous formations, such as mines, storage caverns, subsurface dumps or repositories, require material models, which adequately describe the material characteristics of the rock mass corresponding to the respective requirements. The bearing characteristics of these underground systems have been mathematically calculated for the respective bearing structure, by means of these material models, with the help of numerical prognosis models, which have been determined in respect to the location and which conservatively reproduce reality. These bearing characteristics, characterized by states of stresses and deformations, in the course of (future) time, constitutes, as part of the geotechnical structure planning together with corresponding evaluation criteria, the basis for identifying acceptable and unacceptable structure conditions as well as for the derivation of the design parameters (e.g. structure geometry, operating conditions or safety means).

Figure 1 gives a schematic overview of an exemplary saliniferous deposit with a cavern and mining installation.

The saliniferous rock mass consists of rocks with very different material characteristics. A general differentiation is made between viscoplastic-ductile salt rock such as rock salt, sylvinite and the different potassium salts (chloridic salts) with an also pronounced rate-sensitive behavior and rather elastic-brittle salt rocks such as anhydrite, gypsum, marl and limestone or dolomite. Saliferous clays must be allocated to one or the other material characteristic, depending on the types of minerals and solidification. In the text that follows, the term salt rock means the viscoplastic-ductile rocks of the saliniferous formation.

The subsequently text will introduce some newer developments in the field of salt mechanics and their application to salt caverns will be tested by means examples.

These observations are based on the works of *Lux (1984)*, *Serata & Fuenkajorn (1991, 1992)*, *Aubertin et al. (1993, 1996)*, *Chan et al. (1992, 1994)* sowie *Hou (1997)*.

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