Contents

Abstract

Salt caverns are formed either to obtain brine or to create storage voids for liquid or gaseous hydrocarbons. By creating the cavern, however, the stable equilibrium of the rock is disturbed. The inevitable result is convergence, which is caused by the rock endeavouring to regain a state of stable equilibrium. The result of convergence is rock movement and a deformation of the Earth's surface. This deformation is made up of a vertical subsidence as well as a horizontal displacement, and is primarily dependent on the size and development of the cavern convergence as well as on the properties of the overlying rock.

A vast amount of experience exists worldwide, especially from coal mining, about the movement processes above subsurface mined voids. The resulting theories about the propagation of rock movement between voids and the Earth's surface refer to the collapse of roof strata and therefore cannot be directly applied to converging caverns.

Founded on the experience from other mining areas, numerous models based on cavern convergence have been presented for predicting ground movements over cavern fields. The method based on influence functions will be described in detail. An influence function is used to describe the amount of influence exerted at the surface by infinitesimal elements of the extraction area. The theoretical principles are explained for calculating the expected subsidence as well as tilt, flexure and curvature of the subsidence trough over cavern fields. Finally, by referring to an example, the predicted future development of a subsidence trough for a cavern field is estimated.