

A quantitative description of horizontal ground deformations in the Epe cavern field by using “SubCav“ software calculation

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Abstract

This report will outline the analysis of geodetical measurements gathered in the cavern field in Epe, Germany, especially with respect to horizontal ground deformation at the surface.

The convergence of salt caverns is an inevitable consequence of the minor pressure inside the cavern compared to the surrounding rock pressure. The thereof resulting subsidence at the surface can be reliably predicted by using the analytical ground movement model by Sroka & Schober (1982) and goes along with horizontal displacement, which might cause mining damages on a much greater scale than subsidence alone. This was proven e.g. for the German stone coal mining areas, in which 82,6% of all reported mining damages were linked to horizontal ground deformations (Hegemann, 2003).

This figure illustrates the importance to know, predict and handle with horizontal deformations in order to maintain safe and secure cavern operations, especially taking into account possible damages to private houses, pipelines or similar infrastructure.

As a follow-up to the work of Quasnitza conducted in Etzel/Germany (Quasnitza, 1988), this report will present current results, combine the data from levelling (subsidence) and GNSS/GPS (horizontal displacement) and give an outlook of what could be expected in the long term. To achieve that ambitious objective, a software (SubCav) was developed to allow easy calculations by the use of a mathematical-analytical rock model.

Key words: convergence, subsidence, salt caverns, deformation, pipeline integrity