Design Load Cases for Gas Storage Caverns

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Abstract

The demand for gas storage operations with fast pressure change rates and operation modes different to a seasonal storage regime requires a more detailed rock mechanical consideration of thermal induced stresses in the vicinity of the caverns. This means that the change of gas temperatures during operation and the consequences of these temperature changes on the stressing of the salt rock mass must be taken into account.

Within the rock mechanical calculations a loading history, i.e. a pressure versus time dependency, has to be defined. As rock salt has a time dependent material behavior stress redistributions in the rock salt mass take place even under constant internal pressure conditions. Therefore not only the phases with different pressure change rates but also the duration of phases with nearly constant internal pressure have an influence on the resulting state variables.

The paper discusses the possible design load cases for gas storage caverns. It shows that an optimization is possible, when the main goal requirement is for example high withdrawal rates with no restrictions or optimization of the working gas volume.

Keywords: rock mechanics, gas cavern design, numerical analysis, cyclic loading