

Hydrogen Storage in Salt Caverns: Rock Mechanical Design

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Abstract : For several years, natural gas and crude oil have been stored in salt caverns in Germany and also worldwide. The dimensioning concepts have been continuously developed from a rock mechanics point of view. In addition to the possibilities of realizing large numerical calculation models based on real survey data nowadays, especially the consideration of mechanical processes such as damage and healing played a role in the development of adequate material laws. In addition, thermodynamic aspects have had to be considered for some years in the operation of a gas storage cavern since temperature changes have a significant influence on the stress states in the vicinity of a storage cavern. The possibility of thermally induced fracturing processes is also investigated in the context of rock mechanics dimensioning. In recent years, the energy crisis and the finite nature of fossil fuel use have led to increased discussion of the use of salt caverns for hydrogen storage. In this paper, state of the art is presented, the current research work is described, and an outlook is given as to which questions still need to be answered from a rock mechanics point of view in connection with large-scale storage of hydrogen in salt caverns.

Keywords : cavern design, hydrogen, rock salt, thermomechanical coupled calculations

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