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Influence of Different Loading Histories on the Rock Mechanical Behavior of a Gas Cavern at Shallow Depth

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Abstract

During the last years the operation cycles of gas storage caverns have changed significantly. Whereas the traditional way of operating gas caverns was a seasonal cycle with one filling and one withdrawal phase per year, nowadays more cycles at high withdrawal rates are requested by the operators.

From the rock mechanical point of view the new loading histories for the rock mass in the vicinity of the caverns have to be taken into account with respect to the recommendations for minimum and maximum internal pressures as well as for the permissible withdrawal rates.

Besides mechanical stressing the thermal impact of gas temperature changes are important for the cavern layout. Especially for caverns at shallow depth this fact may be significant, because low rock mass temperatures and low initial rock mass stresses enlarge the risk of inducing tensile stresses during gas withdrawal.

The paper outlines the general concept and shows by the way of examples the influence of different loading histories on the state variables in the rock salt mass and the sensitivity of the stressing as a result of the thermal effects.

Keywords: *rock mechanics, gas caverns at shallow depth, thermal impact*