1. Abstract

Since 10 years, the rock mechanical design has taken into account temperature changes in the gas. If gas is withdrawn from a salt cavern, the stored medium and thus also the cavern wall are cooled. Until now, it has been assumed that discrete fractures will occur at the cavern wall when temperature induced tensile stresses appear in the rock salt, which should be avoided from a rock mechanical point of view.

With the research of recent years at the University of Hanover (IUB), this assumption has been revised.

If the pressure difference between the prevailing internal pressure and the main stress components directed perpendicular to internal pressure is larger than app. 2 MPa, then the appearance of so-called infiltrationfractures in the vicinity of the cavern is likely.

A fracture pattern is then created at the cavern wall, as observed at the shaft Gorleben in 1995 due to an unintentional cooling on the shaft wall. The vertical and horizontal fractures with opening widths of 0.5 to 1.0 mm, which occurred due to the temperature difference of 20°C, were not continuous and occurred at a distance of a few meters at the wall.

At the SMRI Fall Conference 2011 in York (UK), intensive discussions were held on the general occurrence of temperature-induced tensile stresses and a resulting fracturing in the salt rock. These discussions led to a SMRI research project in 2013 to investigate thermally induced fracturing at a salt mine in France.

After the IUB is able to numerically consider the complex processes such as changing continuum to the discontinuum, such infiltrationfractures can be calculated and evaluated.

During the withdrawal phase, the main stress components directed vertically to internal pressure show smaller values than the prevailing cavern internal pressure. The effect of this is that the first infiltrationfractures occur before absolute tensile stresses arise as a result of the further cooling of the gas.

The simulation models and calculations will be presented within this paper and the results regarding the development of fractures into the salt rock will be discussed.

Keywords: *rock mechanics, infiltrationfractures, thermodynamics, gas operation*