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Meeting Paper and Poster Presentation

In-Situ Determinations of Geohydraulic Parameters of Natural Salt Rocks for Gas in Loosening Zones Around Drifts (Cavities)

by

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Abstract

Under IN-SITU conditions more reliable values can be obtained in the determination of extremely low permeability values in a solid rock than under laboratory conditions on cores.

The investigations are realized by gas pressure decay tests. Inflatable packers which can be hydraulically placed are used to form the individual intervals of well that are separated from each other. There the single gas pressure tests were made.

The investigations are realized by the modeling of a single gas pressure pressing of a closed interval of well in the rock to be investigated. The gas pressure behavior in this interval of well and in the adjacent ones is observed and recorded. An identification method makes it feasible to determine the geohyraulic parameters permeability and porosity. All parameters to be identified are taken as coefficients of a corresponding two-dimensional, axial-symmetric hydrodynamic model. Here, spatial pressure distribution in the rock is described by a partial differential equation, the pressure change in the intervals of the well is described by integral boundary conditions.

The lower limit of a respectable determinable permeability is about $1*10^{-24}$ m^2.

The presented method was used to determine the permeabilities in the DRZ of a drift made by drilling and blasting technology. The provisional evaluation of the tests shows that here the secondary DRZ of salt rock caused by drilling the holes should not be neglected. The permeabilities found exponentially decrease with increasing distance from the sidewall. From a distance of 0,5 m from the sidewall permeabilities of lower than $2*10^{-24}$ m^2 were determined. The determined porosities amount to about 0,2 %.

Furthermore, the method was applied to determine the permeabilities of the disturbed rock zone of a circular full cutting drift in salt rock. For this, boreholes were drilled into the horizontal sidewalls, the drift top and the drift bottom. The permeabilities found exponentially decrease with increasing distance from the sidewall. Permeability formation varies not only in dependence on the distance from the sidewall but also in dependence on direction. Thus, in case of equal distances from the sidewall higher permeabilities are determined in drift roof and drift bottom than in the horizontal directions. From a distance of 0,75 m from the sidewall in vertical direction and 0,35 m in horizontal direction the permeability is lower than $2*10^{-24}$ m^2. The smallest distances of the interval of the well in which gas pressure was pressed from the sidewall amounted to 0,085 m. There the permeabilty was determined to $8,5*10^{-18}$ m^2.

It could be shown, that the development of the permeability around the two drifts is not so different in relation to the driftgeometrie.

Furthermore, the method was used to determine the permeabilities in the DRZ of a drift made by drilling and blasting technology in an area with an other geomechanical situation. Permeability formation varies marginally in dependence on the distance from the sidewall. Permeabilities between $8*10^{-19}m^2$ and $4.5*10^{-17}$ m^2 were determined. After a cavity was made near the testborehole the permeability changed near this hallow space.