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Abandonment of the caverns at the brine field Stade – Süd (Germany)

Geomechanical concept – geotechnical procedures and the proof of long-term safety by numerical modeling

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Akzo-Nobel operated between 1964 and 2003 a brine production field in the southern part of the Stade salt dome in Lower Saxony, Germany. After finishing the solution mining operations it was decided to close the brine-filled caverns. Because of economical reasons the preferred closure option was to leave the caverns in the brine-filled state after sealing and backfilling of the drillholes. To achieve acceptance for this abandonment concept a safety assessment has been performed by the IfG, which based on a geomechanical modeling concept of the long-term behavior of fluid-filled underground openings. Therefore, relevant processes of the surrounding rock salt, e.g. the creep behavior, the progressive permeation of brine into damaged rock, changed mechanical properties of the cavern contour and varying temperature field around the cavern associated with thermal brine expansion were taken into account. Reproducing the temporal volume evolution during the leaching history as well as recalculation of the performed field tests facilitated the calibration of the model calculations. Forecasting the long-term development of the sealed caverns could be demonstrated that the fundamental demands, as formulated before, could be fulfilled by the suggested abandonment concept.