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Stability Proof of the Asse Salt Mine and Geomechanical Assessment of the Planned Closing Measures

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Abstract

Controlled flooding is a generally accepted abandonment procedure of underground openings in salt formations. The closure of the Asse II salt mine is probably an unique example of flooding a salt mine after operation time of more than 80 years and nearly 40 years of use as R&D facility for the storage of radioactive waste. Because the owner of the Asse mine, the GSF ('Forschungszentrum für Umwelt und Gesundheit'), has no further research requirements the mine is now being prepared for closure according to the regulations of the Federal Mining Law ('Bundesberggesetz'). Due to the long operation period with excavations kept open it has to be recognized that the pillars and stopes in the excavation fields are characterized by creep deformation, strain softening and rupturing.
With regard to long term safety, GSF will take precaution against any burden of man an environment by radionuclides and other toxic elements released from the stored low and intermediate level waste. Furthermore, during the operation phase until the abandonment, the closing measures mustn't cause any risks for the staff in and outside the mine.
Substantial part of the closing measures is a sophisticated flooding concept using saturated brine (protective brine) which excludes dissolution effects in exposed halite and carnallite formations of the mining chambers. Flooding with brine stabilizes the contours of underground openings by the halmostatic pressure of the brine column. On the other hand, brine penetration into dilated and damaged contour zones will significantly impair the rock mechanical stability by increasing the creep rate and reducing the effective pressure. Furthermore, during flooding an additional reduction of the backfill pressure will be expected.

Because the understanding of these complex and coupled processes is a prerequisite for a prognosis of the geomechanical evolution IfG Leipzig performed comprehensive rock mechanical studies including laboratory investigations, in-situ tests and modeling calculations. These investigations based on the specific site conditions with a weakened and damaged load bearing system, which will be affected by brine induced creep acceleration at the end of the operation phase.

Key words: Computer Modeling, Geology, Germany, Instrumentation and Monitoring, Mechanical Integrity, Rock Mechanics, Safety, Salt Dissolvers