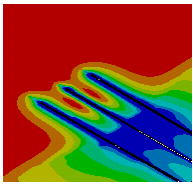


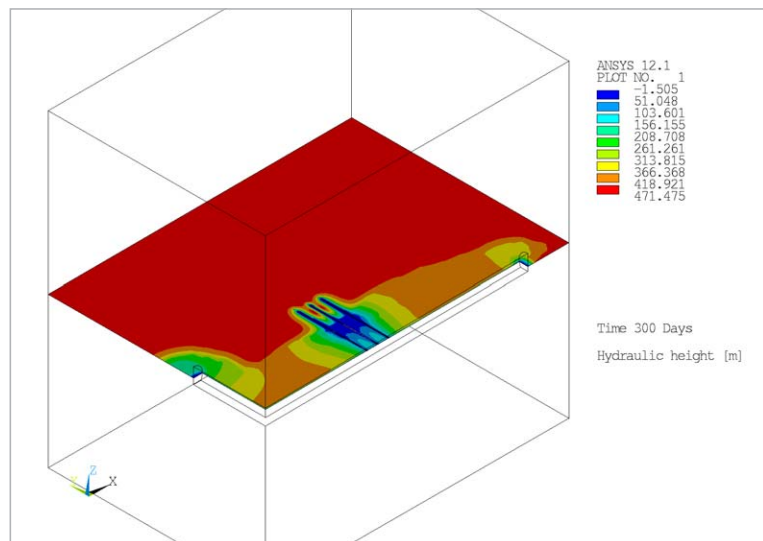
HEATING EXPERIMENTS IN UNDERGROUND LABORATORIES

Calculation of heating experiments in mudstone formations to set up and calibrate a forecasting simulation model.

Optimization Task



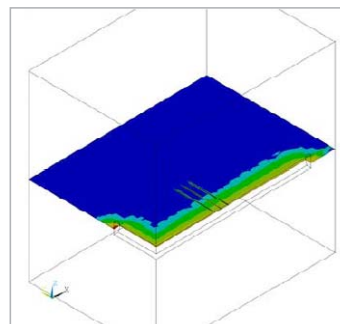
As a part of the investigation of appropriate disposal sites for hazardous waste, heating tests are carried out in underground laboratories for research of thermo-plastic-hydraulic interactions in deep mudstone formations. Therefore, the temporal changes of the temperature distribution, the pore water pressure and the stress state are measured by induction of thermal energy into the formation. In collaboration with Dynardo, DBE TECHNOLOGY GmbH developed a simulation model that can trace these mudstone interactions.



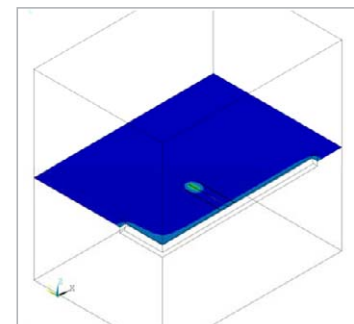
Distribution of pore pressure

Solution Methodology

On the basis of the continuum-mechanical model concept for fractured rock and the Poroelasticity Theory, a thermal-hydraulic-mechanical coupled, three-dimensional finite-element model in ANSYS and multiPlas was developed. The project proved that the interactions within the mudstone caused by the tunnel excavation, by changes in stress conditions and by temperature variations can be calculated with sufficient accuracy and simulation results matched with the measurement results.



Field of temperature



Plastical extension

Customer Benefits

Because of the short calculation time of the simulation model and the use of optiSLang, a sensitivity analysis and parameter identification showed the key parameters, phenomena and interactions in the mudstone. Using the simulation model, it was possible to calculate various other scenarios and the results of the tests in the underground laboratory could be expanded.



Publication by courtesy of DBE TECHNOLOGY GmbH