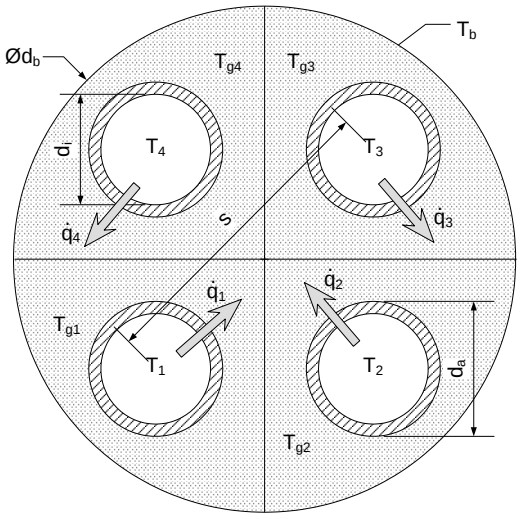
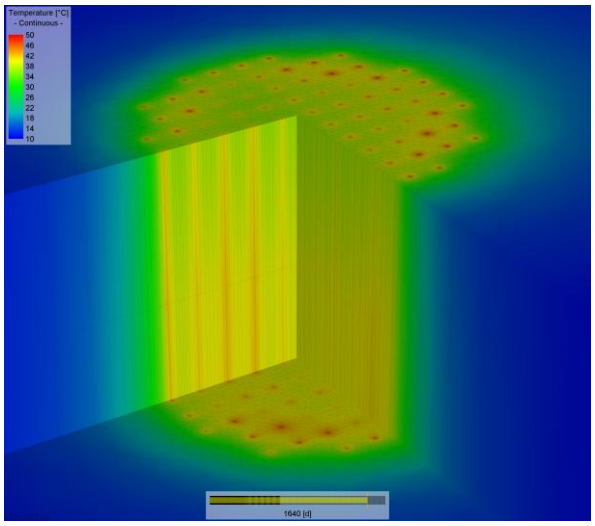
Solar-Assisted Heating Systems With Seasonal Heat Storage (2008-2009)

Location	Crailsheim, Germany
Type of project	Coupling FEFLOW® with the TRNSYS® transient-systems simulation code to simulate a solar-assisted heating system with seasonal heat storage
Client	Joint research project, Germany





Objective Borehole thermal-energy stores (BTES) consist of a (possibly large) number of borehole heat exchangers. BTES can be a reasonable technical and economical alternative to other techniques of seasonal heat storage for solar-assisted district heating systems; however, BTES are also very sensitive to groundwater flow. Permit procedures required by the authorities as well as plant-engineering efficiency call for quantitative simulations to predict the transient three-dimensional temperature distribution in the underground and to assess the thermal efficiency of the store.

Approach Employing the FEFLOW® open programming interface, FEFLOW® was dynamically coupled with the TRNSYS® transient-systems simulation code. A three-dimensional FEFLOW® heat-and-mass-transport model was built to simulate the influence of moving groundwater on a BTES consisting of 80 borehole heat exchangers (BHE) in Crailsheim, Germany. Each BHE was computed in FEFLOW® using a new analytical 1D approach.

Benefit FEFLOW®—TRNSYS® coupling and the new 1D BHE computation in FEFLOW® have made the quantitative simulation of borehole thermal energy stores a feasible task.