Courtesy of

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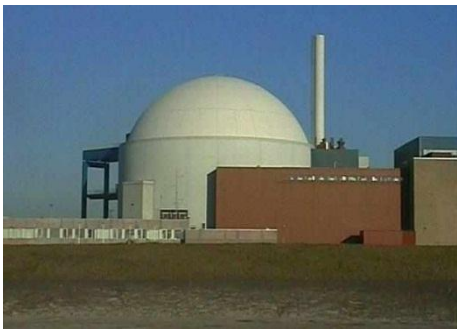
GNB Gesellschaft für Nuklear-Behälter mbH

Save containers for nuclear waste

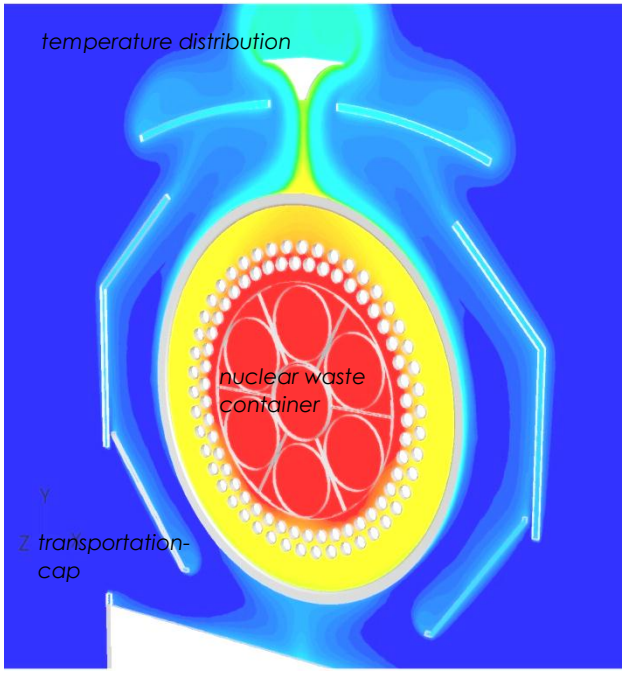


In times of increasing environmental awareness many governments have decided to reduce the contribution of nuclear power to the total primary energy production.

Since then there is a strong demand for containers to transport and store the highly radioactive waste safely. The world market leader GNB develops and manufactures such container taking enormously strict safety rules into account.

One of these rules are mechanical integrity (even in catastrophes), protection against radiation and thermal load. Because of the interaction between the various demands, the development and design of these containers requires a multidisciplinary team of experts in materials, mechanics and fluid dynamics. FlowMotion has been asked to add their expertise in fluid dynamics and heat transfer to the team and to work on the heat transfer of the container to the surroundings.

Heat dissipation is a very important topic for the container. The nuclear waste in the inside still producing a large amount of thermal energy. An insufficient heat dissipation would lead to an strong increase of the container temperature, which could damage the internal structure and therefore could cause leakages or high surface temperatures could endanger the environment. Thus the container is protected by a cap during transportation. Since this cap has a significant influence of the heat dissipation of the container to the surroundings, the different version of the cap have been taken into account in the thermal design of the container.



FlowMotion has simulated the air flow in and outside the cap and the resulting total heat dissipation of the container with the help of CFD (Computational Fluid Dynamics) calculations. In these simulations free convectional flow along all components no approximation by heat transfer coefficients), thermal conduction within the solids and thermal radiation have been calculated.

Aim of the simulations was to determine the accuracy of the simulation with respect to real scale measurements and finally to use the numerical results in the design process of the container and the cap.

In the future the CFD calculation will also help to optimize the entire heat transfer process, to continuously guarantee safety for everybody even for the transportation and storage of nuclear waste with a much larger production of thermal energy.

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