



THE MODELLING OF HEAT TRANSFER PROCESSES IN THE DRY STORAGE SPENT FUEL CONTAINERS USING RELAP5 CODE

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ABSTRACT

Ignalina nuclear power plant uses CASTOR RBMK-1500 and CONSTOR RBMK-1500 containers for spent nuclear fuel interim storage. The container thermal evaluation may be carried out using a variety of numerical simulation codes (such as ALGOR, ANSYS, NEPTUNE). This paper presents the attempt to perform thermal analysis of CASTOR RBMK-1500 and CONSTOR RBMK-1500 containers using thermal hydraulic safety analysis code RELAP5. The RELAP5 code is designed for the thermal hydraulic analysis of the processes in nuclear reactor cooling circuit. Some difficulties arise when the heat removal from the spent fuel storage cask by air is modeled.

The purpose of this paper is to determine whether RELAP5 code is suitable for simulating heat transfer processes in CASTOR RBMK-1500 and CONSTOR RBMK-1500 containers. For a description of a heat exchange inside CASTOR RBMK-1500 container and heat transfer to the environment, special RELAP5 model simulating the container and surrounding environment was developed. Calculations were performed for different parameters of the model and also changing the model itself. The results of calculations were compared with the calculations results of other authors, presented in open literature. It was also attempted to find out the influence of various model parameters to the final simulation results.

Final results showed that due to the RELAP5 specifics this code is not particularly handy with this type of analysis. Finally, RELAP5 code limitations are discussed and recommendations for development of a numerical simulation using RELAP5 code for the heat transfer processes in CASTOR RBMK-1500 and CONSTOR RBMK-1500 containers are provided.

Keywords: container, storage, spent nuclear fuel, numerical simulation, RELAP5 code