

Simulation of a pool type research reactor

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Abstract

The Computational Fluid Dynamic is used to simulate the natural circulation condition after a research reactor shutdown. A Benchmark problem was used to test the viability of usage such code to simulate the reactor model. A model which contains the core, the pool, the reflector tank, the circulation pipes and chimney was simulated [1]. The reactor core contained in the full scale model was represented by a porous media. The parameters of porous media were obtained from a separate CFD analysis of the full core model. Results demonstrate that such studies can be carried out for research and test of reactors design.

After characterizing the reactor core as a porous medium, it was specified a transient type simulation lasting two hours. Below it is shown a picture with the temperature field in time steps $t = 0s$, $t = 60s$ and $t = 2$ hrs. With this simulation it was possible to obtain important information to the problem of similarity in scales and other studies, as the value of the flow velocity in the reactor core. This is an initial study and it is very conservative [2]. For future work, it will be calculated more realistic situations.

References

- [1] ANSTO, "Summary of the Preliminary Safety Analysis Report (PSAR) for the ANSTO Replacement Research Reactor Facility", (2001).
- [2] Oliveira, André Felipe da Silva and Moreira, Maria de Lourdes. Anais da International Nuclear Atlantic Conference - INAC 2011 Belo Horizonte, MG, Brazil, October 24-28, 2011 ASSOCIAÇÃO BRASILEIRA DE ENERGIA NUCLEAR - ABEN ISBN: 978-85-99141-04-5

Results

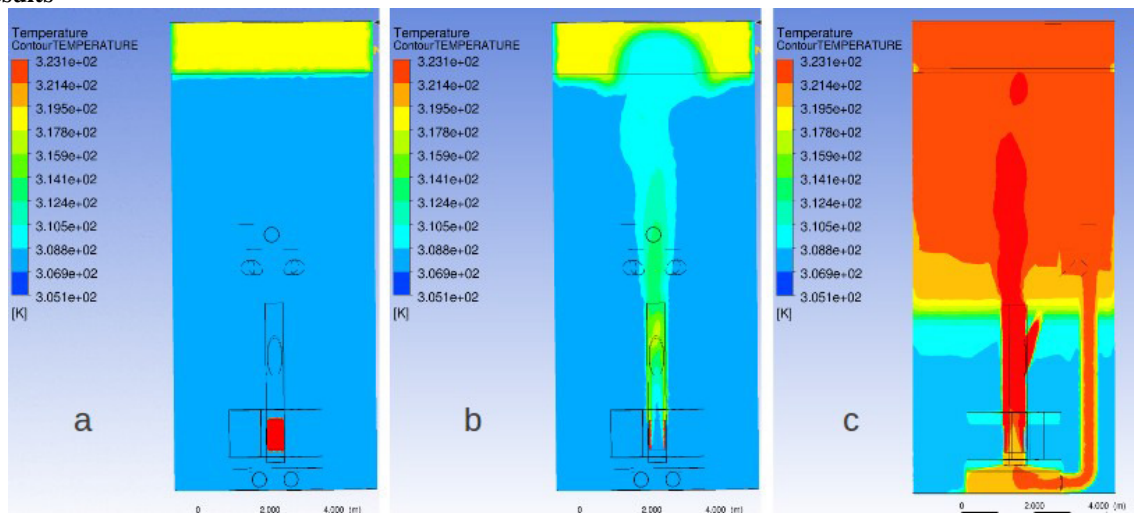


Figure 1. Temperature fields at time steps $t = 0s$ (a), $t = 60s$ (b) and $t = 2h$.