Contribution ID: **460** Type: **POSTER**

Integrated thermal hydraulic analysis of Hot and Cold Pools of a liquid sodium cooled 600 MWe fast reactor

Friday, April 22, 2022 10:30 AM (2 hours)

A comprehensive CFD model of reactor pool of liquid sodium cooled pool type 600 MWe fast reactor design along with immersed reactor components is developed for detailed thermal hydraulic studies. Hot and cold pools along with immersed components represent the primary heat transport system. The two pools are physically separated by inner vessel, which completely envelopes the hot pool. Cold pool along with inner vessel is enveloped by main vessel. Inner vessel is in contact with both hot and cold pools, having widely different temperatures. Apart from this, the complex flow patterns in hot and cold pools introduce circumferential and axial temperature asymmetry on both inner and main vessels. The combination of complex computational domain and flow physics necessitates a detailed three dimensional CFD study. Towards this, a three dimensional CFD model that includes both hot and cold pools along with all major immersed components is developed. Development of a three dimensional model is a challenging task due to the large dimensions, several immersed solid structures and requirement of modelling components with widely different scales. Further inclusion of internal structures like spherical headers, primary piping etc. complicates the task of mesh generation. The model developed for the present study is a 180° sector model to take advantage of inherent computational symmetry. The main focus of this work is on resolving temperature distributions of important structural components, viz., inner vessel, main vessel, primary piping, pump and heat exchanger standpipes, headers etc. during full power operating conditions of reactor. Heat bypass from hot to cold pool through inner vessel is another important quantity estimated from this study. Other important aspects predicted include (i) cross flow velocity patterns in cold pool, (ii) free surface velocity profile in hot pool and (iii) velocity & and temperature distributions at IHX inlet and outlet windows. The results from this study are necessary for thermo-mechanical analysis of reactor assembly components.

Country/Int. organization

India

Speaker's email address

rammaity@igcar.gov.in

Speaker's title

Mr

Affiliation/Organization

Indira Gandhi Centre for Atomic Research

Primary authors: MAITY, Ram Kumar (Indira Gandhi Center for Atomic Research); Mr M., Rajendrakumar (Indira Gandhi Centre for Atomic Research); KUMARESAN, Natesan (Scientific Officer); S., RAGHUPATHY (Indira Gandhi Centre for Atomic Research, Kalpakkam)

Presenter: MAITY, Ram Kumar (Indira Gandhi Center for Atomic Research)

Session Classification: Poster Session

Track Classification: Track 6. Modelling, Simulations, and Digitilization