

Computational Fluid Dynamics Post-Test Verification and Validation Study of the Stratified Flow Separate Effects Test Facility

Background

Accurate modelling and simulation tools for thermal hydraulic calculations are a key element needed to efficiently develop and deploy new advanced reactors systems. Uncertainties in modelling and simulation can have significant safety and economic implications. Among the Next Generation Nuclear Plant (NGNP) designs, the High-Temperature Gas-cooled Reactors (HTGRs) are very attractive

Significance

By understanding and simulating DCC we can advance the research on the HTGR which will save time in contrast to conducting experiments in a lab which stresses time and resources.

BENEFITS OF HTGR



High power conversion efficiency



Potential of providing high-temperature process heat.



Inherent safety features

StarCCM

Using the CAD model from Solidworks, we generate a mesh for the simulation



Vertical Setup

Using the CAD model, we will simulate air-ingress at the outlet of the coolant line



MAR

May

JAN

Apr

Jun

Setup

Setup a CAD model(geometry) to load it into StarCCM



Horizontal Setup

Using the CAD model, we will simulate air-ingress at the outlet of the coolant line



Results

The results that we are observing is the time taken for a sustained presence of air to be detected at the top of the core. The detection threshold of the probe used in the experiment was 10 ppm by volume which translates to $2.27E-7$ kmol of air per cubic meter. Our current result shows that it takes 1325 seconds for air to reach this point in the horizontal configuration.



Rashed Alzaabi

- Setup the Vertical setup in Solidwork
- set up the Vertical configuration in StarCCM
- Running the simulation



Alexander M Fikri

- Setup the Horizontal setup in Solidwork
- set up the Horizontal configuration in StarCCM
- Setting up the Temperature gradient in StarCCM
- Running the simulation



Saqar Alramsi

- Generating mesh in StarCCM
- Running the simulation
- Compare results with Dr.Fishler results