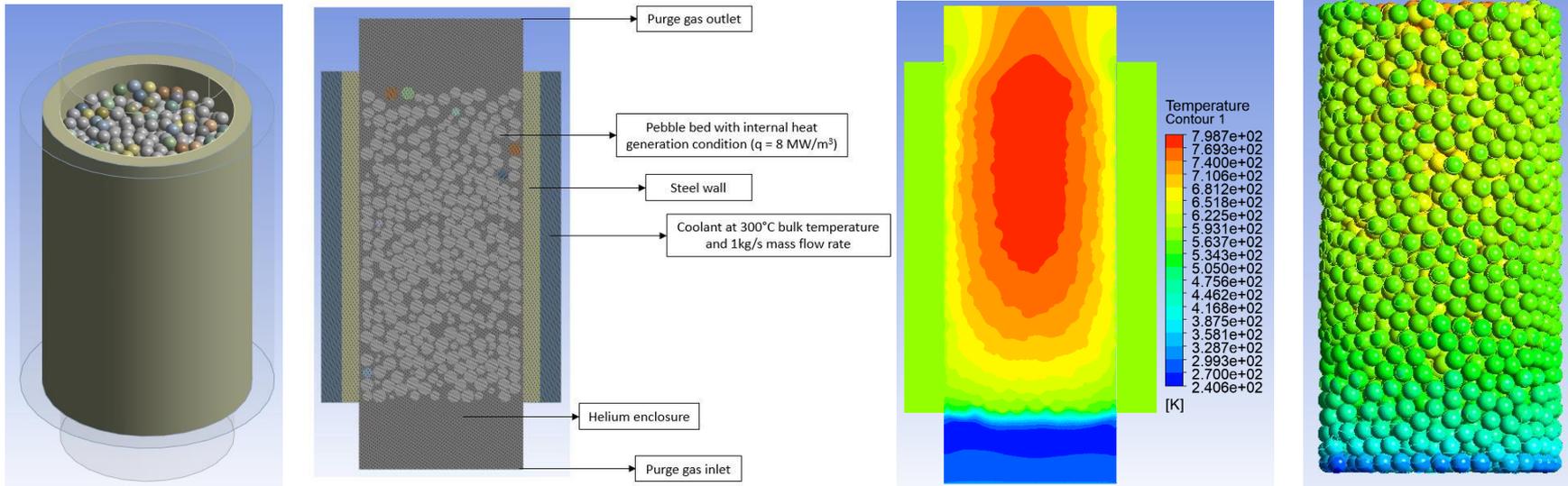


Title: Heat transfer and fluid flow analysis of pebble bed and its verification with artificial neural network

Authors: Chirag Sedani, Paritosh Chaudhuri, Manoj Kumar Gupta

The advancement of sophisticated packed beds has significant implications for the development of new equipment for associated industries. Determining the heat transfer and fluid flow properties of the functional material in the form of a pebble bed is crucial during the design phase of a solid-type ceramic breeding blanket in a fusion reactor. In order to efficiently construct and operate the breeder blanket, the goal of this study is to explore the features of heat transmission and fluid flow. Initially, the heat transfer and fluid flow analyses were carried out independently to benchmark the results using models and experiments using a stainless steel pebble bed with a diameter of 2 mm. Following that, a combined simulation analysis of heat transfer and fluid flow was carried out to demonstrate the system's effective operation for Li_2TiO_3 . A model of an artificial neural network (ANN) has also been employed to forecast the results. The results of simulations are within 5% of the expected values made using ANN.



Pebble bed for heat transfer and fluid flow simulation

Temperature contour of pebble bed with flowing fluid

Source: Nuclear Materials and Energy 35 (2023) 101439

Published Paper Link: <https://doi.org/10.1016/j.nme.2023.101439>