

PACKING SPHERE BEDS TO SIMULATE TRANSIENT SOLID CONDUCTION

by Cecilia van der Merwe



Nicky Russell

→ Cecilia van der Merwe modelled the transient conduction of packed spheres in a pebble bed modular reactor.

Packed beds of spheres constitute an important class of heat exchangers in engineering. In a project conducted in the University of Pretoria's Department of Mechanical and Aeronautical Engineering, new computational modelling technology was developed with which to simulate the transient solid conduction in an ordered one-dimensional array of spheres on pore-scale level in an accurate and effective manner.

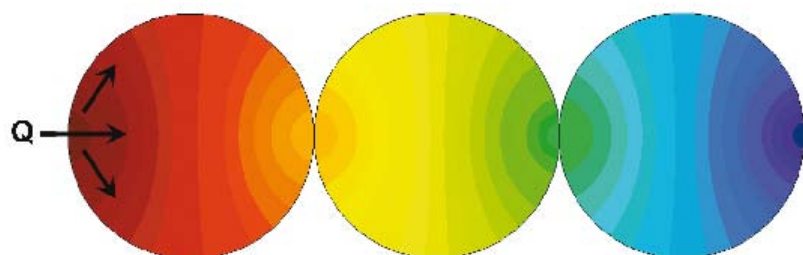
For the purposes of validating the accuracy of the developed modelling technology, a simple yet effective experimental setup was designed and built.

The set-up was composed of a string of three spheres and designed so that the main mode of heat transfer was solid conduction. A comprehensive set of design calculations was performed in order to furnish an effective experiment.

The developed modelling technology was applied to simulate, on pore-scale level, the transient heat conduction of the experimental set-up. It was found to yield results to within an average accuracy of 10% for all time steps considered, thereby successfully validating both temporal and spatial accuracy. The computational cost of the analysis was in the order of seconds, further proving the superb efficiency of the developed model. ⚙

Cecilia van der Merwe is a mechanical and aeronautical engineering graduate of the University of Pretoria. She won the Final Year Student of the Year award in 2005. She currently works for IST Nuclear in Pretoria.

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→ Simulation results of heat being conducted in three packed spheres.