

Experimental investigation into a packed bed thermal storage solution for solar gas turbine systems

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Abstract

High temperature thermal storage in randomly packed beds of ceramic particles is proposed as an effective storage solution for Solar Gas Turbine (SGT) cycles in the near term. Numerical modelling of these systems allows for optimised thermal storage designs, but such models must be validated against experimental data. In this work an experimental test programme was conducted to generate high temperature heat transfer data for a packed bed operating over the temperature ranges 350-900 °C and 600-900 °C. These are representative of two potential SGT cycles. Flue gas from a 45 kW LPG burner was used to heat a packed bed of Denstone ceramic pebbles and the testing procedure involved preheating the system to achieve the desired temperature ranges. The fluid and solid temperature profiles in the packed bed were measured in the axial and radial dimensions and are compared to a numerical model with reasonable agreement. Potential modifications to the test facility are described and future testing plans outlined.