DETAILED MODELLING OF CHARGING BEHAVIOUR OF SMART SOLAR TANKS

Fan, Jianhua; Nielsen, Elsabet Nomonde Noma; Furbo, Simon; Perers, Bengt

Publication date:
2010

Document Version
Publisher’s PDF, also known as Version of record

Link back to DTU Orbit

Citation (APA):
Aim: to validate detailed models for calculation of temperature distribution and thermal stratification in smart solar tanks for solar combsystems during charging

Method: Computational Fluid Dynamics (CFD) modelling, temperature and Particle Image Velocimetry (PIV) measurements.

Why smart solar tank?

The solar tank can be charged either by an electric heating element situated in the tank or by an electric heating element in a side-arm mounted on the side of the tank.

Conclusions:

- A mesh interval size of 0.03 m and 0.006 m is sufficient for CFD modeling of charging behavior of the tank and the side-arm, respectively. The most appropriate time step size is 3 s.
- The CFD model predicts well thermal stratifications in the tank, but gives underestimated temperatures due to incorrect heat loss of the tank which should be further investigated.
- The CFD model predicts successfully the flow pattern in the tank, although the velocity magnitude of the flow is higher than the PIV measurements.

J. Fan*, E. Andersen, S. Furbo and B. Perers,
Department of Civil Engineering, Technical University of Denmark, E-mail: jif@byg.dtu.dk.