A compressed hydrogen gas storage system with an integrated phase change material

A dynamic fueling model is built to simulate the fueling process of a hydrogen tank with an integrated passive cooling system. The study investigates the possibility of absorbing a part of the heat of compression in the high latent-heat material during melting, with the aim of keeping the walls below the critical temperature of 85 °C, while filling the hydrogen at ambient temperature. Results show that a 10-mm-thick layer of paraffin wax can absorb enough heat to reduce the adiabatic temperature by 20 K when compared to a standard Type IV tank. The heat transfer from the gas to the phase change material, mainly occurs after the fueling is completed, resulting in a higher hydrogen peak temperature inside the tank and a lower fuelled mass than a gas-cooled system. Such a mass reduction accounts for 12% with respect to the case of a standard tank system fuelled at -40 °C.

General information
State: Published
Organisations: Department of Mechanical Engineering, Thermal Energy, Aarhus University
Contributors: Mazzucco, A., Rothuizen, E. D., Jørgensen, J. E., Jensen, T. R., Rokni, M.
Number of pages: 4
Publication date: 2015

Host publication information
Title of host publication: Proceedings of The 10th International Green Energy Conference
Article number: IGEC-2015-1458
Keywords: Phase change material, Hydrogen storage, Hydrogen fueling, Dynamic model, Heat transfer
Electronic versions:
A_COMPRESSED_HYDROGEN_GAS_STORAGE_SYSTEM_WITH_AN_INTEGRATED_PHASE_CHANGE_MATERIAL..pdf
Research output: Research - peer-review › Article in proceedings – Annual report year: 2015