

CFD modelling of the entire fuelling process at a hydrogen refuelling station

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ABSTRACT

Inherently safer refuelling protocols that account for heat and mass transfer in all components of fuelling line from high-pressure storage at hydrogen refuelling station through piping, pressure control valve, pre-cooler to onboard storage are of paramount importance for the deployment of hydrogen transport and infrastructure. This study aims at the development of a CFD model to simulate the hydrogen fuelling for the entire line which is currently not available. It is expected that the model will be ultimately able to simulate the fuelling of compressed gaseous hydrogen for arbitrary parameters and establish the numerical standard for the development of fuelling protocols. The CFD model is shown capable of accurately predicting hydrogen temperature and pressure through the entire hydrogen refuelling station line from the station's high-pressure tanks to onboard storage tanks. The CFD simulations accurately reproduced experimental data by Kuroki et al. (2021).