

Theoretical analysis of pipe flow during liquid hydrogen bunkering

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Introduction and background:

The maritime industry accounts for 2-3% of annual carbon dioxide emissions and a change to more carbon neutral fuels is required. One of the fuels considered is liquid hydrogen. The Norwegian Directorate for Civil Protection (FFI) did a series of tests on outdoor- and indoor liquid hydrogen release. The measured pressure and temperature data has been used in this work.

Problem description and objective:

This report aims to evaluate current technology for bunkering liquid hydrogen and to analyze experiments conducted by FFI to further understand the mechanics of pressure, temperature, and mass flow in a bunkering system. To investigate the pressure loss in a bunkering system, a standard pressure loss calculation will be performed and compared to experimental data. A Helmholtz EOS solver will be used to determine the thermodynamic states, provide parameters and to investigate the phase of hydrogen through a bunkering system. Furthermore, the mass flow in a pipe system with liquid hydrogen is analysed using measured data and a nozzle model.



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