

Application of a Real Gas Model by Van-der-Waals for a Hydrogen Tank Filling Process

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Hydrogen fuel tanks operate at high system pressure levels. In these regions effects occur, which cannot be handled by an ideal gas model. One of these is the Joule-Thomson effect. It describes an adiabatic throttling without change in enthalpy, but a change in temperature. The tank filling process can be simplified to a throttling valve, so the effect is of interest. In this investigation the van der Waals equations are implemented in a real gas model for the *Hydrogen Library* and the *Pneumatic Systems Library (PSL)* by Dassault Systèmes and the model is applied to a hydrogen tank filling process. Performance and accuracy are compared to the CoolProp fluid properties library, which is imported with the ExternalMedia library.

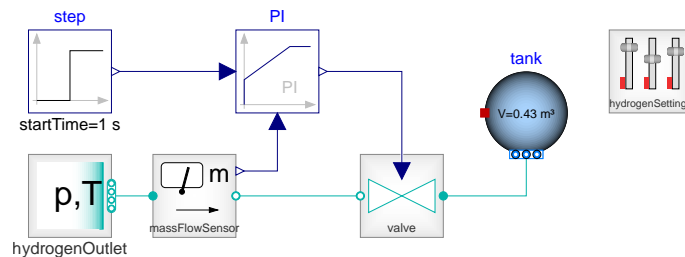


Figure 1. Dymola model to simulate a tank filling process for hydrogen.

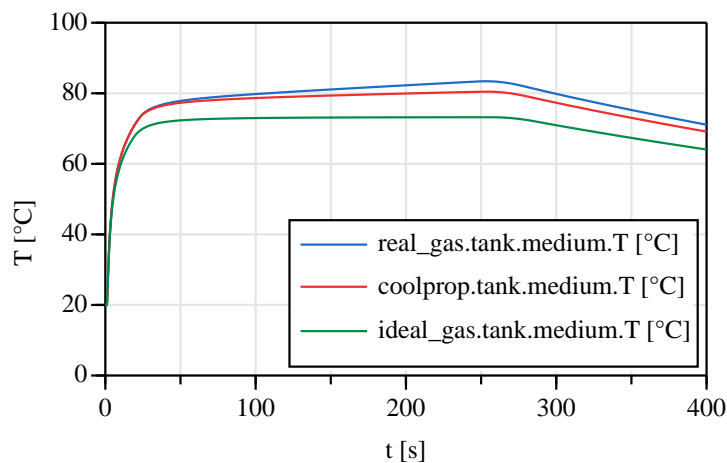


Figure 2. Results of the tank filling process simulation.