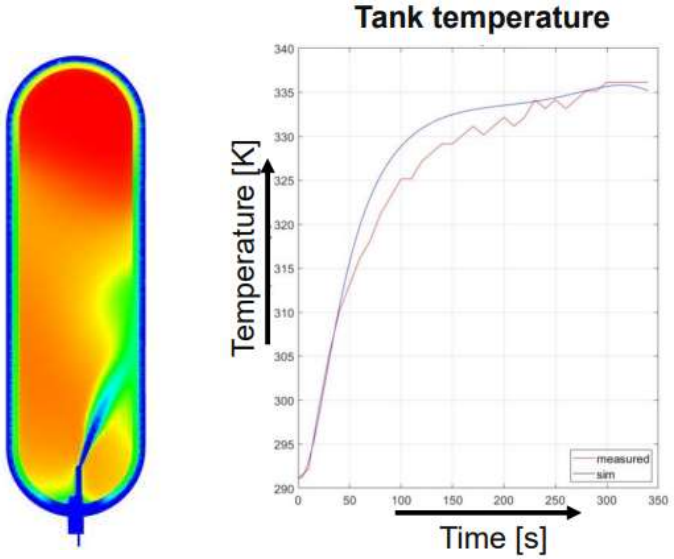
# Machine Learning Methods for Predicting the Hydrogen Temperature During Tank Filling

## Description

To facilitate the use of hydrogen in the mobility sector, faster filling times are essential. However, faster filling rates lead to higher temperatures. Local temperatures above 85 °C can lead to loss of structural integrity of the pressure vessel, and thus pose a significant safety hazard.

The magnitude and spatial distribution of the temperature over the course of the filling process depend on various geometric, operating and environmental parameters. Currently semi-empirical models, consisting of thermodynamic correlations and experimental fitting coefficients, are used. While the computational time itself is not an issue, the model preparation and fitting the empirical coefficients for newer tanks is time-consuming. Machine learning (ML) methods could aid in faster predictions of the temperature evolution based on characteristic geometric and operating conditions.

The thesis aims to (1) research and select suitable ML methods, (2) train the model based on existing experimental and simulation data, and (3) demonstrate the model accuracy via comparison with the validation data set.




Sources: Klopcic et al., Advancing Hydrogen Storage Technologies and Infrastructures, PhD Thesis, TU Graz, 2024.

## Work Packages

- Literature research on existing ML methods (1 month)
- Definition of data features and generation of training data for ML with the existing semi-empirical simulation model (1,5 month)
- Implementation of ML model and demonstration of model accuracy with validation set (2,5 months)
- Written thesis (1 months)

- **Start**: immediately
- **Duration**: approx. 6 months
- **Paid Master Thesis**
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