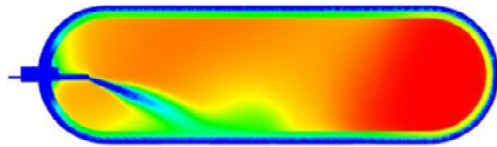
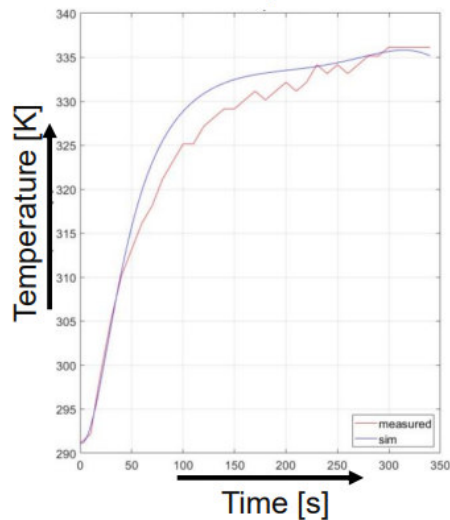


Development and Evaluation of Concepts for Mitigating Hot Spots in High-Pressure Hydrogen Storage Tanks

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Tank temperature



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, leading to the presence of local hot spots. Currently there are no standardized methods for assessment of the temperature distribution.

The aim of this thesis is to investigate and develop possible concepts (i.e. 3D-printed geometries to introduce swirl) for achieving uniform temperature distribution during the tank filling process.

Tasks:

- Literature research on the temperature and flow behaviour in high-pressure hydrogen storage tanks (1 month)
- Conceptualization of swirl-generating geometries (0.5 months)
- 3D CFD simulations to evaluate the impact on temperature distribution (2.5 months)
- Proof-of-concept incl. 3D-printing and experimental test (1 month)
- Documentation and written preparation of the Master's thesis (1 month)

Start: as of now

Duration: ca. 6 months

Compensation: paid master thesis

Contact:

DI Dr.techn. Nejc Klopčič
 +43 (316) 873-9492, klopccic@hycenta.at
 DI Dr. techn. Alexander Trattner
 +43 (316) 873-9502, trattner@hycenta.at

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