

Bachelor's Thesis, Term Project, Master's Thesis

Cryogenic Testing of Pressure Vessels for Aerospace Applications

In the pursuit of advanced space vehicles that are cost-effective and possess enhanced payload capability, the emergence of lightweight cryogenic propellant tanks has become a prominent trend. These innovative linerless composite tanks offer weight reductions ranging from 20% to 40%, playing a crucial role in the exploration of affordable, high-capacity, and recoverable space vehicles. To successfully fabricate and design these storage vessels, it is essential to adequately address the mechanical properties under cryogenic conditions.

This research aims to investigate the behavior of carbon fiber composite materials under cryogenic conditions. The study begins with a literature review to gain insights into the current state-of-the-art testing methods and equipment. It involves a comprehensive examination of all aspects related to conducting tests, including strain measurement equipment, the impact of cryogenic temperatures on the grips, proper handling of nitrogen throughout the testing process, and essential safety considerations for all personnel involved.



Figure: Pressure Vessel <https://www.compositesworld.com/news/boeing-all-composite-cryogenic-fuel-tank-proves-technology-readiness>

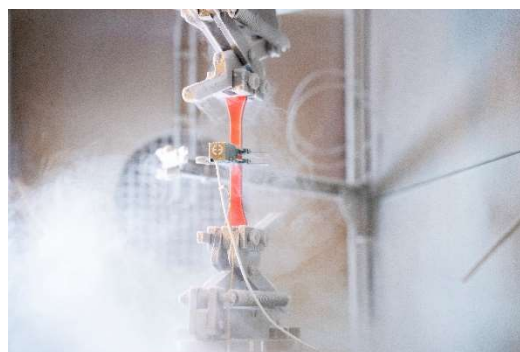


Figure: Cryogenic Test <https://www.ifam.fraunhofer.de/en/technologies/cryogenic-testing-machine.html>

Research focus of the thesis

- Literature research on the characterization of materials under cryogenic conditions
- Identify different strain measurement systems and clamping for cryogenic application
- Address all safety considerations required for performing cryogenic testing

Requirements

- Basic knowledge of fibre composites (Optional)
- Interest in Material Characterization
- Structured and independent work ethic
- Language: English

Starting date: Now

For more details please contact:

Gabriel Eduardo Rojas Valenzuela, Room 5504.01.434, MW, Tel. +49 89 / 289 – 16592, gabriel.rojas@tum.de