

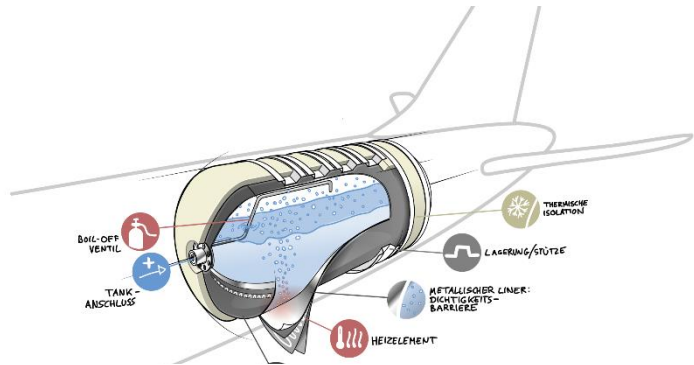
Acoustic data and power transmission through metallic structures

Project description:

Hydrogen as an energy carrier is becoming increasingly important for future-oriented energy supply and transportation. In the near future, the operation of commercial aircrafts with hydrogen is planned. In safety-critical applications such as this, a classic design of pressure vessels for the hydrogen is a double-walled structure with a metallic outer wall. If sensors are to be integrated into the intermediate layer of the pressure vessel, the challenge of power supply and data transmission between the sensor and the outer periphery arises. A cable connection cannot be realized for reasons of tightness, and electromagnetic radiation is shielded by the closed vessel.

One possibility for energy and data transmission, however, is the use of acoustic signals. For this purpose, piezoceramics are attached to the inside and outside of the metal container. If the ceramics vibrate at their resonance frequency, a change in the impedance of the ceramic on the inside can be used to generate a voltage change on the outer ceramic. This results in different voltage levels with which data transmission can be performed.

The aim of this work is to create an experimental setup with which acoustic energy and data transmission through a metallic wall can be achieved.



Source: <https://leichtbau.dlr.de/immer-schon-kuhl-bleiben-herausforderungen-fur-die-strukturauslegung-von-wasserstofftanks>

Scope of work:

- Investigations into acoustic energy transfer. This includes the construction and optimization of an experimental setup. In addition, the limits of energy transfer are to be tested within the scope of the available resources.
- Design of a concept for acoustic data transmission. The design will then be integrated into the experimental setup for energy transmission.
- Final validation of the entire experimental setup. Here, a microcontroller and a sensor are to be supplied with energy through a metal wall and the sensor data transmitted.

Prior knowledge:

- Basic knowledge of electric circuit design
- Basic knowledge of acoustics is advantageous, but not necessary

Target group:

MSc. ET/IT Masterprojekt MSc. SE Masterprojekt

Orientation:

Praxis Hardware

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