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Thermodynamics of a Cryogenic Liquid Hydrogen (LH2) system for Refueling an Airplane, and Use for other Mobile or Stationary Applications

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ABSTRACT

Liquid hydrogen (LH2) is used for energy supply for various stationary and mobile applications. Current political and economic developments show the need of storable, decentralized produced, green energy to ensure supply of fuel, heat and power for an adequate price.
Hydrogen can be part of the solution for those global problems. Especially LH2 is promising as fuel for mobile applications. It is advantageous because of the high energy density, and therefore is used for space applications since decades. Currently, there are many activities, to transfer the LH2 technology to other applications, e.g. aerospace and trucks.
DLR works on that research topic within various projects together with stakeholder from research institutes, industry, and even SMEs and startups are interested to get their products ready for the operation with hydrogen.
The use of LH2 is challenging for different reasons, e.g. security, green and cheap production, storage and transport, and the handling of a cryogenic media. Thus, thermodynamic issues have to be considered for the development and operation of a LH2 system. A deep understanding of thermodynamic is essential for a proper operation.
In this paper the thermodynamics of such an LH2 system will be presented, by analyzing an example of a LH2 refueling station for an airplane, which will be erected an operated at DLR site in Oberpfaffenhofen (Germany), within the EnBiH228 project.

KEY WORDS: Liquid hydrogen (LH2); Cryogenics, Refueling of Mobile Applications; Stationary Refueling System; Green, Secure and Affordable Energy Supply; Aerospace; Trucks; …

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