

Developments in liquid hydrogen on-board systems and ground-based infrastructures for sustainable aviation

Wednesday 24 July 2024 12:30 (15 minutes)

To reduce the environmental impact of aviation, liquid hydrogen has been identified as promising future aircraft fuel. The liquid hydrogen can be used directly in the combustion turbine engine or in a fuel cell in combination with an electric motor. While the first option still produces nitrogen oxides, the second option has the potential of zero-emission.

Many initiatives are ongoing to investigate the use of hydrogen as energy source for aviation. In the Netherlands, Cryoworld plays a significant role in these LH2-aviation projects as liquid hydrogen knowledge partner. Cryoworld is involved in developing and manufacturing the on-board liquid hydrogen storage tanks and distribution systems required, as well as the ground-based cryogenic infrastructure.

This paper introduces the general requirements for on-board storage and distribution of LH2. It discusses and compares in more detail the principle cryogenic system designs, the mechanical design of the storage tank and relevant safety aspects. Furthermore, the design of the ground-based infrastructure will be described. The paper ends with a summary of design considerations for liquid hydrogen aircraft tanks and components, and the challenges in general for on-board cryogenic systems.

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Session Classification: Wed-Or8

Track Classification: Tracks ICEC 29 Geneva 2024: ICEC 05: Cryogenic applications: aerospace