

LH₂-WAM Tank

Development of a WAM-manufactured lightweight aluminium tank for liquid hydrogen (LH₂) with maximum gravimetric storage density for aviation

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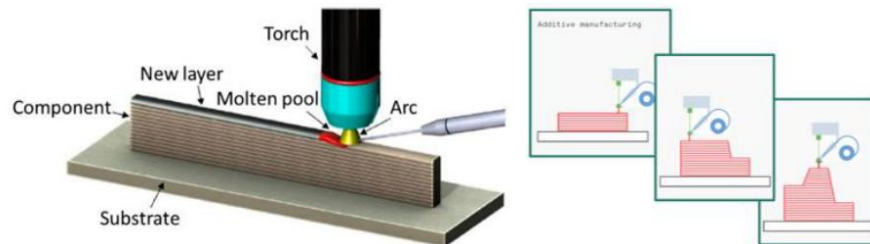
Brief description of the consortium partners

- Leichtmetallkompetenzzentrum Ranshofen GmbH
- Peak Technology GmbH
- Test-Fuchs GmbH
- Test-Fuchs Aerospace Systems GmbH
- Dr. Ryll Lab GmbH



Aim of the project / Background of the project

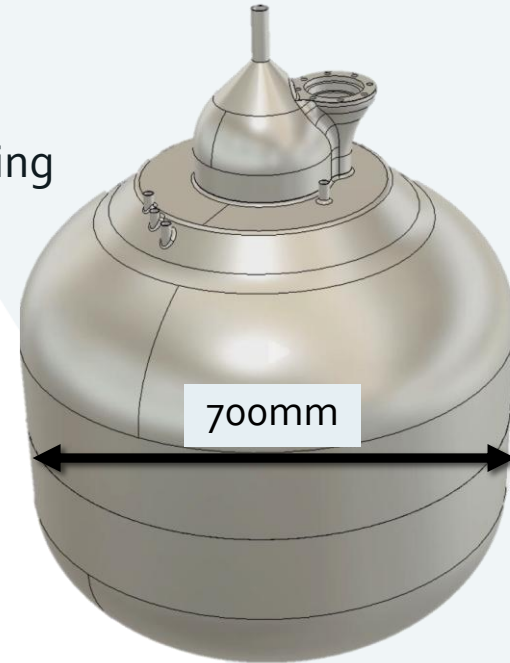
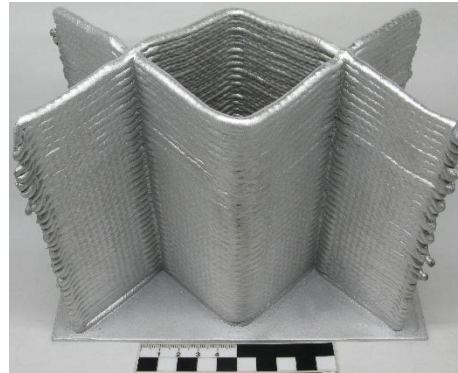
- Realisation of a WAM-manufactured double-walled LH₂ tank made of aluminium
 - Lightweight construction – local reinforcements against denting
 - Functional integration – minimisation of boil-off losses
 - Gravimetric energy density 7.76 kWh/kg



<https://hackaday.com/wp-content/uploads/2018/09/beam-isogrid-nozzel.jpg>; 24.02.2022

Project results (1/3)

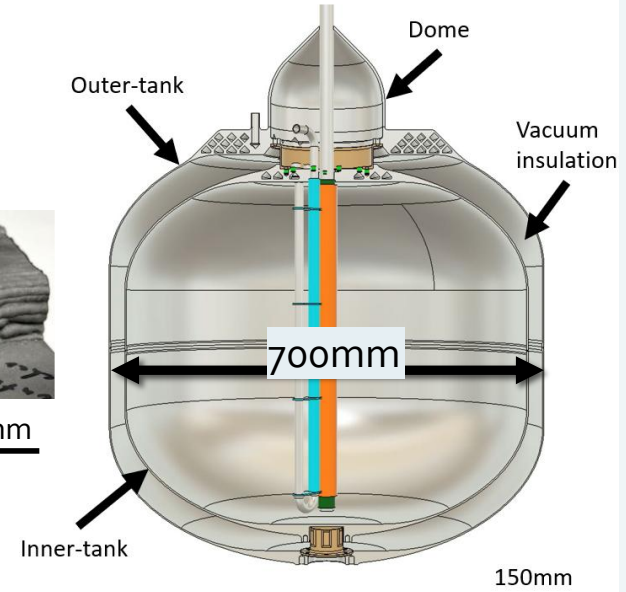
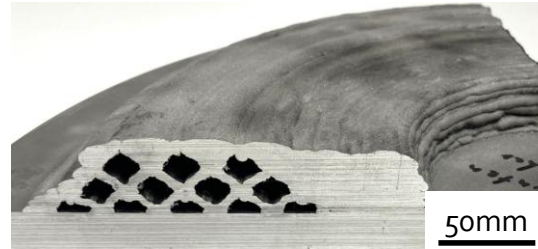
- ☑ Lightweight construction – local reinforcements against denting
- Vessel design specific for WAM with aluminium
- Mechanical simulation optimized geometry
- Enabling WAM process
- No reinforcements required



Project results (2/3)

☑ Functional integration – minimisation of boil-off losses

- Double walled design for vacuum insulation
- Glass fibre connectors
- Heat exchanger channels



Project results (3/3)

- ☑ Gravimetric energy density 7.76 kWh/kg
- Max 10 bar pressure to store 10.64kg LH₂ (~150l)
- System mass (including LH₂) 50kg ±5kg
- Gravimetric storage density of 6.38 – 7.8 kWh/kg



Utilization of the project

- Liquid H₂ storage solutions for regional, intra-European aviation
- 1 peer-reviewed publication in scientific journals
- 2nd place at Upper Austrian State Prize for Innovation



Introducing Airbus ZEROe

Turboprop		 <100 Passengers	 1,000+nm Range
		 Hydrogen Hybrid Turboprop Engines (x 2)	 Liquid Hydrogen Storage & Distribution System
Blended-Wing Body		 <200 Passengers	 2,000+nm Range
Turbofan		 Hydrogen Hybrid Turbofan Engines (x 2)	 Liquid Hydrogen Storage & Distribution System

AIRBUS

Quelle: <https://www.drivingeco.com/de/aviones-comerciales-cero-emisiones-airbus-2035/airbus-zeroe-concepts-description/>

Further steps/(potential) follow-up projects

- Successor project: LH₂-LIWA
 - High strength aluminium alloys for improved lightweight potential
 - Investigation of aluminium – stainless steel mixed joints
 - Development of Al-based cryogenic valves
- Utilizing and developing knowledge on vessel manufacturing in European projects
MASt₃RBoost, DISCO₂₀₃₀, Alrigh_{2t} (Horizon Europe)

Project video



Projektnummer: 890754



Acknowledgements

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Further thanks go to industry partners PEAK Technology, Ryll-Lab, and Testfuchs for their valuable collaboration.

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