



**Making an impact
on the clean
energy transition**

TRANSPORT

SCALING UP LIQUID HYDROGEN ORGANIC CARRIERS FOR DECARBONISATION



Simpler transport

Hydrogen is a volatile and low-density gas. When not generated on-site, producers must transport it to customers in high-pressure equipment – an inefficient and expensive task. Liquid hydrogen organic carriers (LHOC), which trap hydrogen in a liquid chemical, could allow the use of standard oil tankers and infrastructure to deliver the gas.

An experimental system to store and release hydrogen from LHOC is being scaled up in HySTOC, with FCH JU support. The system, which uses a purification unit developed by HyGEAR in the project, stores hydrogen from a 300-bar pipeline in dibenzyltoluene and releases it in a hydrogen refuelling station at 30 bars. With a 'StorageBox' installed at a hydrogen-generation plant in Woikoski and a 'ReleaseBox' at the VTT research centre, both in Finland, the system has successfully produced its first kilogrammes of hydrogen-saturated carrier. HySTOC is now ready to test hydrogen transport and release.

Cost and energy savings

Dibenzyltoluene is not classified as a dangerous compound, is barely flammable and can store up to five times as much hydrogen as standard high-pressure technology. Its use could cut hydrogen transport costs by up to 80 %. A life-cycle assessment and economic comparison with other carriers have shown promising results. To make further savings, HySTOC is investigating the viability of other carriers from the same chemical family that are less energy-intensive, while another FCH JU project, SHERLOHCK, is looking into catalysts that could speed up hydrogen release.

The use of hydrogen as an energy vector must become widespread if Europe is to meet its climate targets. The FCH JU project HySTOC is scaling up a system to transport hydrogen in liquid chemicals as a safe and cost-effective way for producers to supply demand.



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FCH JU Success Stories





DISTRIBUTION SOLUTION

With the right technology, LHOC could be a safe, cost-effective way for hydrogen distribution to decarbonise major industries.

SIMPLER DECARBONISATION

SME, industry and scientific partners from three European countries are developing a LHOC-based system to distribute hydrogen cost-effectively, easily and safely. **The goal?** Manufacturing, materials production, maritime transport and many other sectors could all decarbonise more easily with better access to hydrogen. **Key results?** Proof of a commercial-scale blending and release system as a step towards a viable hydrogen refuelling network.

KEY ACHIEVEMENTS

5 TIMES HIGHER TRANSPORT CAPACITY

compared to 200-bar tube trailers

3 TIMES HIGHER TRANSPORT CAPACITY

compared to 500-bar tube trailers

EUR 85/kg

cost of project system – over four times lower than the target cost

80 %

reduction in operating costs

1 300 kg

capacity of the hydrogen transport trailer

99.95 %

hydrogen purity

6.23 %

gravimetric capacity

750 TIMES

carrier cycling capacity

IMPACT

DATA AVAILABLE FOR BUSINESSES AND POLICY

from a preliminary life-cycle assessment

LOWER TRANSPORT COSTS AND IMPACT

thanks to higher capacity

LOWER INVESTMENT COSTS

from option to use standard oil-tank infrastructure

EASIER TRANSPORT

as handling of hydrogen possible under ambient conditions

GREATLY REDUCED RISK

since hydrogen is bound to a carrier rather than free gas

HIGHLY USEFUL HYDROGEN

thanks to high purity of the released gas

INCREASED ACCESS TO RENEWABLE ENERGY

stored in the hydrogen carrier

DECARBONISATION GAME CHANGER

for industry and transport

CAN ENHANCE PUBLIC ACCEPTANCE

of hydrogen mobility



www.fch.europa.eu/page/fch-ju-projects
<https://www.hystoc.eu/>



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 JOINT UNDERTAKING**

A partnership dedicated to clean energy and transport in Europe