

Hydrogenious^{LOHC}



Carrying the
new energy world.
Hydrogen handling
as an oil.

We are a market-leading cleantech pioneer in hydrogen storage and transportation.

Based on its proven Liquid Organic Hydrogen Carrier technology with benzyl toluene as carrier medium (short: LOHC-BT), Hydrogenious LOHC allows for superior, flexible hydrogen supply to consumers in industry and mobility across the globe, utilizing conventional liquid-fuel infrastructure.

We connect hydrogen producers and consumers in a cost-efficient way, independent of location and complexity of routes. Founded in 2013, our portfolio today includes stationary and mobile (on-board) LOHC-based applications.

Hydrogenious^{LOHC}

Hydrogenious LOHC Technologies, headquartered in Erlangen/Germany, offers – within an EPC partnership with Bilfinger – (de-) hydrogenation turnkey plants, Operation & Maintenance and LOHC logistics services – ensuring safe, easy and efficient hydrogen storage, transport and distribution. With **Hydrogenious LOHC NRW** and **LOHC Industrial Solutions NRW**, we have established subsidiaries in Western Germany/North Rhine-Westphalia, which take care of the development, construction and operation of regional LOHC projects and plants.

Hydrogenious LOHC Emirates, based in the United Arab Emirates and a joint venture with Emirates Specialized Contracting & Oilfield Services (ESCO), acts as the regional spearhead in the Middle East since the end of 2021.

Dr Daniel Teichmann (CEO)
founded Hydrogenious as a spin-off
of the Friedrich-Alexander-University
Erlangen-Nuremberg in 2013.

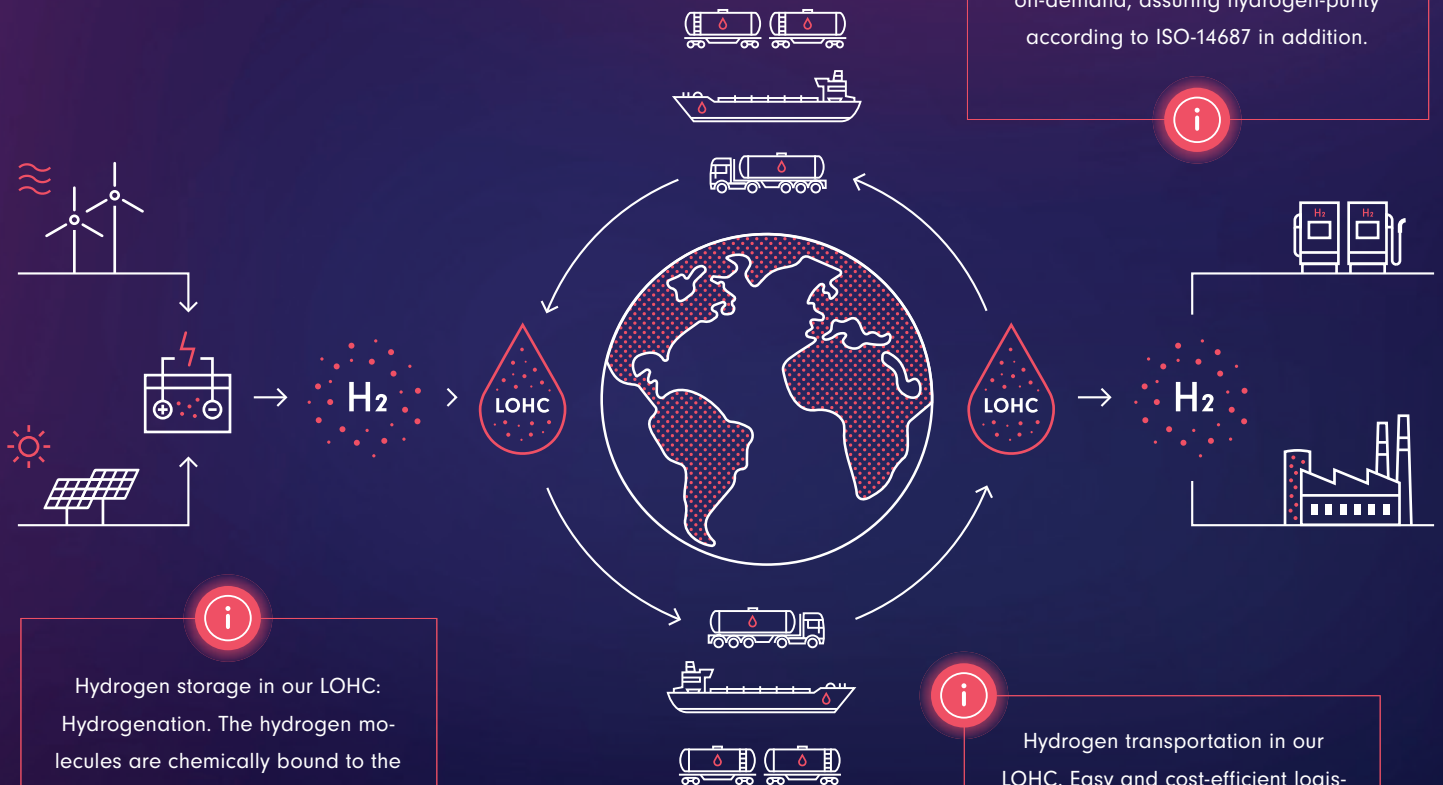


Hydrogenious^{LOHC} Maritime

Hydrogenious LOHC Maritime, established in 2021 jointly with Østensjø Group and located in Norway, develops an emission-free onboard propulsion system with a promising LOHC/fuel cell solution for the global shipping industry.

With its around 200 staff members and investors AP Ventures, Royal Vopak, Winkelmann Group, Mitsubishi Corporation, Covestro, JERA Americas, Temasek, Hyundai Motor Company, Chevron Technology Ventures and Pavilion Capital, Hydrogenious LOHC is a major enabler and accelerator for the energy transition.

We store hydrogen in a liquid organic carrier. The missing link to clean hydrogen supply chains.



Hydrogen storage in our LOHC: Hydrogenation. The hydrogen molecules are chemically bound to the LOHC via a catalytic reaction in a continuous process. The hydrogenation is an exothermic process generating approx. 10 kWh_{th}/kgH₂ heat at approx. 250 °C.



Hydrogen release from our LOHC: Dehydrogenation. The hydrogen molecules are chemically released from the LOHC via a catalytic reaction in a continuous process. The dehydrogenation is an endothermic process that requires approx. 11 kWh_{th}/kgH₂ heat at approx. 300 °C. The hydrogen can be released on-demand, assuring hydrogen-purity according to ISO-14687 in addition.



Hydrogen transportation in our LOHC. Easy and cost-efficient logistics utilizing the existing infrastructure for fossil fuels via ship, barge, train or truck. The same applies to LOHC stocking facilities.

Our LOHC-BT technology is disrupting hydrogen infrastructure.

Superior safety



- > Hardly flammable with flash point 130 °C, non-explosive, even when loaded with hydrogen
- > Handling at ambient temperatures and pressure during storage and transport
- > No self-discharge over time – multi-month storage without losses
- > Hazard potential even smaller than for diesel and thus clearly superior to ammonia

High efficiency and flexibility



- > Conventional liquid fuel infrastructure usable
- > Competitive volumetric storage density 54 kg hydrogen per m³ LOHC
- > Carrier material commercially available and reusable hundreds of times
- > Fuel cell grade hydrogen purity according to ISO 14687 by using off-the-shelf purification technology

We provide stationary LOHC applications, optimized for scalability.



Storage

- > Flexible industrial hydrogenation unit to match with renewables
- > Designed for direct coupling with SMR
- > Designed for direct coupling with large-scale electrolysis
- > To be combined with underground stocking facilities

Plant design	Skid-based
Hydrogenation process	Exothermic reaction using a solid catalyst
Heat release	Approx. 10 kWh _{th} /kg H ₂ at 200 – 250 °C
Elevated reaction pressure	Approx. 15 – 30 barg

Release

- > Designed for continuous and flexible operation
- > Designed for coupling with hydrogen hubs and pipeline networks
- > To be combined with underground stocking facilities

Plant design	Skid-based
Dehydrogenation process	Endothermic reaction using a solid catalyst
Heat demand	Approx. 11 kWh _{th} /kg H ₂ at 250 – 300 °C
Released hydrogen purity	More than 99,9 % Fuel cell hydrogen quality (ISO-14687) with additional purification step
Elevated reaction pressure	Approx. 2 – 3 barg

Together with our strong **EPC partners** such as Bilfinger in Europe, we go beyond technology development and offer comprehensive services for building up turnkey, large-scale LOHC plant infrastructure.

As pioneer in the field of LOHC with a track record of various systems in operation, we provide **O & M Services**, taking care of the initial commissioning, physical and software maintenance plus all other on-site service activities like turnarounds or calibrations. Our plants are designed for round-the-clock operation and can be fully controlled remotely via a dedicated web-interface.

We accelerate green hydrogen supply ramp-up within Europe.



Northern Green Crane with link to Get H2

We are establishing a LOHC-BT based supply chain for green hydrogen from Sweden to Central Europe together with Royal Vopak, one of the world's leading companies in the provision of infrastructure for the chemical and energy industries. Sweden is notable for its great potential in renewable energies, for example in the form of hydropower and wind power. Thanks to an excellent industrial infrastructure and experienced local partners, up to 8,000 tons of green hydrogen per year will be available for the project. We are currently exploring suitable harbour area sites at the Baltic Sea in North Sweden for a hydrogenation plant with a capacity of storing 24 tonnes of hydrogen per day into LOHC, and subsequent transportation via ship. The LOHC will then be shipped to Rotterdam, foreseeing 40 shiploads per year with a ship capacity of 4,500 to 5,000 m³ each, which corresponds to over 200 tonnes of hydrogen annually. Moreover, about 50% of the import volume will reach Lingen/Germany with its industry offtakers via the river Ems (linked with project Get H2). Along the same lines, we are planning LOHC release facilities at an industrial scale in both Rotterdam and Lingen.

(German IPCEI Hydrogen notification process currently running)



Green Hydrogen@Blue Danube with initial roll-out in Bavaria

(South) Eastern Europe with countries like Romania, Bulgaria, Slovakia as well as Ukraine offer high potential for the production and export of green hydrogen. LOHC is an optimal carrier to enable the transport of green hydrogen from there. The Danube, Europe's second largest river linking East with West, is predestined as an efficient transport route for LOHC-BT; other forms of hydrogen transport, such as in liquid form or as ammonia, would not even be permitted, if only because of safety. Hence, we are pushing LOHC (de-)hydrogenation plants to be installed within the river triangle Danube/Inn/Ilz in Bavaria. The plant units are sized to supply and release around 1,000 – 2,000 tonnes of green hydrogen per year. They are to be erected at the sites of large-scale industrial hydrogen consumers near the Danube to create an early hub for green hydrogen supply in Bavaria. These activities are connected to the pan-European parent project "Green Hydrogen@Blue Danube" by VERBUND AG – with the vision to establish a green LOHC supply chain across the Danube region in the future.

(German IPCEI Hydrogen notification process currently running)

We push long-distance hydrogen imports worldwide.



Connecting with the Arab world

Jointly with ADNOC, JERA Americas and Uniper, we are exploring a large-volume and low-carbon hydrogen supply chain from the United Arab Emirates to Europe. The project includes the development of a commercial demonstration project with LOHC plant systems from Hydrogenious and the associated infrastructures with volumes of approx. 10,000 up to 180,000 tonnes of hydrogen per year. The LOHC is expected to be transported by sea to Wilhelmshaven/Germany or Rotterdam/Netherlands. Beyond that, with Hydrogenious LOHC Emirates we also prepare further market activities, connecting capable and ready countries for green hydrogen export from the Middle East region such as the United Arab Emirates, Saudi Arabia and Oman with hydrogen demanding countries worldwide, that means not only in Central Europe but also with e.g. Asia.

Contributing to creating viable hydrogen hubs

Together with the Port of Amsterdam in early 2021, we played a key role in setting up the “H2 Gate initiative” that aims at importing one million tons of green hydrogen annually, also by involving the tank storage company Evos. After successfully finishing the feasibility study with a focus on LOHC as key storage and transport solution, we will now jointly put the worked-out blueprint for becoming a major hydrogen hub into action, under the new name “H2A”.

At the Port of Hamburg, we are planning to establish LOHC release plants at a multi-ton scale for supplying industrial and maritime hydrogen off-takers in the harbour and hinterland region. In this way, we are focusing at an early stage on the Port of Hamburg in its strategic importance as a future hydrogen and LOHC hub. As part of the TransHyDE Heligoland project, we are developing LOHC supply chains from green hydrogen sources, not only with the North Sea/Heligoland as a role model starting point, but also including other import routes.

Let's build the new energy world together: Your key contacts.



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