Hydrogenious LOHC

Carrying the new energy world. Handling hydrogen as an oil.

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

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

Hydrogenious LOHC enables safe, efficient and flexible hydrogen storage and transport to consumers in industry and mobility across the globe. Our proven Liquid Organic Hydrogen Carrier technology is based on benzyltoluene as carrier medium (short: LOHC-BT) and can utilize conventional liquid-fuel infrastructure.

We connect hydrogen producers and offtakers 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, headquartered in Erlangen/Germany, offers (de-)hydrogenation turnkey plants, operation, maintenance and LOHC logistics services – ensuring safe, easy and efficient hydrogen storage, transport and distribution.

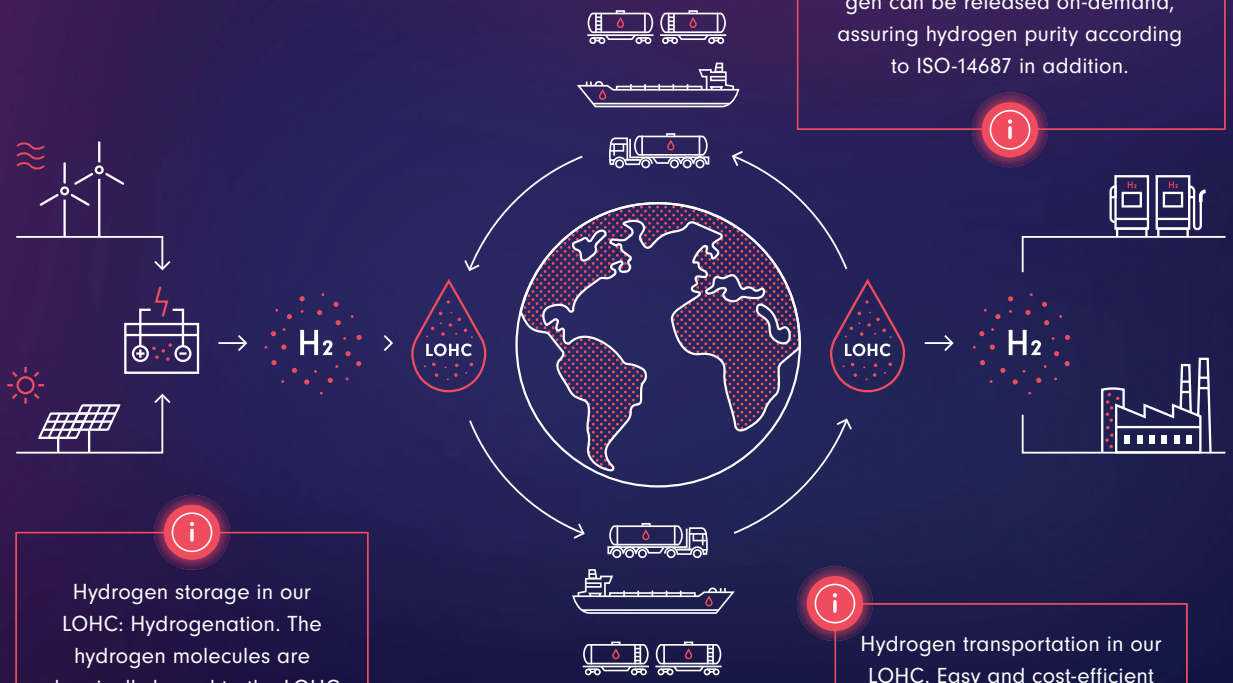
With its around 230 staff members and investors AP Ventures, Royal Vopak, Winkelmann Group, Mitsubishi Corporation, Covestro, JERA Americas, Temasek, Hyundai Motor Company, Chevron Technology Ventures and Pavilion Capital, Hydrogenious LOHC is a major enabler and accelerator for the energy transition.

Hydrogenious LOHC Maritime

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

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

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}/kgH_2 heat at approx. 300 °C. The hydrogen can be released on-demand, assuring hydrogen purity according to ISO-14687 in addition.



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. 9 kWh_{th}/kgH_2 heat at approx. 250 °C.

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 storage.

Our LOHC-BT technology is disrupting hydrogen infrastructure. By taming the lightest and highly explosive element.

Superior safety

> No handling of molecular hydrogen

> Hardly flammable with flash point 112.5 °C, non-explosive, even when loaded with hydrogen

> Hazard potential comparable to Diesel and thus clearly superior to ammonia

Enhanced flexibility

> Conventional liquid fuel infrastructure usable

> Handling at ambient temperatures and pressure during storage and transport

> No self-discharge over time – multi-month storage without losses

High efficiency

> Competitive volumetric storage density 54 kg hydrogen per m^3 LOHC

> More than 99.9 % hydrogen purity from the process without any purification

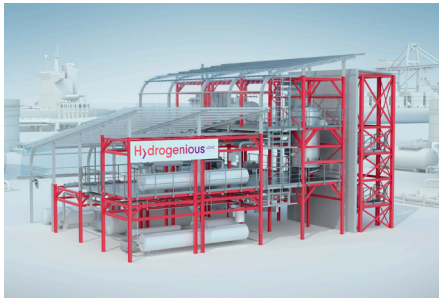
> Carrier material commercially available and reusable hundreds of times

We provide stationary LOHC applications, optimized for scalability.

Storage

- Flexible industrial hydrogenation unit to match with renewables
- Direct coupling with steam methane reforming or large-scale electrolysis
- Can be combined with underground storage
- Also available in box size for small-scale hydrogen storage with ~1 kg H_2/h. Custom solutions with up to ~10 kg H_2/h are feasible

Plant design	Skid-based	Containerized system
Hydrogenation process	Exothermic reaction using a solid catalyst	
Heat release	Approx. 9 kWh_{th}/kg H_2 at 200 – 250 °C for StoragePLANT	
Reaction pressure	Approx. 15 – 30 barg	



Release

- Designed for continuous and flexible operation
- Designed for coupling with hydrogen hubs and pipeline networks
- Can be combined with underground storage
- Also available in box size for small-scale hydrogen release with ~1 kg H_2/h. Custom solutions with up to ~10 kg H_2/h are feasible

Plant design	Skid-based	Containerized system
Dehydrogenation process	Endothermic reaction using a solid catalyst	
Heat demand	Approx. 11 kWh_{th}/kg H_2 at 250 – 330 °C for ReleasePLANT	
Released hydrogen purity	More than 99.9% Fuel cell hydrogen quality (ISO-14687) with additional purification step	
Reaction pressure	Approx. 1.5 – 3 barg	

Together with our strong **EPC partners** such as Bilfinger in Europe, we offer comprehensive services for building turnkey LOHC plant infrastructure as well as **O&M Services**. Our plants are designed for round-the-clock operation and can be fully controlled remotely via a dedicated web interface.

Strong proof points for the LOHC value chain support our project pipeline for international hydrogen supply.

1

First-of-its-kind small-scale systems demonstrate LOHC-BT's relevance and technological maturity

> First LOHC-BT-based hydrogen project in operation since June 2016 at the Fraunhofer IAO Stuttgart.

> World's first LOHC-BT-based hydrogen refueling station 2022. Successful implementation of a comprehensive LOHC value chain.

> SmartQuart 2023: Direct Coupling of a StorageBOX with PEM electrolysis to supply the mobility sector with green hydrogen.

2

Go West 2016

> Two box systems for United Hydrogen to expand the local hydrogen supply radius.

3

HySTOC 2018

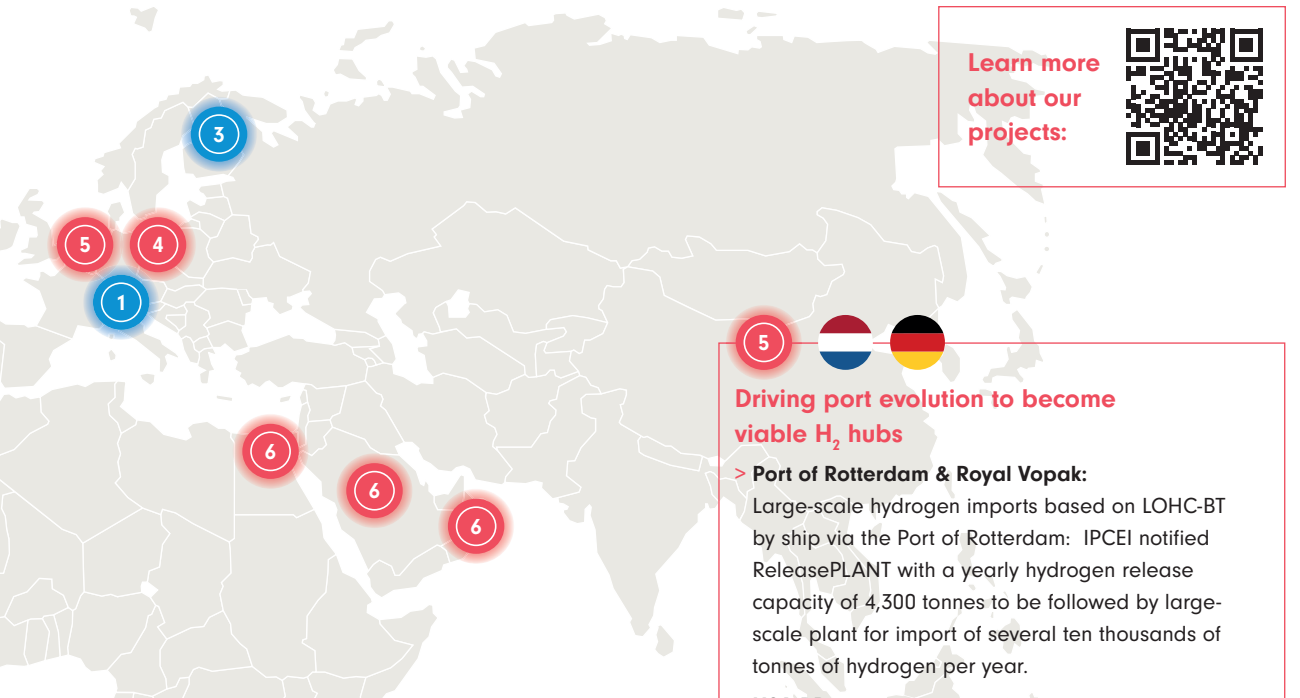
> Demonstration of cost-effective storage and transport of hydrogen stored in LOHC to a hydrogen refueling station.

4

Accelerating green H_2 supply ramp-up within Europe

> **Green Hydrogen@Blue Danube:**
First LOHC hub in Central Europe with a hydrogen release capacity of up to 1,800 tonnes per year. This hub will supply industrial offtakers in the Danube region (Bavaria) and beyond with green hydrogen by 2028. Notified as IPCEI Hy2Infra project. National funding of €75,5 million received in July 2024.

> **Project Hector:**
Industrial plant for storing up to 1.800 tonnes of green by-product hydrogen in LOHC at CHEMPARK Dormagen (Cologne, Germany) per year. Construction planned in 2025.



Learn more about our projects:

5

Driving port evolution to become viable H_2 hubs

> **Port of Rotterdam & Royal Vopak:**
Large-scale hydrogen imports based on LOHC-BT by ship via the Port of Rotterdam: IPCEI notified ReleasePLANT with a yearly hydrogen release capacity of 4,300 tonnes to be followed by large-scale plant for import of several ten thousands of tonnes of hydrogen per year.

> **H2A-RP:**
Joint cross-border lighthouse project with Evos & Port of Amsterdam with the goal to install an industrial large-scale LOHC ReleasePLANT (RP), aiming to import 36,000 tonnes of green hydrogen per year.

6

Enabling long-distance H_2 supply chains worldwide

> Large-scale hydrogen exports from MENA region and North America to Europe with strong strategic partners along the value chain, e.g. Suez Canal Economic Zone and ACME. Feasibility studies and small-scale pilots in preparation.

> **One Reactor:**
Unique reactor concept at Forschungszentrum Jülich to leverage the potential of LOHC-BT as energy storage medium: Storage and release of up to 100 tonnes of hydrogen per year from and in LOHC using one single reactor. Ready for operation by the beginning of 2025.

> **Multi-SOFC demo project:**
First-of-its-kind combination of hydrogen technologies for Hermann Josef Hospital Erkelenz: Bosch Multi-SOFC-system, supplied with hydrogen released from LOHC as of 2025.

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

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