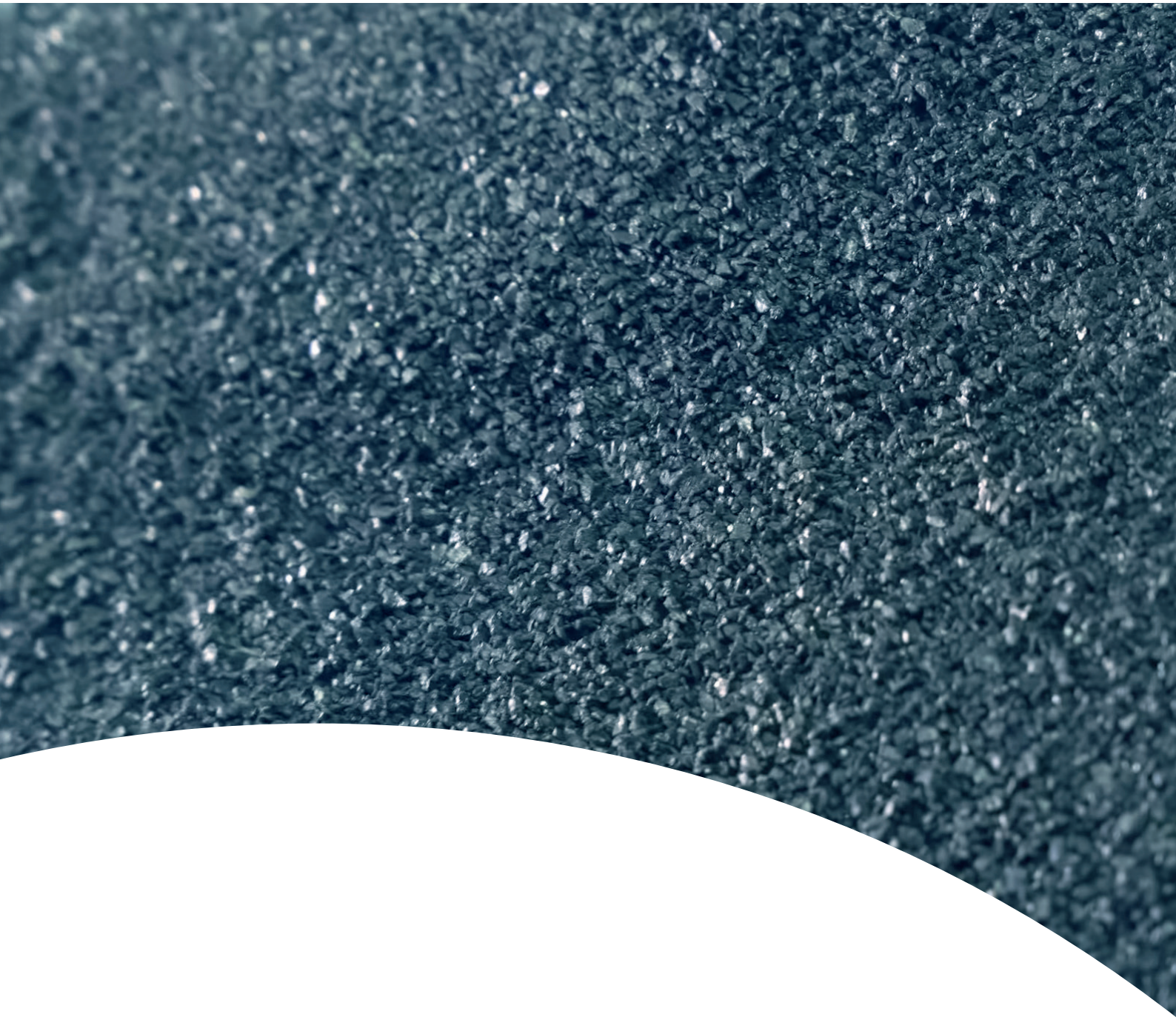
Services along the hydrogen value chain

Storage:

H_2 hybrid storage



TÜV®

TÜV NORD GROUP

H_2 competence @ TÜV NORD

1. Energy generation

Wind energy

2. H_2 generation

Electrolysis

Seawater desalination plants

3. Distribution/transport

Electrical grid

Pipelines

District heating

Intelligent networks

Pipelines

Refuelling stations/ filling systems

Tankers (lorry, train, ship)

4. Storage

Battery storage

Gas tanks

Cavern storage (H_2 and CO_2)

Pressure vessels

H_2 hybrid storage

5. Consumption/use

Fuel cell systems

Methanol synthesis units

Refinery

Mobility

In every field of services, we support you in the following phases:

Concept/planning

Production

Operation

Concept/planning

We support you in the concept phase with comprehensive services that will give your project the security it needs in technical and legal aspects from the very start. From product design through the assessment of requirements and technical specifications to plant development and process optimisation, our specialists have the details and the desired goal in view and are equipped and prepared for your tasks with ultra-modern IT and AI instruments as well as a broad spectrum of risk analysis, certification, test and evaluation services.

Production

With specific testing,auditing and approval services, we provide neutral and technically competent support as a notified and accredited body for manufacturers. This includes assessment and certification as a material manufacturer, obligatory for the production of certain products. Our range of services also includes the assessment of manufacturing processes, material assessments, stress tests, damage appraisal and product certifications. In addition, on top of monitoring production, we also support commissioning, assembly works and personnel instruction in production processes.

Operation

After setup and commissioning, we help you when operations are up and running to avoid shutdowns, eliminate technical sources of danger and reduce costs with the use of software-supported maintenance systems. We take on the task of carrying out all recurring inspections and specific tests of electrical and mechanical plants and systems. We can also create risk-based maintenance plans and provide you with tailor-made strategies to reduce operational risks and increase plant safety over the long term.

Metal hydride storage – hydrogen storage with potential

With a view to mobile and portable applications, the storage of gaseous hydrogen in metal hydrides is under consideration. To date, compact solid-state storage offers relatively low capacity for weight, but its low storage pressure does offer advantages with regard to the safety of the system. This differs particularly from the current high-pressure or cryo-storage technologies. As part of a pervasive hydrogen infrastructure, further-developed hydride storage could be used to a greater extent in the future, say, as fuel cell system components in vehicles or in fuel cell-operated small devices such as wearable computers.

We are your partner for the research, development and market deployment of high-performance metal hydride storage. With the most modern analysis methods and competent specialists, we are at your side to carry out your project safely and successfully and let you benefit from potential subsidies. Do get in touch.

Material and mode of functioning

To manufacture hydride storage facilities, specific metals, intermetallic compounds and multiphase alloys and light metals are used:

- metals such as palladium, magnesium and lanthanum
- intermetallic compounds such as $ZrMn_2$, $LaNi_5$ or Mg_2Ni
- multiphase alloys such as TiNi-Ti_2Ni or Mg-Mg_2Ni
- light metal hydrides (nanocrystalline hydrides)

Hydride storage is able to bind hydrogen chemically and release it later. As soon as the gas comes into contact with the surface of the hydride, the hydrogen is stored at the atomic level in the storage medium. While the chemical binding reaction is exothermic, extracting the gas again requires the provision of heat. The filling and emptying of powerful hydride storage facilities can take place within a few minutes at the high pressure level, as a rule between 1 and 50 bar.

Simple metal hydride storage consists of a hydride powder contained by a pressure shell. Complex storage facilities are designed both as pressure containers and heat exchangers, able to receive the waste heat from high-performance fuel cells. High-temperature hydride storage works in the temperature range between 300 °C and 400 °C, low-temperature ones between -20 °C and +100 °C.

Advantages

As energy sources within the hydrogen economy, hydride storage is the focus of research and development. Despite its high mass and relatively low storage capacity, it has advantages over high-pressure and liquid storage technologies. Its materials and low storage pressure give it high long-term stability and protect against boil-off losses and self-discharging. Thanks to its range of working temperatures, it is also ideal for integration in the cooling circuits of PEM fuel cells. Incorporated in the systems of suitable electrolysers, hydride storage could help avoid the use of cost and maintenance-intensive H_2 compressors.

Our services

We offer you comprehensive services in the fields of testing, inspection and certification – in the following phases of the project at hand:

	Concept / planning	Production	Operation
Design evaluation of hydrogen hydride storage	■		

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