

Meet the third generation of this family-owned company! Brothers and joint managing directors Werner Hartmann (right), Christian Hartmann (left) and Martin Hartmann (centre) are proud to continue their grandfather's legacy of innovation in engineering.



Hartmann Valves: the hydrogen valve specialists

Hartmann Valves – a medium-sized, family-owned company in Germany that just celebrated its 75th anniversary – remains totally focussed on engineering valve solutions for demanding applications. With an extensive track record with valves for a variety of hydrogen applications, Hartmann is ideally placed to support all "hydrogen clients" during the energy transition.

Compiled by David Sear

Hydrogen may have hit the newspaper headlines in recent months, yet this smallest of elements has been playing an important part in the petrochemical industry for decades. Hydrogen is therefore nothing new to Hartmann, whose "hydrogen

valves" have been tried and tested over a period spanning many years.

Werner Hartmann comments: "With the energy transition accelerating, hydrogen will be increasingly found in various systems such as

production via electrolysis, storage, transportation, processing, mobility and fuel cells. Common to all these applications is the necessity to safely handle hydrogen at all times. Hence the need for reliable shut-off valves is paramount."

All-round engineering expertise is a prerequisite when manufacturing ball valves for hydrogen application. “Based on our long experience with ball valves for many other demanding industries, we have developed durable, customized ball valves that are equipped with a metal-to-metal seal between ball and seat ring. These are gas-tight, even at high pressures up to 690 bar. Special designs for temperatures up to 550°C are available,” says Martin Hartmann.

Christian Hartmann adds that even when extensively used – such as 200,000 cycles per year – Hartmann ball valves offer a secure and reliable shut-off

requiring little maintenance effort. “For applications where additional safety is required, we can provide a double isolation and bleed (DIB) option or the twin ball valve (TBV) design, whereby a double ball arrangement creates up to four barriers in a single valve.”

Cavern storage

In the future, underground caverns may be used to store large volumes of hydrogen gas, indicates Christian Hartmann. “This will necessitate suitable wellheads that can form a secure interface between the underground cavern and the above-ground plant. Hartmann wellheads are equipped as standard with pure metallic

sealing ball valves to API 6A and have a double seal against the bore pressure. Furthermore, doubled sealings at the flange connections as well as additional metallic sealings can be integrated at the wellhead. To reduce flange connections also a solid block design is possible, which integrates several components in one block.”

Application examples

In the petrochemical industry, Hartmann ball valves have already proved their worth in hydrogen applications. This track-record serves as a guarantee of valve tightness at extremely high temperature ranges. Just to give a few



examples, Hartmann has supplied DN 200 PN 420 valves for use at 184 bar and 380°C as well as DN 600 PN 420 ball valves which close securely at 191 bar and 426°C.

Looking at the renewable energy market, good examples showing Hartmann's valves in hydrogen systems can be found in power-to-gas processes. Take for instance the German Falkenhagen pilot plant, constructed in 2013, where Hartmann ball valves control

the flow of hydrogen produced by electrolysis. Incidentally, this gas is then fed into the natural gas grid.

Additional requirements these valves had to meet included a high level of leak tightness over a long operating period in combination with low-maintenance performance. Twenty-four specially developed ball valves (DN 25 and DN 50 up to PN 100) are being successfully deployed in the plant.

Standardised hydrogen tests

All valves used in hydrogen systems must be tested to ensure leak tightness. Emission control is therefore an area where Hartmann has paid considerable attention. Werner Hartmann: "We offer two hydrogen tests for both ball valves and wellheads. Our tests can also be used by other manufacturers to check the performance of their products. These expert tests raise operational safety and reduce the complexity of in-house testing. Note that our tests can also be used to re-evaluate existing valve inventories to check their suitability for use with hydrogen. Standardised tests therefore contribute to the future viability of a plant, even if for example valves are left idle for extended periods – even at high pressures."

"Being a small molecule, hydrogen can migrate through sealing elements," notes Martin Hartmann. "A comprehensive pressure test provides assurance that the threshold values are adhered to and fugitive emissions are minimised."

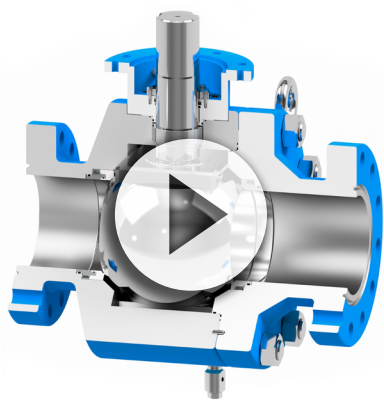
External leaks are checked using a mass spectrometer. For safety reasons, forming gas (5% hydrogen, 95% nitrogen) is used as the test medium in accordance with DIN EN ISO 14175. The leak tightness is measured based on DIN EN ISO 15848.

Ready for hydrogen!

The first Hartmann wellhead for hydrogen well testing phase 1 was recently installed in the Netherlands. The customer, Gasunie, is responsible for developing the national hydrogen infrastructure. Within the project, sustainable hydrogen will be stored at the Zuidwending underground gas storage facility. First, the existing wellhead equipment was comprehensively tested by Hartmann's Material Suitability Test in order to prevent material fatigue and hydrogen embrittlement. In addition to the existing parts deemed suitable for hydrogen (green spool), Hartmann designed and manufactured new wellhead components including metal-to-metal sealing, API 6A ball valves. As part of the factory acceptance test a successful hydrogen test for leak tightness was conducted at Hartmann. Simultaneously, Hartmann is currently processing wellhead orders for Gasunie's hydrogen testing phase 2 as well as for the first German hydrogen projects.



Hydrogen valves video



To learn more about the types of valves, wellheads and tests used in hydrogen applications, please do check out this video produced by Hartmann

Martin Hartmann continues: “Thus, whilst complying with the safety requirements, tests can still be carried out with the original hydrogen medium. At the same time, the high-level sensitivity of the mass spectrometer ensures that the mixture is in no way compromised in terms of measurement accuracy. Thus, even the smallest leakages in the ppm range can be reliably detected.”

The company is also fully equipped to run standardised materials suitability tests on all metallic components in direct contact with hydrogen, adds Christian Hartmann. “Within the test scope the metallic material selection is evaluated regarding its resistance against hydrogen embrittlement to ensure that it is fit for hydrogen service. Molecular hydrogen is comparatively stable and marginally reactive, therefore

corrosion in the conventional sense is unlikely.”

Martin Hartmann continues: “So-called hydrogen embrittlement, i.e., hydrogen-induced stress corrosion, presents a risk for highly stressed, pressurised components, which requires particular consideration. The test is performed on the basis of the following standards: Pressure Equipment Directive 2014/68/EU (DGRL), API 6A, API 6D, ASME, NACE MR175 / DIN EN ISO 15156. The following criteria are considered: hardness, surface hardness, ductility, heat treatment and structure. In other words, we can confirm the material suitability and leak tightness for hydrogen to the customers not only based on our experience but with the aid of modern test procedures and formulated criteria.”

Sustainable future

Asked about the years to come, Werner Hartmann sees a strong role for the hydrogen sector. “Hydrogen is the ideal carrier to store excess electrical energy from renewable sources such as solar panels and wind turbines. It is also a good energy source in itself. That means hydrogen has to be a very important future market for Hartmann. Moreover, as we are a medium-sized company with a flat

hierarchy, you can rely on us to act fast whenever needed.”

Martin Hartmann notes the strategic importance of the company’s strong research and development team when quickly designing and manufacturing innovative valve products for hydrogen and all other sectors. “We recently restructured our R&D activities to create a stand-alone department. This reflects our commitment to innovation and has already resulted in extra patent applications. Watch this space for more news about hydrogen to follow.”

The final words, however, must go to Christian Hartmann.

“With our well-established trainee programmes, we benefit from a constant influx of highly talented technicians and engineers. These young people are bursting with new ideas and insights to create even better valve solutions; solutions that will of course benefit our customers but also help shape a sustainable future for all of society.”

Further reading

For more information, please do visit Hartmann’s website and the special section dedicated to valves for hydrogen.

www.hartmann-valves.com