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Towards a CO2-neutral factory

The potential for industry and environment is enormous and the hydrogen boom has long since begun – billion-dollar investments have already been made or are in the planning stages. Valves and actuators play a key role in this, as they are used along the entire hydrogen process chain. However, the market has such a high dynamic that the definition of a European standard for hydrogen is still lagging behind and there are currently programs to investigate the hydrogen compatibility of existing valves. Still, the valve sector has plenty of experience dealing with the medium of H2 already – and can really put their foot down as it is.

“The hydrogen market is very broad,” explains Thomas Weisschuh, Director Product Management and Innovation at AS-Schneider Group. Applications range from generation, storage and transport to use. In electrolysis, in addition to H2 the media of water and oxygen must also be treated. Therefore, valves are very different as far as requirements are concerned – in terms of pressure, temperature and media handling.

A great potential that needs leveraging – with regard to the goal of accelerating the energy transition and independence from Russian gas too. This for instance makes pipelines for hydrogen necessary. By 2030 for example, around 2.5 billion Euros are expected to be spent on creating a line from Barcelona to Marseille. Up to ten percent of the EU's expected demand for green hydrogen could flow through “H2Med”. “The maximum capacity of the Mediterranean pipeline will be two million tons of hydrogen per year,” reports Germany Trade and Invest (GTAI). The pipeline is now to be extended to Germany.

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High investments in H2 projects

Electrolysis systems are essential for H2 production. Samson Pfeiffer is supplying more than 1,000 control and shut-off valves for a new plant in Saudi Arabia. “This major order gives us the opportunity to help shape the carbon-neutral factory of the future,” says Pfeiffer sales manager André Schnepper.

A development also confirmed by AS-Schneider. There is, for example, a high level of investment in H2 projects in the Middle East. “These countries are gearing up for the time after oil and gas,” explains Thomas Weisschuh. Plants for some large projects are supplied by European companies such as ThyssenKrupp and Siemens.

Hydrogen is used in various industries, including the food sector. The MPreis manufacturer in Austria for example invested 13 million Euros in a large single-stack electrolysis plant. H2 from renewable sources will be produced for use both in their large bakery and transport truck. The order comprises a total of 200 valves, for instance 70 stainless steel ball valves.

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A challenge for valves

The hydrogen market is undoubtedly an attractive one – but with high expectations with regard to design, quality and material stability. One reason for example is the high level of explosiveness of this gas. The highest standards are therefore required when selecting valves – so internal and external impermeability are of the utmost importance. And: “In order to store the same amount of energy, a higher pressure is usually required,” explains Product Manager Stefan Schenk. Furthermore, the operating temperature spectrum is significantly greater: At atmospheric pressure, hydrogen only liquefies at a temperature of minus 253° C. In addition, when designing valves and choosing the material, hydrogen embrittlement must be taken into account.

In order to ensure the suitability of the valves, the industry relies on hydrogen emission tests. Hartmann Valves also offers material suitability testing. Comprehensive internal leak tests ensure that statutory thresholds are met and volatile emissions minimized.

Appropriate controls are required

The hydrogen industry is also increasingly shaped by digitization and automation. “For us, this means that there are constantly new developments in control solutions for valves,” explains Peter Wegjan, sales engineer for special ball valves at Hartmann Valves. Here, they work together with actuator suppliers “so to be able to offer controls tailored to the application”.

One supplier of actuators for example is AUMA. “Our explosion-proof actuators are suitable for hydrogen,” emphasizes Kai Ewald, Head of Sales Oil & Gas. AUMA actuators are used, for example, in the power-to-gas plant of Windgas Haßfurt, where excess wind energy is converted into H2. They are used for feeding hydrogen into the gas network.

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The market is booming – with consequences for dimensioning, too. Corresponding systems, modules and pipelines are therefore getting larger and larger. Waldemar Pruss Armaturenfabrik notes a trend towards the increasing importance of systems being maintenance-free. They are therefore offering special valves for hydrogen applications, which on the one hand meet standards and norms, yet on the other also dispense with maintenance-prone components made of elastomers.

Big things are awaiting the industry

Some things still need clarifying – that is why the regulations of the German Association of Gas and Water (DVGW) are being revised and adapted to the future use of hydrogen. The project aim is to investigate the possible applications and limitations of shut-off valves with regard to their H2 impermeability. In addition,

standardisation in Europe is relatively unclear. Some companies apply international standards and databases – such as ASME B31.12 for hydrogen piping and pipelines – and develop an internal standard from this. However, the dynamics of the hydrogen market will also give a strong boost to standardisation. After all, the valve sector is expecting great things as to its potential.

Trends and highlights from the valves and fittings industry can be experienced at VALVE WORLD EXPO from 3 to 5 December 2024 in Düsseldorf. Current industry and product information can be found on the internet portal at www.valveworldexpo.de.

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