



PRUSS: perfecting precision of flow control

With over 130 years of history, PRUSS is a globally established company specialising in the design and manufacture of customised control valves and actuators for a wide range of industrial sectors. Building on decades of expertise in valves for hydrogen service, the company is now developing products for the rapidly growing hydrogen market.

By Matjaž Matošec

Since its inception in 1889 by innovator and entrepreneur Waldemar Pruss, the Hanover-based company has gone from strength to strength, growing from a small family business to a trusted partner of an impressive array of industrial and energy giants. Its earliest products – explosion-proof valves for gas lighting – could be found in such iconic locations as the Champs-Élysées Avenue in Paris, whereas nowadays PRUSS valves provide reliable flow control of gases and liquids in some of the most demanding operating conditions found across the industrial landscape.

Seeing hydrogen as a key element of the future energy mix, the company is now using its extensive know-how and manufacturing capabilities to provide a comprehensive portfolio of valve products required for the safe handling of hydrogen and other fluid media associated with its production, transport, storage, and industrial application.

Experience with hydrogen

The use of hydrogen as a fuel predates the current hype surrounding it, and PRUSS has an extensive track record and decades of experience in the



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hydrogen embrittlement, which is a risk that we take very seriously” explains Mr. Drehmel.

“Another challenge is the size of hydrogen. As one of the smallest elements, it can diffuse through many materials considered air-tight or impermeable to other gases, which calls for special sealing solutions,” continues Mr. Drehmel. “To meet the demanding tightness requirements for hydrogen-service valves, we are able to use metallic seals for high-temperature applications, with our meticulous material selection process being supported by rigorous testing conducted in-house and in accordance with a range of industry-recognised standards.”

manufacture of valves for hydrogen service. “In East Germany, for instance, the industrial cluster in the so-called Leuna-Buna-Bitterfeld Chemical Triangle produced significant amounts of hydrogen as a by-product, and it was then, in the 1970s, that we began developing our expertise in hydrogen,” explains Wilfried Drehmel, CEO of PRUSS. “This waste hydrogen was injected into the natural gas network in much higher concentrations than in West Germany, sometimes stored in salt caverns and primarily intended for household use. We supplied many valves for this gas pipeline and storage system, so hydrogen is nothing new for us.”

The thermodynamic, chemical, and physical properties of hydrogen place unique demands on process equipment, requiring special material and design solutions to ensure safe operation. “While molecular hydrogen is relatively inert and therefore not corrosive, atomic hydrogen can cause cracking in certain metals, with highly stressed pressure-bearing components being particularly prone to

Complete package for power plants

The power generation industry is a key market for PRUSS, not only historically but also as an area of great business growth potential. “Wherever flow media such as oil, cooling water, steam, condensate, or gas must be controlled, shut off, secured or diverted, PRUSS can provide a solution – regardless of the application,” proudly and confidently asserts Mr. Drehmel. “We manufacture valves in all sizes and various materials, designed for temperatures of up to 620°C and operating pressures of up to 700 bar. To make the package complete, we also manufacture the corresponding pneumatic, hydraulic, and electro-hydraulic actuators.”

Among various types of thermal power plants, gas-fired plants are the fastest-growing segment. This is due to several important advantages compared to other fossil-fuel-based power stations, including higher efficiency, faster response time, lower capital costs, shorter construction times and lower carbon emissions.



Another great advantage is the fact that hydrogen could eventually replace natural gas as a fuel for both single- and combined-cycle gas turbines. While most existing gas-fired plants will require modest to moderate equipment modifications to run on a mixture of natural gas and hydrogen, a growing number of new plants are designed to be hydrogen-ready so that they can switch to the cleaner fuel as soon as the hydrogen supply, cost and pipeline infrastructure allow it. As major gas turbine manufacturers race to develop turbines capable of combusting 100% hydrogen, component and equipment manufacturers must follow suit, with valve companies being no exception.

Hydrogen valves for gas turbines

PRUSS is at the forefront of these efforts, building on its decades-long expertise in the design and manufacture of valves for gas turbines. “We are already one of the key suppliers to large gas turbine companies and see the gradual transition to hydrogen as a fuel in power generation as a major driver of our product innovation and business growth,” explains Mr. Drehmel.

“In the last few years, we have developed special fuel gas control valves with emergency shut-off function for hydrogen service in gas turbines,” continues Mr. Drehmel. “We already have orders for the first plants that will be capable of burning up to 50% of hydrogen blended with natural gas and are conducting tests for valves for pure-hydrogen

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service. We will thus be able to provide both valves for the flow control of a natural gas/hydrogen mixture as well as dosing valves for the addition of 100% hydrogen to natural gas. These products meet ultra-high, Class VI, leakage requirements – even after an endurance test of 20,000 cycles under operating conditions. Furthermore, our valves are available with rangeabilities of up to 350:1, allowing exceptionally precise flow control. What this means in practice is that they are also able to control the ignition phase, which in turn means greater reliability and efficiency as well as lower investment and installation costs.”

As Mr. Drehmel explains, these applications are extremely specific. “We only have a couple of competitors, so I like to say that we work in a niche of a niche. Making gas turbines more efficient can be compared to dancing on a razor blade, where even the tiniest of details matter. The continued trust of our customers is a testament to our expertise in this field.”

Power-to-X and other applications

The product portfolio of PRUSS is well suited to address the flow control needs of a range of other applications along the hydrogen value chain, from green hydrogen production plants to pipelines and underground storage facilities. More specifically, the company’s valve solutions for hydrogen service include process valves for the water electrolysis process, gas-liquid separation, pressure control and safety shut-off valves for various applications, and blow-off and anti-surge valves for compressor protection. Both static seals and moveable sealing parts are designed in such a way that all these valves are in principle maintenance-free, decreasing operational costs and preventing downtime.



As large-scale electrolyzers are becoming a reality, some of the processes associated with green hydrogen production may have to be optimised. One such process is the gas-liquid separation, for which PRUSS offers a fitting valve solution. Mr. Drehmel provides more detail: “The hydrogen gas coming out of the PEM electrolyser stack still contains a certain amount of water, which must be let out of the system. Currently, this is mainly done via cyclonic separation, but this process leads to significant pressure losses, making it uneconomic for large-scale electrolyzers. A more efficient alternative is to collect this water in a header that works like a condensate trap and then drain it. This requires an abrasion-resistant blowdown valve, which is a product that we have supplied in thousands for use in steam power plants.”

Made in Germany, available globally

PRUSS takes great pride in manufacturing and assembling their products in Germany. “With the exception of gaskets and electronic devices, which we acquire from our partners, all our production takes place here in Hannover,” explains Mr. Drehmel. “We work with castings from India and China but can also obtain them in Germany or elsewhere in Europe if required by the client.”

Through their distribution partners, PRUSS is represented in more than 50 countries. The company’s global presence entails not only sales but also service. “We provide customer support wherever needed,” says Mr. Drehmel. “This can be done on-site by accredited service teams of our representatives, by our in-house specialists or remotely. Whether for commissioning, regular shutdown service, emergency operations or spare parts recommendations, our highly qualified service team is available at any time. Just as an interesting fact, a PRUSS valve made in the 1920s remains in service to this very day – and we can still deliver the spare parts.”

Future plans

When asked about his company’s next challenge, Mr. Drehmel reveals two ambitious plans.

“Having so far focused on developing valves for high-temperature applications, our next goal is to develop products of equally high quality for cryogenic service. Another R&D project is a maintenance-free fuel gas metering valve for pure-hydrogen service. Although this product is still in the early stages of development, we are already excited about launching it within the next few years.”