

PRUSS: reliable valve solutions for large-scale hydrogen systems

Established in 1889, PRUSS is a globally trusted supplier of control valves and actuators for various industrial sectors. Recognising the role of hydrogen in the future energy landscape and leveraging decades of expertise in flow-control solutions for hydrogen service, PRUSS now provides an extensive range of valve products for large-scale systems used in water electrolysis, hydrogen transport, storage, and industrial applications. To learn about the company's latest projects and developments, we talked to Wilfried Drehmel, CEO of PRUSS.

By Matjaž Matošec

Founded by innovator and entrepreneur Waldemar Pruss, the Hanover-based company has flourished over time, evolving from a small family business into a household name among a long list of industrial giants. Although the company has established a solid reputation for quality and reliability, it remains committed to growth and innovation. Since our first conversation with Mr. Drehmel eight months ago, PRUSS has won six major contracts for the supply of valves for gas-fired power plants, made significant progress in developing a maintenance-free fuel gas metering valve for pure-hydrogen service, increased its



workforce by 15%, and put into operation a new machining centre.

Vast experience with hydrogen

PRUSS has a wealth of experience in the manufacture of hydrogen-service valves, with a track record spanning decades. "We began developing our expertise in hydrogen in the 1970s, so hydrogen is nothing new for us," says Mr. Drehmel.

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 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-

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house and in accordance with a range of industryrecognised standards."

Comprehensive solutions

The power generation industry is a vital market for PRUSS, with significant potential for growth. "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," says Mr. Drehmel. "We manufacture valves in all sizes and various materials, designed for temperatures of up to 720°C and operating pressures of up to 600 bar. To make the package complete, we also manufacture the corresponding pneumatic, hydraulic, and electro-hydraulic actuators."

Compared to other types of thermal power stations, gas-fired plants are characterised by relatively high efficiency, faster response time, lower capital costs, shorter construction times and lower carbon emissions. Another advantage is the fact that hydrogen could eventually replace natural gas as a fuel for 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.

First projects already underway

PRUSS has recently received multiple orders for valves and actuators from pioneering projects in Europe and Asia-Pacific that aim to generate power using hydrogen, either in its pure form or mixed with natural gas.





"Currently, we have orders for six projects, two for pure (100%) hydrogen and the remaining four for up to a 70% hydrogen blend," explains Mr. Drehmel. "The two 100% hydrogen projects are for testing purposes at existing plants, while the other four are for large-scale new installations, the largest of which has an output of more than 590 MW. These projects are currently being developed for customers who plan to initially operate their plants using natural gas but want the option to blend it with hydrogen in the future.

"We are currently working on obtaining type approvals for our new valve version, which will be used in these projects. The project scope includes hydraulically actuated fuel gas control valves for all burner stages and the relevant emergency shut-off valves, which are pneumatically actuated. To implement these projects, we need to run an endurance test and conduct detailed characteristic testing, which is currently being done in-house."

Cutting-edge flow control technology

As one of the key suppliers to large gas turbine companies, it is no surprise that PRUSS is at the forefront of innovation of flow control equipment for gas turbine applications.

"In the past few years, we have developed special fuel gas control valves with emergency shut-off function for hydrogen service in gas turbines," says Mr. Drehmel. "These products meet ultrahigh, 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."

Another recent product development is a fuel gas metering valve for pure hydrogen service, which has been designed to provide maintenance-free operation for at least five years. This valve is currently undergoing endurance testing.

Valves for large-scale electrolysers

PRUSS offers a diverse product portfolio to meet flow control needs throughout the hydrogen value chain, from green hydrogen production plants to pipelines and underground storage facilities. Its valve solutions for hydrogen service include process valves for water electrolysis, 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 electrolysers are becoming a reality, some of the processes associated with green hydrogen production may have to



be optimised. One such process is the gasliquid 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 electrolysers. 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 abrasionresistant blowdown valve, which is a product that we have supplied in thousands for use in steam power plants."

Sustaining quality and growth

To meet the ever-growing demand for its products, PRUSS has recently added 15 new employees to its workforce. At the end of last year, the company also put into operation a state-of-the-art machining centre, which has been seamlessly integrated into its existing CNC machine park. This centre enables the company to produce a great variety of complex components fully automatically, resulting in a 30% increase in efficiency and 300% increase in capacity.

The company's global network of sales and service partners is also expanding and now represents PRUSS in more than 60 countries. "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."

Finally, PRUSS regularly exhibits at various industry trade shows worldwide to showcase its products and forge new business partnerships. The next opportunity to meet Mr. Drehmel and his team will be on 4 and 5 April at the Hydrogen Tech World event in Essen, Germany. Visit the PRUSS stand F16 to learn more about their products and services!

