

Sealing solutions in the green hydrogen revolution: a market overview

As the world accelerates its efforts towards a sustainable, carbon-neutral future, green hydrogen has emerged as a pivotal solution in the clean energy transition. Produced via water electrolysis powered by renewable energy, green hydrogen offers a pathway to decarbonizing industries. However, this flourishing market also presents unique challenges, particularly in the development of reliable sealing solutions for electrolyzers and hydrogen fuel cells, where safety and efficiency are essential.

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Gasket customization

With industrial processes increasingly focused on emission reduction and environmental safety, companies providing sealing solutions are adapting to meet the demands of this rapidly expanding market. Electrolyzers, the technology behind green hydrogen production, are complex systems requiring hundreds of seals to ensure safe, leak-free operation. For example, a 5-MW alkaline electrolyser can require roughly 500 gaskets. As future plant capacities are projected to be measured in gigawatts, the demand for sealing solutions is set to grow exponentially.

The need for customized sealing solutions has, therefore, simultaneously become more pronounced. Many electrolyzers, which are often custom-built, require seals tailored to their unique designs. Customization remains crucial, especially in the early stages of product development, to ensure that the gaskets effectively prevent any potential leaks.

Early collaboration between seal providers and manufacturers can lead to more economical and efficient solutions, optimizing the design and performance of the electrolyzers. More specifically, the product gains an inherent value when the sealing manufacturer can create tailored solutions that are both technically superior and more cost-effective. The earlier they are involved, the higher the level of customization.

This collaborative approach can ultimately reduce production costs and improve the efficiency of hydrogen systems – a critical factor as the industry moves toward mass production.

Regional market dynamics

The green hydrogen market is experiencing different rates of growth across regions. In Europe, where significant government funding supports the energy transition, the sector continues to develop. In North America, particularly in the U.S., the market is somewhat uncertain, influenced by political factors that could impact the pace of development. On the other hand, the Middle East is emerging as a key player, as countries like Saudi Arabia establish large-scale gigawatt projects and investing heavily in renewable energy.

Despite some regional slowdowns, innovation in sealing technology has not decelerated. Companies developing solutions continue to invest in research and development to stay ahead in



the race to provide high-performance seals for hydrogen applications. The industry is placing particular emphasis on technical leadership, ensuring they remain at the forefront of innovation as green hydrogen projects scale up globally.

Innovations in PTFE

One example of innovative technical stewardship from certain gasket manufacturers is the adoption and advancement of polytetrafluoroethylene (PTFE) seals, which have proven especially effective in alkaline electrolyzers. PTFE has been the material of choice due to its proven long-term reliability, durability, chemical resistance, and ability to withstand harsh operating environments; some seals have been documented to last up to 20–30 years in electrolyser applications.

While new materials are being explored, there is currently no long-term data to suggest that they can match the performance of PTFE in these demanding conditions. This has reinforced the position of PTFE as the standard for sealing solutions in the green hydrogen industry.

To further enhance efficiency and cost-effectiveness, companies are introducing innovative gasket technologies. One such development is the creation of segmented gaskets, which provide the same technical reliability as traditional gaskets but at a lower cost. These innovations are critical as electrolyser manufacturers face increasing competition, particularly from lower-cost producers in competing regions. The segmented gaskets help manufacturers remain competitive without compromising on quality or performance – a key consideration as green hydrogen projects expand globally.

Importance of expertise in sealing solutions

As the industry evolves, the expertise of sealing solution providers is becoming increasingly important. Sealing companies with strong research

and development capabilities and a global network of specialists are well-positioned to support the growth of hydrogen production. These providers offer not only high-quality materials like PTFE gaskets but also tailored engineering solutions that help electrolyzers operate more efficiently and safely.

In addition to sealing expertise, partnerships with electrolyser manufacturers are critical to advancing the market.

Outlook

As the green hydrogen market grows, the demand for advanced and reliable sealing solutions will increase. The need for customized, high-performance gaskets that can withstand the harsh conditions of electrolyzers is clear, and companies providing innovative and cost-effective solutions will play a pivotal role in driving the energy transition forward.

With significant projects underway across Europe, the Middle East, and beyond, the sealing industry is well-positioned to support the global push toward green hydrogen. As manufacturers ramp up production to meet the world's clean energy goals, the role of sealing technologies in enabling safe, efficient, and scalable hydrogen production will be more critical than ever.

About Teadit

With a manufacturing and distribution network spanning more than 50 countries, the TEADIT Group is a global player. Its comprehensive range of sealing products can be found in a wide variety of applications, including in industries governed by stringent environmental and safety regulations. While the company's green credentials are further strengthened by its growing presence in the biofuels market, the energy transition presents many other opportunities for growth and innovation, which TEADIT is determined to capture. Green hydrogen is one of them, as the company is perfectly positioned to become a major provider of sealing solutions to manufacturers of water electrolyzers and hydrogen fuel cells.