

# **HONEYWELL GREEN HYDROGREN PURIFICATION**

A crucial step on the journey to net-zero



**Honeywell**

The most abundant element in the universe, hydrogen offers significant potential to reduce global greenhouse gas emissions. That's because hydrogen's ubiquity in industrial processes and suitability as a fuel for applications ranging from fuel cell-powered transportation to industrial feedstock and energy storage makes it ideal for widespread adoption. However, it's the purity of hydrogen that enables its use in low carbon intensity energy applications.

### THE ROLE OF PURIFICATION IN PRODUCING GREEN HYDROGEN

Most industrial-scale hydrogen today is produced using the steam reforming of methane (SMR) technique. The downside of SMR is that it yields carbon dioxide as a byproduct and uses natural gas or off-gas from the hydrogen purification plant to fire the process furnaces, generating additional emissions.

A cleaner alternative is to produce hydrogen through the electrolysis of water. And, if the power source for the electrolysis is renewable electricity from wind or solar power, then it can be classed as 'green hydrogen' producing significantly less emissions overall.

Green hydrogen is expected to play an important role in fulfilling net-zero climate pledges in the coming decades, with the market expected to grow by

54.7% annually, from US\$0.3 billion in 2020 to \$9.8 billion by 2028, according to Valuates Reports. At the COP26 United Nations Climate Conference in 2021, green hydrogen was deemed essential for decarbonizing energy-intensive sectors in which emissions is difficult to control, such as heavy industry, long-haul freight, shipping and aviation.

### HONEYWELL'S PURIFICATION SOLUTION: POLYBED PSA

Honeywell UOP's solution to purifying green hydrogen leverages a technology developed by UOP in 1966 called Polybed™ Pressure Swing Absorption (PSA).

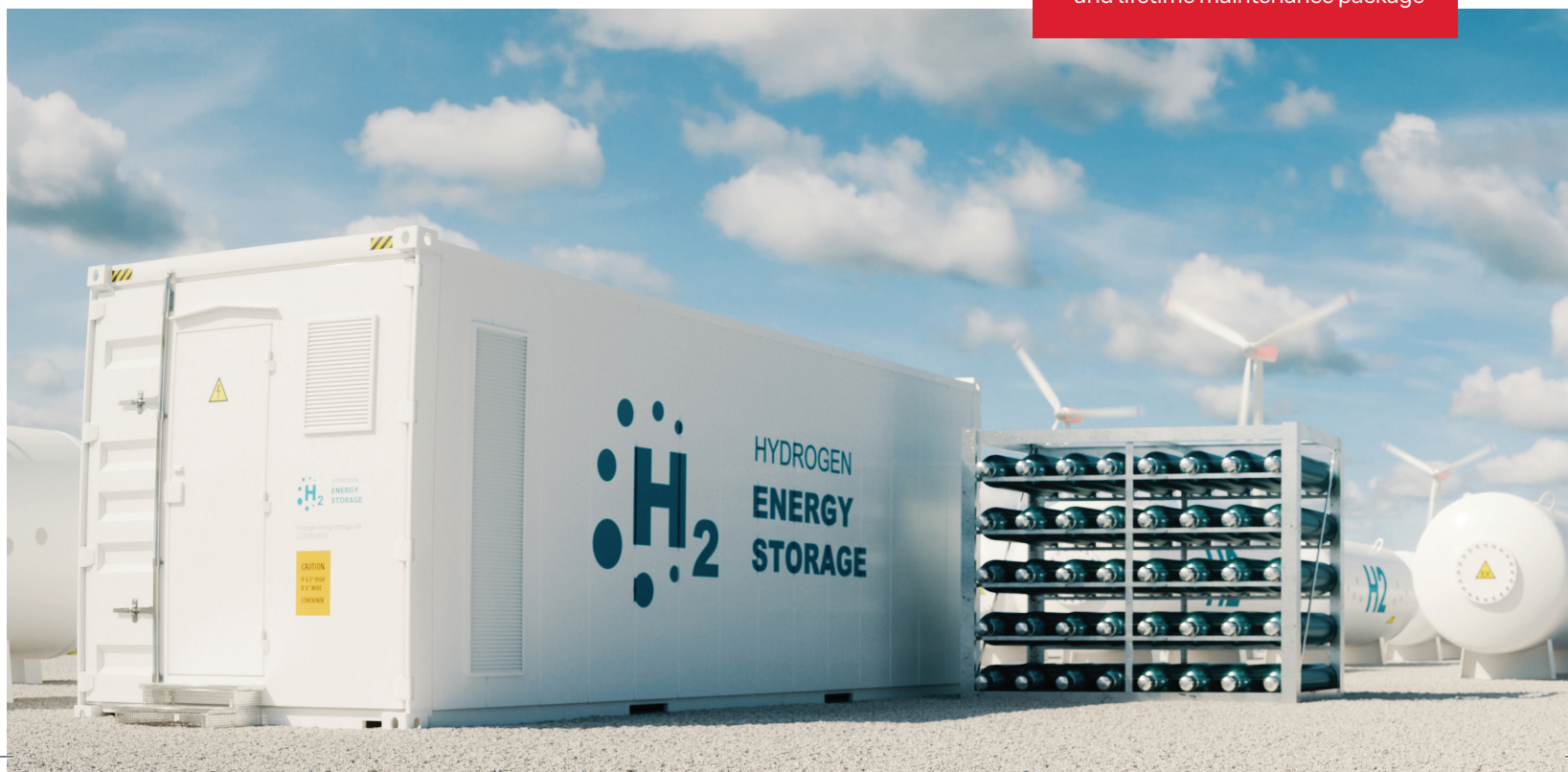
Polybed PSA uses proprietary UOP adsorbents at high pressure from hydrogen-containing process streams to remove trace contaminants such as oxygen, water and nitrogen. This allows

### KEY BENEFITS

Honeywell innovations such as the Polybed PSA system are designed to achieve operational excellence, lower tax liability, meet country and regional regulations, and deliver faster payback.

Key advantages of the Polybed PSA system include:

- Minimal hydrogen loss and reduced greenhouse gas emissions
- Increased capex savings through standardization and the smaller plot size required for the solution, which is achieved by eliminating the DeOxo reactor traditionally used in the purification process
- Consistent performance – even amid fluctuations of renewable power/hydrogen generation
- Instils customer confidence through a performance guarantee and lifetime maintenance package



hydrogen to be recovered and upgraded to more than 99.9% purity to meet various high purity green hydrogen needs.<sup>1</sup>

Polybed PSA is delivered as a skid-mounted, modular system complete with the control systems, catalyst, adsorbents, embedded process technology and compression required to condition the process gas to meet customer specifications with minimal hydrogen loss and reduced carbon footprint.

The system provides compelling economics by integrating UOP's proprietary DeOxo catalytic reaction and adsorption purification processes and delivers peace of mind through historically-proven Honeywell UOP technologies and experience. Furthermore, the Polybed PSA system's modular design reduces installation time by up to 30% versus conventional 'stick-built' construction.<sup>1</sup>

Today, more than 1,100 Polybed PSA systems have been designed, fabricated and delivered in more than 70 countries – collectively representing about 25 million Nm<sup>3</sup>/h of pure hydrogen produced.<sup>2</sup>

### **CUSTOMIZATION, SERVICE AND SUPPORT**

In addition to providing comprehensive service and support for Polybed PSA installations around the world, Honeywell UOP technical specialists can work with

customers to ensure hydrogen is delivered to the purity levels required for specific applications and/or standards, such as ISO 14687-2 for fuel cells. In addition, the solution can be tailored to customer objectives such as lower hydrogen cost of production or reduced capital expenditure.

Customers can also leverage Honeywell UOP expertise in areas such as plant operations, asset management, customized training, strategic and tactical support, troubleshooting and engineering services.

### **HONEYWELL'S GREEN HYDROGEN PROGRAM**

The Polybed PSA process is part of Honeywell's Green Hydrogen Program, which leverages decades of R&D and manufacturing experience in developing and manufacturing market-leading catalyst coated membranes (CCMs) for gas processing, refining, steel and petrochemical industries, as well as the experience in the most recent development of novel membranes for battery and power applications.

Honeywell's CCM technology has been shown in lab testing by third-party hydrogen technologists to enable higher electrolyzer efficiency and higher electric current density enabled by a breakthrough proprietary high ionic conductivity membrane and high activity catalyst.

### **COMMITMENT YOU CAN COUNT ON**

Honeywell recently committed to achieving carbon neutrality in its own operations and facilities by 2035. This commitment builds on the company's track record of sharply reducing the greenhouse gas intensity of its operations and facilities as well as its decades-long history of innovation to help customers meet their environmental and social goals. About half of Honeywell's new product-related R&D investment is directed toward products that improve environmental and social outcomes for customers.

1. <https://uop.honeywell.com/en/news-events/2020/09/honeywell-uop-polybed-psa-units-supplying-high-purity-hydrogen>
2. <https://uop.honeywell.com/en/industry-solutions/refining/hydrogen-recovery/polybed-psa-systems>



**For more information**

To learn more about Honeywell's Green Hydrogen program, please visit

[www.pmt.honeywell.com/sustainability/green-hydrogen](http://www.pmt.honeywell.com/sustainability/green-hydrogen) or contact:

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