

# Eliminating emissions and going green

Flow control solutions for  
green and blue hydrogen







# Emission-free hydrogen production for a greener future

Valmet offers a wide range of valve solutions for hydrogen applications from renewable power generation to the production of emission-free hydrocarbons and chemicals.

As the significance of responsible and sustainable industrial processes increases, the role of green and blue hydrogen as carbon-neutral fuel produced from surplus renewable energy, or through CO<sub>2</sub> removal respectively, will continue to grow.

## Going green is a global megatrend

Going green is a global mega-

trend that can be seen in all industries and everyday life in general. The same applies to hydrogen. We are experiencing a shift from the traditional gray and brown hydrogens to new emission-free green fuels. With decades of experience in industrial gas and hydrogen applications, We are equipped to serve customers taking the leap into both blue and green hydrogen.







## From production to utilization

Power-to-X (PtX) technologies based on taking surplus energy from renewable energy sources and utilizing hydrogen technologies to store it or convert it into hydrogen-based fuels or feedstock such as ammonia or methane.

### Electrolysis and carbon capture

The first step in the green hydrogen process is typically electrolysis, a process where the surplus electricity is used to create hydrogen by splitting water. Our valves perform well under the pressure and temperature requirements present in these processes. Another way to decarbonize emissions in process industries is to capture the produced carbon dioxide. Hydrogen produced in this way is called blue hydrogen.

### Sector-coupling

From there an entire value chain has emerged. The term sector-coupling is often used to describe the energy network that is formed around energy generation via H<sub>2</sub> production, including everything from the industrial sector to the residential and transportation. As the ambitions towards the total decarbonization of global industry continue, green hydrogen is emerging as a viable solution for fuelling production with no CO<sub>2</sub> emissions.

# A carbon-neutral value chain

Our valves deliver reliable performance in all the typical applications related to the industrial use of hydrogen across the entire sector-coupling spectrum.



## Green hydrogen production

Green hydrogen refers to  $H_2$  produced from water utilizing surplus renewable energy by the process of electrolysis.

Today, electrolyzers, the devices used in production, utilize technologies such as low or high temperature electrolysis.

Technological development has already seen us move up to large-scale 10MW electrolyzers, but 100MW units are not too far in the future either.

Our valves portfolio fulfil today's requirements for electrolysis applications as for PEM, AWE or SOEC electrolyzers. Our R&D is also equipped to develop solutions to meet the requirements of the future.

## Transportation of hydrogen

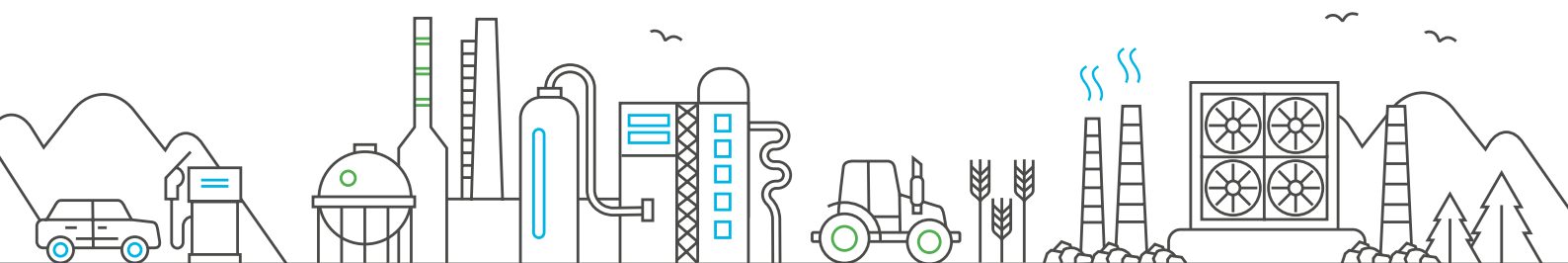
The transportation of hydrogen typically requires either compression or liquification.

Compressed gas is typically transported shorter distances using trucks and trailers. Longer distances are covered by tankers carrying liquid hydrogen or hydrogen.

For the future, the less energy-intensive liquid carriers (LHC) are the more promising option for the transportation hydrogen from producer to user. The most promising are the new developments in using ammonia ( $NH_3$ ) or the organic subset of liquid carrier (LOHC) for long distance transportation.

We are one of the few valve manufacturers that has the capacity and capabilities needed to deliver butterfly valves for control and shut-off duty in  $LH_2$  applications.

The future of sustainable industrial processes requires finding new safe and reliable ways of producing, processing and transporting materials while eliminating carbon emissions



### Green hydrogen utilization

Green hydrogen has many uses in the industrial gas sector. It is most often applied to fertilizer production with Ammonia synthesis or as feedstock for chemicals.

Our long-term experience in the refinery and petrochemical industries also help to make the usage of emission-free produced gases and liquids such as eAmmonia, eMethane, Methanol and eHydrocarbons more efficient.

Another important future usage is seen with the green fueling of fuel gas turbine. Our segment and ball valves help reach the higher pressure classes required due to the H<sub>2</sub> enrichment of the fuel gas.

### Carbon capture and storage (CCS)

Carbon capture as a means of eliminating harmful CO<sub>2</sub> emissions into the atmosphere is a key factor in developing more sustainable industrial processes.

There are many ways of carrying out carbon capture. In pre-combustion capture fossil fuels are partially oxidized by applying gasifiers. Post-combustion capture involves removing CO<sub>2</sub> from flue gas. In oxyfuel combustion fuel is burned in oxygen instead of air.

We need to also remember cryogenic separation as a carbon capture process as well as Direct Air Capture (DAC) where CO<sub>2</sub> is captured directly from atmospheric air rather than an industrial gas stream.

Each of these processes require and can benefit from reliable, durable and high-quality valves from Valmet.





## Delivering proven performance

Valmet is your valves partner for greener hydrogen processes. Our long experience and comprehensive portfolio cover the majority of applications in the industrial use of hydrogen.

Many of the world's leading industrial gas companies already rely on Neles valves for reliable performance. Also, many downstream end users turn to us when selecting valves for demanding H<sub>2</sub> and O<sub>2</sub> applications.

As many turn their focus towards the production of blue hydrogen with carbon capture or green hydrogen created by water electrolysis, the basic requirements for valves in liquid and gaseous media service remain largely unchanged.



### Portfolio for hydrogen service



Segment valves



Butterfly valves



Globe valves



Ball valves



Eccentric plug valves





# Valmet solutions for green hydrogen

Valmet offers a wide range of high-quality valve solutions for green and blue hydrogen applications.

We produce a wide range of segment, butterfly, globe and other valves that have proven themselves in long-lasting service over many decades. Our valves deliver superior performance in low temperature electrolyzers as well as in those that are subject to high temperatures reaching up to 800°C (600°C with our standard offering). All our valve products are supported by our comprehensive service offering and service network.

## Fast and accurate valve control

Electrolyzers must typically react very quickly to variations in supply when it comes to renewable energy. This means that internal processes require fast adjustment, and the valves need to deliver accurate control with quick response times. Our positioners are excellent for providing fast and extremely accurate valve control.

## Addressing the needs of new technologies

New electrolysis technologies are also creating the need for valves that can ensure both high capacity and

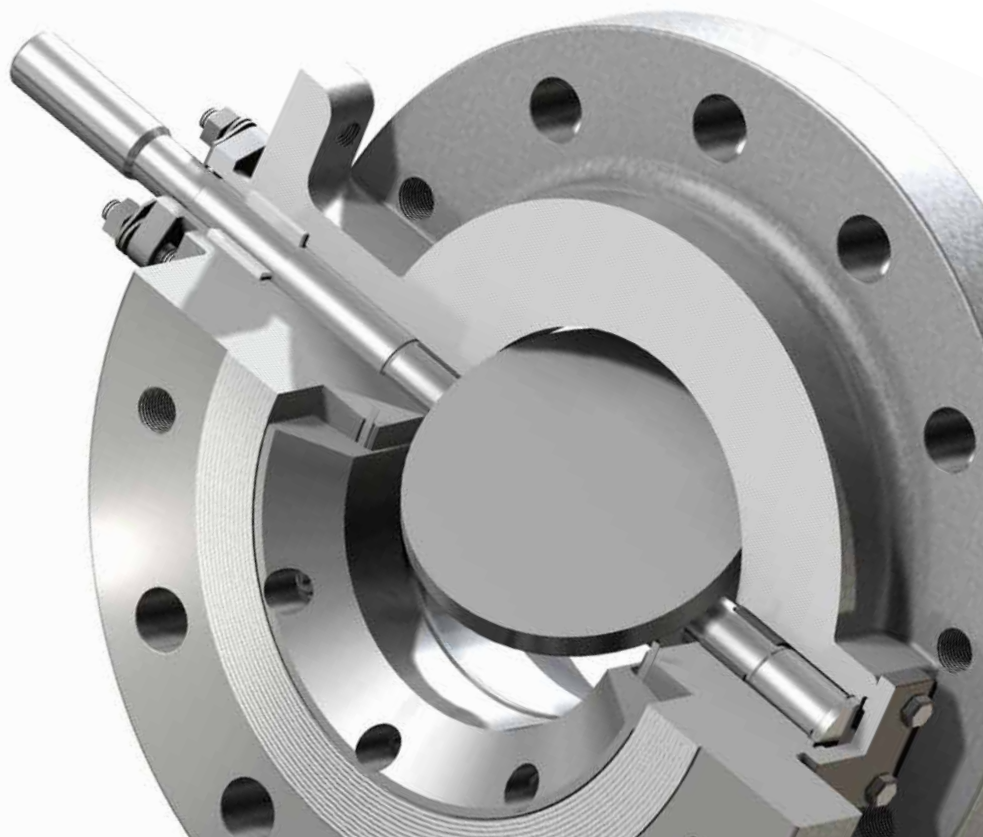
low pressure losses respectively. Our segment valve offering and the L-series butterfly valves with their 2-shaft design are particularly strong performers in this area.

## Tested and proven performance

All of our valves are designed for long-lasting tightness, minimized fugitive emissions and low differential pressures. We want each of our

valves to be environmentally friendly, energy efficient and reliable in operation. We provide field-proven designs and tested performance in each and every valve delivery.

In addition to a wide range of flow control solutions, we also offer automation solutions to further improve your efficiency and reliability in PtX applications. We call it Valmet DNA.





Valmet's professionals  
around the world work close  
to our customers and are  
committed to moving our  
customers' performance  
forward – every day.

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