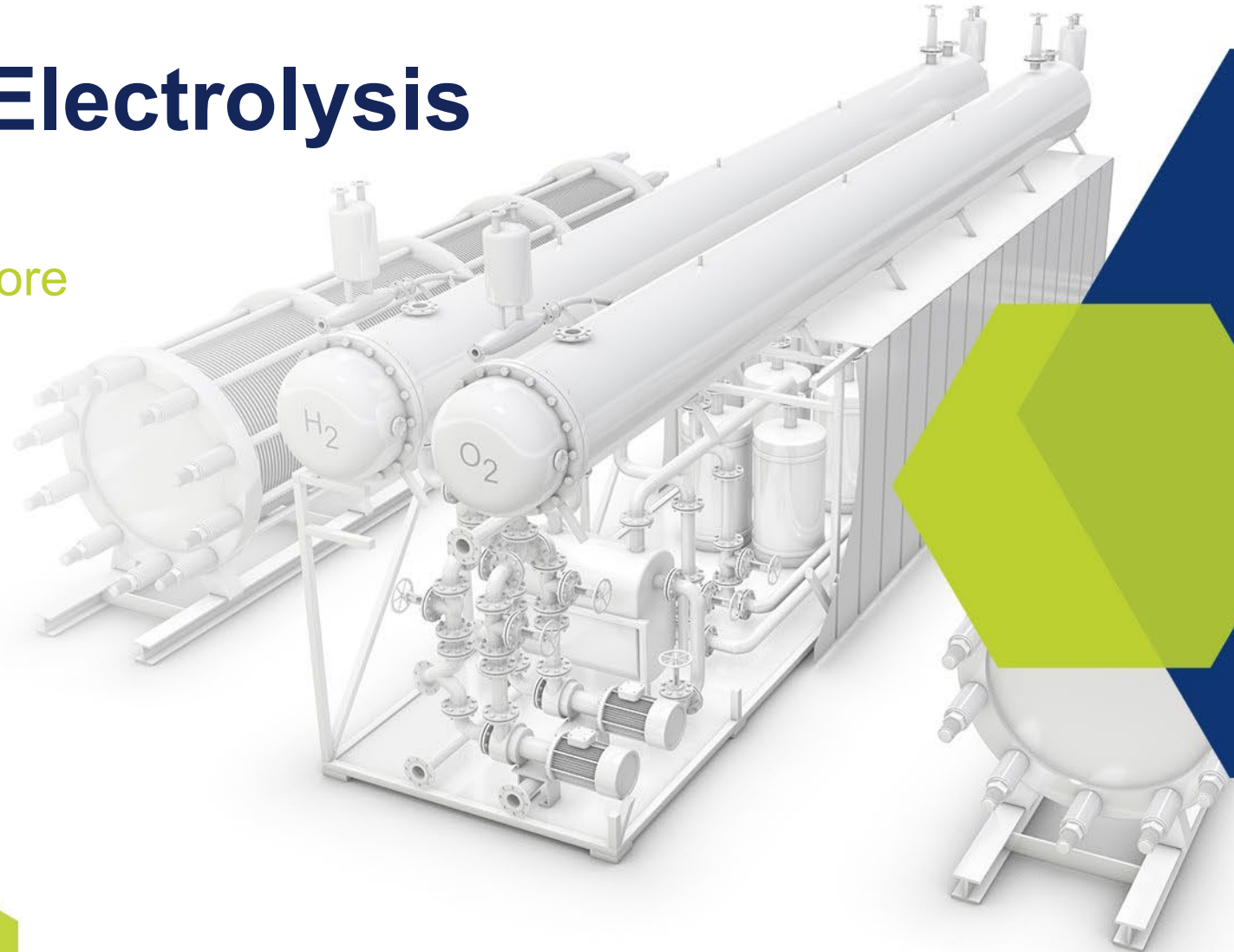


Case Study – Electrolysis

Frenzelit gasket materials:
The tighter the seal, the more
efficient the operation!



Electrolysis

Introduction



Definition of electrolysis

Water is converted into hydrogen (H_2) and oxygen (O_2). Consider electrolysis in connection with the production of hydrogen. Here, a redox reaction is triggered by means of electrical energy.

A single electrolysis cell consists of two electrodes (cathode and anode) and an electrolyte, whereby the electrolyte used determines the type of electrolyzer.

Frequently used forms of electrolysis

- Alkaline electrolysis: strong alkali as electrolyte
- PEM electrolysis: thin solid polymer membrane (Proton Exchange Membrane)
- High-temperature electrolysis: solid oxide electrolyte (e.g. ceramic zirconium dioxide)

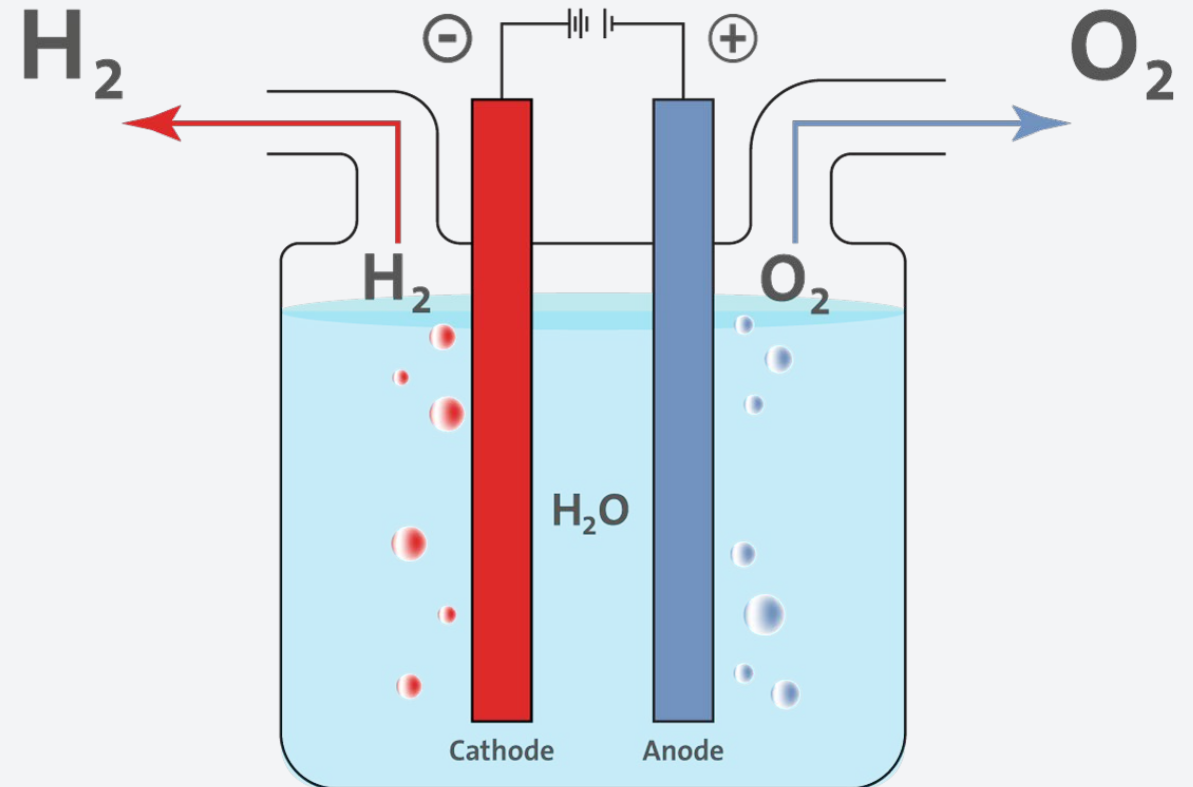


Illustration of electrolysis

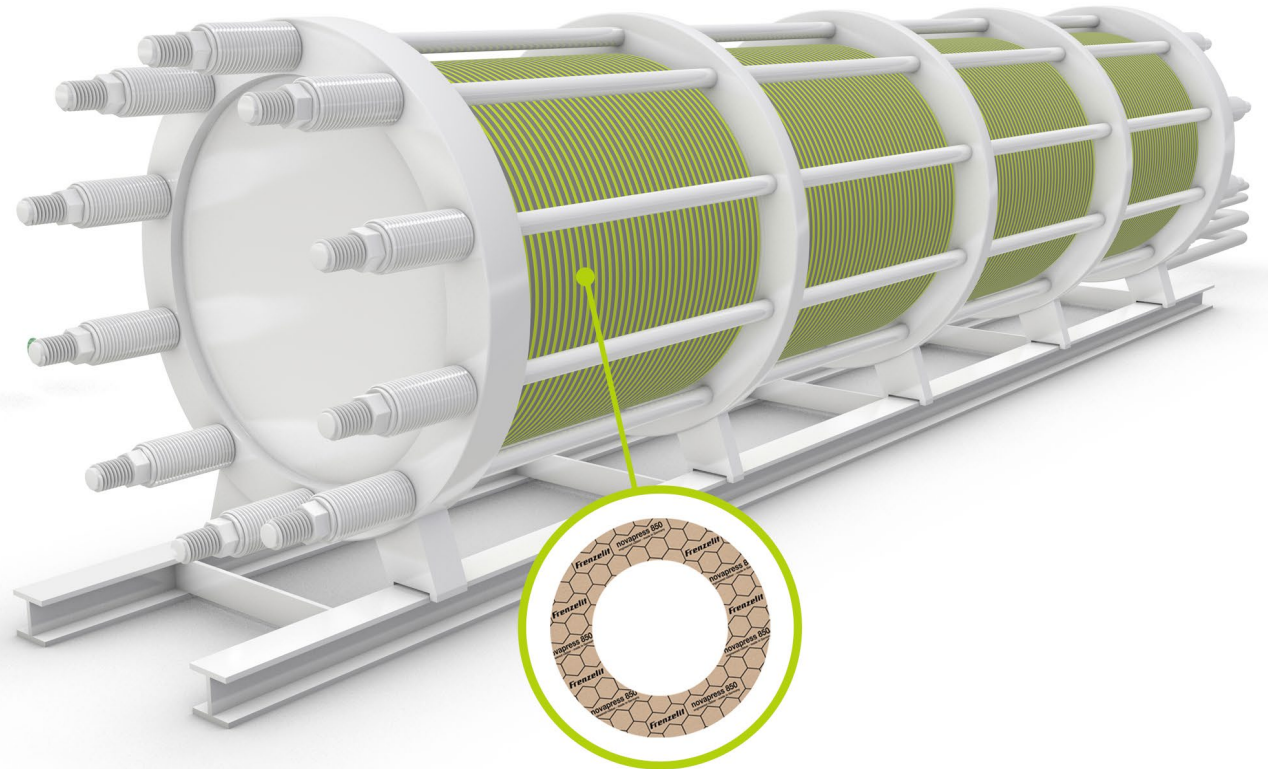
Use in an electrolyzer

Gaskets within the stack



Since individual electrolysis cells can only produce a small amount of power, a **stack structure** is generally used in practice, particularly for industrial-scale applications. In this process, several electrolysis cells are connected in series to build a powerful electrolyzer.

The individual electrolysis cells must be **sealed off from one another** within the stack. The **gasket materials** used in these scenarios must meet demanding specifications. They must be **permanently chemically resistant** to the media hydrogen, oxygen and the electrolyte used in the system. Moreover, **long-term resistance to the operating temperatures and pressures** must also be ensured. Similarly, the gasket materials must have very good **mechanical stability** and a **defined setting behavior** to prevent deformation and leaks in the stack structure. Finally, in some types of electrolysis the gasket **must not** contain any **soluble ionic components** that could be washed out of the material, thus altering the conductivity of the electrolyte.



Use in an electrolyzer

For sealing tanks

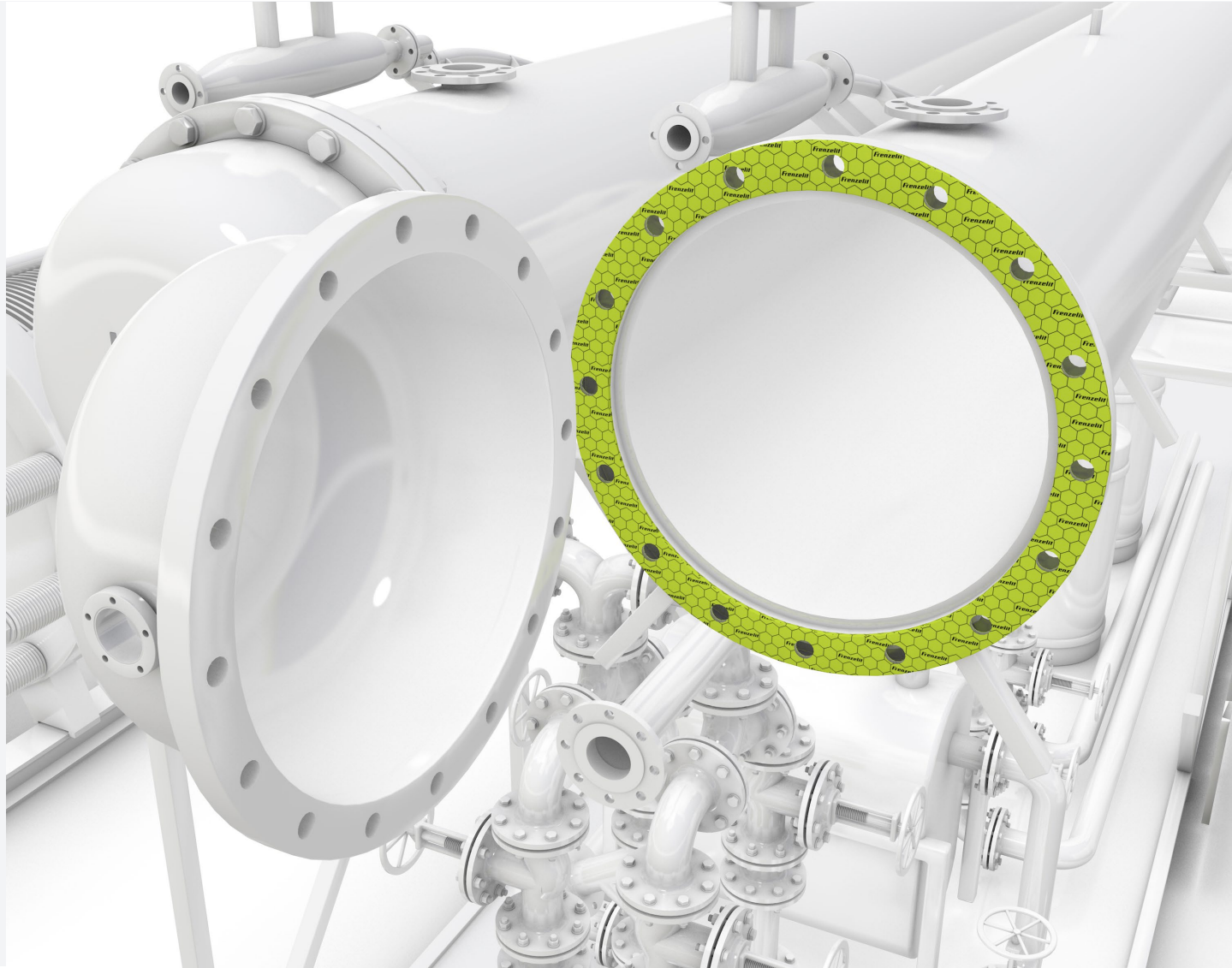


During electrolysis, the water is broken down into its components hydrogen and oxygen.

These gases, some of which are highly explosive and flammable, are stored in large containers or tanks. Because extremely high pressures often prevail in these applications and there is a risk of explosion if the gases escape, ultra-high-performance gasket materials are required.

Gasket selection:

- novapress®
- novamica®
- novaphit®



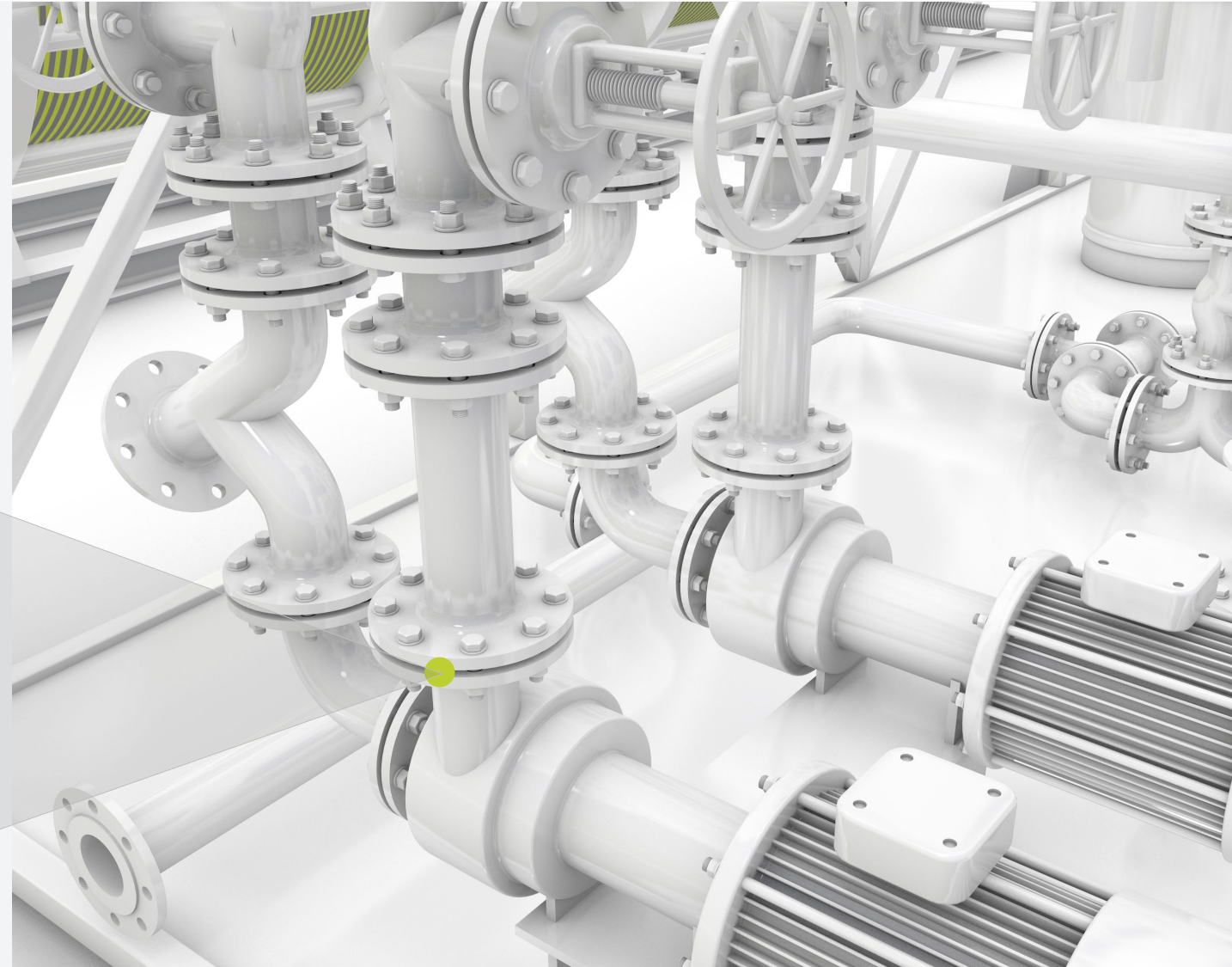
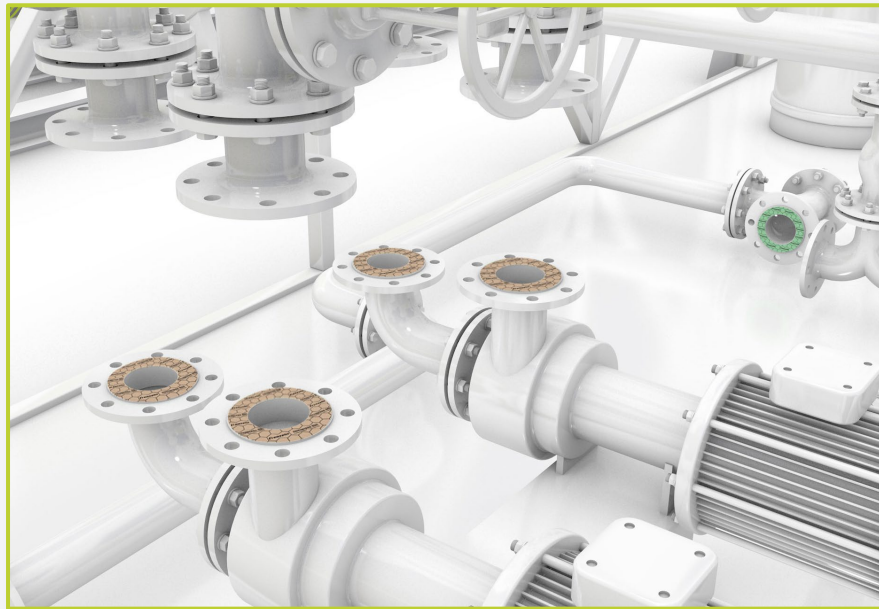
Use in an electrolyzer

Gaskets in the supply and discharge lines



Frenzelit gaskets can also be used in these applications. Here they act as a **flange gasket**, sealing the pipe connections in the supply and discharge systems of the electrolyzer.

Media resistance as along with excellent leakage behavior are also important here in order to do justice to the small molecular size of the hydrogen.



Gasket selection

High performance – The tighter the seal, the more efficient the operation

Summary

- ✓ Very good leakage performance of the gasket material for high electrolyzer efficiency
- ✓ Media resistance (e.g. strong alkalis in alkaline electrolysis)
- ✓ High temperature resistance (high temperature electrolysis up to 1000 °C)
- ✓ Electrical insulation when used within the stack
- ✓ Very good mechanical properties: low creep, defined setting behavior → Electrolyzers must not deform during operation.
- ✓ Long service life of the materials to ensure the electrolyzers require little maintenance and remain operational

Other application areas outside the electrolyzer


- ✓ Pipelines for supply and discharge lines
→ Sealing is the decisive factor in ensuring electrolyzer efficiency. The following applies here as well: The tighter the seal, the more efficient the operation!
- ✓ Various gasket materials are suitable depending on the type of electrolysis.




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