

# Water treatment for sustainable hydrogen

Clean, efficient, indispensable.



Using water intelligently  
**envirofalk.com**

Results that speak for themselves!

# Strong figures. Clear advantages.



## 40 years experience in the water sector

At EnviroFALK, everything revolves around one thing: using water sustainably, safely and efficiently. For industrial processes, energy generation, hospitals, laboratories, pharmaceutical and high purity applications. Because water is unspeakably precious!



## More than 400 active service customers

With EnviroFALK water treatment systems, you are not only opting for first-class water technology, but also for top service. Our team supports you exactly where you need us. On site or through our digital service platform WaterExpert™.



## Over 500.000 m<sup>3</sup> of treated water per day

As unique as every industry is, so individual are the requirements for our water treatment plants. Hydrogen production, for example, requires a constantly high purity water treatment to feed the electrolysis electrolysis plants. Day after day.



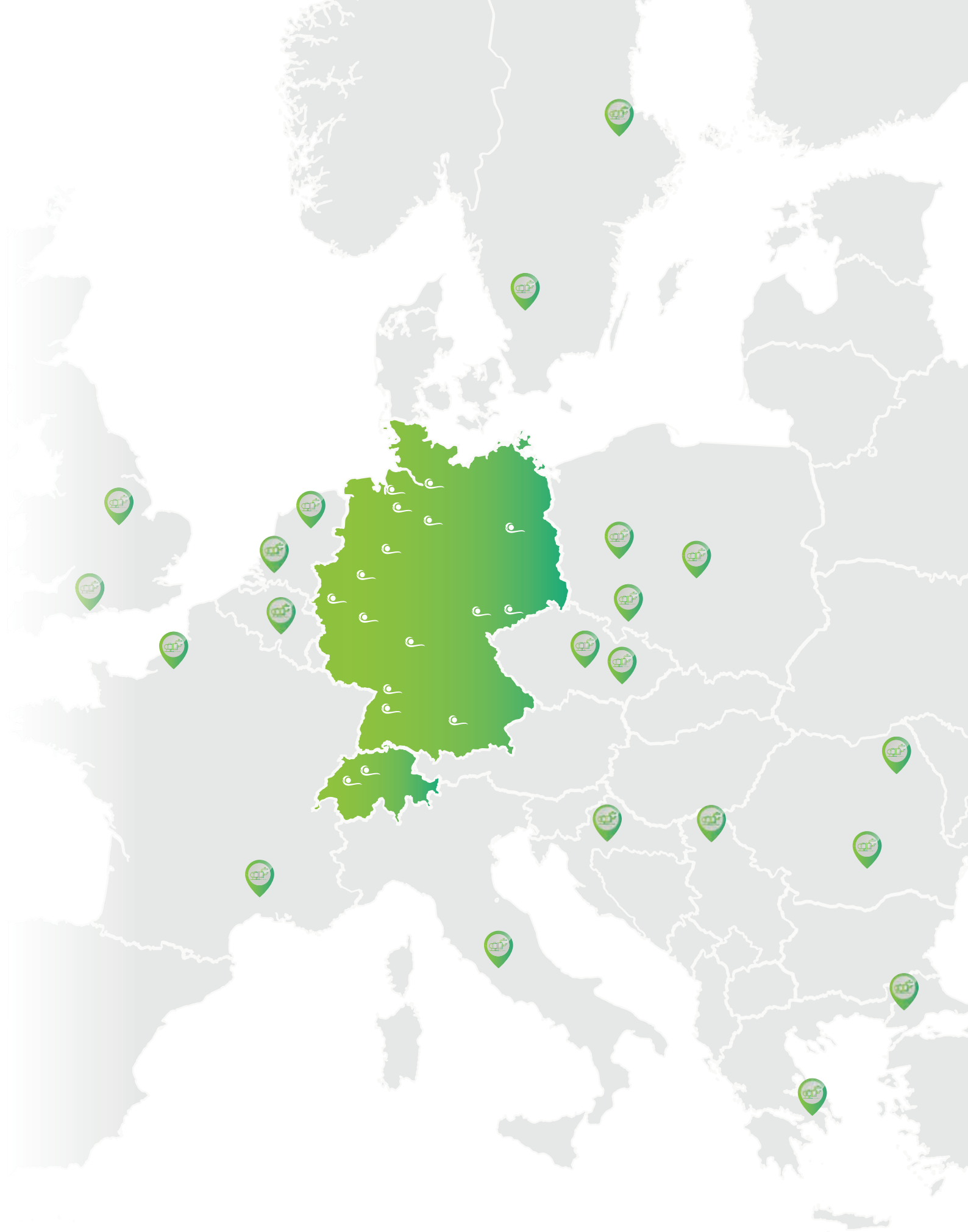
## In use worldwide

In addition to our core markets, such as DACH and Europe, our water treatment plants are in use worldwide. For example in Japan, Thailand, China, the USA, Mexico and Chile.



## Why EnviroFALK water treatment systems?

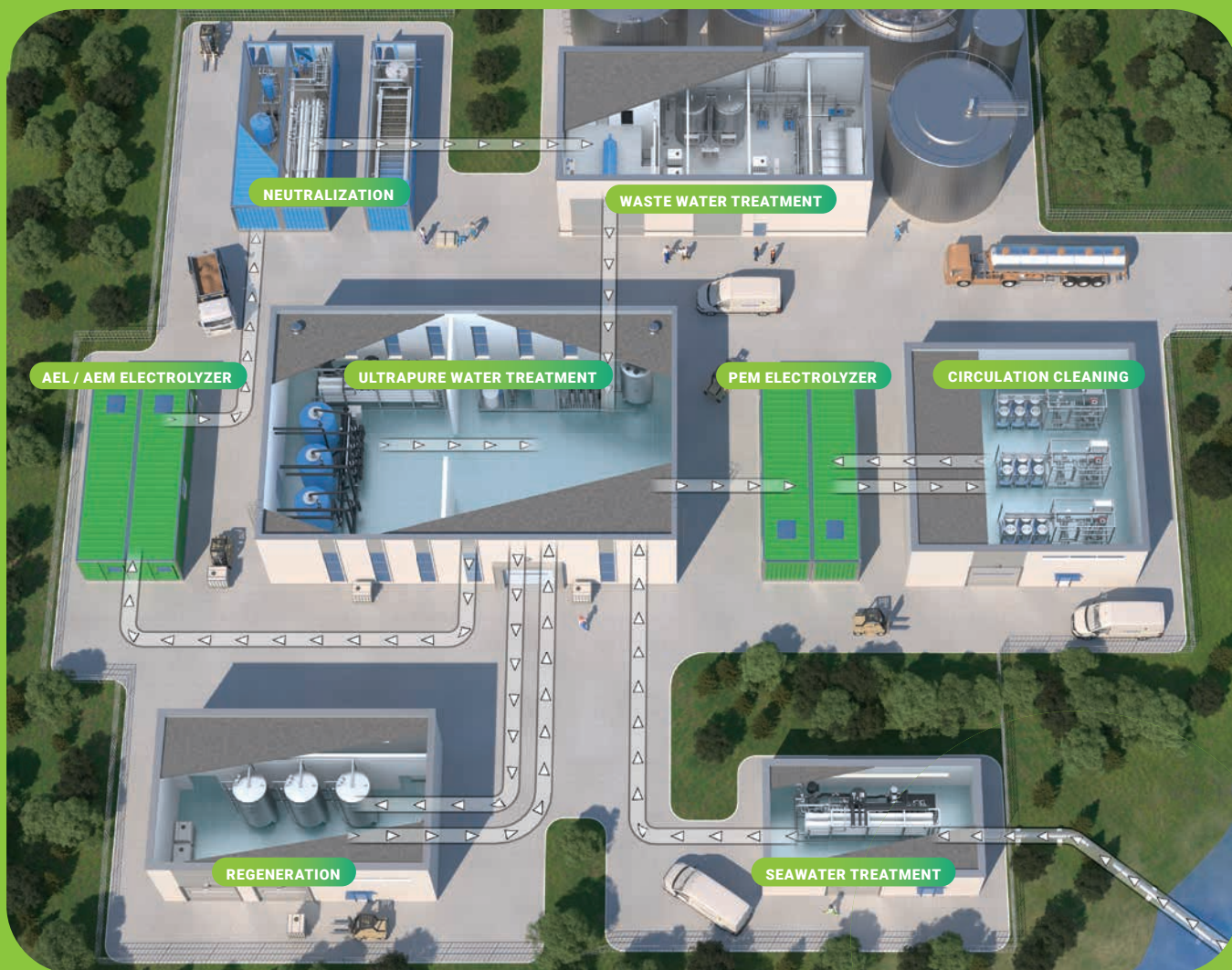
We drive technologies forward, develop solutions and continuously expand our range of services and expert knowledge. Thanks to our network of specialists, the EnviroWater Group, we cover all areas in which water plays a role.



Locations – EnviroFALK



International water treatment systems – Made by EnviroFALK



Clean, efficient, indispensable.

# Hydrogen, the element of the future

As hydrogen is mainly present on earth in bound form, it must be converted into its molecular form for technical use. Various types of electrolysis systems, known as „electrolysers“, are used here to split water into its chemical components hydrogen ( $H_2$ ) and oxygen ( $O_2$ ) using an electric current. The resulting coupling between electricity and gas infrastructure is known as power-to-gas (PtG).



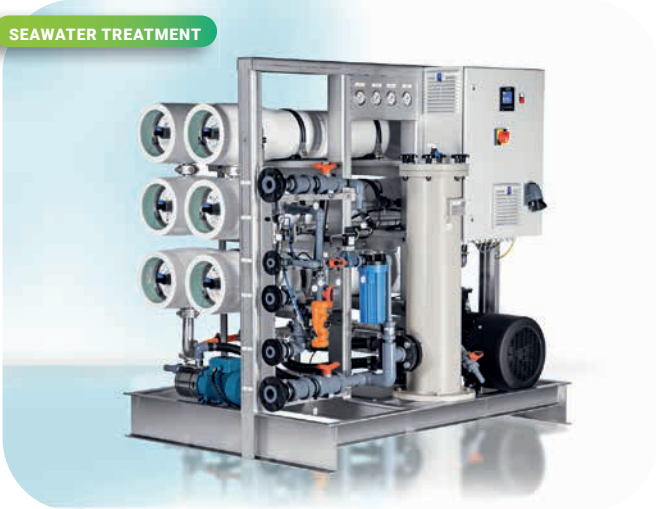
WASTE WATER TREATMENT



CIRCULATION CLEANING



SEAWATER TREATMENT



ULTRAPURE WATER TREATMENT



## Highest requirements for High Purity Water

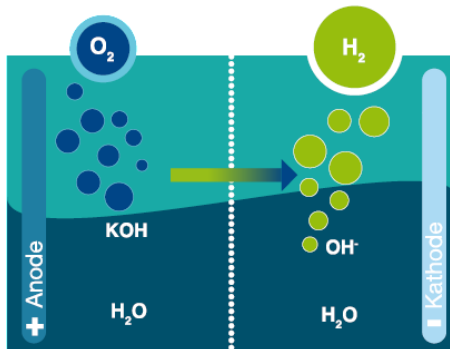
We are very familiar with the strictly regulated purity requirements for a wide variety of water qualities. What can you expect from us? Many years of expertise, pioneering process technologies and in-depth industry knowledge. Because with the EnviroWater Group you will be advised by experts who are familiar with your specific water treatment requirements for electrolysis systems. We develop cost-effective solutions along the entire water treatment life cycle of water treatment.

Precisely fitting, effective, sustainable.

# For every electrolysis process the right water treatment

Electrolysis is the technical process of splitting water ( $H_2O$ ) into its components hydrogen ( $H_2$ ) and oxygen ( $O_2$ ) using an electric current.

This overall reaction can be achieved using various methods:

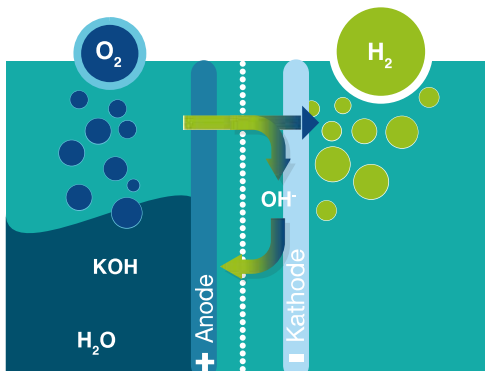
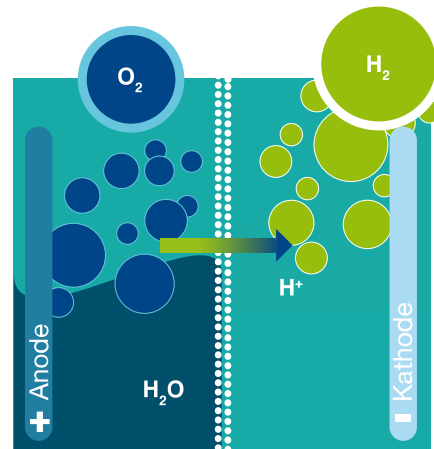


## Alkaline electrolysis (AEL)

- In AEL electrolysis, a potassium hydroxide solution (KOH) (approx. 20 to 40 % potassium hydroxide) is used as the electrolyte
- At the cathode, the application of an electrical voltage splits water into hydrogen and hydroxide ions ( $OH^-$ )
- $OH^-$  ions migrate from the cathode to the anode, where they react to form oxygen and water

## Proton exchange membrane Electrolysis (PEM)

- In PEM electrolysis, a proton exchange membrane is used as the electrolyte. While both the anode and cathode are flushed in AEL, in PEM only water is added to the anode.
- At the anode, the application of an electrical voltage causes water is split into oxygen and hydrogen protons ( $H^+$ )
- $H^+$  ions migrate through the membrane to the cathode and react with electrons to form hydrogen



## Anion exchange membrane Electrolysis (AEM)

- In AEM electrolysis, as with AEL, a potassium hydroxide solution (KOH) (approx. 1 % potassium hydroxide) is used as the electrolyte
- When an electrical voltage is applied, water molecules migrate through the membrane, where they are reduced at the cathode to hydrogen and hydroxide ions ( $OH^-$ ) are reduced
- The  $OH^-$  ions migrate back to the anode and react to form oxygen

Intelligent, well thought-out, tried and tested.

# Expertise along the entire value chain



## Feed water

Depending on the feed water quality, the **drinking water is treated to produce high purity water for electrolysis** in several process stages and process combinations. Precise detail engineering right from the start.

- Pre-filtration  
e.g. through backwash filters, gravel filters, activated carbon & ultrafiltration
- Softening systems alternatively with antiscalant dosing
- Desalination >99 % via reverse osmosis
- CO<sub>2</sub>-removal by means of membrane degassing
- Complete demineralization via electrodeionization (CEDI) or via 2nd RO stage
- Storage and distribution of high purity water by means of a downstream buffer tank
- TOC treatment (optional)
- Polisher

## Circulation cleaning

Circuit cleaning is essential for **maintaining the water quality within PEM electrolysis systems**. The ions released during the electrolysis process, such as metal ions and fluoride, are removed here, such as metal ions and fluoride are removed by means of a circulation cleaning system.

- Process water cooling unit (optional)
- Ultra-pure resin polisher  
for continuous desalination to <0.1 µS/cm
- Particle filtration <3 µm
- Plug & play: simple system  
for quick polisher changeover
- Degassing system  
for residual removal of H<sub>2</sub> and O<sub>2</sub> (optional)
- Modular system solutions



## Technical data

# Feed water Water treatment

The specific data of your water treatment system depends on the requirements profile. The experts at EnviroFALK will be happy to help you!

### Water treatment material [ AEL, PEM, AEM ]

Plastic: PE, PP-H, PVDF / Stainless steel: 1.4404, 1.4571 / Hybrid

### Producer output

100 to 25.000 l/h

### Ultrapure water quality

< 0.1 µS/cm, particle-free

### Operating pressure

16 bar

### Procedure

Softener, reverse osmosis, EDI, mixed bed polisher

### Optional

Antiscalant dosing / membrane degassing / UV treatment / TOC monitoring

### Design temperature

up to 90 °C

### Control and visualization

e.g. S7-1500/TP900 or integration in customer control system

### Plant layout

3D STP-Format



## Technical data

# Circulation cleaning

The specific data of your water treatment system depends on the requirements profile. The experts at EnviroFALK will be happy to help you!

### Water treatment material [ PEM ]

Plastic: PE, PP-H / Stainless steel: 1.4404, 1.4571 / Hybrid

### Circulating capacity

modular, typically factor 10-15

### Operating temperature

up to 60 °C

### Design temperature

up to 90 °C

### Operating pressure

up to 50 bar

### Procedure

Ultra-pure resin polisher, plug & play system

### Control and visualization

e.g. S7-1500/TP900 or integration in customer control system

### Plant layout

3D STP-Format





Clear solutions for pure water  
**References of EnviroFALK**

[envirofalk.com](http://envirofalk.com)



# Experts in the hydrogen value chain rely on EnviroFALK high-purity water technology.

A German family-owned company with a global network of production, sales, and service locations is driving forward the energy infrastructure of tomorrow, the energy transition, and the circular economy with holistic solutions. The experts specializing in the hydrogen value chain offer, among other things, hydrogen production systems.

## Water treatment circulation systems for hydrogen production

EnviroFALK has launched a pioneering collaboration with the company specializing in turnkey, containerized hydrogen plants: the targeted expansion of sustainable water treatment systems! Together, the experts implement customized high-purity water solutions precisely tailored to the requirements of global hydrogen production—efficient, sustainable, and future-oriented.

Another key to this joint success lies in the close partnership with IFM. This collaboration enables EnviroFALK water treatment systems to be equipped with state-of-the-art sensor technology. Whether flow, conductivity, or fill level—every measurement point is equipped with IFM sensors, ensuring maximum process safety and transparency.



# Water treatment technology for the production of hydrogen in Germany

For the production of sustainable chemical and energy products, EnviroFALK supplied the water treatment technology for green hydrogen production to a leading global energy company in Germany. For hydrogen production, the company uses electrolysis plants that **convert regeneratively generated electrical energy into hydrogen**.

## Process water technology as the key to hydrogen production

The water treatment system is based on the ion **exchange process**. The fully demineralized water is continuously circulated through the PEM electrolyser. The electrolysis system contains a solid polymer electrolyte, a so-called proton exchange membrane. To ensure maximum production reliability, the membrane must only be flushed with fully demineralized water. The PEM plant **enables hydrogen to be obtained from electricity instead of natural gas**, thereby reducing the energy company's CO2 intensity. The aim of the site is to produce clean fuels and petrochemicals and at the same time use the hydrogen in transportation and other sectors.

The emission-neutral hydrogen produced enables refineries to gradually replace the previously used "grey hydrogen" from the steam reforming of natural gas, gradually replace it.



# Improved electrolysis efficiency thanks to specialized water treatment for a chemical company in Ludwigshafen

PEM (Proton Exchange Membrane) electrolyzers play a central role in the sustainable hydrogen production of the future, particularly due to heavy load changes in the renewable energy sector. However, due to the precious metals used, this technology is very sensitive in terms of water quality, which makes the **continuous treatment of the process water of crucial importance** for the efficient and sustainable operation of PEM electrolyzers.

## Pioneering work in the field of closed-loop cleaning

EnviroFALK recognized this need early on and has built up outstanding expertise through more than a decade of experience in this field. In cooperation with renowned manufacturers of electrolyzers worldwide, the company has continuously improved the process to meet all the needs of its customers.

**Ion leaching** is a process in which ions or salts are dissolved out of a solid material through contact with a liquid. Despite the use of precious metals, this effect in PEM electrolyzers leads to an increase in the conductivity of the water and therefore to a reduction in the efficiency and service life of the overall system. The released ions are removed from the system through the circulation cleaning process, thus meeting the high water quality requirements. This is also the case with a large-scale plant for a chemical company in Ludwigshafen. With a circulation capacity of 150 m<sup>3</sup>/h, the efficiency and service life can be significantly increased again and smooth operation ensured.





# Energy company in Singapore relies on seawater treatment

Traditional freshwater sources are often overused or affected by environmental pollution. Seawater treatment offers an alternative and efficient solution to meet the increasing demand for water in a sustainable and resource-saving manner.

## State-of-the-art technologies in efficient systems

The water treatment plant is redundant with a capacity of **20 m<sup>3</sup>/h** and consists of RO fresh water generators **designed for drinking water production**. In addition, UV disinfection and hypochlorite dosing systems are integrated to ensure safe treatment. The water treatment system is mounted on a skid and complies with ATEX directives, which ensures safe use in potentially explosive environments.

The water treatment system **complies with both the Norsok standard and the COP-TCD standard**. These standards guarantee the high quality and safety of the system. The documentation and the LCI (Last Control Index) were created in accordance with the COP requirements to ensure transparent and traceable operation.



# For a long life of your water treatment system

In addition to planning & consulting, project planning and operational implementation, our service promise also includes reliable maintenance of the systems, as well as comprehensive and individually tailored services for our customers.

In order to provide the best possible support for your water treatment system life cycle management, we offer you the best possible support and advice in the area of service and maintenance.



## Shared Stock

We implement an automated spare parts inventory management system for you and identify critical spare parts for your water treatment plant.



## Assembly & Commissioning

We only leave when your new water treatment system is running perfectly and are happy to make sure it stays that way.



## training courses

Contact us and together we will develop a training and familiarization concept for your employees on how to use our water treatment system.



## For every application the right ion exchange resin & regeneration service

Every industry has its own specific requirements and guidelines when it comes to desalinated water. This is also the reason why EnviroFALK's ion exchange resins are precisely tailored to the area of application.

In addition, we professionally recycle the resins in the ion exchanger in our modern regeneration stations.

**Sustainability par excellence!**



## Augmented-Reality Support

The use of smart glasses can significantly improve the efficiency and accuracy of maintenance operations.

It enables us to provide remote support from our experts in real time at the customer's site and supports visual inspections to check the condition of system components.



We tailor your water treatment perfectly to meet your specific challenges!

# Three centers of excellence. One brand. Your optimal water solution.

Water treatment is more than just technology – it's a matter of expertise, industry knowledge, and customized solutions. With our three centers of excellence, we offer the right solution for every challenge – efficient, reliable, and sustainable.



Whether for laboratories, hospitals, or industrial applications – we offer standardized and customized water treatment systems, including comprehensive ion exchanger services, to ensure smooth operations.

**EnviroFALK  
Prozesswasser-Technik**

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Your partner for high-purity applications in the pharmaceutical, cosmetics, and semiconductor industries, as well as hydrogen production. Our validated systems meet the highest regulatory requirements.

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Innovative and sustainable water treatment concepts for building services engineering, heating and cooling circuit technology, and boiler feed water treatment.

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# We are where you are.

Our offices throughout Germany and Switzerland

Are you looking for water treatment technology?  
Learn how to use water intelligently,  
cut operating costs and make savings:



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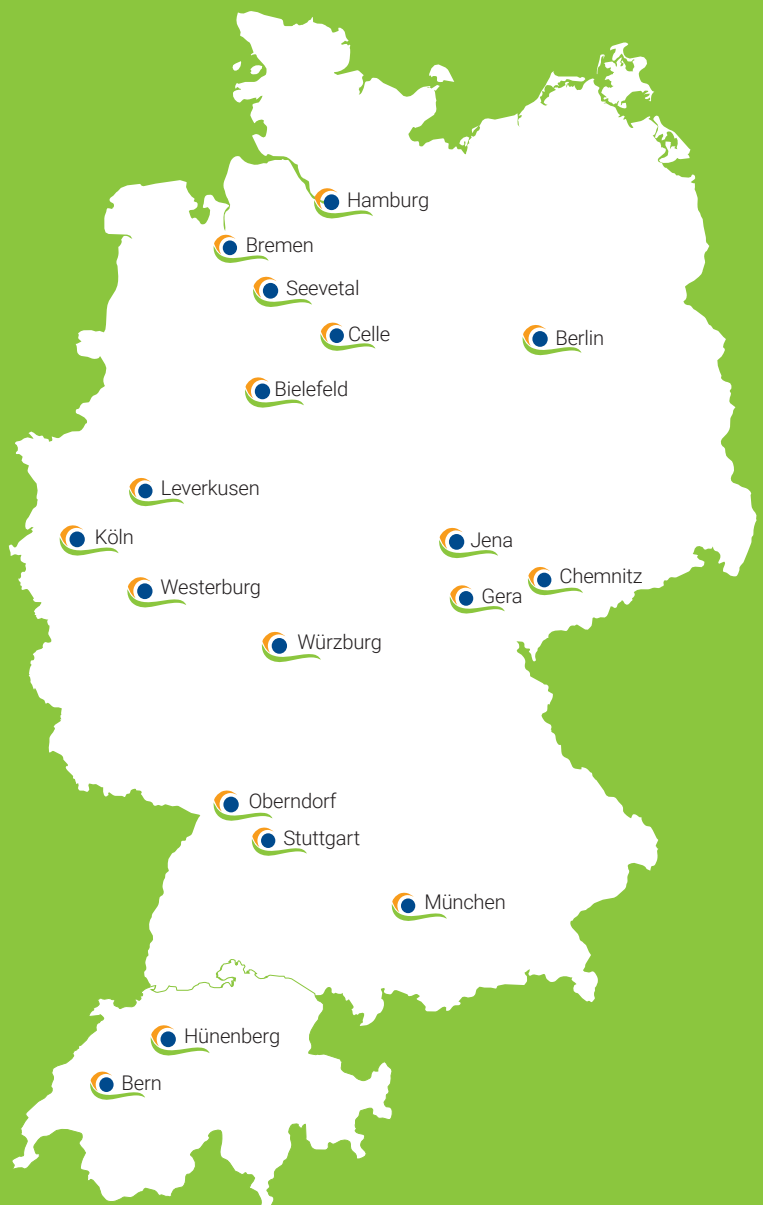
With one of our numerous branches,  
we are sure to be close to you.

We look forward to seeing you!



EnviroFALK is a company  
of the EnviroWater Group.

The EnviroWater Group combines the expertise of several companies to form a network of specialists for the treatment of industrial water, process water and wastewater.



Using water intelligently  
**www.envirofalk.com**