

GEMÜ butterfly valves in the Niedernhall waterworks Partial deionization using the CARIX® procedure

To begin with, the raw water that is fed in is filtered in the Niedernhall waterworks over the course of various preparation phases using ultra-filtration, is softened using an ion exchanger and then sanitized via UV disinfection. 300 m³ of water is treated every hour – equating to 2.2 million m³ every year.

The plant is run by the North East Würtemberg water distribution management authority and its most notable feature is the ion exchange using the CARIX® procedure (Carbon Dioxide Regenerated Ion Exchangers). The fact that this procedure has particularly low operating costs and is environmentally friendly is especially advantageous.



Ultra-filtration

After coarse filtration, the water requiring treatment is fed under pressure (0.1 - 0.8 bar) through porous diaphragms with a pore size of approx. 0.01 µm. This enables the finest solids, turbidity and pollens, as well as germs, to be retained. The water, dissolved ingredients such as hardening salts or minerals, and small molecules can pass through the diaphragm.



Ultra-filtration plant

Partial deionization and regeneration: The CARIX® procedure

Using ion exchange (mixed-bed filter), the hardness components calcium and magnesium, and undesirable substances – such as nitrate, sulphate and chloride - are approximately halved in the sanitized but still hard water.

Carbonic acid is generated as a by-product, and it breaks down into water and carbon dioxide (CO₂). This is then removed in the secondary pure-water degasifier before the treated water is transferred to a pure-water container and is fed into the municipal water supply following UV sterilization. During the subprocesses, the water hardness is reduced from 27° dH to the optimal level of 13 to 14° dH (from hard to medium).

Raw water is used as a regeneration agent for the mixed-bed filter, which has been enriched with CO_2 – the direction of the „exchange reaction“ is therefore reversed during the regeneration process: Under pressure, CO_2 is then dissolved in water and this creates carbonic acid. The carbonic acid is then channelled in the counter current over the mixed-bed, which is regenerated as a result. The exchanger resins are therefore returned to their initial state.

Most of the CO_2 that is required for regeneration is recovered (approximately 95%) and fed back into the process.

This regeneration principle and recovery of CO_2 is the key element of the CARIX® procedure and turns it into a particularly environmentally friendly and resource-saving procedure to partially deionize water.



Softening using the CARIX® procedure

GEMÜ products

Alongside pneumatically and manually operated GEMÜ butterfly valves in nominal sizes up to DN 400, ball valves and plastic butterfly valves are also used in all treatment processes for the distribution of raw water and treated water at the Niedernhall waterworks.



GEMÜ D480 butterfly valves in the ultra-filtration plant