VEOLIA

CARIX®

Economical and environmentally-friendly water softening

WATER TECHNOLOGIES

The challange

Many regions of the world have to deal with the problems that come with having hard water or elevated nitrate, sulfate and chloride levels in drinking water.
A side effect of hard water is lime scale, which is caused by calcium, magnesium and hydrogen carbonate dissolved in the water.
Increased concentrations of sulfate and chloride can also have a corrosive effect on concrete and metal, whereas nitrates in higher quantities are harmful to one's health.
That is why many households and businesses frequently rely on decentralized water softening units, which must be regenerated with the aid of environmentally harmful chemicals such as acid, lye or saline solutions.

The solution

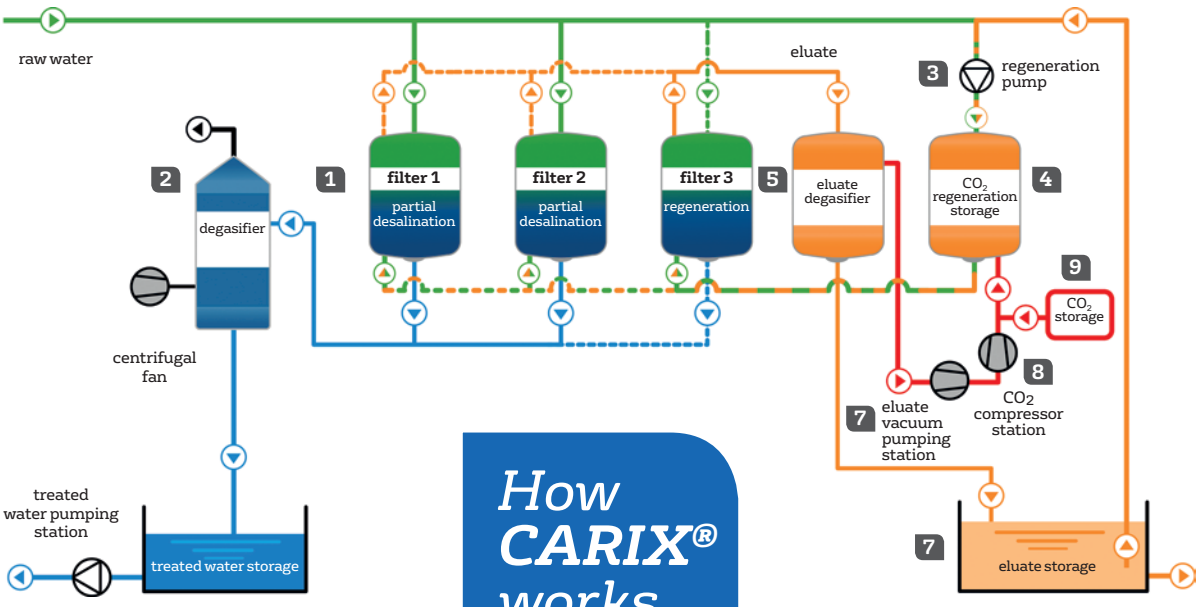
CARIX® (CArbon Dioxide Regenerated Ion EXchanger) allows for a powerful removal of cations, such as calcium and magnesium as well as anions, such as sulfate, nitrate and chloride. Additionally, the ion exchange materials can be regenerated with carbonic acid in a very environmentally friendly manner. **CARIX®** is the only ion exchange process in the world, where the product won (carbon acid) during the loading process can be used for the regeneration of the filter material.

Thanks to this type of regeneration, the wastewater contains the right ratio of substances that were absorbed during the softening process. The wastewater is a carbonated »mineral water« of drinking water quality that is free of solids. Unlike other desalination technologies, with **CARIX®** there is no salinisation of the wastewater that would otherwise be caused by the regeneration chemicals or the entry of phosphates when using antiscalants (nanofiltration, reverse osmosis).

Soft water saves money and time!

CARIX® soft water protects plumbing, fittings and equipment against hard water deposits and corrosion, saves energy and increases the service life. For instance, an encrusted heating element in a washing machine requires up to 20% more energy when it comes to heating, before a premature breakdown makes an expensive replacement necessary. With soft water the cleaning expense is reduced considerably, and can lead to savings up to 50% when it comes to detergent and cleaning agent usage.

The first plant went operational in 1986 and has delivered top-quality drinking water since then.



How CARIX® works

Process description

The untreated water flows through the ion exchange filter 1 from top to bottom. The partial desalination takes place here. The process reduces calcium, magnesium, carbonate hardness, sulfate, nitrate and chloride, and CO_2 forms as a reaction product, which is then removed from the water in the downstream degasifier 2. During regeneration, the exchanger resins are restored to their original state by removing the ions absorbed during the loading process and replacing them with H+ and HCO_3- ions accumulated from the regeneration solution (CO_2) in the water. To achieve this, the untreated water is pumped by means of a regeneration pump 3 to the regeneration storage tank 4 and gets enriched with CO_2 from the recovery process 7 8 and, if necessary, from a CO_2 tank 9. The regeneration solution (CO_2-enriched water) flows from the regeneration storage tank 4 to the exchanger filter.

In the eluate degasifier 5, approx. 95% of the CO_2 is recovered from the regeneration stream and pumped back 7 to the regeneration storage tank by an oil-free compressor station 8.

The eluate, which is the wastewater from the regeneration process, flows from the regenerated filter via the eluate degasifier 5 to an eluate storage tank 6. Approx. 50% of the eluate is re-used for the next regeneration cycle.

Key advantages

- Low operating costs and environmentally friendly regeneration
- Smaller environmental footprint than membrane desalination processes: approx. 60% less wastewater, 60% less energy consumption and 70% less CO_2 emissions
- Simultaneous removal of cations and anions without impacting the water quality
- Direct wastewater discharge of solids-free »mineral water« to the receiving stream without adding salt through regeneration chemicals or antiscalants
- Trouble-free operation in the partial load range or during system startup and shut-down
- Minimum operating effort
- Resistant to changes in the raw water quality
- Environmentally friendly usage of the greenhouse gas CO_2
- Consumers save money and time

Installed base: more than 15 plants in operation worldwide

Resourcing the world

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Gedruckt auf 100 % Recyclingpapier

Veolia Water Technologies Deutschland GmbH · 5.2018