

# Use of Membrane Filtration Technology for the Recycling of Process Water From Weakly Acidic Ion Exchange Columns

Michael Eumann - EUWA Water Treatment Plants

## Introduction

Weakly acidic cation exchangers are common technology in many breweries. They can effectively reduce the carbonate hardness and m-alkalinity of process water.

The exchangers become exhausted and periodically have to be regenerated with acid. In this process a considerable amount of effluent is produced.

A new concept is being displayed which will allow for the collection, treatment and reuse of effluent for further regeneration processes.

Using this technology, around 75% of the water can be recovered using conventional membrane filtration technologies.

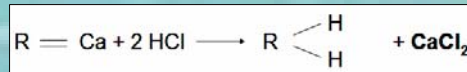
## Operating Basis

We currently view the money saving potential of this technology as being very high. This is due to the large volume of water that would be saved by the system on a continual basis.

The amount of water that can be recycled is dependant on the water treatment processes in each individual brewery.

During the operation phase, carbonate hardness is exchanged with hydrogen on the resin active sites. This results in the production of water and carbon dioxide.

During the regeneration, the process is reversed by the addition of hydrochloric acid. The calcium is displaced from the resin and calcium chloride is produced.

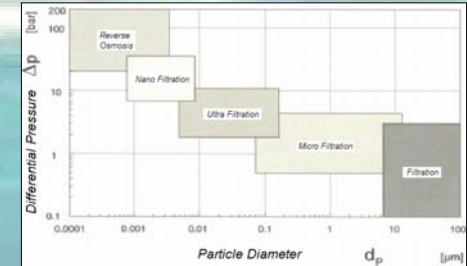
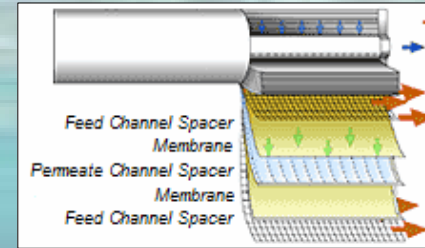


The result of this is a large volume of rinsing water with a moderate content of calcium chloride. The process aims to reduce the calcium content of the water to below 100mg/l and be microbiologically sound.

## Treatment System

The system is based around using membrane technology to reclaim some of the water.

The system uses nano-filtration (NA) membranes fabricated out of PA (polyamide) in a spiral wound configuration. The operation is cross flow, meaning that continuous operation is possible.



The selectivity of nano filtration can be adapted. A membrane with a specific pore size and molecular weight cutoff can be chosen based on the requirements of the process.

The process flow diagram shows the overall arrangement of the equipment. It includes raw and treated water tanks as well as the transferal pumps and high pressure pump.

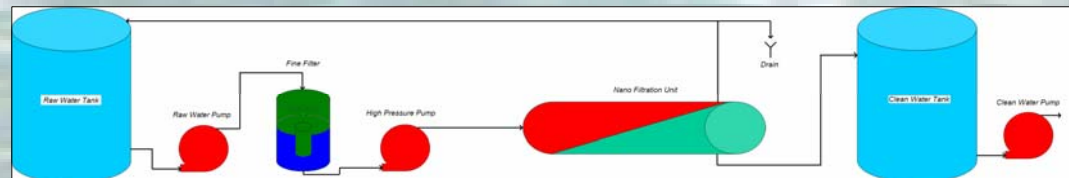
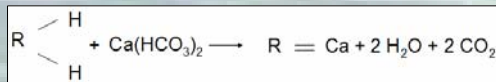
There is a recycle line where some of the retentate is sent back to the raw water tank for reprocessing, while a portion of the flow is sent to drain.

The process involves using a differential pressure driving force across the membrane with the separation taking place based on molecular size. The water is pumped up to high pressure prior to entering the unit to overcome the osmotic pressure and increase the throughput rate. Polymeric membranes are used as they have the ability to be resistant to changes in pH.

## Conclusions

Results from the operation of an actual plant show:

- Approximately 95% of all calcium and chloride is retained in the retentate.
- Approximately 70% of the total effluent flow can be reclaimed and used again as regenerant water.



## Acknowledgments

Christoph Kunzmann - VLB Berlin