Resource recovery using direct nanofiltration membranes

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Abstract:

Climate change and population growth are resulting in a growing demand for fresh water and other raw materials. Resource scarcity is increasingly becoming an issue and therefore it is important to develop and implement new technologies and processes that allow industries to operate in a more sustainable manner. NX Filtration is a supplier of direct nanofiltration membranes that fit in this category. The dense hollow fibers, based on polyelectrolyte multilayers, are capable of selectively removing low molecular weight organics from water, in a simple one-step process with low energy usage and avoiding the use of chemicals in pre-treatment steps. These membranes offer a great potential for water and resource recovery.

A very promising application to reduce both the water footprint and use of raw material, is the recovery of spent cleaning-in-place (CIP) solutions. In the food & beverage industry, large amounts of CIP solutions are used for various cleaning steps in the production processes. Typically, these spent solutions are discharged to wastewater treatment facilities, where they are neutralized and released to the environment. In this context, the application of hollow fiber nanofiltration membranes for the recovery of the CIP solutions was studied, specifically streams containing high levels of sodium hydroxide. We explain and show that, unlike with conventional nanofiltration membranes, the membranes based on innovative polyelectrolyte multilayers are stable under these extreme pH conditions, due to the specific electrostatic interactions between the different polyelectrolytes. As such, contaminants can be efficiently removed from the spent caustic solutions and a clear, re-usable, product is obtained. We show that more than 80% of the caustic can be recovered, offering solutions to reduce the environmental impact and at the same time even lower the operating costs in the food & beverage industry.

Keywords: nanofiltration, resource recovery, hollow fiber

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