

Multistage Membrane Hybrid ZLD Process

Extraction of Fermentation Products in Biotechnology

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Motivation

Membrane technology has been proven successfully used for decades in many industrial production processes. In the past, the focus was more on the treatment of feed water or process water, membrane filtration is increasingly developing solutions for production of highly valuable substances. In the described application, an organic molecule is obtained in a fermentation broth and has to be extracted from the nutrient solution and other process liquids. With regard to suitability for sale, transport or storage, this product requires certain treatment steps. Finally, this process chain in water/wastewater treatment would be called “ZLD”.

The process

The following process technologies are downstream the bioreactor:

1. Separation of biomass, MF-ceramic crossflow
2. Discolouration of the product, “tight” UF
3. Pre-desalination, High pressure-NF (40 bar)
4. Residual discolouration, IEX
5. Product-concentration, High pressure-RO (120 bar)
6. Product drying

The right approach

A complex combination of process technologies requires a customized approach. In this case, the technical feasibility was worked out in close cooperation with the customer. First, for each stage a lab-scale test was carried out. Later, these results had to be confirmed in extensive semi-scale trials on site.

Special attention was paid to the unique OSMO high-pressure reverse osmosis: Due to the achieved high yield it significantly reduces the required capacities of the downstream components, leading to savings in CAPEX and OPEX of the drying system.

The system is currently being under construction. First large-scale technical results are expected in the summer of 2018.