

362a Membrane Cascades and Intensification of Downstream Processing

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Use of efficient membrane cascades for the fractionation and purification of biologicals and their utility for decreasing both processing costs and environmental pressures will be discussed. Both high-value medicinals and many chemicals of agricultural origin require processing large volumes of fluid streams, and the cost of such processing is nearly proportional to the mass of fluid in the feed to the separation train. The production cost of therapeutic proteins for example is dominated by solvent consumption, and the dominant separation technique is one or more forms of chromatography.

It has long been known that selective membrane filtrations are much cheaper than chromatography, and the selectivity of membranes has been increasing rapidly. However, many applications will always require multi-stage processes, and these have yet to be developed at a commercial level. Moreover, the use of staged membrane processes, most efficient in continuous operation, must be adapted to what are still for the most part batch processes. At the same time there is a strong trend toward continuous processing with the expected significant intensification.

We have shown that so-called ideal cascades can be adapted to the processing of biologicals by using a novel combination of dia- and ultra-filtration units as the basic module. Furthermore, the logical first step, use of a basic three-stage process, can be converted from batch to continuous very simply, thus easing the transition to continuous processing.