Rotating microfilters for sustainable microfiltration treatment of process streams

Project Leader: Aquamarijn Micro Filtration BV
E-mail: microfiltration@aquamarijn.nl
Partners: Aquamarijn Micro Filtration, Cosun, DSM, and NIZO food research, NL GUTS
Budget: k€ 161
Duration: 1 year (2015-2016)

Objective:

Evaluation of a prototype rotating-filtration system with microsieves for highperformance energy-efficient filtration of raw process streams containing complex molecules and proteins.

Motivation:

Conventional filtration systems based on ceramic tubes require energy-intensive operation, as they require high pressures and require large membrane surfaces in order to achieve acceptable process capacities. In conventional systems, a large part of the energy is used to generate along the membrane shear forces in the fluid in order to reduce the layer thickness of contaminating particles, and in addition, a considerable part of the energy is used in order to achieve a sufficiently high operational flux. In addition, a lot of energy is lost due to the continuous circulation of all the liquid flows.

In this project, we primarily use energy to initiate the movement (rotation) of flat membrane filtration elements (Figure 1) in a filtration chamber. This allows considerable energy saving without loss of high-shear forces. By applying high-flux membranes (e.g. microsieves) in combination with an innovative flow-reversal device 10 to 100 fold increase in fluxes can be achieved with reduced energy consumption.

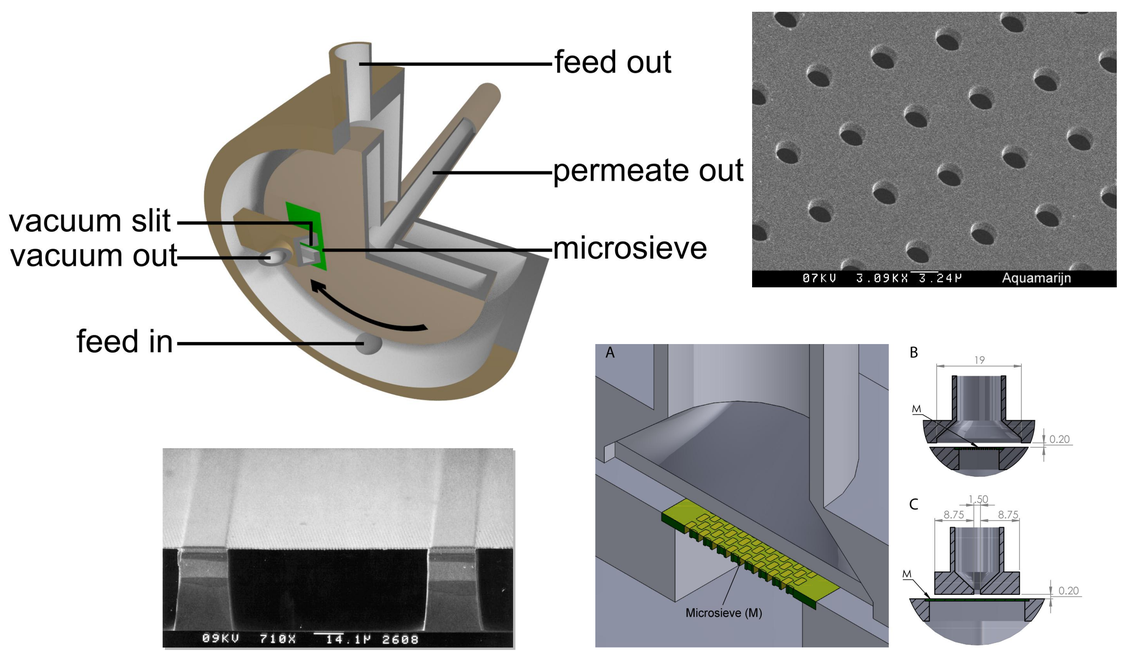
Project scope:

- Insight in the energy savings and the application of rotary-microfilter filtration for reduction of microbiology in process streams.
- Feasibility of scaling up the prototype rotary-microfilter filtration systems with respect to energy consumption, footprints etc.

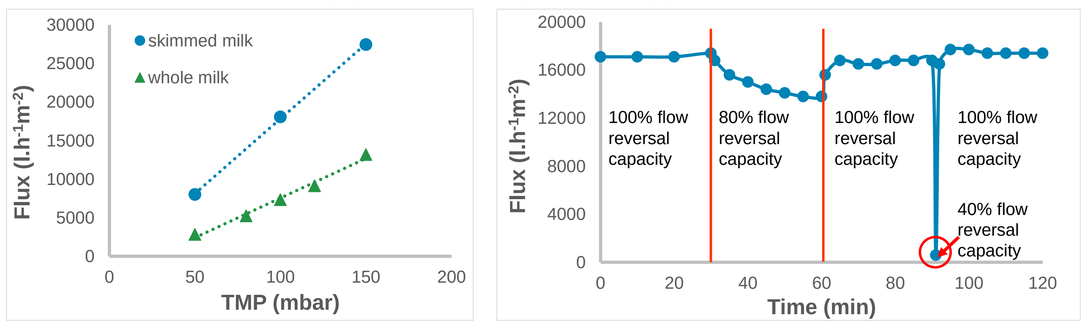
Applicability:

High-Frequency Flow Reversal (HFFR) is the process that allows to stabilize high filtration performances of ultrathin hi-flux membranes, such as microsieves, by removing non-permeable substances concentrating on the membrane surface very effectively. Small sectors of less than 1% of the total membrane area are cleaned 10-50 times per second during the HFFR process. The short flow reversal concentrated on a small membrane area effectively prevents adhesion of organic substances such proteins inside the pores and at the surface of the microsieve.

Rotating-Filter System with High-Frequency Flow Reversal



Filtration Performance for Milk



Journal of Membrane Science, 494, **2015**, pp121–129

Status:

The project started fall 2015 and experiments are planned during fall/winter 2015/2016.