Influence of environmental and process conditions on biofouling development

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Motivation

High quality drinking water can be produced with membrane filtration processes like reverse osmosis (RO) and nanofiltration (NF). An increasingly important role is expected for membrane filtration, because the demand for drinking water in the world is increasing and also regulations on drinking water quality become stricter.

A disadvantage of membrane filtration processes is that membranes can foul. Fouling results in an increase in pressure drop, which increases the costs of operation and may endanger the continuity of water supply. The major type of fouling, biofouling, is caused by biofilm accumulation in the membrane elements (figure 1). Therefore, research is performed to elucidate the causes of biofilm accumulation.

Fig 1: fouled membrane

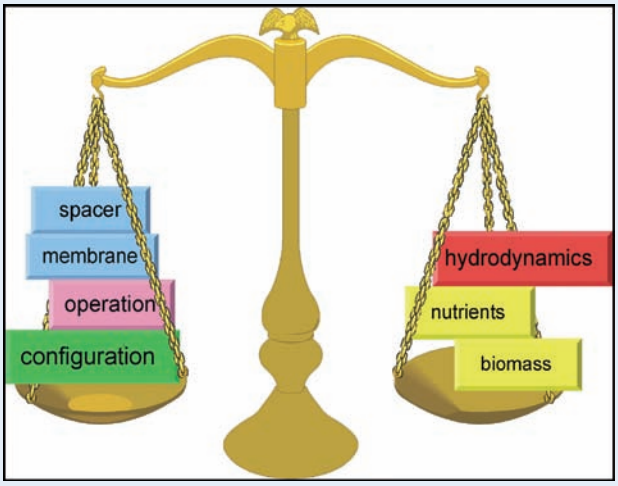

Fig 2: balancing of parameters influencing fouling

Technological challenge

The main objective is to develop membrane filtration processes that are less susceptible to membrane fouling.

Our approach is to determine key parameters that influence biofouling (figure 2). Under representative conditions at laboratory scale, the development of membrane fouling will be studied (figure 3). Factors that play a role at membrane fouling such as nutrient and biomass load, linear flow velocity and membrane material will be investigated (figures 2 and 4). It is expected that the results of this study lead to adaptations in membrane systems in which biofouling development is delayed, reduced or prevented.

Fig 3: laboratory set-up for biofouling studies

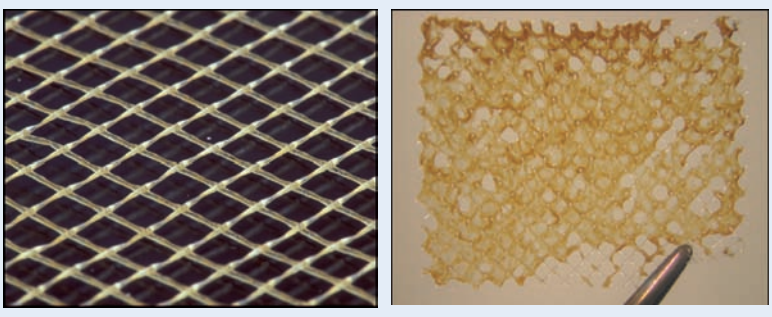

Fig 4: new (left) and fouled (right) membrane feed spacer

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