REVERSE OSMOSIS MODELING FOR WATER REUSE: HOW TO BEST DESCRIBE FOULING FOR COST-EFFECTIVE OPERATION?

Introduction

Membrane technologies such as reverse osmosis (RO) are of great interest thanks to a wide range of applications, among which, drinking water production (e.g. desalination) and industrial water reuse. However, membrane fouling increases the cost of operation due to expensive pretreatments and hampers the applicability of this technology. Higher operating pressures and frequent chemical cleanings can damage the membranes and its lifetime.

To avoid this, a good operational strategy is of primary importance. Nowadays, expert knowledge is merely used to manually drive the setpoint of the recovery (the amount of water recovered) only a few times a year causing this technology to underperform and waste energy and resources. The application of model predictive controls on the operation to optimize membrane cleaning according to fouling extent can dramatically enhance the value of RO applicability.

Methodology

In this thesis, the student will perform a literature search and review of various mechanistic RO fouling models. Each of these fouling models will be integrated to an existing mechanistic RO model. The integrated models will then be tested and their performance, in terms of prediction of important output variables, will be analyzed and compared against literature data. In addition, the various fouling models will also be examined based on complexity, ease of calibration, input data requirements, etc.

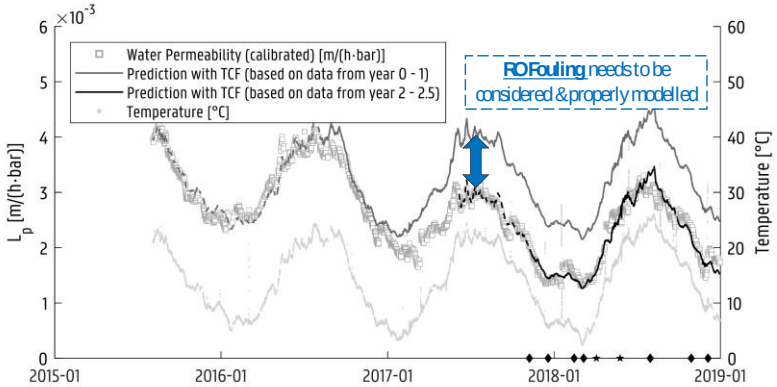

Figure 1 – Example result of model prediction for water permeability of an RO membrane. Deviation (denoted by blue arrow) of the model prediction from calibrated data is due to appearance of fouling.

Objectives of the thesis

The main objective of this thesis is to review and assess the impacts and performance of different fouling models as integrations to available RO models.

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BACKGROUND

Chemistry & bioprocess technology, Environmental Science and technology, Environmental Technology

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English

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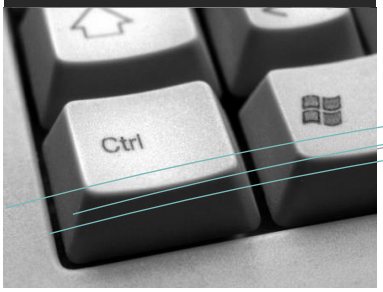

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