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Subject Area	Wasseraufbereitung

Evaluation of two long channel membrane test cells

Laboratory tests

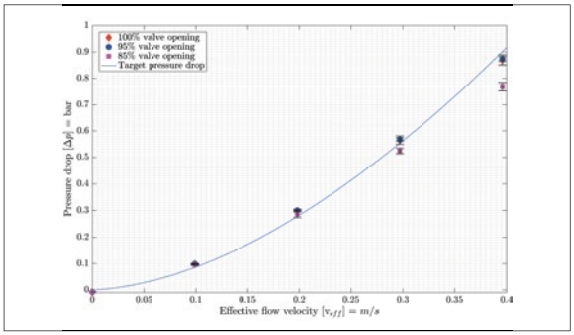

Figure 1: Measured pressure drop (UMTEC test cell)

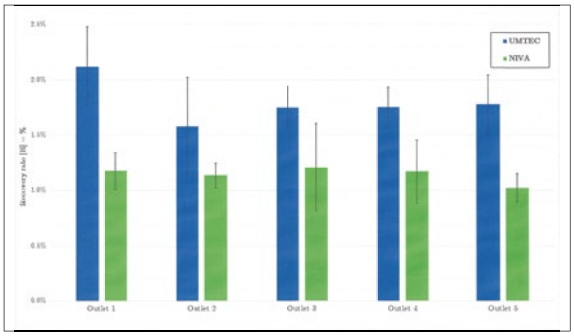

Figure 2: Permeate flow in different outlets (comparison)

Introduction: Reverse osmosis is a proven process for the desalination of seawater and brackish water. Fouling, however, can decrease the efficiency of this procedure considerably. To investigate the process of membrane fouling in spiral wound modules (SWM), the Institute for Environmental and Process Engineering (UMTEC) in Rapperswil as well as the Norwegian Institute for Water Research (NIVA) in Oslo, operate test cells which can be equipped with various membranes and spacers. To assess, if the newly build test cell in Rapperswil can deliver solid results, the two test cells are evaluated and the test results compared.

Objective: There are two main test cases: (1) pressure drop in the feed channel and (2) permeate flow in the sections of the test cell with the same membranes. The pressure drop is compared to the target pressure drop trend line according to Schock & Miquel to clarify, if the conditions in the test cells meet the conditions in an industrial SWM. This tests are conducted with two different feed spacers. Because the height of these spacers are not conform with the height of the test cells, certain modifications have to be made.

Result: Both test cells can generate reproducible results with a high precision but low correctness. Neither test cell is well suited for spacers with the given heights. The implemented modifications could not stop the feed water from by-passing the feed spacer and therefore, the measured pressure drop was in most cases lower than the target pressure drop (Figure 1). The measured permeate flows across the test cells were higher in the UMTEC test cell than in the one at NIVA (Figure 2). The observations made, however, led to a concept, how the test cells can be modified to test a wider range of spacers.

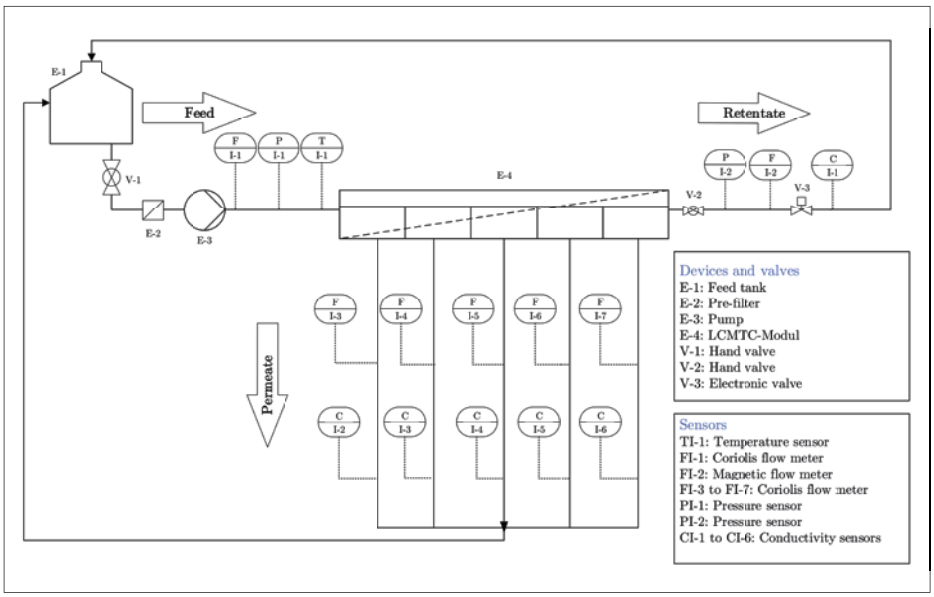

Figure 3: P&ID (UMTEC test rig)