Further Investigations on Fouling of Ultrafiltration through Oily Wastewater Treatment (W-UFO)



WILLY-HAGER-STIFTUNG

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Project Description

The ultimate objective of W-UFO research project series is to establish an efficient pressure-driven membrane-based treatment for the purification of produced water, employing polymeric ultrafiltration (UF) membranes. This is targeted as a polishing step in the treatment process of oily wastewater effluents, i.e., produced water after primary and secondary treatment stages, where oil concentration is in range of 20 - 100 mg/L, and the average oil droplet size is commonly < 1 µm. The vision is that an efficient dead-end filtration protocol can replace the already well-investigated crossflow operation, by virtue of reduced operation costs (less energy consumption) and higher clean water recovery. To achieve that, it is essential to gather a deep understanding of UF membrane performance during filtration of different oil-contaminated feeds at different operating conditions, as well as the accompanied fouling mechanisms.

The research plan is divided into three subprojects (named as W-UFO I – III). W-UFO I aimed at studying the influence of oil droplet size distribution on the fouling mechanisms and the coalescence phenomena, as well as the effect of salt content in the water matrix on the stability of nano-emulsions and the fouling mechanisms. W-UFO II focused on the impact of using surfactants and co-surfactants on the stability of nano-emulsions and on fouling mechanisms. W-UFO III is devoted to quantifying the dissolved oil portions in oily-wastewater and studying their influence on fouling mechanisms. In addition, an investigation of the possibility of enhancing the filtration performance via dosing of powdered activated carbon or flocculants to be conducted. Furthermore, the outputs of the three subprojects are to be evaluated, along with the adaptation of the operating parameters and/or the membrane surface properties.

| Project Funding | Willy-Hager-Stiftung |
|-----------------|------------------------------------|
| Duration | W-UFO I: 01.04.2018 – 31.03.2019 |
| | W-UFO II: 01.09.2020 – 31.10.2021 |
| | W-UFO III: 01.01.2022 - 31.12.2023 |