Fouling prevention through biological activated carbon and ultrafiltration

Sara Ribeiro Pinela
sara.pinela@wetsus.nl

Motivation

Biological Activated Carbon (BAC) is a water purification process that combines physical adsorption onto granular activated carbon (AC) and biodegradation to remove pollutants (Fig 1). The technology is eco-friendly and cost-effective, since the biodegradation helps to prevent the saturation and replacement of the AC. BAC is an established process in drinking water treatment[1], however, BAC also has potential for wastewater reclamation[2,3]. At the Puurwaterfabriek (Emmen, the Netherlands), ultrafiltration (UF), BAC Pre-filter (O_2BAC PrF) and BAC Polishing Filter (O_2BAC PoF), and Reserve Osmosis (RO) are subsequently applied to produce ultrapure water from the effluent of a wastewater treatment plant[5]. This ultrapure water plant has been in operation for over 9 years without the need to replace the AC and RO membranes, although in literature, BAC is associated with downstream fouling[4]. This research aims to understand how UF and BAC can prevent downstream fouling.

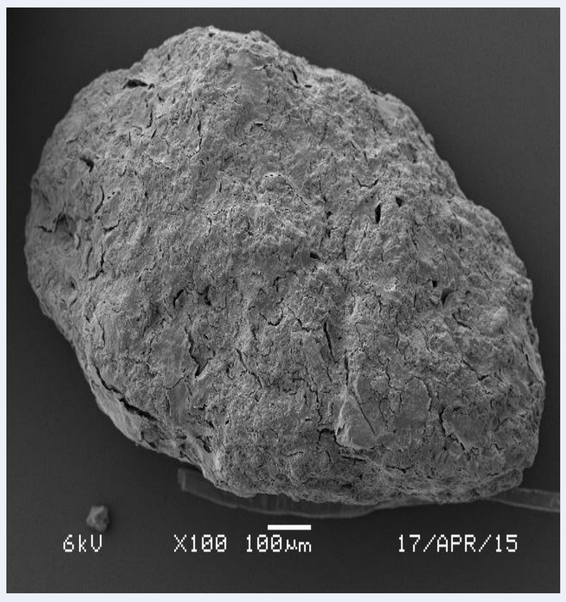
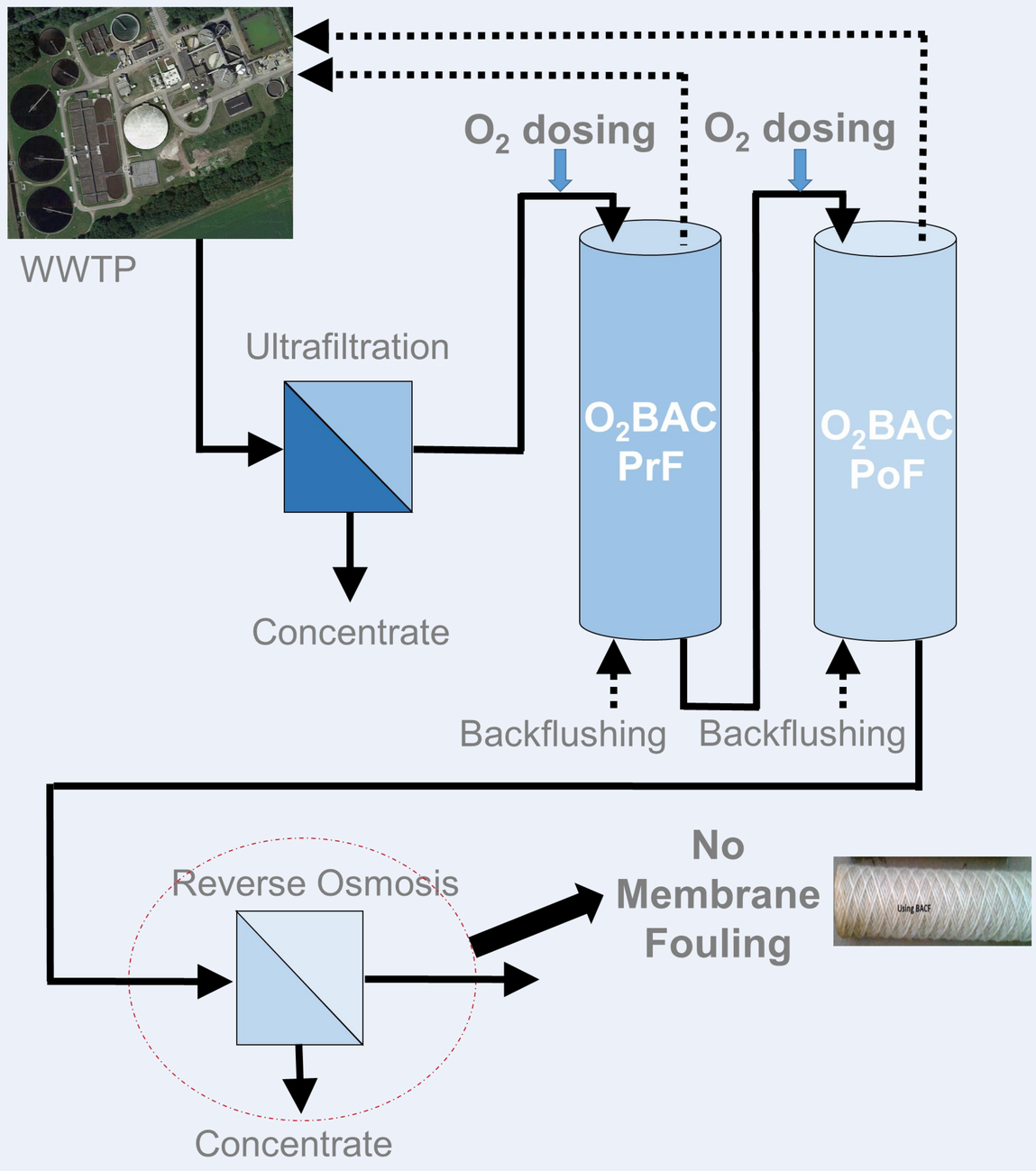


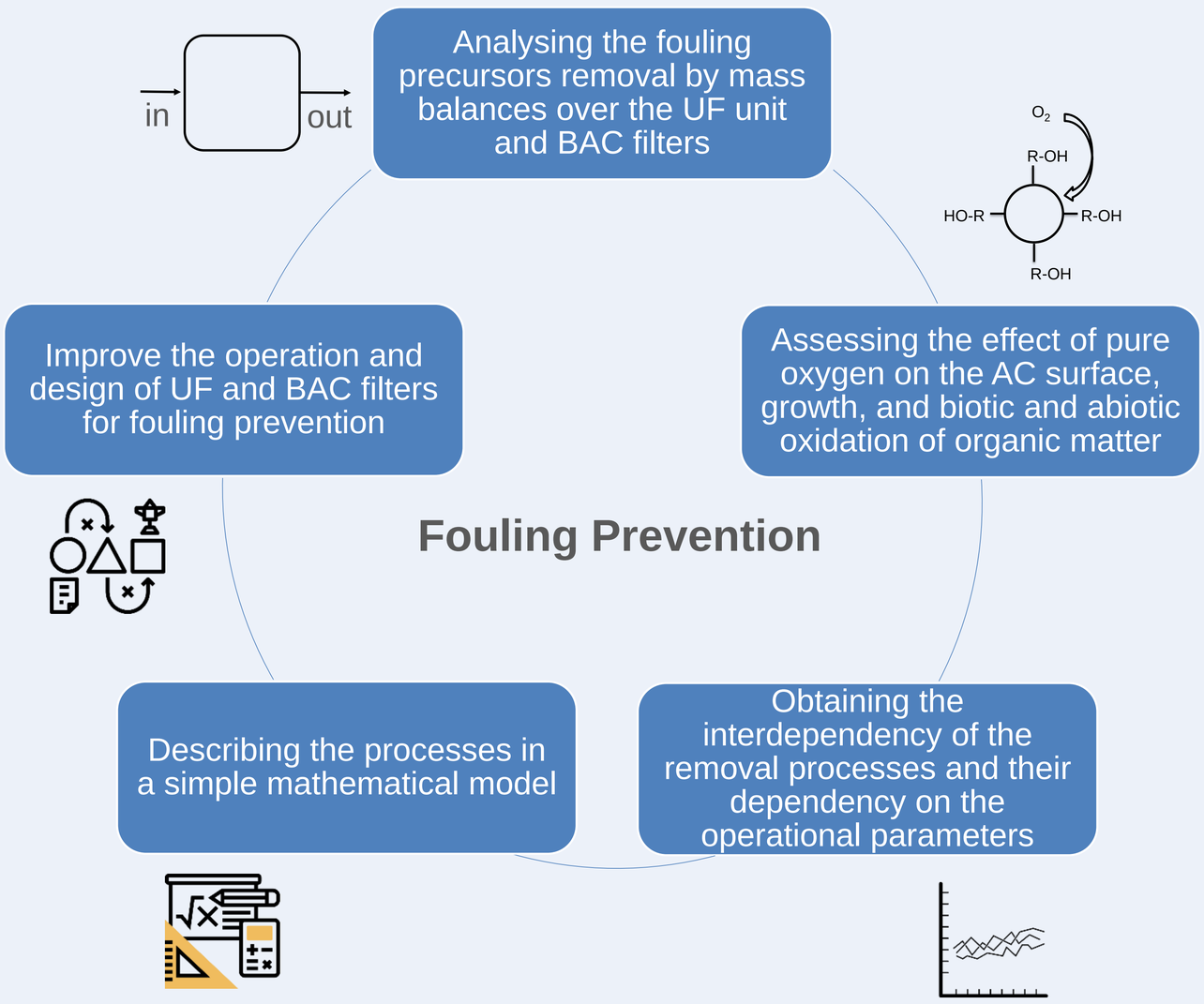
Fig 1. Activated carbon granule covered by a microbial biofilm[6].



Technological challenge

The BAC filters at the Puurwaterfabriek are unique as they are oxygenated and periodically back-flushed. The challenge is to investigate possible synergy between the biotic and abiotic processes contributing to the removal of fouling precursors, and to establish how these processes depend on the BAC operation and design.

Research goals



[1] Korotta-Gamage, S. M., and Sathasivan, A., *Chemosphere*. 167 (2017) 120-138
[2] Riley, S. M. *et al*. *Sci. Total Environ.* 640-641 (2018) 419-428.
[3] Tammaro, M., *et al*. *J. Environ. Chem. Eng.* 2(3) (2014) 1445-1455.
[4] Im, D., *et al. Chemosphere.* 220 (2019) 20-27.
[5] NWTR (2016) *Puurwaterfabriek*. Retrived from: www.nwtr.nl/puurwaterfabriek.php
[6] Abromaitis, V. *et al. Chem. Eng. J.*317 (2017) 503-511

This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No 665874

S. Ribeiro Pinela MSc, dr. ir. R.J.W. Meulepas, dr. M.C. Gagliano, dr. R. Kleerebezem, prof. dr. ir. H.H.M. Rijnaarts