Ripening of granular media filters for pretreatment of seawater in membrane desalination

Matan Beery[a], Ji Jung Lee[b], Joon Ha Kim[b*], Jens-Uwe Repke[a]

[a]*Chair of Process Dynamics and Operation, Berlin Institute of Technology (TU-Berlin), Strasse der 17. Juni 135, Berlin, Germany*
[b]*Department of Environmental Science and Engineering, Gwangju Institute of Science and Technology (GIST), Gwangju, 500-712, Korea*
Tel. +82-62-970-3277; Fax +82-62-970-2434; email: joonkim@gist.ac.kr

ABSTRACT

The successful operation of a seawater reverse osmosis desalination plant depends greatly on the performance of the pretreatment step. The start-up of a pretreatment filtration process usually begins with a dynamic part called ripening, during which the filter media increases its adsorption ability and improves the removal of foulants from the seawater. In that period (typically lasting 30–60 min, depending on the system's conditions) the effluent often does not meet the quality requirements of the RO membranes and must often be disposed of. An observation and analysis of the ripening phenomena was performed using lab scale acrylic filter columns containing granular activated carbon. The seawater originated from the Yellow Sea in Korea and an inline coagulation was performed prior to filtration using an optimal dose of $FeCl_3$ based on a jar test. The turbidity, total suspended solids concentration and dissolved organic carbon were measured before and after filtration with the goal of assessing the filtration performance. The filter media, which was cleaned and dried before filtration showed distinct ripening characteristics. The measurements were then used for parameter identification of a typical filtration model. Based on the fitted model one can predict the optimal filter depth that would reduce the waste stream production of the plant.

Keywords: Desalination; Pretreatment; Media filtration; Granular activated carbon; Ripening

* Corresponding author.