reusable water in the hospital laundry facilities will contribute to save energy and enable more efficient water resource consumption.

3.18.P-Mo293 Membrane Distillation as Technology to Remove Microplastics in Drinking Water Production by Desalination: Lab-scale System Performance, Microplastics Behavior and Removal, and Future Research

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The study of the occurrence and fate of microplastics (MPs) through the water supply chain has been identified by the World Health Organization as a priority research need since MPs are classified as contaminants of emerging concern with potential adverse effects on human health. There is also a need to ensure drinking water safety and affordability, and to minimize the effects of the increasing frequency of extreme events, such as droughts and heat waves, on freshwater availability. Membrane Distillation (MD) is a thermally driven separation process employed to obtain water from wastewater or seawater, with a high rejection efficiency for undesired non-volatile substances and particulate matter. Thus, it can be used as a viable technology to achieve vital progress to counter the growing drinking water crisis. The main goals of this work comprised the i) assessment of MPs behavior and removal during a lab-scale treatment of seawater with MD, and ii) the potential impact of the presence of MPs in the MD process regarding the amount of water produced and its quality. For that, i) filtered seawater with known spiked amounts of MPs of unplasticized poly(vinyl chloride) (UPVC) was fed into the MD system, ii) the MD parameters (vapor pressure gradient, membrane permeability for water, and the interval permeate flux) were monitored during the experiments, iii) the quality of the treated water was assessed in terms of its conductivity, salinity and presence of MPs (> 1.2 µm by Raman microscopy), iv) the MPs were recovered and characterized to assess their potential aging during the treatment, v) the membrane used in each experiment was characterized. The data collected revealed that a high load of MPs (> 0.1 g L^{-1} of UPVC) can decrease the amount of treated water produced. However, under the expected loads found in the environment, the presence of MPs that are relatively resistant to temperature is expected to have minimal interference with the normal operation of a desalination unit based on MD. The treated water quality was good concerning conductivity (maximum 10.6 µS cm^{-1}) and salinity (0.0 ppt), with no signs of the spiked MPs being found in it. At the end of the experiments, MPs were recovered from the system, suggesting a very high removal efficiency with MD (≥ 99%). This constitutes one of the first assessments of this technology to remove MPs during desalination, with favorable results, and raises new research questions to be tackled in the future.

3.18.P-Mo294 Do the Treatment Units Fragmentate or Remove Microplastics? A Case Study of an Urban Wastewater Treatment Plant (Southeast of Spain)

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Plastic enters the environment in different ways, such as through wastewater treatment plants (WWTPs), which play an important role in releasing microplastics (MPs) into the environment. MPs are highly persistent and bioaccumulated in living organisms, suffering multiple adverse effects from their interaction with the MPs and their associated additives and contaminants.

This research aims to study the performance of various technologies in municipal wastewater treatment for microplastics removal and to understand the fate of microplastics through a wastewater surveillance study.

Four sampling campaigns were carried out during the four seasons of the year 2023 (from January to November), in an urban WWTP in south-eastern Spain with a daily water discharge of 7,500 m^3/day. The sampling points were selected according to the different treatment stages. All the samples were separated by size using a set of sieves ranging from 25 to 1000 µm. Depending on the characteristics of the samples, they were treated with Fenton/peroxide oxidation, enzymatic digestion, and/or density separation to remove organic matter and isolate the microplastics. Visual sorting with a stereoscopic microscope (10-80x) was for MP identification and quantification. MP identity was confirmed using µFTIR.

The wastewater analyzed during the first sampling campaign showed a concentration of 435 MPs/L in the influent and 23 MPs/L in the effluent, reaching a 95% MP removal efficiency. The treatment units in the water line showed different behaviors: 1) during the pre-treatment, after the grit and grease removal unit, a concentration of 431 MPs/L was found; 2) after the biological treatment, the presence of MPs increased to 1,323 MPs/L; 3) after the secondary clarifier, the removal efficiency was 95% (24 MPs/L). 246,595 MPs/kg wet weight were found in the dewatered sludge (83% moisture). In all the treatment units, the MPs with sizes between 100-500 µm were predominant (41-65%), and fibers were the most prevalent type of MPs (65-80%). The MPs analyzed are made of polyurethane, polyethylene, polypropylene, polyester, polyacrylonitrile, synthetic cellulose, etc. Polyurethane fragmentation was observed during pretreatment, and secondary treatment.