

Microplastics: Challenges and Options for Removal through Wastewater Treatment Plants

Yasemin Kunukcu (ykunukcu@rouxinc.com) (Roux Inc., Somerset, New Jersey, USA)

Background/Objectives. Global plastic production has increased from 2 million tons in 1950s to 390.7 million tons in 2021 (PlasticsEurope, 2022). Meanwhile, the world has also witnessed a tremendous increase of plastic waste in the environment, which has led to many associated adverse impacts on human health and the environment. Many human activities contribute to plastic pollution such as the mismanagement of plastics, degradation of large plastics deposited in the environment or in landfills, atmospheric transport of plastic particles deposited in soils, maritime activities (e.g., fishing and transport by ship), agricultural activities (e.g., greenhouses films, fertilizers, etc.), industrial activities directly related to plastics production, urban activities (e.g., personal and cosmetic products, paints, washing of textile, detergents, etc.) and, finally, wastewater treatment plants (WWTPs). Microplastics (MP) are mostly formed from the degradation of these larger plastic products and wastes. WWTPs have been identified as receptors of MP pollution and effective in capturing the majority of MP in the sewage sludge, which is commonly employed as organic fertilizer.

Approach/Activities. Despite recent efforts to detect MP in the aquatic environment worldwide, identifying the different sources by which MP are released to the environment is a challenging issue. WWTPs, both industrial and municipal, have been identified as potential sources of MP to surface waters and MP particles have also been found in isolated regions like Arctic snow, deep ocean waters, and alpine air. MP occurring in municipal wastewater commonly originates from daily human activities. For example, polyester and polyamide components are commonly shed from clothing during the laundry process and personal care products such as toothpaste, cleanser and shower gel enter WWTPs. Moreover, plastics disposed at the landfills are decomposed by microorganisms in the leachate and then are discharged into WWTPs.

Although MP is not regulated as a “contaminant” at this time, they are emerging as an environmental issue that industries and local/state municipalities will increasingly focus on in the coming years and an in-depth understanding of the behavior of MP among the critical treatment technologies in WWTPs is an important piece of the puzzle.

Results/Lessons Learned. This presentation will focus on the occurrence of MP in WWTPs, traditional and emerging technologies associated with managing MP at WWTPs, and the challenges and knowledge gaps associated with evaluating those technologies due to the vast differences in WWTPs across industry and municipal settings. Discussion will also focus on the opportunity for organizations producing plastic waste to lead the way in identifying and quantifying MP in their WWTPs to facilitate a proactive approach to this emerging topic.