

Investigation of microfibers and microplastics in process water from spunlace nonwoven production

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Microplastic (MP) pollution has become a pressing environmental issue due to its transfer to aquatic ecosystems through wastewater discharge, posing a growing risk to environmental sustainability. The textile industry, particularly nonwoven manufacturing, is one of the key contributors to this problem. The spunlace nonwoven process stands out in this context because of its high water demand and significant wastewater generation. Although several studies have investigated microplastics originating from textile effluents and disposable products, the contribution of the spunlace nonwoven production process, characterized by intensive water use and effluent discharge, to microplastic release has not yet been examined. Considering that spunlace fabrics are widely used in disposable Fast-Moving Consumer Goods (FMCG) such as wet wipes and hygiene products, and that their production volumes are continuously increasing, understanding the microplastic dynamics at different stages of the manufacturing process is crucial for evaluating the environmental sustainability of spunlace production. This study examines the formation and characteristics of microfibers (MFs)—including both synthetic (polyester) and cellulosic (viscose and cotton) types in different stages of the process water used in a spunlace nonwoven production facility. Water and sludge samples were collected from the influent, effluent, and treatment stages of the process water system. The samples were pretreated with hydrogen peroxide (30% H₂O₂) and filtered to recover MPs and MFs. Mass- and count-based assessment and characterization analyses were performed on the particles obtained after filtration. By focusing on a previously unexamined stage of textile manufacturing, this work provides the first insights into process-related microfiber and microplastic formation in spunlace nonwoven production. The results highlight the importance of developing process and policy-level strategies to improve water reuse and wastewater management in the spunlace and nonwoven industry.