

# DAIRY WASTEWATER ULTRAFILTRATION USING 3D PRINTED SPACERS IN A VSEP MODULE

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## ABSTRACT

The basis of our research project is the detailed investigation of ultrafiltrations for membrane separation processes by testing a crossflow membrane filtration device capable of modul vibration. Our goal is to map the ultrafiltration parameters of a dairy wastewater model with an average load, using a 3D printed spacer that can be placed in the module. The design and printing of the 3D printed elements to be examined was also part of our work. We examined the change in filtration parameters with the use of the spacer, primarily with respect to changes in fluxes, retention values, and resistance values. For our research, we used a laboratory-scale (L-mode) vibrating membrane separation, VSEP (Vibratory Shear Enhanced Processing) equipment. For our laboratory ultrafiltration experiments, 50 kDa cut off polyethersulfone (PES) membrane with a 500 cm<sup>2</sup> filter surface was tested. For 3D printing, we used a composite polylactic acid (PLA) philatelic, the shape and arrangement of which were designed to improve the filtration indices, and then we compared and improved it accordingly during their tests. Based on the studies, we chose the most obvious layout and shape for more comprehensive measurements. Based on our results it can be concluded that the application of spacer and vibration of the module showed positive results, and we were looking for a way to explore the effectiveness of their joint application.

*Keywords: membrane filtration, 3D printed spacer, dairy wastewater, ultrafiltration*

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