

Investigation of Novel Methods of Reducing Membrane Fouling

Abstract

This study aims to improve the efficiency of Membrane Bioreactor Systems (MBR) by reducing membrane fouling, allowing for lowered operating costs. Firstly, the length of individual membranes in one membrane module was varied in order to optimise the driving pressure on each membrane. A length of 22.5 cm for each membrane for a total membrane length of 90 cm was found to provide the greatest flux rate. Secondly, novel methods of reducing membrane fouling were developed and tested against a control to determine efficiency. The use of a self-designed wiping system showed the greatest potential for replacing the current method of reducing membrane fouling – aeration – with a percentage increase in flux rate of 100% in comparison to the control, as compared to aeration, which only has a percentage increase in flux rate of 40%. The use of a plastic board as bottom cover to reduce number of particles in the MBR also shows promise, providing a percentage increase in efficiency of 14% over the control. The proposed solution combines both the use of a plastic board as bottom cover and the self-designed wiping system, resulting in considerable advantages over conventional systems. Not only is it extremely energy efficient, with a 99.99% percentage decrease in energy consumption per length of membrane, it is efficient and economical, with a total cost below \$20, potentially resulting in vastly decreased MBR operating costs.