Anaerobic Membrane Bioreactors (AnMBR): Current Status and Future Potentials

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Abstract:
Anaerobic processes are considered as attractive low cost options to treat high strength wastewater, but with minimum nutrient removal capability. Where membrane bioreactors (MBRs) highly energy intensive technologies, promoted as an attractive alternative for wastewater reuse. Thus combining these two processes is viable when compact process for energy recovery is desired, or when disinfection is required after anaerobic treatment such as cases of water reuse with nutrients. At the moment, AnMBRs are not likely to be able to compete with biofilm or granular anaerobic reactors, due to higher capital and operational costs. However, there are many applications when biofilm or granule formation cannot be ensured, or when total solids retention is an attractive feature. This is indeed the case of many industrial wastewaters, characterize by particulate, high temperatures or the presence of specific pollutants. Total biomass retention may be of interest for these applications, and may facilitate the application of anaerobic digestion within the reactor. Anaerobic MBRs provide an efficient treatment of wastewater, enabling energy recovery, solids free effluent and low sludge production. The fact that nutrients are not removed (N, P) may be indeed an advantage, since treated water could be used for irrigation purposes, enabling the nutrients recovery and reuse. Recently the research and development of AnMBR technology has attracted attention. Different configurations of MBRs (i.e. single stage, two stage) were considered by various researches to achieve certain goals (i.e. treatment of high temperature effluents with thermophilic anaerobic MBR under two stage process while retaining the biomass within the reactor and recovering energy from the wastewater). This paper discusses about the growing potential of AnMBR application in wastewater treatment.

Key words: Anaerobic, Membrane Bioreactor, Particulate Wastewater, Membrane Fouling, Energy Recovery, Municipal Wastewater.

1. Introduction

Anaerobic treatment process has been applied since early 1900 for treating excess sludge discharged from sewage-treatment plants. This technology has since been developed to treat wastewaters successfully with energy recovery. Nowadays, it is considered as an established technology and it is successfully used for the treatment of many kinds of industrial wastewaters. The success of anaerobic wastewater treatment can be attributed to an efficient uncoupling of the solid retention time from the hydraulic retention time through biomass immobilization, which is usually accomplished through biofilm or granule formation. Separation of biomass from the effluent using membrane technology is another attractive method to retain the biomass within the anaerobic reactor.

With the global attention on reducing green house gas emissions and energy recovery form waste, the attraction on anaerobic wastewater treatment over aerobic wastewater treatment has been grown rapidly. *Copenhagen Accord* (UNFCCC, 2009) emphasizes the need of