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Editorial

# Membrane Bioreactor Operation–Past Achievements and Future Challenges Christoph Brepols Erftver Band

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## INTRODUCTION

The river water association, Erftver band looks back on two decades of experience in design and operation of municipal Membrane Bioreactors (MBR) in the Erft river catchment in Germany. During that time MBR operations have been monitored scientifically and process optimizations have taken place. For example between 2010 and 2015 the specific energy consumption of Nordkanal MBR (80,000 population equivalents) was cut down from 0.94 kWh/m³ to 0.63 kWh/m³ wastewater treated (see figure1) while membrane filters remain in continuous operation since 2004. With that background, Erftver band sees a promising potential of MBR in the future development of wastewater treatment not only in the Erft river catchment but the energy consumption at Nordkanal MBR will be further reduced. Construction works for primary clarification and anaerobic sludge treatment started in February, 2017. Membrane Bioreactor (MBR) technology for wastewater treatment has been developed for over three decades. Our latest survey shows that MBR applications for wastewater treatment are still in rapid growth today. This review summarizes the pros, cons and progress in fullscale MBR applications. Critical statistics on the capital cost, operating cost, footprint, energy consumption and chemical consumption of full- scale MBRs are provided, and are compared to those of Conventional Activated Sludge (CAS) processes with/without tertiary treatment. The efficiencies in full- scale treatment of ordinary pollutants (C, N and P), pathogens (bacteria and viruses) and emerging pollutants (e.g., trace organic pollutants) are reviewed. The long-term operation stability of full- scale MBRs is also discussed with several examples provided, with special attention placed on the seasonal variation of membranefouling.Finally, the future challenges of MBR applicationare outlinedfromtheperspectives of fouling control, pollutant removal, cost-effectiveness and competitiveness in specific fields of application water known as effective accompanied with greatly increased number of published papers. This paper attempts to critically review the recent developments in OMBRs and to present a clear outline for further studies. Firstly, OMBR fundamentals including its configuration and FO process are presented. Subsequently, performance of OMBRs is summarized and compared to conventional MBRs. In this article, membrane bioreactor principles and applications will be discussed in particular. These landfills yield leachate which is a highly contaminated wastewater. Thus, a proper treatment of leachate is highly recommended before the final discharge. Recently, the use of membrane separation technology alongside bioreactors have opened a new gateway in treating refractory wastewater such as landfill leachate.

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