ABSTRACT
Interest in anaerobic treatment as an alternative to conventional aerobic treatment for domestic wastewater is growing rapidly. Although the anaerobic process has often been thought to be unsuitable for meeting stringent effluent quality, an integration of membrane with anaerobic bioreactor (AnMBR) can overcome this disadvantage. Membranes permit not only retaining the anaerobes in the reactor at relatively short hydraulic retention time, but also the maintaining of the long solid retention time that is required for efficient treatment. Nevertheless, the major concern with AnMBR is still the adequate control of membrane fouling caused by deposition of foulant material on membrane surface and/or within membrane pores. Traditionally, biogas sparging has been widely used to control membrane fouling through vigorous action along membrane surfaces. Cross-flow filtration has also been applied to induce back transport of foulants away from membrane under high shear conditions along membrane. However, these methods are reported to require high energy cost, which can detract from achieving potential energy-neutrality through anaerobic wastewater treatment. Novel method to control membrane fouling as an alternative to the gas-sparged or cross-flow based AnMBR is the anaerobic fluidized bed membrane bioreactor (AFMBR), which combines membranes with anaerobic fluidized bed bioreactor. Here, granular activated carbon particles are used as the fluidized media, providing not only high surface area for biofilm formation, but also a mechanical scouring action on membrane surface to control membrane fouling. GAC fluidization occurs by fluid recirculation through membrane reactor with relatively low energy consumption while providing excellent fouling control by mechanical scouring of membrane surface. In this presentation, experimental results to investigate effect of GAC fluidization on membrane fouling, system performance and energy consumption with the AFMBR system treating domestic wastewater are discussed. Fouling control with respect to feed solution experiencing to the membrane and types of fluidized media is discussed. Macroscopic approach to develop fouling models under GAC fluidization in AFMBR system is also presented. In addition, future perspectives to optimize AFMBR to develop energy-positive wastewater process will be suggested.

ABOUT THE SPEAKER
Dr. Jeonghwan Kim is currently Associate Professor at the Sustainable Environmental Membrane Technology Laboratory, Department of Environmental Engineering at Inha University, Korea. He received his Ph.D. in the Department of Environmental Sciences and Engineering at the University of North Carolina at Chapel Hill, USA. Before joining the Inha University in 2008, he was post-doctoral research associate in the Department of Civil and Environmental Engineering at the Michigan State University. He is a member of International Water Association specialized group of Membrane Technology and Anaerobic Digestion, Korea Society of Environmental Engineers, Korea Membrane Society, North America Membrane Society and American Chemical Society. His main research areas focus on resource recovery from wastewater, decentralized treatments, industrial wastewater treatment by developing hybrid membrane technologies. Particularly, he has been studying intensively for combining membrane materials with anaerobic bioreactors to achieve energy-positive wastewater treatment process. He is currently leading several government projects related to anaerobic fluidized bed membrane bioreactor with domestic sewage and low-cost ceramic membrane for anaerobic membrane bioreactor. He is the author or co-author of over 60 refereed articles with 3115 citations in the last eight years. He has been serving as Editorial Board Members in the Journal of Chemical Technology and Biotechnology.

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