UNIVERSITY OF MICHIGAN

Department of Civil and Environmental Engineering

Announcement of PhD Dissertation Defense

KU LEUVEN

Advancing Anaerobic Membrane Bioreactors for Low Temperature Domestic Wastewater Treatment

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GM room - Lurie Engineering Center (North Campus), University of Michigan

Dissertation Co-Chairs: Professors Lutgarde Raskin, Steven Skerlos, and Ilse Smets

Water resource recovery facilities are being re-invented to allow for production of water of different levels of purity (drinking water to irrigation water), energy, and a variety of other products. Anaerobic membrane bioreactors (AnMBRs) have the potential to contribute to this need. AnMBRs combine anaerobic biological treatment with membrane filtration to convert organic carbon present in wastewater into renewable energy in the form of biogas while achieving excellent effluent quality. Past research suggested AnMBRs to be promising for domestic wastewater treatment because of advantages such as small physical footprint, energy recovery, and stable effluent quality. In cold to temperate climates, the temperature of domestic wastewater is generally below 20°C and can drop to below 5°C during the coldest days of the year. Operation at these temperatures raises economic and environmental challenges associated with membrane fouling and the loss of methane dissolved in the effluent. In this dissertation, I present critical reviews of the patent and academic literature to help identify promising AnMBR design features and microbiological monitoring methods focused on direct interspecies electron transfer (DIET). I then apply this knowledge through lab-scale AnMBR studies designed for cold to temperate climates. By identifying design and operating characteristics best suited for low temperature AnMBR treatment of domestic wastewater, this research contributes to pushing anaerobic wastewater treatment towards net positive energy operation with minimal environmental impacts.