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**Navigating Wastewater Energy Recovery Strategies:  
A Life Cycle Comparison of Anaerobic Membrane Bioreactor and  
High Rate Activated Sludge with Anaerobic Digestion**



**Wednesday, March 20, 2013, 4:00 – 5:00 PM**

**2315 G.G. Brown Building (North Campus)**

**The University of Michigan**

**Refreshments served before and after the seminar**

**Abstract.** Anaerobic membrane bioreactor (AnMBR) and high rate activated sludge with anaerobic digestion (HRAS+AD) are two processes that strive to recover energy in the form of biogas either directly from domestic wastewater (AnMBR) or during sludge digestion (HRAS+AD). Energy balance, life cycle assessment (LCA), and life cycle costing (LCC) methods were applied to compare AnMBR and HRAS+AD at two temperatures, three sludge disposal scenarios, and two wastewater strengths. At 15°C and for medium strength wastewater treatment, AnMBR recovered over 30% more energy in the form of biogas than HRAS+AD but used over 300% more energy, primarily to prevent membrane fouling. In addition, while AnMBR and HRAS+AD had similar life cycle costs, AnMBR had greater environmental impacts in all impact categories. AnMBR global warming impact was dominated by direct emissions of effluent dissolved methane (70% of impact). Despite these results, there is future potential for AnMBR to have greater energy recovery and lower environmental impacts than HRAS+AD provided that energy demands for fouling control are reduced and effluent dissolved methane emissions are mitigated. These findings represent targets for AnMBR research moving forward.