Exploration of Reverse Osmosis Based Reuse Trains

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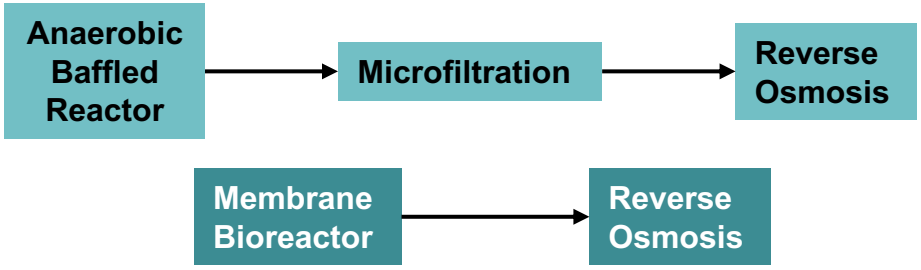
Background

Potable water reuse is becoming an important component of water resource management. The current approach uses treated wastewater, microfiltration (MF), reverse osmosis (RO), then advanced treatment. This current reuse train requires a high energy input, so alternative wastewater treatment processes are being considered as an alternative. Membrane Bioreactors (MBR) produce higher quality effluent and combines many steps of traditional treatment. Anaerobic baffled reactors (ABR) do not require aeration and could produce energy in the form of biogas. ABRs have been shown to successfully treat many contaminants, but there is no breakdown of nitrogenous or phosphoric compounds. In addition, current reuse trains suffer from membrane fouling and difficulty dealing with the RO waste stream.

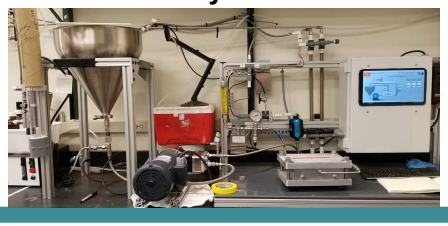
Research Goals

1. How does the RO membrane foul in respect to MBR and ABR treated water
2. How does the DOC and nitrogenous compound removal of the RO membrane vary between MBR and ABR pretreatment
3. Can a wash protocol mitigate fouling in the filtration step
4. Can the RO waste stream be reused

Reuse Trains



RO System



MF System

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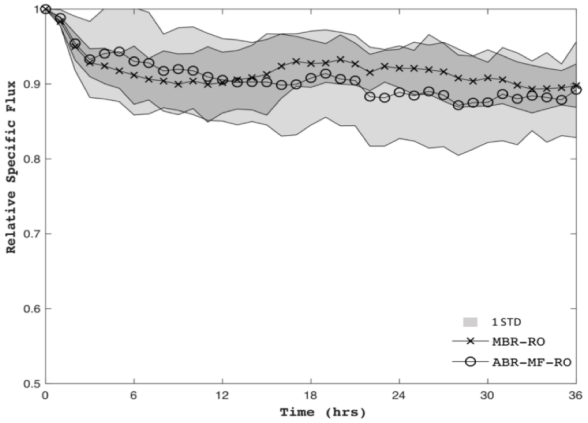
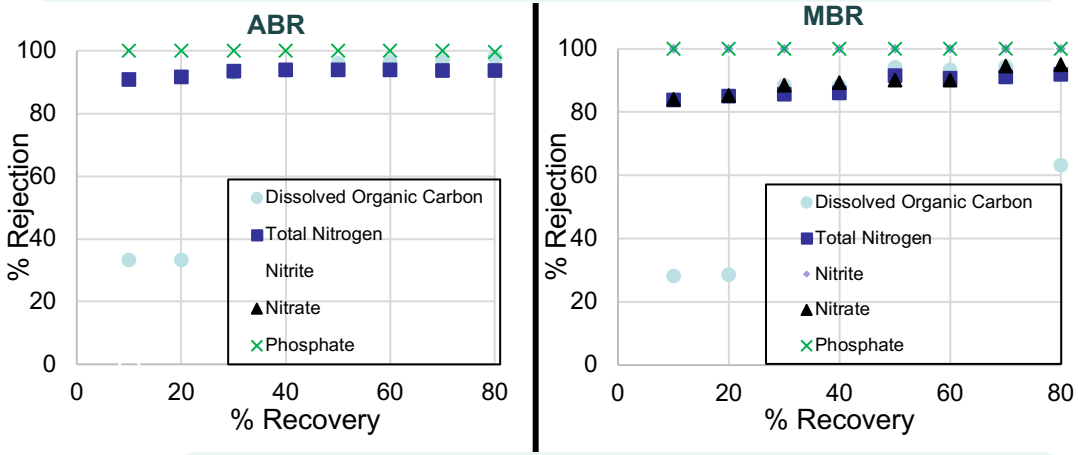
Results and Conclusions

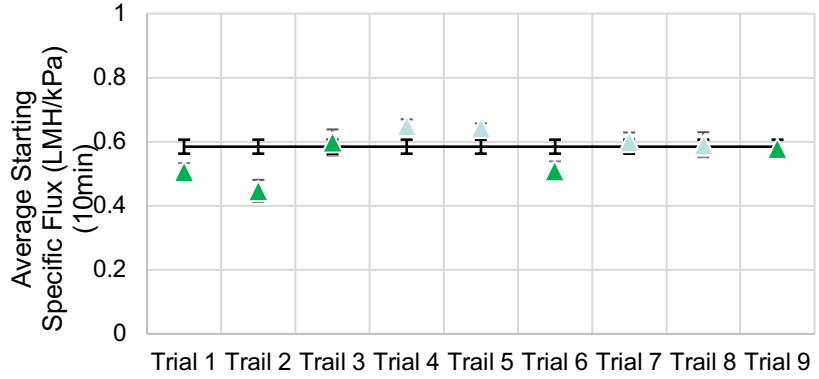
1. There is no difference between ABR and MBR pretreatment for RO membrane fouling:



2. Membrane performance is consistent, but more studies need to be conducted to affirm reults



3. An acid-base wash mitigates MF fouling



4. MBR pretreated RO waste stream can be used for agriculture, and ABR waste stream can be used for anammox feed

	Anaerobic Pretreatment (mg/L)	Reject Concentration (mg/L)	Aerobic Pretreatment (mg/L)	Reject Concentration (mg/L)
Ammonia	37.8	81.8	7.07	ND
Nitrite	ND	183.47	ND	0.22
Nitrate	ND	24.36	7.2	27.97
Phosphate	15.683	23.75	ND	1.29