

# The Start-Up of a Gas-Lift Anaerobic Membrane Bioreactor (GI-AnMBR) for the treatment of domestic wastewater and nutrient recovery

## Goals:

- Develop standards of procedure for the start-up requirements of a GI-AnMBR
- Monitor preliminary performance of the GI-AnMBR

## Process:

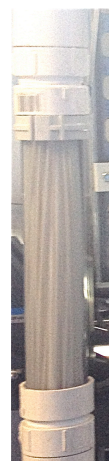
- Trouble-shooting, clean water recirculation for leak-proofing
- Influent & effluent (feed & permeate) testing
  - COD, ammonia, nitrate, phosphorus, TS, TSS, VF

## Materials:

- Seed sludge from Denver Metropolitan Wastewater Treatment Plant
- Raw sewage from Mines Park as continuous feed



Sludge from DM WWTP stored outside the Mines Park Facility



Ultrafiltration membrane fibers with a filtration surface area of 0.2m<sup>2</sup> before and after (left and right, respectively) sludge was introduced to the system



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## Analysis:

-Nutrient recovery and COD removal efficiencies

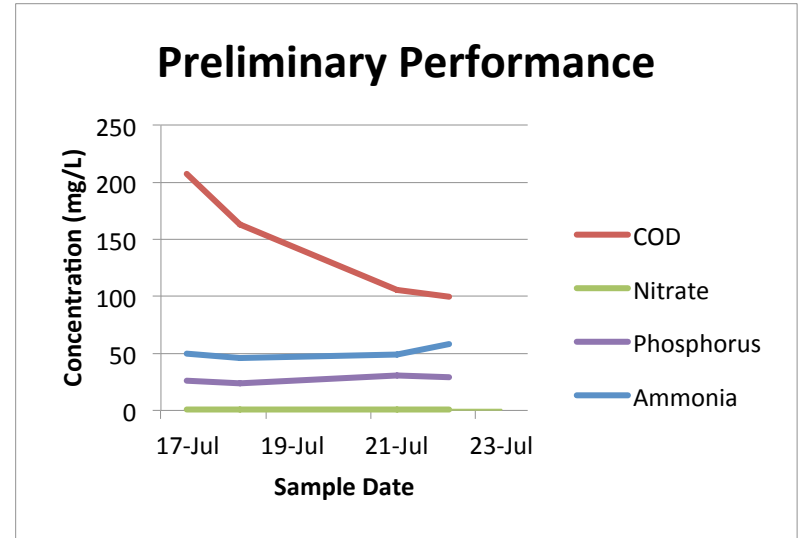
-90% COD removal goal

-60% nutrient recovery goal

-TS & TSS in filtered sludge vs. seed sludge

Ammonia	% Recovery			% Removal	
	Nitrate	Phosphorus		COD	
104.96	75.31		161.18		46.93
97.45	82.89		165.38		53.89
105.53	71.88		131.26		68.13
114.92	69.99		113.95		76.89
140.09	49.81		119.72		67.54
<b>average:</b>					
112.59	69.97		138.30		62.68

Average recovery and removal rates during the first week of operation. Nutrient recovery goal being met, COD removal goal still low due to background concentrations from initial seed sludge.



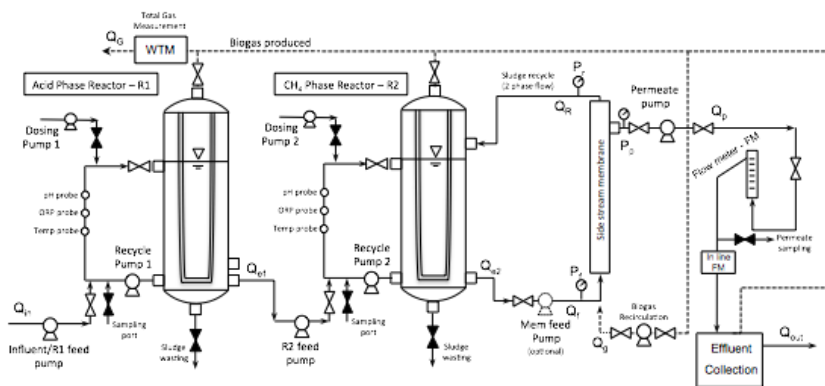
Trends of nutrient and COD concentrations during the first week of operation.

## Conclusions:

-more time needed for further recovery & removal

-GI-AnMBR good wastewater treatment alternative

-recovery of nutrients, solids filtration, biogas capture → potential for fertilizers, potable water, energy neutral processes



Detailed schematic of a general GI-AnMBR set-up