Stony Brook University

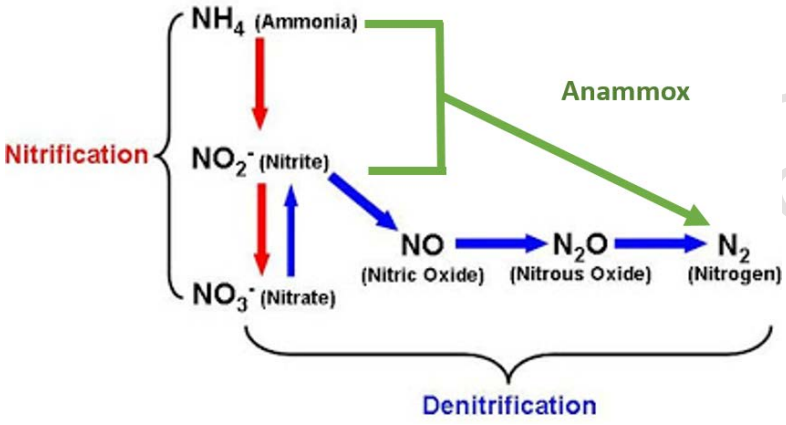
Membrane Bioreactors; Next-Generation Technology for Nutrient Removal

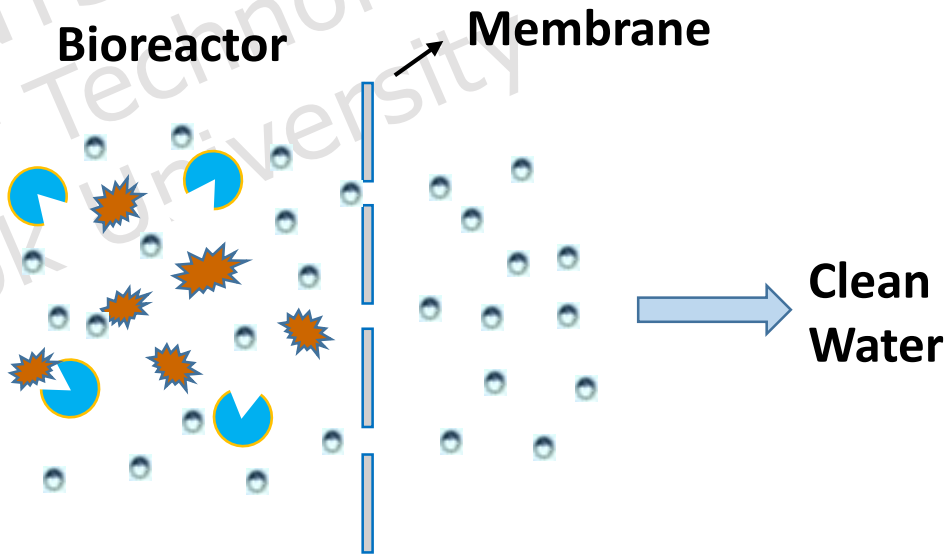
Pejman Hadi, Benjamin S. Hsiao, Harold Walker, Xinwei Mao, Xiangyu Huang, Mengying Yang, Ilana Heckler

FAR BEYOND

Membrane Bioreactor (MBR)

MBR is based on biological treatment followed by perm-selective membrane separation.

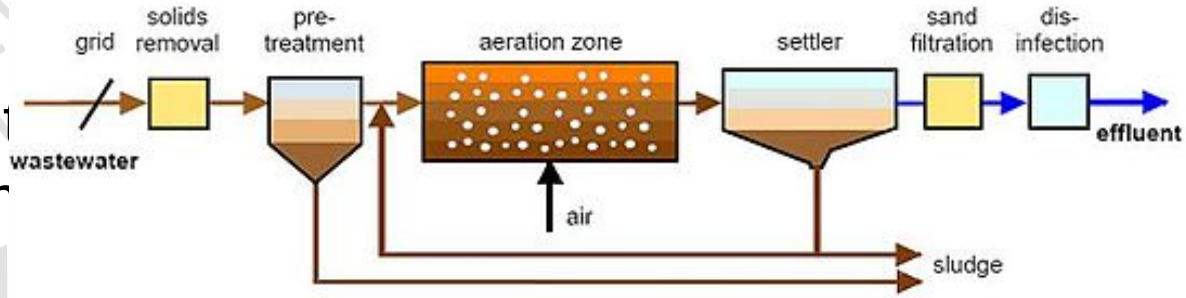




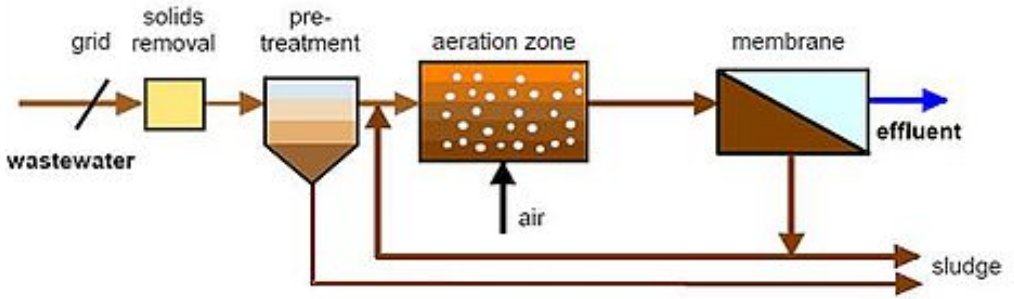
Advantages of the MBR

- High effluent quality
- Elimination of clarification/settlement process
- Small footprint

Conventional treatment process

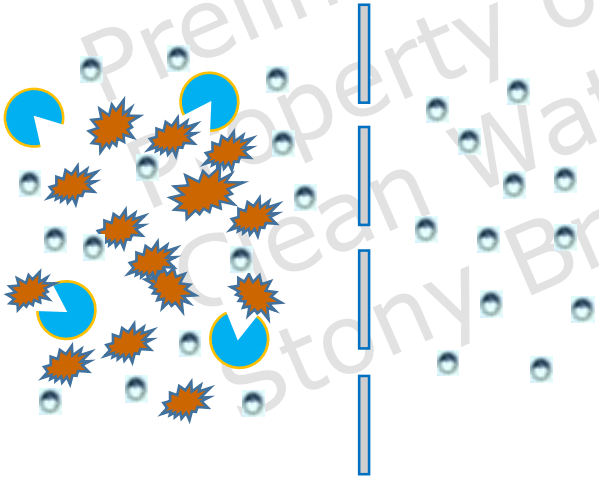


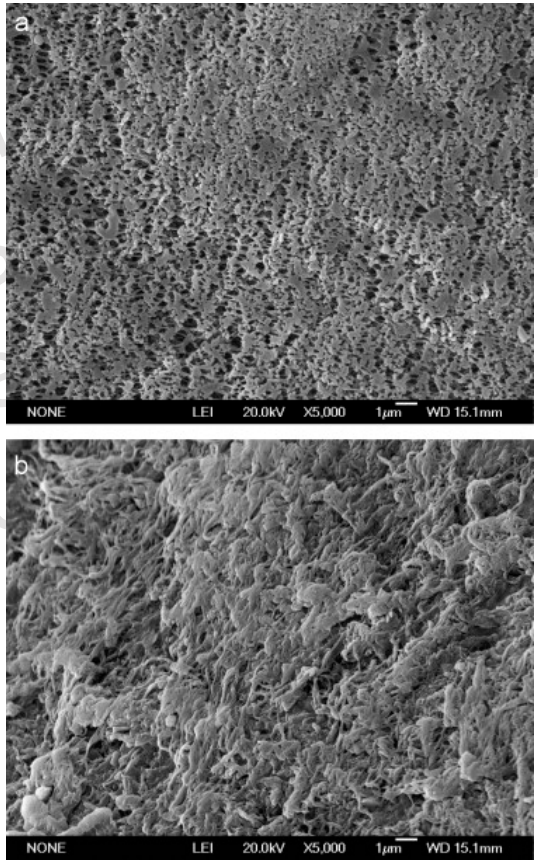
Membrane-based treatment process



Challenges with the MBR

- High cost
- Fouling problem



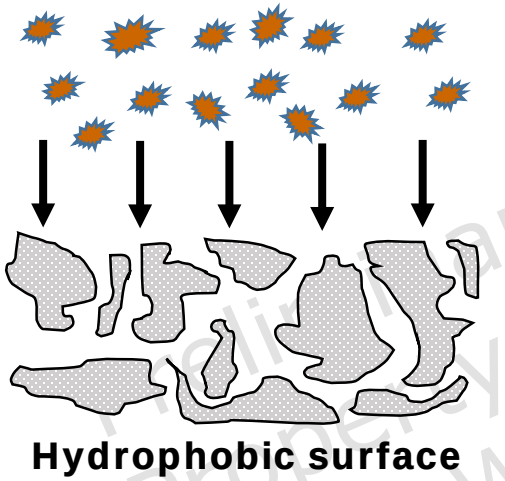


Virgin Membrane

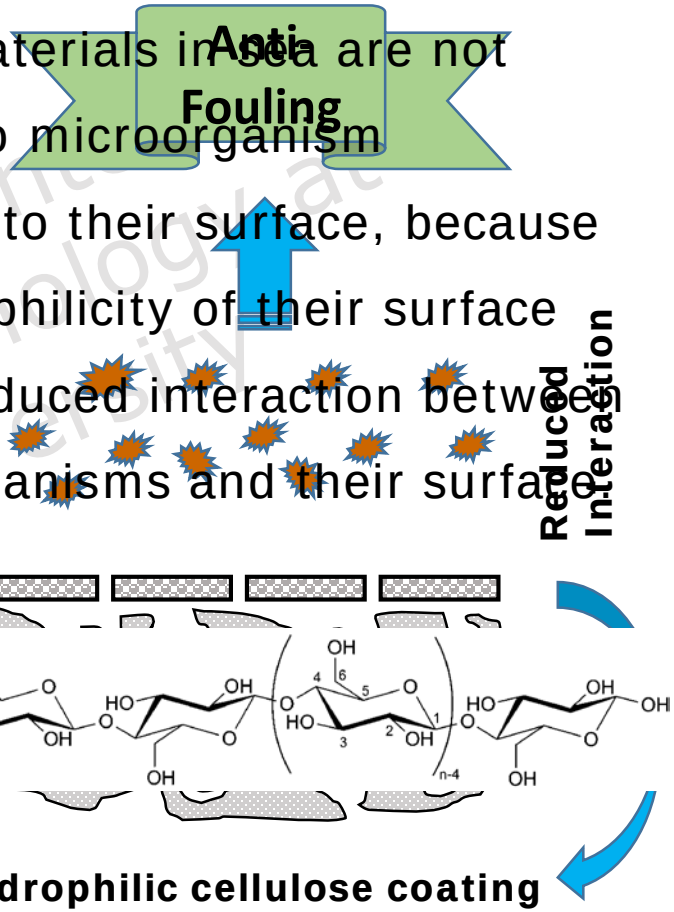
Fouled Membrane

Hu et al. (2013) J. Membr. Sci., 431, pp. 156

Bio-inspired Antifouling Membrane

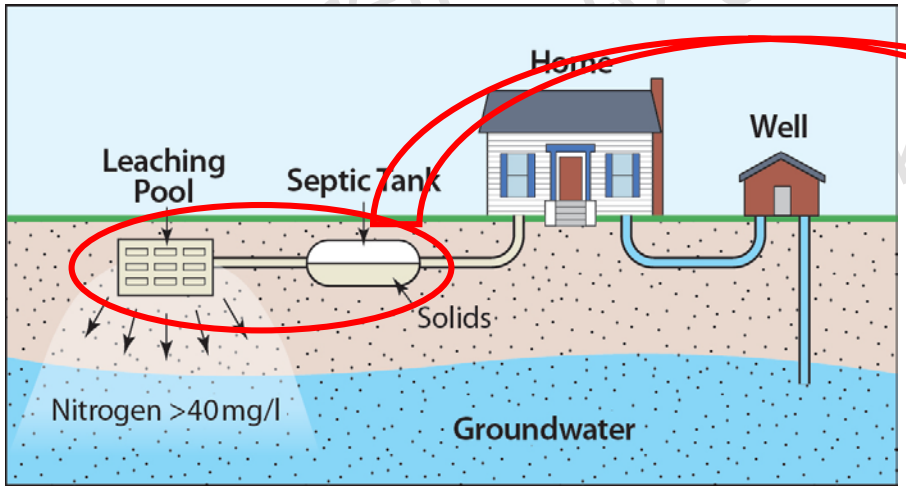


Cellulosic materials in sea are not vulnerable to microorganism attraction onto their surface, because of the hydrophilicity of their surface and thus, reduced interaction between the microorganisms and their surface.

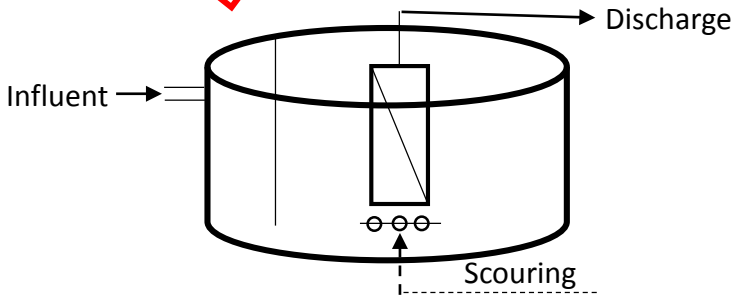


Nitrogen Removal Using the MBR

- ✓ Fabrication of next-generation antifouling membranes for efficient, cost-effective nitrogen removal by the MBR.
- ✓ Re-engineering the biological processes and microorganism manipulation
- ✓ Prototype development of an onsite MBR-based wastewater system



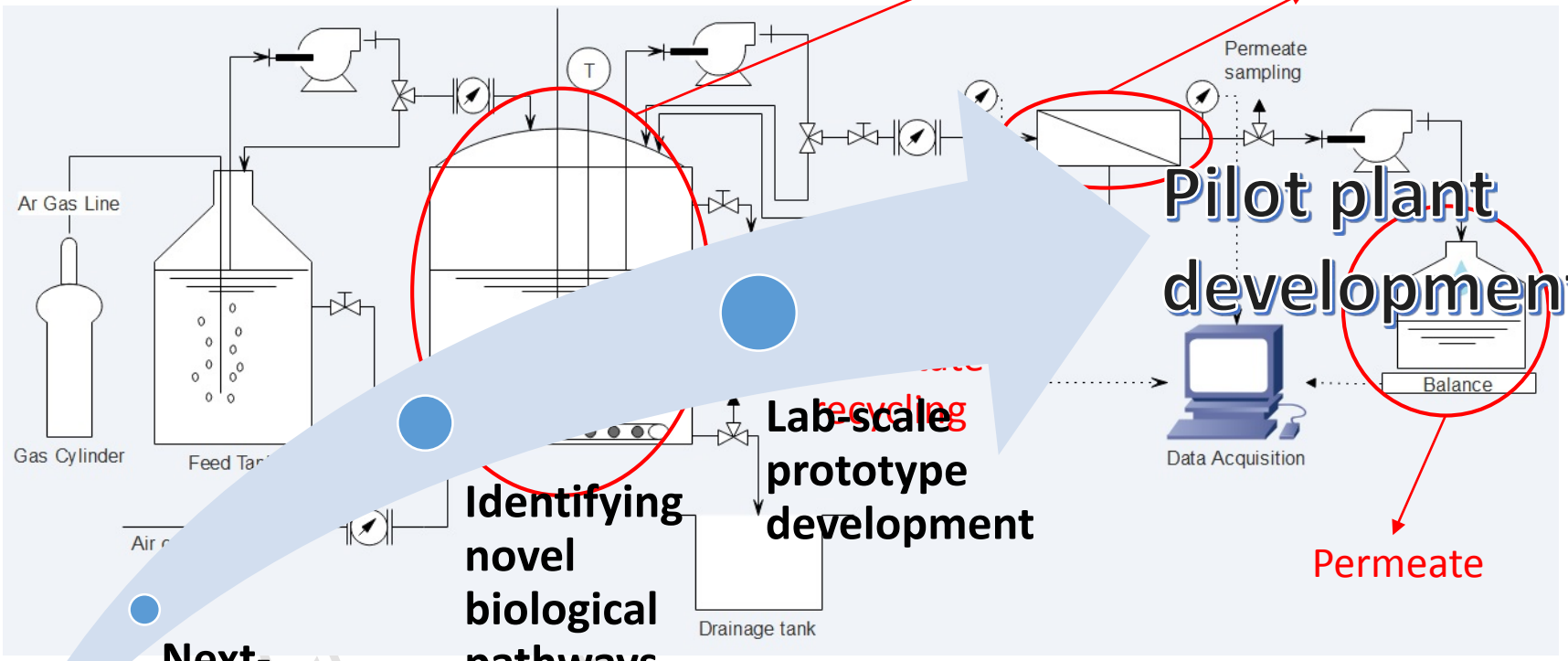
Feasibility of the replacement of the cesspool system by the MBR in onsite systems



Scalable Technology

- Municipal wastewater treatment
- Industrial wastewater treatment
- Landfill leachate treatment
- Bathing wastewater treatment
- Public place wastewater treatment, such as hospitals and stadiums
- River water treatment

Lab-scale MBR Design



Coming together is a beginning;
Keeping together is progress;
Working together is success

- Henry Ford -