Wastewater Treatment can be really simple and it is in all our control

"Quit Producing it (and we'll find ways to quit treating and getting rid of it)"

QUOTE AT MANY WASTEWATER OPERATOR TRAINING SCHOOLS

Wastewater treatment plant effluent has only two places to go: surface water and/or groundwater

- What we do with the treated wastewater defines what's needed for treatment
  - Groundwater Discharges:
    - Land Application (slow rate)
      - Reuse, etc.
    - Land Application (high rate)
      - Rapid infiltration basins
      - Exfiltration trenches, etc.
    - Injection
  - Surface Water Discharges
    - Wetlands Treatment Systems
    - Into surface water bodies
- Biosolids Treatment requirements are defined similarly, and are not considered in this presentation

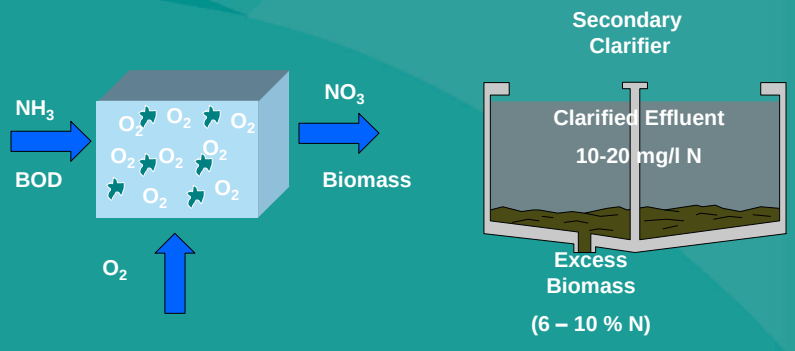
Wastewater disposal application rates and effluent parameter limits are dictated by stringent FDEP regulations

Disposal Method	Limiting Parameters (key parameters from FDEP regulations)
Ground Water Discharge with slow rate land application	1. Agronomic uptake rates 2. Groundwater constraints
Ground Water Discharge with rapid rate land application	1. Groundwater constraints
Injection (Class I or V)	1. Groundwater constraints
Surface water discharges	1. Receiving water characteristics

Wastewater Treatment technologies must consider effluent disposal needs

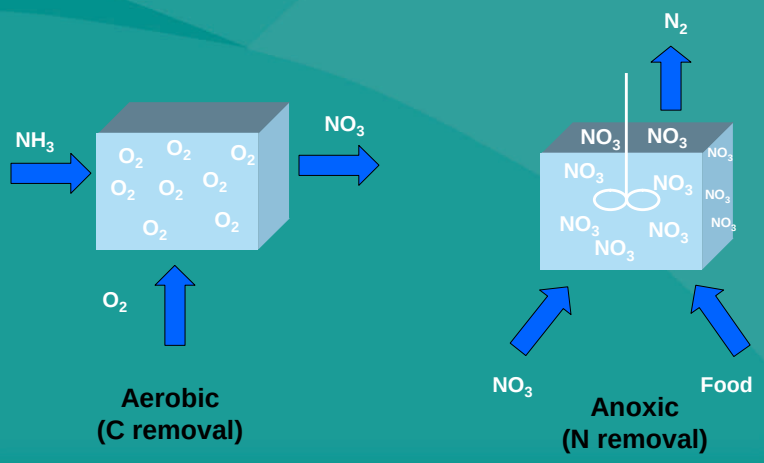
Reuse	1. Too much nitrogen removal will result in farmer/homeowner adding fertilizer 2. Some TN/TP limits are appropriate
Class V Injection	1. Need to meet more stringent criteria 2. Drinking water limits may apply
Class I Injection	1. Less stringent criteria than Class V
Wetlands Disposal	1. Need to reduce TN below 2-3 mg/L moot due to bird/animal habitat and algae

Conventional Wastewater Treatment will meet reasonable effluent parameters of 20/20/10*



* Wastewater effluent concentrations are reported as BOD/TSS/N/P

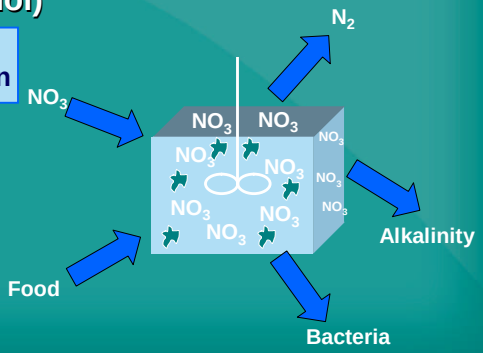
Biological Nutrient Removal (BNR) wastewater treatment will remove a high percentage of total nitrogen



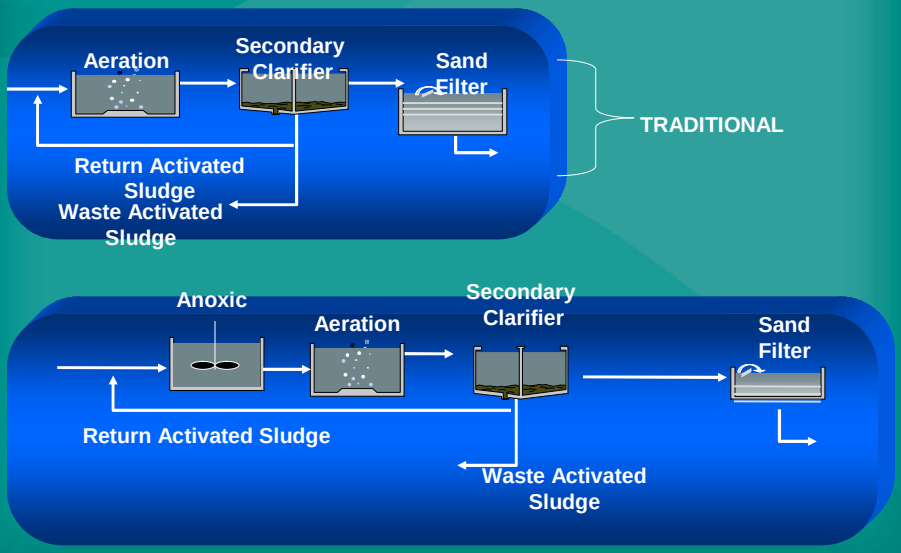
Environmental Conditions For Denitrification must be Created for Nitrogen Removal

- Denitrifying (facultative heterotrophic) bacteria
- Food (BOD or methanol)
- Nitrate
- No oxygen

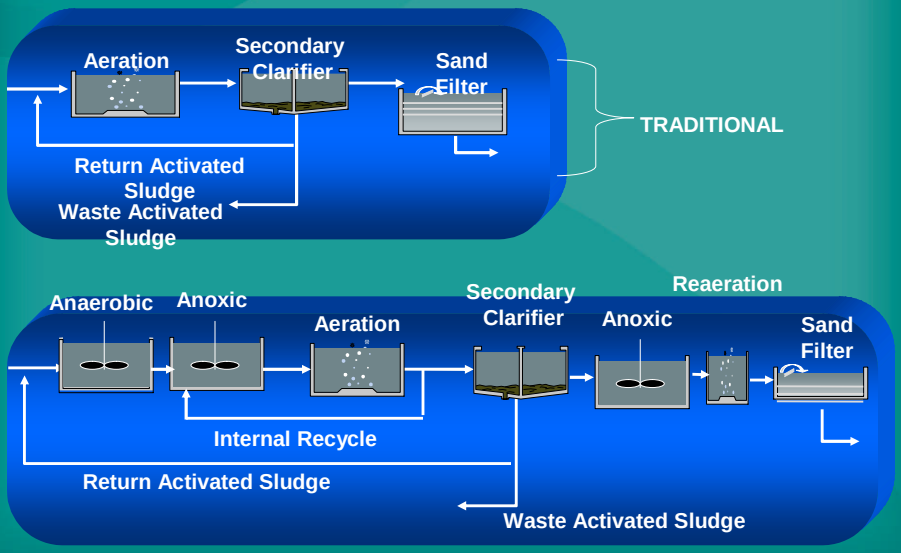
Anoxic Condition



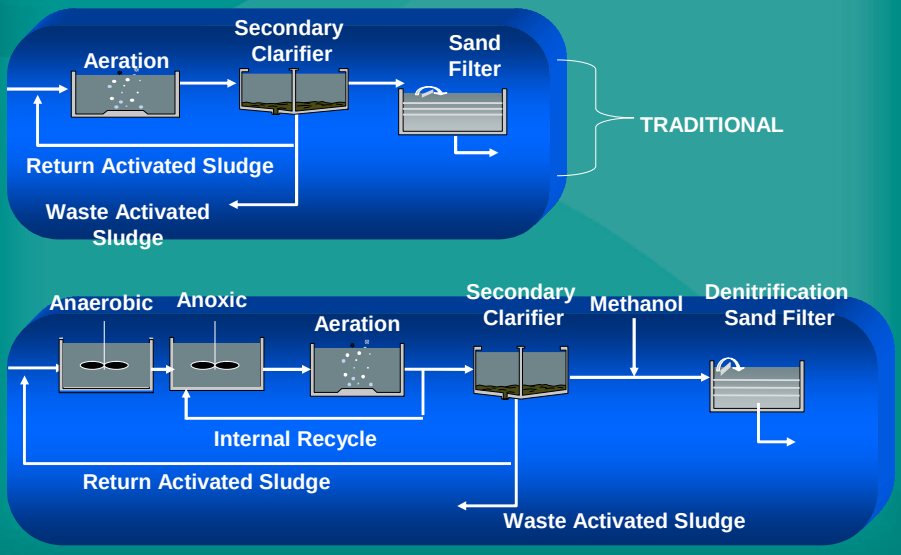
Modified Ludzack-Ettinger (MLE) can meet limits of 5/5/6



5-Stage Bardenpho™ can produce effluent parameters of 5/5/3/1



3-Stage Bardenpho™ w/ Denitrification Filters can produce an effluent of 5/5/2/1



Choosing the right technology for implementation is critical to manage utility rates

Treatment Method	Effluent Parameters	Approximate Cost for Liquid Treatment Train (Solids Handling will cost more)
Conventional	20/20/10 +/-	Approximately $60 million for 20 mgd
MLE with filtration	5/5/6 +/-	Approximately $90 million for 20 mgd
Bardenpho without filtration	5/5/3/1 +/-	Approximately $110 million for 20 mgd
Bardenpho with filtration	5/5/2/1 +/-	Approximately $130 million for 20 mgd

In conclusion, planning to meet effluent limits will drive level of treatment, but there are limits

- Treating to the appropriate level is important, difficult to treat better than 5/5/2
- Over treating can result in additional costs for no benefit:
  - Treating with a nutrient removal process and then disposing the effluent through reuse may require fertilizer addition
- Determining the desired effluent level of BOD, TSS, TN, and TP (if applicable) will allow cost optimization for the ratepayers