UOSA Nutrient Monitoring

Preliminary Experience and Future Plans

Objectives

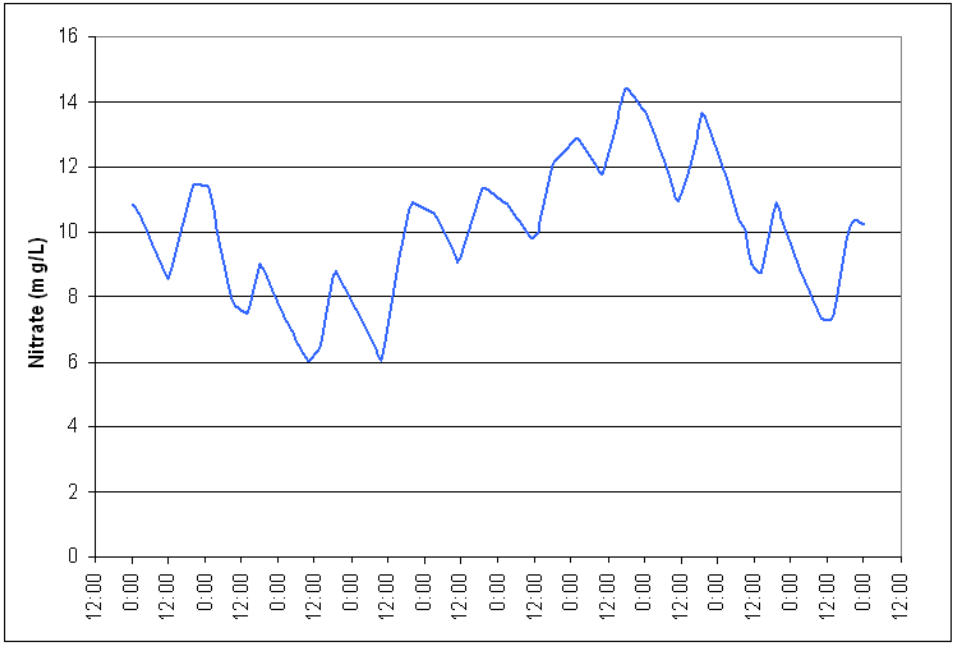
- Annual loading limit
- 5-Year projections for trading
- Reliable control of existing MLE
- Energy
- Cost/Benefit & outsourcing

Process Uses

- MLE
- Real-time nitrate monitoring at basin effluent
- Nitrate feedback for recycle control
- Nitrate feedback for substrate/recycle
- Ammonia feed-forward for DO control
- Ammonia feedback for DO control

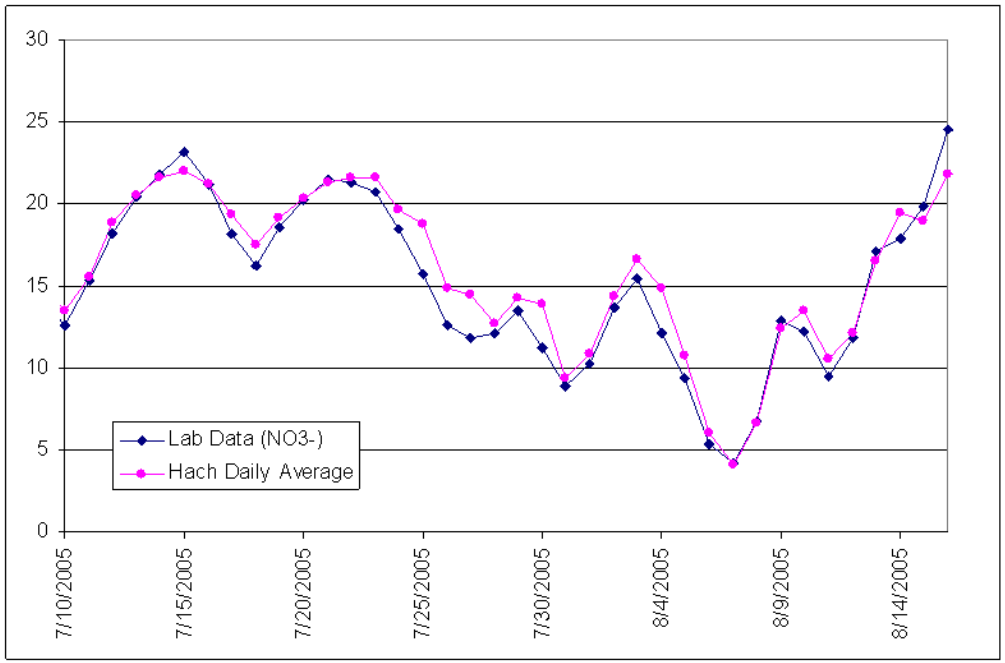
Nitrate Monitors

- Hach, Endress-Hauser, WTW / Combination
- Typical SE data



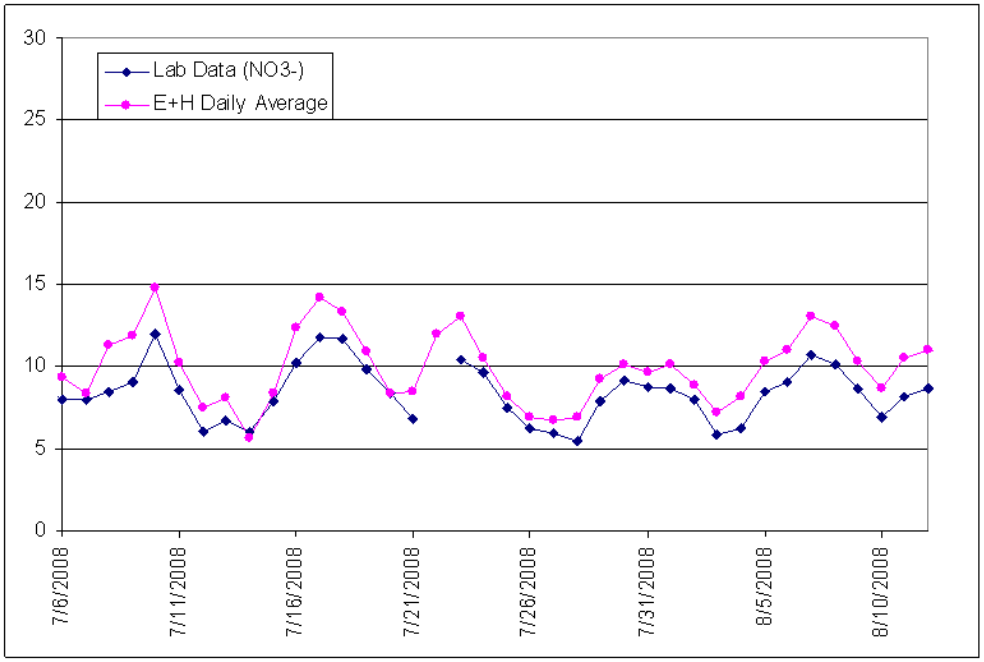
Hach Nitratax Data

- Installed in SE prior to MLE operation
- Excellent agreement with lab data (R^2=0.95)



E+H Data

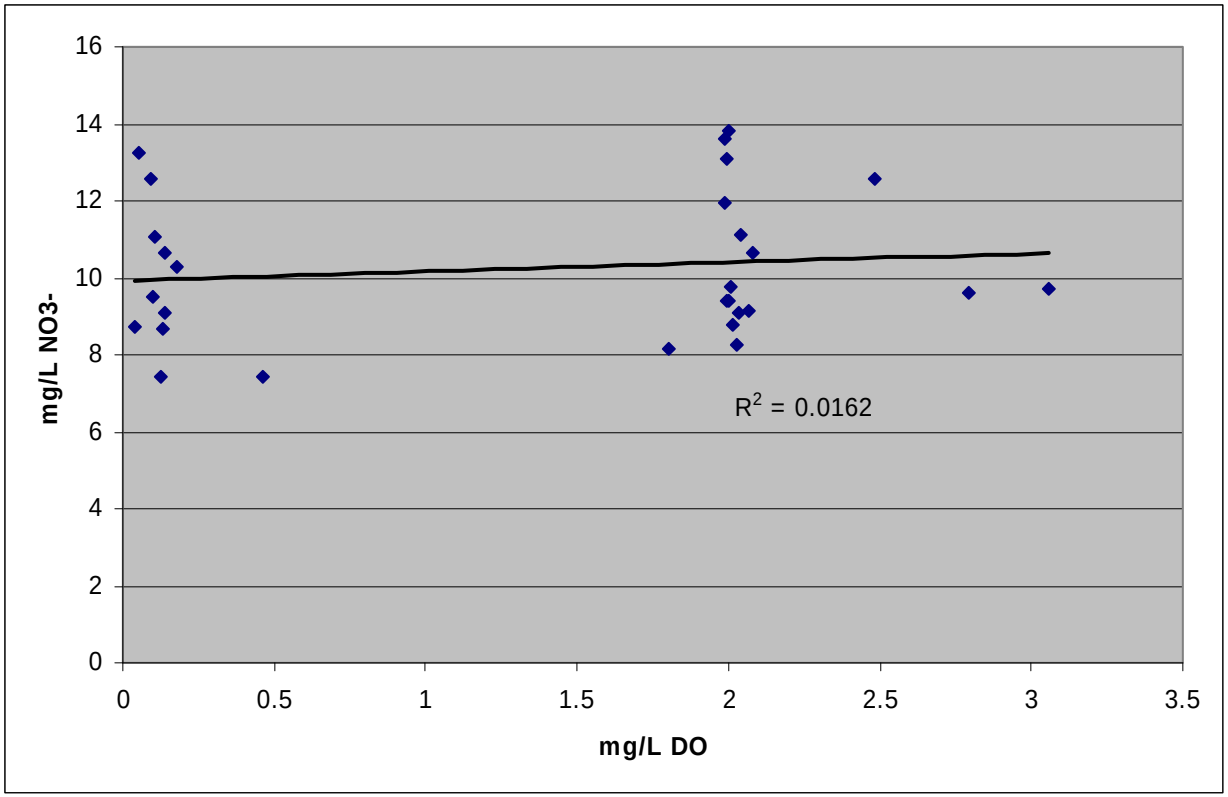
- Chosen on cost grounds
- Calibration issues, good precision (R^2=0.92)



Process Evaluation

- MLE “Light”
  - RAS return only
  - DO in front half to zero
  - No baffle
  - One basin, 20% of flow
- Other possibilities
  - Alternating aeration
  - SNdN
- Need to dedicate to single train
- RAS intermix issues

MLE “Light”

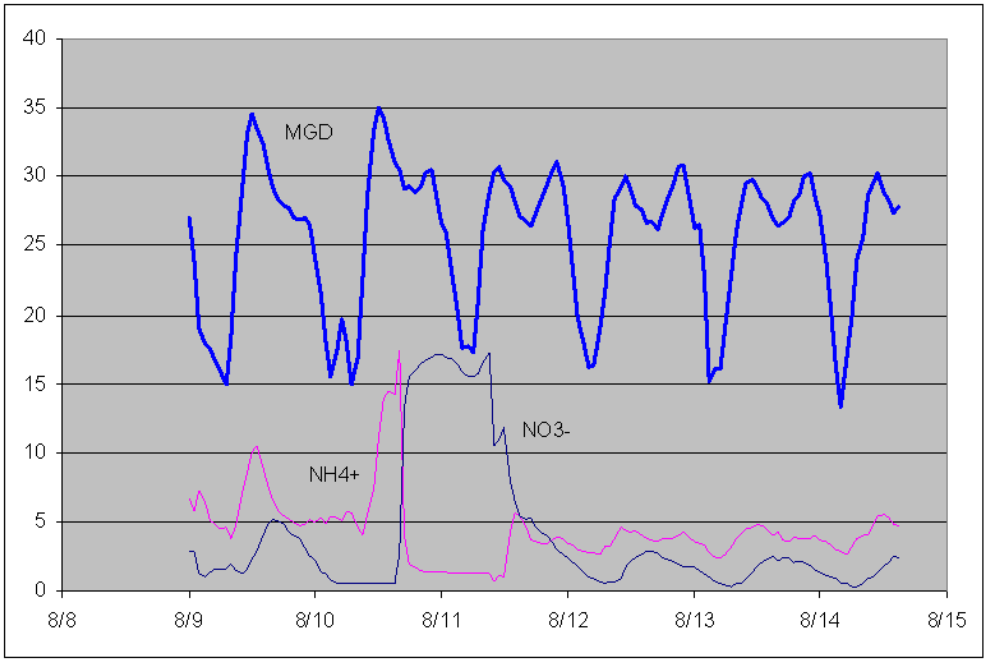


Ammonia Probes

- Preliminary work
  - Hach
  - WTW
- Require matrix correction/calibration
  - Weekly?

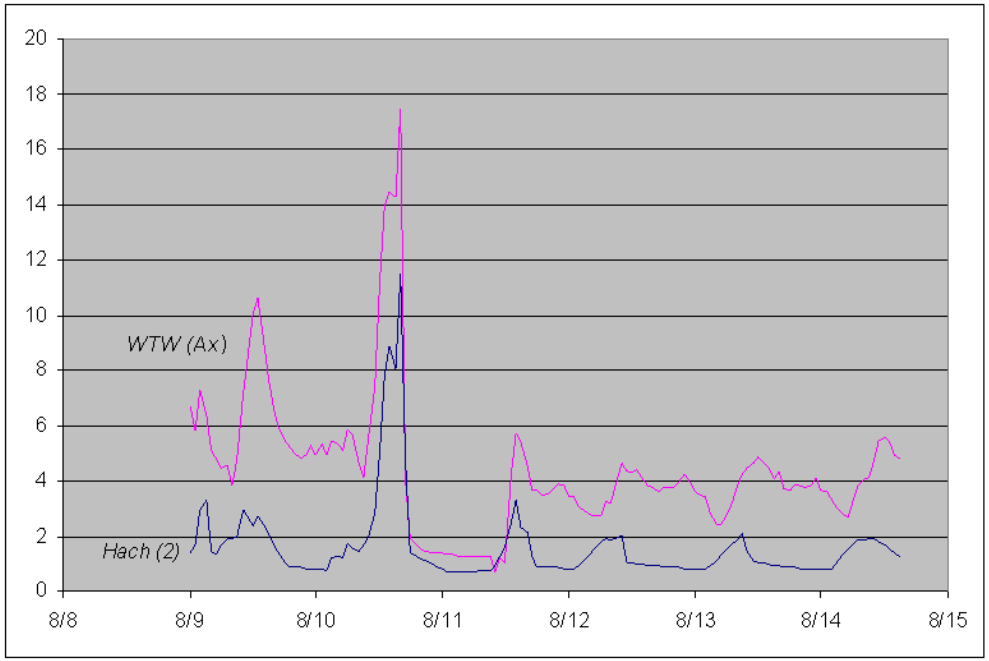
WTW Ammonium/Nitrate

- Installed in swing zone
- Preliminary data only



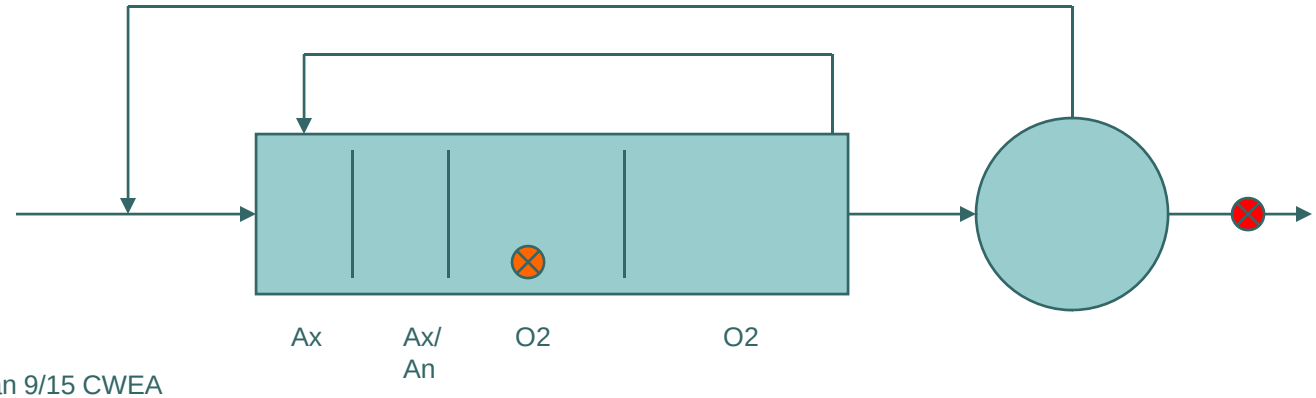
Hach Ammonia

- Good performance



Process Control

- Numerous schemes possible
- Initial testing NH4+ feed forward in zone 2
  - Logic set to drive DO low when ammonia low
  - Initial results showed savings, but…
  - Testing ongoing, later results not significant
  - Possible SNdN advantages



Lessons Learned

- Nitrate easy, Ammonia hard
- Algae
- Best control options still unknown
- Nitrate kinetics vs. substrate vs. O2
- …Phosphorus