Revolutionizing Ammonia Monitoring

Discover the NH6000sc Advantage

Adam Jennings WWT-IV, WWC-IV, WLA-I Wastewater Applications

Agenda slide

- Why measure NH3 / NH4?
- What is Ammonia / Ammonium?
- Ammonia Treatment
- Common Nitrification Challenges?
- How to measure NH3 / NH4 online?
- New NH6000sc analyzer
  - Accurate and Reliable Results
  - How to Check Analyzer Accuracy
  - Maintenance
- Q & A

Why Measure NH3 / NH4?

Why NH_3/NH_4 Matters

1. Ammonia is a **regulated** parameter
2. Water body **impairment**

>4200
Nutrient Permits

>5700
Nutrient
Monitor

Environmental Toxicity

Ammonia (NH_3) is toxic to aquatic life

Eutrophication

Agal blooms/die off causing oxygen depletion

Recreational use loss: Fishing, Tourism, Property Value

“Blue Baby Syndrome”

Nitrate leaching into drinking water systems is harmful to babies

Water Body
impairment

https://archive.epa.gov/water

https://www.epa.gov

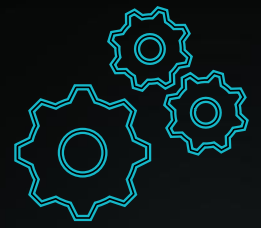
Why Measure NH3 / NH4?

Regulation

At last check there were >4200 NPDES permits with numerical limits for nutrients (Ammonia/Phosphorus). An additional >5700 were required to monitor only.

If Ammonia, Total Nitrogen, Total Inorganic Nitrogen, ect. Is expected on upcoming regulations. Measuring ammonia online now can better inform design.

Process Optimization



Ammonia is removed through biological processes requiring regular monitoring to ensure treatment efficiency.

There are numerous factors that affect Ammonia removal and how we monitor nitrification

Optimization allows for the balance between compliance risk **AND** efficiency.

Measuring ammonia helps ensure water quality, comply with regulations, and monitor the effectiveness of treatment processes

Common Requirements in NPDES Permits

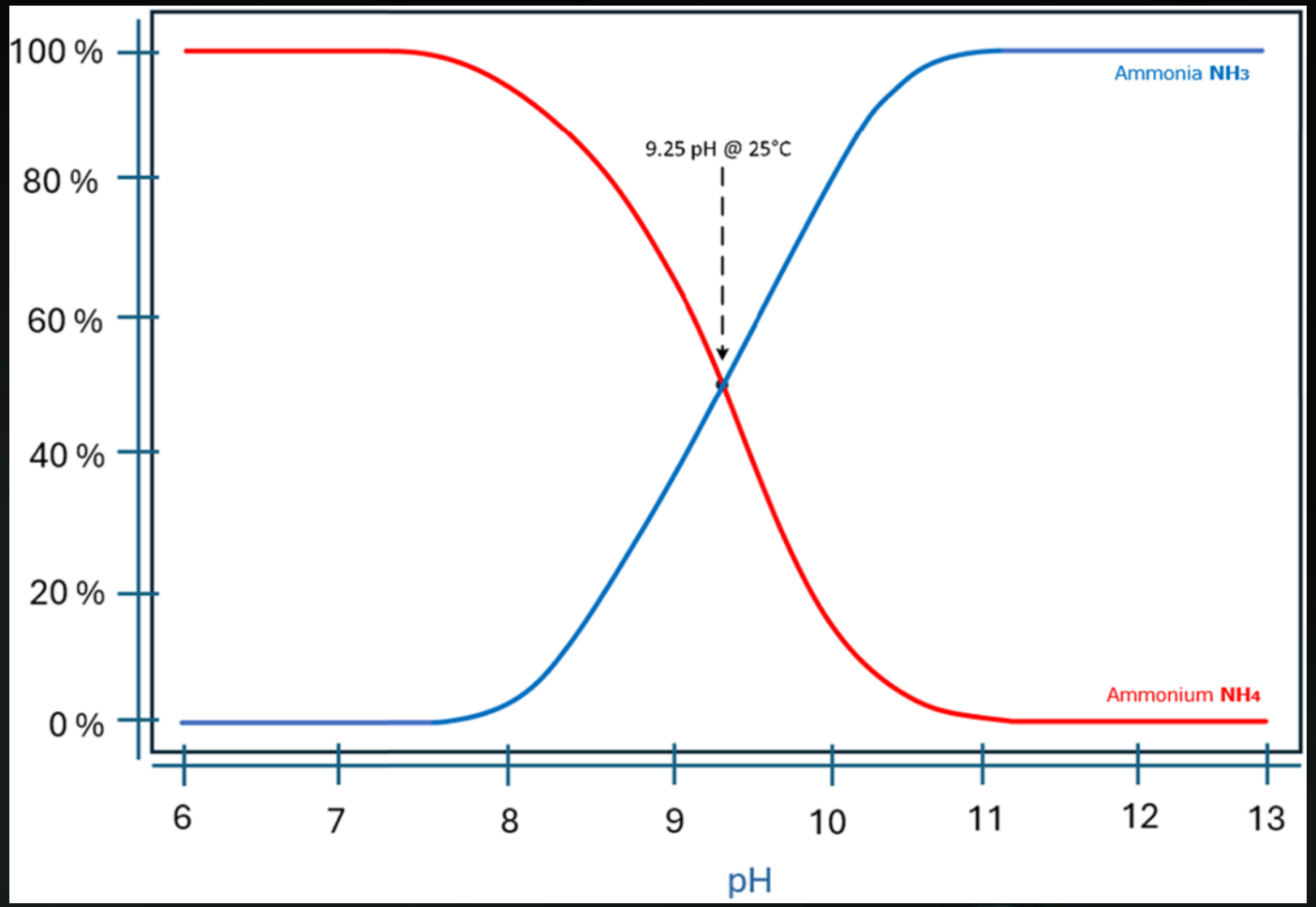
Table 2: Effluent Limitations and Monitoring Requirements for Outfall 001						
Parameter	**Units**	**Effluent Limitations**			**Effluent Monitoring Requirements**	
		Average Monthly Limit	**Average Weekly Limit**	**Maximum Daily Limit**	**Sample Frequency**	**Sample Type**
pH[8]	s.u.	6.5 – 9.0 at all times			5/week	grab
E. coli Bacteria[1,2]	#/100 ml	126 (geometric mean)	—	576 (instantaneous max.)	2/week	grab
Phosphorus, Total as P[4]	µg/L	Report	Report	—	2/week	24-hr. comp.
	lb/day	See Table 1				calculation[9]
Ammonia, Total as N[2,4] (October – April)	mg/L	0.308	—	1.25	5/week	24-hr. comp.
	lb/day	26.2	—	106		calculation[9]
Ammonia, Total as N[2,4] (May – September)	mg/L	0.406	—	1.65	5/week	24-hr. comp.
	lb/day	34.5	—	140		calculation[9]
Dissolved oxygen	mg/L	6.0 minimum			5/week	grab

- **Seasonal limits**: Tighter in certain seasons
- **24 Hour Composite**: Daily Maximum
- **24 Hour Composite**: Monthly Average
- Lbs. based and/or concentration based
- WET Testing (Bioassay)

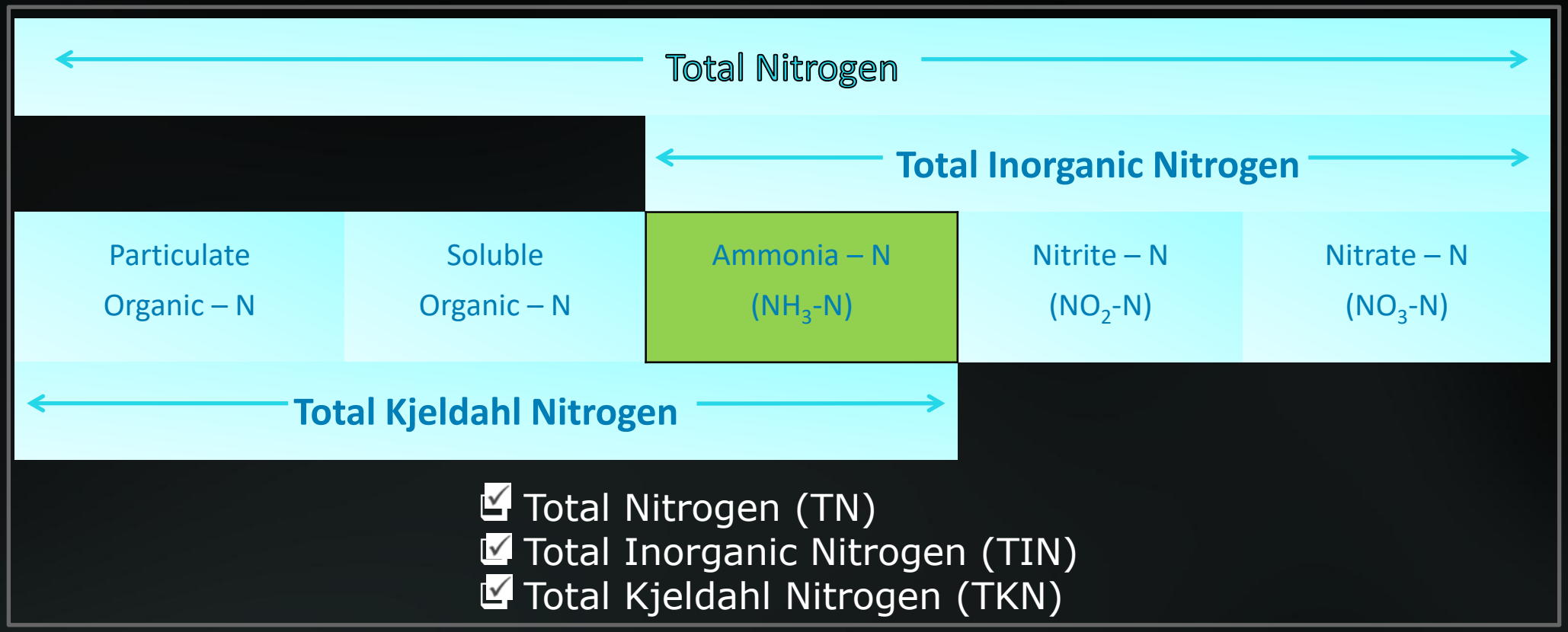
What is Ammonium / Ammonia?

Ammonia vs Ammonium

- Ammonia (NH_3) **highly toxic** to aquatic life
- Ammonium (NH_4) far **less** toxic
- Most Municipal WW **~7 pH**



Permit Requirements



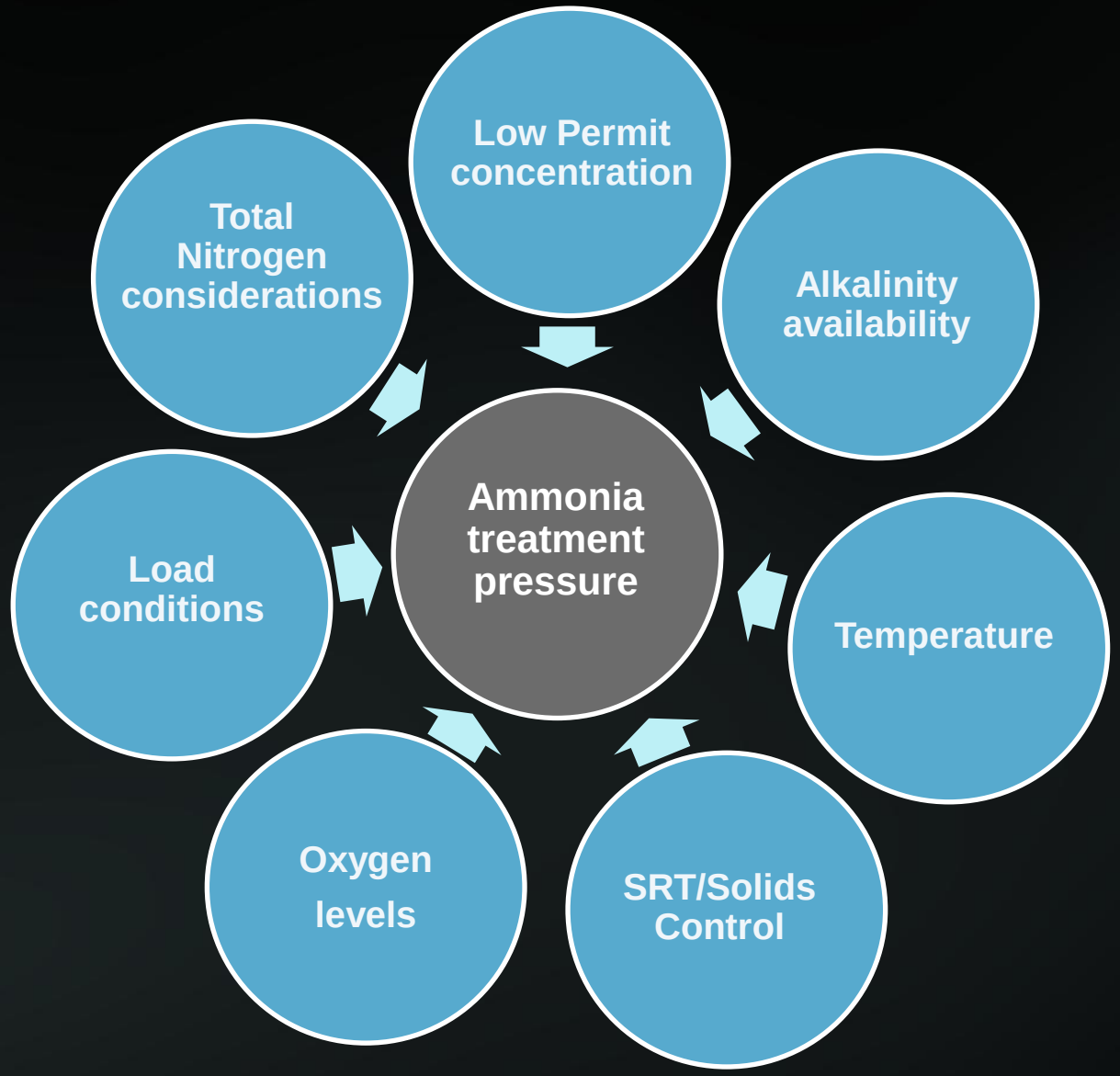
- ☑ Total Nitrogen (TN)
- ☑ Total Inorganic Nitrogen (TIN)
- ☑ Total Kjeldahl Nitrogen (TKN)

9

Dynamic Ammonia Treatment Pressures

Dynamic pressures on Ammonia Removal Performance

Specific Ammonia Treatment Kinetics



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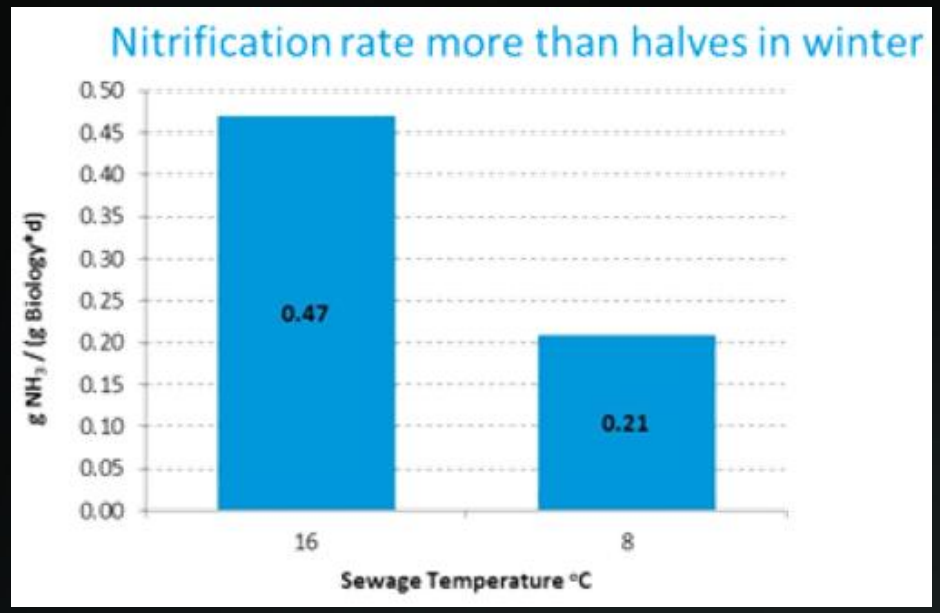

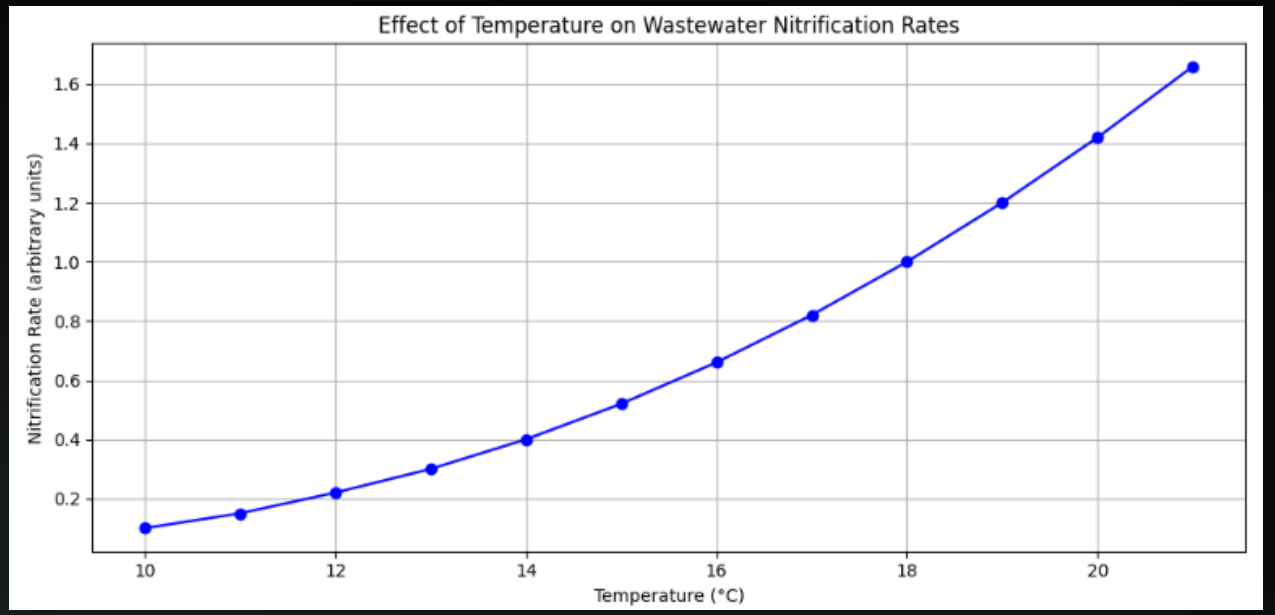

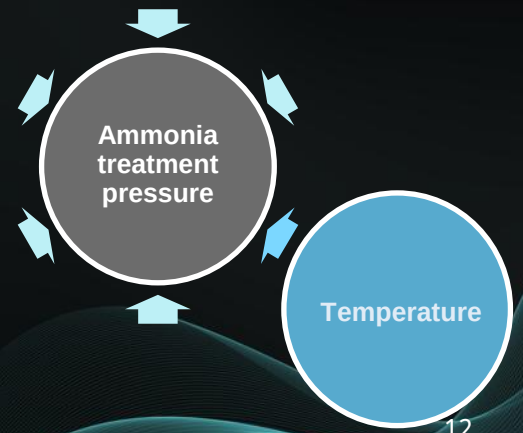

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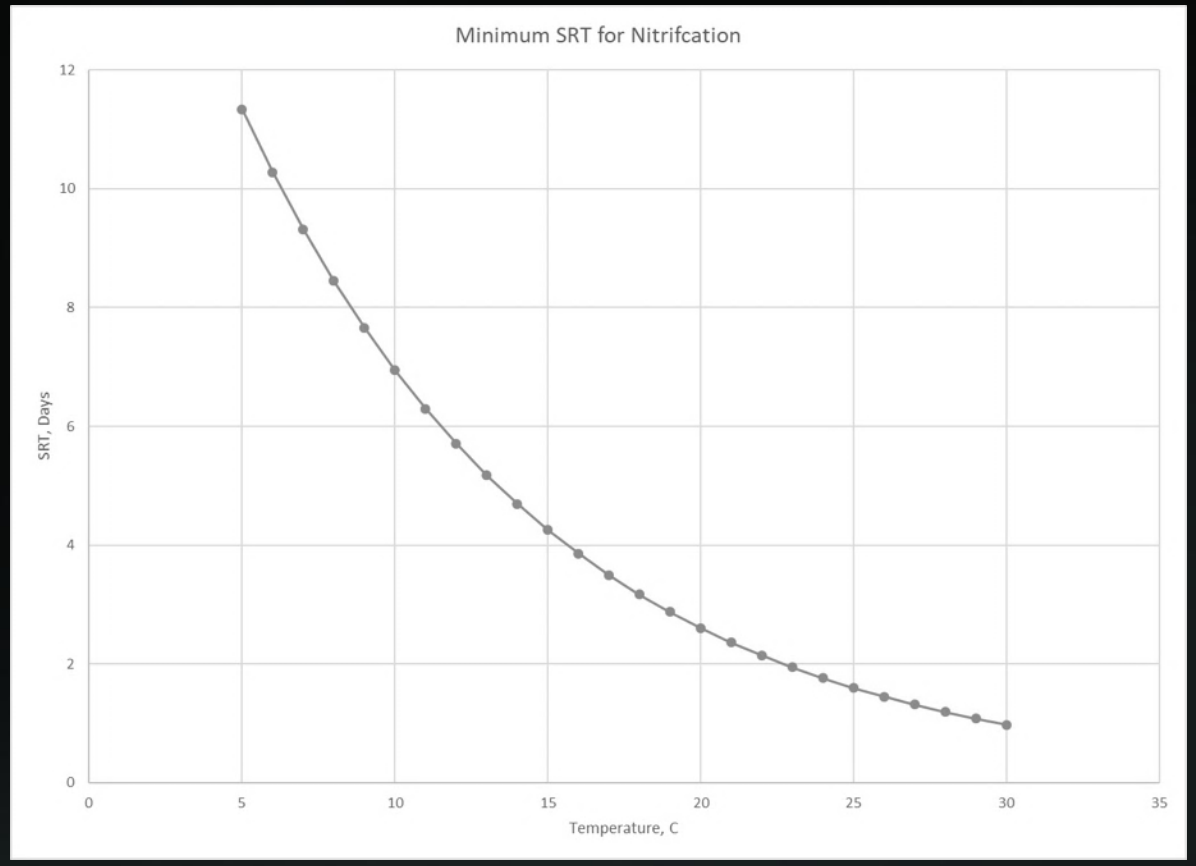
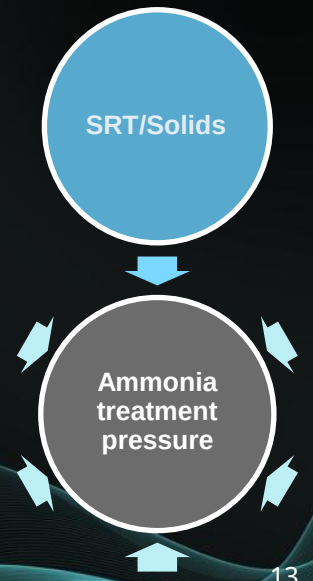


Common to over design with a high-risk factor for solids capacity

Maintaining proper SRT key in avoiding issues like filament bulking, aeration expense



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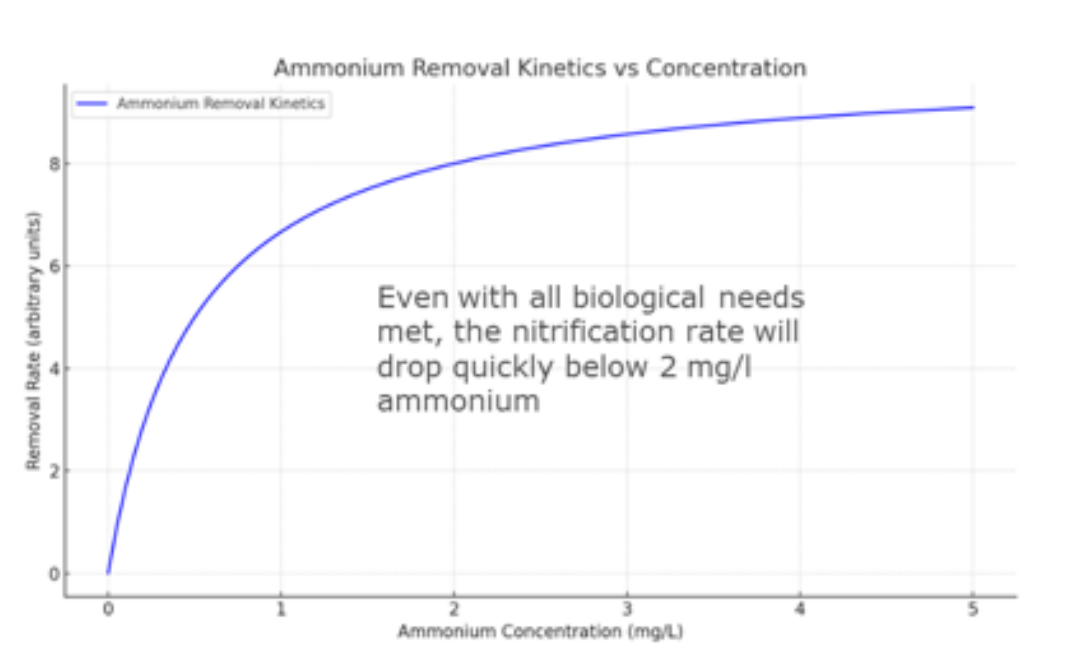

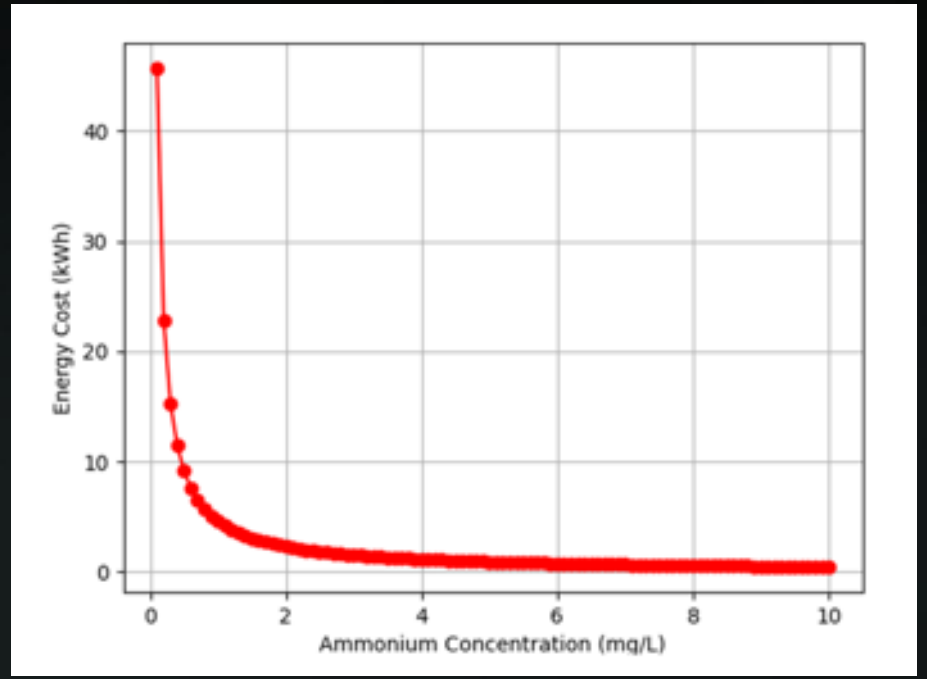

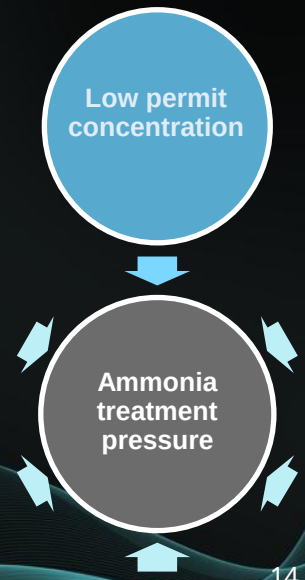

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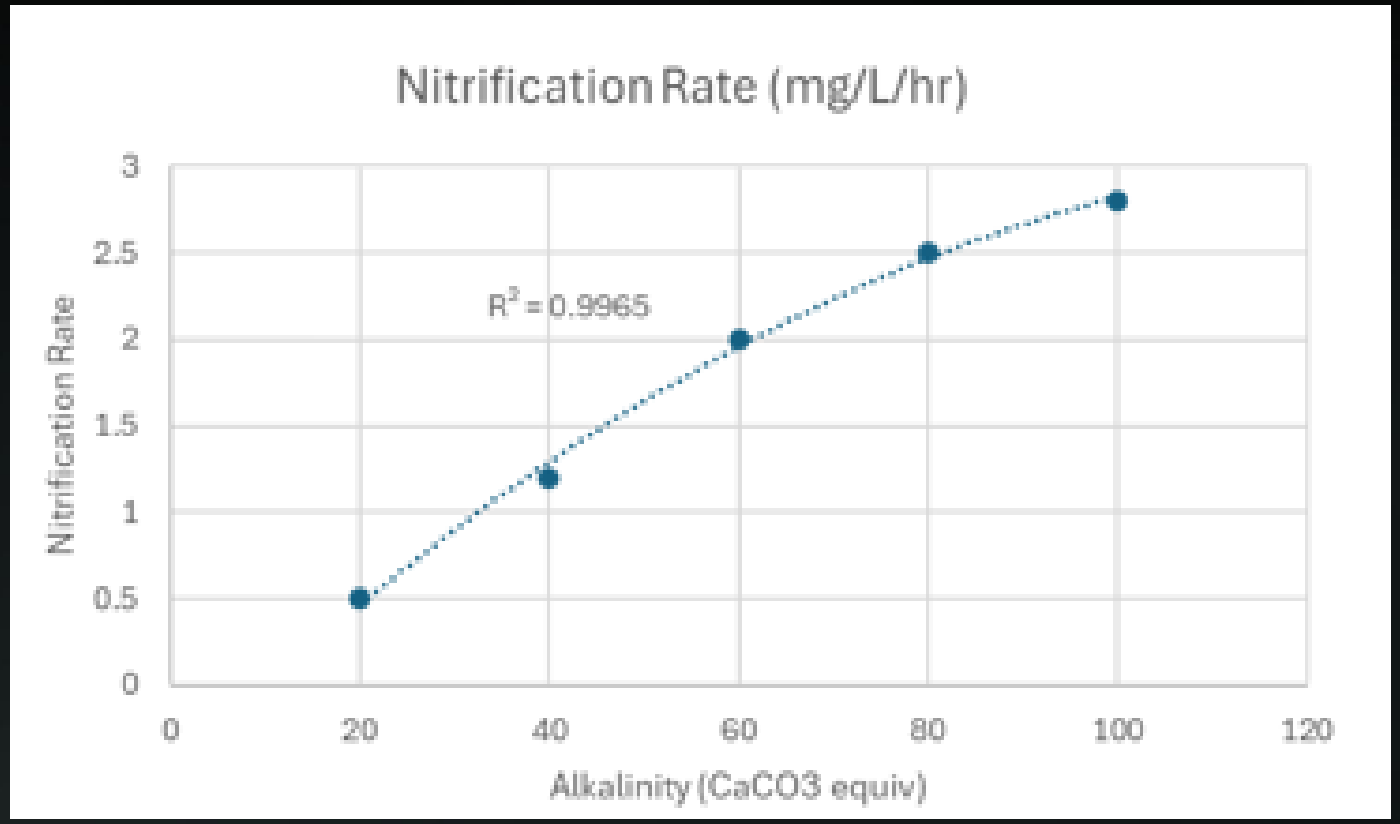

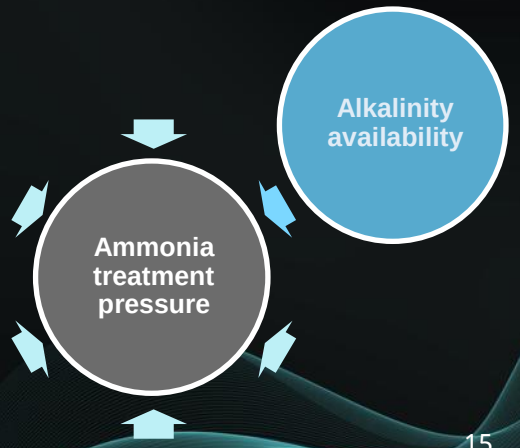

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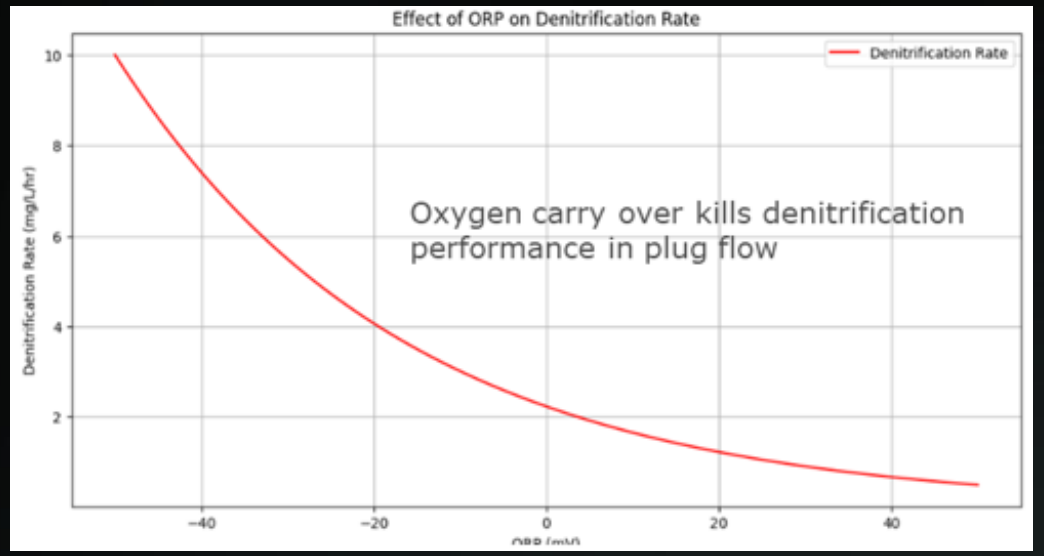
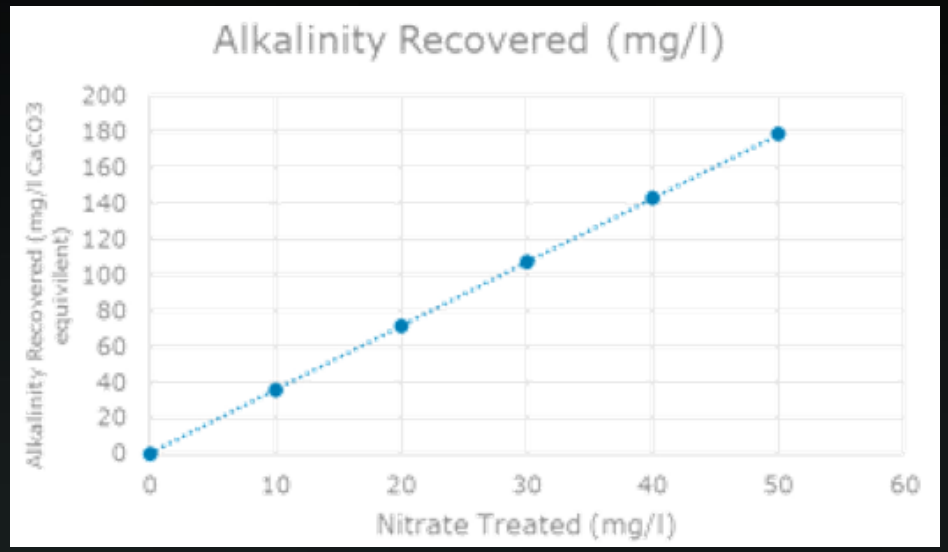
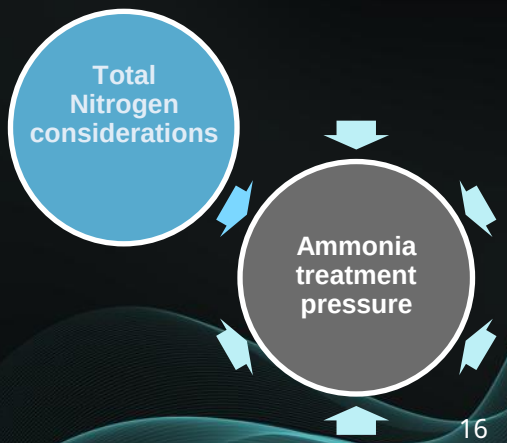


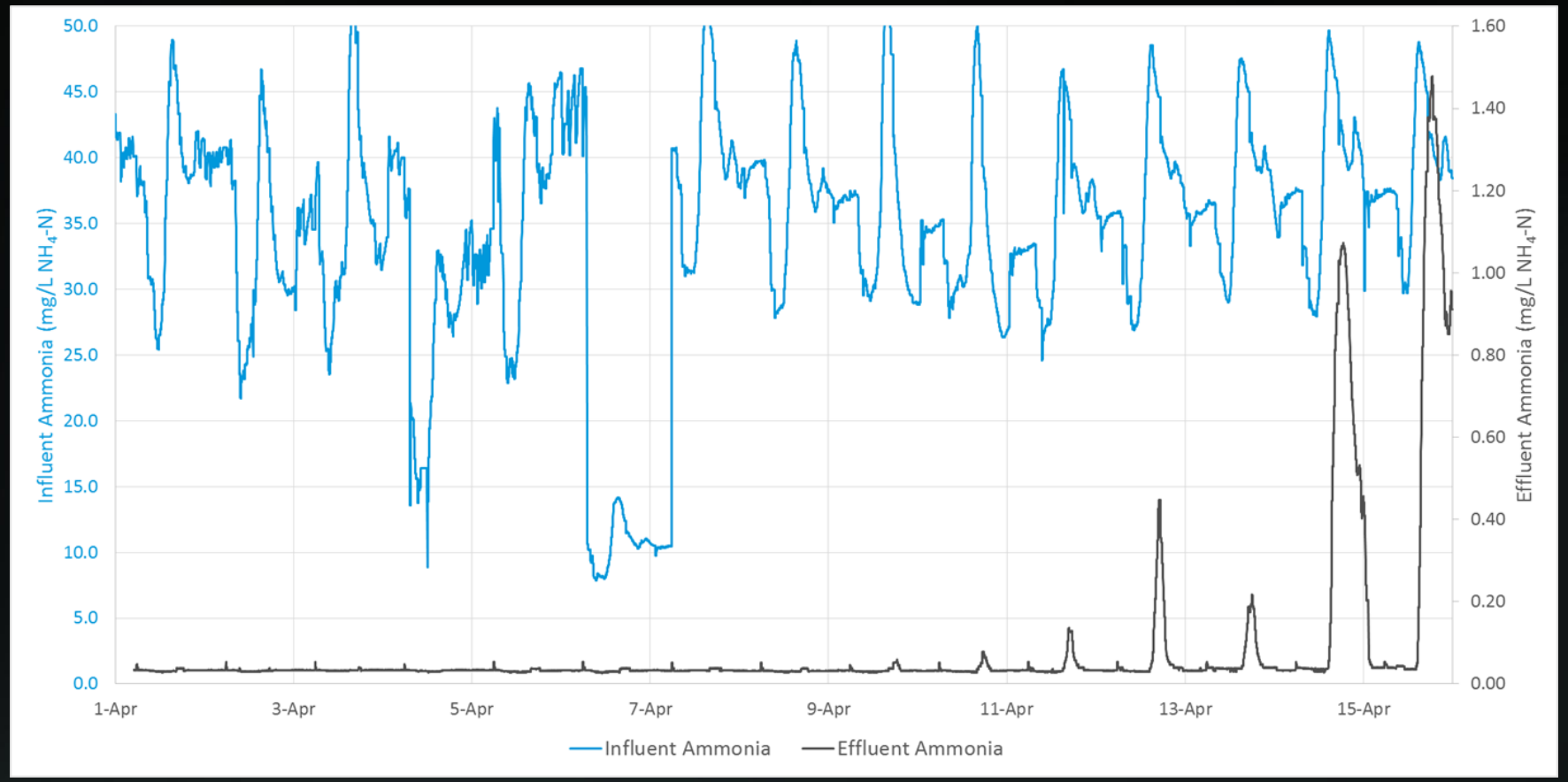


Optimized ammonia treatment will create the space for improved nitrate removal performance



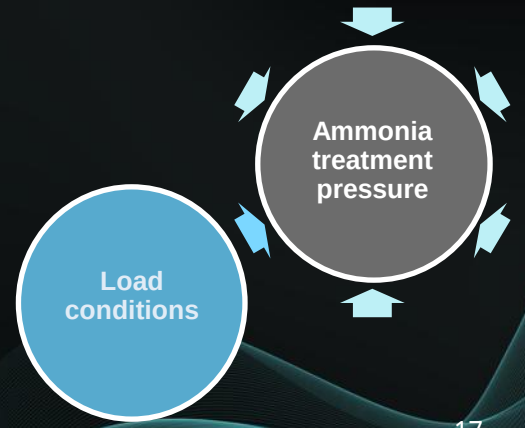
Dynamic pressures on Ammonia Removal Performance

Specific Ammonia Treatment Kinetics



Two weeks of influent/effluent ammonia data

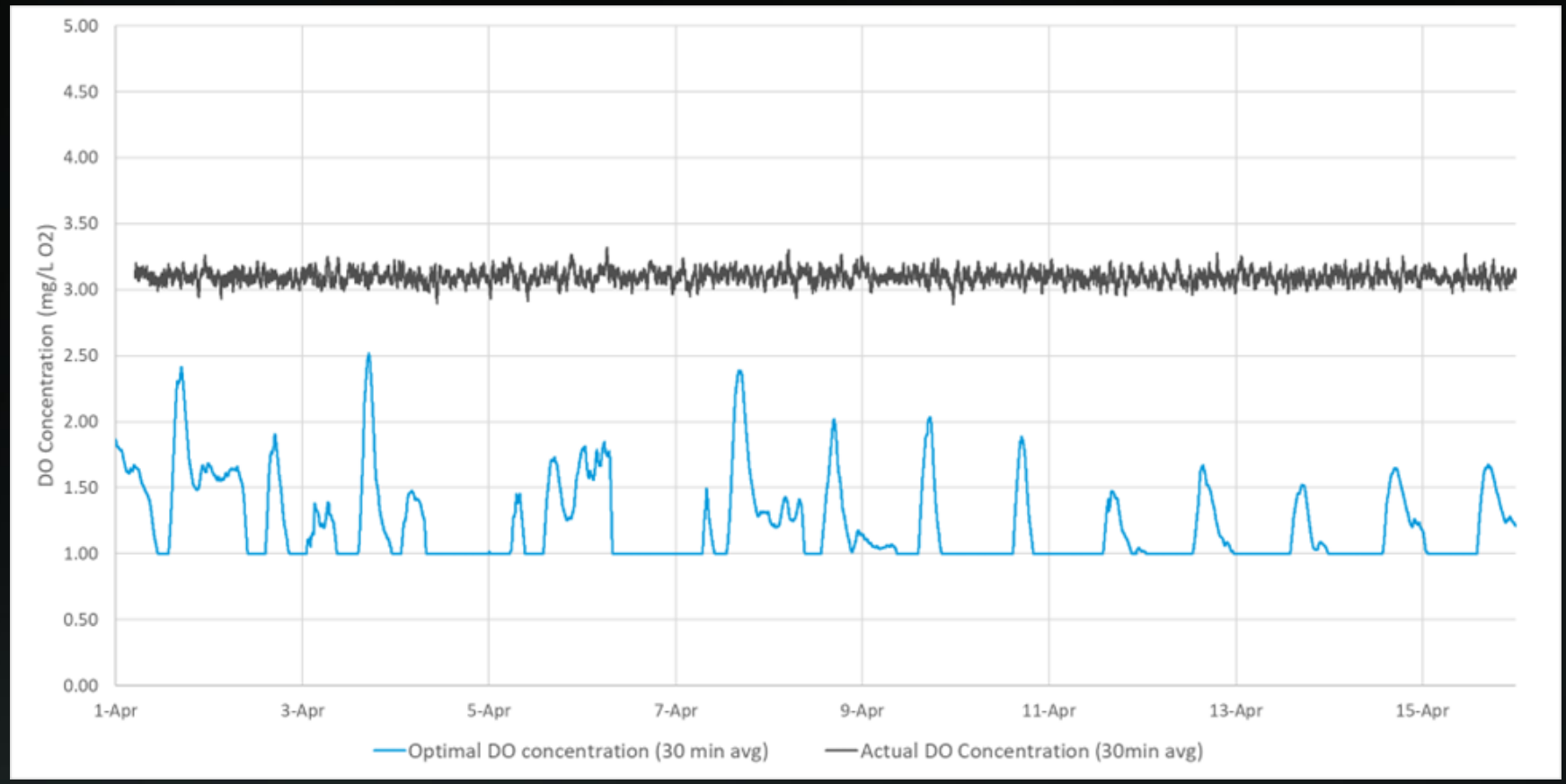
Often there are internal recycle streams high in ammonia

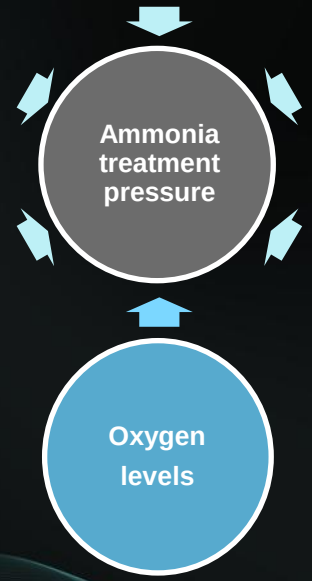


Dynamic pressures on Ammonia Removal Performance

Specific Ammonia Treatment Kinetics

DO Control vs Ammonia Based

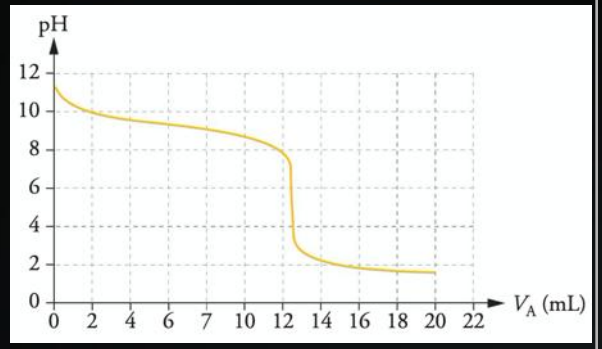




How to Measure NH3 / NH4 Online?

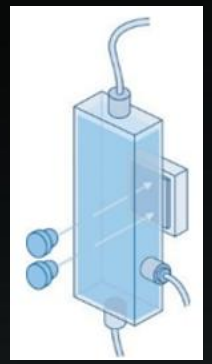
How to Measure Ammonia / Ammonium online?

Titration



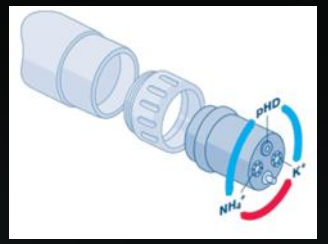
- Online solution with basic principal
- Usually cost or application prohibitive

Photometric



- Frequent analyzer reagent changes
- Optical fouling common
- Temperature and color can cause error

Ion Selective



- Lower initial investment
- Increased calibration and frequent manual maintenance at low concentrations

Gas Sensing Electrode

- No drifting issues with auto calibration and auto clean
- High low-level accuracy and low maintenance
- Unaffected by color and temperature changes

Best in class ammonium analysis just got better.

Introducing the NH6000sc with integrated FX filtration.

Six Generations Strong of Ammonia Analyzers

Amtax
(1989-1994)

Amtax inter
(1994 – 2001)

Amtax inter2
(2000 - 2020)

Amtax compact
(2000 - 2008)

Amtax sc
(2004 - 2025)

NH6000sc

Game Changing Technology

Here's what makes it different:

- **Accurate Low-Range Monitoring**
  - Stable values, even <1mg/L
- **Integrated Components**
  - Simplified setup with no separate compressor or pump needed
  - Quality Control Features Inside
- **Minimal Maintenance**
  - 50% less maintenance than previous generations
- **Trusted Technology**
  - Proven Gas Sensing Electrode (GSE) with automatic calibration and cleaning

50% Less Maintenance

30% Less Reagent Consumption

70% Lighter Filter

200% Longer Filter Duty Time

50% Longer Compressor Lifespan

* Compared to Hach previous AMTAX / Filtrax analyzer

The Strength of the Hach GSE:

Hach has more than 15 years of expertise in GSE technology

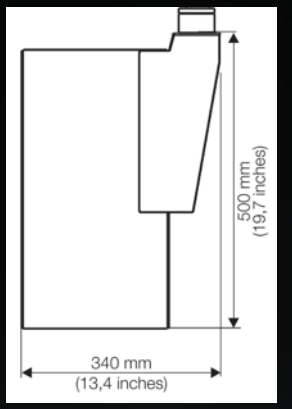
- GSE only needs **Sodium hydroxide** as reagent (compared to 2-3 reagents for colorimetric method)
- NaOH is sold “Ready to use” (No mixing of powder and liquid necessary) and stable for **2 years** even for temperatures above 60°C (no additional fridge needed like some colorimetric methods)
- Sodium hydroxide is corrosive but **not toxic** (Nitroprussid sodium used in colorimetric method is toxic)
- Not sensitive to the **color** of the sample, possible fouling of measuring chamber, or “drift”

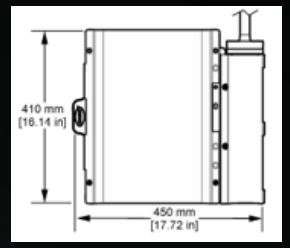
GSE technology gives very accurate and reliable results with low operation costs

Filtration improvements

Weight
(16.53 lbs → 7.72 lbs)
Improved Handling

Installation height
(19.69 in → 16.14 in)
Easier installation e.g. in outlet channels



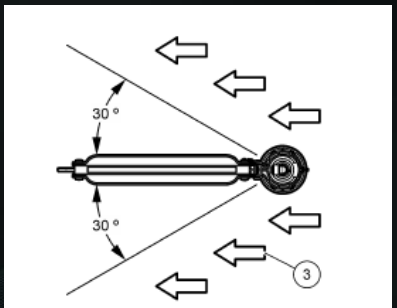


Change of filter module
Simple replacement without disconnecting of tubes

Flexible Configuration
With or without automatic air bubble cleaning

Air bubble cleaning
Distinct higher air volume to extend operation life-time

Alignment in the flow
Less pressure on filter module carrier because of an integrated hinge



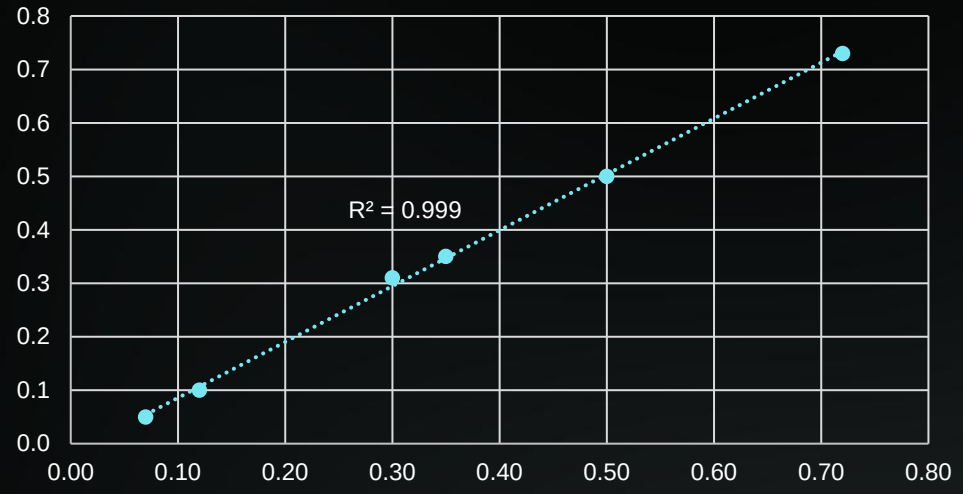
How to Get Accurate and Reliable Results?

Reliable Accurate Data

- All starts with filtration
- GSE Technology
- Automatic Calibration
- Automatic Cleaning – *to the filter!*
- Automatic Grab Sample Feature
- Self Diagnostics
- Stop the drift

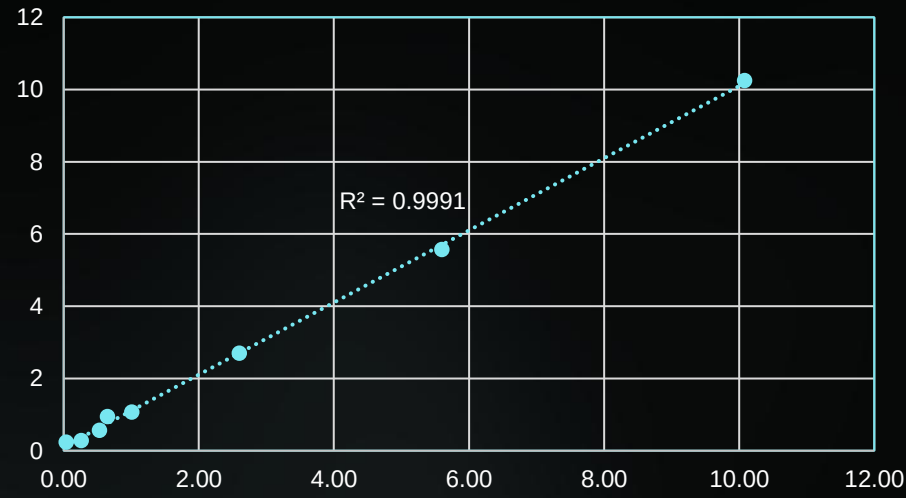
Comparison Laboratory vs NH6000sc Results

Low range

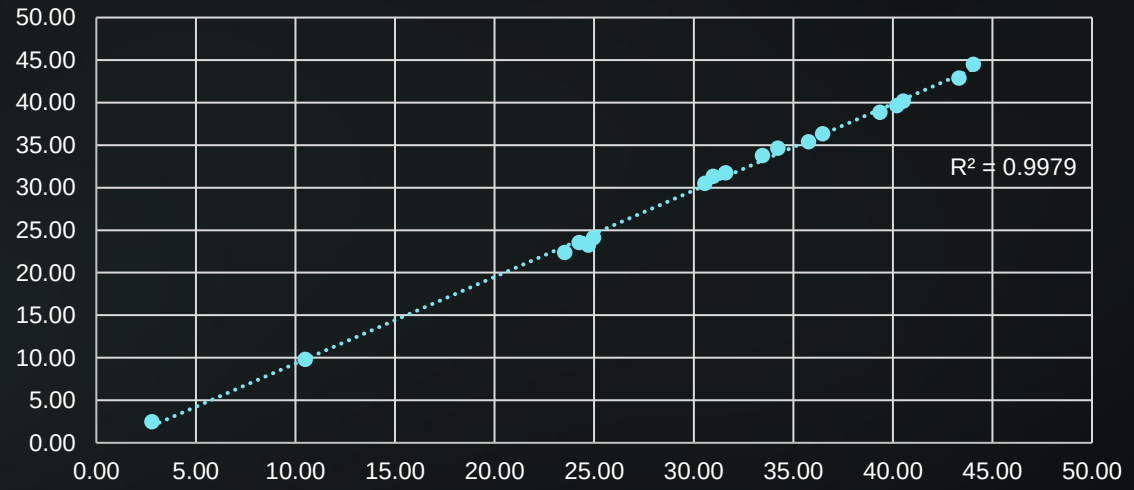


NH6000sc shows an excellent correlation with laboratory measurements in all ranges

Medium range



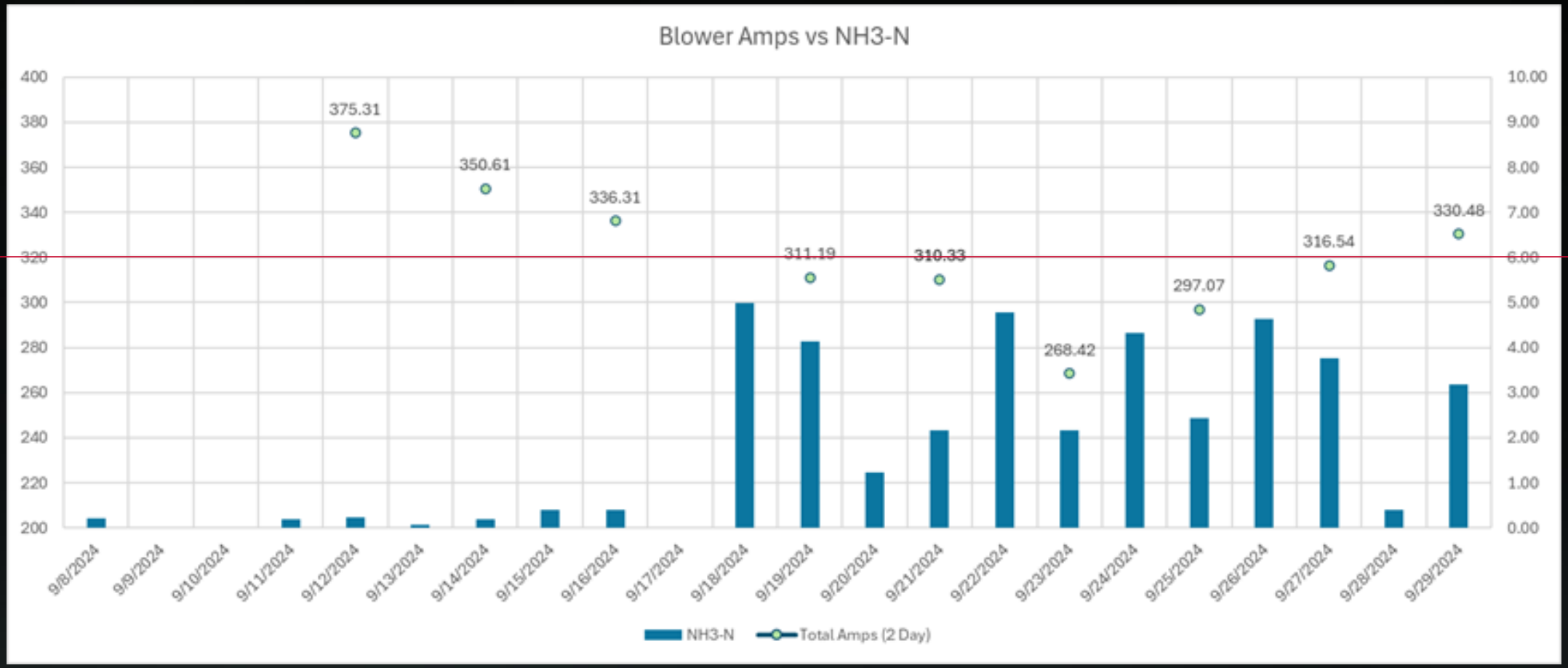
High range



Tests done by using grab samples feature

Field Example

City of Grapevine Testing



6 mg/l

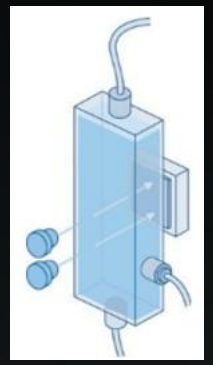
- Reduced aeration in one of their (3) AB trains
- Turned off 1 of 2 ***100*** hp blowers 9/23
- Overall energy reduction 18.4%

- Annualized ***cost savings*** **~$74,000**
- Annualized CO_2 **carbon reduction** around 404,449 lbs
- Application note available

Total Inorganic Nitrogen/ TN

Online Nitrate Measurement Methods

Photometric



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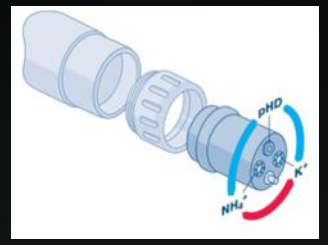

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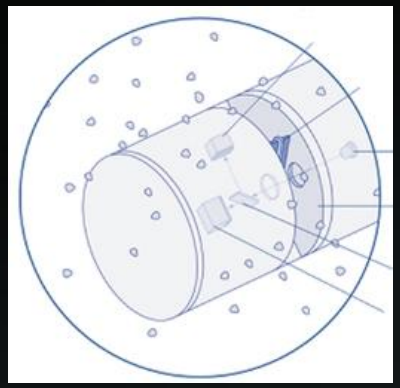
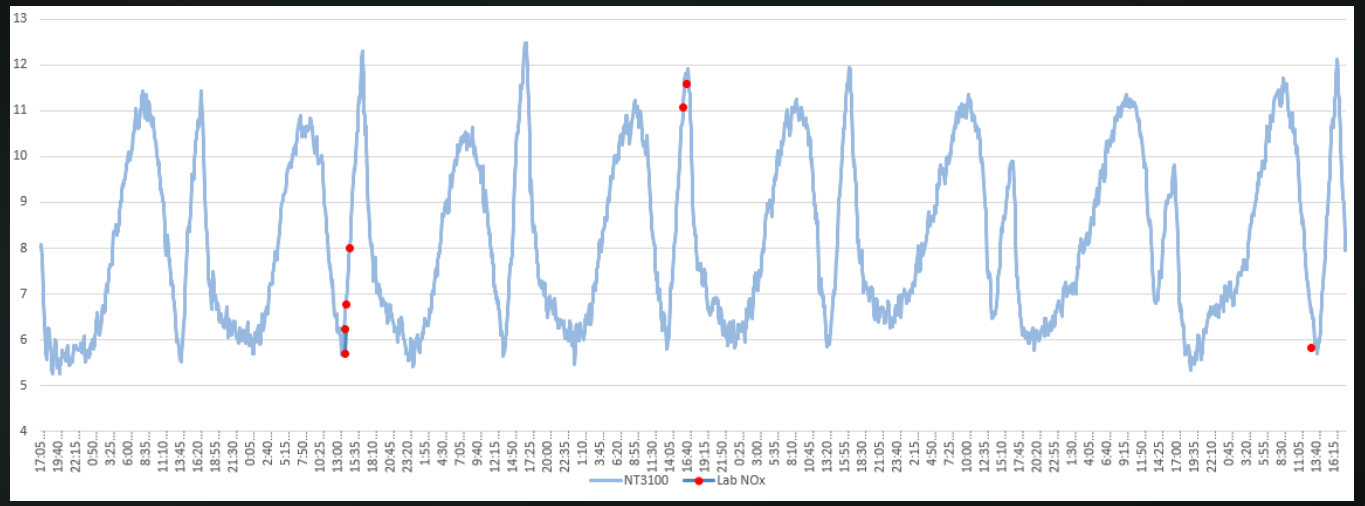
UV Absorbance



- Reagent free - direct read
- Auto cleaning wiper
- High low-level accuracy and low maintenance

NT3100 Nitrate/Nitrite (NOX)

- Automatic Cleaning System – Built in wiper
- Excellent repeatability with lab level accuracy
- Turbidity Compensated
- Tool Free User Maintenance
- Multiple ranges for flexibility in many applications



NH6000 and NT3100 put the pieces of Nitrogen together

- Make decisions faster with less effort
- Keep up with Dynamic Plant Loading
- Online sensor and analyzers are great tools for:

  - **Troubleshooting**
  - **Identifying issues early**
  - **Optimizing with confidence**

Final Thoughts

- Big project coming? Consider installing online sensors early
- Sidestreams are sneaky
- NH6000 GSE Technology is a hands off blazing fast ammonia monitoring solution
- Consider ammonia-based aeration (DO is a surrogate)
- Use the Lab to dial in on issues affecting ammonia spikes
- Consider adding nitrate monitoring

Thank you

Q & A