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N2ORisk DSS Case Studies

Proven Approach:

Use *N2ORisk DSS* outputs to examine risk of N_2O emissions versus N_2O and process data to identify mitigation strategies

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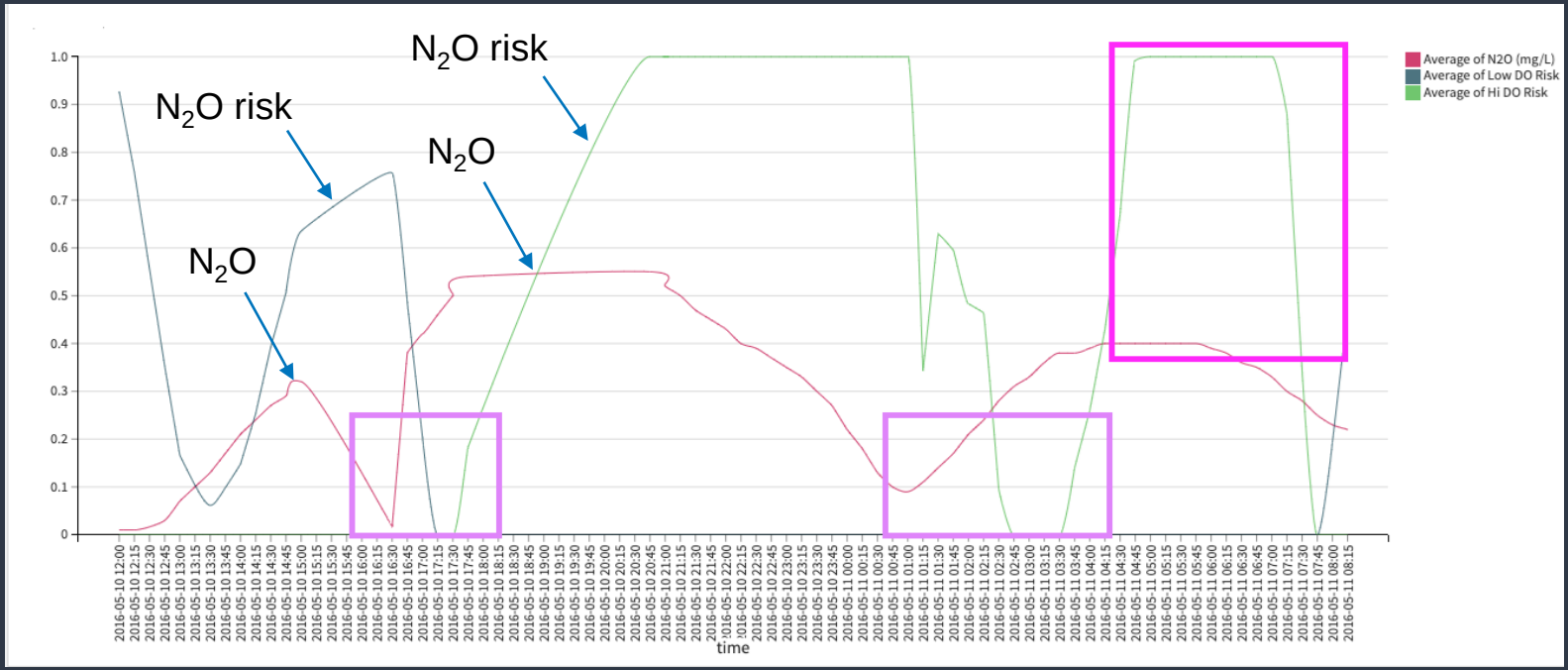
N2ORisk DSS Outputs



N_2O Risk and measured N_2O trend closely, so if we eliminate risk peaks by better controlling DO (move to low risk) during NH_4^+ peaks, **we eliminate N_20**

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Case Study: Eindhoven RWZI

- Eindhoven, NL
- Water Utility: Waterboard De Dommel (NL)
- Overall WWTP GHG reduction: **40%**
- Potential Savings: **$400,000***
- Treatment Plant Capacity: 750,000 PE
- Treatment Plant Configuration: Modified-UCT, carrousel
- Methods: *N_2ORisk DSS*, process model, and measurements

*Savings over a 20-year period compared to purchasing carbon offsets

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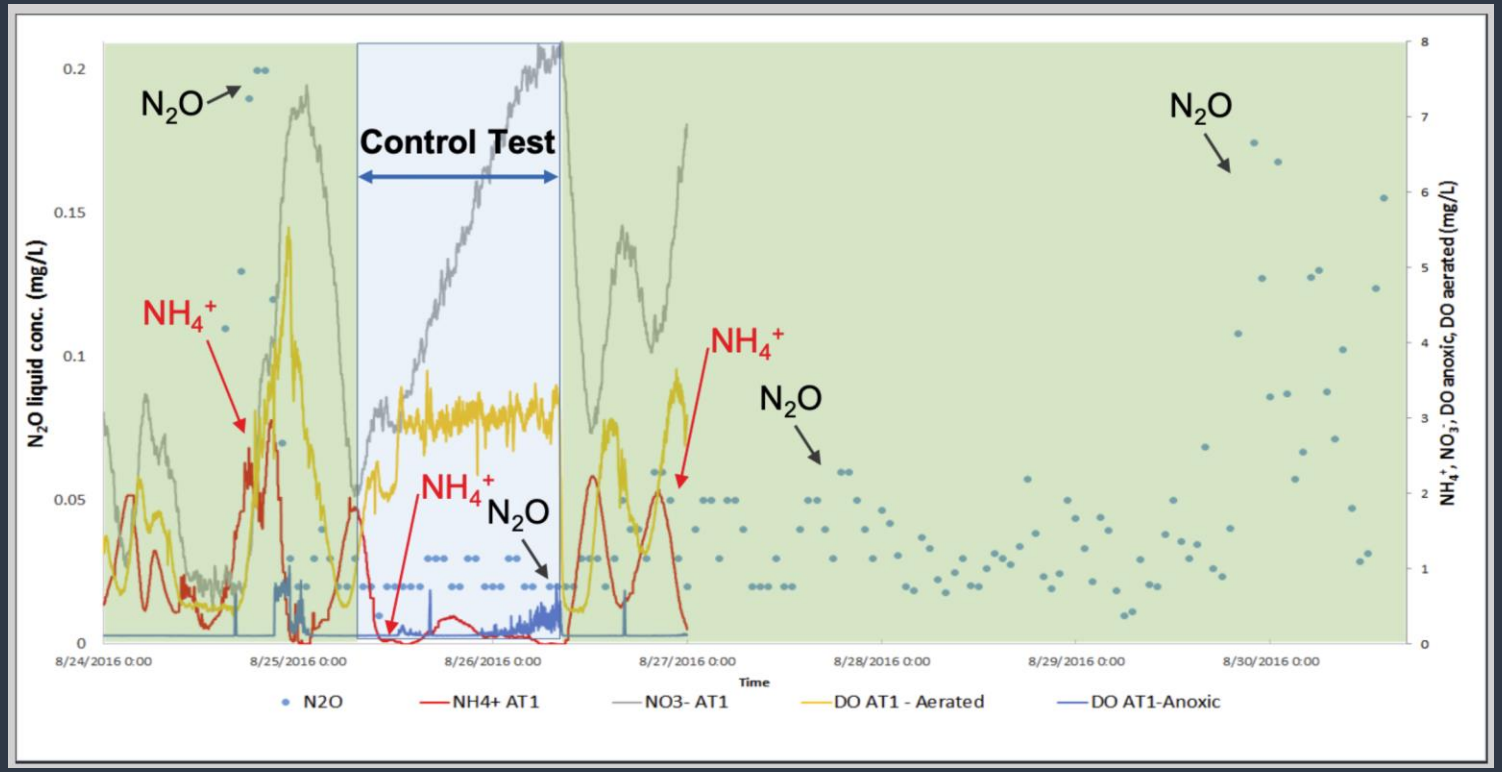
Eindhoven WWTP N_2O Mitigation Control Test



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Case Study: Eindhoven RWZI

Additional Process Benefits from *N2ORisk DSS*:

- Lower ammonia (NH_4^+) peaks
- No net increase in grid energy consumption
- Nitrate increased, but not significantly above current levels and can be fine tuned
- 90% reduction in N_2O

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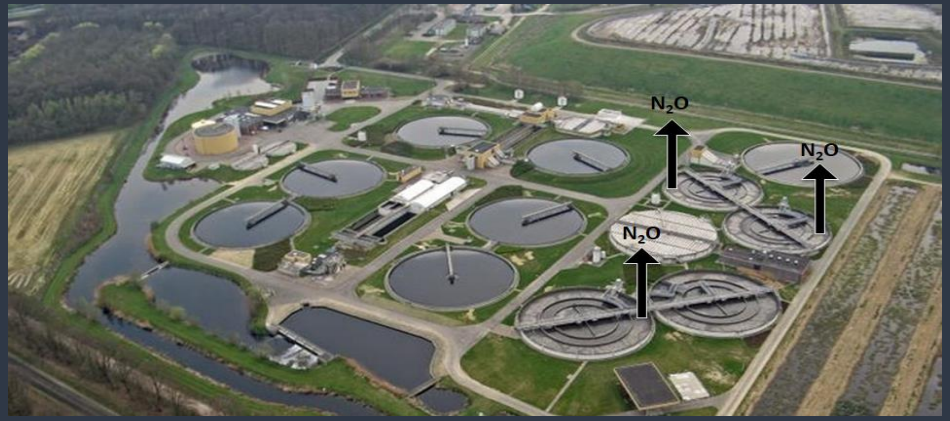
Case Study: Land van Cuijk RWZI



- Overall WWTP GHG reduction: **70%**
- Potential Savings: **$600,000***
- Treatment Plant Capacity: 175,000 PE
- Treatment Plant Configuration: Modified-UCT, carrousel
- Methods: *N2ORisk DSS* and measurements

*Savings over a 20-year period compared to purchasing carbon offsets

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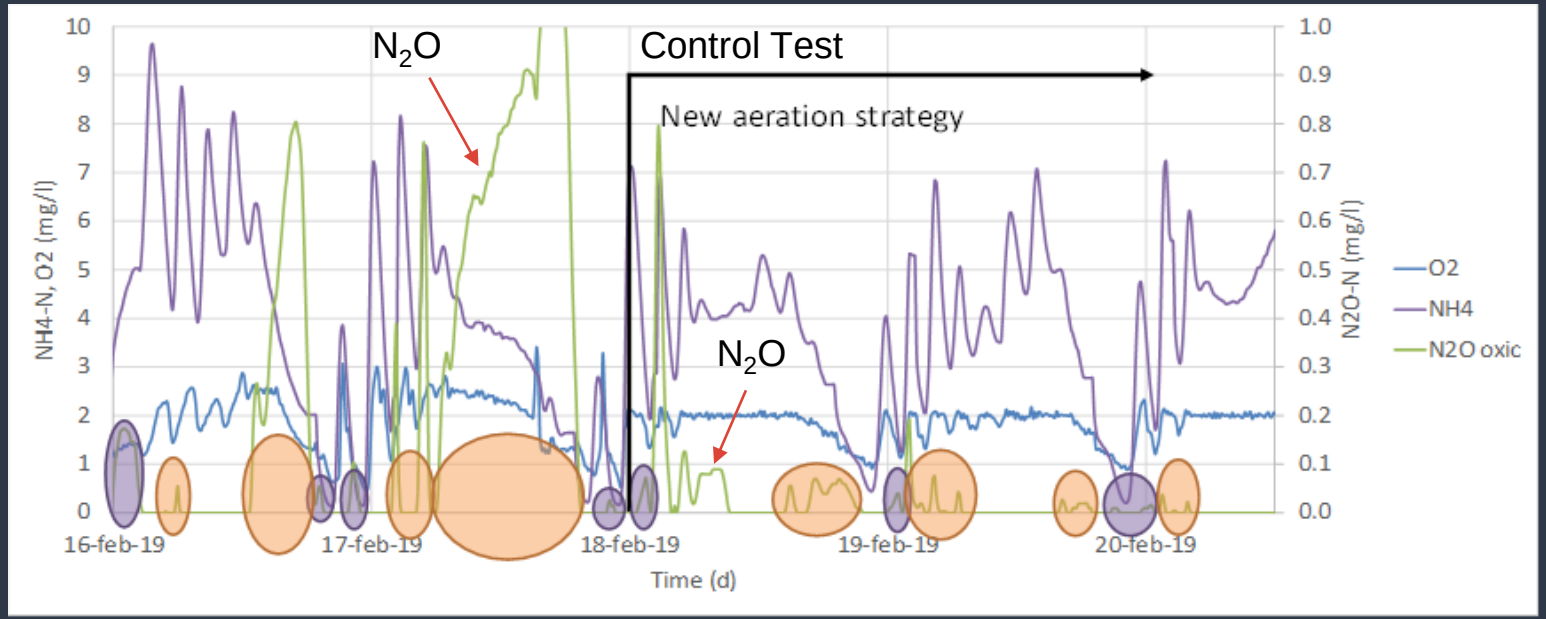
Land van Cuijk WWTP N_2O Mitigation Control Test



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Case Study: Land van Cuijk RWZI

Additional Process Benefits from *N2ORisk DSS*:

- Improved nitrification (lower ammonia peaks)
- Improved denitrification (lower nitrate)
- Improved biological phosphorus removal (from better DO control)
- Net reduction in grid-energy consumption
- 85% reduction in N_2O

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Conclusions

- In each case the *N2ORisk DSS* has proven to be able to reduce overall GHG missions by large percentages with virtually no capital investments. A value bomb for achieving net zero emissions.

- In each case the *N2ORisk DSS* has proven to improve process efficiency by stabilizing DO and ammonia, making compliance easier, and reducing operator headaches.

- Now coupling the knowledge-based AI with machine learning process benefits are only anticipated to increase

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