Supplementary Materials for

Assessment of Full-Scale N_2O Emission Characteristics and Testing of Control Concepts in an Activated Sludge Wastewater Treatment Plant with Alternating Aerobic and Anoxic Phases

Xueming Chen[1,*], Artur Tomasz Mielczarek[2], Kirsten Habicht[3], Mikkel Holmen Andersen[3], Dines Thornberg[2], Gürkan Sin[1,*]

[1]Process and Systems Engineering Center (PROSYS), Department of Chemical and Biochemical Engineering, Technical University of Denmark, 2800 Kgs. Lyngby, Denmark.

[2]Biofos A/S, Refshalevej 250, 1432 Copenhagen, Denmark.

[3]Unisense Environment A/S, Tueager 1, DK-8200 Aarhus N, Denmark.

*Corresponding authors:

Dr. Xueming Chen, Phone: +45 8194 8080, E-mail: xuem.chen@hotmail.com

Dr. Gürkan Sin, Phone: +45 2381 1148, E-mail: gsi@kt.dtu.dk

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Pearson's partial correlation analysis

Partial correlation is a method used to describe the relationship between two variables (e.g., $\boldsymbol{x}$ and $\boldsymbol{y}$) whilst removing the effect of other variables (e.g., $\boldsymbol{t}$). It firstly considers linear regression to predict $\boldsymbol{x}$ and $\boldsymbol{y}$ from $\boldsymbol{t}$, and then correlates the residuals (i.e., $\boldsymbol{x} - \hat{\boldsymbol{x}}$ and $\boldsymbol{y} - \hat{\boldsymbol{y}}$) to quantify the strength of the relationship between $\boldsymbol{x}$ and $\boldsymbol{y}$ when the effect of $\boldsymbol{t}$ has been excluded. The Pearson's partial correlation coefficient is calculated using the equation below.

$$r_{xy,t} = \frac{r_{xy} - r_{xt} * r_{yt}}{\sqrt{(1 - r_{xt}^2) * (1 - r_{yt}^2)}} \quad \text{(S1)}$$

Where $r_{xy,t}$ = partial correlation between $\boldsymbol{x}$ and $\boldsymbol{y}$ controlling for $\boldsymbol{t}$

r_{xy} = correlation between $\boldsymbol{x}$ and $\boldsymbol{y}$

r_{xt} = correlation between $\boldsymbol{x}$ and $\boldsymbol{t}$

r_{yt} = correlation between $\boldsymbol{y}$ and $\boldsymbol{t}$

As indicated in Eq. S1, the coefficient, $r_{xy,t}$, calculated through the Pearson's partial correlation which removes the effect of other variables should be different from r_{xy} calculated directly using the Pearson's correlation.

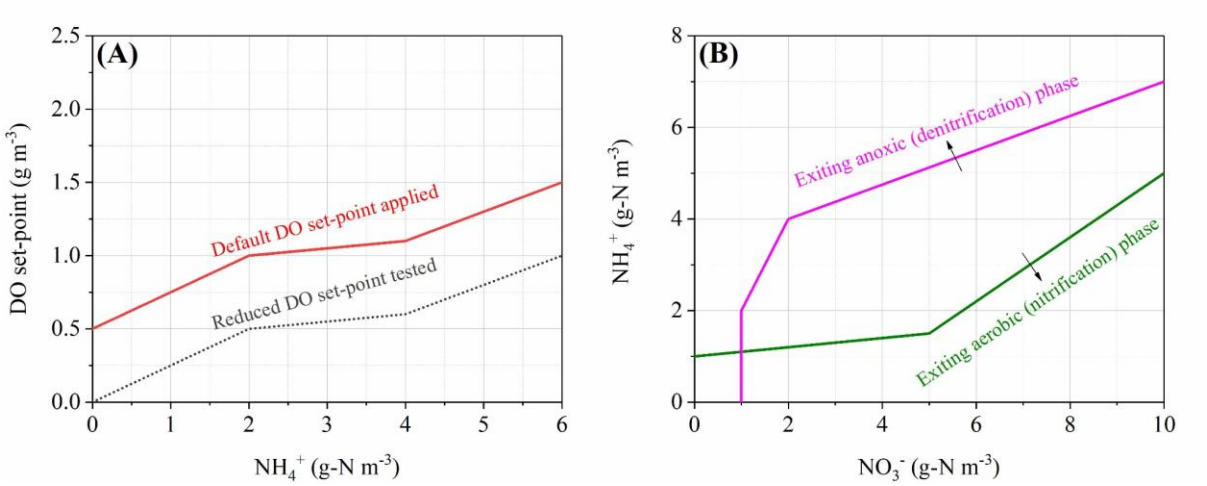

Figure S1. (**A**) Default and tested DO set-point based on NH_4^+ concentration and (**B**) default relationship between NH_4^+ and NO_3^- concentrations that regulates exiting of aerobic/anoxic phase in the STAR Control®.

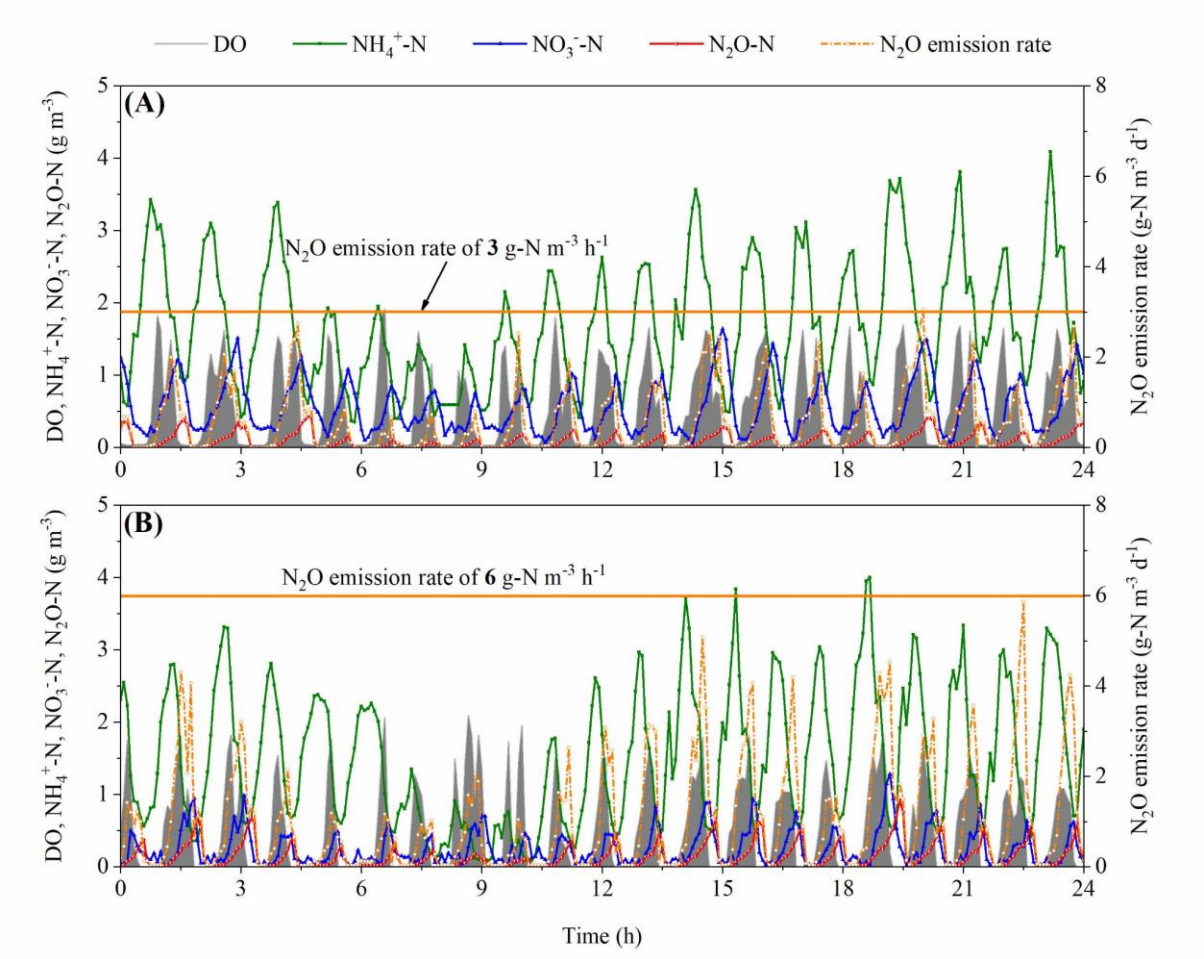

Figure S2. Dynamic profiles of process variables on June 26, 2018 in (**A**) Reactor 1 and (**B**) Reactor 3 with similar concentrations and behavior of NH_4^+, NO_3^-, and DO but different ranges and responses of N_2O.

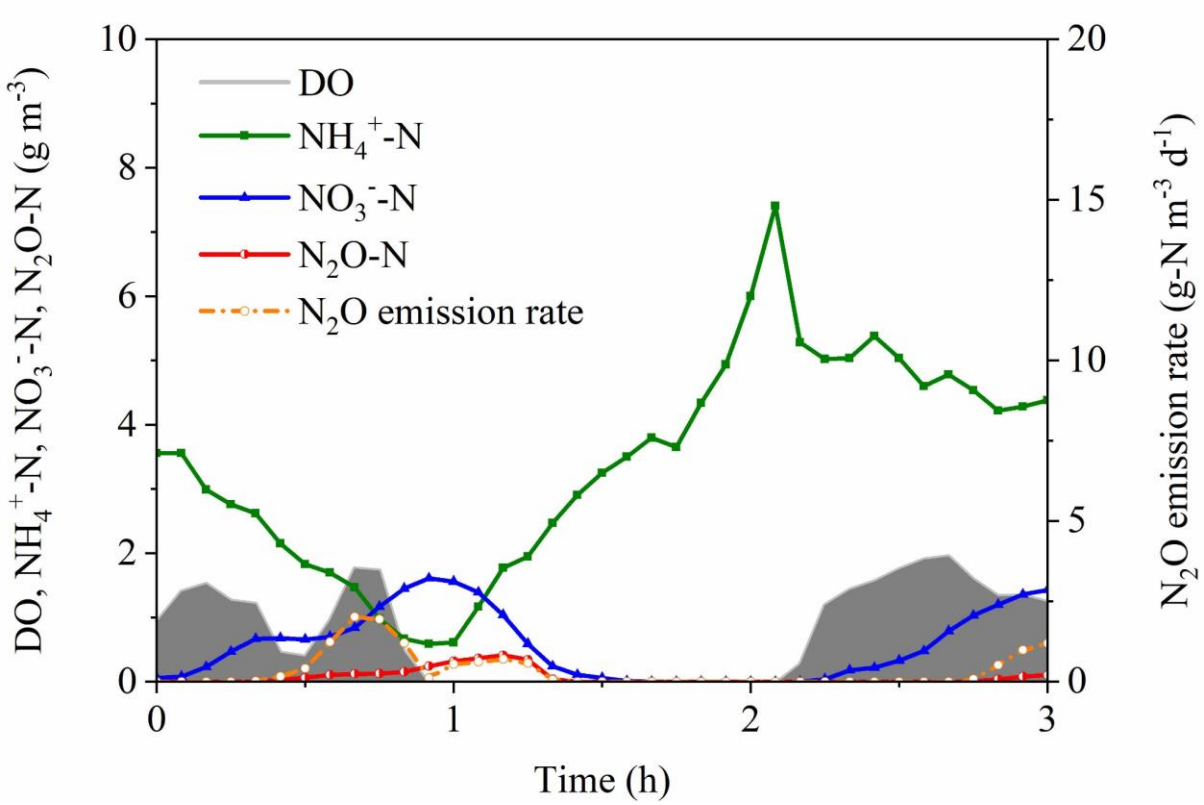

Figure S3. Cyclic data showing lack of nitrification activity in the anoxic phase (DO as electron acceptor for nitrification was strictly 0 and nitrate didn't reappear after depletion, while ammonium increased consistently due to influent supply).