



Controlling Greenhouse Gas Emissions from Wastewater Treatment Plants



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GHG simulation and control in WWTPs

Problem:

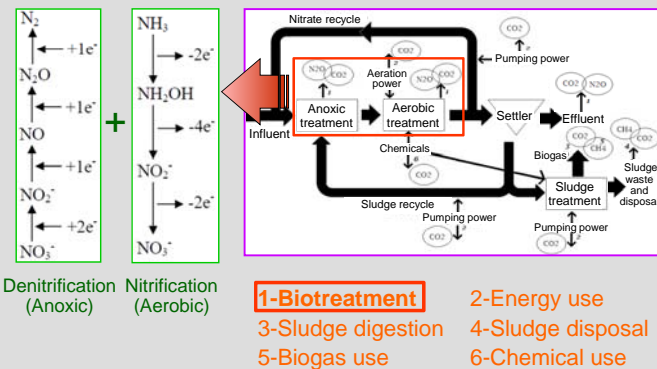
1. Greenhouse gas (GHG) emissions from the WWTPs.
2. N_2O is a powerful GHG.



Solutions:

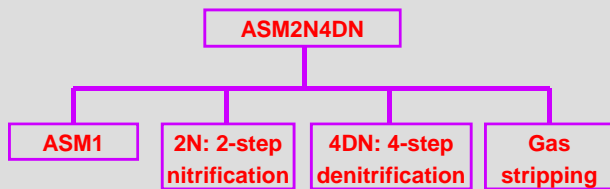
1. Simulation of the GHG production (focus: bioreactions in the activated sludge reactors)
2. Process control strategy

GHG emissions in a WWTP



- 1-Biotreatment
- 2-Energy use
- 3-Sludge digestion
- 4-Sludge disposal
- 5-Biogas use
- 6-Chemical use

ASM2N4DN model for activated sludge system



Developed from Activated Sludge Model No. 1

Addition of 4 components:

N_2 , N_2O , NO , NO_2^-

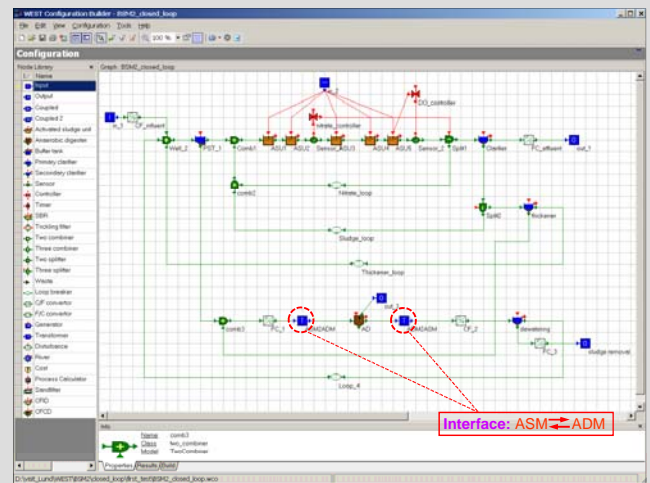
Addition of more detailed process descriptions:

2-step nitrification, 4-step denitrification, gas stripping

ADM1 model for anaerobic digestion

Application

Modelling software: WEST



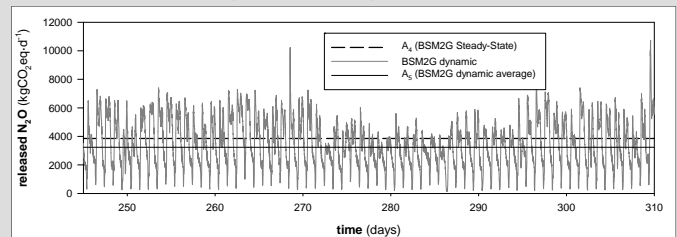
Sketch of closed-loop BSM2G with controllers

Computation and results

Simulation procedure:

- Dynamic simulation for 609 days (rain, dry weather)
- only last 365 days are used for evaluation
- start of evaluation in summer
- Comparison with steady state simulation

Released N_2O estimated using the BSM2G platform under steady-state and dynamic simulations



TAKE HOME MESSAGE

- WWTP contributes to climate change.
- A modified ASM model helps to evaluate and minimize GHG emissions from WWTPs through process control.
- Future work includes evaluation of impact of hydraulic conditions in WWTP on GHG emissions.