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Optimal control for activated sludge alternating flow/aeration systems with more than two basins

A. Fenu

Aquafin

T. Wambecq

Aquafin

K. de Gussem

Aquafin

M. Weemaes

Aquafin

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OPTIMAL ALTERNATING ACTIVATED SLUDGE PLANT CONTROL



Outline

Aquafin in Flanders

Scope of the study

Results

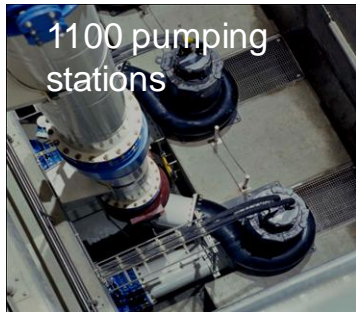
Conclusions



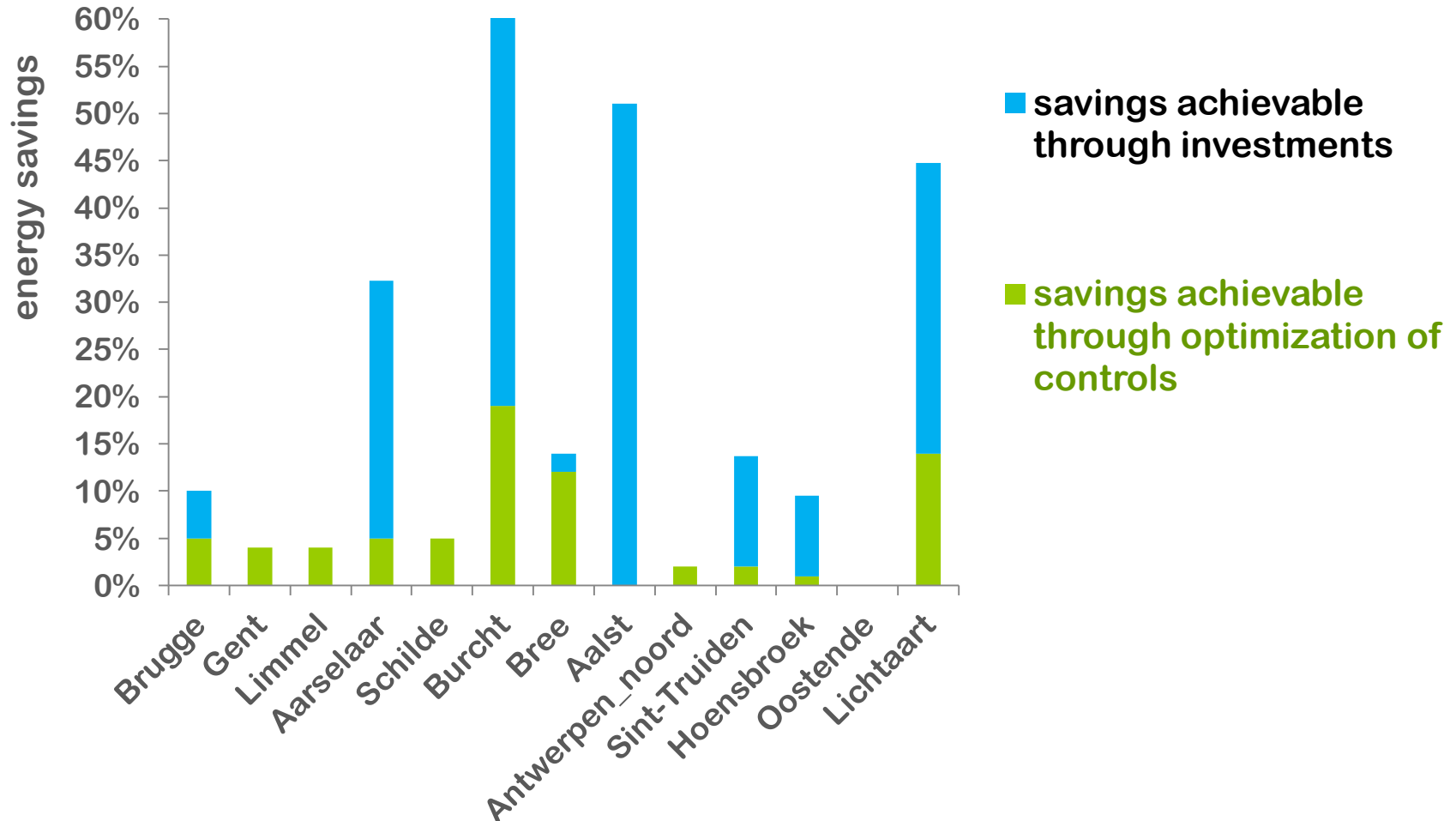
Wastewater treatment in Flanders



■ 6 million inhabitants



Aquafin invests in energy saving



Hasselt WWTP



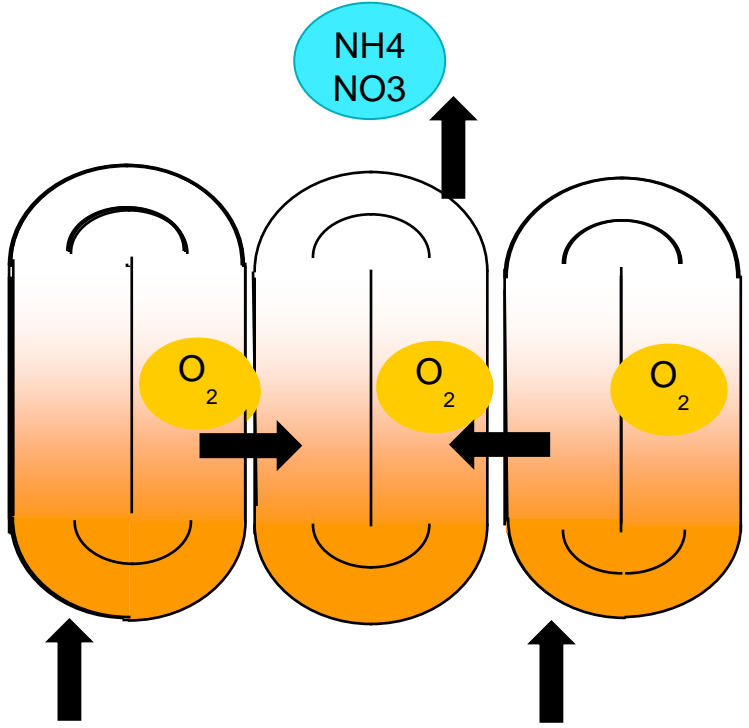
Wwtp Hasselt: 70.000 P.E.




Max biol. Flow = 4800 m³/h

BOD/N = 2-3 mgBOD/mgN



Aeration control

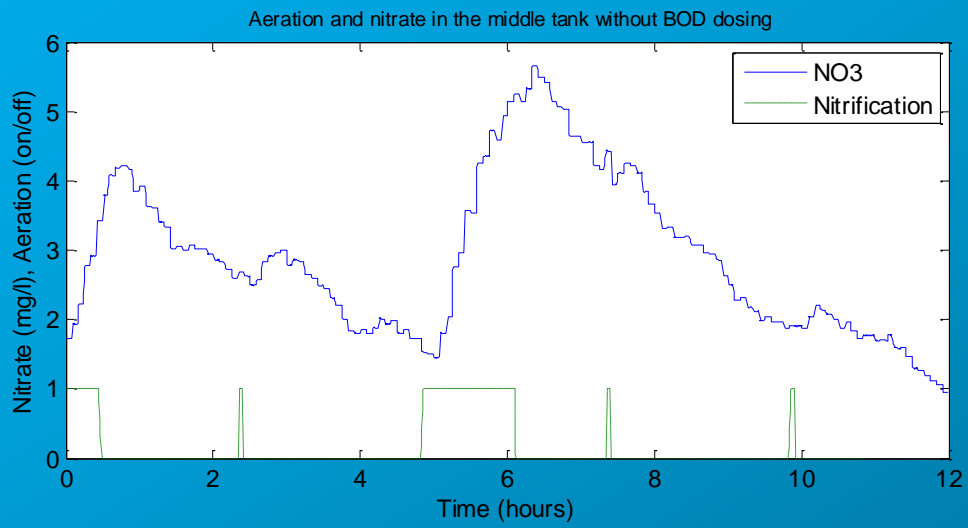
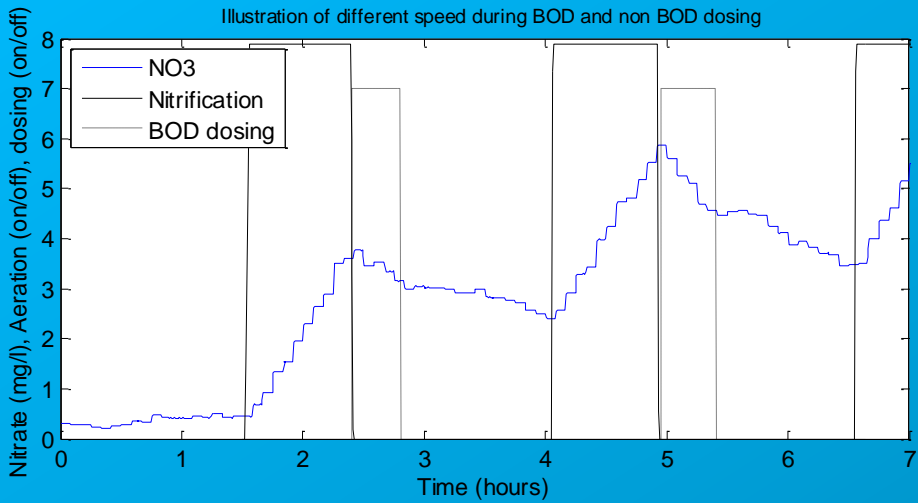


-  Aeration on
-  Aeration off
-  Flow

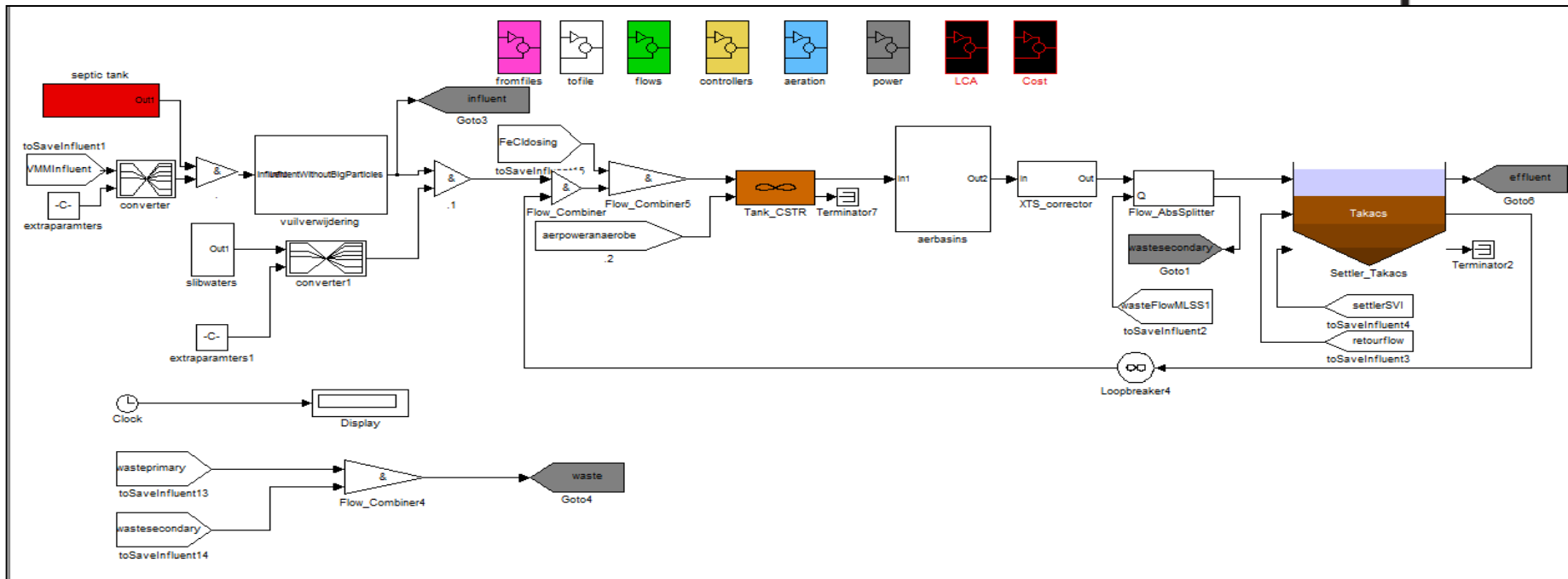
Optimal BOD use

Internal recirculation minimized





Methodology

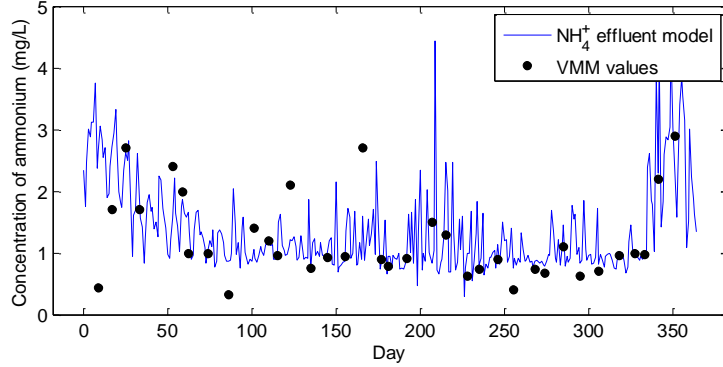


- Activated sludge model (ASM 2d)
- Composite daily samples
- Energy sampling campaign
- Calibration on nutrients, sludge production, energy

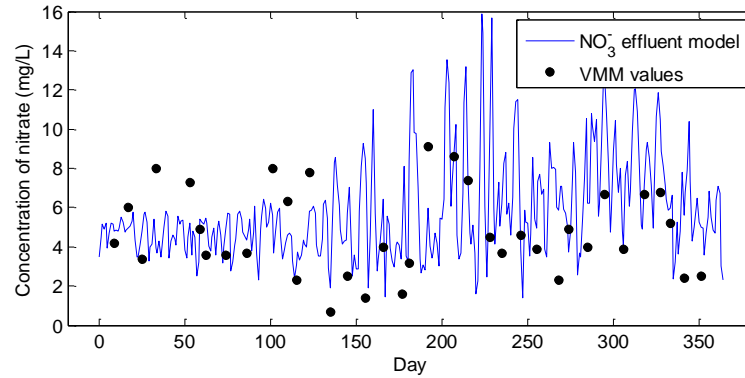
Model calibration



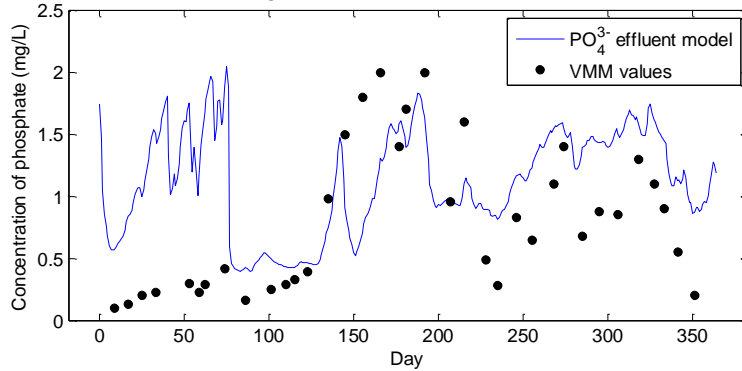
Ammonium concentration effluent



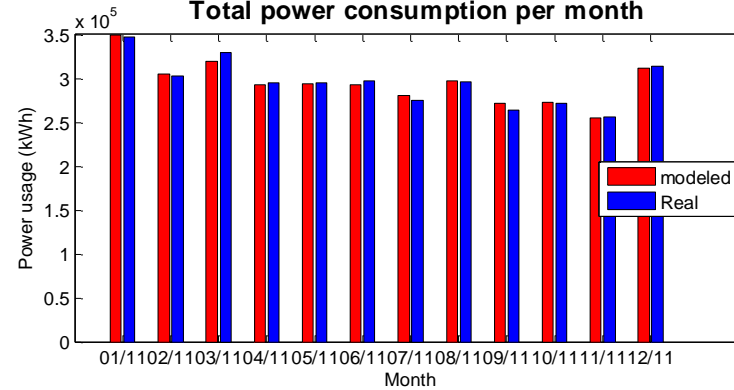
Nitrate concentration effluent



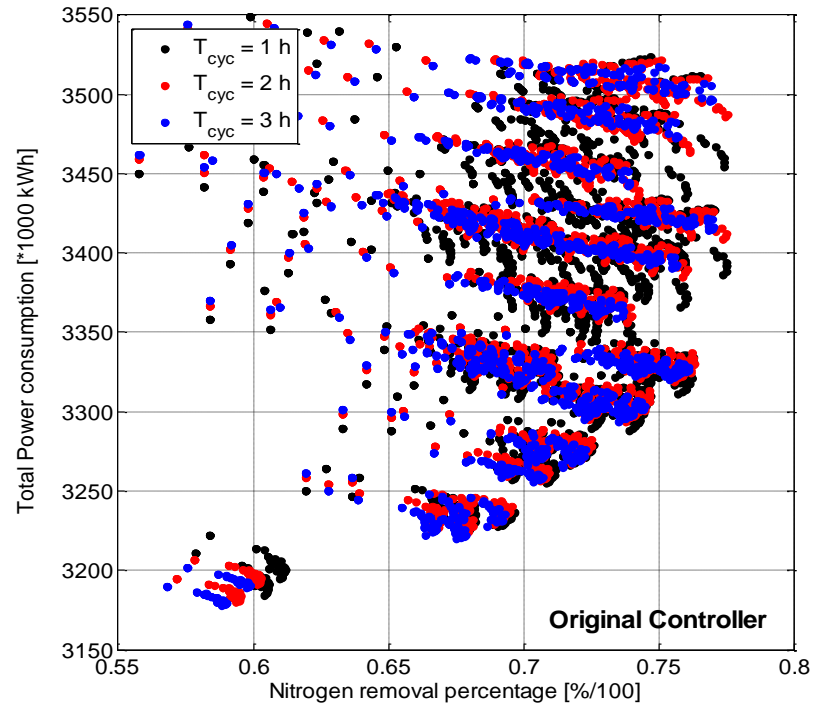
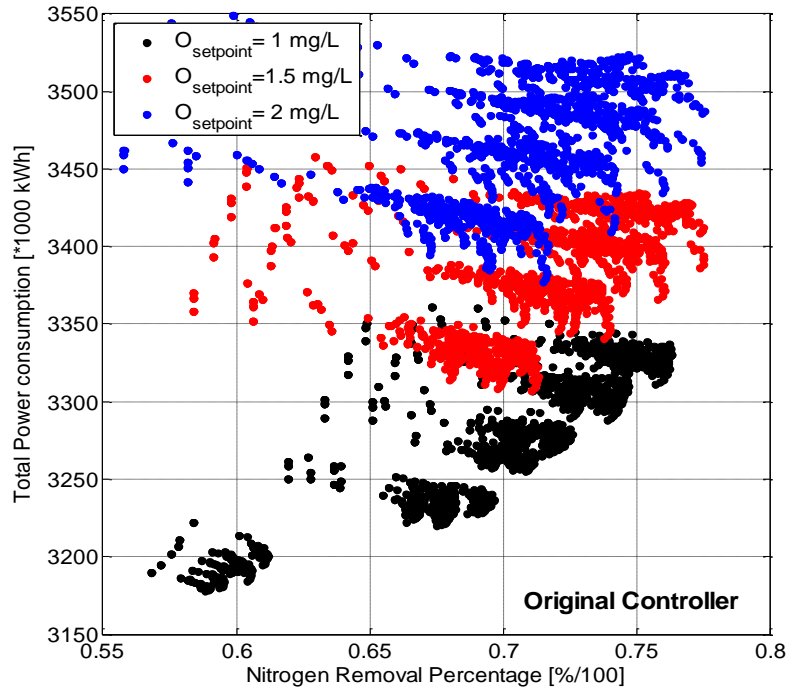
Phosphate concentration effluent



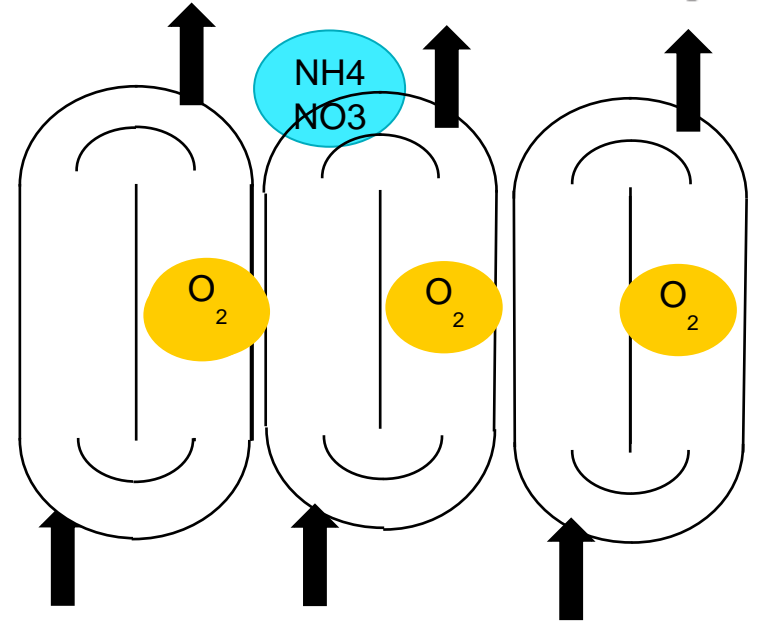
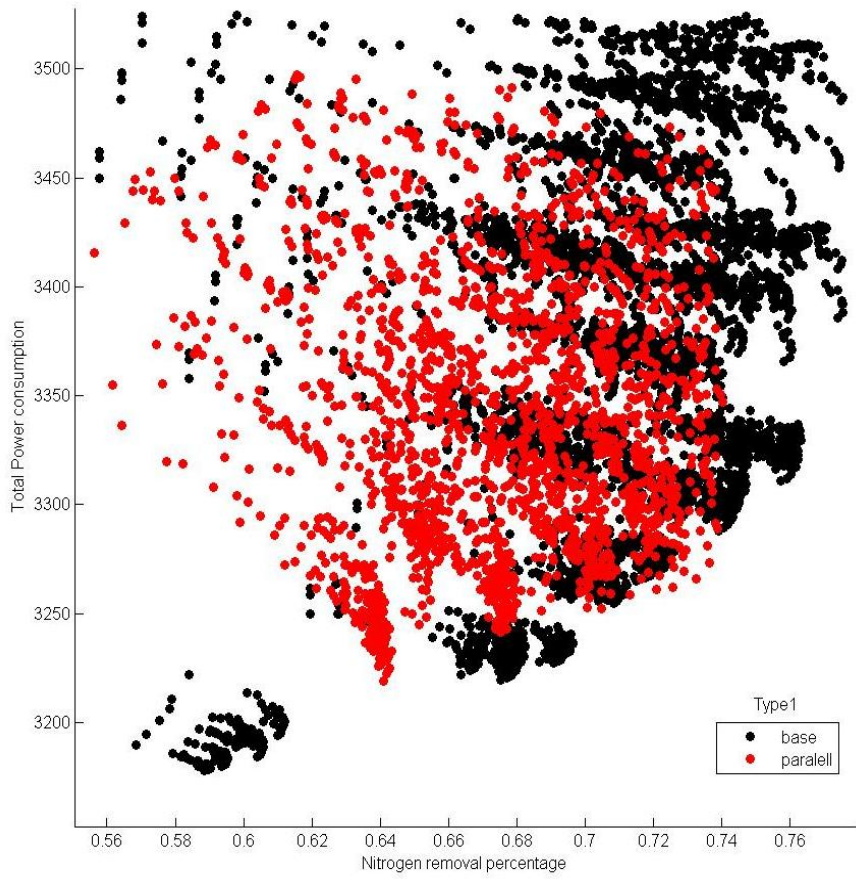
Total power consumption per month



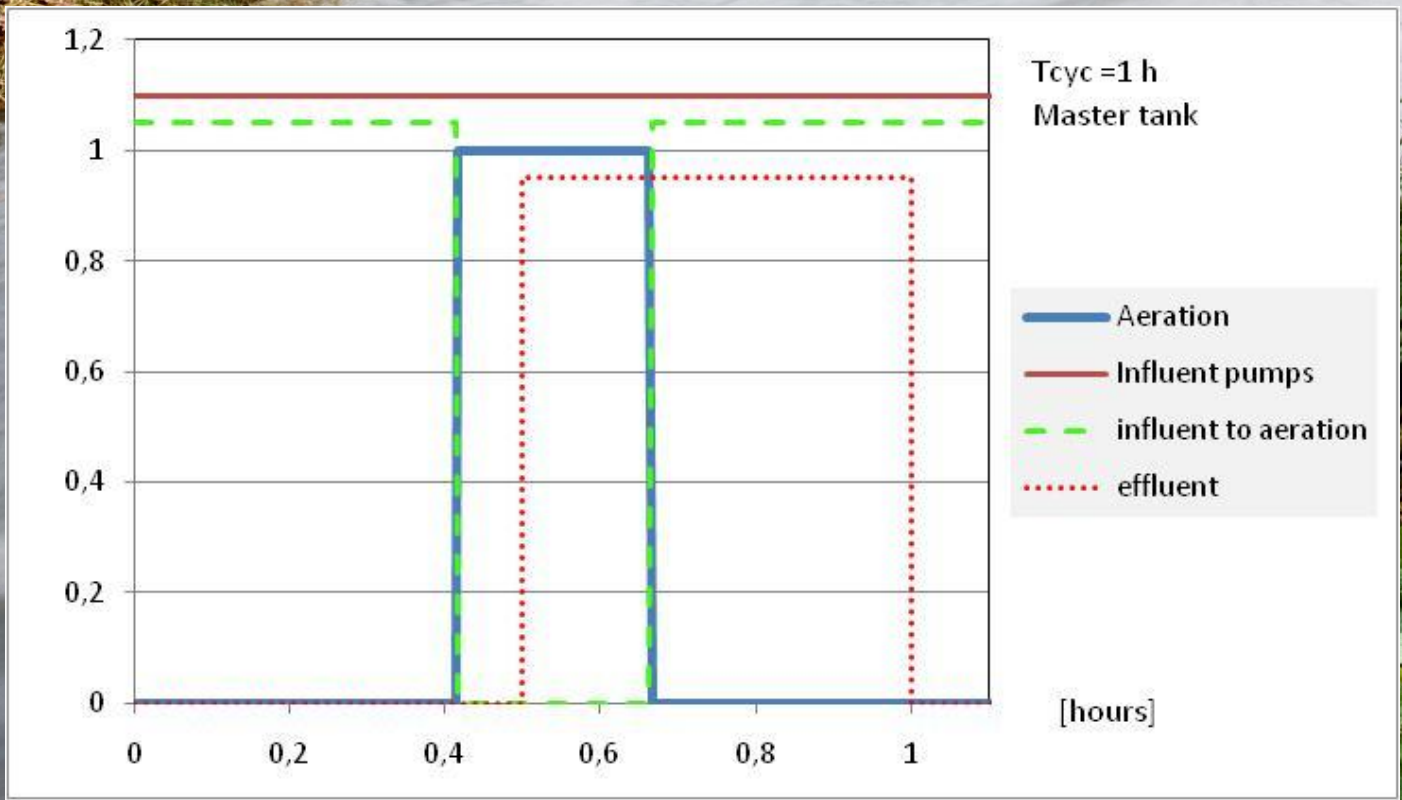
Original Controller



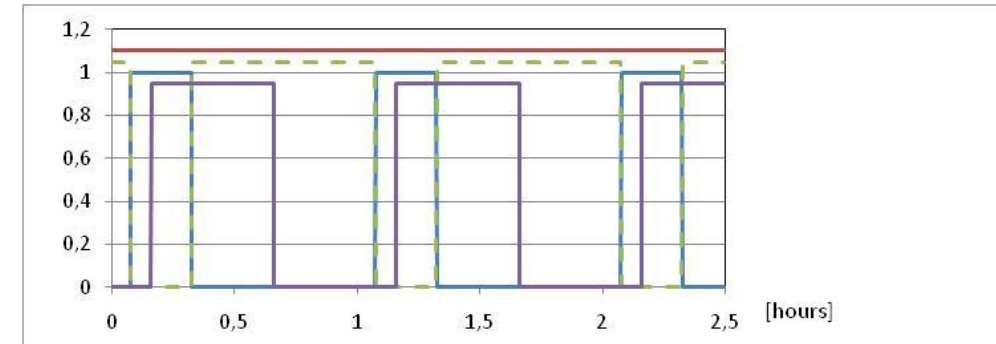
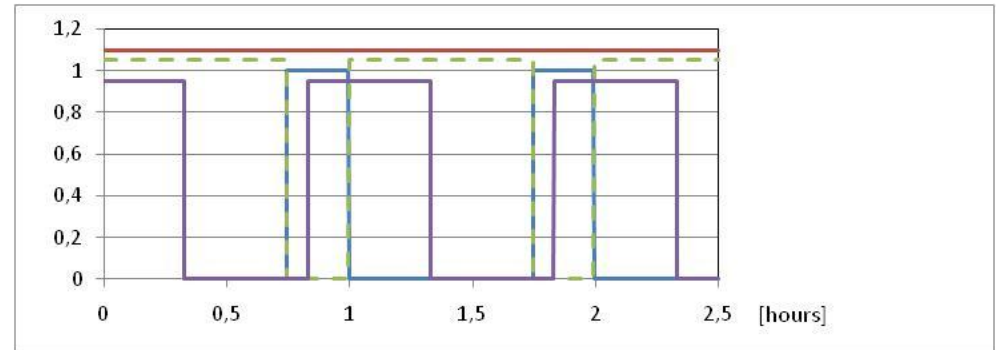
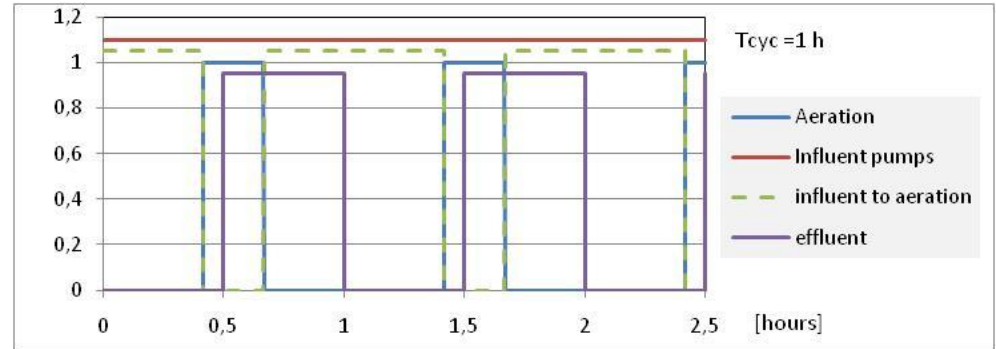
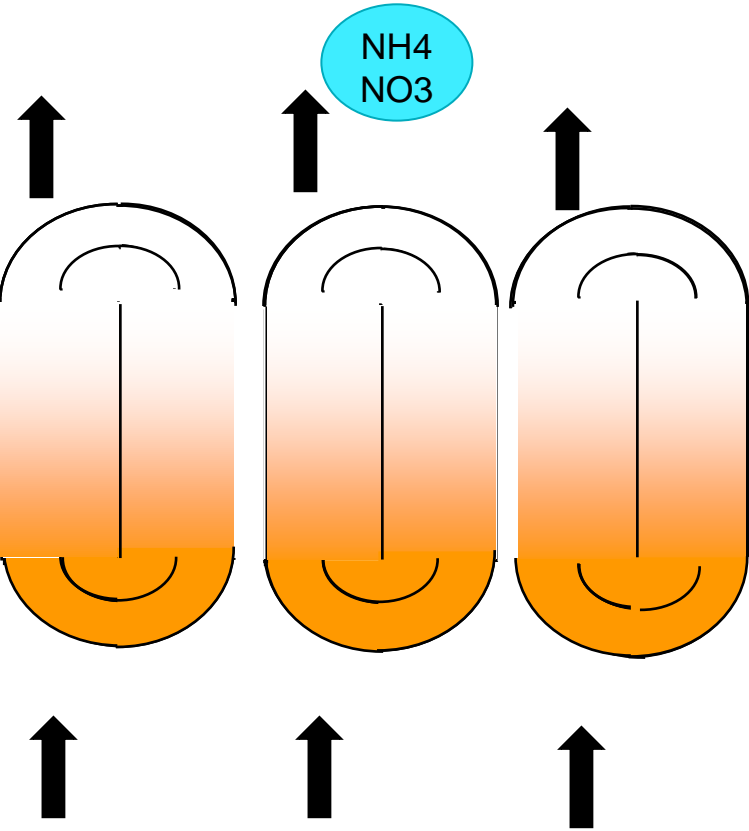
Original Controller vs Parallel Tanks



A novel alternating control?



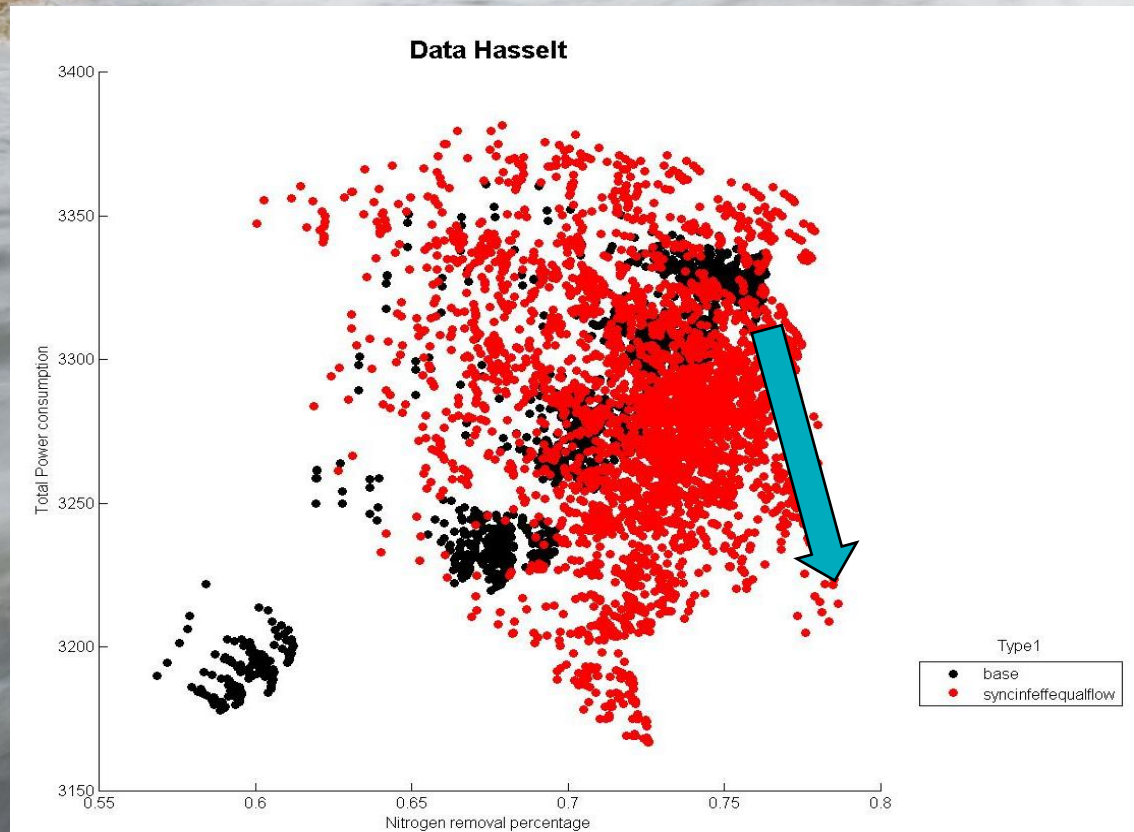
A novel alternating control



A novel alternating control?

5 % Energy consumption reduction

2 % Total Nitrogen removal gain



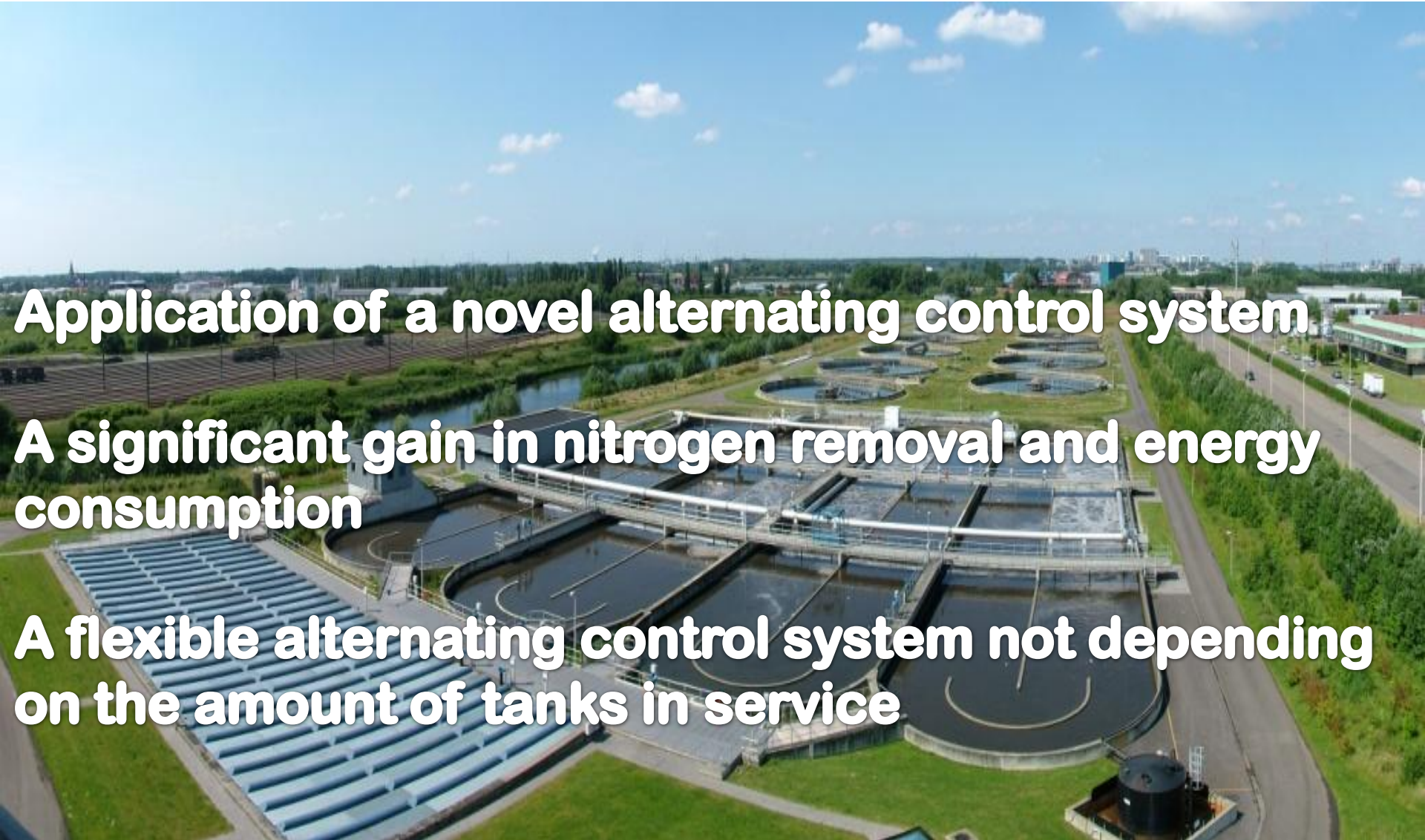
Conclusions



Application of a novel alternating control system

A significant gain in nitrogen removal and energy consumption

A flexible alternating control system not depending on the amount of tanks in service





tom.wambecq@aquafin.be

alessio.fenu@aquafin.be

R&D, Aquafin nv

Dijkstraat 8, 2630, Aartselaar, Belgium