

Demand response strategies and wastewater treatment plants: Demand shedding through aeration control

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25.10.2018



Wastewater treatment & Energy

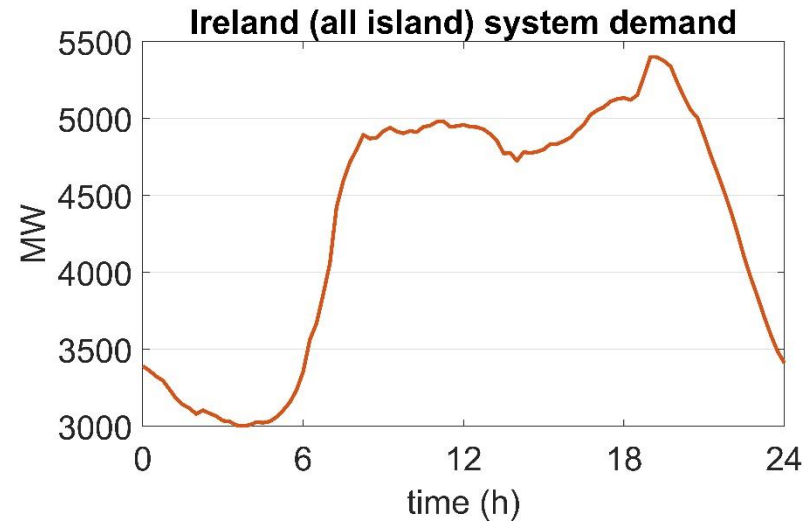
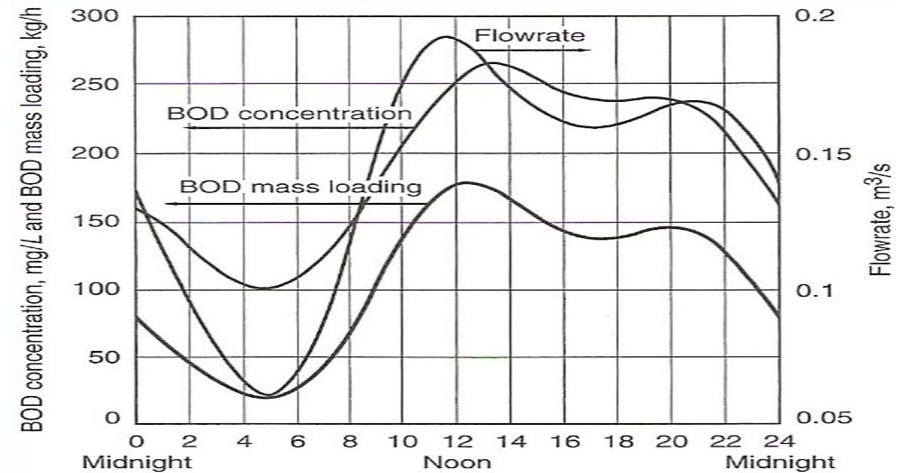
Diurnal and seasonal flow/load fluctuations as a source of flexibility for WWTPs.

How to optimize the existing infrastructure?

- Dynamic wastewater flows and pollutant loads
- Dynamic energy prices

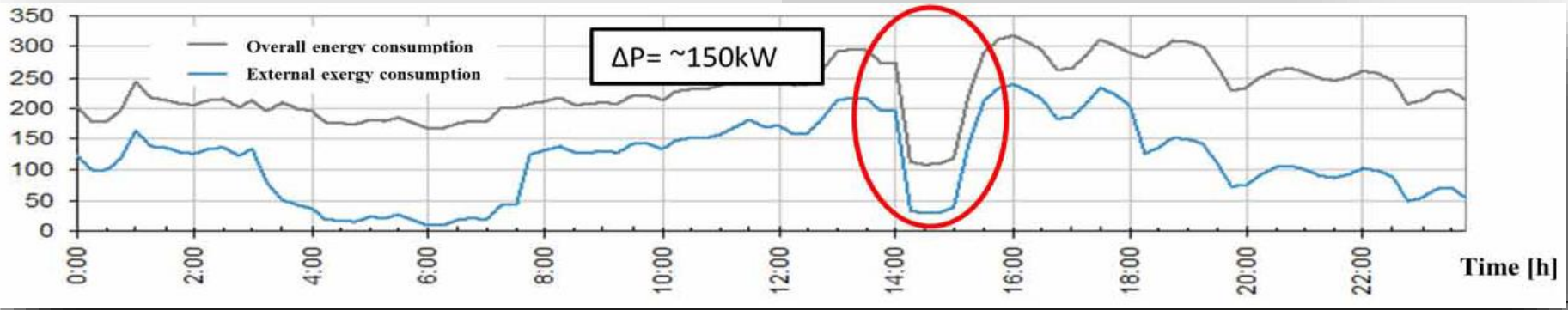


Demand response



Demand and response capabilities of wastewater treatment plants

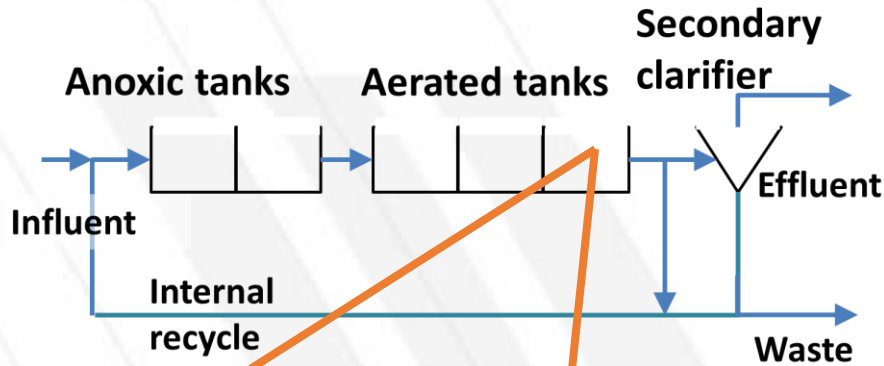
Aggregate	Effective power ^a (kW)	Switch-off time [min./max.] (min)	Switch-on time [min./max.] (min)	Regeneration time (min)	Start-up time (s)	Shut-down time (s)
Grit chamber (<i>aeration, intermittent</i>)	2.1/2.1	5–60	5–60	30	60	60
Aeration tank 1 + 2 (<i>aeration, intermittent</i>)	0.0/61.6–98.9				10	5
Aeration tank 1 (<i>agitator, intermittent</i>)	7.2/3.6–10.8	15–30	15–40	30	60	60
Field trials of 1 hour aeration reduction		20	–	60	60	5



^aNegative flexibility/positive flexibility.

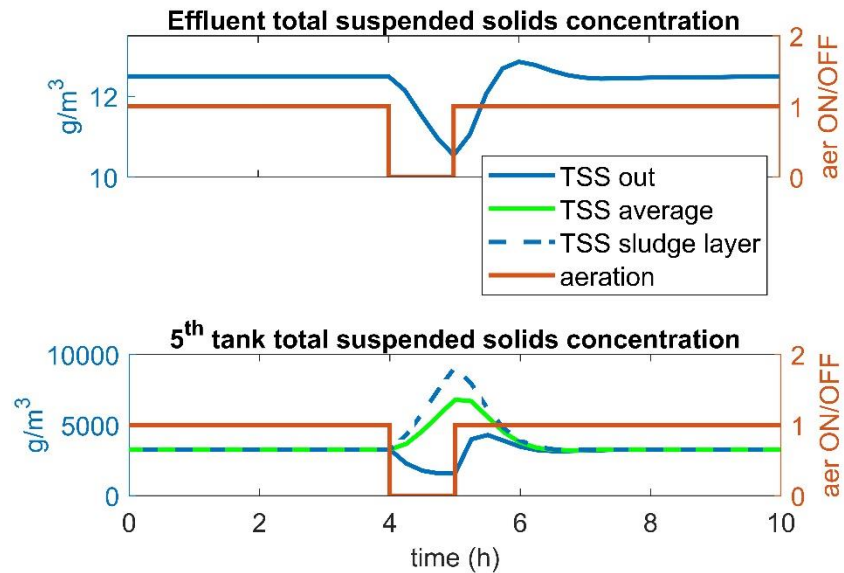
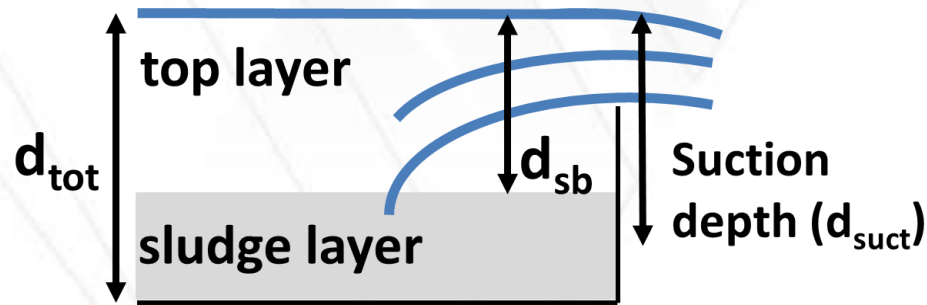
Characteristic values for a 58 000 PE plant – Schafer, Hobus, Schmitt (2017)

Reactions + settling model



Benchmark Simulation model No. 1

Matlab-Simulink implementation



Dual layer sludge settling model

Conclusions

Aeration system as a source of flexibility

Assessment of the effects on the effluent quality remains critical



Mathematical modelling of wastewater treatment plants

Improved integration with energy systems

Lower costs

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This publication has emanated from research conducted with the financial support of Science Foundation Ireland under the SFI Strategic Partnership Programme Grant Number SFI/15/SPP/E3125. The opinions, findings and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the Science Foundation Ireland.