



## How far can various control options take us in terms of increased hydraulic capacity under wet weather conditions?

Sharma, Anitha Kumari; Guildal, T.; Thomsen, H. A. R.; Mikkelsen, Peter Steen

*Publication date:*  
2013

*Document Version*  
Publisher's PDF, also known as Version of record

[Link back to DTU Orbit](#)

*Citation (APA):*

Sharma, A. K., Guildal, T., Thomsen, H. A. R., & Mikkelsen, P. S. (2013). *How far can various control options take us in terms of increased hydraulic capacity under wet weather conditions?*. Poster session presented at 86th Annual Water Environment Federation Technical Exhibition and Conference (WEFTEC 2013), Chicago, United States.

---

### General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

# How far can various control options take us in terms of increased hydraulic capacity under wet weather conditions?

Sharma A.K.<sup>1\*</sup>, Guildal T.<sup>2</sup>, Thomsen H.A.R.<sup>3</sup> and Mikkelsen P.S.<sup>1</sup>

<sup>1</sup>Department of Environmental Engineering (DTU Environment), Technical University of Denmark, Miljøvej, Building 113, 2800 Kgs. Lyngby, Denmark; <sup>2</sup>Avedøre Wastewater Services, Kanalholmen 28, 2680 Hvidovre, Denmark; <sup>3</sup>Krüger - Veolia Water Solutions and Technologies, Gladsaxevej 363, 2860 Søborg, Denmark

E-mail: akush@env.dtu.dk

## Introduction

Many modelling studies have demonstrated that the hydraulic capacity of the WWTP can be improved by introducing various real time control options, however few studies have demonstrated how effective these controls are in the real world.

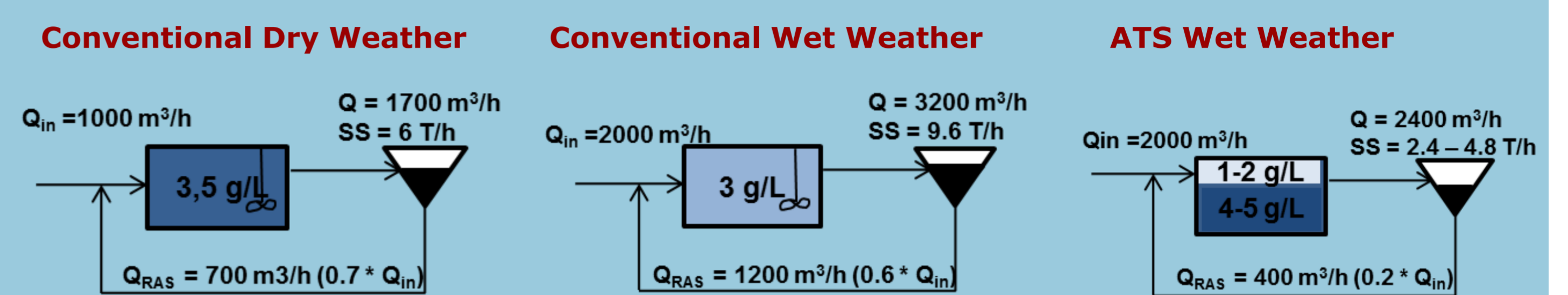
Based on 7 years full scale operation data this study investigates the performance of implemented controls strategies on hydraulic capacity and pollution treatment during wet weather conditions



- Location: Avedøre WWTP, Denmark
- Design Capacity: 345 000 PEB60
- Industrial and residential area
- Separate sewer
- Data: 7 years full scale operational data

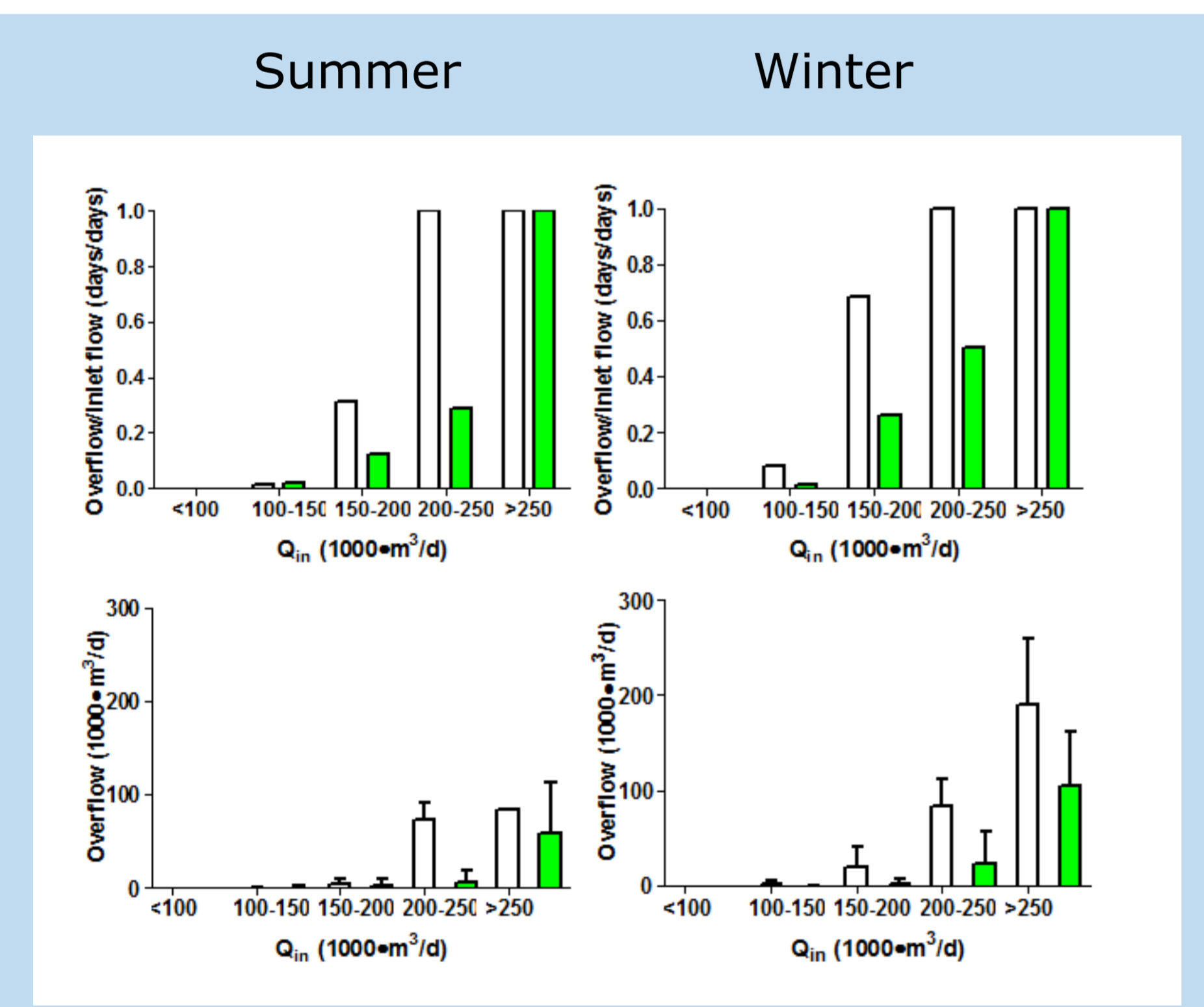
## Implemented Wet Weather Control Strategies

- **Aeration Tank Settling:** Introducing settling phase in aeration tanks during wet weather (patented method).

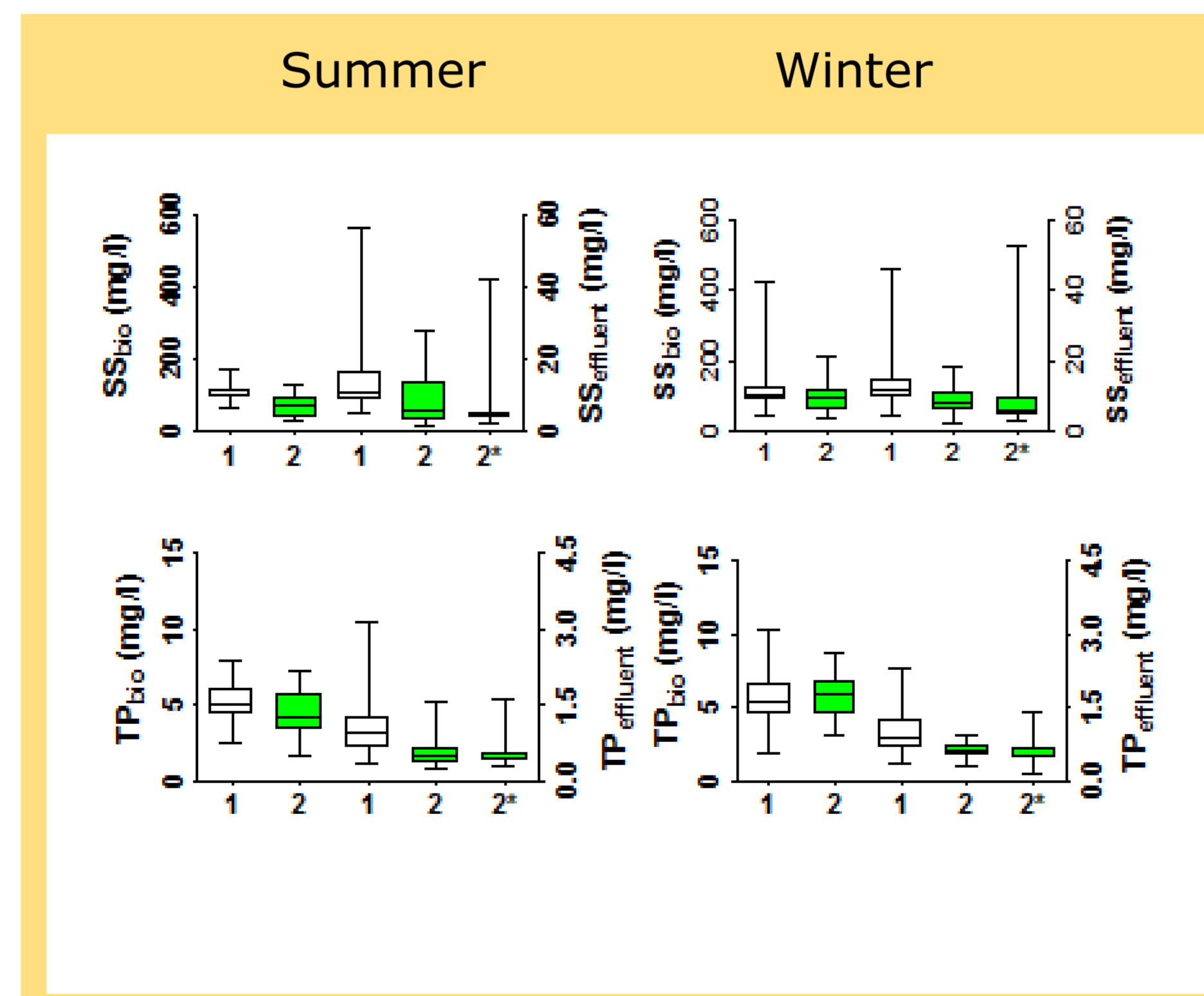


- **Sludge Age Control:** Dynamic control of mixed liquor suspended solids in aeration tanks based on temperature,  $\text{NH}_4\text{-N}$  and  $\text{NO}_3\text{-N}$  concentrations.
- **Switch to wet weather mode based on flow predictions:** Flow data from a pumping station with approximately 1 hour flow prediction time were used
- **Return Sludge and inlet flow Control based on sludge blanket level:** Controlling the return sludge flow and inlet flow based on sludge blanket level and suspended solids in return sludge.
- **Flow equalization tank:** Storm water storage tank at the WWTP is used as flow equalization tank
- **Platform used for implementation:** STAR control™

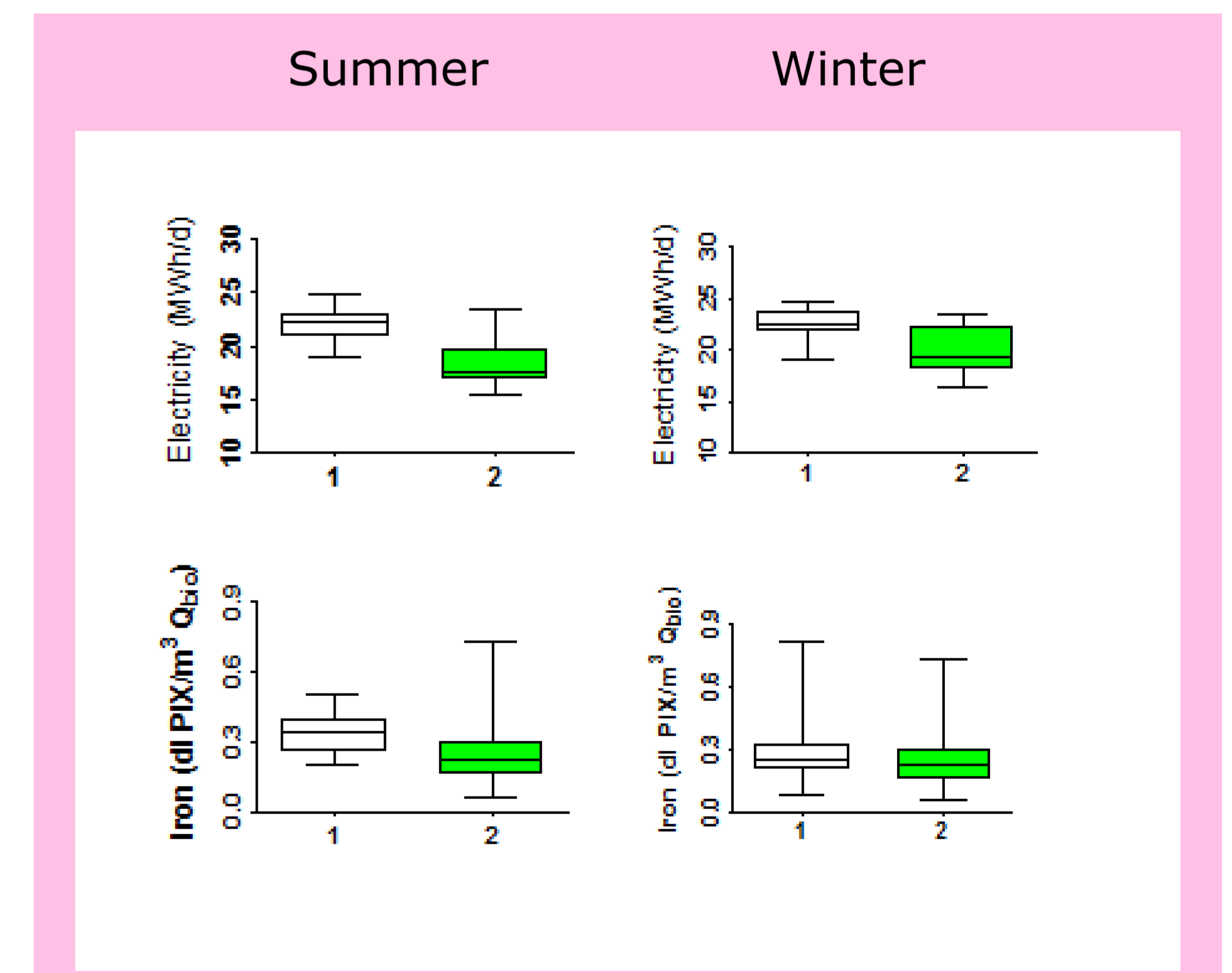
## Results - Overflows



## Results – Treatment Efficiency



## Results – Electricity and Chemicals



## Conclusions

### ATS operation in combination with other RTC strategies

- increases the hydraulic capacity with up to 150% and 67% of the design capacity during winter and summer, respectively
- reduces the effluent concentrations compared to the conventional wet weather operation by
  - 50-60% for chemical oxygen demand (COD)
  - 30-60% for Suspended solids
  - 40-50% for total phosphorous (TP)
  - No change in total nitrogen (TN) removal efficiency
- reduces the electricity consumption by 7-12 %.

However, in very few cases the ATS operation in combination with RTC was unable to avoid overflows below the design capacity.

## Future Improvements

Flow predictions based on radar can be used to start the ATS operation and has recently been implemented at some WWTPs. Practical experience in future would show whether the usage of these models would reduce the predicted overflow frequency due to climate changes

## Further Information

- Sharma A.K., Guildal, T., Thomsen, H.A.R., Mikkelsen, P.S., and Jacobsen, B.N. (2013). Aeration tank settling and real time control as a tool to improve the hydraulic capacity and treatment efficiency during wet weather: Results from 7 years full scale operational data. Water Science and Technology, 67 (10), Pages 2169-2176
- WEFTEC 2013, Session 417: Wet Weather Operation and Control of Integrated Sewer and Wastewater Treatment Plant Systems, 8<sup>th</sup> October, 2013, 13:30 – 17:00, Room S406b.