



# MOVING TOWARDS SMART WWTP'S THROUGH ADVANCED AERATION CONTROL

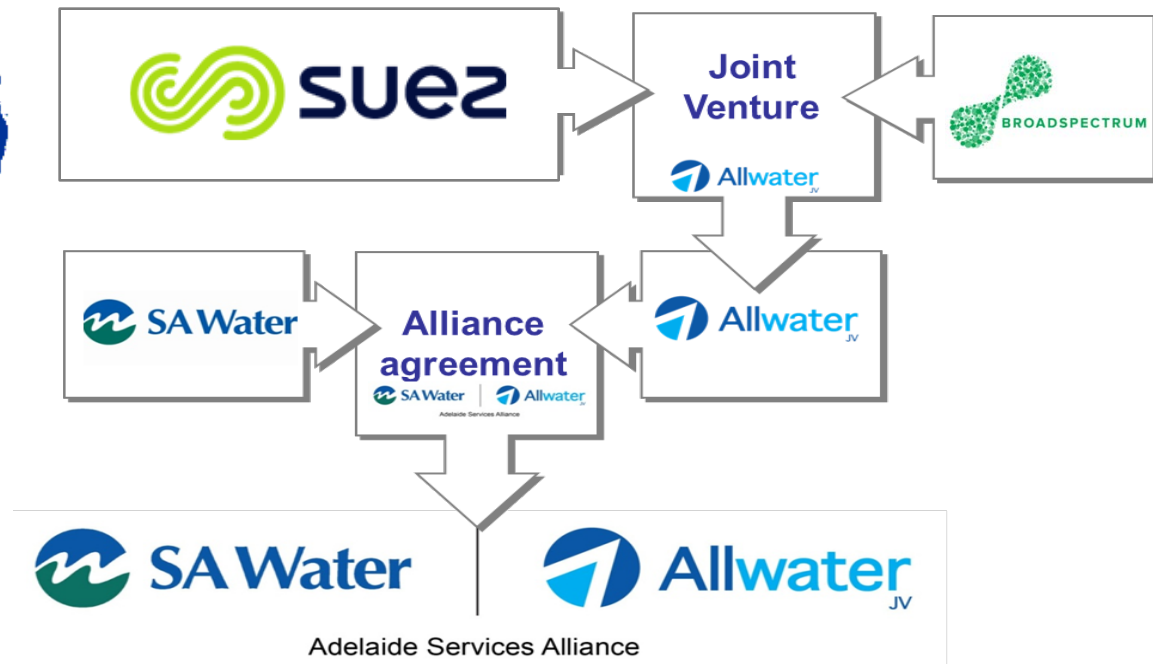
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2. SUEZ, Paris, France
3. SA Water Corporation, Adelaide, SA, Australia

# Who is ALLWATER?



Serving 1.3 million customers living and working within the Adelaide metropolitan area



# Who is ALLWATER?



- Allwater operate and maintain:
  - 6 water treatment plants & 8,900 km of water mains
  - 6 wastewater treatment plants & 7,200 km sewer mains
  - 4 wastewater & 3 stormwater reuse schemes
  - Over 400 pumping station & fan sites



- **Project Overview**
  - Objectives
  - Technology Overview – Analysers and Algorithms
  - Trials Proposed
- **Results to Date**
  - Greenbass™
  - HACH Amtax/Filtrax
- **Next Steps & Further Opportunities**





Christies Beach Waste water treatment plant:  
35 ML/d  
870 MWh/month

A and B-plants  
(BNR Process)

C-plant  
(MBR process)



In 2015, a feasibility study undertaken by SUEZ France found:

- Potential energy savings estimated between 14-20%
- Return on investment: 2.2 to 3.3 years

## Project Objectives

- Implement smart control on a full scale plant as a trial
- Assess advanced aeration control technology
  - Operation
  - Maintenance
  - Results
- Further define costs and potential savings
- Obtain information to assist decision-making regarding further implementation of this technology

Greenbass™

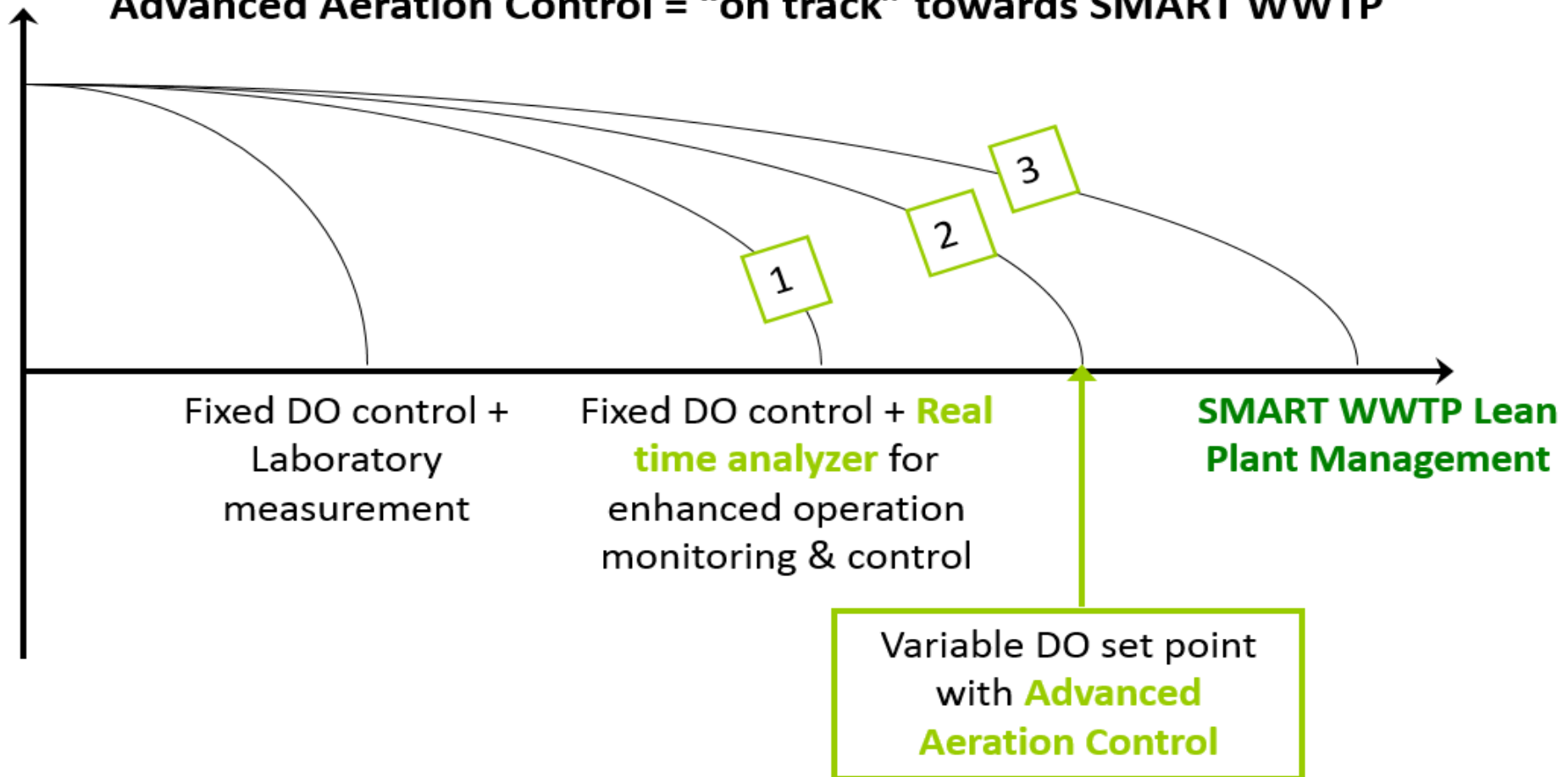


*AAC = new process controllers, algorithm or architecture that allow the adjustment of aeration system (air production, air distribution) according to actual needs within the biological reactor (biomass + influent loads)*

## Advanced Aeration Control

Innovation towards SMART WWTP

Advanced Aeration Control = "on track" towards SMART WWTP





*What do we need?*

**Data + Control**

*Analysers:*



*Be Right™*

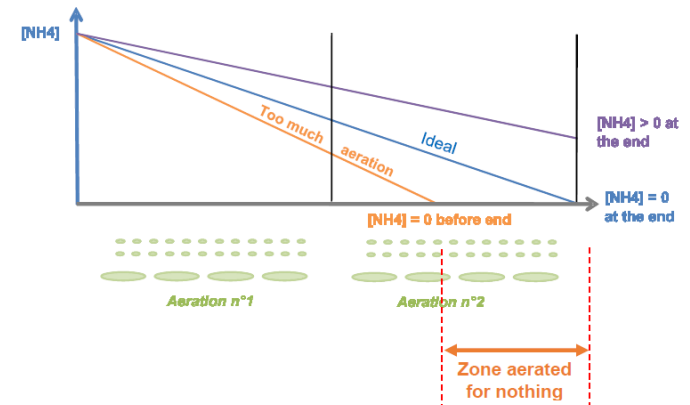


*Algorithms:*

**Greenbass™**

- Greenbass™ Plug Flow is a new AAC system by SUEZ (patent pending)
- Applicable to nitrifying activated sludge processes
- Uses a plug flow hydraulic configuration based on ammonia measurements in the biological tanks

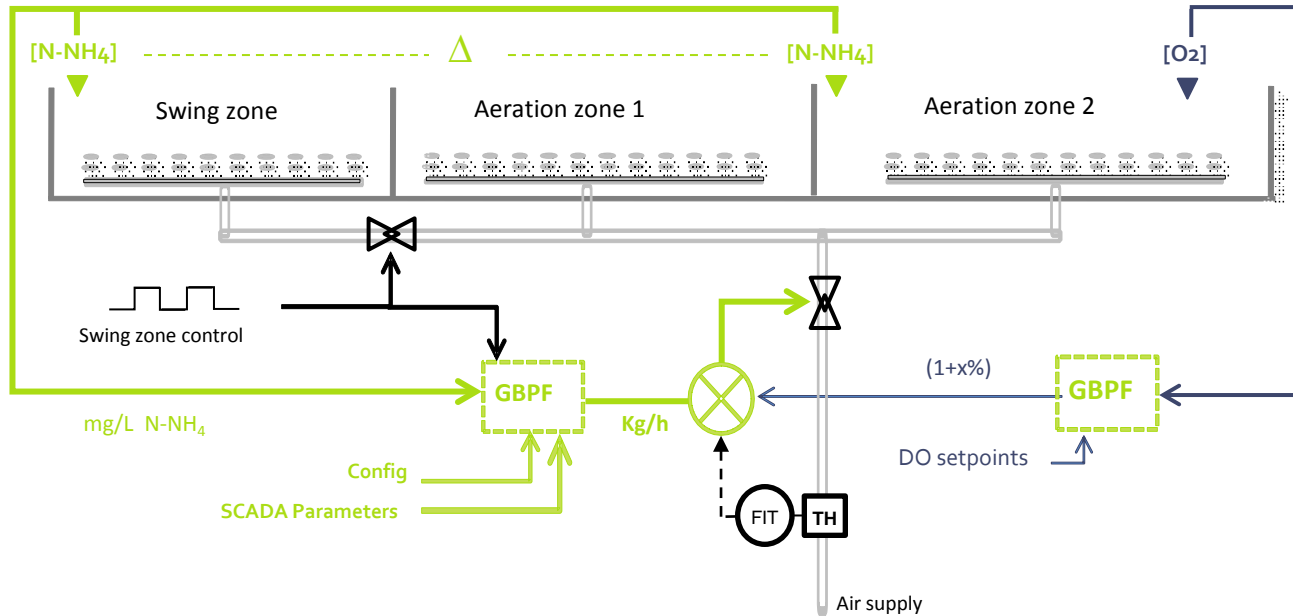
Greenbass™



## The aim of Greenbass™ Plug Flow:

- Adapt the oxygen supply and thus the ammonia reaches zero at the very end of the tank
- Reduce energy usage due to reduction in aeration
- Effective wastewater treatment and process monitoring

# Greenbass™ Plug Flow principle

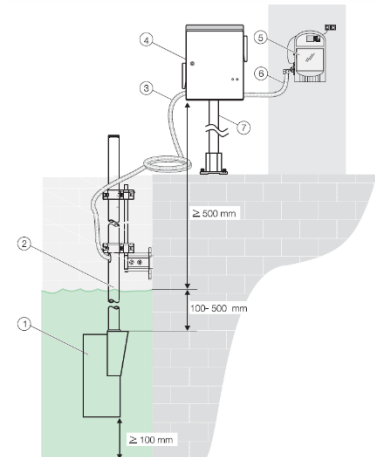


## Greenbass™ algorithm uses 3 actions:

- Predictive control loop
- Feedback control loop
- Failsafe control loop

## HACH:

- Recommended by SUEZ in 2015 based on assessment of available technologies and field experience
- 2 AMTAX Analyzers (0.05-20MG/L NH<sub>4</sub>-N, 2 CHANNEL, Continuous Sample) & 2 FILTRAX purchased with Suez price agreement with HACH
- 12 month maintenance contract

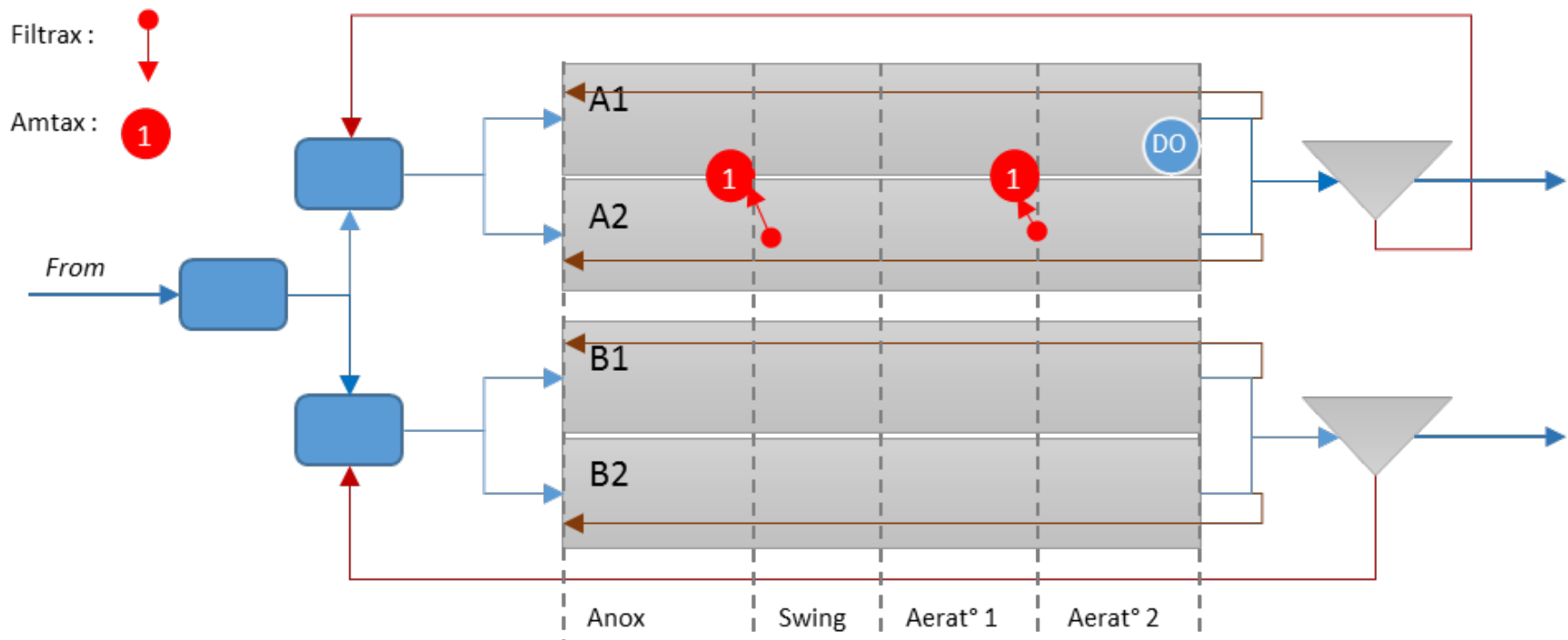


# Analyser Locations at CBWWTP



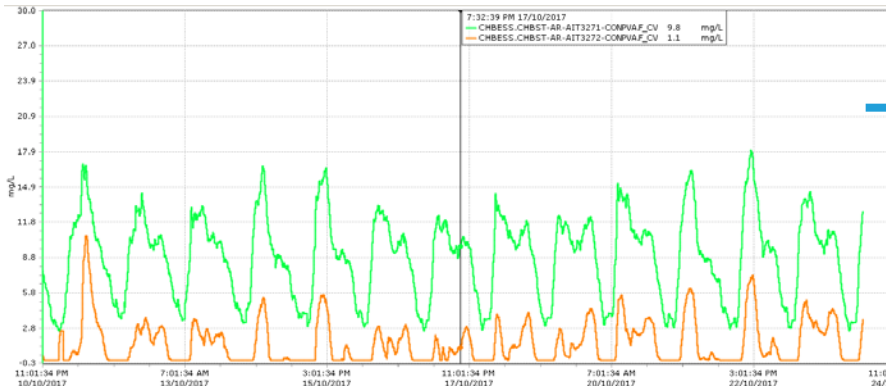


- **Trial 1:** Full Greenbass™ algorithm on A2 tank with aim to test AAC system
- **Trial 2:** Only the  $\text{NH}_4$  feedforward predictive control on one aeration tank. Only the swing zone inlet  $\text{N-NH}_4$  analyser will be used in the control algorithm, the mid aeration tank measurement point will be used for information purpose only.

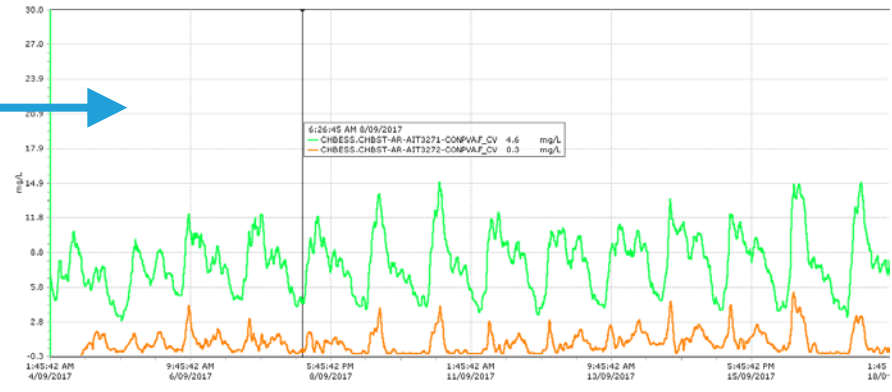


## Greenbass in action

### Without AAC...



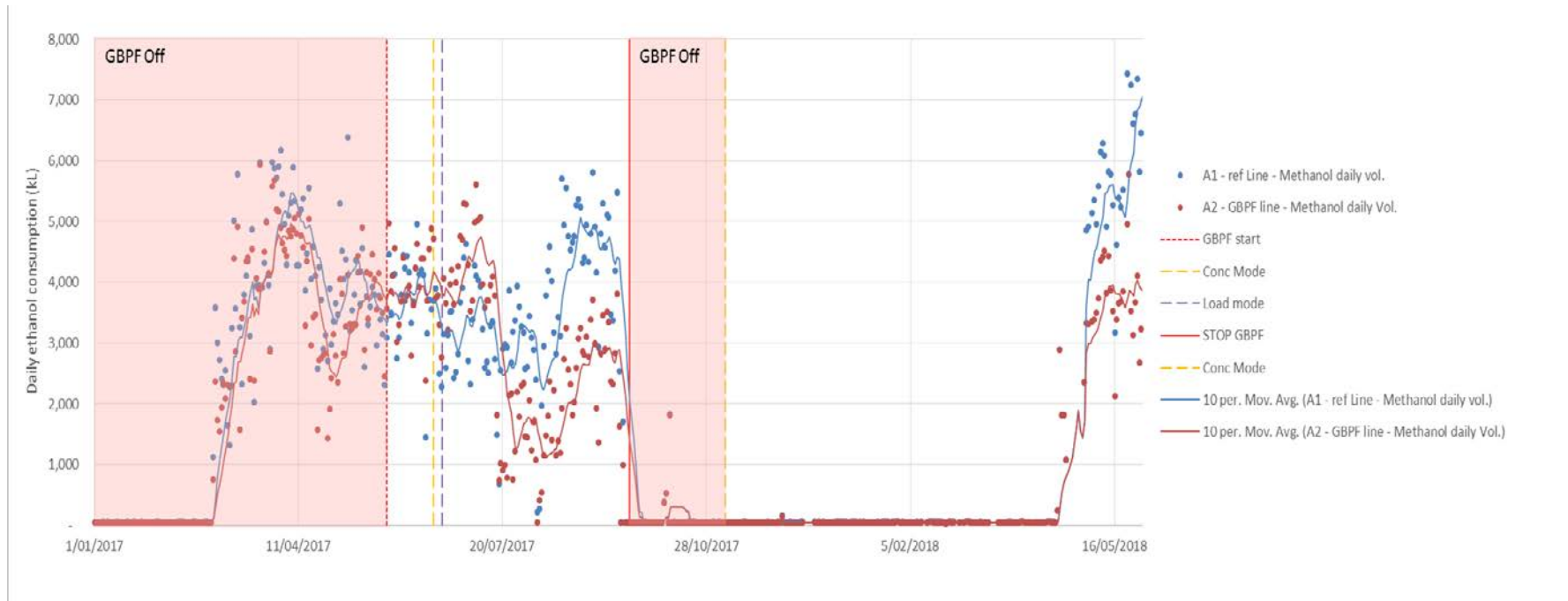
### With AAC!



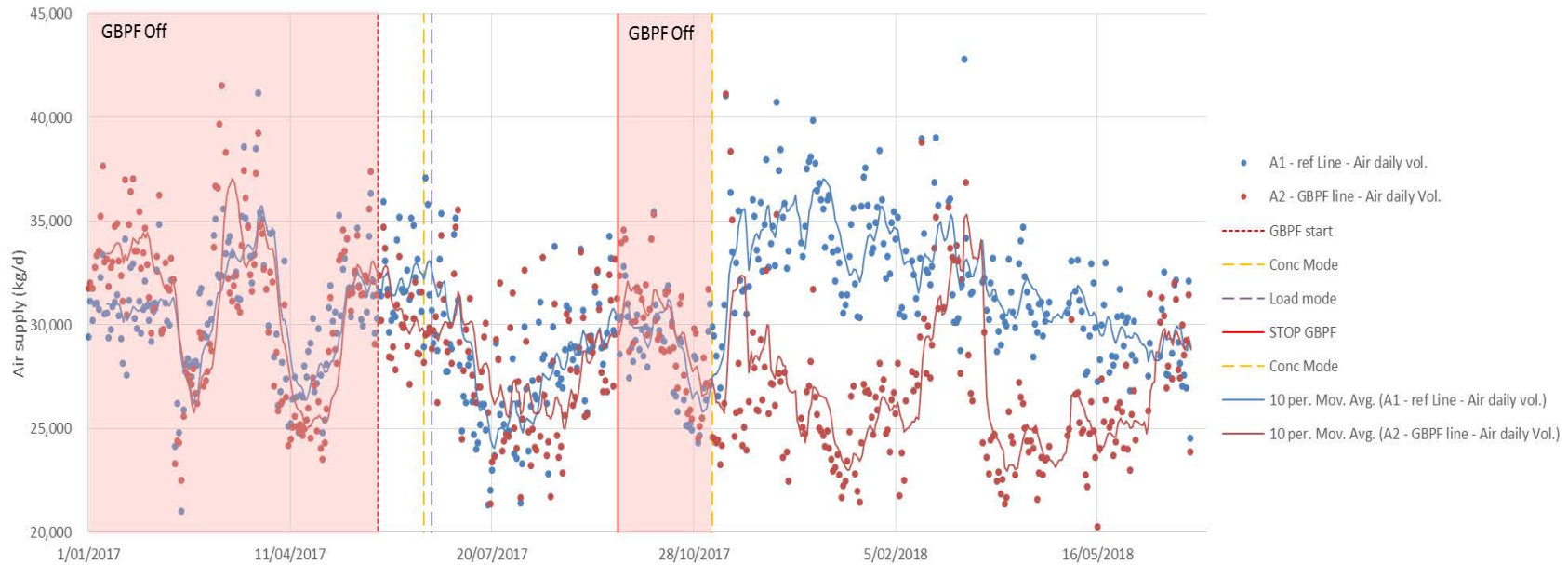
- Less Ammonia breakthrough during peak flows
- Reduced period at zero Ammonia at the middle of the reactor

Securing our effluent quality and making sure we don't over-perform and waste energy !

# Greenbass™ Feedback: EtOH dosing



# Greenbass™ Feedback: Air flows



A Plant WQ Standard Deviation	Ammonia	Nitrate
Conventional DO control	1.10	7.11
Greenbass™ Plug Flow control	0.71	6.14
% Reduction	36%	14%

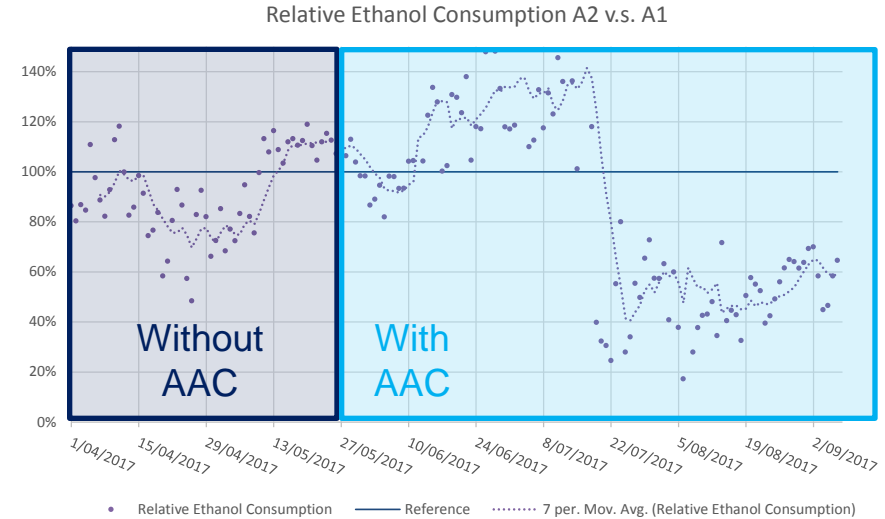
## Energy and chemical savings through aeration

- Preliminary results
  - Use of statistical models
- Reduction in aeration
  - Different air distribution throughout the day
  - Average 5 000 kg/day saved – 140kWh/day

Approx. **16%** power savings

- Reduction in Ethanol dosing
  - 28L - 45L/day saved with combined control

Approx. **30%** Ethanol saving





- Aeration Savings between 14-20% as forecasted
- Potential for more savings in aeration as cannot reduce aeration below the blowers minimum output
- Savings in ethanol dosing due to change in aeration distribution during the day
- Improved Stability of Effluent Water Quality

One Team. Growing People. Creating the future.



SA Water



Allwater

Adelaide Services Alliance



Thank you for your attention

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One Team. Growing People. Creating the future.

## Results and operability:

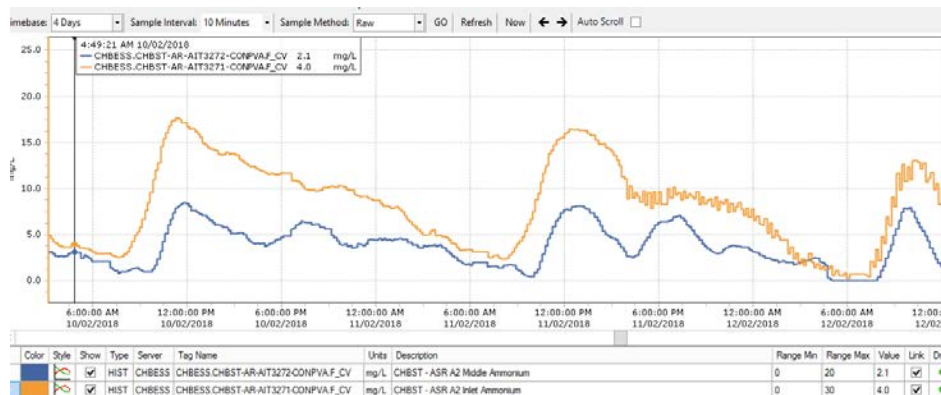
- Instrumentation running reliably since February 2017
- Quality and reliability of the data sufficient to trust our process control with!

## Maintenance

- Overall limited maintenance, mostly cleaning of the sampling tubes and vials (once every couple of months) and replacing the reagents when required

## Issues

- Biofilm accumulation in the sampling tubes and vials leading to irregular trend but overall trend acceptable:



- UF membrane damage possibly leading to SS entering the sampling system