



Final Conference “Water in the circular economy -
Innovations for urban water treatment”

Reuse, Recovery and Resource efficiency,
Innovations in urban wastewater treatment

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OptimEDAR: Low cost online aeration control system

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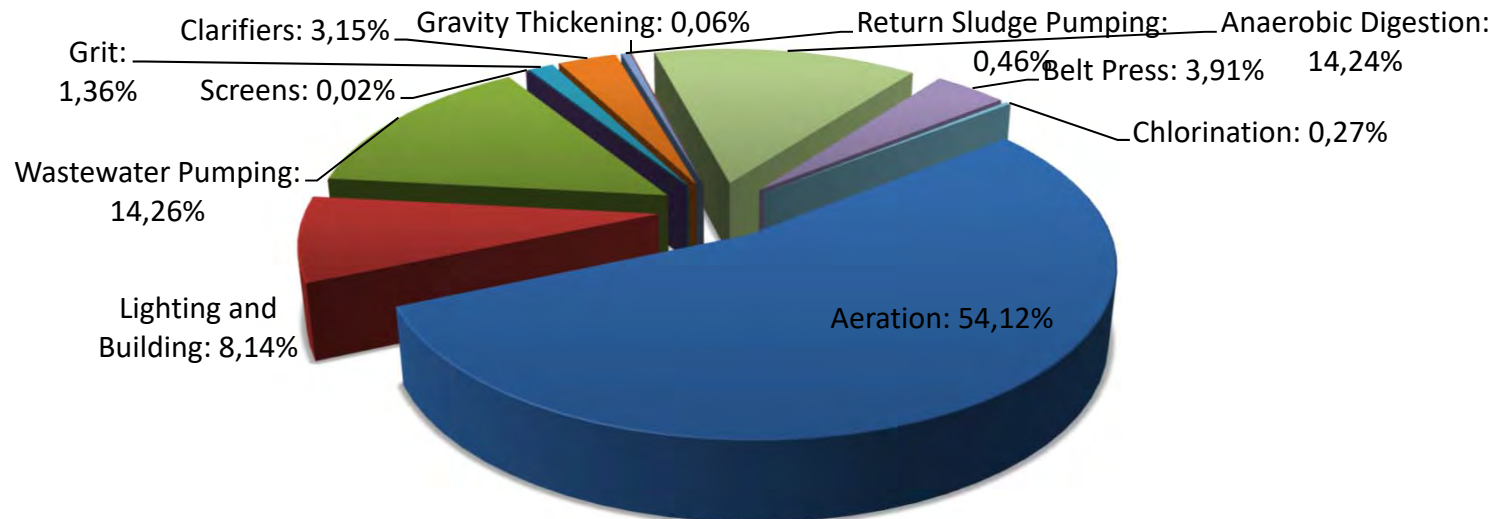
www.r3water.eu

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Need

- Aeration cost = 45-75% of energy.
- Regulatory compliance: UWWTD Directive 91/271/EEC.
- > 70.000 existing WWTP in EU, mostly designed with biological treatment



Ref. Science Application International Corporation.
“Water and Wastewater Industry – Energy Best Practice”

Approach

Optimal aeration control thanks to an innovative on-line monitoring of the biological reactor:

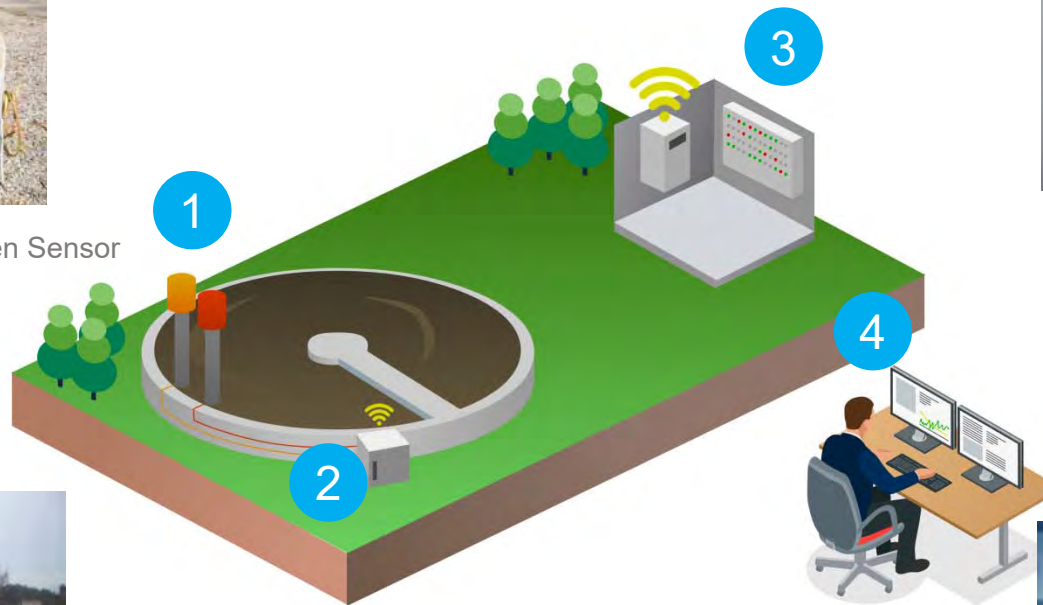
- Application of ‘virtual sensing’ techniques: calculation of Equivalent Organic Charge (EOC) by measuring DO and Redox
- Blowers are operated according to EOC, instead of the typical DO control
- Reduction of the blowing time while allowing longer denitrification cycles
- ‘Add-in’ solution, easy to install, based on robust probes with low maintenance requirements



Approach



- 1**
- Dissolved Oxygen Sensor
 - RedOx Sensor



2 Sensors Cabinet

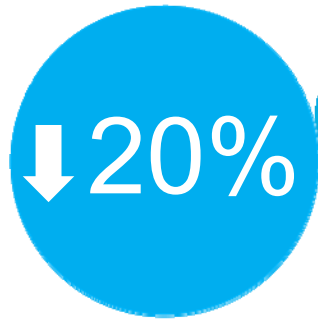


- 3**
- Control Cabinet
 - Virtual sensing Equivalent organic charge
 - Add-in solution
 - Online aeration control (blowers)



4 Integration with local/remote Control Centre

Benefits



Reduce energy consumption.



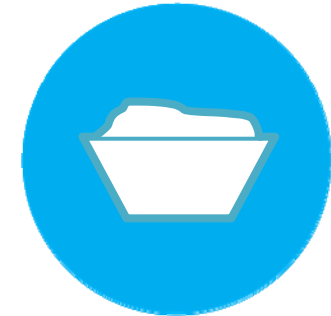
Decrease CO₂ emissions.



Enhance effluents' water quality.



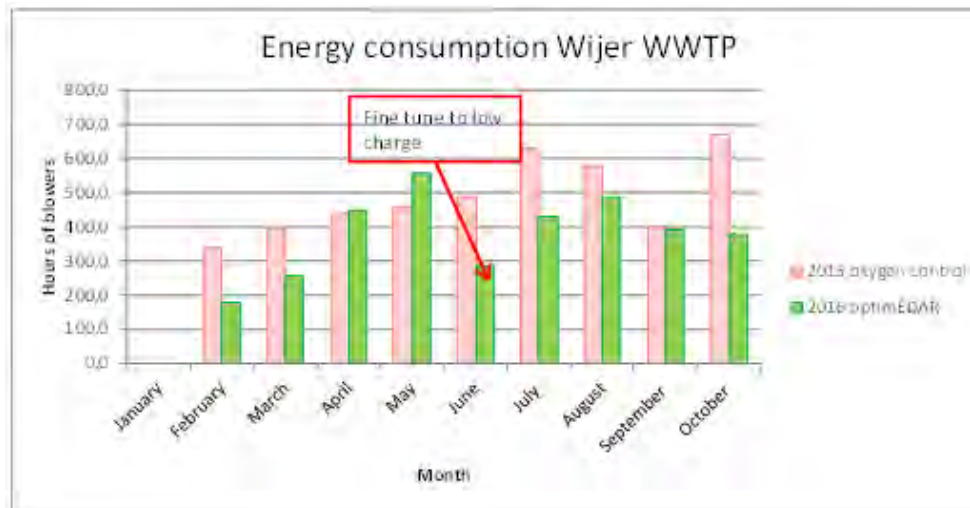
Improved Nitrogen and Phosphorous removal.



Decrease sludge production.

- Reduce energy consumption, by average 20%, by adapting blower operation to the current organic matter load.
- Increase the efficiency of the nutrients removal due to denitrification - dephosphatation cycles and provides microbiological stability.

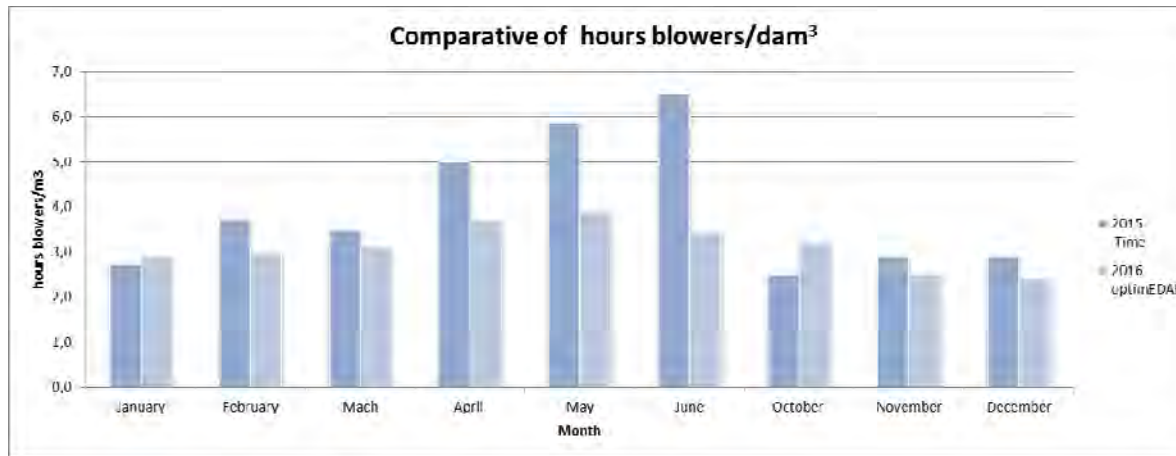
Case study: Wijer (Belgium)



Wijer WWTP (1.600 P.E., Aquafin)

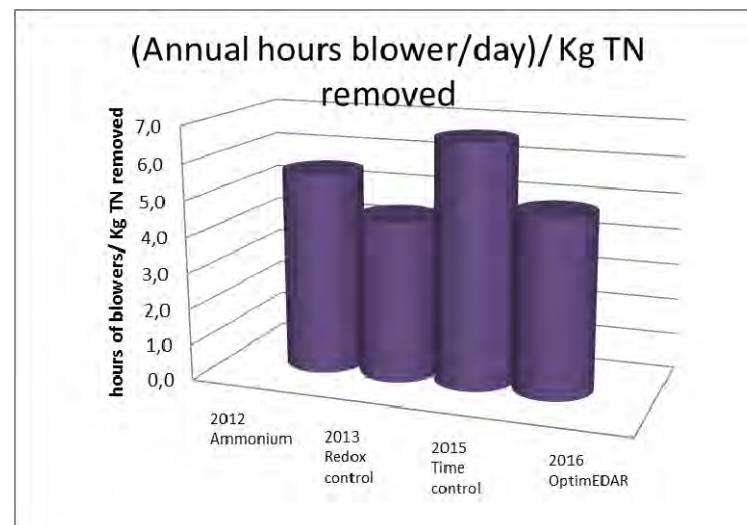
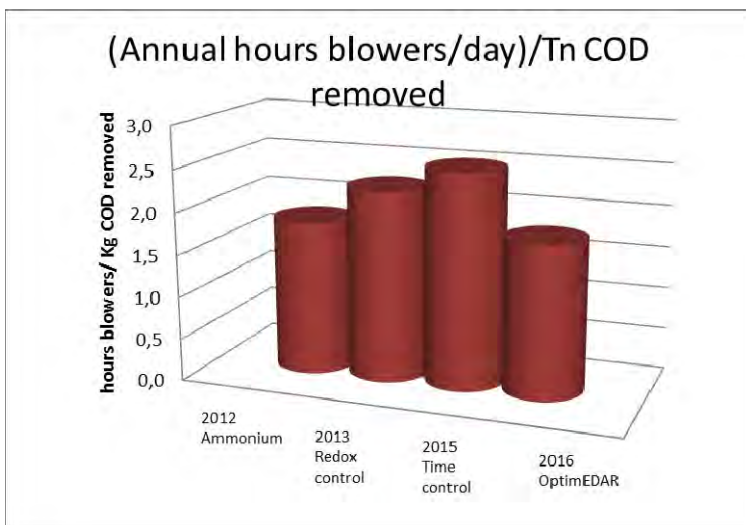
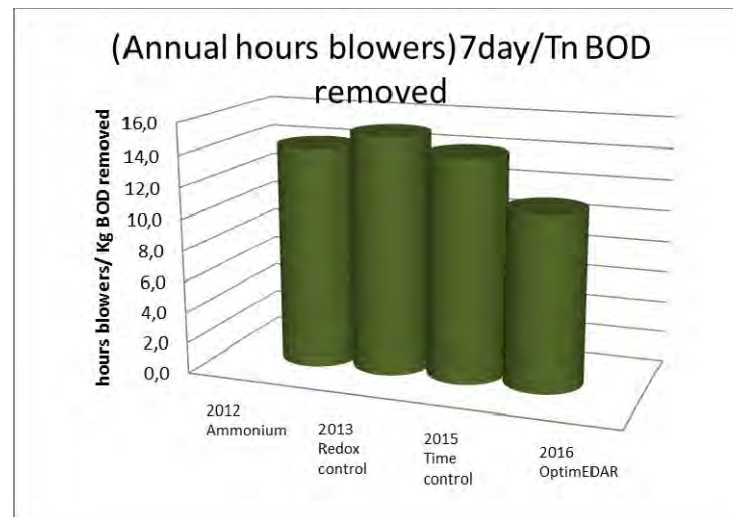
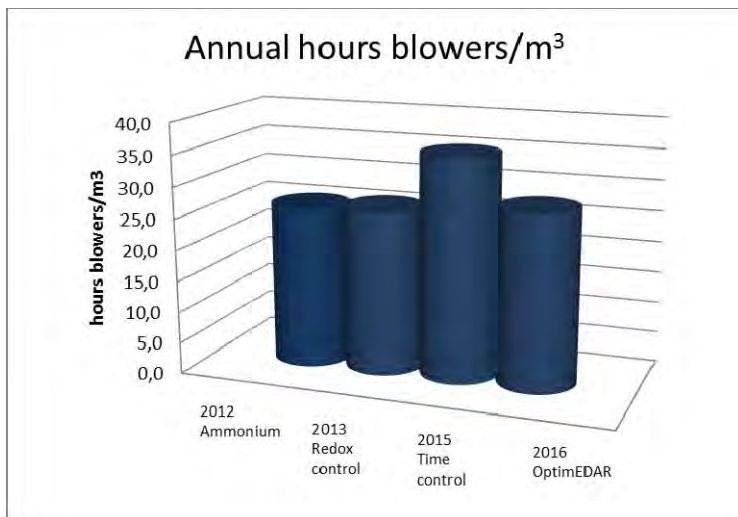
- Characteristics: diluted influent
- Reduction of use of blowers until 10 % compared to the same period of 2015 using oxygen control.
- Slight absolute decrease in TN removal efficiency by 3-4%
- Long ROI because of the low power of blowers
- For a target ROI of 3 years, plant must be greater than 10.000 P.E.

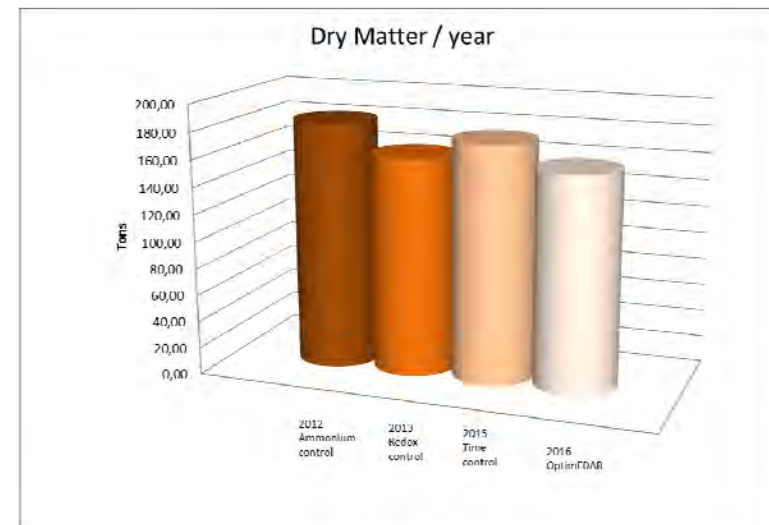
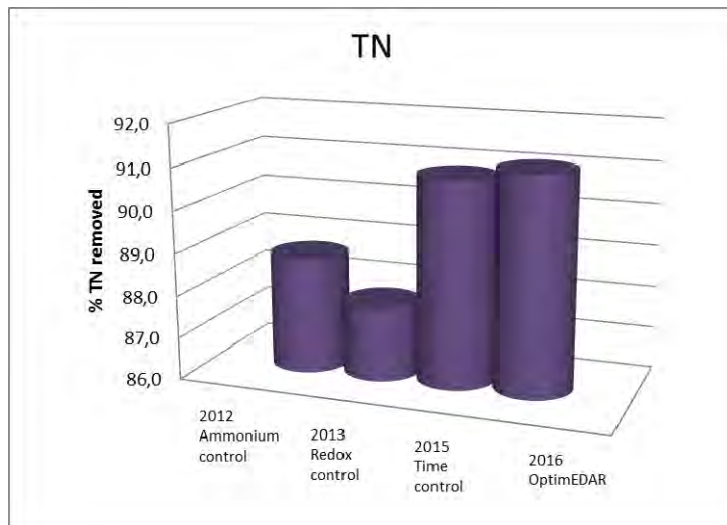
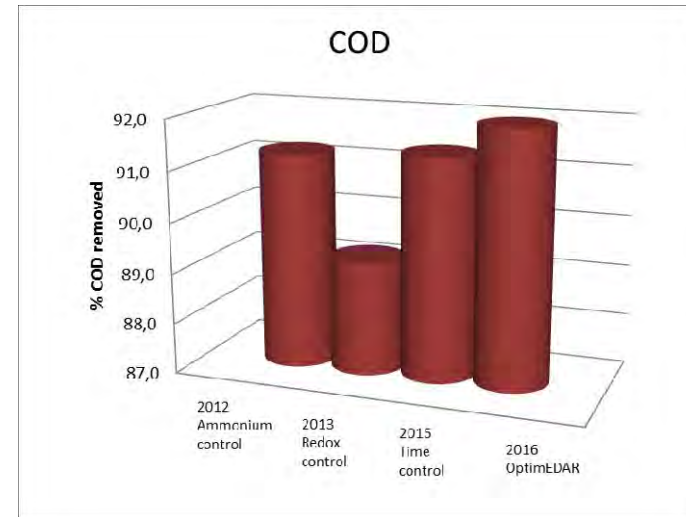
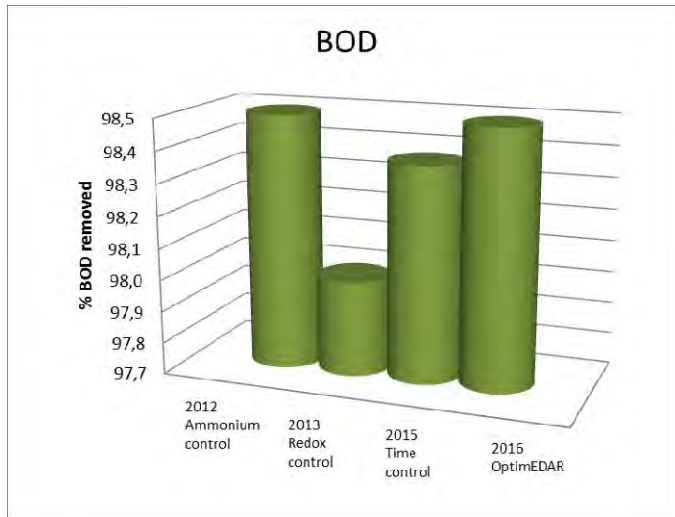
Case study: Empuriabrava (Spain)



Empuriabrava WWTP (70.000 P.E. CCB)





































- Characteristics: high seasonality (4 to 1)
- Reduction of use of blowers until 21 % compared to the same period of 2015 using time control.
- Slight improvement in nutrient removal
- ROI = 2 years, including not only the energy costs but also the costs associated to sludge treatment and polyelectrolyte





Comparative with other control methods

- Intensive data analysis performed for Empuriabrava WWTP, comparing OptimEDAR with previous control methods (Ammonia, redox, time controls)

	Energy/Flow	Energy/BOD	Energy/COD	Energy/TN	BOD removal	COD removal	TN removal	Sludge production	CO2 emissions
Ammonia control									
Redox control									
Time control									
OptimEDAR									

- The overall performance of OptimEDAR is similar to ammonium control method
- While CAPEX and OPEX are lower, mainly due to the reliability of the DO and Redox sensors compared to ammonium sensor.

Market potential

- Main target: medium/large WWTPs (> 10.000 P.E.), representing 40% of the overall EU market.
- Other side markets: Food and beverage industry
- Applicability: Active Sludge WWTPs with biological reactor (concentric or carrousel)
- Better ratios of improvement for:
 - plants where influent suffers a significant variation in organic matter load
 - plants designed for covering a seasonal peak demand that are normally oversized
 - the extended aeration WWTPs with Oxidation Ditch Configuration

Thanks for you attention !!

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Acknowledgments:

<http://www.ccbgi.org/>

<http://www.aiguescb.com>

<http://www.aquafin.be/>