Control Strategies for Climate Change Adaptation of WWTPs during Wet Weather

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Content

- Climate change and WWTP problematic
- Plant Introduction
- Plant Description
- Control Strategies
- Conclusions
- Acknowledgments

Plant Introduction

Denmark
43 km^2
5.6 M people
130 people/km^2

Canada
10 000 000 km^2
35 M people
3.4 people/km^2

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Plant introduction

- Location
  - Lynettefælles-skabet, DK
- Lynetten WWTP
  - 700 000 PE
  - 5 - 6,6 m^3/s
- Receiving water
  - The Sound Strait (Øresund)

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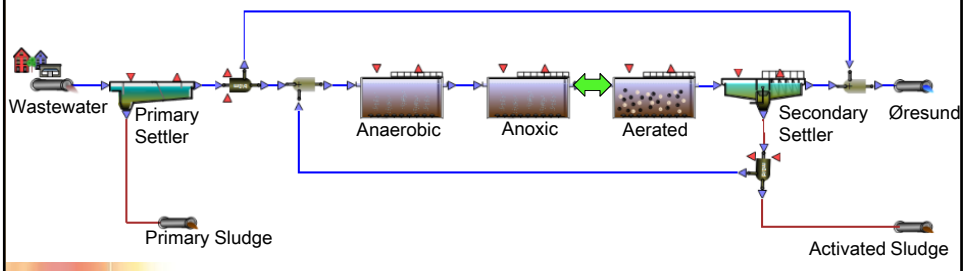
Plant description



Source: MikebyDHI (WEST)

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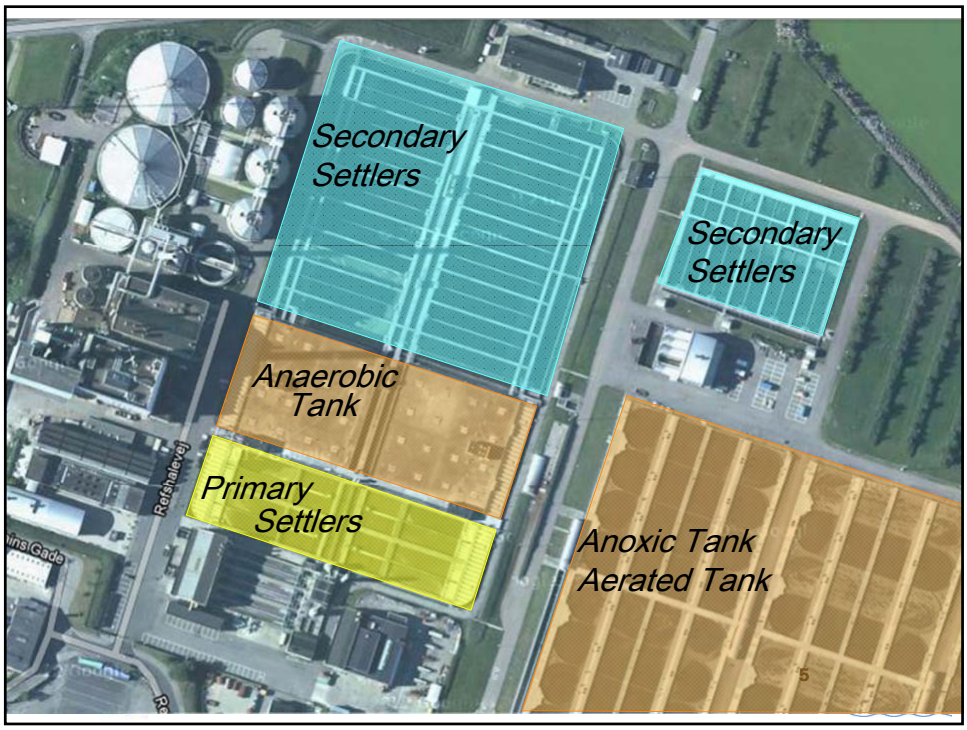

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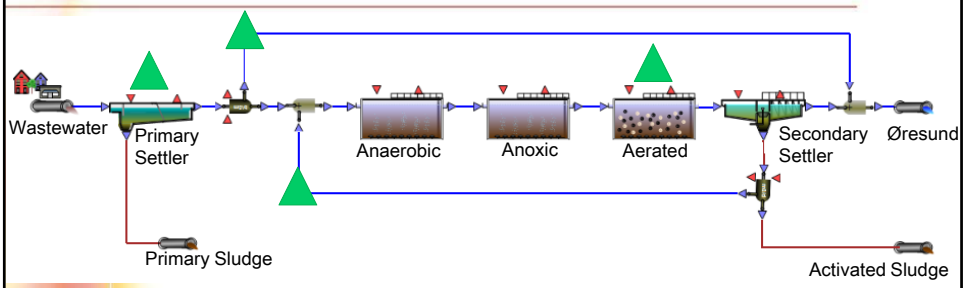
- Climate change and WWTP problematic
- Plant Introduction
- Plant Description
- Control Strategies
  - Evaluation tool
  - Rain Event
- Conclusions
- Acknowledgments

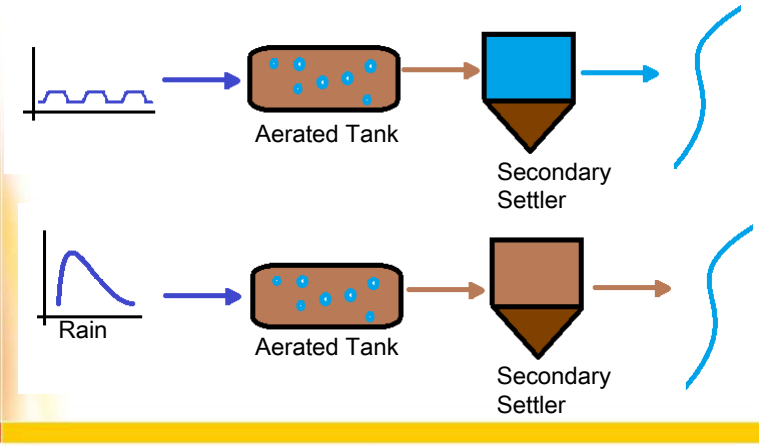
Control Strategies



- Chemically Enhanced Primary Settler
- By-Pass
- Activated Sludge Recycling
- Aeration Tank Settling

Source: veoliawaterst.com

Control Strategies : Aeration Tank Settling



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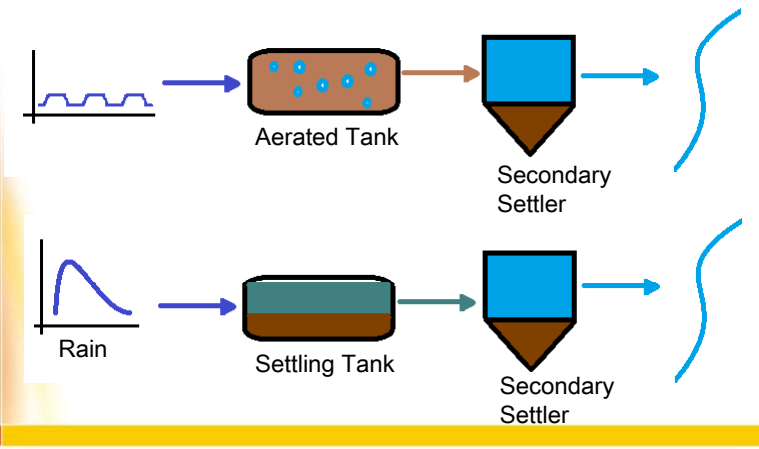
Control Strategies : Aeration Tank Settling



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Evaluation tool : Effluent Pollution Index (EPI)

EPI = Organic matter + Nitrogen compound + Phosphorus compound

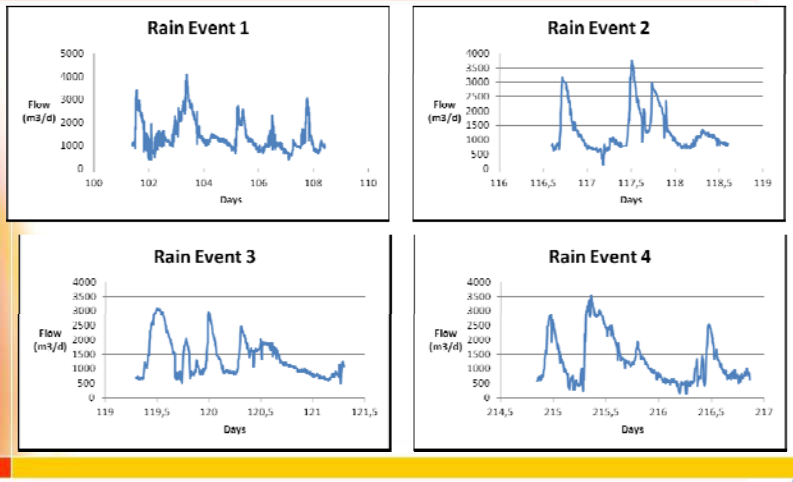
$$EPI = w_1(TSS)+w_2(COD)+w_3(BOD)+w_4(TKN)+w_5(NO)+w_6(TP)$$

- Organic (Org) = Total Suspended Solids (TSS)
  + Carbon Oxygen Demand (COD)
  + Biological Oxygen Demand (BOD)
- Total Kjeldahl Nitrogen (TKN) = Org.-N + NH_3-N
- NO = Nitrate (NO_3) + Nitrite (NO_2)

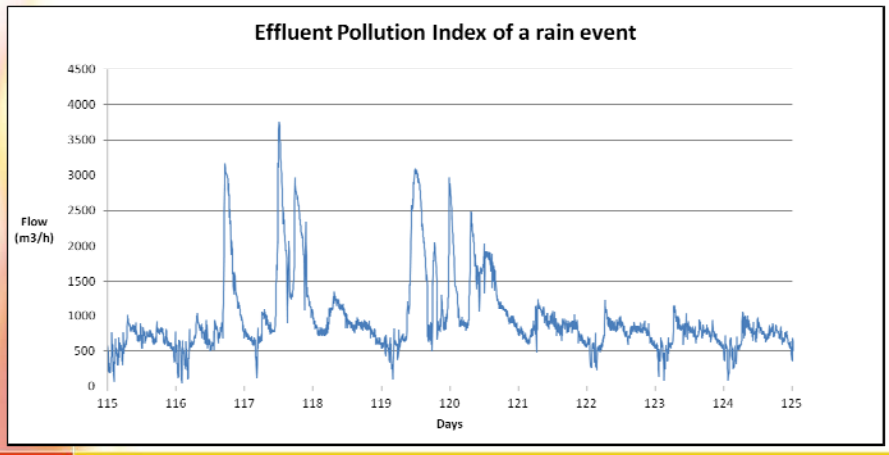
} Total Nitrogen

- Total Phosphorus (TP)

Rain Events



Reference behaviour



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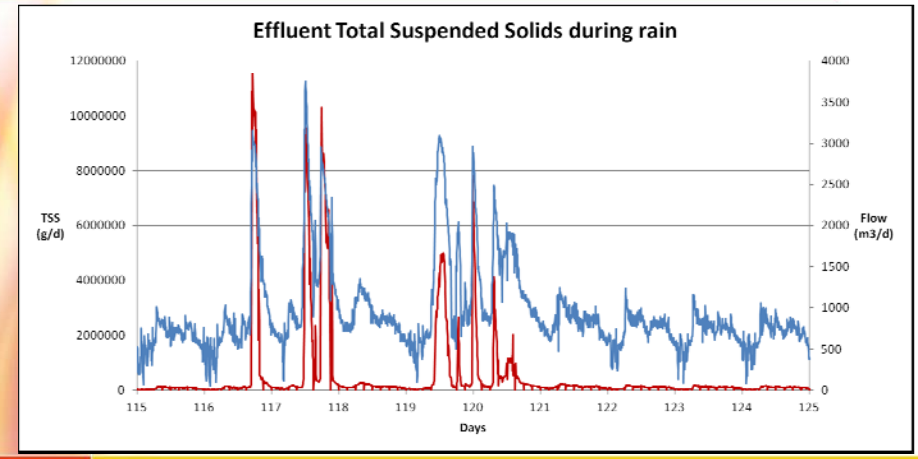
Reference behaviour



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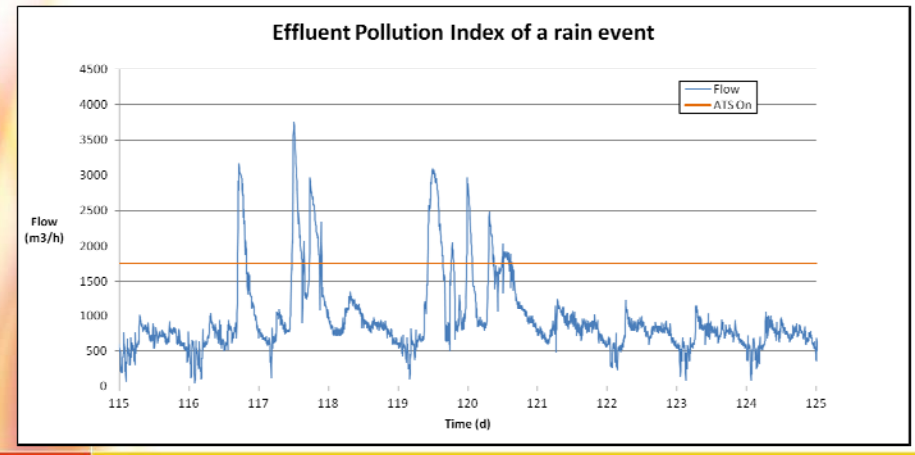
Control Strategies : Aeration Tank Settling



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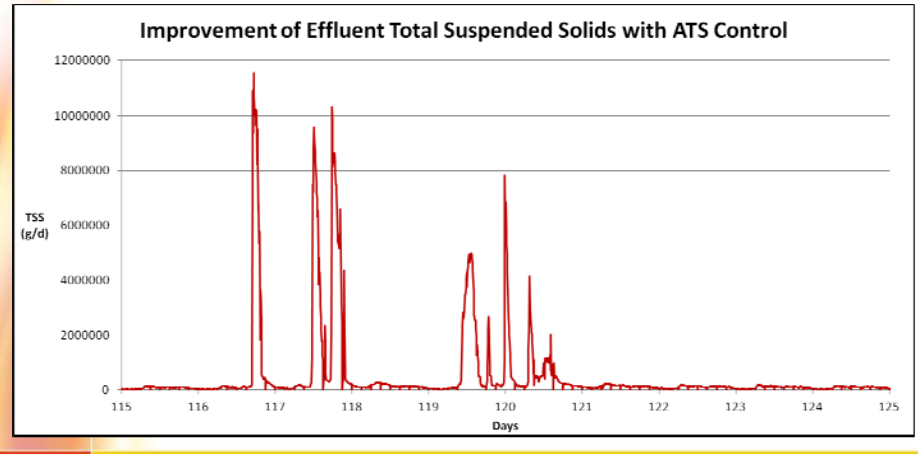
Aeration Tank Settling : The case of TSS



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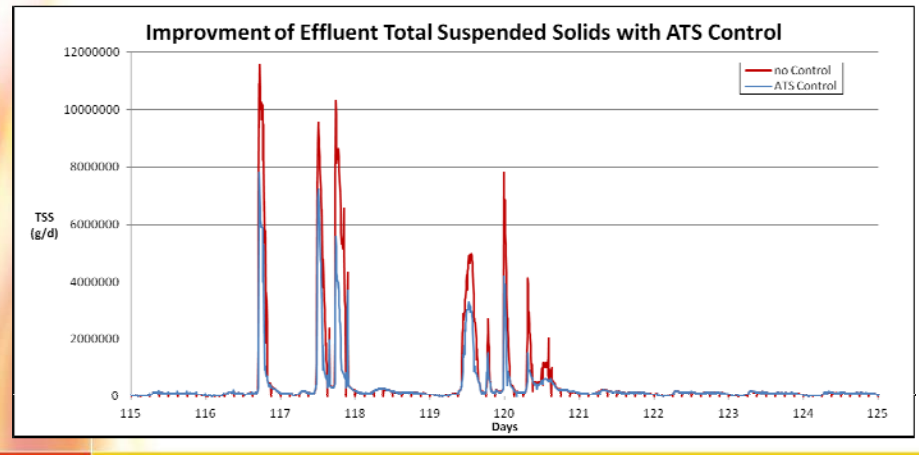
Aeration Tank Settling : The case of TSS



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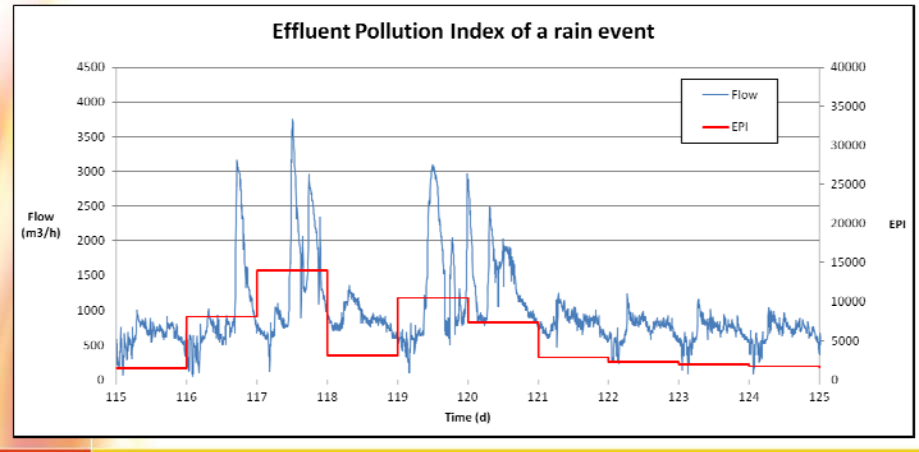
Control Strategies : Aeration Tank Settling



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EPI improvement with ATS Control

Rain event	Duration (d)	EPI (%)	Org. (%)	TKN (%)	NO (%)	TP (%)
1	7	27	39	28	(10)	12
2	2	43	50	39	12	33
3	2	41	46	44	(27)	36
4	2	28	46	26	(22)	(21)
Rain event average		35	45	34	(12)	15
Serie	150	18	33	18	(4)	(5)

Conclusions

- Controllers are alternatives solution to increase WWTP capacity at low cost
- ATS improve EPI, but no perfect situation for all pollutant
- ATS is a flexible solution but has to deal with compromise regarding biological treatment

➢Evaluation of other control strategies ongoing

Acknowledgments

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