

Technical development Priorities in water Industry

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The New Solutions



**Drinking Water
Trends for Tomorrow?**


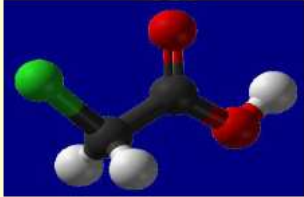
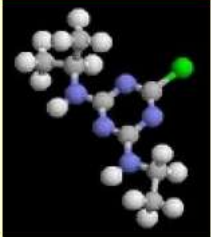
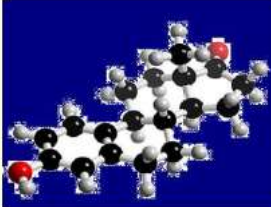
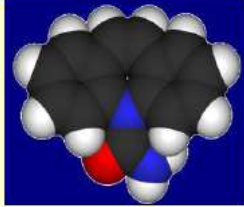
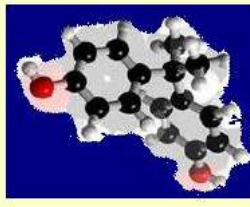


**Wastewater:
More arduous ELV's ?**

**Sludge:
The New 'El Dorado' ?**

Drinking Water Development will focus on



<p>NOM</p>	<p>THM : 100 $\mu\text{g/L}$... 60 $\mu\text{g/L}$</p> <p>Halogen Acetic Acid</p>  
<p>Pesticides</p>	<p>0.1 $\mu\text{g/L}$ 0.05 $\mu\text{g/L}$</p> 
<p>Endocrin Disruptors Drug residues</p>	  

And.....

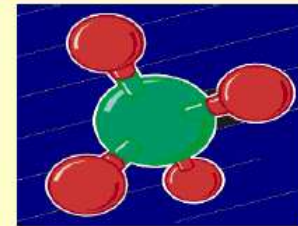


Radionucleids

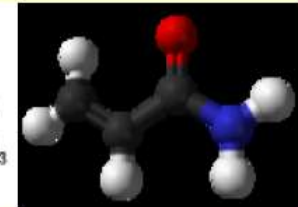
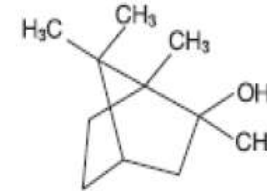
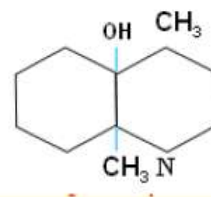
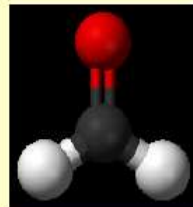


Perchlorates

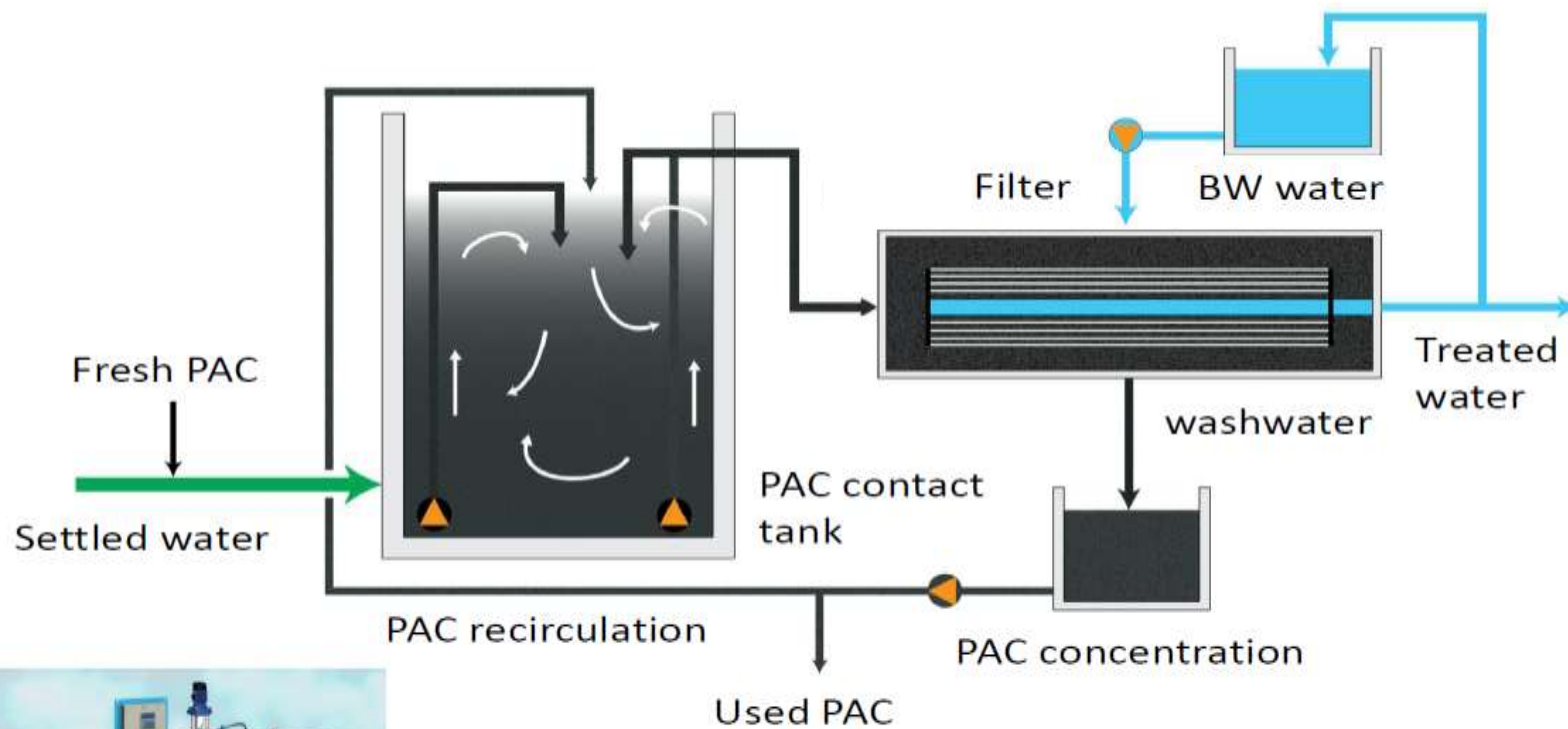
4 µg/L



Formaldehyde Algae toxin Polymer Residual

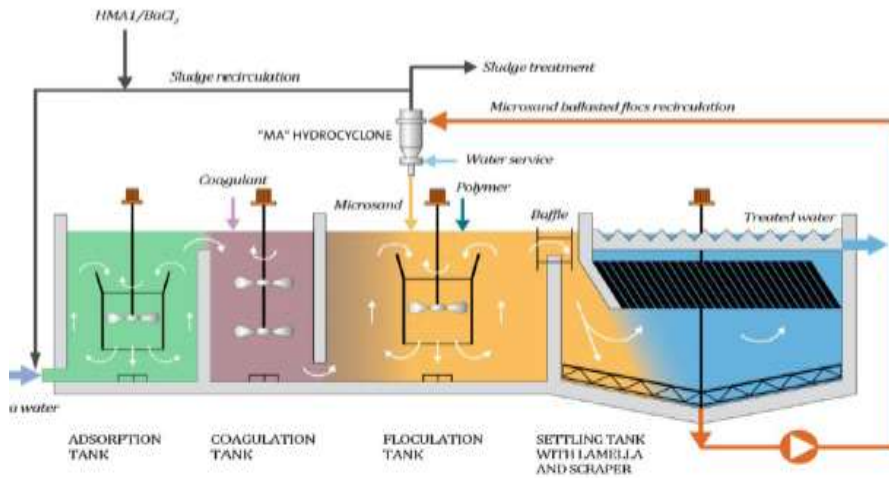


OPALINE C Removal of DOC, pesticides, & endocrine disruptors



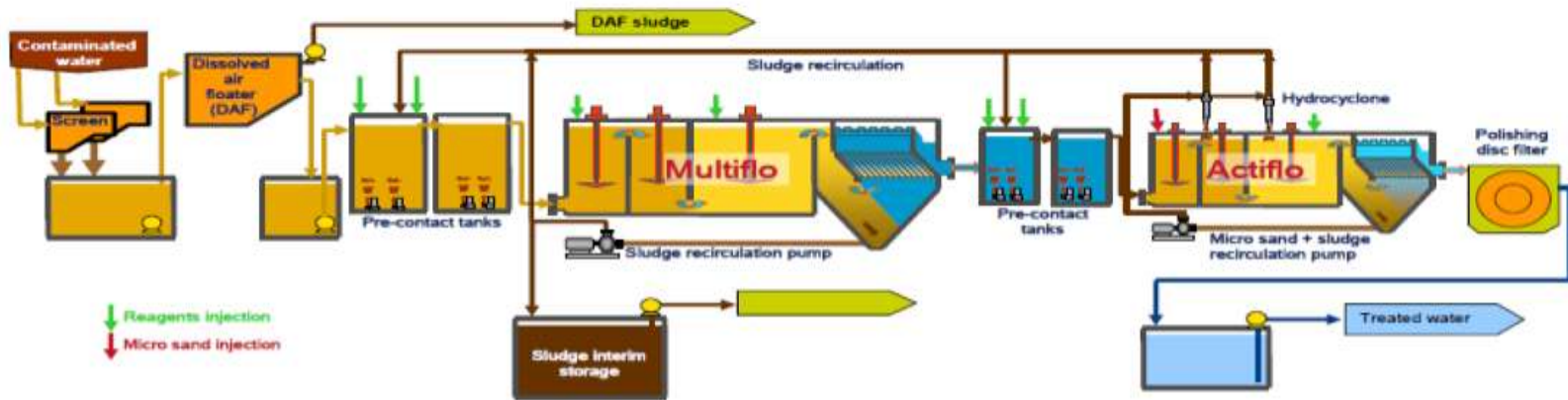
No addition of coagulant nor polymer

Actiflo Rad™ & Multiflo Rad™

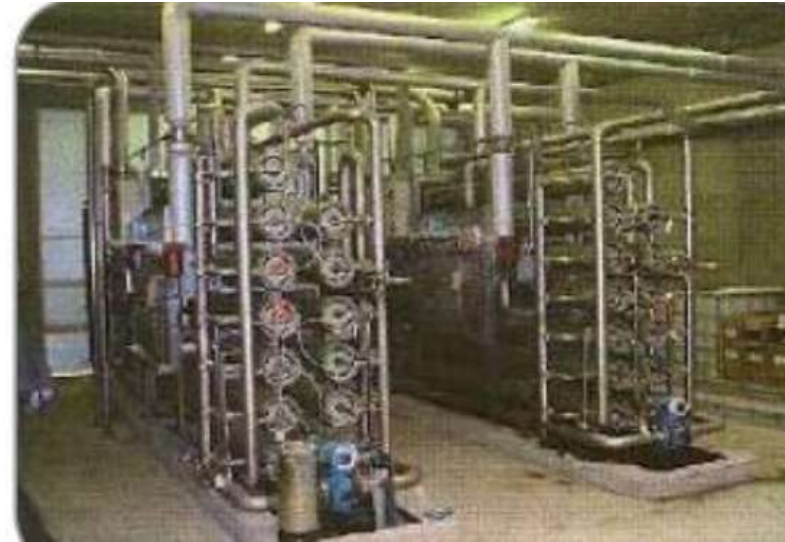


Actiflo Rad

Radioactivity treatment



Nano-filtration



(+ F, NO₃⁻, Pesticides)

(Se, Ni, PO₄)



Wastewater Development will focus on



Performances

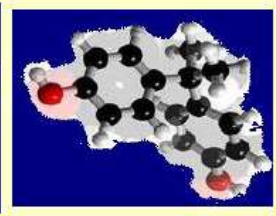
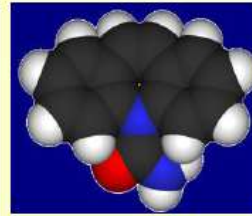
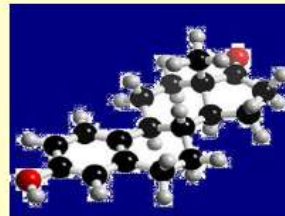
TN: 15 mg/L 10 mg/L

PO₄: 0.5 mg/L 0.1 mg/L

**Energy Self –
sufficiency**



**Endocrin disruptors
Drug residues**



And....



Compacity



Wastewater reuse



« Zero » Odours



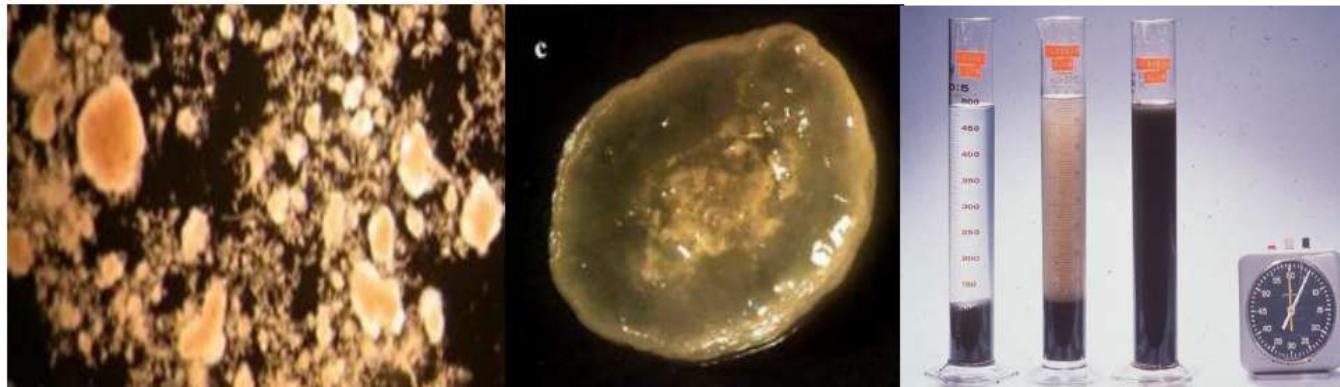
Products recovery



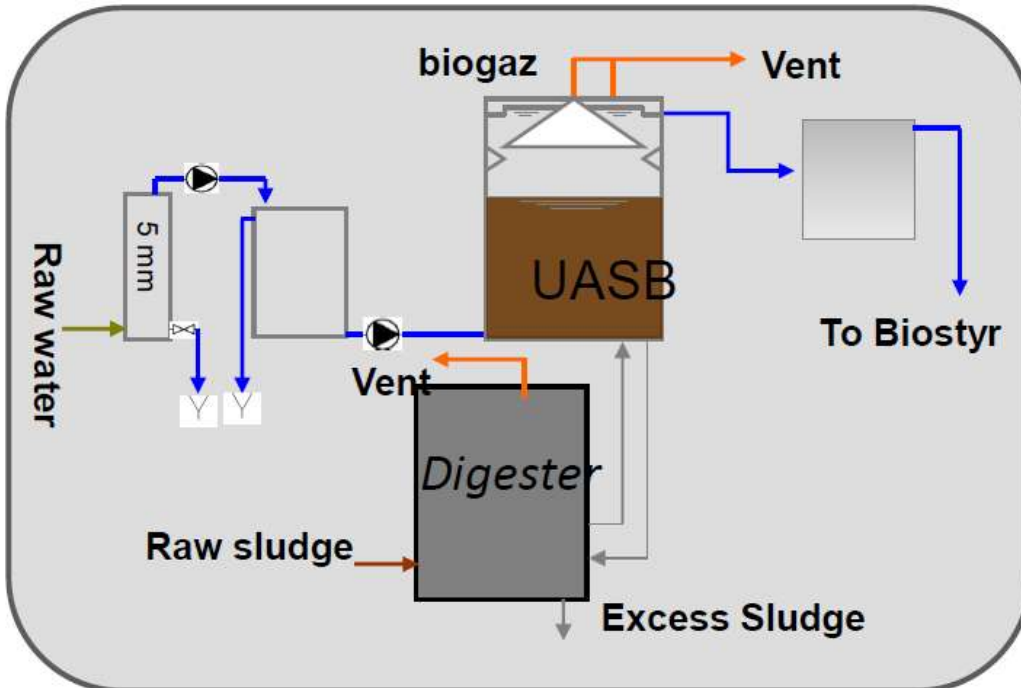
Granular Bacteria



	Classic SBR	SBGR
Sludge concentration (g/L)	5	10-20
Settling time (h)	2	0.5
Load (kgDCO/m ³ /j)		15
Settling V. (m/h)	1	10-20
SVI (mL/g)	100-200	50

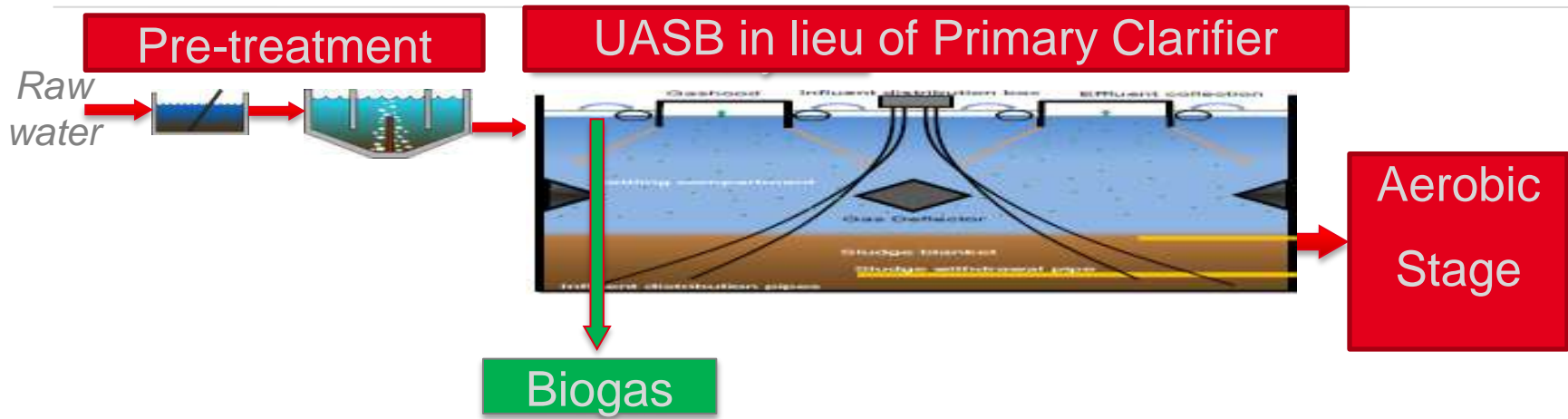


Municipal UASB

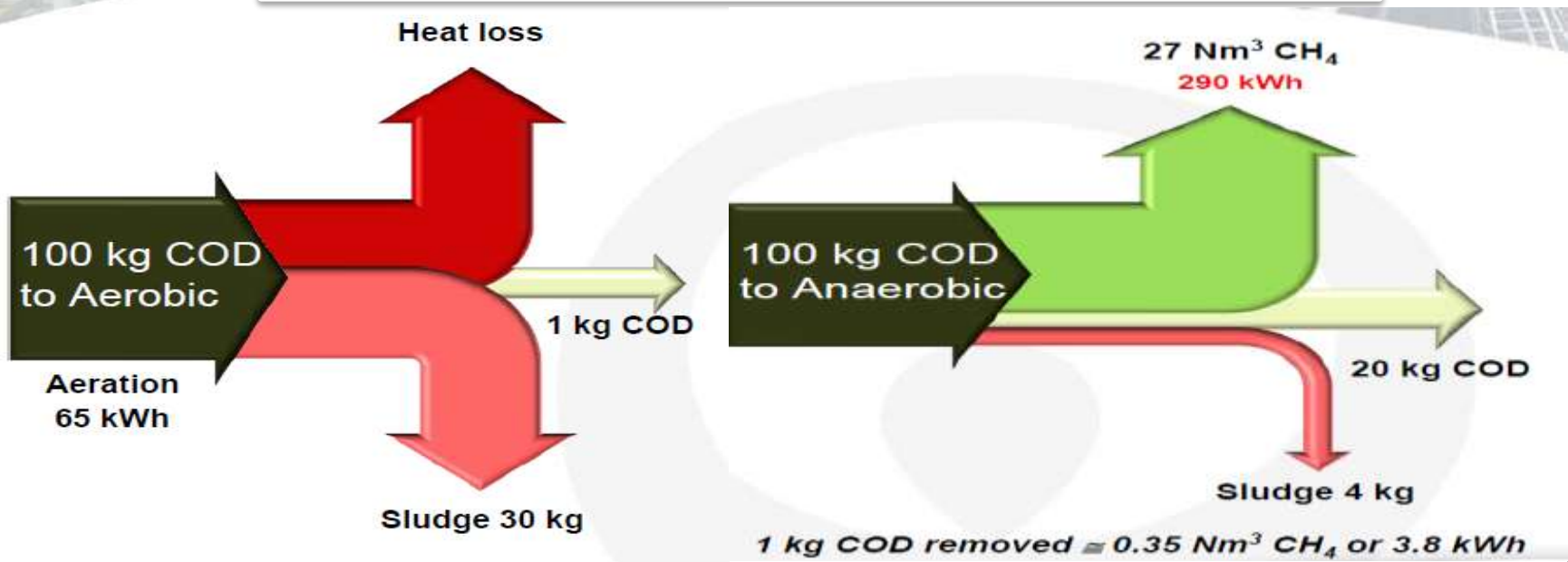


- Reduce energy consumption:
 - with CH₄ production
 - Reducing O₂ consumption in the biological tank

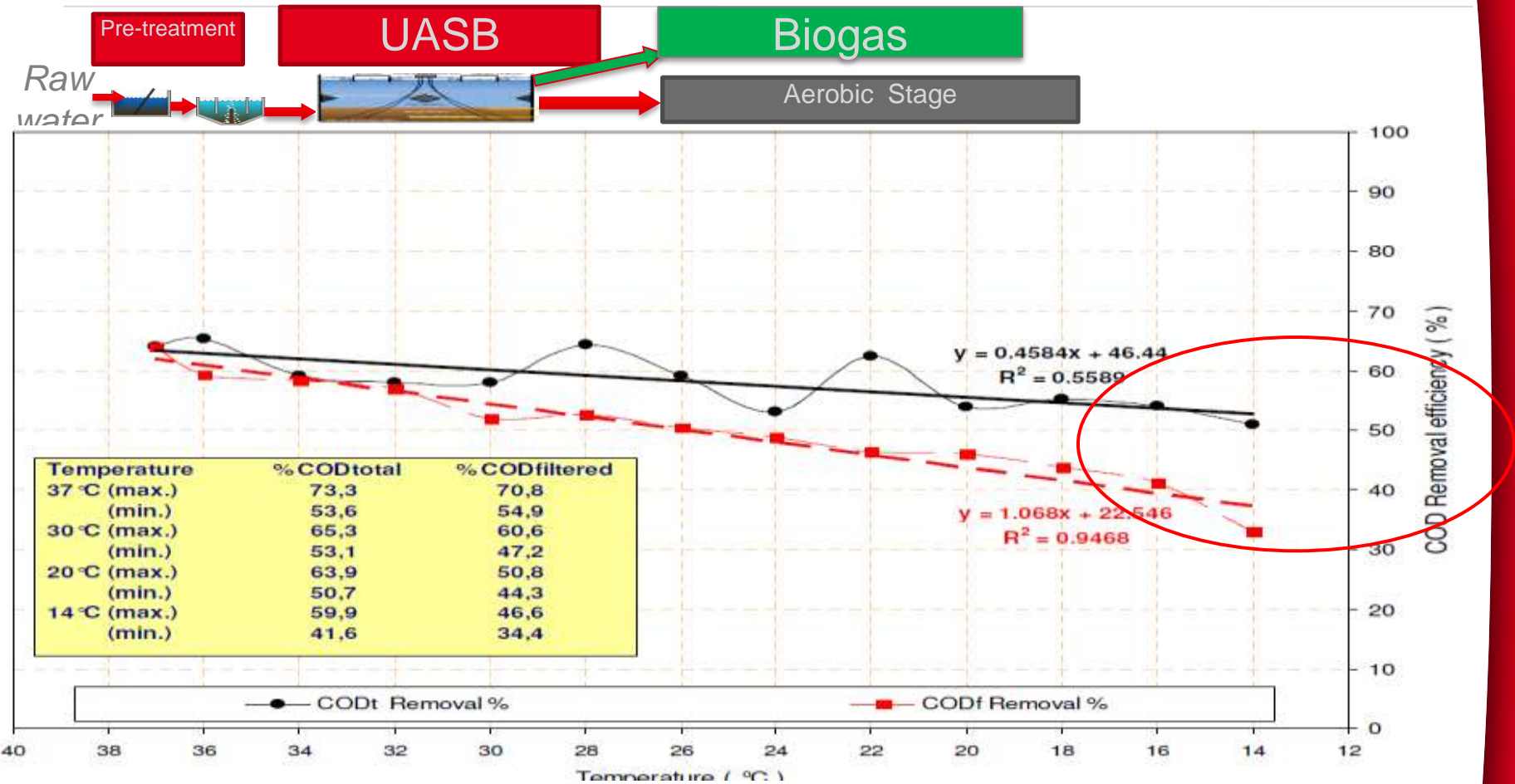
Primary Clarification Alternative in future... UASB



Aerobic vs Anaerobic Wastewater Treatment



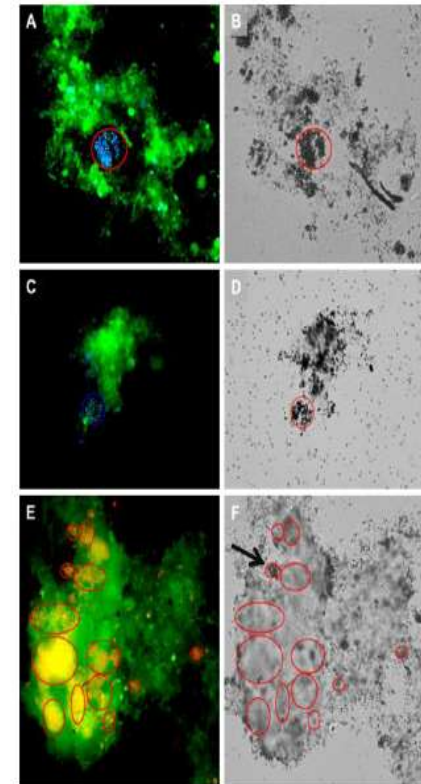
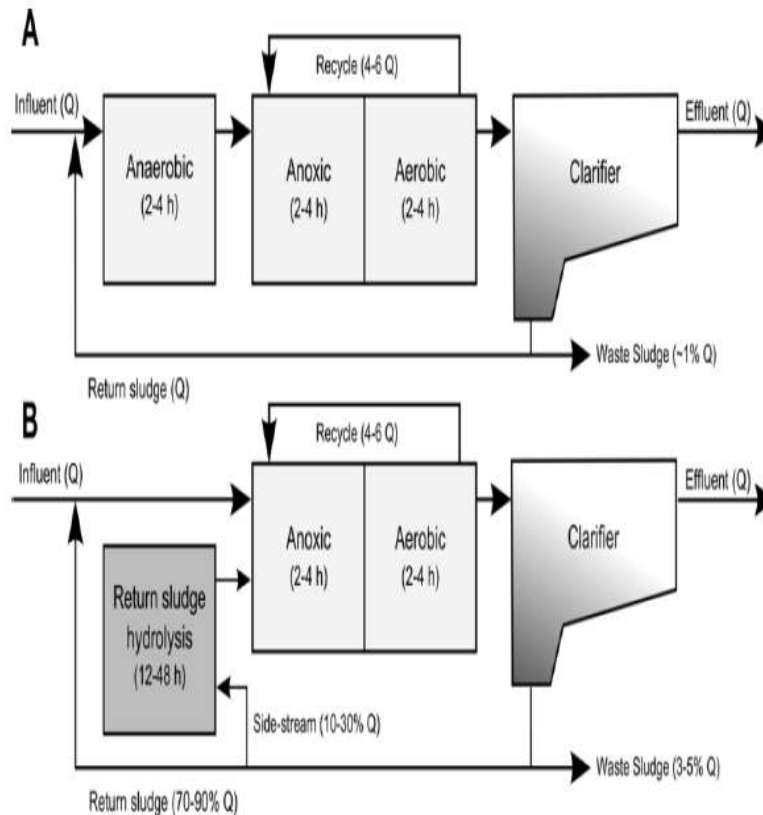
UASB IMPACT



- Electricity consumption reduction to ca. 0.25 kWh/m³
- Sludge production reduction by > 30%
- WWTP self sufficient increase from 50-70% to 90-110%

Bio-P Removal

- Design to inhibit presence of Glycogen Accumulating Organism (GAO) and promote Polyphosphate Accumulating Organism (PAO) to facilitate an efficient bio DeP.



Aeration savings, e.g. Ammonit

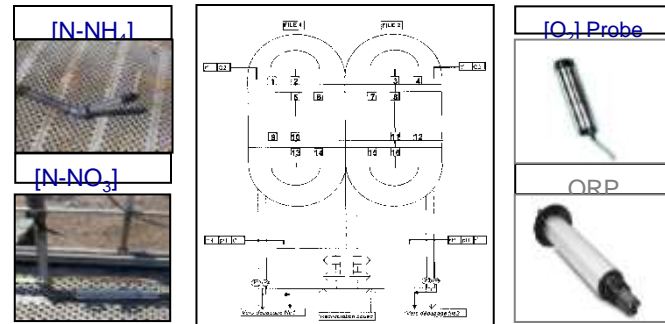


Online aeration control for conventional Activated Sludge treatment including

2 major benefits :

Improve effluent quality

Reduce energy consumption

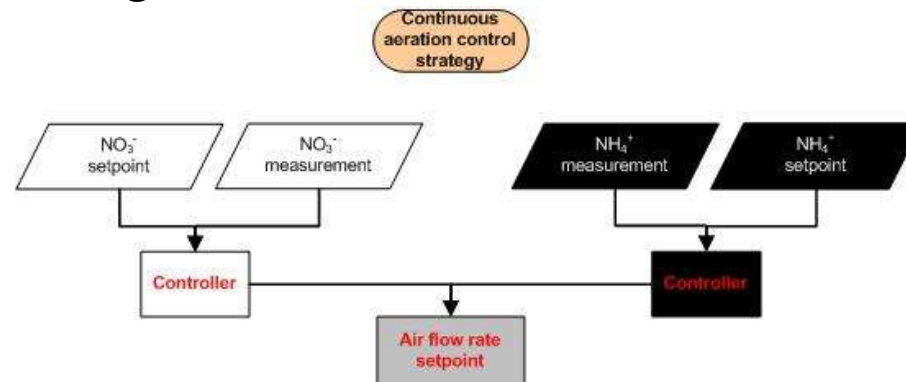


3 modes available:

Mode 1: Simultaneous Nitrification - Denitrification with Nitrogen probes

Mode 2: Sequencing Nitrification - Denitrification with Nitrogen probes

Mode 3: Sequencing Nitrification - Denitrification with ORP/DO probes



Endocrine disruptors:

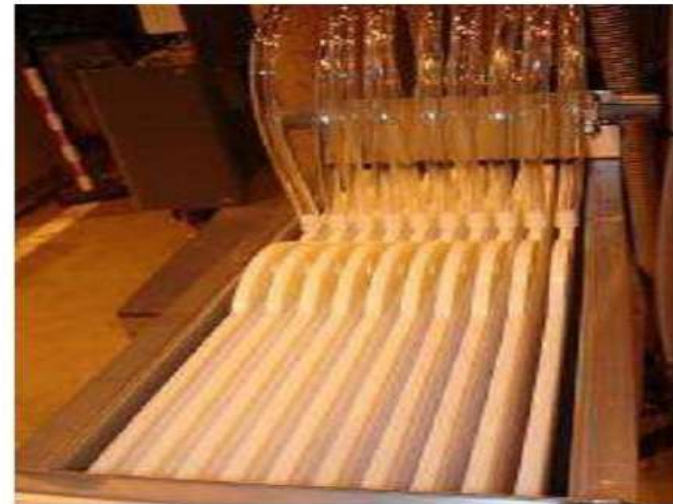
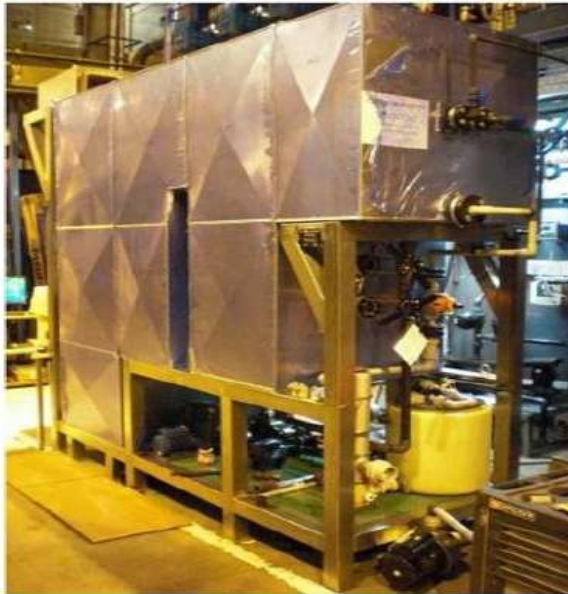
- *Remove pharmaceutical & drugs by-products, hormones, heavy metals and pesticides*

Combination Actiflo carb / O3



High Performance MBR

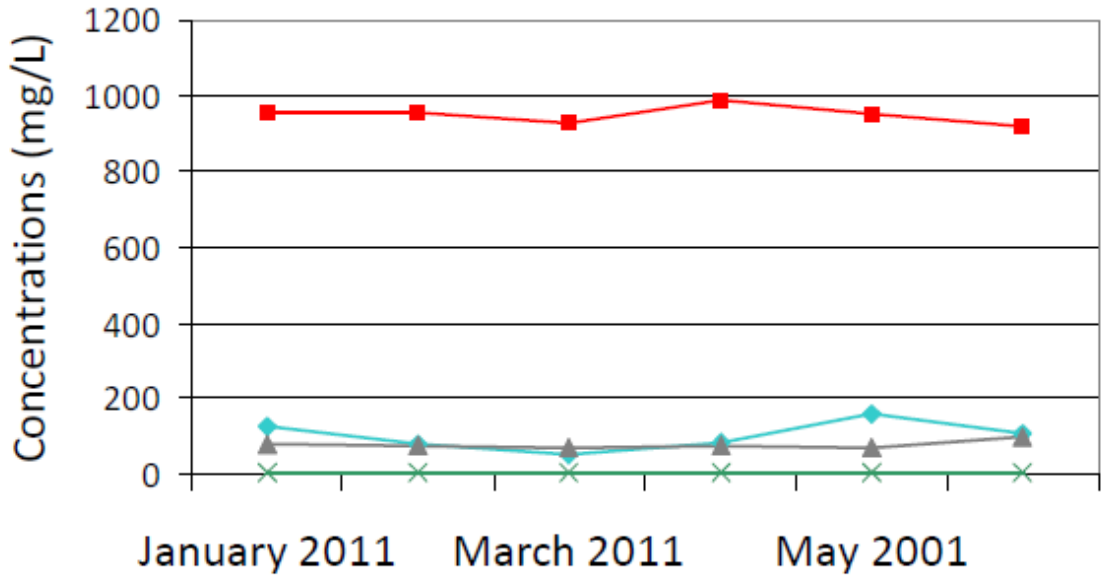
- Biological Treatment
- Sludge age: 6 – 12 d
- T C : 40 °C
- SS: 10 g/L
- Evaluation of the performances on C, N & P.



AnitaMOX - Sjölunda WWTP Sweden(550,000PE) – Ammonia Removal without Carbon Source -



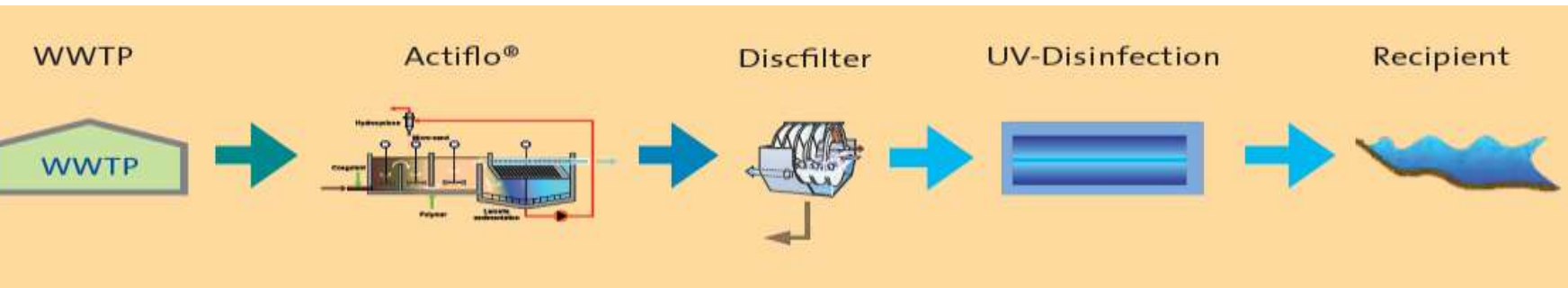
NH₄, NO₃ and NO₂ concentrations in and out



■ NH4-N in
 ◆ NH4-N out
 ▲ NO3-N out
 × NO2-N out

Parameters	Average influent concentration	Average effluent concentration	Average removal
NH4	950 mg/L	100 mg/L	90%
TN	1050 mg/L	210 mg/L	80%

Tertiary Treatment to facilitate Reuse, & Reduce Water Footprint e.g. Barcelona (4m³/sec)



Sludge Treatment Development will focus on



Energy Production



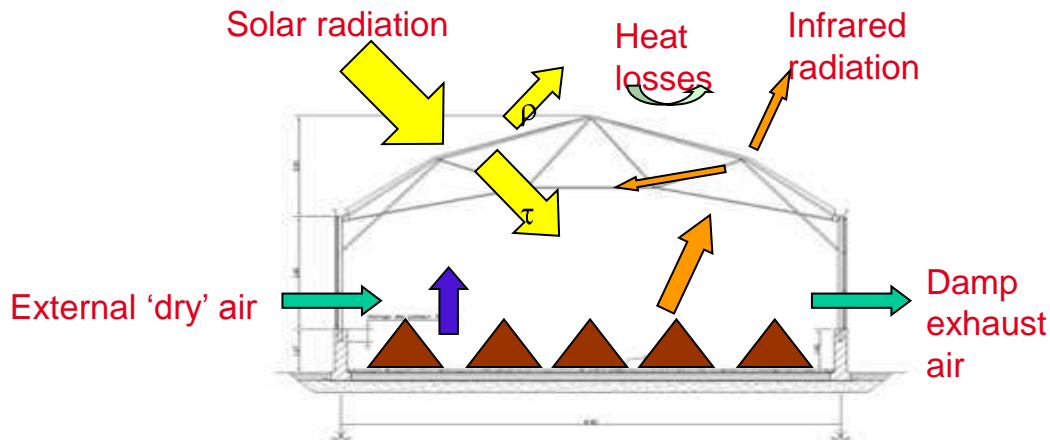
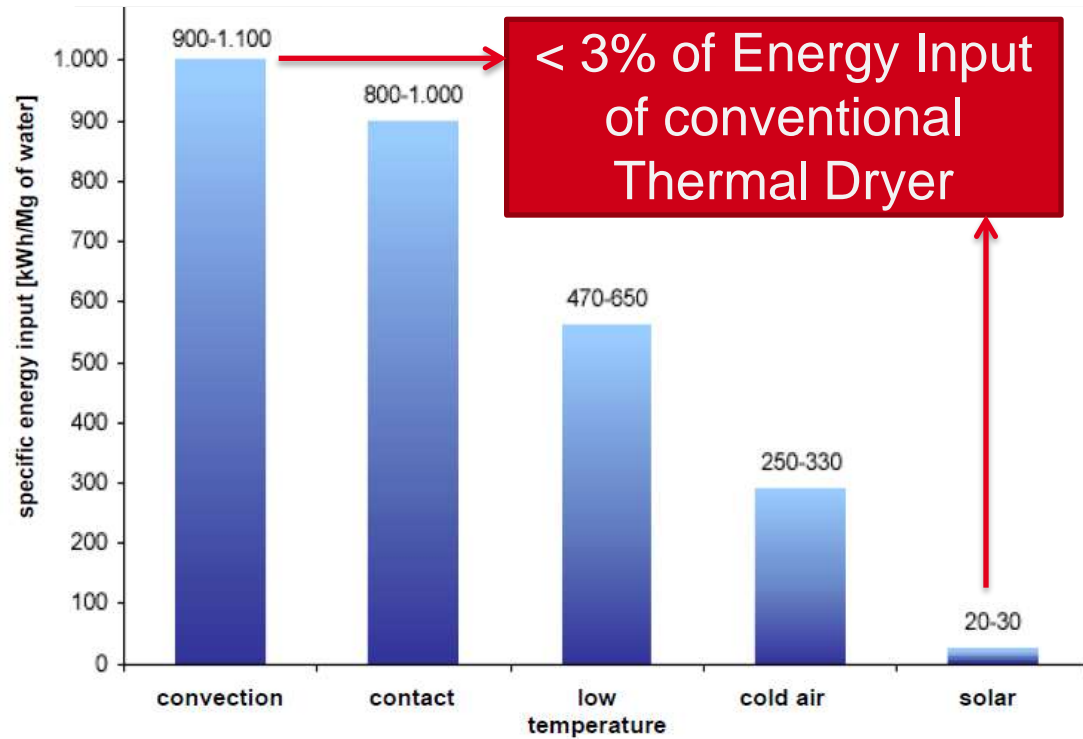
Product Recovery



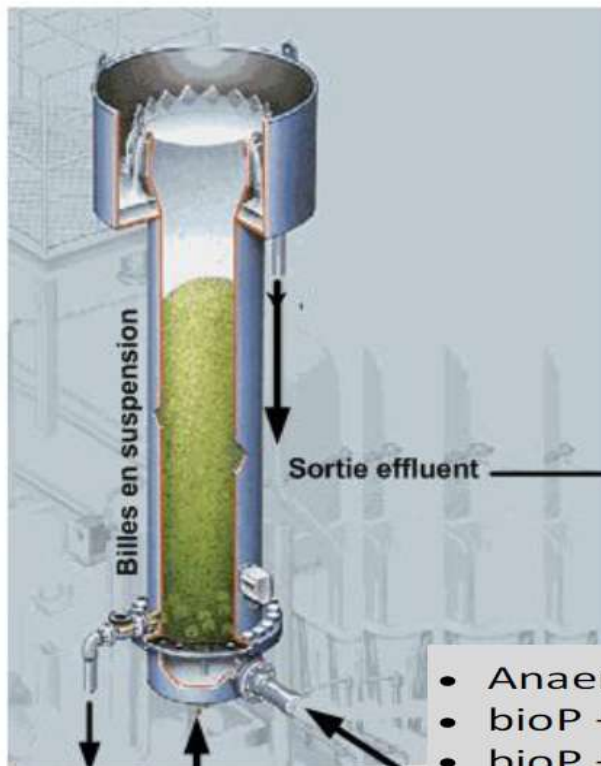
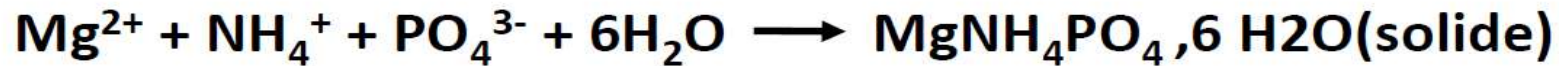
Volume Reduction



Sludge Drying Alternative: Solia



Product Recovery



Struvite pellet

Extraction billes struvite

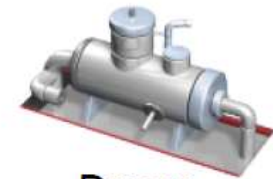
Réactifs (MgO, NaOH)

- Anaerobic digestion
- bioP + AD
- bioP + Advanced AD (Exelys, Biothelys, DLD)
- bioP + AD + Athos

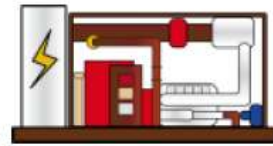
Energy Production



Biogas



Dryer
Less sludge



Cogeneration



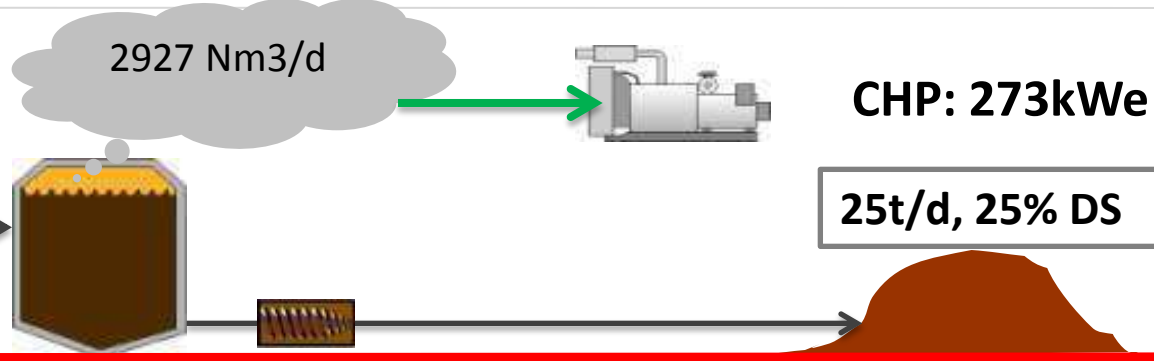
Biofuels

Increasing biogas and electrical production: EXELYS™ e.g. convert an existing AD to Veolia's DLD configuration



Conventional

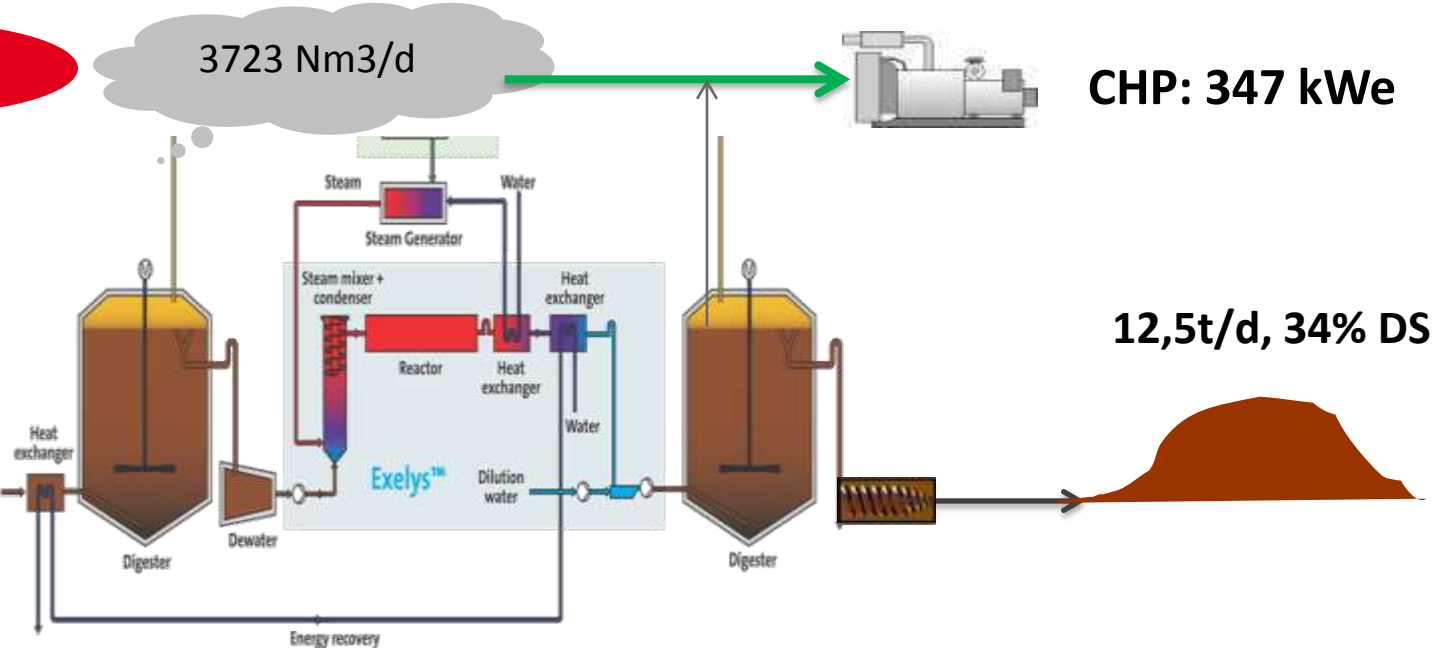
160 t/d
10tDS/d
25 C



+25-30% electricity production & -50% on sludge volume

TH : DLD

160 t/d
10tDS/d
25 C



Hillerød WWTP, Denmark : Biothelys example



- Post TH Integration

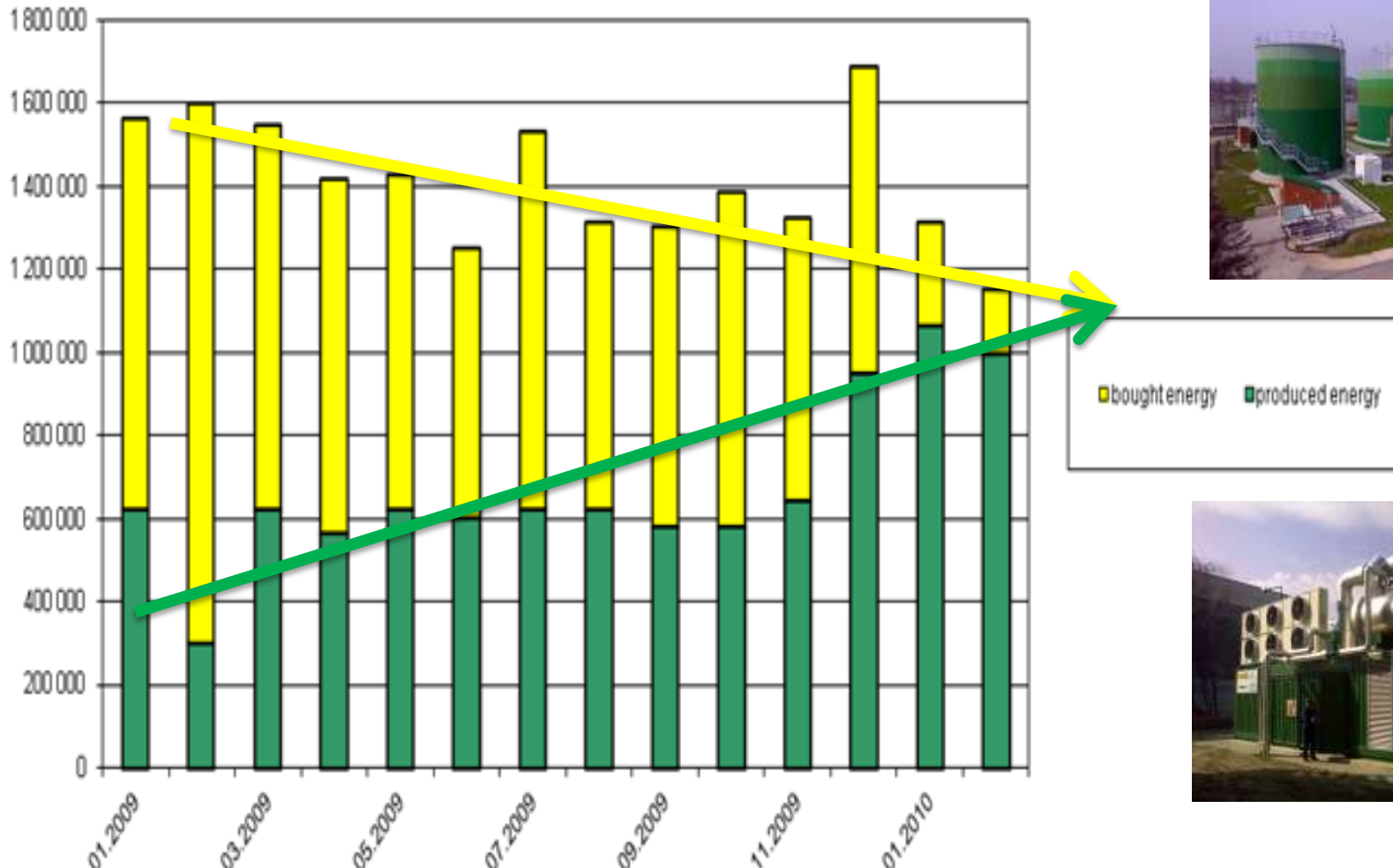
VS Destruction
65% (+30%)

Biogas
378Nm³/hr (+30%)

Sludge cake production
1,640 kg/d (-39%)

DS content
32%

Energy balance at North-Pest WWTP (2009-2011) as a result of co-digestion/optimisation



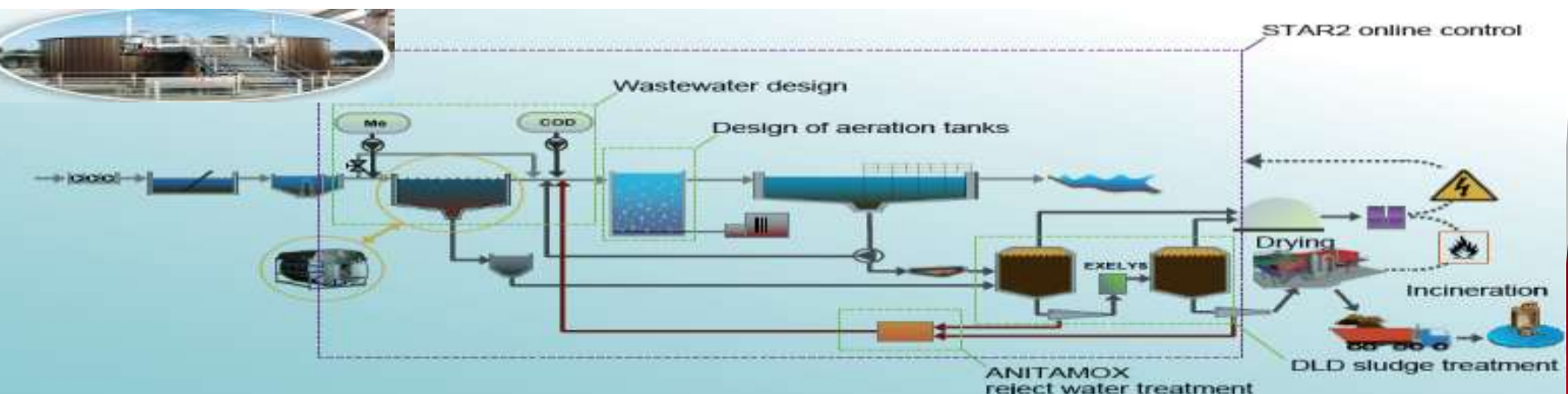
- **2008 : 100% of electricity purchased →**
- **2011 : 100% of electricity produced (0% purchased)**

Energy profile of Future for a 100,000 PE WWTP plant

Today's WWTP : as it comes today includes pre-treatment, digesters and gas engine. The total result of the annual **electricity consumption is 2,200 MWh** (load of $\sim 1,300$ t CO₂/year).

Energy Neutral WWTP: enhanced pre-treatment, Advanced control of aeration tanks, TH, reject water treatment and gas engine. Total annual **electricity consumption is 0 MWh** (load of ~ 50 t CO₂/year).

FUTURE enhanced pre-treatment, UASB, Advance Treatment & control, TH process, reject water treatment, fuel cells, co-digestion, sludge drying and incineration. **Total annual electricity production is 1,700 MWh** (a displacement of $\sim 1,000$ t CO₂/year).

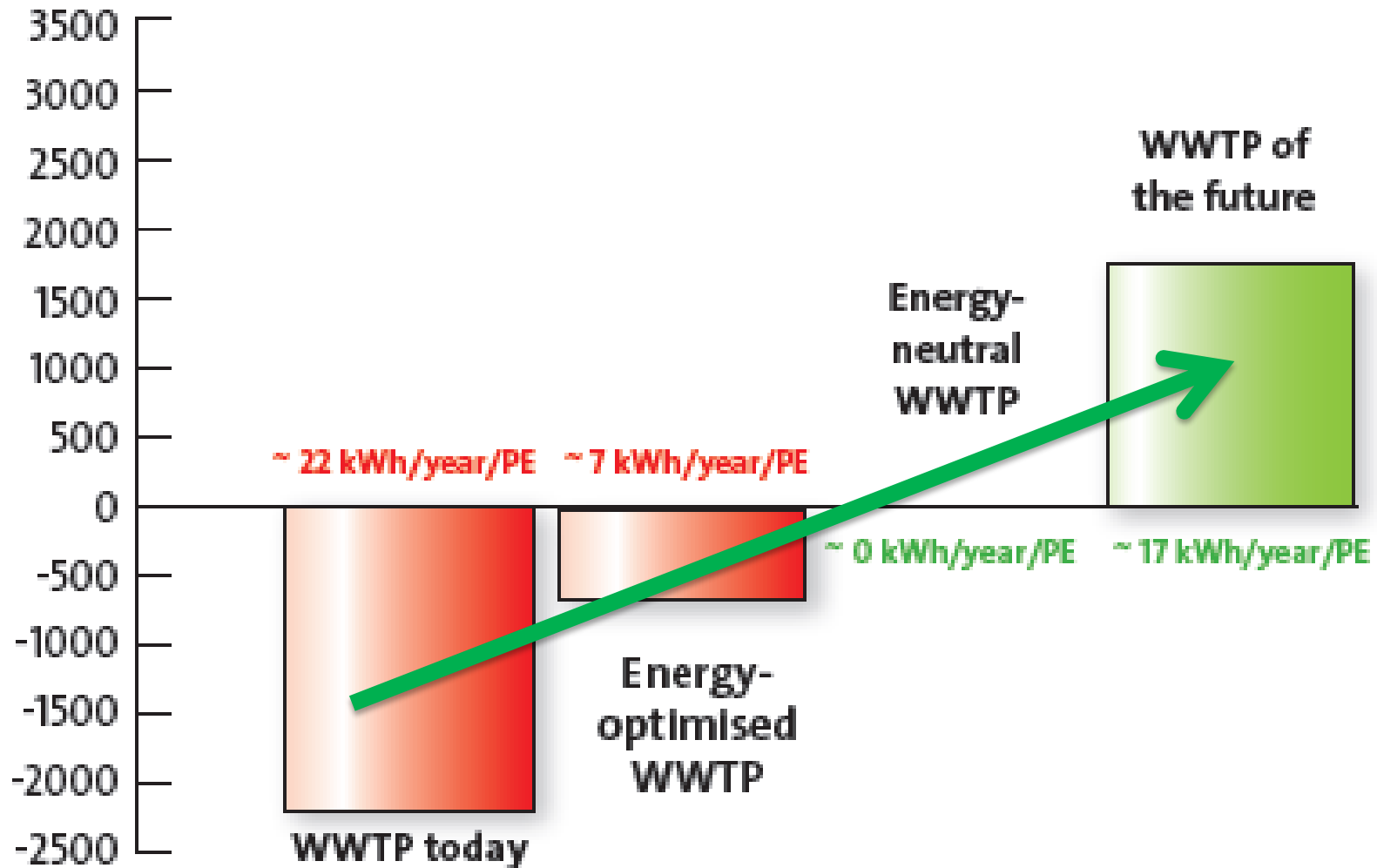




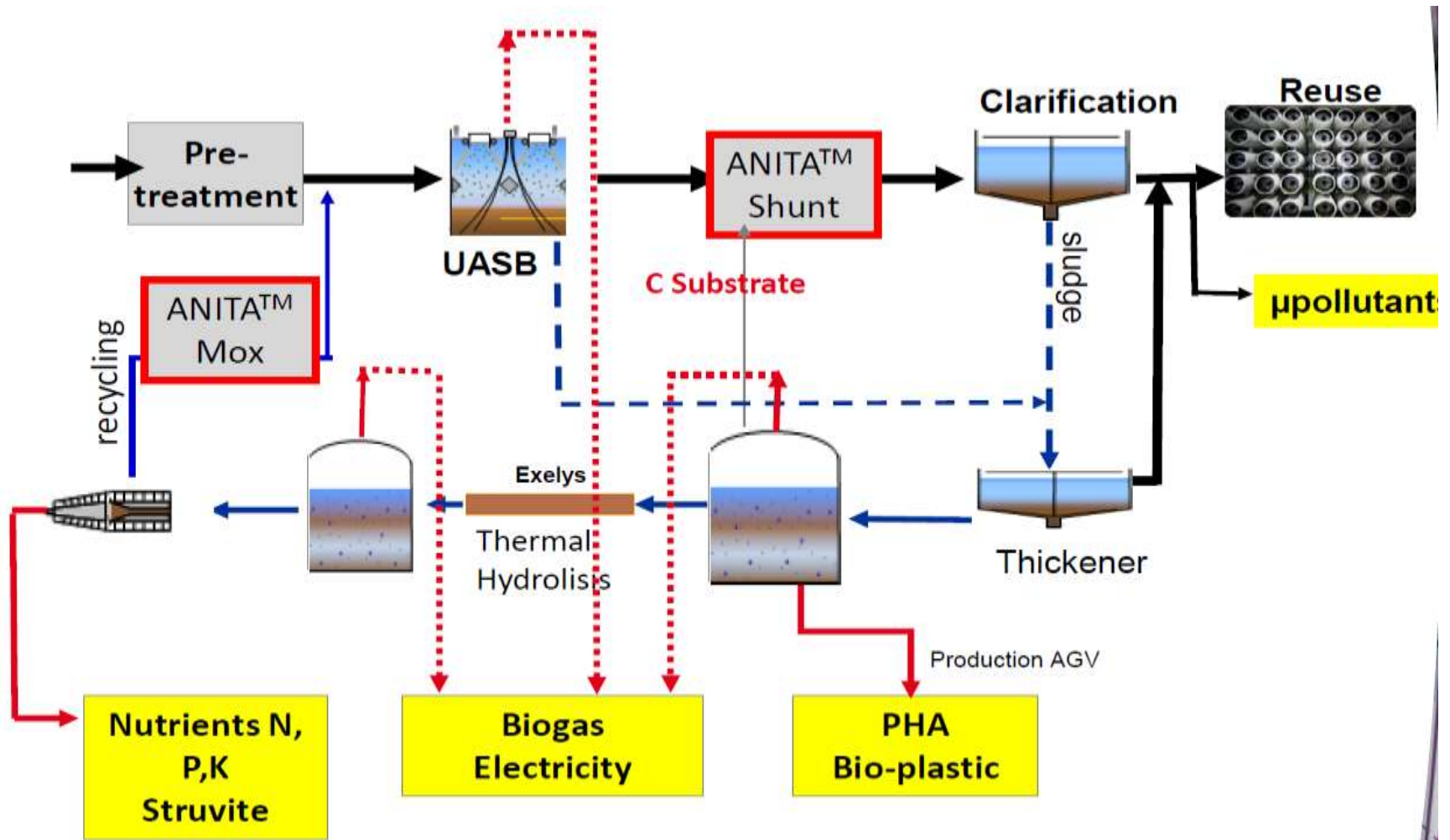
Future WWTP Energy Trend ?

100.000 PE plant

MWh/year



Next Generation WWTP?





Thank You

