

We deliver Phosphorus made in Europe



The background image shows a hand holding a small green seedling with soil in its palm, positioned over a large industrial facility with blue domes, likely a wastewater treatment plant. The sky is blue with some clouds.

A promising process to increase P recovery as mineral fertilizer from sewage sludge by bio-acidification

ENVIRON2018 - 28.03.2017, Cork, IRELAND

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What is Phosphorus ?!

MENTS

A periodic table of elements with a magnifying glass focusing on Phosphorus (P). The magnifying glass is positioned over the element Phosphorus (P), which is highlighted in green. The element's symbol 'P' and atomic number '15' are clearly visible. The atomic weight '30.974' is also shown. The magnifying glass handle points towards the bottom right corner of the slide.

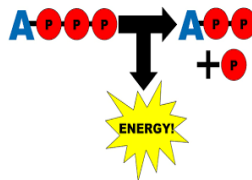
27 Co Cobalt 58.933	45 Rh Rhodium 102.9	19 K Potassium 39.0983
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P is just
too
Arrogant

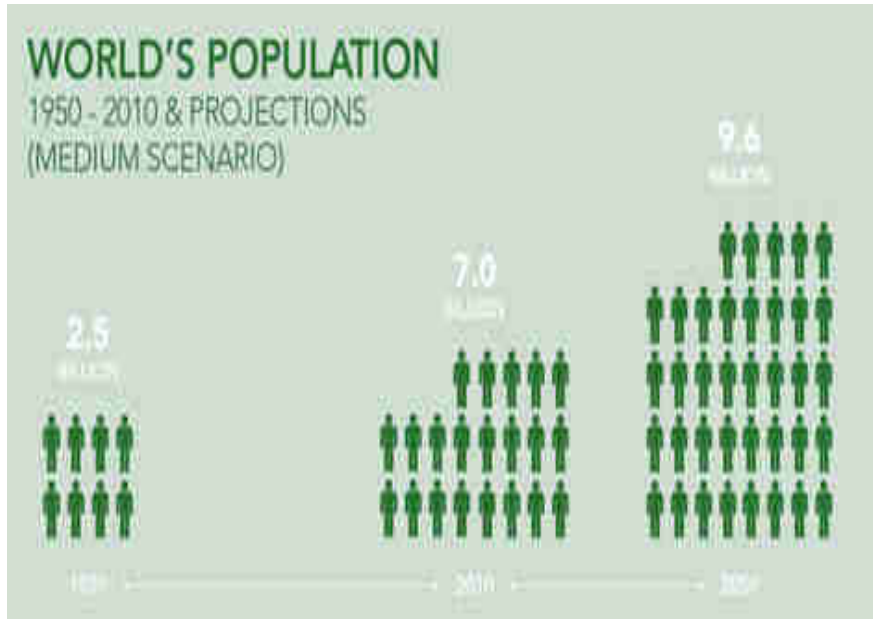
I am the basis of
every living thing !

Without me ! You
will be extinct !

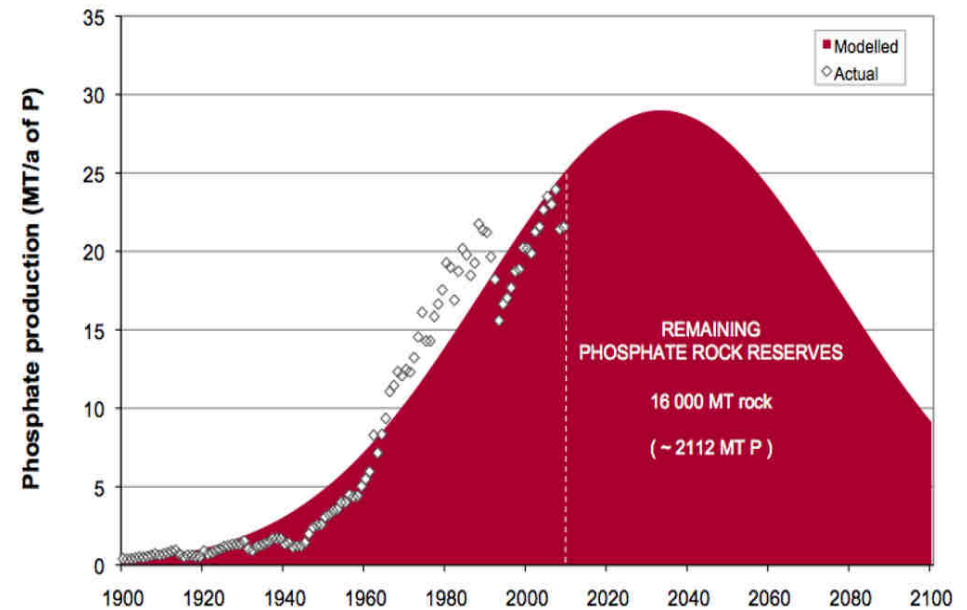
I am UNIQUE !!!
I am irreplaceable
!!!



What is the issue ?



Source: <http://www.cema-agri.org/publication/food-security-using-smart-farm-machines-produce-more-less>



Cordell, D.; Drangert, J.-O.; White, S. The story of phosphorus: Global food security and food for thought. *Glob. Environ. Change* 2009, 19, 292–305

"peak phosphorus" will occur in 30 years and that "At current rates, reserves will be depleted in the next 50 to 100 years." [Lewis, Leo \(2008-06-23\). "Scientists warn of lack of vital phosphorus as biofuels raise demand". The Times.](#)

What the solution ?



Struvite: also known as Magnesium Ammonium Phosphate or MAP

European Sustainable Phosphorous Conference 1, Bruxelles- 2013 & ESPC2, Berlin - 2015

We cooperate to close P-cycle

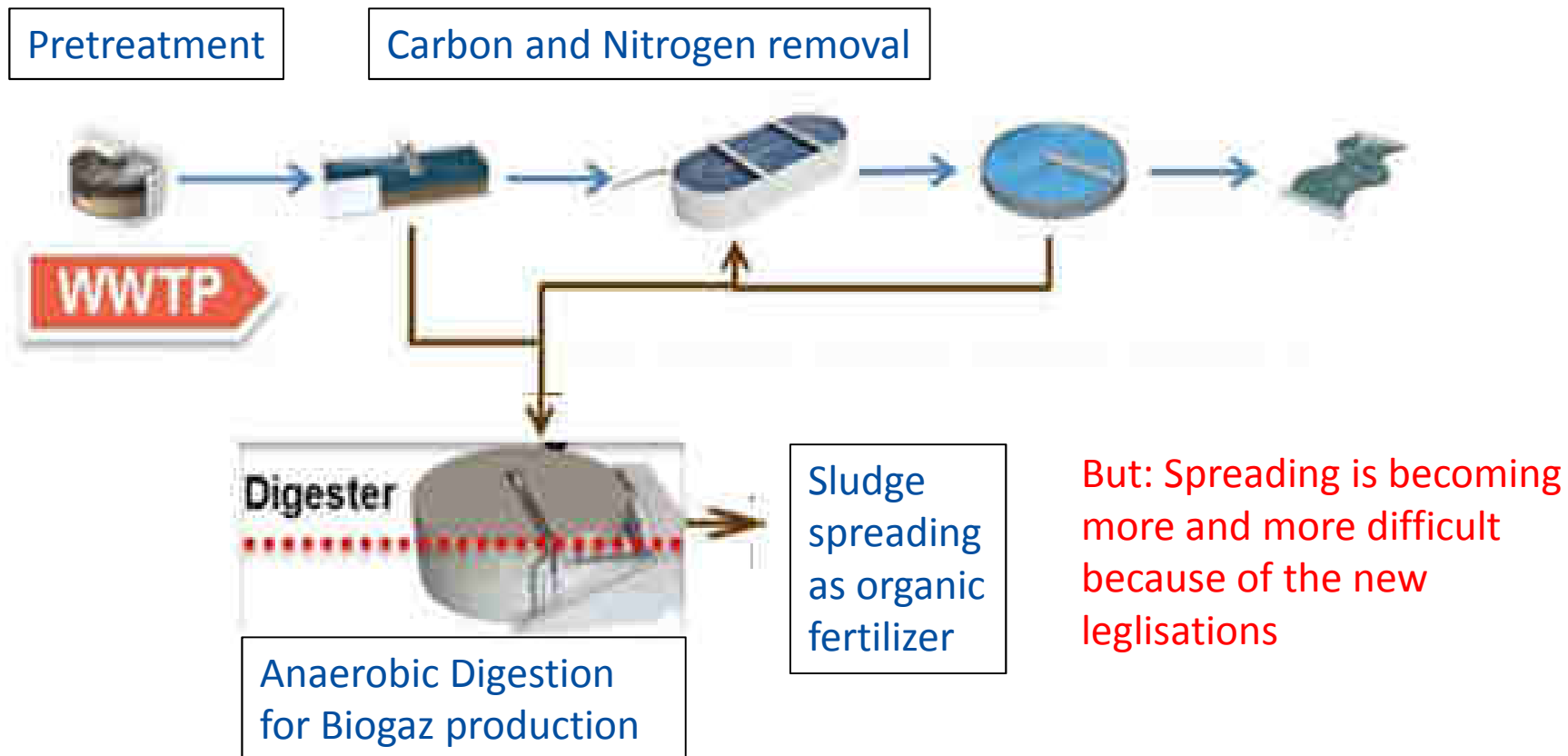


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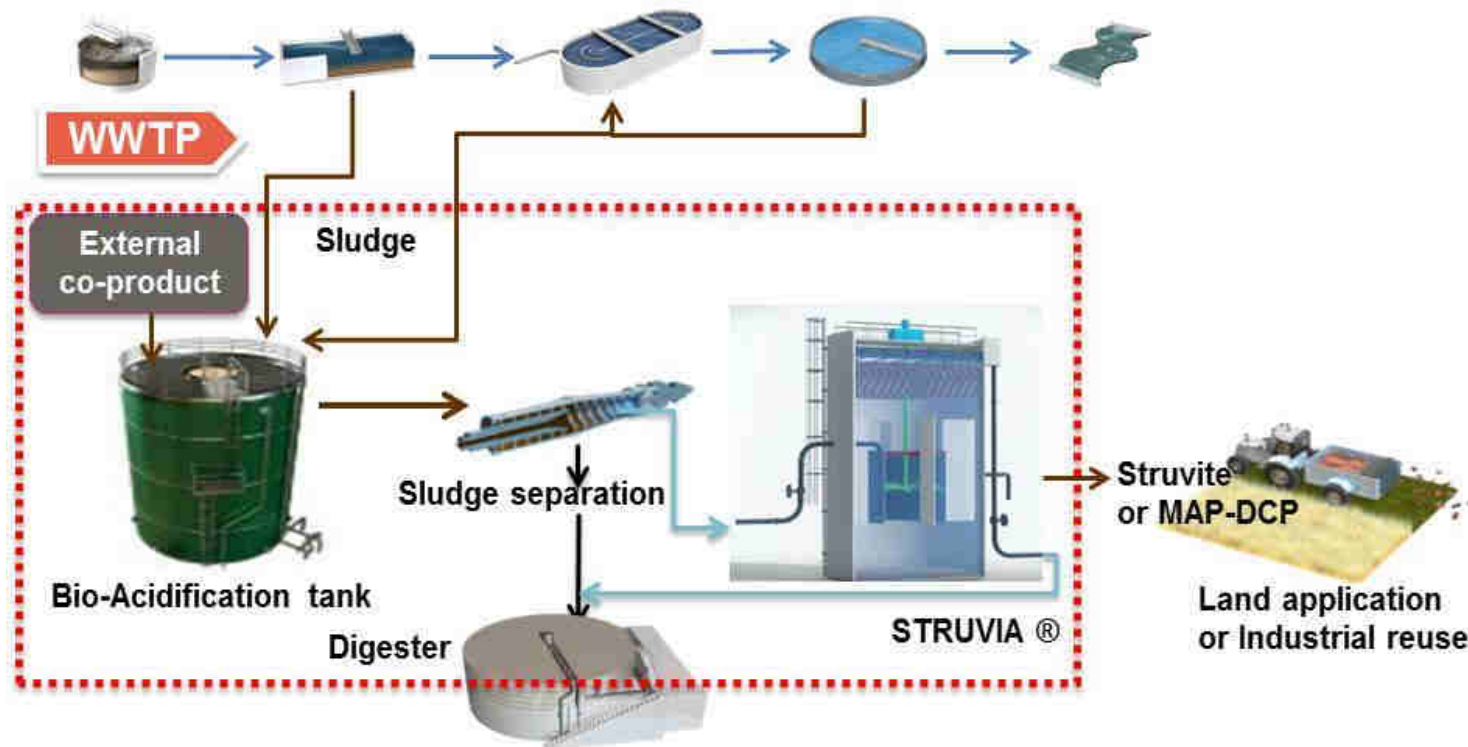
Phosphorus recovery process in a WWTP (Lille, France)

- Simple standard WWTP with no/low P recovery

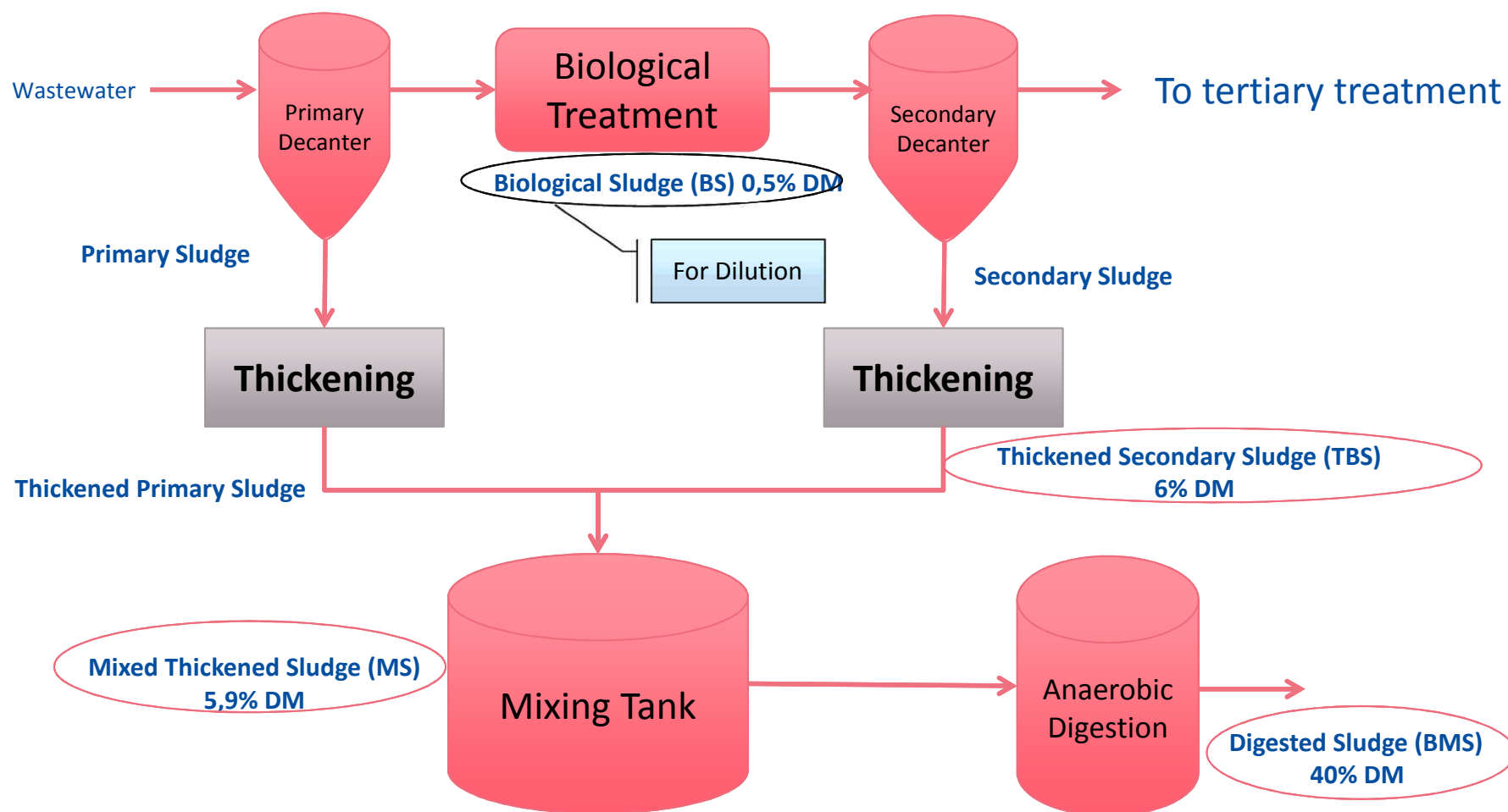


Phosphorus recovery process in a WWTP (Lille, France)

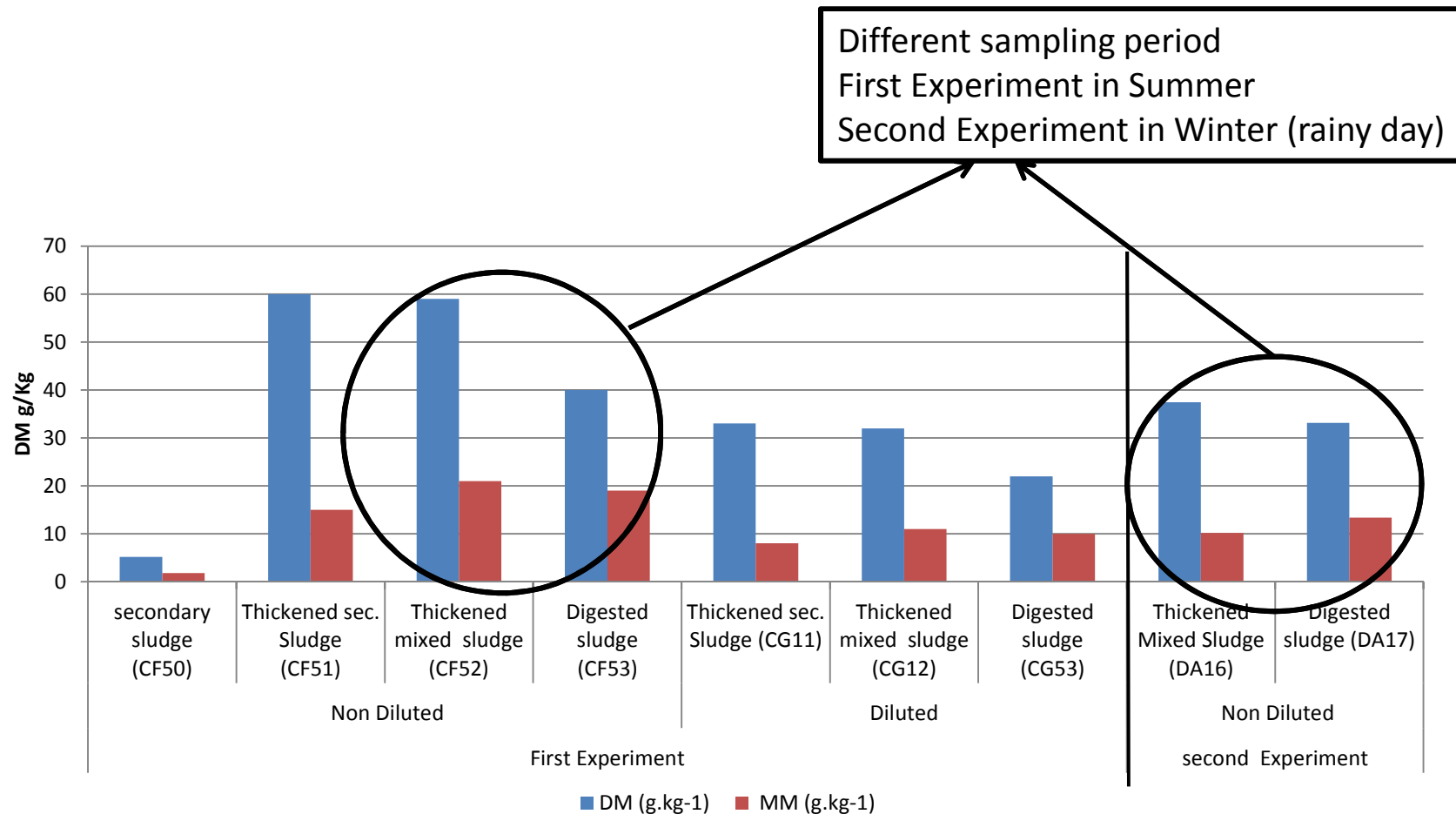
- WWTP with high P recovery



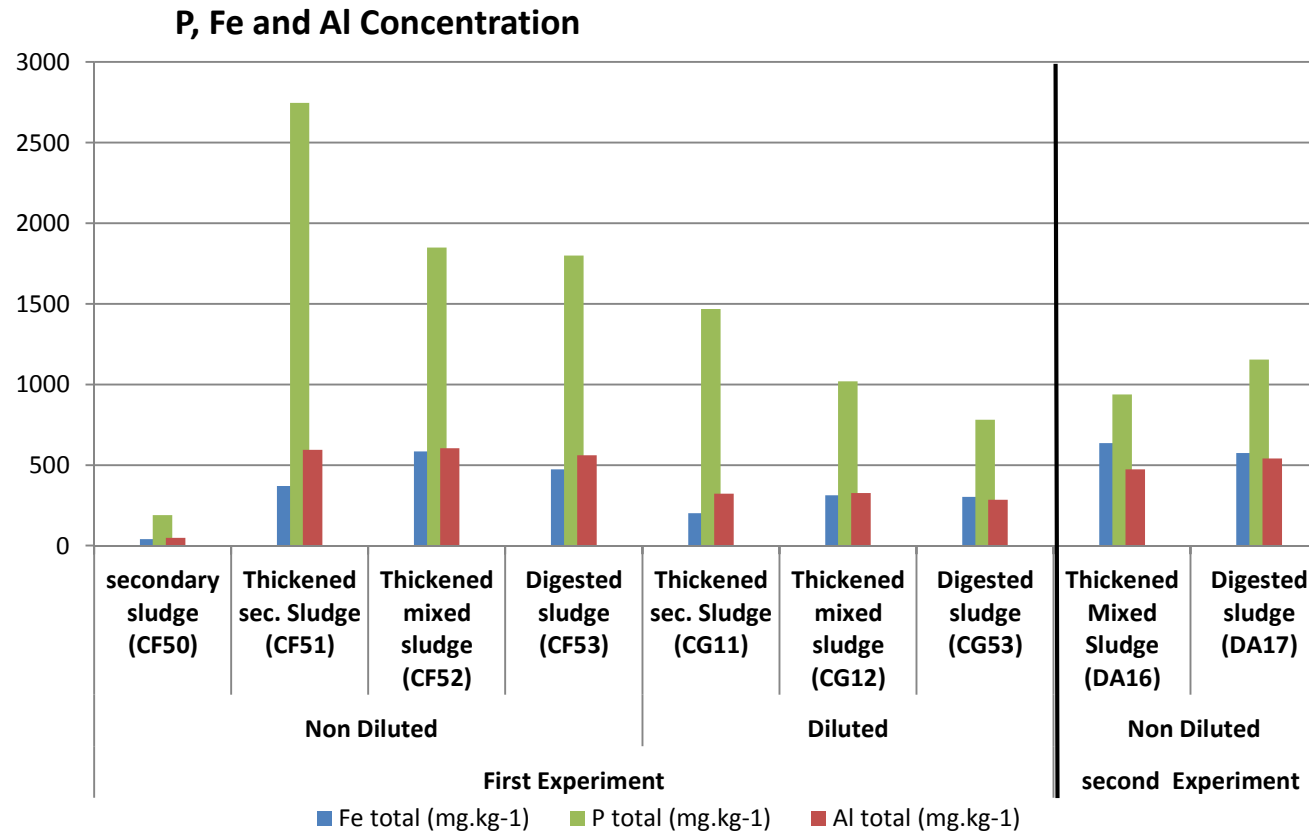
The Targeted effluents for the study of the biological Phosphorus dissolution in Lille WWTP



Characteristics of the targeted WWTP's Effluents



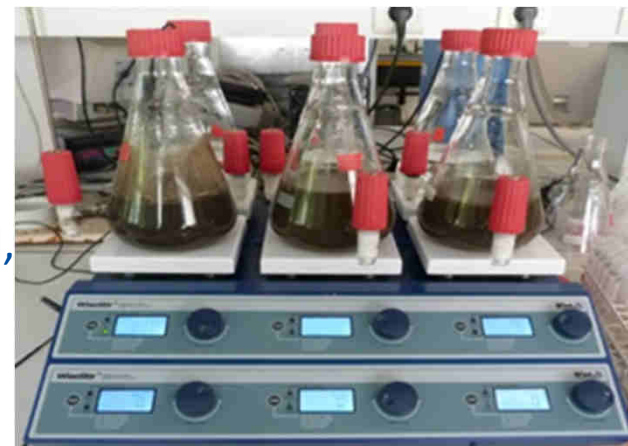
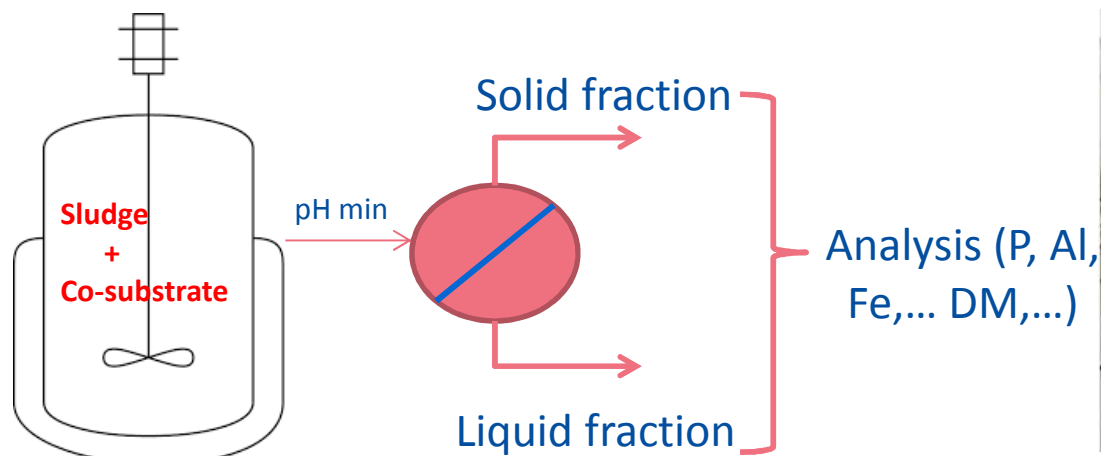
Characteristics of the targeted Effluents



Note:

The first experiment is carried with the Diluted samples and the second experiment with the Non-Diluted samples

Materials and Methods



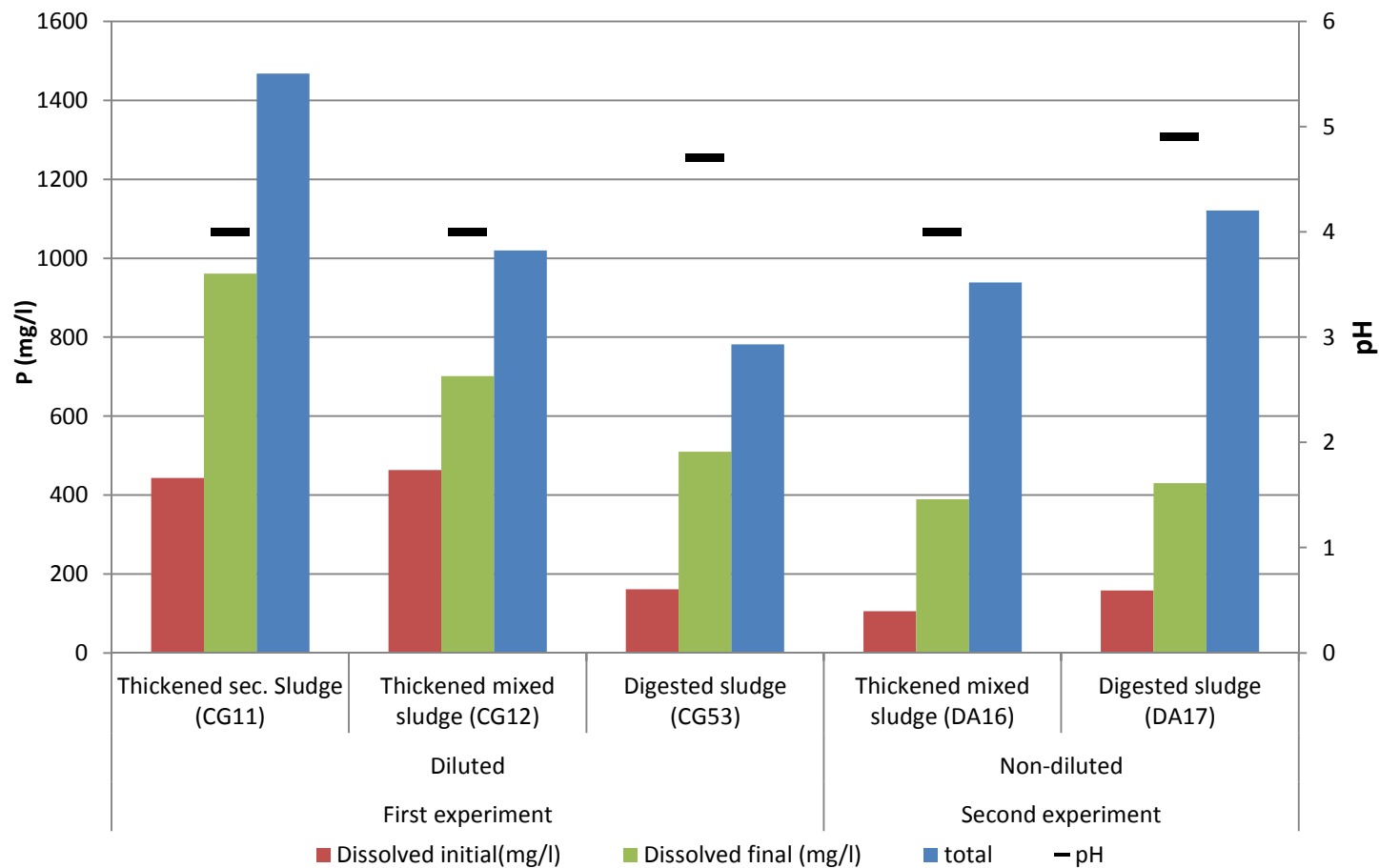
$T = 38^{\circ}\text{C} \pm 2^{\circ}\text{C}$
 $\text{HRT} = f(\text{pH})$

- The co-substrate concentration in the sludge is set at $0,5\text{gDCO}_{\text{Cosubstrate}}/\text{gVM}$
- Co-substrate used is White Sugar (commercial); $\text{DCO} = 1,17\text{g/g}_{\text{sugar}}$
 - Sugar concentration in the non digested Sludge =

	First experiment			Second experiment	
	Diluted			Non-diluted	
	Thickened sec. Sludge (CG11)	Thickened mixed sludge (CG12)	Digested sludge (CG53)	Thickened mixed sludge (DA16)	Digested sludge (DA17)
gSugar/Kg sludge	9,7	10,3	6,8	11,6	17,7

Results

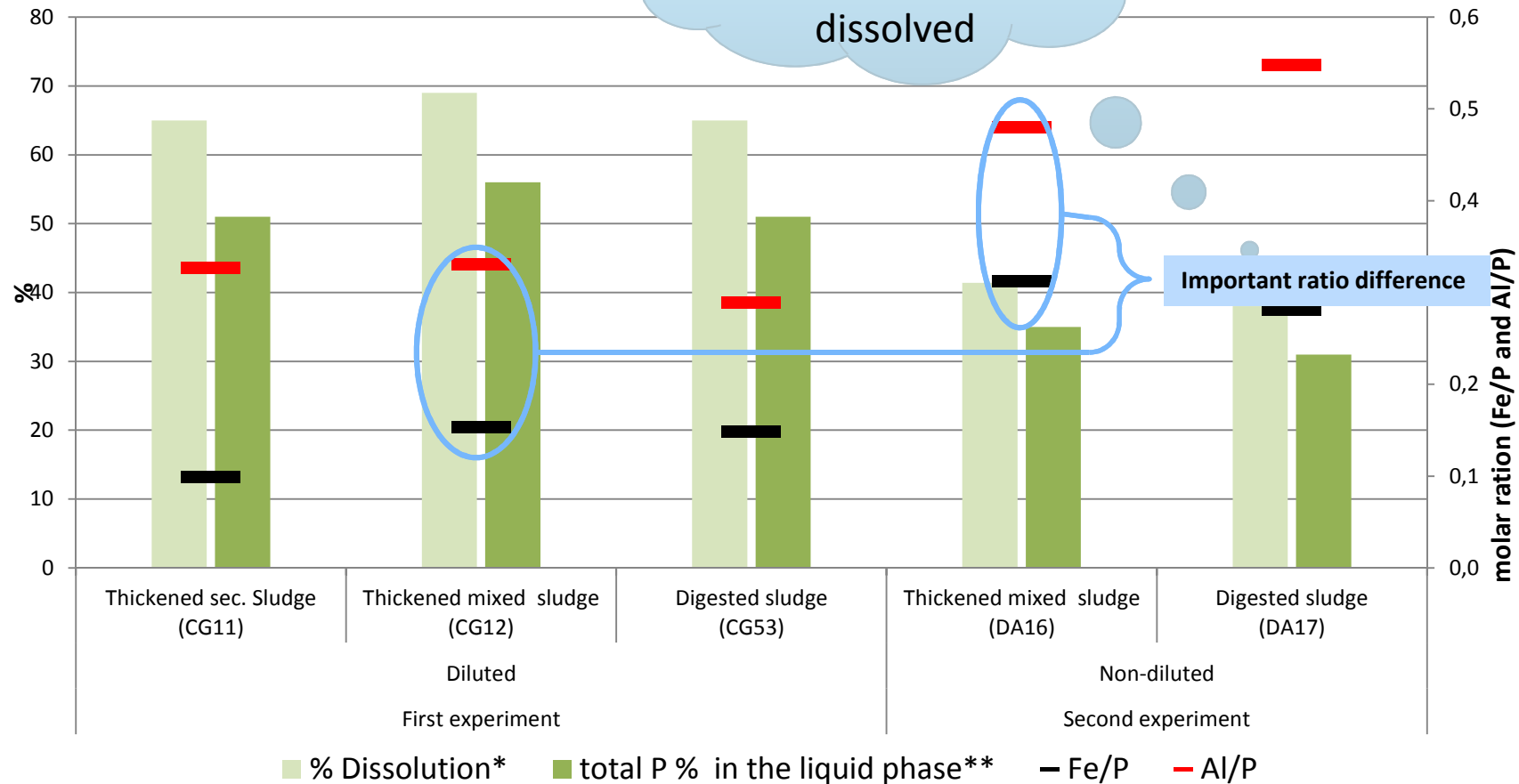
- pH and Concentration of the dissolved P



Results

- Percentage of the dissolved P

Potential presence
Fe-P and Al-P
complex form
difficult to
dissolved

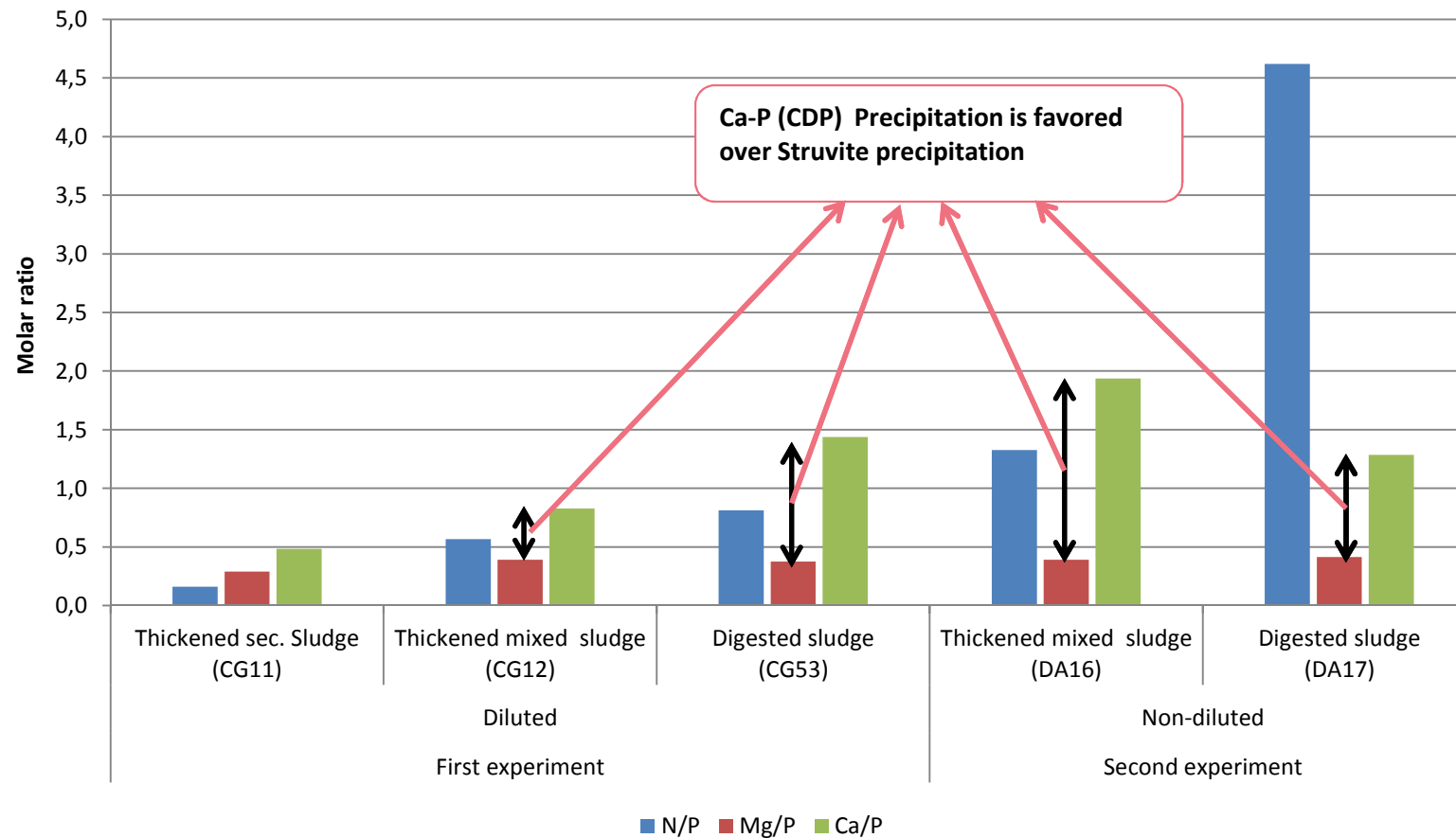


* % Dissolution= [Dissolved P]/[total P] *100

** Total P in the Liq= [Dissolved P]_{liq} * M_{liq} + [Dissolved P]_{solid} * M_{solid} / [total P] * (M_{liq} + M_{solid}) *100,
While: M_{liq} is Mass of the liquide phase and M_{solid} is the Mass of the solide phase

Results

- Prediction of the Phosphorus' forms recovered by STRUVIA, for each sludge

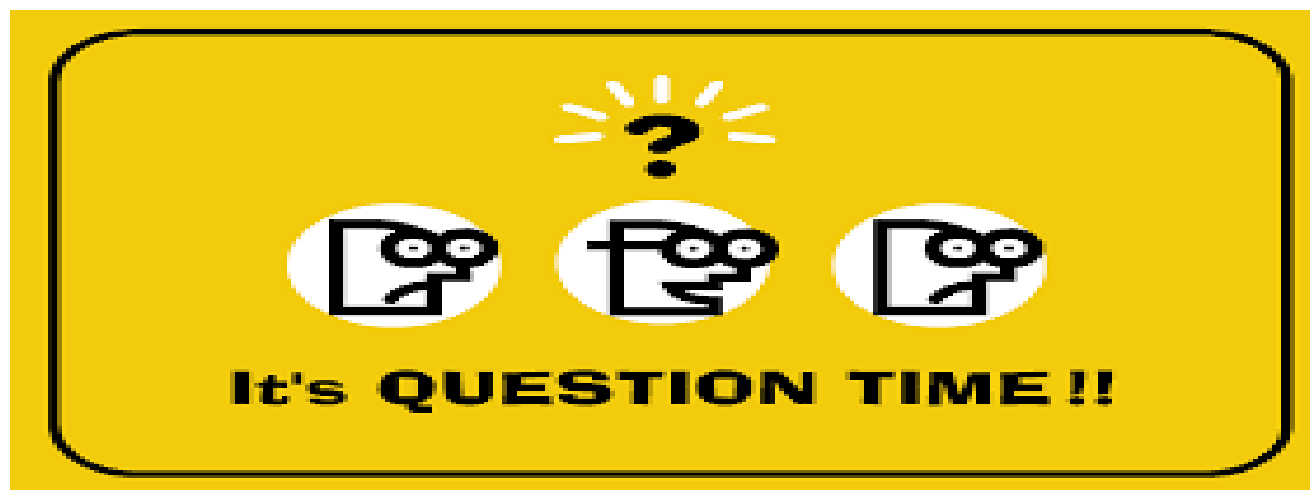


Conclusion

- Biological acidification (and P release) is a promising way to increase the P recovery of WWTP's sludge
- The biological P recovery efficiency depends on several factors such as:
 - Effluent nature (Digested or non digested, Alkalinity,...)
 - Fe/P and Al/P Ratio.
- A mixture of the thickened sludge with a low DM sludge improve the biological acidification i.e. the P dissolution.

Perspectives:

- Do over of both the first and the second experiments with the same samples
- The use of other low cost co-substrat (ideally residues and byproduct near the WWTP area),
- Shift to a continuous mode
- Up scale to semi-industrial pilot.



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