Workshop: Cristalización de estruvita en EDAR, una inversión en forma de fertilizante

PHORWater
Integral Management Model for Phosphorus recovery and reuse from Urban Wastewater

Logroño, 30 de junio de 2016
Phosphorus (P)
Phosphorus concerns

Phosphorus scarcity

Phosphate rock mine
Phosphorus scarcity

Phosphate rock reserves

Phosphorus concerns

Resource scarcity

P scarcity

Environmental impacts

Global food security

## Food security

<table>
<thead>
<tr>
<th>End Use</th>
<th>Mined P input (%)</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mineral fertilizers</td>
<td>≈ 82</td>
<td>Food production</td>
</tr>
<tr>
<td>Animal feed</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Food additives</td>
<td>Small (&lt;5)</td>
<td></td>
</tr>
<tr>
<td>Detergents</td>
<td>10</td>
<td>Domestic/Industrial use</td>
</tr>
<tr>
<td>Other industrial uses</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

*Fuente: Schröder et al., 2010*
Food security

Phosphorus flux

Uses
- Reserves
- Mineral Rock
- Processed Rock
- Fertilisers
- Crops
- Food

Losses
- Minery
- Processing
- Fertiliser production
- Agriculture
- Food wastes
- Sewage
Phosphorus concerns

Resource scarcity

P scarcity

Environmental impacts

Global food security

Environmental impacts

Eutrophication
Environmental impacts

Environment degradation due to phosphate rock mining

1. Open pit mines. Big areas
2. Generate lot of waste
3. Large amounts of water are required
4. It requires a high energy consumption
5. The extracted phosphorus requires processing and transported until use
6. Soil contamination by Cd
Use P more efficiently as a resource

Not only **efficiency**, but **effectiveness** is needed in the overall management of P to contribute to a better recovery and reuse.
Sustainable strategies

1. Reducing mining losses.
2. Efficiency in agriculture.
3. Recovery.

Struvite $\text{MgNH}_4\text{PO}_4 \cdot 6\text{H}_2\text{O}$
PHORWater

P RECOVERY
from:
ash, sludge, wastewater,
biowaste,
animal residues
(manure, meat & bone meal)

Substitution of mined phosphates

210 Mt P rock
(global mining 2012, USGS 2013)

amended from: http://www.nhm.ac.uk/research-curation/research/projects/phosphate-recovery/ceep11.htm
Phosphorus at WWTP

- Discharges of phosphorus through WWTP have to be limited.
- EBPR allows P-recovery.
- Anaerobic digestion of EBPR sludge releases P-rich streams.
- Uncontrolled precipitation.

P arrives with N and other nutrients.
Phosphorus at WWTP

Pipe blockage

Equipment damage
Consortium:
LIFE+ PHORWater (Sept 2013 – Sept 2016)

The main objective of PHORWater is to demonstrate, at pre-industrial scale, the viability and sustainability of the correct management of the P in a WWTP obtaining struvite by crystallization.
What make PHORWater different

PHORWater moves **from less to more** at three different levels

<table>
<thead>
<tr>
<th>PHORWater struvite precipitation</th>
<th>PHORWater sludge line configuration</th>
<th>EBPR</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Simple and easy control reactor</td>
<td>• Less uncontrolled precipitation</td>
<td>• P removal</td>
</tr>
<tr>
<td>• Low P at effluent</td>
<td>• More P availability</td>
<td>• Less reagent</td>
</tr>
<tr>
<td>• P recovered as struvite</td>
<td></td>
<td>• Less sludge volume</td>
</tr>
<tr>
<td>• Less P at sludge</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
PHORWater

Calahorra WWTP, La Rioja
PHORWater

Integral Management Model for Phosphorus recovery and reuse from Urban Wastewater

LIFE12 ENV/ES/000441

PHORWater

[Imagery of wastewater treatment plants and associated infrastructure]

DAM 
Depuración de Aguas del Mediterráneo

Universitat de València

Université Claude Bernard Lyon 1

LAGEP
El Cidacos WWTP

**Primary Settling**
- 11 m diameter
- 3.5 m height

**HUBER Rotary Screw Thickener**
- 7-8% SS

**V = 494 m³**
- Uncontrolled precipitation observed

**Secondary Settling**

**Mixing Chamber**

**Secondary Sludge Thickening**

**Sludge Dewatering**

**Secondary Anaerobic Digestion**

**Anaerobic Digestion**
- V = 1.930 m³
- RT = 20 d
- SCABA agitator
# Project structure

<table>
<thead>
<tr>
<th>B. Implementation actions</th>
<th>B.1 Integral management of the WWTP for optimal phosphorus recovery.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B.2 Design, construction and start-up of the crystallization process.</td>
</tr>
<tr>
<td></td>
<td>B.3 Implementation on the Phosphorus recovery demonstration pilot plant. Struvite production.</td>
</tr>
<tr>
<td></td>
<td>B.4 Validation of the obtained struvite as a fertiliser.</td>
</tr>
<tr>
<td></td>
<td>B.5 Economical feasibility study.</td>
</tr>
<tr>
<td>C. Monitoring of the impact of the project actions</td>
<td>C.1 Effectiveness of the project actions. Project results monitoring.</td>
</tr>
<tr>
<td></td>
<td>C.2 Project socioeconomical impact.</td>
</tr>
<tr>
<td>D. Communication and dissemination actions</td>
<td>D.1 Communication and dissemination of project results.</td>
</tr>
<tr>
<td>E. Project management and monitoring of the project progress</td>
<td>E.1 Project management.</td>
</tr>
<tr>
<td></td>
<td>E.2 Networking activities.</td>
</tr>
<tr>
<td></td>
<td>E.3 After LIFE Communication Plan</td>
</tr>
</tbody>
</table>
Legal aspects: European Level

EU Fertiliser Regulation

• The proposed text (17/3/16) of the revised EU Fertiliser Regulation is now publicly available at [http://ec.europa.eu/DocsRoom/documents/15949](http://ec.europa.eu/DocsRoom/documents/15949), defining how recycled nutrient and organic carbon products can be placed on the market across Europe (CE Mark) as fertilisers or soil amendments.

• This will now be subject to consultation and discussion by Member States (Council) and the European Parliament, with an objective of final adoption in 2017-2018.

• Defines acceptable input materials (CMC = Component Material Categories) and product specification (PFC = Product Function Categories).
Legal aspects: European Level
EU Fertiliser Regulation

• Materials conform to the criteria of the new Regulation will be considered “products”, will be able to be traded and sold in all EU countries and will automatically cease to be considered as “waste” (End-of-Waste status).

• The revised EU Fertilisers Regulation will enable placing on the European market (CEMark) of recovered nutrient products, so enabling inter-state trade of these materials.

• Member States will also be able to maintain or implement national regulations authorising other types of recycled materials as National Fertilisers or authorise agricultural use under waste-type controlled spreading regulations.
Legal aspects: European Level

EU Fertiliser Regulation

- In parallel to this, as proposed by ESPP, the Commission has launched work led by the EC Joint Research Centre (JRC).

- The goal is to define criteria for:
  - struvite,
  - ash-based materials and
  - biochars,

  to add into the revised Fertiliser Regulation Annex II (as additional Component Material Categories) as soon as the new Regulation is published.
Legal aspects: National Level

EU Fertiliser Regulation

- Struvite is not legislated at the moment in Spain
- Not included in RD506/2013 Fertilisers

- Possibilities:
  - Obtain the end of waste condition (Orden Ministerial)
  - Struvite inclusion in RD506/2016 under the positive list for inorganic waste material
  - Apply for the inclusion of a new fertiliser in the RD506/2016 fertiliser list
  - Apply for being a authorised handler (national)
Thank you for your attention

laura.pastor@dam-aguas.es

www.phorwater.eu

www.dam-aguas.es