
CHANGE
YOUR MIND
ABOUT PHOSPHATE
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For valorization of P containing (low grade) rock or SSA
into
Well-known market accepted fertilizers and animal feed:

THE ECOPHOS TECHNOLOGY

TO CLOSE THE P CYCLE
AND SAFEGUARD THE WORLD'S FOOD CHAIN

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Quote European Committee:

"The complete replacement of phosphate mined in the EU by recycled phosphorus is neither feasible nor necessary in the foreseeable future. However, greater recycling and use of organic phosphorus where it is needed could stabilize the amounts of mined phosphate required and mitigate the soil contamination and water pollution issues. This will put on track to close the phosphorus cycle in the long term, when the physical limitations of the resource will become increasingly important"

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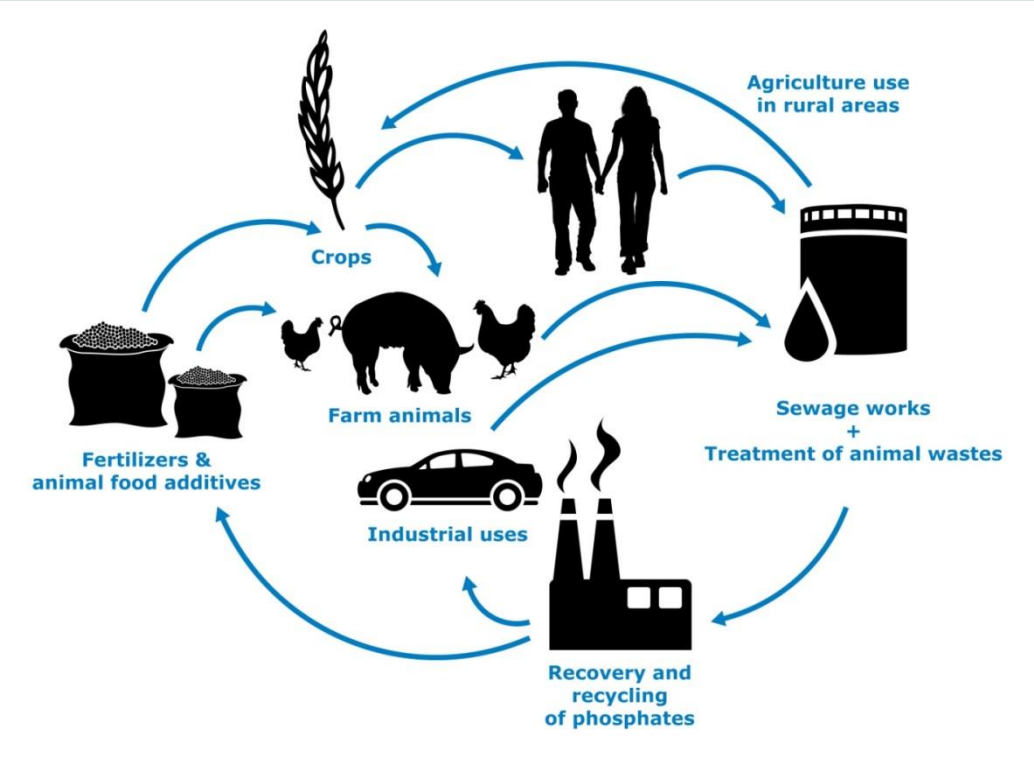
Economy, Quality, Health & Safety

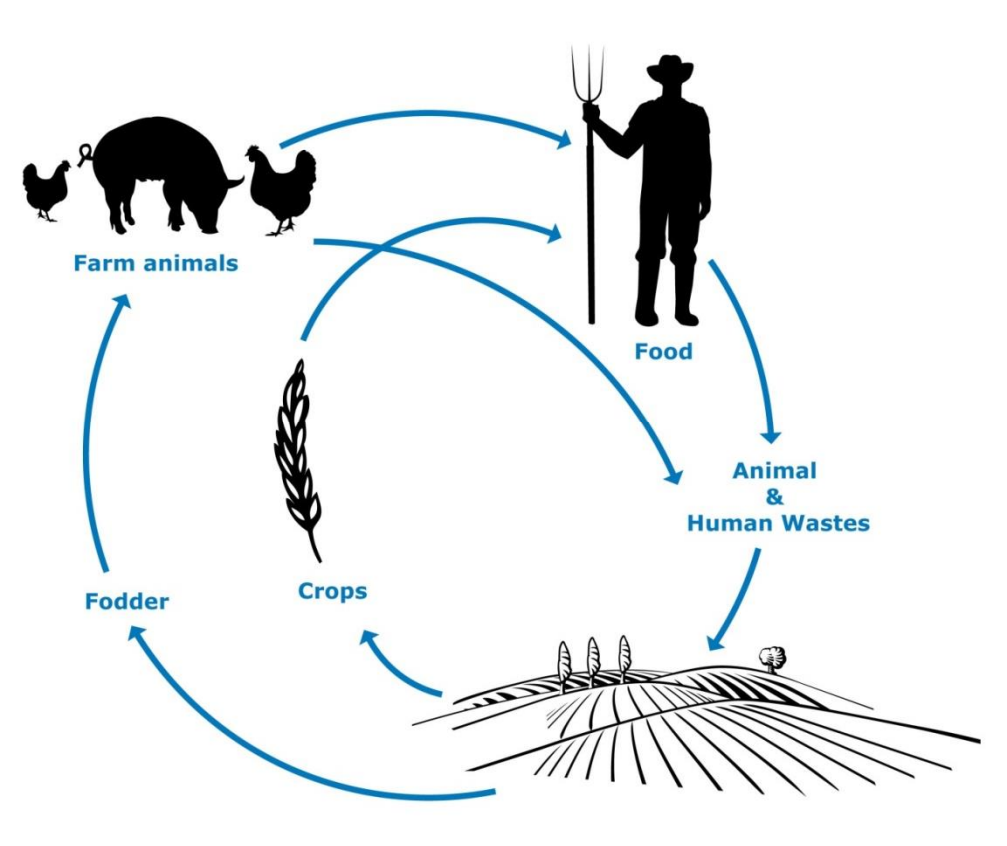
- Todays conventional fertilizer and animal feed processes are only economically and technical feasible for high grade phosphate rock
- Rock contains heavy metals (Cd) and Radio-activity (U)
- By conventional processing heavy metals and Uranium ends in Fertilisers → → → human body
- This situation will worsen in case lower grade rocks will be explored
- **<u>This calls for new innovative processes and raw materials</u>**

Phosphate: a sustainable resource



'EcoPhos has the **unique, world wide patented technology** *to close the phosphorus cycle and hence to contribute to meeting the ever expanding need of the world's population for nutrients a Green Phosphates production process'*

Traditional phosphorus cycle



Business Case / Drivers

- Phosphate is being wasted and suitable for up-cycling (SSA → food)
- Low grade phosphate rock not economically accessible for conventional processes
- New (EcoPhos) Technology is key → Quality/ Safety / Process Design: Gives access to lower grade raw materials (natural rock AND P-containing waste, SSA)
- Backward integration Urban Mines (P containing waste) increases influence/independence in the chain
- Market segmentation & Competitive Advantage
- Fertilizer and Animal Feed Market grow with world population

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Time line (From Lab test to Industrial Licenses and own Production)

1996 Foundation of the company by M. Takhim and by venture capitalists in Louvain.
2001 Collaboration agreement with Solvay s.a. which takes part in EcoPhos capital.

2002-4 Positive pilot test validation of modules 1-4 (Hydrochloric acid attack) in Dombasle (France).
2005 EcoPhos takes a part of 50% of DecaPhos, Bulgarian producer of DCP/MCP.
2006-9 Development and validation of modules 5-12, including severals PA purification technologies.

2006 EcoPhos' license for UCCI.
2008 DecaPhos becomes 100% EcoPhos.
2009 Ecotac: EcoPhos' license for phosphate plant in Saudi Arabia.
2010: UCCI plant successful start-up
2011: Quimpac: EPCL for DCP & PA plant in Lima (Peru)

2011-12 Modules validation for SSA (SNB/HVC)*
2012 Acquisition of Temco, an engineering company
2012 Namfos : pilot plant in Namibia (base for a future 650kt/y plant using marine rock)
2013 TechnoPhos GO → industrial demonstration for all units

2013 EcoPhos' license for Eurochem 660kt/a DCP plant in Kazakhstan
2013 Ecophos signs SPA to acquire AF Bus. Tessenderlo (30-40% market share in Europe)
2014 Sign contract with HVC/SNB to valorise 50-60 kt SSA per annum

* On the basis of collaboration/JV agreement HVC/SNB/EcoPhos

EcoPhos Group before Aliphos

- **Situation:**
  Louvain-la-Neuve, Belgium
- **Role:**
  Headquarter, Project development, Project Management, R&D
- **Resources:**
  15 highly skilled employees

- **Situation:**
  Lummen, Belgium
- **Role:**
  Engineering and construction management
- **Resources:**
  72 experienced engineers (process, electrical, mechanical, civil)

- **Situation:**
  Varna, Bulgaria
- **Role:**
  Production (100kt/y DCP/MCP animal feed), Industrial validation, Project support
- **Resources:**
  10 administrative and sales employees
  12 engineers
  8 Laboratory technicians
  40 Production operators

Intellectual Property

8 patents in more than 50 different countries

Rock phosphate valorisation:

- Method for producing phosphoric acid
- Method for the production of phosphoric acid and / or a salt thereof and products thus obtained

Phosphoric acid purification:

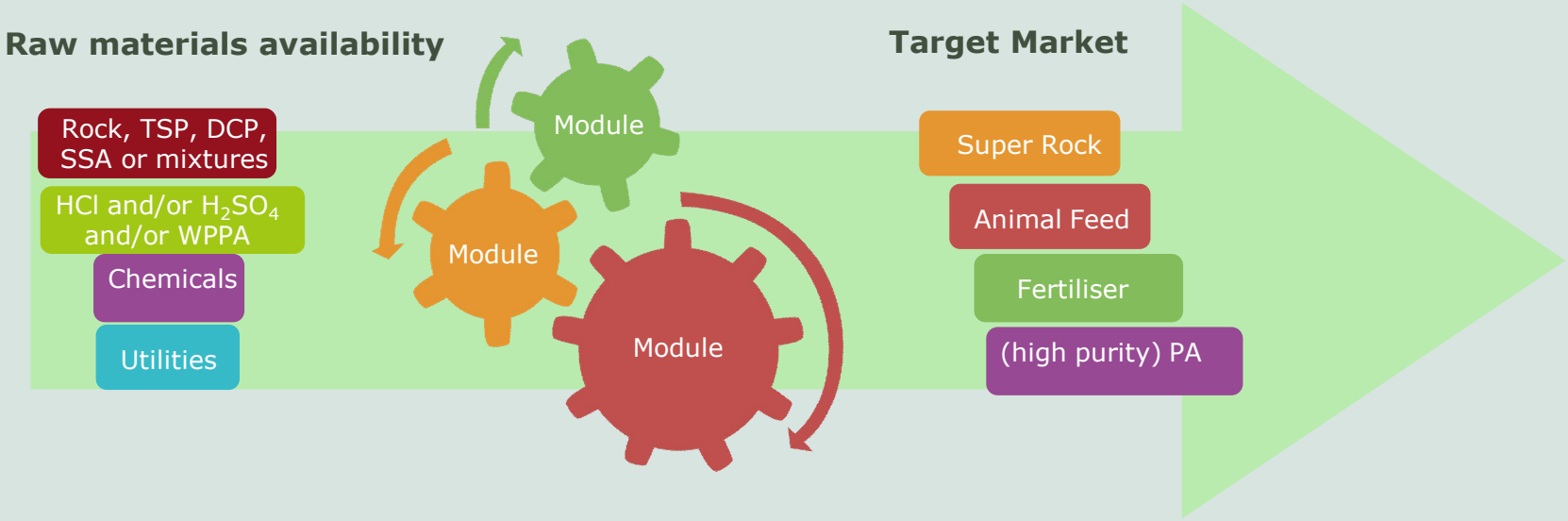
- Liquid medium extraction purification method
- Method for concentrating phosphoric acid
- Process for the production of high purity phosphoric acid

Other phosphate derivates:

- Method for etching phosphate ore
- Method for producing strong base phosphate
- Mineral additive for a dietary composition for animals and method for the production thereof

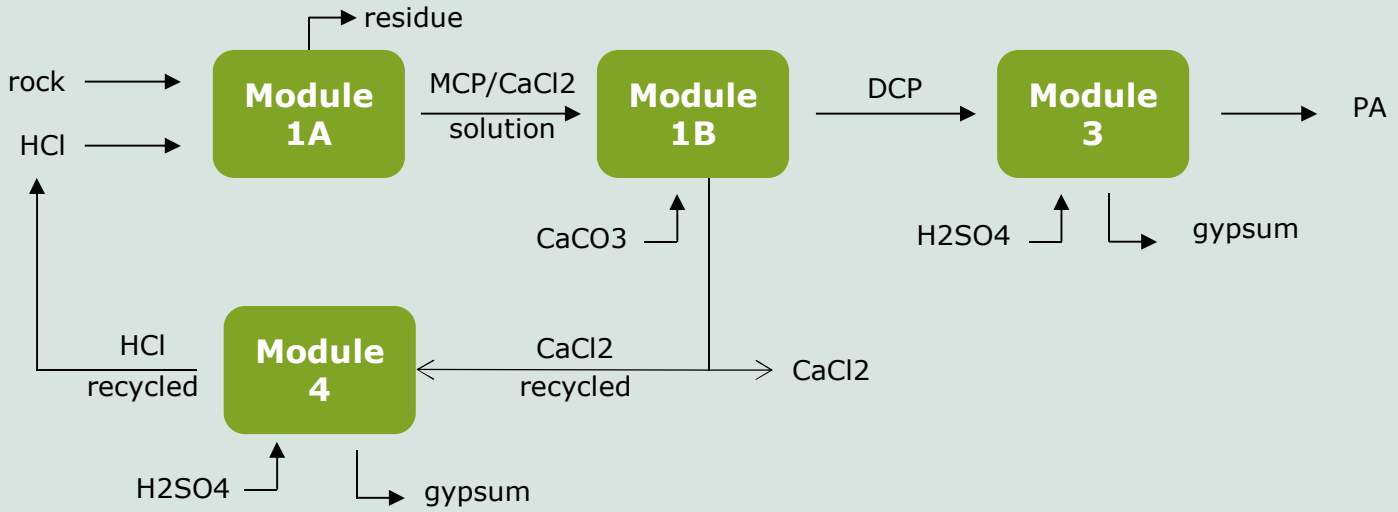
Technology description

Several possible combinations of EcoPhos modules according to the raw materials availability & the target market:



Technology description

Low-grade rock and/or SSA →
high quality phosphate products



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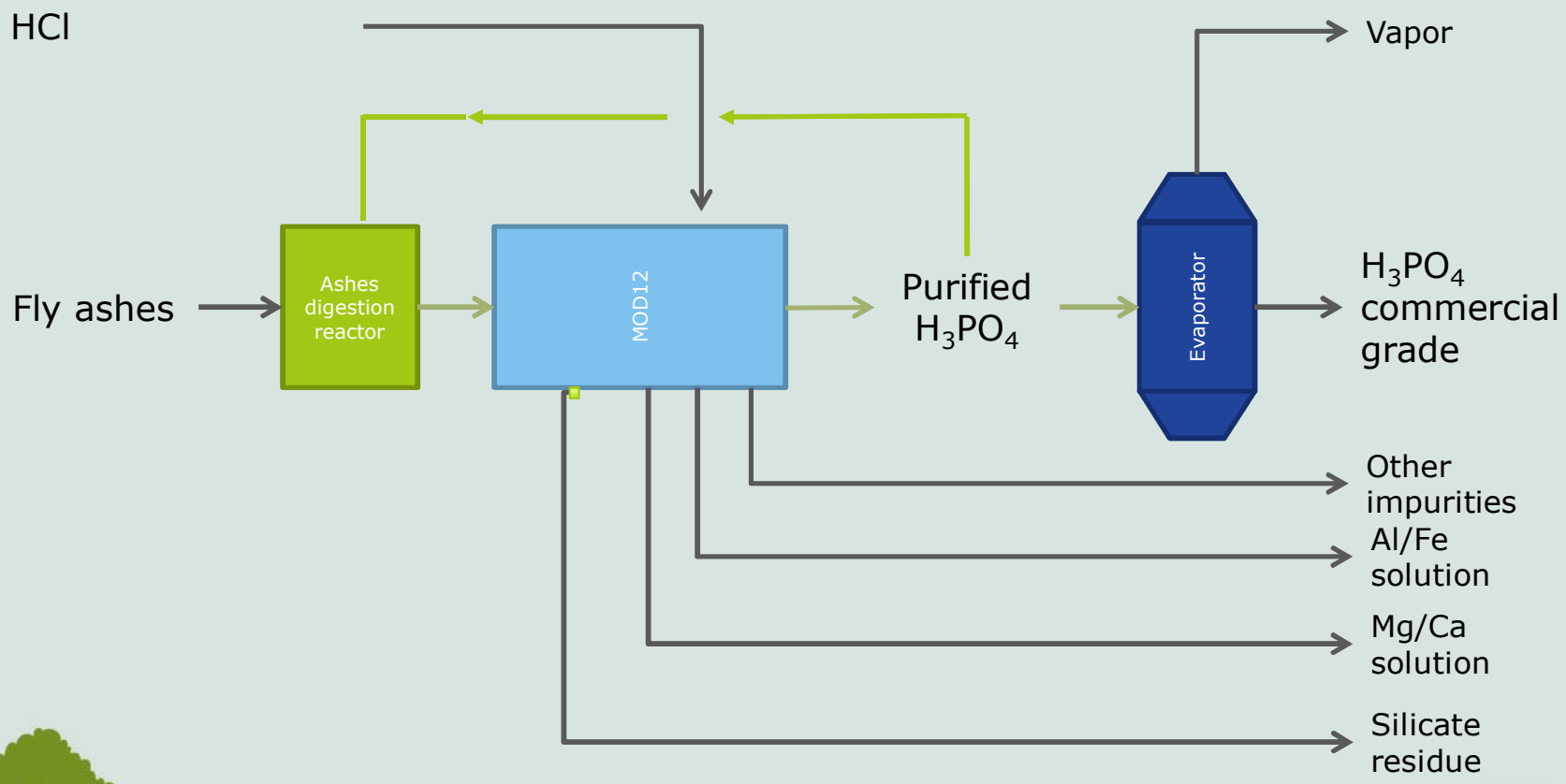
Unique technology for Phosphates Valorization

EcoPhos HCl process is a unique method to valorize (low grade) phosphate rock and Ashes to well known high quality market products

- Less/No beneficiation of raw material needed, lower cost
- Lower variable cost: Low cost raw materials high P205 yield (93-98%)
- Saving cost on energy consumption (no stripping, concentrated PA is obtained : >42% P_2O_5 without evaporation)
- Safe process (no use of volatile solvent)
- High flexibility (raw-materials, simple process monitoring)
- Pure co-products ($CaCl_2$, gypsum)
- Lower investment cost
- Well known market products (Animal Feed and/or Fertilizer)

Process overview



Process advantages

- Good integration in existing incineration facilities (also suited for smaller quantities, from 5 kt SSA/a and more)
- High added value product: phosphoric acid of high quality (fertilizer, technical, feed)
- High value co-products (AlCl3, FeCl3), low waste production
- Simple and safe process
- Low residence time → Small units possible
- Low energy consumption, easy automized, low labour coststst
- Low investment costs (payback: 3 years) → Franchise concept

EcoPhos Now ✓ & Tomorrow

Lima P205/DCP Plant (Quimpac) ✓

Several larger and smaller PA units at mono-incinerator sites, on the basis of SSA

DecaPhos: Animal Feed production unit, 100 kt/a, operated by EcoPhos ✓

Vlaardingen Animal Feed Production site, 200 kt/a, operated by EcoPhos ✓

TechnoPhos Industrial Demonstration plant for All EcoPhos units ✓

Duinkerke/Zeebrugge 200 kt/a Animal Feed production site operated by EcoPhos, on the basis of HVC/SNB SSA (60 kt/a) and LG Rock ✓

660 kt DCP/a by Eurochem ✓

Namibia PA plant, 600 kt P205/a on the basis of EcoPhos technology ✓

Several joint activities between EcoPhos and conventional phosphate mines on the basis of LG Rock

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SNB & HVC, the first mono sludge incinerators to valorise 50-60 kt SSA/a
Who is next?

THANK YOU FOR YOUR ATTENTION

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