



European Sustainable
Phosphorus Platform



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from the EU Horizon 2020
research and innovation
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SMART-Plant

ECOMONDO
THE GREEN TECHNOLOGIES EXPO

Green & Circular Economy
6-9 Novembre 2018
Rimini Italy

22^a Fiera internazionale
del recupero di materia ed energia
e dello sviluppo sostenibile

IN CONTEMPORANEA CON
KEY ENERGY

Ash2Phos – Clean commercial P products from sludge ash



Dr. Yariv Cohen – EasyMining Sweden

3rd EUROPEAN NUTRIENT EVENT @ ECOMONDO 2018

8 - 9 November 2018, Rimini, Italy

www.smart-plant.eu/ENE3



EASYMINING A COMPANY IN THE RAGN-SELLS GROUP



Chemical processes for extraction of clean commercial products from wastes

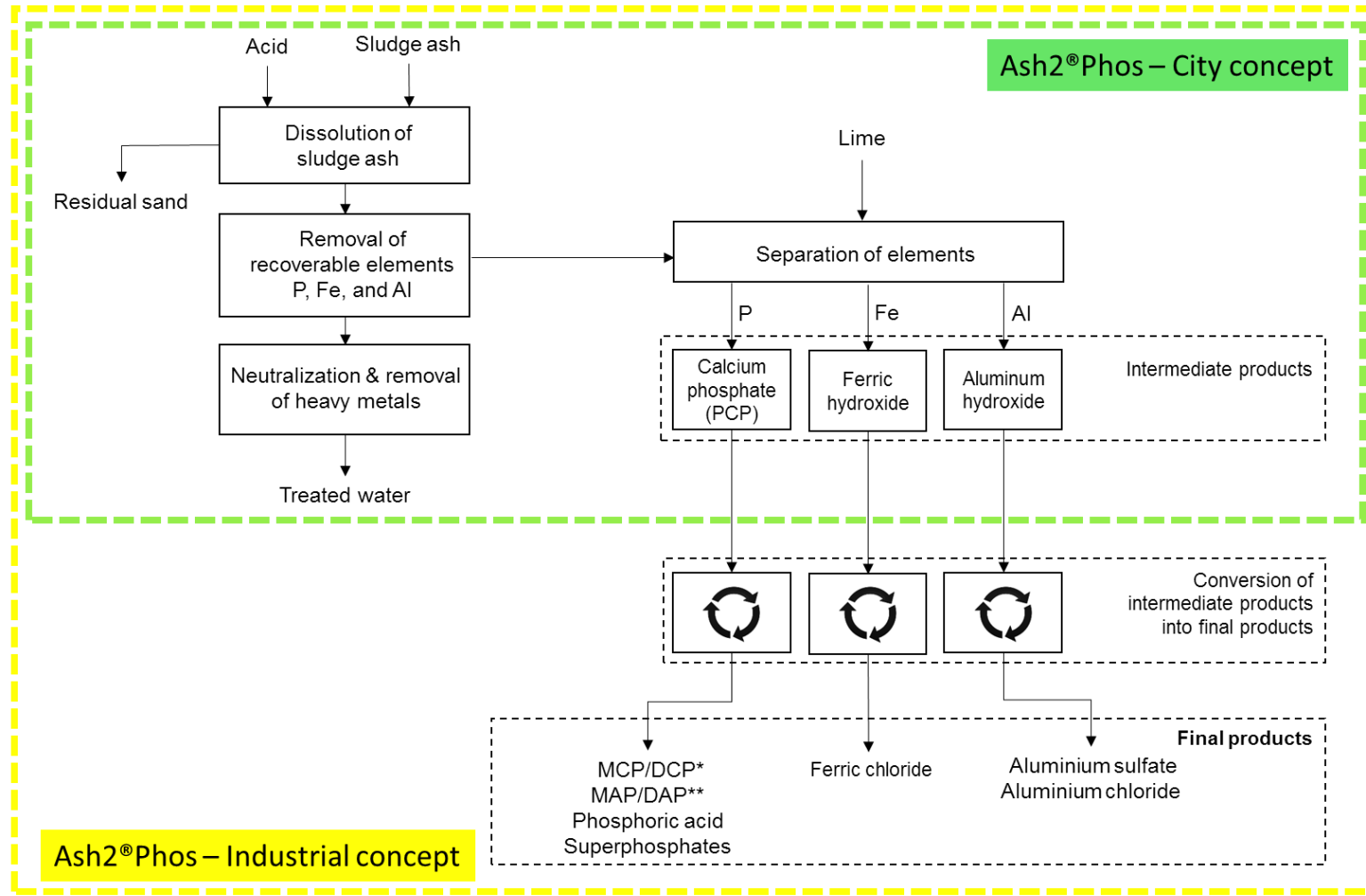


Ragn-Sells group
Turnover: 5 543 MSEK
Personell: 2 764
EBITDA: 524 MSEK



Ash2[®]Phos - process

Ash2[®]Phos - process

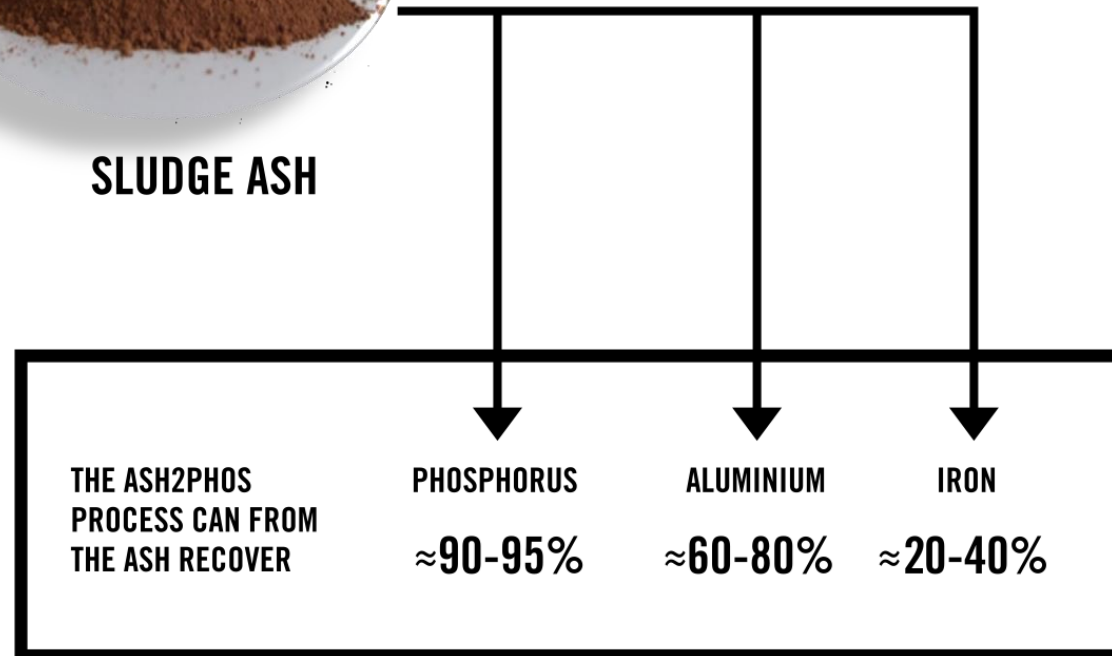


* mono/di-calcium phosphate (feed phosphate), mono/di-ammonium phosphate (fertilizer)

Ash2Phos- Process Capability



SLUDGE ASH



Industrial pilot runs at the Kemira site in Helsingborg

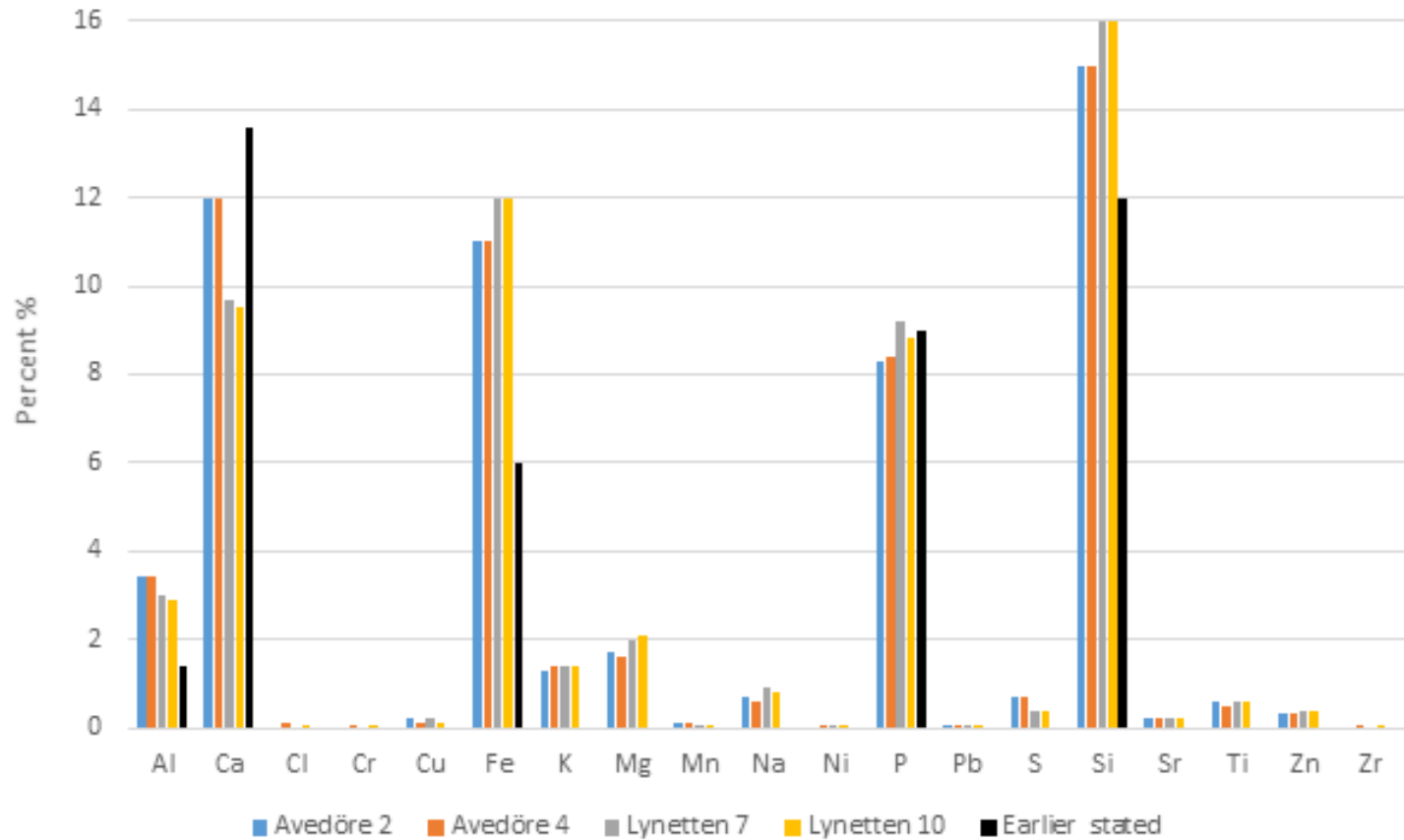


The pilot plant at the Kemira site in Helsingborg



Elemental composition of sludge ash

EasyMining Ash, Feb 2018



Sludge ash – a concentrated phosphorus raw material



Sludge mono-incineration

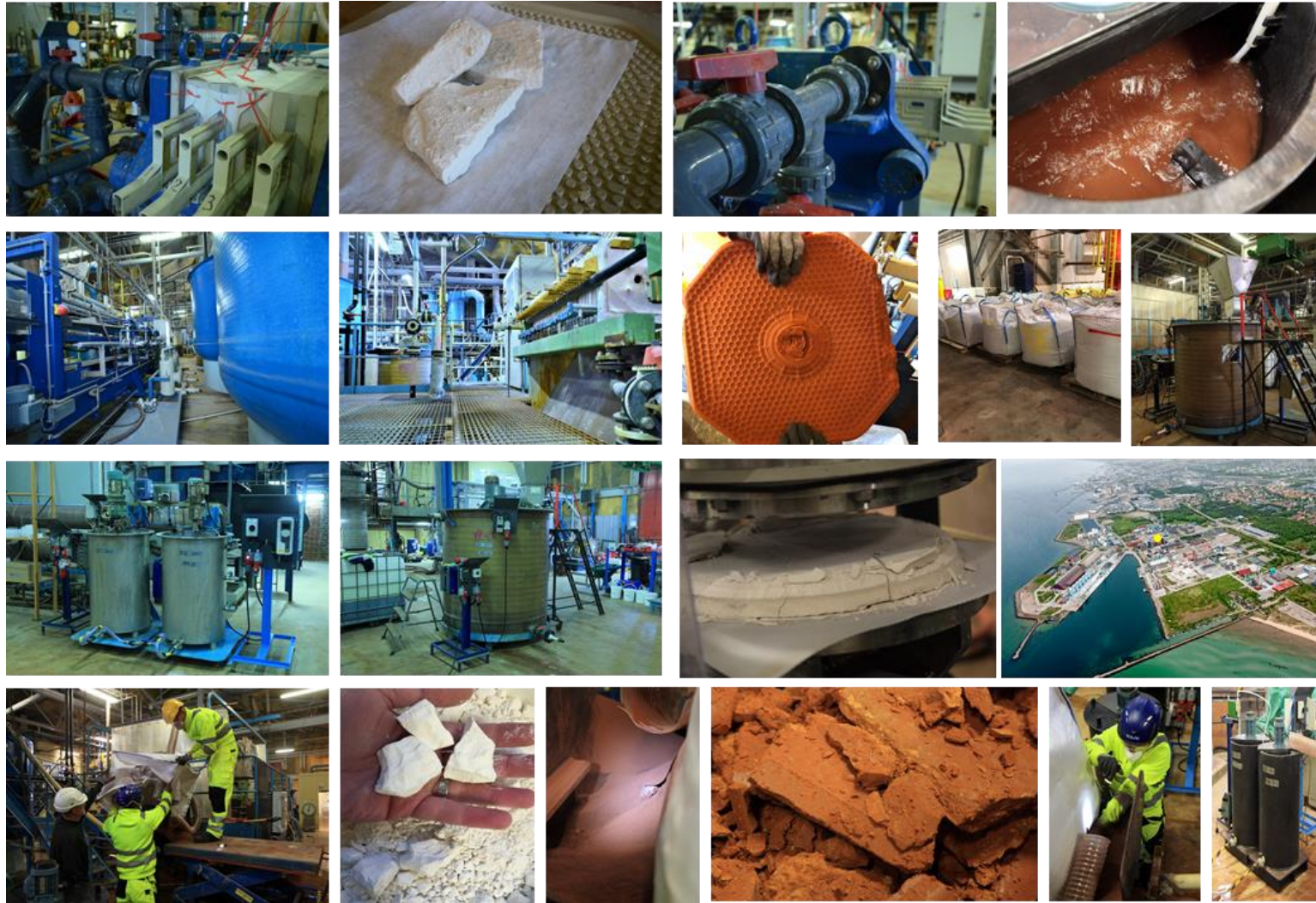


Sludge ash 9-11% P



Apatite 12-16% P

Industrial pilot trails



Precipitated calcium phosphate (PCP) of high quality



Precipitated Calcium Phosphate (PCP)

Benefits

- Low heavy metal content
- High phosphorus content
- Part of an environmentally advantageous circular process

Typical analysis	%
Phosphorus (P)	16.9
Calcium (Ca)	35.5
Fluorine (F)	0.014

Typical heavy metal content	mg/kg
Cadmium (Cd)	<0.09
Cobalt (Co)	0.7
Chromium (Cr)	2.3
Copper (Cu)	5.9
Mercury (Hg)	<0.2
Nickel (Ni)	2.5
Lead (Pb)	1.74

Conversion of PCP to end products

- Raw material for fertilizer industry
- Production of SSP
- Production of MAP
- Raw material for feed phosphates
- Production of DCP/MCP (feed phosphates)



Recovered products

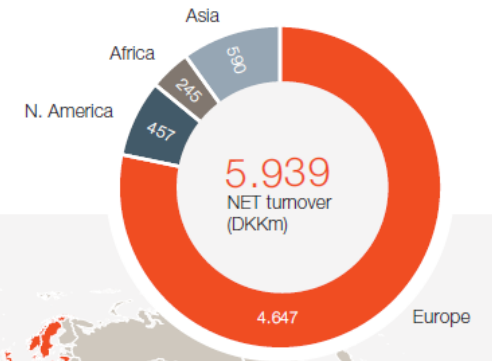


EasyMining has purchased basic engineering for our Ash2Phos process from our engineering partner COWI

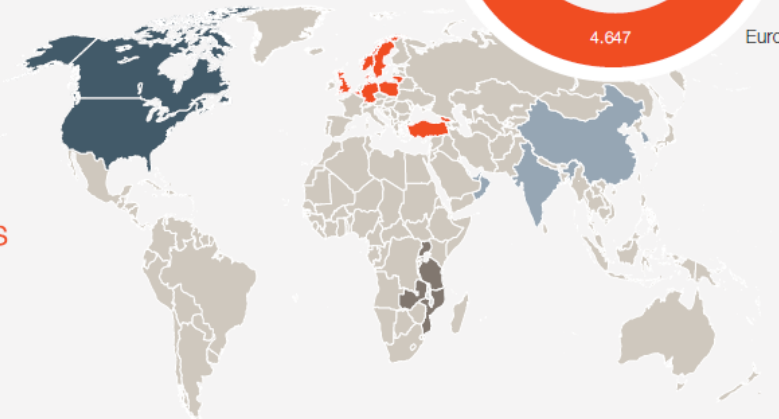


COWI IN BRIEF

- › A leading international consulting group within engineering, economics and environmental science.
- › Dedicated to creating coherence in tomorrow's sustainable societies.
- › Founded in Denmark in 1930.



At any given moment, our
6,600 employees
are involved in more than
14,000 projects

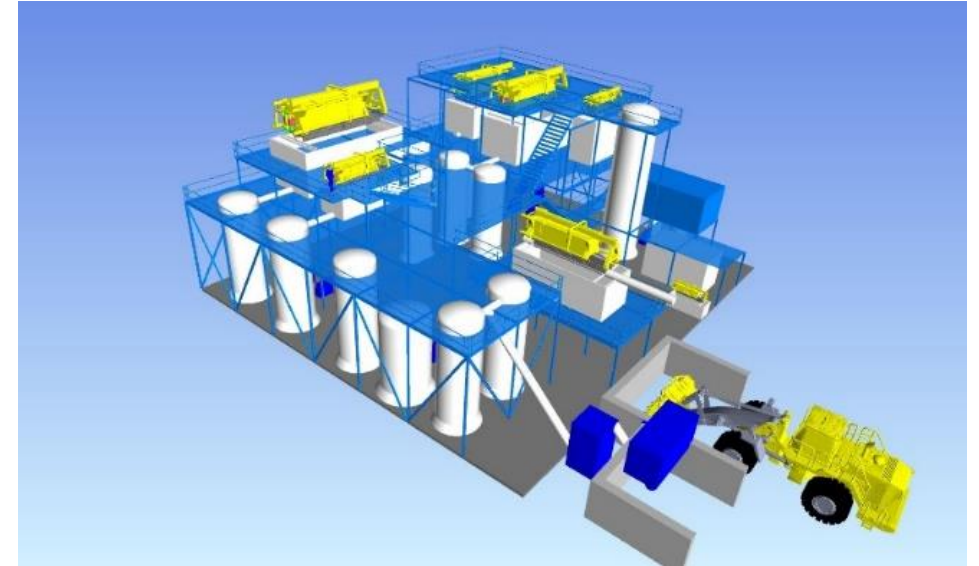


Ongoing process optimization



Ash2Phos – activities to full scale plant

- 30 000 ton ash per year plant in Sweden
 - Pilot tests for final design
 - Basic engineering
 - Ash supply contract
 - Permit application
 - Detailed engineering, construction, commissioning and start up
- Marketing and negotiation agreement for Ash2Phos projects in Europe



Ragn-Sells and Gelsenwasser enter partnership on P recovery in Germany



Ash2Phos – process advantages

- High value products, ammonium phosphates or calcium phosphates
- Clean phosphorus products <1 mg Cd/Kg P
- High phosphorus recovery rate
- Possible to process moist ash
- Recovery of iron & aluminium as precipitation chemicals
- Separation of heavy metals
- Favorable mass balance
- Low energy consumption
- Option to use waste acid



Ash2Phos technology presented in the UN



Ash2Phos – fulfilling the four guiding principles for circular economy

