

Technology #3 Nutrients recovered from residual dewatering liquid from anaerobic digestion

Description

Struvite ($MgNH_4PO_4 \cdot H_2O$) and ammonium sulphate $[(NH_4)_2SO_4]$ are compounds used as fertilizers and they can be recovered from residual dewatering liquid of anaerobic digestion. A cascade process obtains the former first, while the latter proceeds from the residual liquid phase. Nutrient recovery technology, a well-established process on wastewater, can be economically profitable on digestate for contents of phosphate (> 240 ppm) and ammonium (> 2500 ppm). The cascade process allows to produce pellet fertilizers that include both compounds.

Innovation keys for the environment

- Avoiding the pollution of underground and superficial waters by removing phosphorous and nitrogen from waste streams.
- Decouple the production of fertilizers from EU critical raw materials, like phosphate rocks, and energy-intensive processes.
- Production of novel formulations of biofertilizers.

Biowaste feedstocks

Digestate (anaerobic digestion) from manure, Organic Fraction of Municipal Solid Waste (OFMSW) or Urban Waste Water Sludge (UWWS).

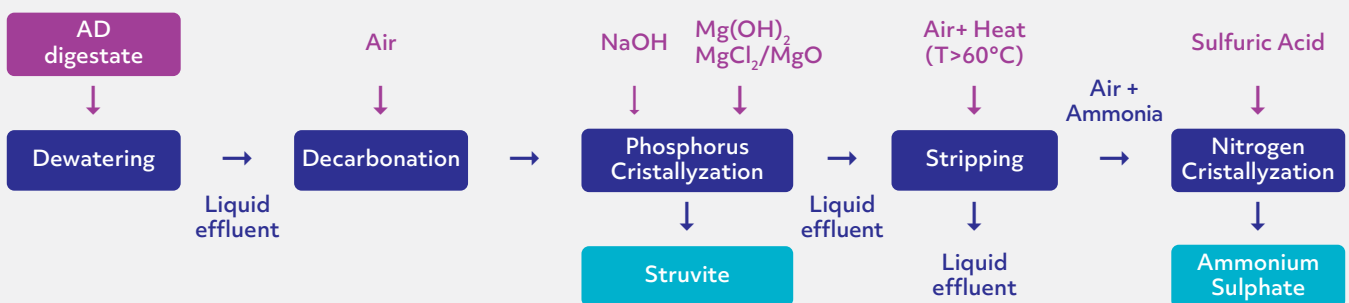


Bioproducts

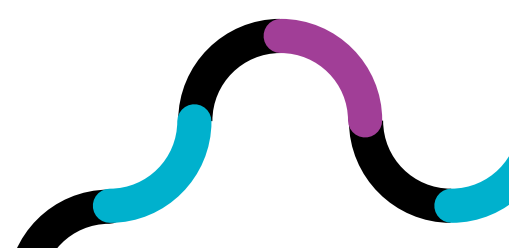
Bioproduct(s)	Market sector	Market price ⁽¹⁾
1. Struvite	Agriculture	100€/ton
2. Ammonium sulphate	Agriculture	220€/ton



Process flowchart

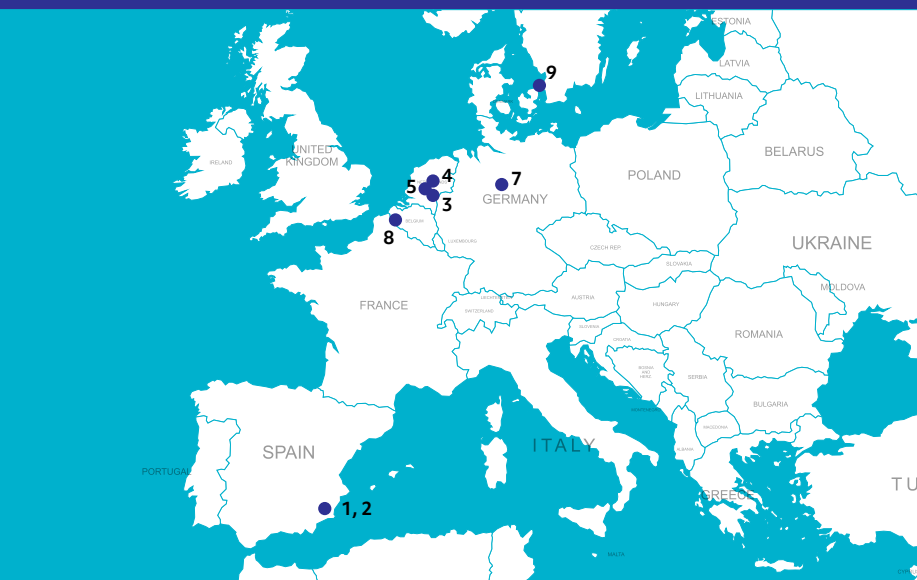


Legend: Biowaste feedstock Process input Process step Bioproduct



Existing production plants

	Production plant location	Feedstock	Bioproduct	TRL	Production capacity (ton/year bioproducts)	CAPEX	OPEX ⁽²⁾
1	Murcia, Spain (H2020 ValueWaste)	Digestate of OFMSW	Struvite + Ammonium sulphate	7	N.A.	CAPEX <1M€	30%
2	Murcia, Spain (LIFE ENRICH)	Wastewater	Struvite	7	1,8 ton / yr	CAPEX <1M€	N.A.
3	Cuijk, The Netherlands	Wastewater	Struvite	9	146 ton / yr	CAPEX <1M€	32 %
4	Apeldoorn, The Netherlands	Wastewater	Struvite	9	547 ton / yr	1M€ < CAPEX < 5M€	56 %
5	Nieuwegein, The Netherlands	Wastewater	Struvite	9	N.A.	CAPEX <1M€	43 %
6	Arizona, USA	Wastewater	Struvite	9	N.A.	CAPEX >5M€	45 %
7	Braunschweig, Germany	Wastewater	Struvite	9	N.A.	CAPEX <1M€	41 %
8	Nieuwerkerke, Belgium	Wastewater	Struvite	9	657 ton / yr	1M€ < CAPEX < 5M€	32 %
9	Helsingborg, Sweden	Digestate from a UASB	Ammonium sulphate	8	36 ton / yr	CAPEX <1M€ (no OPEX provided)	N.A.



Acknowledgements

H2020 ValueWaste
valuwaste.eu



LIFE ENRICH
life-enrich.eu



Further information

(1) Price of ammonium sulphate is significantly increasing in 2022.

(2) OPEX: Opex are simulated using a calculation program with fixed variable costs for each case. This might differ from the original values. Opex is expressed as percentage decrease compared to the traditional approach of removing phosphorus by iron coagulants. This percentage decrease is calculated for 1 kg P conversion to struvite vs 1 kg P conversion to waste sludge using iron coagulants.

The market prices for struvite and ammonium phosphate are expected to raise: by one side, the global demand of P-fertilizers is increasing, on the other side, the cost for traditional (fossil-based) production of ammonium sulphate is rocketing due to its intensive energy requirement. Therefore, nutrient recovery is becoming a competitive process with increasing economic profitability.



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