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Success stories

NuReSys Appeldoorn struvite plant now operational

The NuReSys struvite recovery unit at Appeldoorn (Vallei en Veluwe water board), The Netherlands, is *now operational*. The NuReSys Stripper unit operates on anaerobic digester outflow liquor, upstream of sludge thickening by centrifuges. This optimises the beneficial impact objectives of improved sludge dewatering and reduced polymer consumption in dewatering, and to avoid nuisance deposit risks in sludge dewatering equipment. This is obtained by simply exhausting the magnesium present. After dewatering the effluent is lead to a NuReSys Crystalizer where $MgCl_2$ is added to form struvite. When works engineering upstream of the unit is completed the plant in Apeldoorn will produce about 750 tonnes/year of struvite. NuReSys sell recovered struvite to the fertiliser industry, for example Timac Agro who use it after conditioning as a specialist starter fertiliser for maize, showing high performance results in field crop trials (see SCOPE Newsletter *n°118*).



See NuReSys success story in [SCOPE Newsletter n°115](#).

Robobank selects nutrient recycling innovators

The world's leading food and agribusiness bank, Robobank, has *nominated* 10 innovative agri-food start-ups for *FoodBytes! Boulder*, of which three concern nutrient recycling or food loss minimisation. *Biotech Services Senegal*, will collect, sort, grind, sieve and process urban wastes to produce organic fertilisers, using a specific fermentation process (Biopost). *FreshSurety* addresses food waste for fresh produce (fruit, vegetables, but also cut flowers), with new technology based on sensors of chemical metabolites emitted to air (a high-tech equivalent of sniffing fruit to gauge its freshness) and algorithms enabling to real-time report on freshness and better manage shelf-life and consumer-delivered quality. *Mad Agriculture* will grow black soldier fly larvae on food waste, then convert the larvae into a protein-rich supplement for animal and fish feed, so recycling nutrients. Note: other companies already have full-scale black soldier fly larvae factories operational in Canada and South Africa, see SCOPE Newsletter *n°118*. Another of the ten selected start-ups is *One Hop Kitchen* producing insect-based Bolognese source, but the two projects are not linked.

Policy and regulation

EU Commission call for information on struvite – biochar – ashes

In the context of the future European Fertilisers Regulation (STRUBIAS working group), the European Commission (JRC-IPTS) is calling for input of any information relevant to:

- agronomic value; environmental and health safety; and potential market
- recovered struvite, biochars or ashes (e.g. from sewage sludge incineration, biomass or manure combustion ...)
- use of these materials either as fertilisers or soil improvers, or as raw materials (ingredients) for production of these

The European Commission will use this information to prepare an Impact Assessment (to evaluate whether or not each of these three materials should be included into the future EU Fertiliser Regulation (as CMCs Component Material Categories) and if the impact assessment concludes positively, then draft criteria for this inclusion. All relevant information (publications, data, studies, market estimates, examples of products already placed on the market ...) should be sent EU JRC as below.

Send all relevant information to JRC-IPTS-fertilisers@ec.europa.eu by 15th November, or as soon as possible. If any information sent is company confidential (e.g. product analysis, company market data) then this should be indicated clearly on the sending email. Please send non-confidential information also in copy to info@phosphorusplatform.eu because ESPP is represented in STRUBIAS.

German sludge P-recycling ordinance notified to Europe

The new German sewage sludge ordinance (AbfKlärV), which will make phosphorus recovery obligatory for most of Germany's sewage, has been notified by Germany to the European Commission on September 26th 2016 and may enter into force in early 2018. The ordinance will make phosphorus recovery from sewage sludge obligatory for all German sewage works larger than 50,000 person equivalents (p.e.), that is, around 500 out of a total of c. 9 300 sewage works in Germany. These 500 larger sewage works represent around 2/3 of the total phosphorus removed from German wastewater and transferred into sludge. For these larger sewage works, phosphorus recovery will be obligatory if the sludge contains > 2% phosphorus (dry solids), either by P-recovery from the sludge or by mono-incineration and recovery from sewage sludge incineration ash. If P < 2%, then co-incineration will be authorized. Land application of sludge will only be allowed for sewage works < 50,000 p.e. and will have to respect the quality criteria of the new German fertilizing ordinance (DüV). Currently 29% of German sewage sludge is spread on farmland. The entry into force of these two new ordinances (AbfKlärV and DüV) is expected to be cut this by half.

See ESPP's SCOPE Newsletter in press <http://www.phosphorusplatform.eu/scope-in-print/scope-in-print/1327-german-sludge-p-recycling-ordinance-notified-to-europe> and (in German) <http://www.bmub.bund.de/themen/wasser-abfall-boden/abfallwirtschaft/wasser-abfallwirtschaft-download/artikel/abfklav-klaerschlamverordnung>

EESC Opinion on Fertilisers Regulation

The European Economic and Social Committee has *adopted* its 'Opinion' on the EU Fertilisers Regulation revision. EESC supports the objective of extending the existing regulation from only mineral fertilisers (at present) to cover organic and waste based fertilisers, subject to ensuring environmental protection, underlining that recycled fertilisers "may in the future constitute an important part of an integrated circular economy" (recalling the EESC *Opinion* on the Circular Economy jobs and SMEs, 2014). The need to clarify definitions of a "secondary raw material", waste, by-products, end-of-waste are underlined, pointing to the contradictions in the current text between application to PFCs and CMCs [\$4.2 of EESC Opinion]. EESC wants systems of control, labelling (present in the proposed text) and [\$1.3] traceability (not present). EESC underlines [\$1.9, \$4.5] that municipal sewage sludge has potential and value as a raw material for organic fertiliser – whereas this is excluded in the current regulation proposal. EESC also notes [\$4.8] the need to exempt from REACH recovered materials beyond compost (EESP comment: e.g. digestate see www.phosphorusplatform.eu/regulatory). EESC calls for incentives to support company investments in [\$1.8, \$4.10] in nutrient recycling, in particular for recycling nutrients from livestock manure.

Opinion of the EESC on the EU Fertilisers Regulation Revision, adopted 13-14 July 2016, refs. NAT/691 – EESC-2016-03054-00-01-AC-TRA (EN) 1/8, rapporteur Cillian Lohan <http://www.eesc.europa.eu/?i=portal.en.nat-opinions.39587>

Manure management in livestock intensive regions

Stakeholders and experts from six European regions with high livestock intensity (Brittany, Flanders, Netherlands, Lombardy, Catalonia and North-West Germany) met at the pig production forum organised by COOPERL (France's biggest pig production cooperative), Rennes, Brittany, 13th September. Although production systems and environmental contexts may be very different between these regions, a number of regulatory and market trends were identified, in particular: opportunities to develop markets towards consumers who are prepared to pay higher prices for pork produced respecting animal rights and environmental criteria, phosphorus spreading limits (beyond the 'literal' implementation of the Nitrates Directive which limits only nitrogen), processing manure to enable production of recycled fertiliser products with involvement of new actors (contractors, farmers' cooperatives, organic fertiliser companies) in manure processing and marketing, value of traceability to ensure user (farmer, food industry) confidence in recycled fertiliser products, reducing ammonia emissions, because of both greenhouse gas impacts and local air quality (including PM10 particles).

Summary in ESPP's SCOPE Newsletter in press www.phosphorusplatform.eu

Nordic Phosphorus Network announced by Nordic Council of Ministers

At the Nordic Phosphorus Conference, organised by Danish, Swedish and Norwegian waste associations (DAKOFA, Avfall Norge, Avfall Sverige), Malmö, 27-28 October, a Nordic Phosphorus Network was announced by the Nordic Council of Ministers. Michael Höysti, Secretariat of the Nordic Council of Ministers, underlined that the Nordic countries can and should take the lead in phosphorus sustainability in Europe. He indicated that the new network will provide a platform for phosphorus recycling and reuse, information exchange, and will identify challenges and define a Nordic phosphorus strategy.

A summary of the Nordic Phosphorus Conference and of the ESPP international workshop on organic contaminants in sewage biosolids organised prior to the Conference will be published shortly on the ESPP website "SCOPE Newsletter in press" www.phosphorusplatform.eu Speakers slides are available on the Nordic Phosphorus Conference website <https://dakofa.com/conference/conference/programme/>

European farmers' federation position on Fertilisers Regulation

The EU farmers' and agri-cooperatives' federation COPA COGECA has *published* (ref. FER(16)3924) a position paper expressing concern that the revision of the EU Fertilisers Regulation, by enabling EU marked recycled products to displace existing nationally authorised fertilisers, will increase fertiliser costs and reduce the quality of products sold to farmers. The economic logic is not clear as to how opening the market to new recycled fertilisers products would lead to an increase in price of fertilisers already on the market. The federation also suggests that competition with recycled fertiliser products will make it more difficult for farmers to dispose of their own manure (under Nitrates Directive manure N application limits). COPA COGECA proposes to limit organic carbon to 1% in "inorganic fertilisers", to not reduce cadmium limits below 60 mgCd/kgP₂O₅ (again because of possible cost implications); to oblige declaration of different nitrogen forms and of phosphorus solubility tests, and to impose stricter constraints on organic and organo-mineral fertilisers - composts and digestates (in order to not undermine currently existing stricter regulations in some Member States). COPA COGECA wants processed manure to be a recognised EU fertiliser ingredient (CMC11) and wants digestate to be exempt from REACH – but only for digestates produced from agricultural by-products.

France Nitrates Directive programme approved by Brussels

France has updated its Nitrates Directive Action Programme, intended to prevent agricultural nitrate pollution of surface and ground waters in Nitrate Vulnerable Zones. France was condemned by the European Court of Justice in 2013 and 2014 (SCOPE Newsletter n°107). The updated Programme corrects points raised in the condemnation, five years after initiation of the proceedings by the European Commission in 2011: forbidden manure spreading periods, manure storage prescriptions, forbidding of spreading on frozen soils, accounting of nitrogen from livestock other than pigs and cows. However, the Government's own Environmental Authority opinion considers that the changes are "a minima" to respond to the condemnation, include other non justified changes (e.g. use of simplified nutrient balance on pig farms) and do not appear to correspond to an "ambition to restore ecosystems perturbed by nitrates". The Authority requests an evaluation of the impacts of the Action Programme on eutrophication, water quality, Water Framework Objectives and Natura 2000 areas.

Journal de l'Environnement 30/9/2016 – Arrêté soumis à consultation 2016 – Opinion of the Autorité Environnementale adopted 16/3/2015

Funding opportunities

Two new Horizon 2020 research calls on raw materials

The European Commission (EC) published on 14th October two new research funding calls within the Horizon 2020 research program **Societal** Challenge 5 "Climate action, Environment, Resource Efficiency and Raw Materials". The EC concludes that the EU is highly dependent on raw materials that are crucial for a strong European industrial economy. Securing the sustainable access to raw materials, including metals, industrial minerals and construction raw materials, and particularly Critical Raw Materials (CRM), for the EU economy is of high importance. Call **SC5-14-2016-2017** about "Raw materials Innovation actions" focusses on "sustainable metallurgical processes", and "processing of lower grade and/or complex primary and/or secondary raw materials in the most sustainable ways". The EC wants to stimulate industry to scale-up promising raw materials production technologies and to demonstrate that raw materials can be produced in an innovative and sustainable way. The objective is to make sure that (1) research and innovation end-up on the market, (2) to strengthen the competitiveness of the European raw materials industries, (3) to meet ambitious energy and climate 2030 targets and (4) to gain the trust of the EU citizens to raw materials sector. The other call **SC5-15-2016-2017** about "Raw materials policy support actions" focusses on optimising collection of raw materials data in Member States. According to the EC, one of the major challenges regarding the EU knowledge base on primary and secondary mineral raw materials is the quality, harmonisation of the collected data and information sharing at the different levels within the EU. There is a need to optimise collection of data in Member States in support of the EU Knowledge Base on Raw Materials (EC Raw Materials Information System – RMIS). For both calls the first-stage deadline is 7 March 2017.

EC Horizon 2020 call SC5-14-2016-2017

<http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/sc5-14-2016-2017.html>

EC Horizon 2020 call SC5-15-2016-2017

<http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/sc5-15-2016-2017.html>

Science & media

Update of phosphorus Dietary Reference Intake not justified

A methodical scanning of studies concerning diet phosphorus and health concludes that there is not sufficient evidence to justify updating the US Dietary Reference Intake (DRI) which dates from 1977. The DRI takes into account both recommended minimum intakes (EAR Estimated Average Requirement and RDA Recommended Dietary Allowance) and safe maxima (TUIL Tolerable Upper Intake Level). Here, relevant publications since 1996 were assessed: 127 potential publications were identified, of which 29 were fully reviewed. Papers were rejected because either non-systematic review papers only, addressed mechanisms not outcomes, not relevant to phosphorus – health response or not concerning healthy populations. Only 15 papers were finally identified as relevant, and these do not provide indications that diet phosphorus is linked to health issues such as cardio-vascular disease, bone mineral density. The authors note that the phosphorus DRI was planned for update in 1997, which has not happened, and that this evidence scan concludes that there is insufficient new evidence to prioritise a review of the phosphorus DRI.

"Scanning for new evidence to prioritize updates to the Dietary Reference Intakes: case studies for thiamin and phosphorus", P. Brannon et al., Am J Clin Nutr (AJCN) 2016 <http://dx.doi.org/10.3945/ajcn.115.128256>

Calcium phosphate nano particles inhibit cancer cells

High temperatures are known to transform amorphous calcium phosphates into crystalline forms with lower water solubility. Here tri calcium phosphate (= hydroxyapatite = TCP) was sintered at 700 - 1000°C then tested for inhibition in vitro of MCF-7 strain breast cancer cells. 900°C sintering of TCP produced approximately spherical nanospheres, with less agglomeration and so smaller particle size than at 700 or 1000°C. These nano calcium phosphate particles achieved 80% inhibition of breast cancer cells at 50 mg/l. A differential effect to non cancer cells may be related to higher negative charges on the cancer cells. This study confirms previous work suggesting that hydroxyapatite nano particles can inhibit cancer cell proliferation (Choi 2015, Han 2014, Meena 2012, Morgan 2001).

"Inhibitory Effect of Tricalcium Phosphate Sintered at Different Temperatures on Human Breast Cancer Cell Line MCF-7", M. Rahmian et al., Tehran, Iran, Multidisciplinary Cancer Investigation, January 2017, Volume 1, Issue 1 <http://dx.doi.org/10.21859/mci-01012>

Comparing manure management to reducing livestock numbers

The EU-funded (Horizon2020) TRANSrisk *project* is comparing two possible transition pathways to reduce the environmental impacts of livestock production in the Netherlands: reduction of livestock numbers or integrated manure management (IMM). The

project indicates that livestock production represents 3% of Netherlands GDP, so that reducing livestock numbers would have considerable economic impacts. At the same time, significant action is needed to reduce agricultural environmental impacts are recognised to be needed, including greenhouse emissions, ammonia emissions and phosphates. Mature management is expected to have cost impacts for farmers, to offer the benefit of increasing renewable energy production (anaerobic digestion of manure to produce biogas), and may have some negative side-effects (e.g. reduced animal grazing time, as farmers optimise in-stable manure production to input to biogas). Livestock reduction may not have anticipated positive results if production is simply transferred to other regions of the world. Farmers, manure managers, bioenergy actors and other stakeholders are invited to contact the project to participate.

“Cows and pigs for sale!? Assessing the side-effects of low carbon transition pathways in livestock farming in the Netherlands”, Addendum *JIQ Magazine* vol. 22, no. 3, Oct 2016 Joint Implementation Network (JIN <http://cdn.jin.ngo/>) Climate & Sustainability eise@jin.ngo

Improving digestate fertiliser performance by injection

Short-term (2 year) field tests of digestate in Brescia, Lombardy, Italy, show that it is as effective or more effective as a nitrogen fertiliser than urea, on condition that it is soil injected not surface applied. The digestate was from a biogas plant using as inputs cattle slurry and energy crops and it was applied (surface application and soil injection, whole digestate or liquid fraction) in field trials for two growing seasons on silage maize, with comparison to no fertiliser, urea and animal slurry (both surface applied). Injected digestate gave better crop production than urea, whereas surface application gave slightly lower results. Ammonia emissions were generally slightly lower for injected digestate than for surface urea application, but were higher for surface applied digestate. This study shows that, as for animal manures, application method of digestates is very important, with soil injection offering better N fertiliser effectiveness and lower ammonia emissions.

“Short-term experiments in using digestate products as substitutes for mineral (N) fertilizer: Agronomic performance, odours, and ammonia emission impacts”, C. Riva, V. Orzi, M. Carozzi, M. Acutis, G. Boccassile, S. Lonati, F. Tambone, G. D'Imporzano, F. Adani, *Science of the Total Environment* 547 (2016) 206–214 <http://dx.doi.org/10.1016/j.scitotenv.2015.12.156>

No risk bacterial expected from recovered struvite

An article by Shiba et al. indicates that two strains of *Bacillus subtilis* bacteria were found in struvite (magnesium ammonium phosphate) recovered from raw sewage sludge at East Rand sewage works, South Africa. The process involved extraction of P from the sludge using 1M sulphuric acid at 5%, ion exchange to separate P from ion, then struvite precipitation (at pH 9) and drying for 12 hours at 100°C. The recovered struvite was then tested for bacteria growth (petri dish culture). *Bacillus subtilis* strains were shown to be present, but the authors note that these bacteria exist in the general environment, as well as in human and animal gastrointestinal tracts, so that their presence may have come from laboratory working conditions not from the sewage. The authors also underline that these bacteria are in any case naturally found in humans and soil, so are not a pathogen issue, with no possibility of harm to users of the recovered struvite.

“Extraction and precipitation of phosphorus from sewage sludge”, N. Shiba, F. Ntuli, *Waste Management* 2016 <http://dx.doi.org/10.1016/j.wasman.2016.07.031>

Events

- ❖ 11 November, Berlin, **German Phosphate Platform Forum** <http://www.deutsche-phosphor-plattform.de/veranstaltung/dpp-forum-2016/>
- ❖ 1 December, Brussels, ESPP General Assembly and workshop on **sustainable use and innovative applications of phosphorus in the chemicals industry**. Register: info@phosphorusplatform.eu
- ❖ 15-16 November, Edinburgh, Scotland, **European Biosolids Conference** <http://european-biosolids.com/>
- ❖ 13-15 March 2017, Tampa, Florida, **Phosphates 2017** <http://www.crugroup.com/events/phosphates/>
- ❖ 8-10 May 2017, Marrakesh, SYMPHOS International Symposium on Innovation and Technology in the Phosphate Industry <http://www.symphos.com/index.php>
- ❖ 19 May 2017, Washington DC, North America **Sustainable Phosphorus Alliance (SPA)** stakeholder meeting <https://sustainablep.asu.edu/about>
- ❖ 21 June 2017, Belfast, Ireland **Phosphorus from wastewater conference** <https://phosphorusie.wordpress.com/>

Information and full events listing: <http://www.phosphorusplatform.eu/events/upcoming-events>