European Sustainable Phosphorus Platform

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Workshop on pharmaceuticals and organic contaminants in sewage biosolids

27th October 2016, Malmö (near Copenhagen)

ESPP General Assembly on phosphorus innovation and stewardship in the chemicals industry

1st December 2016, Brussels

Success stories

NuReSys struvite recovery technology chosen at Braunschweig, Germany.
Phosphorus recycling from expired fire extinguishers
Outotec and Thermo-Systems partner for nutrient recycling

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€ 400 million for raw materials in Horizon 2020

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Success stories

NuReSys struvite recovery technology chosen at Braunschweig, Germany.

The Municipality of Braunschweig, assisted by PFI Planungsgemeinschaft GbR, has awarded its future phosphorus recovery plant to the combination Bremer-Pro-Aqua - who is the main contractor and will build the struvite recovery unit - and NuReSys - who provides design, support, start-up and commissioning of the unit. The P-recovery unit will treat 100% of the sewage sludge dewatering liquor from the Steinhof sewage works (275 to 350 000 e.h. biological phosphorus removal EBPR). The requirements of the tender required a versatile and flexible solution: flow to the struvite reactor can vary from 8 to 25 m^3/h and soluble phosphate (P- PO_4) levels between 300 and 800 ppm. The combination offered a tailor-made solution which offers phosphate recovery taking into account the possible effects on post and preceding treatment processes.

Press release: http://www.nuresys-p.be/files/160924-Press-Release-Braunschweig.pdf - http://www.abwasserverband-bs.de/ - http://www.bremerproaqua.de/

Phosphorus recycling from expired fire extinguishers

The PHOSave project (Horizon 2020 SME Instrument), led by PROPHOS Chemicals will construct a pilot plant near Cromona, Lombardy, to recover and recycle phosphate from exhausted fire extinguishing powders. Over recent years, problematic chemicals in fire extinguishers have been largely replaced by phosphate based dry powders, considered as not posing environmental or health issues and effective in combating fire. Phosphates are also widely used as additives to water sprayed on forest and wildland fires, again because they are considered (see e.g. review Kalabokidis 2000) to have minimal health impacts and to generally not harm ecosystems. Prophos Chemicals is Italy's only producer of dry fire extinguisher chemicals of all classes. Fire extinguishers have to be periodically emptied, overhauled, refilled and re-pressurised, to guarantee reliable performance in case of fire. The recovered phosphate will be recycled into the chemical industry or as fertilisers.

Outotec and Thermo-Systems partner for nutrient recycling

Outotec, a global leader in minerals and metals processing technologies, has agreed partnership with Thermo-Systems, German-based leader in low-energy drying solutions. These technologies will enable pre-drying of municipal sewage sludge and other bio-materials (e.g. manures) before thermal treatment, where Outotec can deliver a range of technologies for energy recovery and nutrient recycling. Options include mixing of dried bio-materials with biomass ashes to develop slow-release, organo-mineral fertiliser products. A pilot is under construction, in cooperation with the Finland organic fertiliser producer Ecolan Oy, near Nokia, Finland.

Opportunities

€ 400 million for raw materials in Horizon 2020

The European Commission has published an update of the 2016-2017 Horizon 2020 Work Programme for climate, environment and raw materials, allocating €400 million to raw materials. This will target mainly the EU Critical Raw Materials list, which includes phosphate rock, and will include raw material data systems, international cooperation, the objective of a World Forum on Raw Materials, international networks of raw materials training centres and raw materials 'innovation actions' (pilot projects or scale-up and roll-out of new technologies to produce raw materials).

Horizon 2020 Work Programme 2016 – 2017 - 12. Climate action, environment, resource efficiency and raw materials C(2016)4614 of 25 July 2016

Policy

EU Fertilisers Regulation enters Parliament – Member State discussion

The revision of the EU Fertilisers Regulation will define European criteria for placing on the market of recycled nutrient products (as fertilisers, as soil improvers or as artificial soils), including composts, digestates, plant and crop by-products, food industry wastes, animal by-products and in the future recovered fertiliser products such as struvite or ammonia salts. The draft text published in May 2016 has now entered the European Parliament – Council (Member States) discussion and amendment process. A first proposal for amendments has been published, as a starting point, by Slovakia, the Council Presidency. This includes tighter contaminant levels for both organic and inorganic fertilisers. ESPP is inputting to the discussion process of this text, addressing in particular: the need to include traceability as an option (important to ensure farmer and food industry confidence for nutrients recycled from organic wastes), animal by-products and manures (currently an "empty box" in the Regulation proposal CMC11), workability and definitions of CMCs and PFCs, interactions with REACH …

Summary of Commission proposal: SCOPE Newsletter n° 120 and www.phosphorusplatform.eu/regulatory

Standard for land use of sewage sludge out for consultation

A working draft for an international ISO standard for land application of wastewater biosolids has been circulated for comment (not published online). The guidelines cover sewage sludge and composted sludge application to farmland (for food crops, biofuels), to forestry and for soil remediation. The document considers that land application of biosolids brings advantages of improved soil quality (soil carbon, biological activity, density, stability and porosity, cation exchange enabling reduced fertiliser use and pH), nutrient supply and greenhouse emissions benefits (long-term sequestration of c. 50% of biosolids carbon in soil, offset of c. 200 $kgCO_2$ /dry tonne biosolids for nitrogen and phosphorus mineral fertiliser equivalent. The draft ISO Guidelines provides definitions, general information about biosolids nutrients and quality criteria, and then guidelines for application for food and non-food crops and for land reclamation, including principles of risk management, application programme definition and management, information of farmers and others, and sampling. As proposed, the document provides general outlines within which existing national or local biosolids quality and management schemes can be implemented.

ISO 275/WG4 - ISO 19698 WD "Land application of biosolids: guidelines for the land applications of biosolids and biosolids derived products", dated 5/9/2016. Document not available online: contact your national standards organisation or info@phosphorusplatform.eu

UN Environment Assembly recognises global nutrient challenges

UNEA-2, second meeting of the United Nations Environment Assembly brought together 174 nations and 120 Ministers in Nairobi, May 2016. The final resolutions on Sustainable Consumption and Production (UNEP/EA2/L.9) and on Oceans and Seas (UNEP/EA2/L.11/Rev.1) recognise the need for further action to reduce nutrient inputs to the marine environment. The in 2012 Manilla Declaration is confirmed, mandating action on this by UNEP and GPA (Global Programme of Action for the Protection of the Marine Environment from Land Based Activities). A resolution also recognises the need to address food waste (UNEP/EA2/L.10/Rev.1).

Restriction on ammonium salts in insulation materials

The EU has published a Restriction of the use of "inorganic ammonium salts" in cellulose insulation materials, unless ammonia emissions are shown to be low (specified concentrations and CEN/S 16516 adapted conditions). This concerns ammonium phosphates and polyphosphates used for fire safety in a range of cellulose-based building insulating materials, including recycled materials such as textiles, straw or paper. The restriction follows incidents of ammonia emissions occurring during storage or installation of such materials (not during building use) related to temperature and humidity. Ammonia salts and ammonia gas are not considered to show chronic toxicity but in enclosed spaces can be irritating to throat, lungs and eyes and so pose risks for workers. The restriction as published enables continuing use of ammonia phosphates for fire safety, subject to processing or application which prevents ammonia emissions.

Commission Regulation 2016/2017 of 23 June 2016, amending REACH http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L_.2016.166.01.0001.01.ENG&toc=OJ:L:2016:166:TOC

ECHA consultation on toxicity testing of monosodium phosphate

ECHA (European Chemical Agency) has opened to 17th October 2016 a public consultation on animal toxicity testing of sodium dihydrogenorthophosphate (EC 231-449-2, monosodium phosphate), for reproductive toxicity (extended one-generation reproductive toxicity study). The testing proposal has been submitted under REACH by the producers of this substance, who propose to carry out this testing at their expense. The submission notes that there are no studies available to generate necessary information for REACH chemical dossier endpoints, but that there is no data suggesting toxicity. This phosphate is approved for use in human foods (E339 sodium or potassium orthophosphates) and has been widely used, and indeed will simply dissociate to sodium ions Na^+ and phosphate ions PO_4^- in solution and in the body. The public is invited to submit any comments on the proposed animal testing, or any additional relevant data. The full list of all studies relevant to inorganic phosphates is published by industry at http://www.inorganic-phosphates.org/files/ip-consortium/IP%20Website/Documents/Studies/IP_All_studies_list.pdf

ECHA testing proposal consultation: reproductive toxicity (extended one-generation reproductive toxicity study) on Sodium dihydrogenorthophosphate, EC Number 231-449-2, CAS Number 7558-80-7 https://echa.europa.eu/information-on-chemicals/testing-proposals/current/-/substance-rev/14512/term

EU Organic farming committee positive opinion on recovered struvite and calcined phosphates

The EU's "Expert Group for Technical Advice on Organic Production" (EGTOP) has published its response to two dossiers proposing authorisation of recycled phosphate products as fertilisers in organic agriculture (under EU Organic Farming Regulation 889/2008). The dossier for struvite was submitted by the UK in 2014 and concerns struvite (magnesium ammonium phosphate) recovered in sewage works or from animal waste processing. The dossier for calcined phosphates was submitted by Austria in 2011 and concerns recovery from ashes of sewage sludge, meat and bone meal (MBM), or other biomass ash. The committee concludes that for Ostara Pearl struvite (the submitted dossier) there is no hygiene risk (organic pollutants or pathogens), but that this is not proven for other struvite production methods. Struvite recovery is noted to be conform to environmental objectives (reduces N and P losses to surface waters, recycles nutrients, reduces consumption of non-renewable P resources) and concludes that struvite should be authorised for organic farming "provided that the method of production ensures hygienic and pollutant safety". For calcined phosphates, the committee also concludes that recovery from ashes is conform to environmental objectives (but with some concerns about energy consumption) and that calcined phosphates should be authorised for organic farming subject to being recovered from sewage sludge incineration ash and that heavy metal content should be limited (proposal: chromium(VI) non detectable, other heavy metals "minimised"). However, EGTOP also concludes that these two products cannot be authorised under the Organic Farming Regulation until they are authorised under the EU Fertilisers Regulation, so confirming the importance of the 'STRUBIAS' process underway to integrate such products into the current revision of this Regulation.

Expert Group for Technical Advice on Organic Production (EGTOP) "Final Report on Organic Fertilizers And Soil Conditioners (II)", final version 2 February 2016 http://ec.europa.eu/agriculture/organic/eu-policy/expert-advice/documents/final-reports_en

CEN considers standardisation needs for secondary raw materials

A meeting was organised by CEN (the European Standardisation Committee) and CENELEC (electrical equipment) on 'Standards for circular economy: waste management and secondary raw materials' in Brussels 8th September. Of around 100 participants, ESPP and the paper industry were maybe the only representatives of the bio-nutrient and bio-materials sector. Yet, the need for standards development to support nutrient recycling and valorisation of bio-waste streams was made clear. Some of the day's conclusions are strongly applicable to the nutrient circular economy: need to standardise terminology and definitions, including how to measure the recycling rate, importance of public information (e.g. traceability) to develop trust; potential of EN standards to open markets for export; quality standards for input materials, processes and recycled (nutrient) products; benchmarking to indicate for what uses a recycled product is appropriate. The meeting registered that a number of initiatives are underway or expected: EC mandates to CEN for standards development to support the Fertilisers Regulation revision and the EU Circular Economy Package, interface work to identify gaps and incoherence between fertiliser regulations, REACH, waste regulation; BS 8001 proposed standard "Framework for circular economy principles". This meeting aims to launch a CEN informal process for dialogue on standards for the circular economy, waste and secondary materials, in which ESPP will actively participate.

Science and media

Phosphate fertiliser prices falling

Integer market research consultants suggest that world phosphate fertiliser prices, which have fallen very low, may stop dropping. The current low price level of DAP and MAP (di- and mono ammonium phosphate) has led to a 30 – 50% reduction in China's exports and is pressuring even integrated producers' margins, despite low sulphur and ammonia prices. The consultants suggest that the PotashCorp – Agrium merger announced in North America may push prices upwards. On the other hand, important capacity investments in MENA (Middle East North Africa) soon to come into production will lead to further overcapacity and downwards pressure on prices. ESPP notes that producers of recycled fertilisers in Europe are also facing difficulties, as current low mineral fertiliser prices push down the sale prices of their products.

"What is driving Phosphate markets and have prices stopped falling?" Integer Research 5/9/2016

Evaluation of manure management in Europe

The EU-funded LIFE+ 5-year MANEV project, bringing together 8 knowledge institutes in Denmark, Spain, Italy and Poland, has published its final report assessing the sustainability of manure management systems in Europe. Livestock in Europe generates 1 400 million tonnes of manure per year, containing 7 million tonnes of nitrogen (N) – compared to some 11 million tonnes N applied in mineral fertilisers. The environmental impact cost of ammonia emissions, greenhouse gases and nitrogen losses to rivers alone is estimated at 12 300 million €/year. Treatment systems assessed are: acidification, solid-liquid separation, anaerobic digestion, aerobic biological treatment, composting, evaporation, thermal drying, ammonia stripping and recovery, filtration / osmosis, phytoepuration and land spreading. The report concludes that the appropriate treatment depends on the local situation. Land spreading is the first option where possible (not local manure surplus), that nutrient removal should not be implemented without recovery and recycling, and that aerobic digestion can support nutrient recovery. Also, it is noted that manure acidification will develop if legislation requires limiting of ammonia emissions, solid-liquid separation is important to facilitate nutrient recovery, further work is needed on the quality of recovered products from ammonia stripping, quality standards are needed to develop a market for composted manure, filtration and osmosis are likely to remain limited because of high cost.

MANEV "Evaluation of manure management and treatment technology for environmental protection and sustainable livestock farming in Europe" (LIFE09 ENV/ES/000453), final report, December 2015, 180 pages www.lifemanev.eu

Technology reviews: nutrient recovery from digestate

Vaneeckhaute et al. 2016 summarise the characteristics of digestate are summarised, noting the wide variability, and processing technologies discussed. Most processing starts with solid/liquid separation. A number of nutrient recovery technologies as applicable to digestate are reviewed, looking at technical and economic aspects, and marketability of the end-products as fertilisers: ammonia stripping and adsorption, acidic air scrubbing, membrane filtration, ammonia and phosphorus sorption onto different materials (e.g. natural zeolites), biomass production and harvest, struvite precipitation, calcium phosphate precipitation, phosphorus recovery from ashes/biochar. Ammonia stripping then recovery using acidic air scrubbing and struvite precipitation were identified as the best available technologies. However, ammonia sulphate from the former does not necessarily find a market in liquid form as it is generally produced. Biomass production can be cost effective, but requires a large land footprint. Membrane filtration systems have often suffered technical problems and are not today economically viable for digestate treatment.

Drosg et al. 2015 provide a practical presentation of nutrient recovery from digestates for biogas plant operators and developers, as well as policy makers. The report covers both solid-liquid separation (decanter centrifuge, screw press, belt filters, decantation, flotation and others), processing of the digestate solid and liquid fractions (composting, drying, ammonia stripping, ion exchange, struvite precipitation, membranes, evaporation). A detailed cost analysis for six digestate processing scenarios is provided, concluding that direct land application is most cost effective if locally possible, and optimal processing system is highly site and case specific.

"Nutrient Recovery from Digestate: Systematic Technology Review and Product Classification", 20 pages, C. Vaneeckhaute et al., Waste and Biomass Valorisation, 2016 http://dx.doi.org/10.1007/s12649-016-9642-x

"Nutrient Recovery by Biogas Digestate Processing", B. Drosg, IEA Bioenergy ISBN 978-1-910154-15-1, 2015, 40 pages http://www.iea-biogas.net/files/daten-redaktion/download/Technical%20Brochures/NUTRIENT_RECOVERY_RZ_web1.pdf

EFSA considers data on urea user risks

EFSA (European Food Safety Agency) has published an assessment of urea – safety for users – regarding use under the Plant Protection Products Directive 91/414/EEC. EFSA cite the US EPA conclusions that chromosome aberrations have been noted in some tests and that data does not enable to exclude genotoxicity or carcinogenicity. EFSA notes that data submitted is inadequate to derive acceptable exposure levels for operators (AOEL). Previous EFSA Opinions have concluded that urea is safe for appropriate uses in cosmetics and in ruminant animal feeds.

"Outcome of the consultation with Member States, the applicant and EFSA on the pesticide risk assessment for urea in light of confirmatory data", EFSA 12 July 2016. "Scientific Opinion on the safety and efficacy of Urea for ruminants", EFSA-Q-2004-030 2012.

Agriculture and air pollution

The UK's Financial Times reports that agriculture is Europe's biggest contributor to air-pollution related mortality. Based on a Netherlands government funded study (not yet published), the article states that air around "farming hotspots" can be as damaging to health as in a city with traffic. A key problem is indicated to be ammonia, released from manures in livestock production, manure storage and spreading. Ammonia can combine with other atmospheric pollutants to form particles which can damage the lung and the heart. 94% of Europe's ammonia emissions come from agriculture. A study of 2 500 persons in the Netherlands indicated that people living within <1km of 15 or more farms showed an average 5% worse lung function. Lung health was also negatively correlated to atmospheric ammonia exposure.

"Farming 'hotspots' carry air pollution risk, Dutch study finds", P. Clark, Financial Times, 2 September 2016. Study by Lidwien Smit, Utrecht University, Netherlands.

Dietary choices key to reducing phosphorus footprint

The average Australian diet includes c. 0.67 kgP/day (1.8g phosphorus per day) but with a phosphorus footprint of 4.9 kgP/year to produce this food. The authors calculate that changing to a vegetarian diet with the same protein content would reduce this P-footprint by -72% whilst the diet P intake (and so P in human excreta entering sewage) would increase by +8%. This assumes the same protein intake in the vegetarian diet, which is probably unrealistic as this would mean replacing a 150g of braised steak by nearly 600g of cooked lentils or beans. Even though some authors recommend a 25% higher protein intake with a vegetarian diet, the Australia average protein intake is around 80% higher than needed for health (world average is one third higher).

"Potential impact of Dietary choices on Phosphorus recycling and Global Phosphorus Footprints: the case of the Average Australian city", G. Metson1, D. Cordell & B. Ridoutt, Frontiers in Nutrition, Aug. 2016, vol. 3, art. 35 http://dx.doi.org/10.3389/fnut.2016.00035

Innovative solutions to food waste

The Sierra Club USA magazine highlights ten innovative solutions for food waste. The US is estimated to waste half the food grown, generating 70 million tonnes of food waste per year, containing significant contents of nutrients. Action is however starting in the US, with an official objective announced a year ago to cut food waste by 50% by 2030 and legislation to loosen restrictions and increase tax benefits for restaurants, stores and institutions which donate food. The ten solutions presented by Serra Club support businesses to make food waste minimisation a revenue centre and local government to enable food waste management, provide geolocalisation to bring past-date food to needy charities, ensure marketing of imperfect produce, online exchange of surplus garden fruit and veg, composting of non-edible food waste.

"10 Innovative Solutions to Food Waste" K. O'Reilly, Sierra Magazine, July-August 2016

Workshop on pharmaceuticals and organic contaminants in sewage biosolids

27th October 2016, Malmö (near Copenhagen)

Workshop 8h-12h, in coordination with the Nordic Phosphorus Conference "Phosphorus a limited resource - Closing the Loop" 27th – 28th October, same venue.

The workshop will look at the question of pharmaceuticals and contaminants in sewage biosolids, before and after treatments, and implications for crops and the environment. This is key to the Circular Economy for sewage nutrients and organic carbon. The objective is to assess the current level of information, to identify areas where further research is needed and to define collaborative actions between scientists - waste water / manure / biogas industry – ONG and farmers organisations.

Workshop registration is 75€, free for **Nordic Phosphorus Conference** participants registration on the Conference website https://dakofa.com/conference/conference/ .

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ESPP General Assembly on phosphorus innovation and stewardship in the chemicals industry

1st December 2016, Brussels

New phosphorus chemistry applications in industry – phosphorus in energy storage and renewable energy technologies – recycling phosphorus in plastics, fire safety equipment – green phosphorus chemistry - recovering phosphorus to P_4 or high-grade uses.
Register: info@phosphorusplatform.eu

Events

- 11-12 October, Manchester UK, **European Waste Water Management Conference** (EWWM) http://ewwmconference.com/
- 27 October, Malmö near Copenhagen, **workshop on pharmaceuticals and organic contaminants in sewage biosolids and agricultural application** https://dakofa.com/conference/conference
- 27-28 October, Malmö near Copenhagen, **Nordic Phosphorus Conference** https://dakofa.com/conference/conference
- 15-16 November, Edinburgh, Scotland, **European Biosolids Conference** http://european-biosolids.com/
- 1 December 2016, Brussels, ESPP General Assembly on **phosphorus innovation and stewardship in the chemicals industry**
- 13-15 March, Tampa, Florida, **Phosphates 2017** http://www.crugroup.com/events/phosphates/

Registration information and full events listing:
http://www.phosphorusplatform.eu/events/upcoming-events