Phosphate salts

**Origin:** Phosphorus recovery plants at waste water treatment works

**Recycling pathways:**
- Inorganic fertilizer
- Compound solid inorganic macro-nutrient fertiliser
- Fertilising product blend

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**COMPONENT MATERIAL DESCRIPTION**

**ORIGIN & AVAILABILITY**

Phosphate salts can be produced at recovery plants using sewage sludge or concentrated industrial water as input material. Based on a precipitation process, the recovery unit can be optimized with a biological or chemical acidification step (e.g. STRUVIA™, PULSE). Application from effluent of small waste water treatment plants (wwtp) are also feasible.

Resources of P-salts range from 110 to 250 Mg/year/plant in average, depending on the process implemented, and based on wwtp for 90,000 PE. P-salts recovery plants can be distributed similarly to wwtps, thus following a decentralized approach. A first full-scale implementation with bioacidification is constructed in Schönebeck (2020).

A seasonal variability in quantity and quality can be expected due to the chemistry applied (Mg or Ca based P-salts) and the wwtp original’s process (Bio-P or co-precipitation).

**QUALITY CONSIDERATIONS**

P-salts such as struvite are generally grey and turn to white when dehydrating. A minimum of P₂O₅ content of 16% of the dry matter and a max. organic carbon content of 3% dry matter content ought to be expected. The content of macroscopic impurities, Salmonella spp, E. coli and Enterococcus as well as the further criteria (i.e. as laid down in the STRUBIAS report for P-salts) should be checked.

The end-of-waste status of P-salts is available in some countries and included in legislation. A REACH registration is required in case the P-salts are to be used within the EU fertilising products regulation (still under development).

**INTEREST & VALUE**

P-salts are a valuable source of phosphorus with a very good P-bioavailability. As side effect, a sewage sludge with a reduced P-content is also generated, which can be used within co-incineration plants such as in the cement industry.

**TIPS/BE AWARE**

P-salts are basically suitable for organic agriculture. Their addition to the Reg. 889/2008 Annex I (and FiBl list) is under consideration.

Various business models are existing depending on the interaction of the technology provider with the fertiliser market.

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**RECYCLING PATHWAYS**

As this compound material can be recycled as a fertiliser, the formulations proposed refer to a possible Product Function Category (PFC) according to the numbering set up in the EU-fertiliser Regulation (June 2019). The recognition of precipitated phosphate salts and derivates as compound material category (CMC) for PFC is in process. In any case, the existing national legislation apply.

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Information sheet, September 2020

www.nweurope.eu/phos4you
INORGANIC MACRONUTRIENT FERTILISER – PFC 1(C)(I)

P-salts can be incorporated such as P extracted from P-Rock into granulated water-soluble straight P fertilisers or compounds fertilisers (NPK, NP, incl. Mg).

The targeted users are a.o. the existing fertiliser industries with international market outreach.

A limiting factor is surely the constant and homogenous supply of a minimum quantity (approx. 10 000 Mg P-salts/year). Also clear agreement should be made for the case the P-salts don’t reached the wished quality.

The reliability of a continuous wwtp operation can incite fertiliser companies to use P-salts as input material.

COMPOUND SOLID INORGANIC MACRONUTRIENT FERTILISER – PFC 1(C)(I)(A)(II)

Providing appropriated granulometry, the P-salts are directly usable as compound solid inorganic macronutrient fertiliser (e.g. N-P-Mg) for land application or gardening.

Direct users, such as farmers or landscaping enterprises belong to the target group. Producer of eco-friendly compounds for gardening and horticulture are also targeted to make the products available for hobby gardeners.

Offer and demand might be regulated through storage capacities.

The enabled short chain supply is a main factor in support of this use. For farmers, the application is independent of land registry (contrary to sludge spreading). Hobby gardening is an expanding market that can also foster the reuse of recovered P-salts.

FERTILISING PRODUCT BLEND – PFC 7

P-salts (as inorganics fertilisers) can be mixed with other nutrients to offer a customized balance by adjusting fertiliser inputs to crop requirements.

The targeted users are the fertilisers blenders.

The match between demand and offer can be faced providing storage capacities of P-salts are available.

The increase of the demand of customized fertiliser is a supporting factor for this route.

STAKEHOLDERS MAPPING

This figure shows the main stakeholders that may be involved in the recycling pathways of P-Salts.