CALCIUM-SODIUM-PHOSPHATE FROM SEWAGE SLUDGE ASH CONVERSION WITH THE "ASHDEC®" PROCESS

Keywords:Ash •Thermochemical conversion •mineral fertilizer•high plant available P

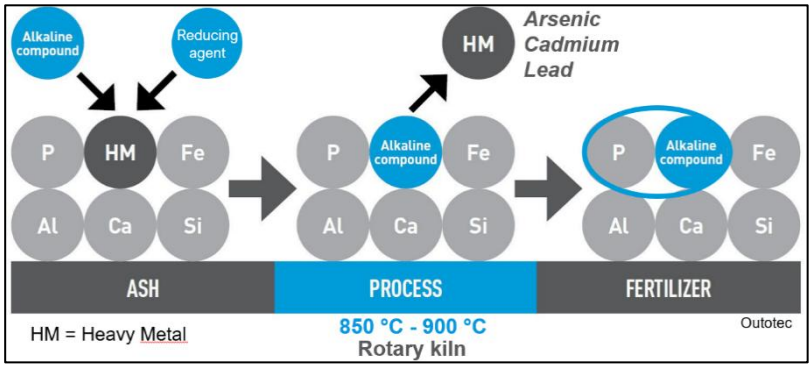
Key facts:

Product Category: PFC1(C): Inorganic fertilizer

- → **Input material:** Sewage sludge ash, sewage sludge, sodium carbonate
- → **General appearance:** After the process, it's a sandy material which is milled and pelletized/granulated in further preparation steps
- → **Nutrient Content (N-P-K %):** 0% N – (15-25)% P_2O_5 – 1% K_2O
  - Depends on the composition of input material
- → **Product status:** advanced development stages
- → **Limitation of application:**Plants should have a minimum capacity of 15.000 t per year
- → **Permit availability**: Recommendation to authorize recovered fertilizers (e.g. from biomass ashes) for organic farming by EGTOPexpert group. (as it is in 01/2020)
- → **Geographical area: Germany, EU 28, worldwide**
- → **Price range:**not commercial yet

Summary

AshDec® is a thermochemical process designed to convert the low plant available phosphorus compound in the ash ($Ca_3(PO_4)_2$) to the highly plant available compound $CaNaPO_4$ while reducing the heavy metal content.The core process encompasses feeding ash to a rotary kiln where it is mixed with sodium compounds and a reducing agent, preferably sewage sludge. The material istreated at around 900 °C for 15-20 min. Sodium ions replace calcium ions in the phosphates and form the AshDec®-product: Citrate-soluble $CaNaPO_4$ compounds. Simultaneously, sodiumreacts with silicon dioxide present in the ash and forms sodiumsilicates.As reducing agent, preferably sewage sludge is added to reduce theoxidized heavy metals. A noticeable high amount of heavy metalsin their elemental form evaporate at the prevalent temperatures.



How to use:

- → **Type of farming**: conventional. Organic possible in future
- → **Cultivation methods:**Vegetable, greenhouse, arable, fruit, ornamental
- → **Recommended crops**: all
- → **Application doses/ha:** Depending on the P-nutrient needs of thecrop and the P-nutrient status of the soil.

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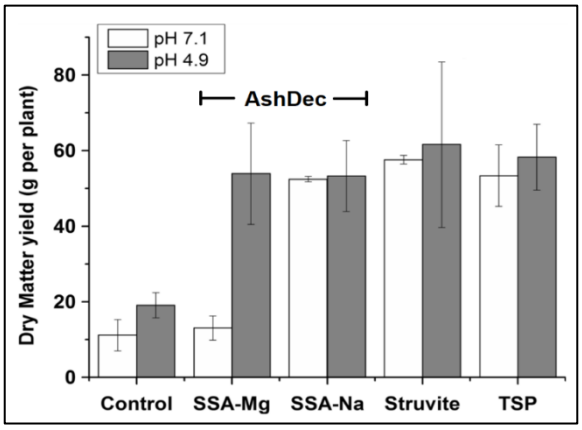
Key product features:

- → Thermochemical P-recovery by improving the plant availability and reducing the heavy metal content
- → Phosphorus fertilizer (~ 15-25 % P_2O_5)
- → Variety of input streams possible (biomass ashes: e.g. sewage sludge, manure, chicken litter)
- → Efficacy tested in pot trails and field experiments
- → Low content of contaminants, e.g. heavy metals (Cd, U, As, Pb), no organic compounds and free of pathogens
- → AshDec (and other ash-based mineral) products are recommended to be authorized for organic farming

Key product benefits:

- → P-content highly soluble in neutral ammonium citrate> 80 % as a Calcium-Sodium-Phosphate
- → Not soluble in water → reduced risk of runoff, leaching and fixation
- → P-supply on demand: Release of P only in presence of crop root exudates
- → Fertilizer performance comparable to Triple-Superphosphate

Pot tests with spinach by University of Bonn, 2019 [not published]



Dry matter yield of pot experiments with maize (SSA-Mg: AshDec with $MgCl_2$; SSA-Na: AshDec with Na_2CO_3; TSP: Triple-Superphosphate) [Vogel et al. 2017]

Competitive position and advantages:

- → The AshDec process is a robust technology to convert low plant available phosphorus compounds in biomass ashes (e.g. sewage sludge ash) to highly plant available phosphorus compounds
- → P-Recovery rate > 95 %,
- → No hazardous input/output material
- → No to very little amounts of residues, no by-products
- → Compared to conventional phosphorus fertilizer production: Similar greenhouse gas potential and cumulative energy demand and lower potential for terrestrial acidification [Kraus et al. 2019]

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