

07 December 2020

AshDec[®] Thermochemical P-Recovery from Sewage Sludge Ash

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AshDec[®]

Metso:Outotec

Metso Outotec in brief

Metso Outotec is a frontrunner in sustainable technologies, end-to-end solutions and services for the aggregates, minerals processing, metals refining and recycling industries globally.

By improving our customers' energy and water efficiency, increasing their productivity and reducing environmental risks with our process and product expertise, **we are the partner for positive change.**

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* Illustrative combined in 2019.



4.2
billion euro
sales*



50+
countries with
presence



15,000+
employees, 80+
nationalities



150 years of
expertise in mining
and metal

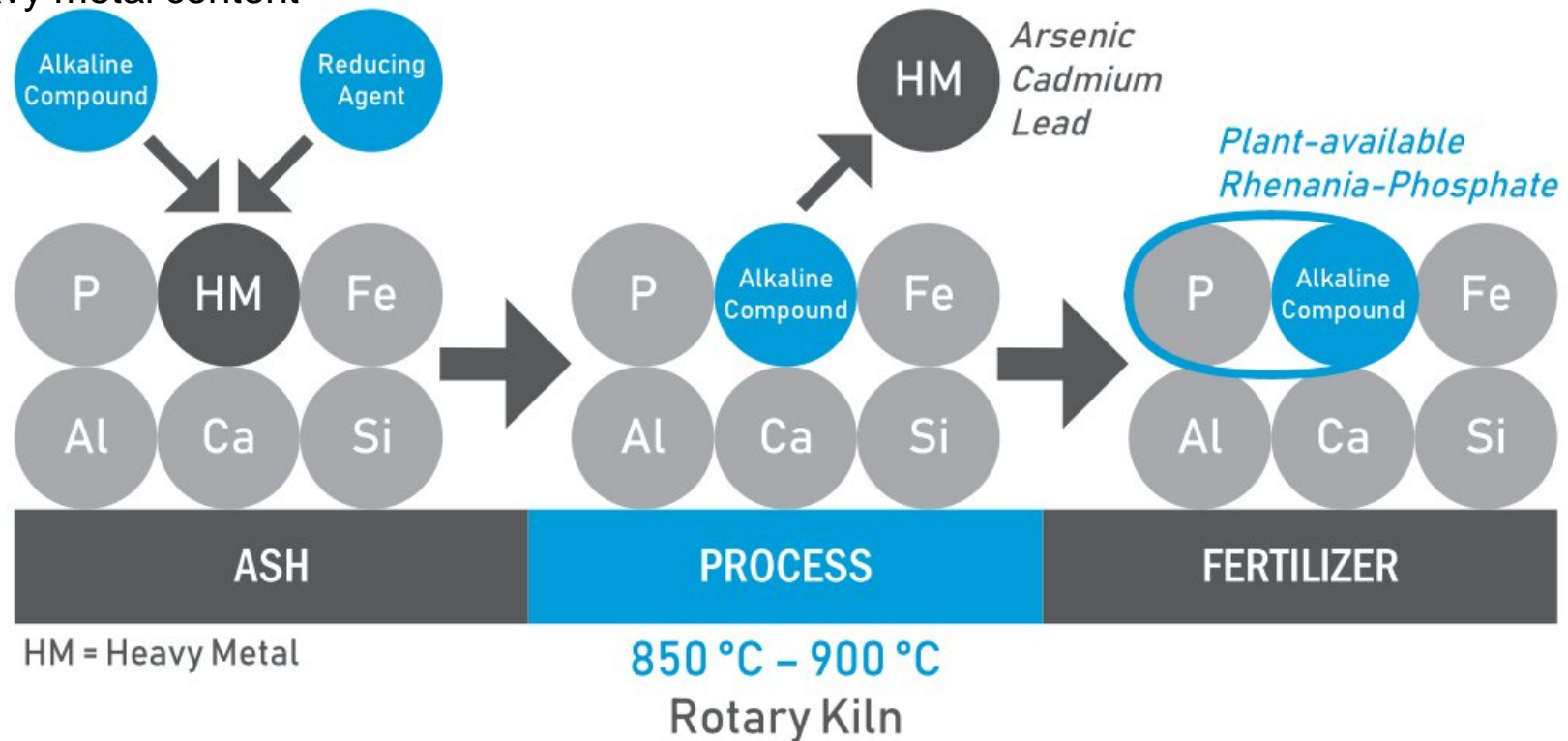
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P-Recovery with the AshDec® - Process

Why do sewage sludge ashes need to be treated with a P-Recovery technology?

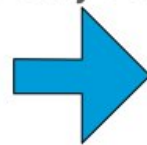
- Low plant availability of Phosphorus compounds and eventually
- Heavy metal content



HM = Heavy Metal

850 °C – 900 °C
Rotary Kiln

- Poor plant availability of Phosphorus
- Ash contains heavy metals (HM)



- Highly plant available phosphorus
- Reduced heavy metal content

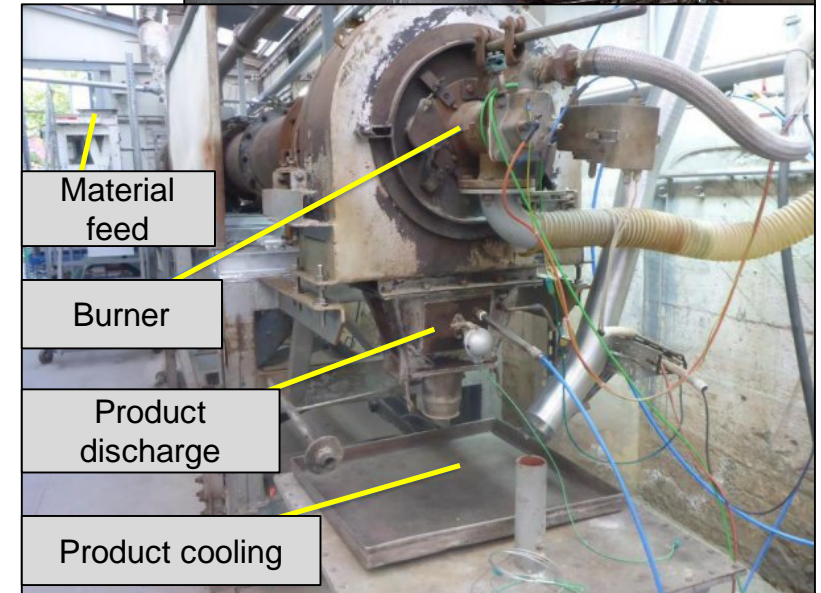
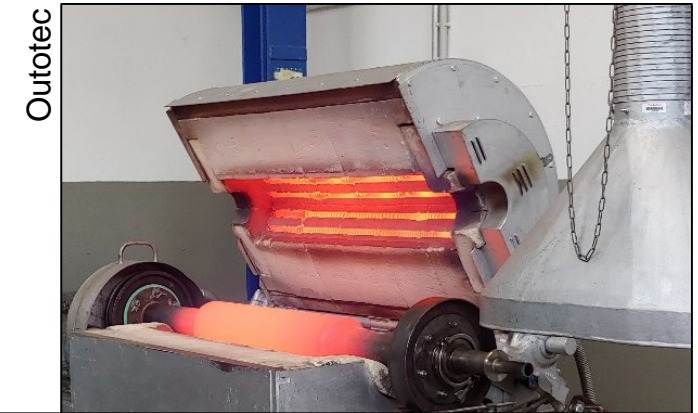
Test work: Laboratory and semi-industrial scale

Target

- Increasing the solubility of phosphorus in neutral ammonium citrate (P_{NAC})
- P_{NAC} is a common indication factor for the plant availability of a phosphorus compound
- Removal of heavy metals
- Production of 1,5 t P-fertilizer (~20 kg/h)

Variation of process parameters

- Additives (Na_2SO_4 ; $NaHCO_3$; Na_2CO_3)
- Na:P - ratio (2 steps)
- Temperature (850 °C - 1.000 °C)
- Retention time



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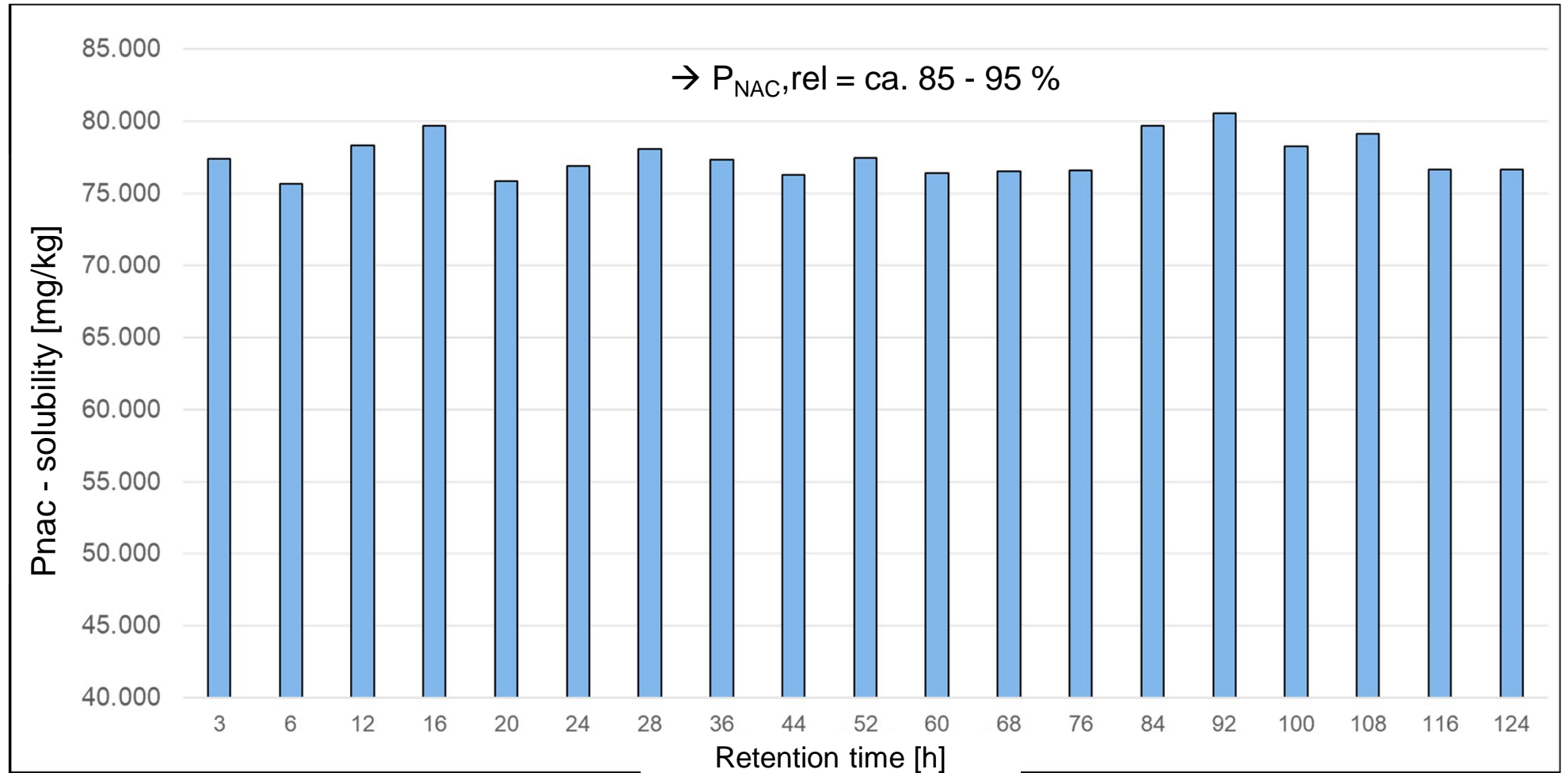
Vorstellung des AshDec® - Verfahrens

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Results: Semi-industrial scale 2020

Production



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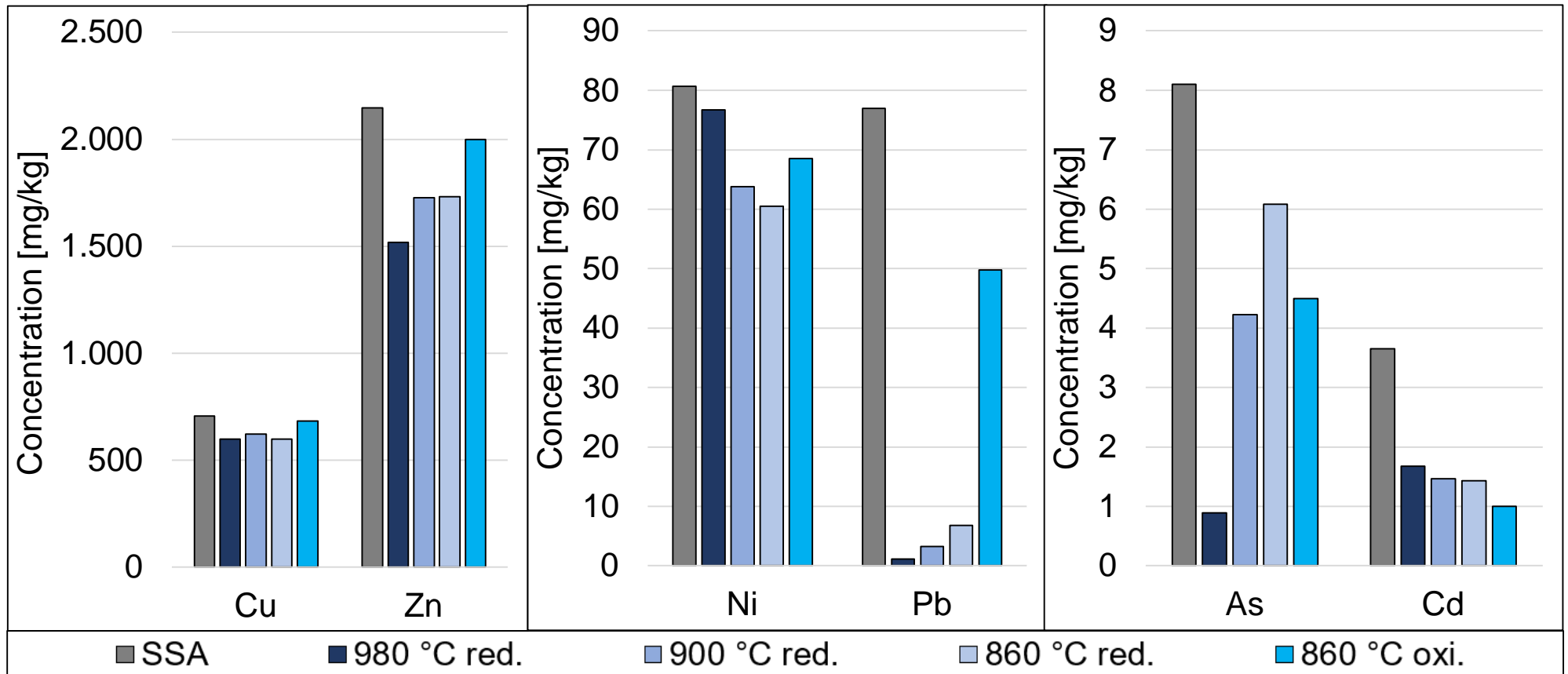
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Preliminary results: reduction of heavy metals

➤ NaHCO₃ used as additive



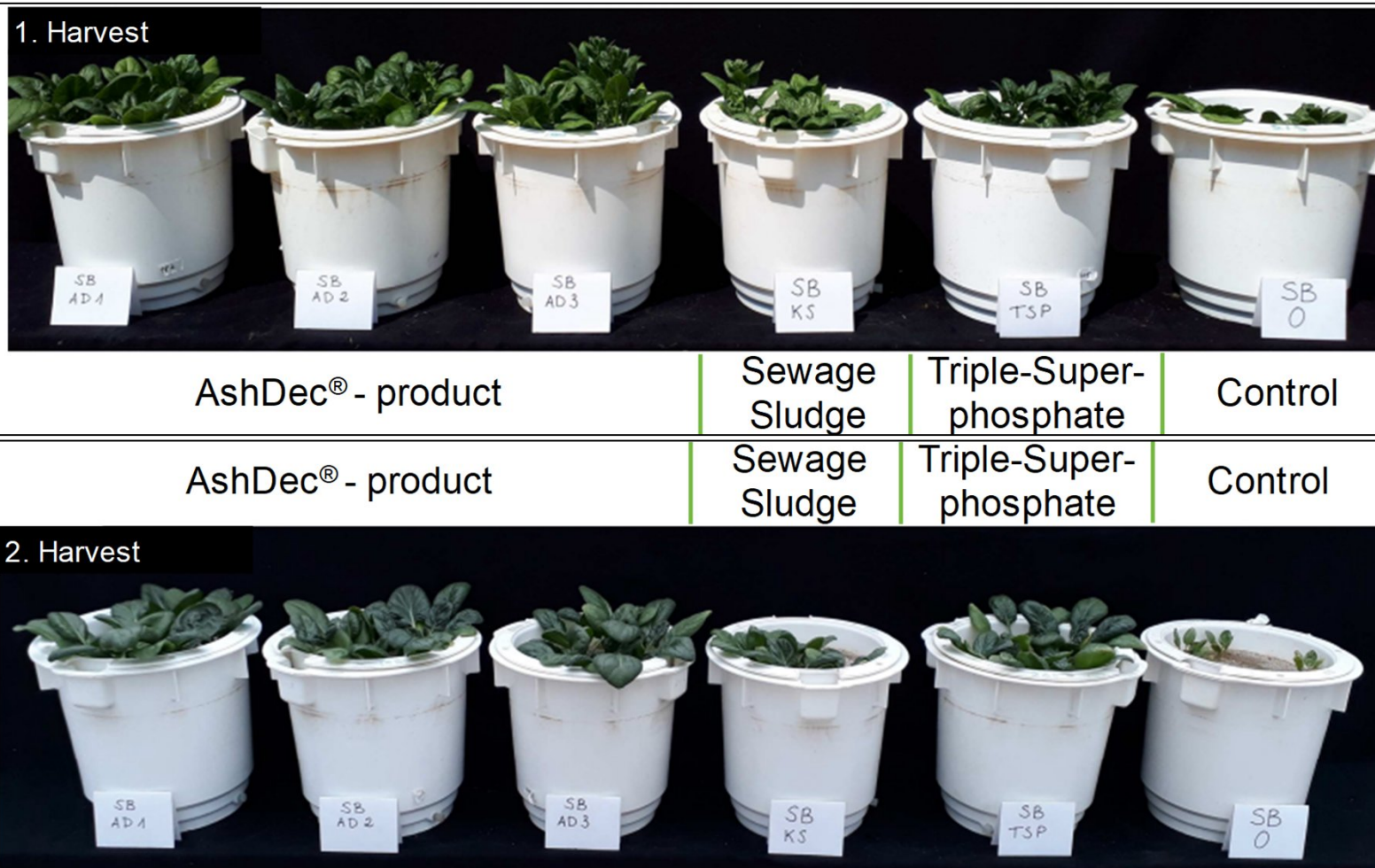
The product of the AshDec® process

- Phosphorus fertilizer (~ 15-25 % P_2O_5)
- Not soluble in water → reduced risk of runoff, leaching and fixation
- Solubility of phosphorus in neutral ammonium citrate (P_{NAC}) > 80 %
- P-supply on demand: Release of P only in presence of crop root exudates



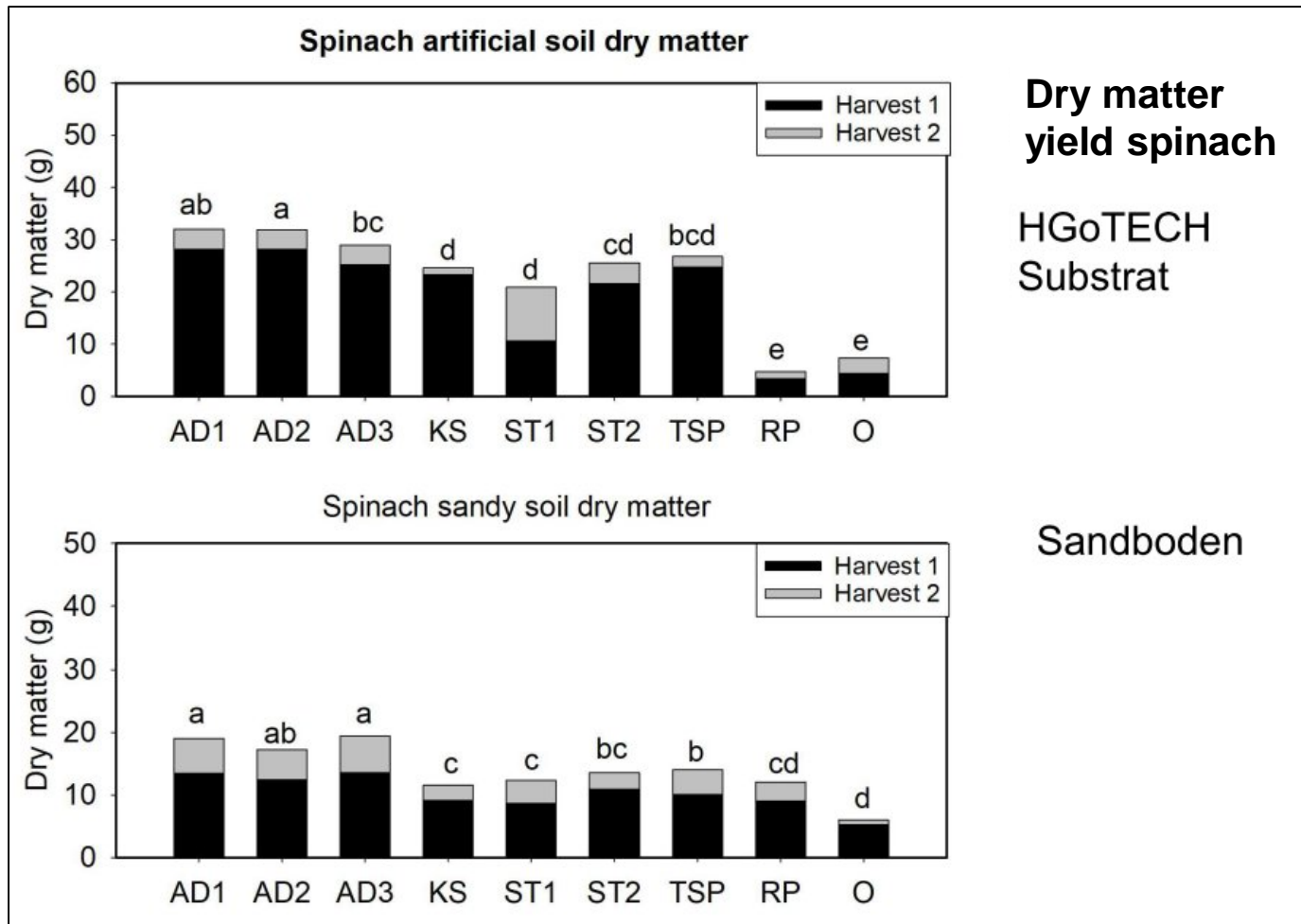
The product of the AshDec[®] process

Spinach, Pot tests, University of Bonn. 2019



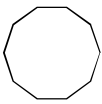
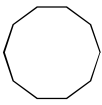
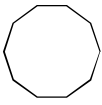
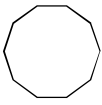
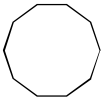
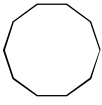
The product of the AshDec® process

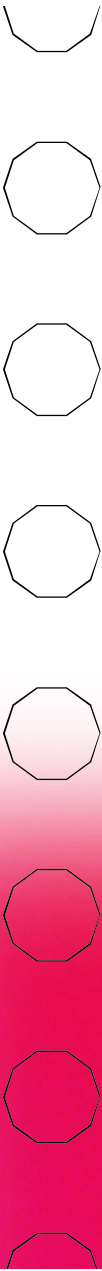
Spinach, Pot tests, University of Bonn. 2019





Summary

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- Thermochemical P-recovery by improving the plant availability and reducing the heavy metal content with AshDec®
 - Product is not water-soluble, but highly citrate-soluble → smaller environmental footprint
 - Advantages: P-Recovery rate > 95 %, no hazardous input/output materials, lower chemical consumption, no or very little amounts of residues, no by-products, comparable or lower CapEx and OpEx compared to other ash processes
 - Next steps for AshDec®: Participation in the German project “RePhoR”. Objective: To build a full-scale demonstration plant for phosphorus recovery in Germany (2020-2025)



Partner for positive change