

Phos4You

PARFORCE-process

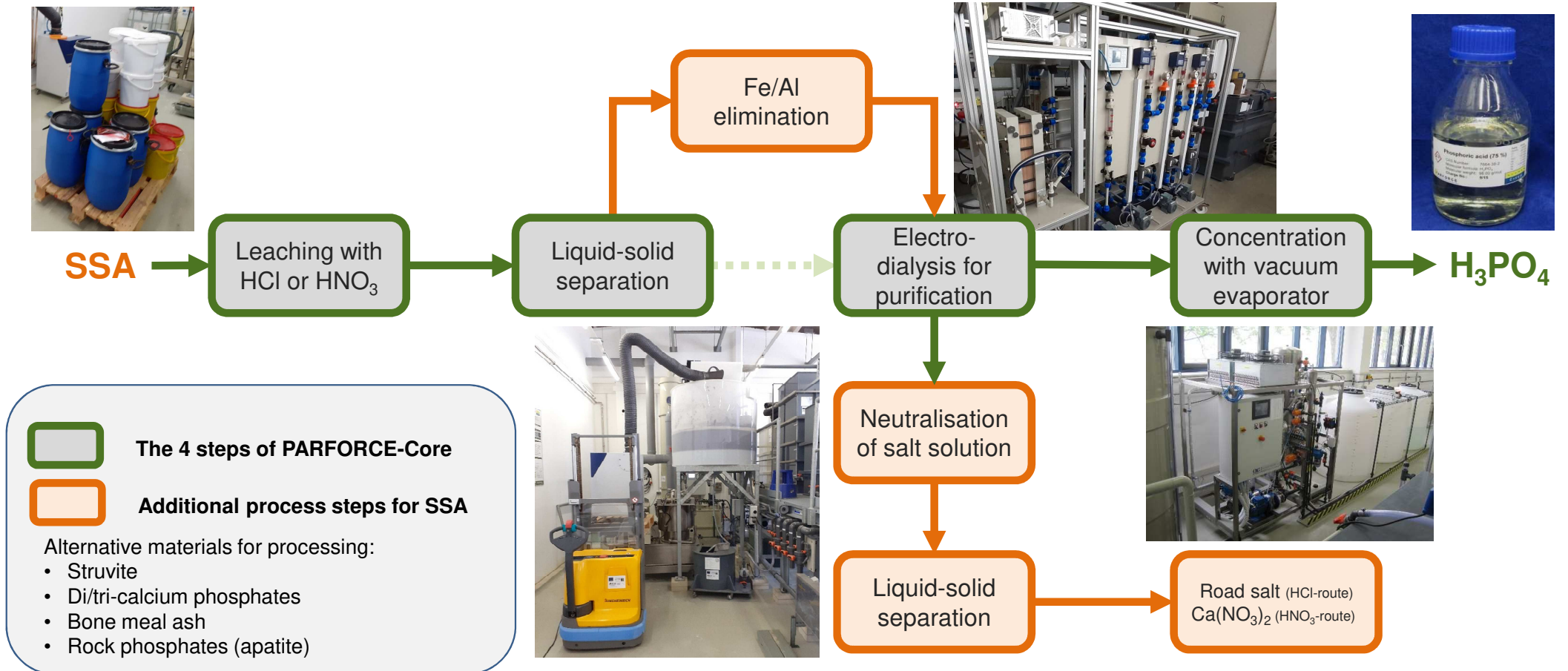
Results of trials with
sewage sludge ash
of
Emscher-Lippe-Region



Essen, September 22nd 2021

The PARFORCE-Technology principle

Gaining P-acid from a variety of primary & secondary resources containing P



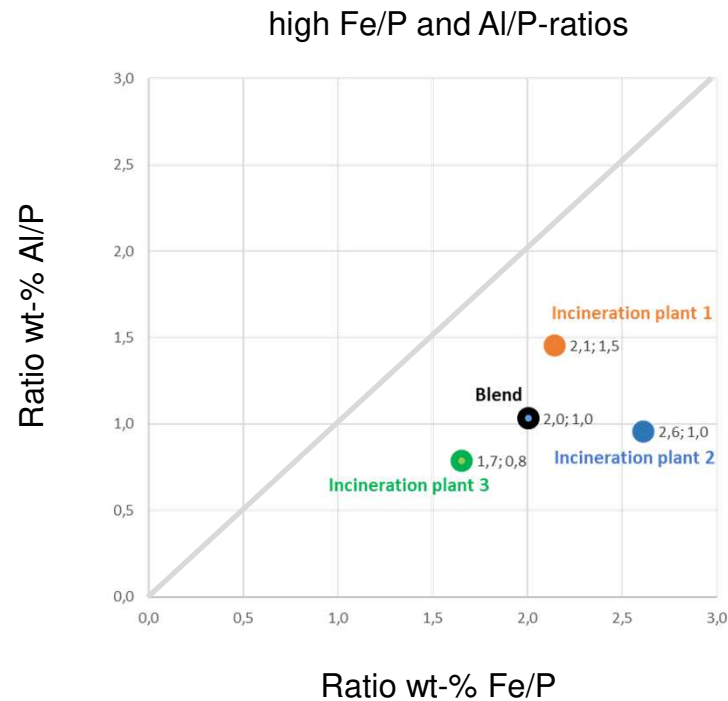
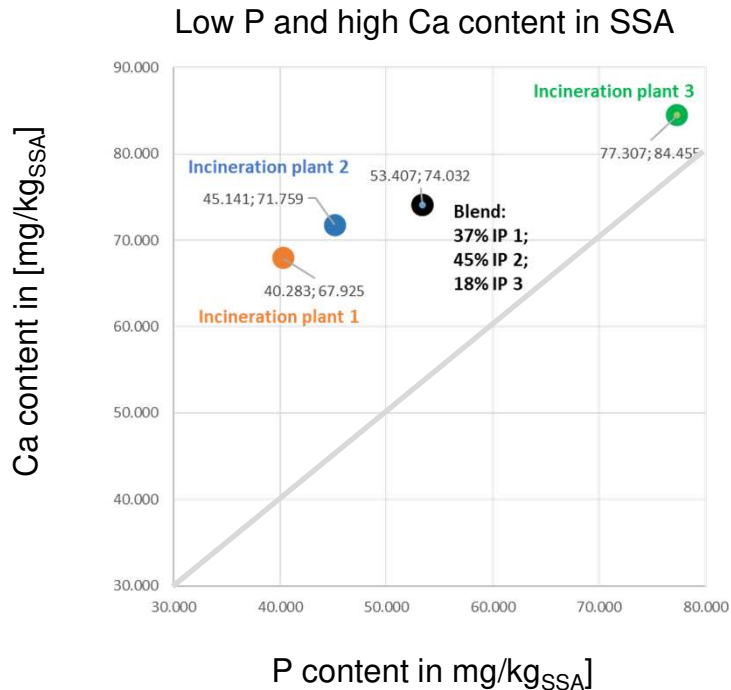
Processing a blend of ash from 3 different incineration plants

Task: producing high quality P-acid from challenging sewage sludge ash

Unfavourable SSA: low P content and high concentration of impurities

- Blend contained only 5,3% P in DM and 7,4% Ca
- Ratio (Fe+Al)/P above 3
- High concentration of heavy metals (especially Pb, Ni, Zn)

- SSA from IP 3 shows average composition of incinerated of municipal sewage sludge

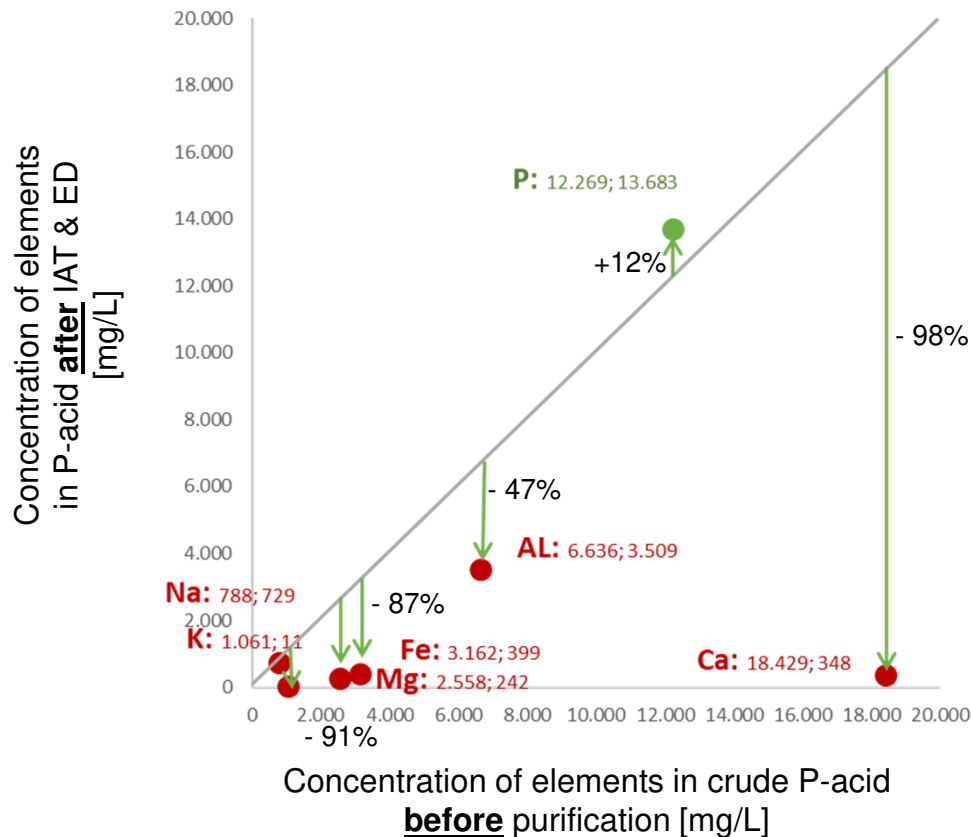


- SSA 1 + 2 show far more unfavourable composition than average
- All ash samples showed in at least one HM parameter limit exceedance
- None are suitable for use as or in fertilizer according to German Fertilizer Act

Purification of crude P-acid from leaching liquor

Demonstration trials showed even better results than laboratory trials

Change in concentration of elements



Removal of impurities in electro-dialysis from leaching liquor after Fe/AL-separation (core process step):

- Increase in P concentration due to hydrate shell transportation
- Decrease in concentration of leached impurities:
 - Ca, Mg, K: >> 90%
 - Fe: 87%
 - Al: 47%
 - HM: most below detection level (< 5 ppm)
 - Cu: 94% (< 7 ppm)
 - Zn: 98% (< 6 ppm)

P recovery rate way above legal requirement of 80% (actual transformation into product)

- Reliable mass balance
- Purity H₃PO₄: 88,5 %; increase to 99,7 % with simple measures after ED shown (mainly decrease in Al)
- By-product: road salt meeting strict requirements

Conclusions

- Scale up trials in PEC's Demonstration plant showed even better results than laboratory tests due
 - to higher masses processed
 - better use of capacities
- PARFORCE is suitable to meet upcoming German legal P-recovery requirement for even the most challenging SSA
- Unfavourable composition of SSA of Emscher-Lippe-Region poses no problem for PARFORCE
 - >> 80% recovery rate, minimum purity of P-acid 88,5%
 - Increase of purity of P-acid up to 99,7% with simple measures demonstrated
 - By-product: road salt meets all requirements for marketing
- Trials delivered consistent mass balances and allowed reliable cost estimates

Project responsibilities at PEC



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