



*Sustainable
phosphorus
recycling*

Gunnar Thelin 2023-09-28



EKOBALANS

EkoBalans solutions for sustainable nutrient and carbon recycling

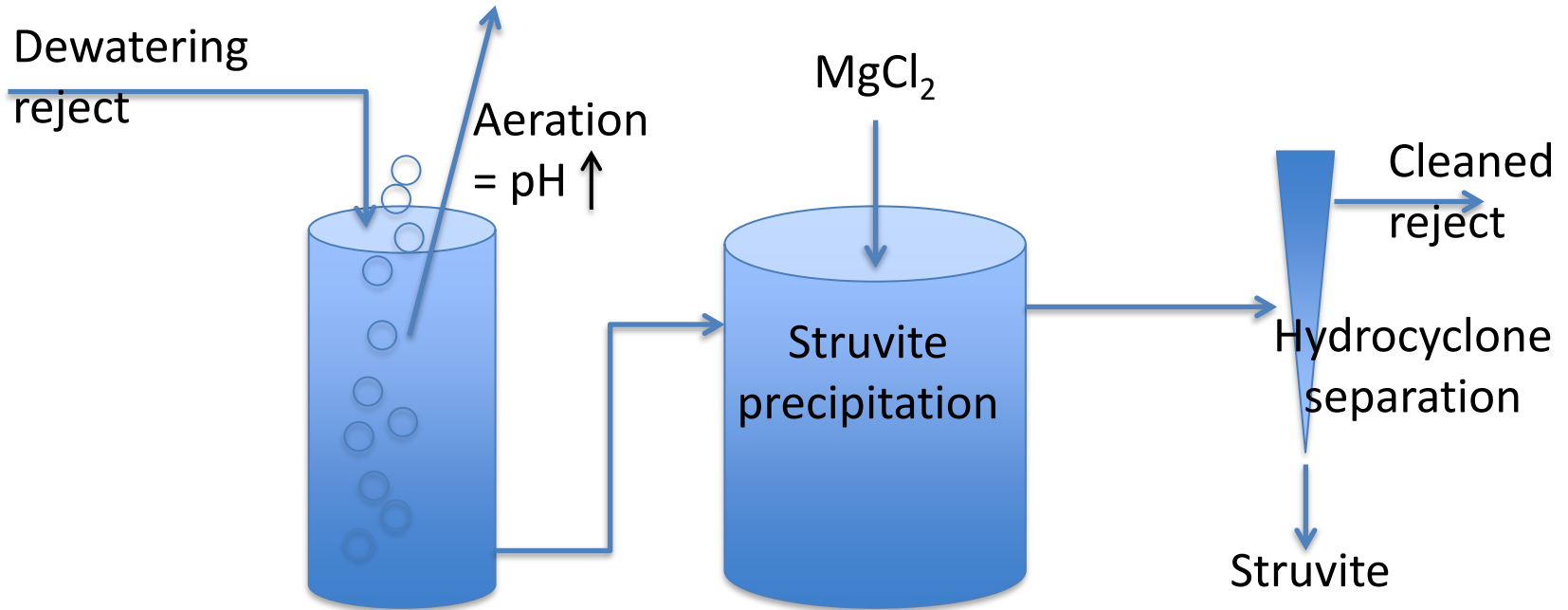
- eco:P - Phosphorus extraction as struvite ($\text{MgNH}_4\text{PO}_4 \cdot 6\text{H}_2\text{O}$)
- eco:N – Nitrogen extraction as solid ammonium sulfate ($(\text{NH}_4)_2\text{SO}_4$)
- eco:S – Drying and pyrolysis of sludge and other organic residues with cadmium removal
- Digestate refining concepts
- Fertilizer and soil improvement products and concepts



Solutions are adapted to

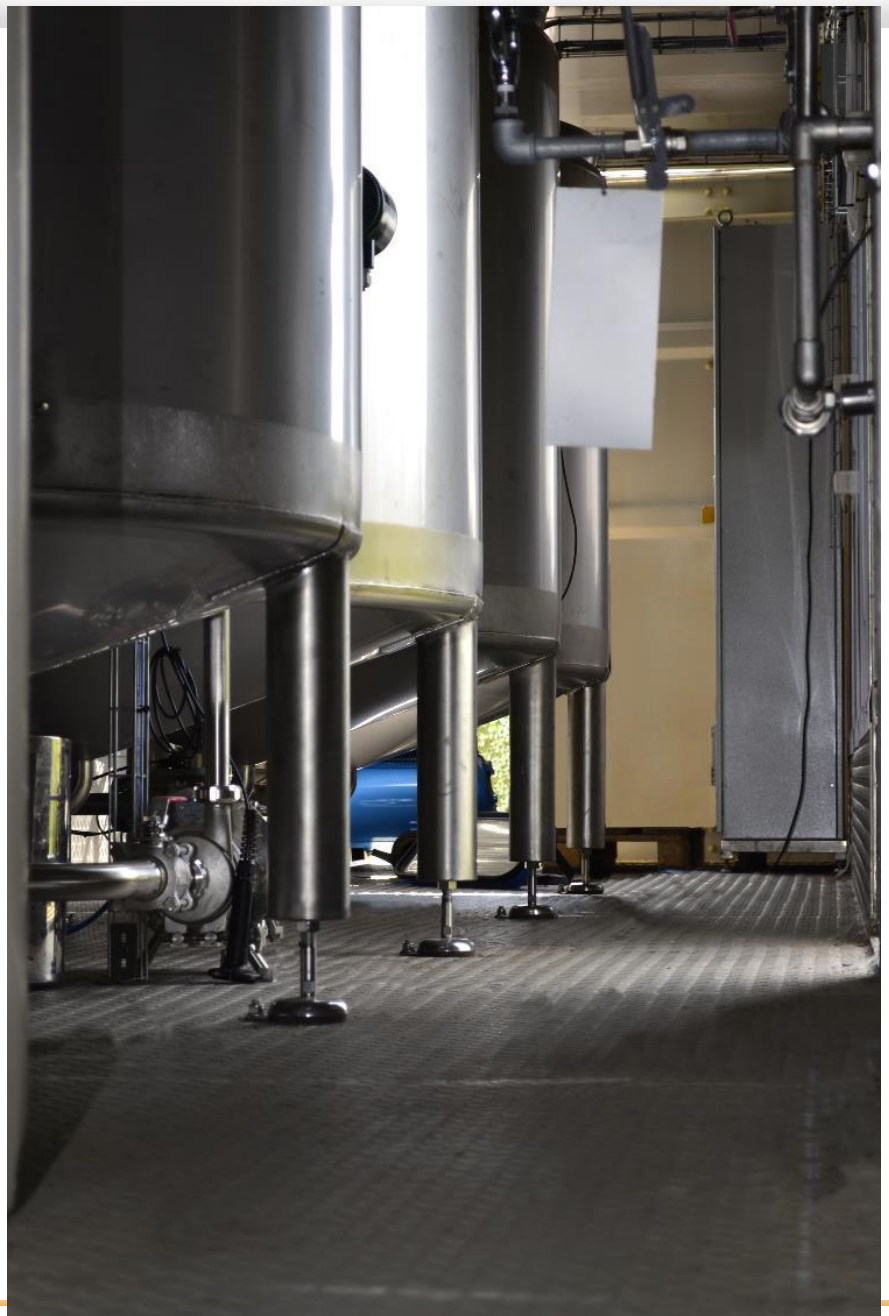
- *residue properties*
- *market options*
- *local circumstances*

The eco:P process



The eco:P process

- Batch-based struvite precipitation with very short retention time *and* high recovery = small footprint
- 90 % P removal at <30 min retention time and pH 8
- Separation of micro crystals: suitable as raw material for fertilizer production

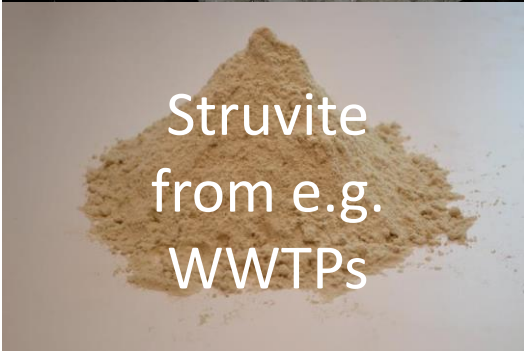
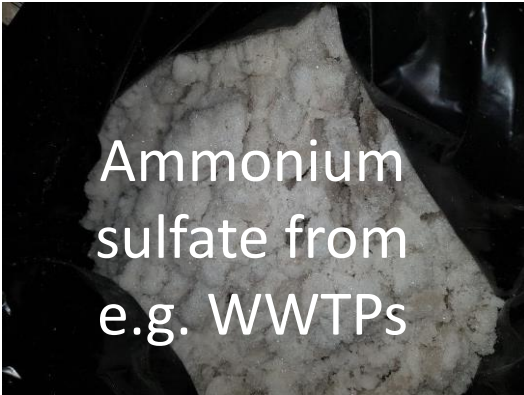


eco:P-extracted struvite



- Microcrystalline powder
- Raw material for recycled fertilizer production
- 12,5 % P; 5,5 % N; 9,5 % Mg
- High nutrient plant availability
- Cd below detection limit
- Other heavy metals in lower concentrations than in artificial fertilizers

Circular, soil health promoting fertilizers

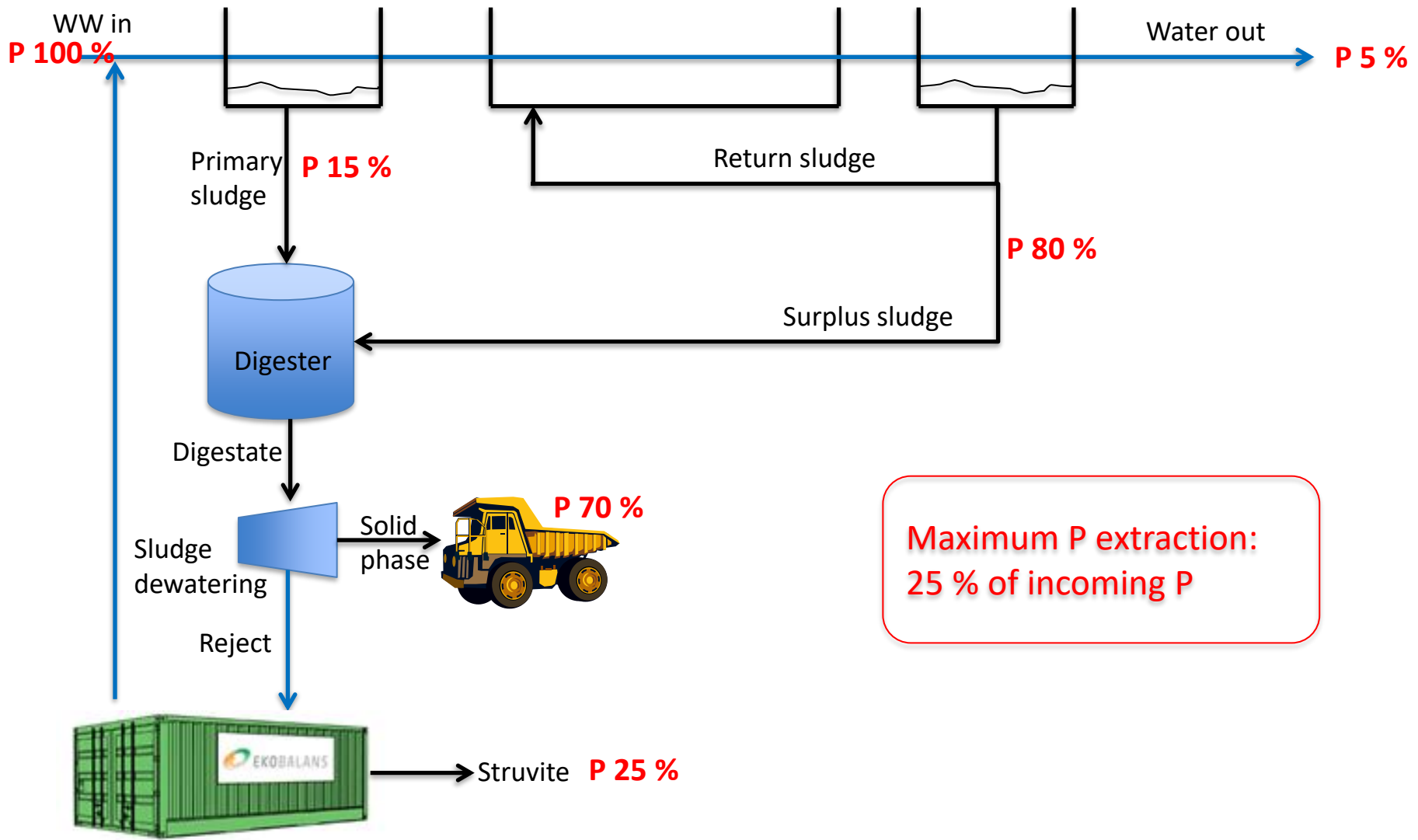


Pelletized fertilizer products

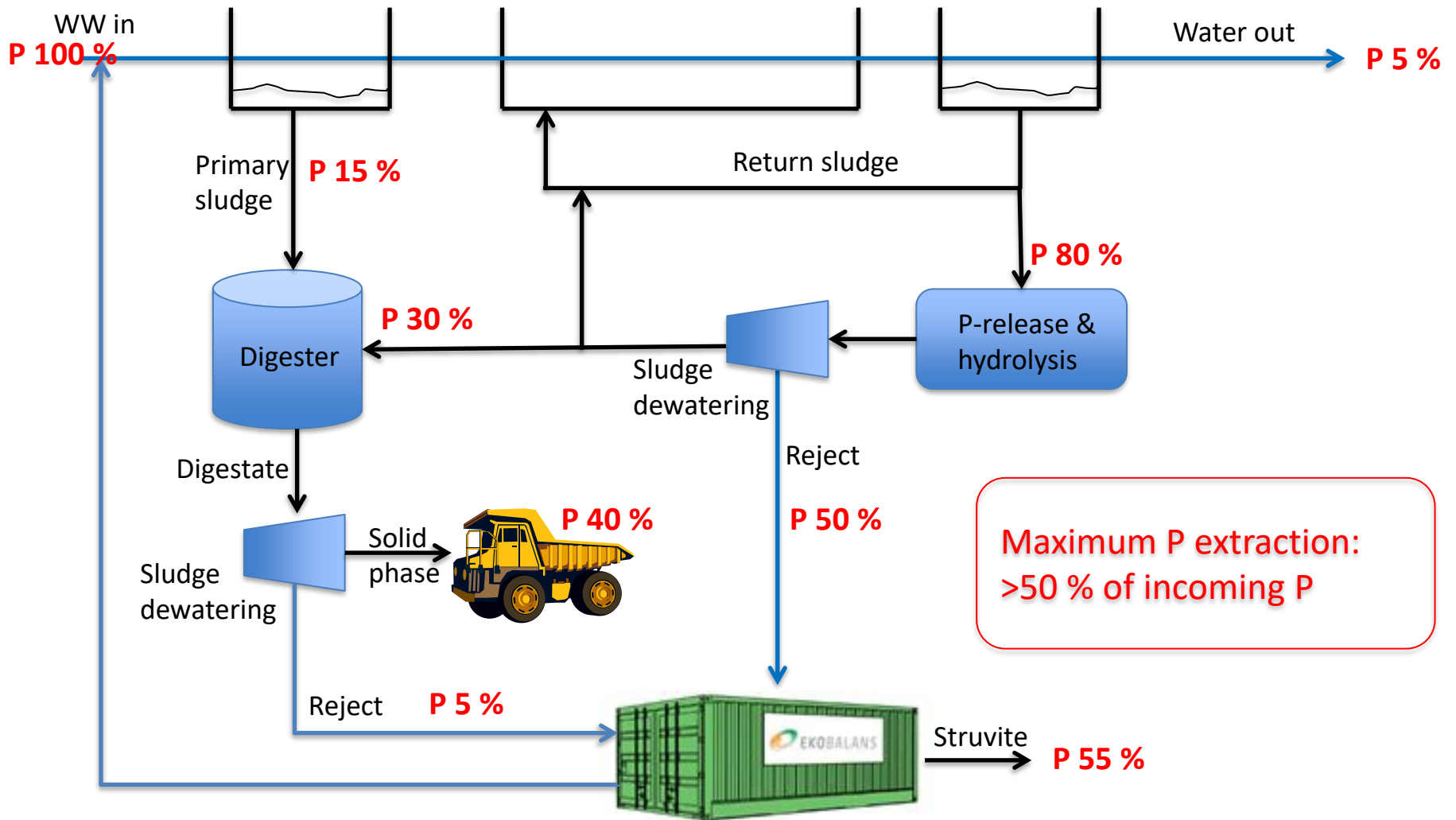
- Pelletization technology adapted to the raw materials
- Complete and balanced content optimized for long term sustainable plant production
- The organic matrix improves nutrient use efficiency and promotes soil health
- Can be spread with existing farming equipment



Struvite precipitation on final sludge dewatering reject at WWTPs with Bio-P



Integrated system: struvite precipitation on biosludge dewatering reject before digestion

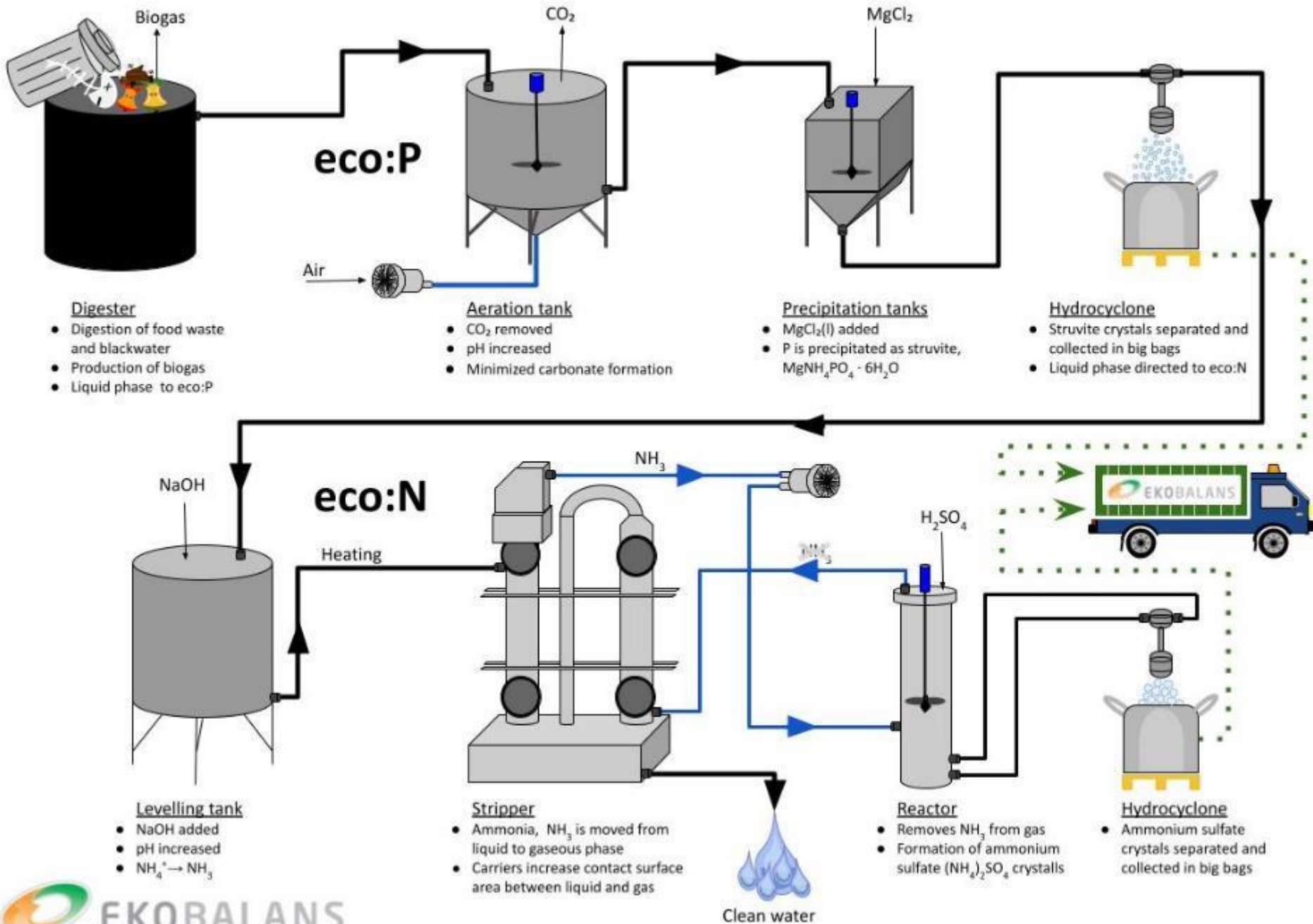


Economy

Economy at conversion from chemical to biological phosphorus removal and eco:P installation at a 100.000 p.e. WWTP

OPEX struvite extraction	€/yr	15 000
Revenue for sold struvite	€/yr	30 000
<u>Cost reduction</u>		
- Chemicals	€/yr	130 000
- Sludge disposal	€/yr	100 000
- Energy savings	€/yr	70 000
- Nitrogen removal	€/yr	55 000
Net improvement	€/yr	370 000
Investment eco:P	€	900 000
ROI	yrs	2,4

EkoBalans' RecoLab installations





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