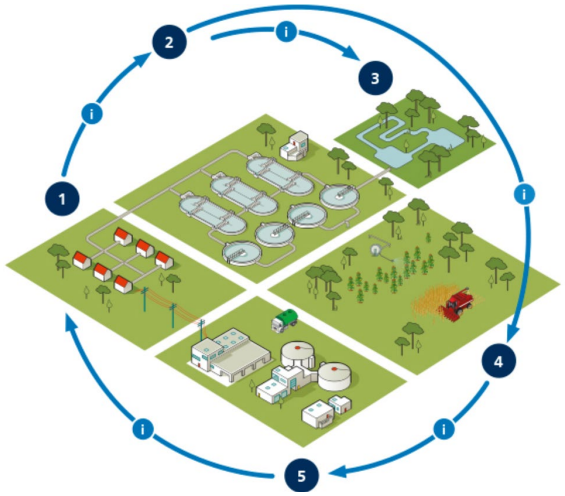
#1. Braunschweig

Germany



Circular solutions for

Materials

Energy

Relevant data

WWTP (actual load: 350,000 PE)

Relevant sectors

- Water treatment
- Horticulture
- Energy

Lead partner:

Abwasserverband Braunschweig

Other partner:

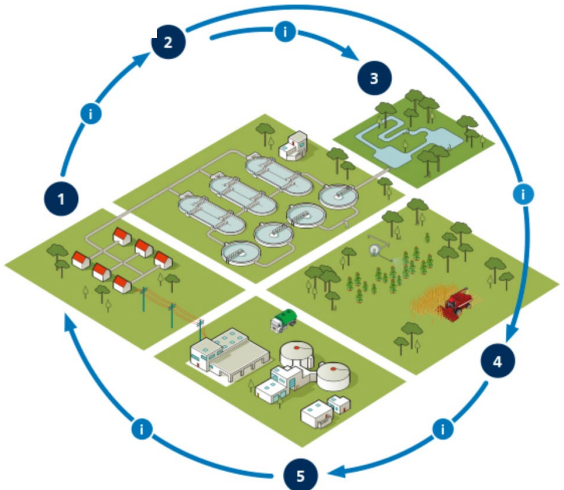
KOMPETENZZENTRUM Wasser Berlin

1. Objectives of the NextGen solutions

Starting status of sludge treatment at the WWTP:
three full-scale one-stage digesters

NextGen solution implemented in the sludge treatment:
1. Two-stage digestion system
2. Thermal pressure hydrolysis (TPH) between the two stages
3. System for struvite precipitation
4. System for ammonium sulfate production

Benefits of thermal pressure hydrolysis:
- Higher methane yield in second digestion stage
- Improved dewatering process of digested sludge
- Increase in dissolved phosphate and ammonium concentration

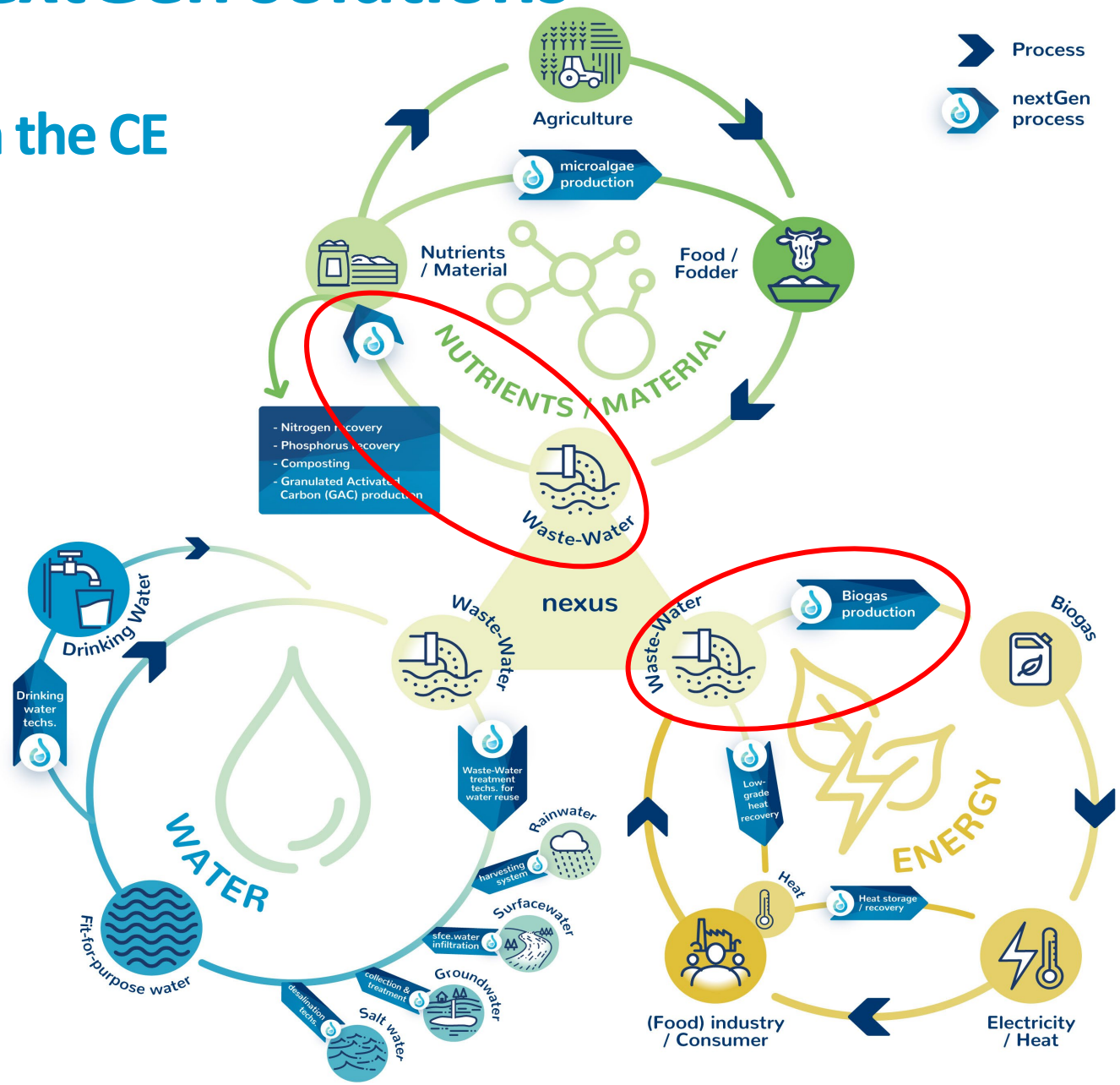


1. Objectives of the NextGen solutions

Positioning of demo case within the CE

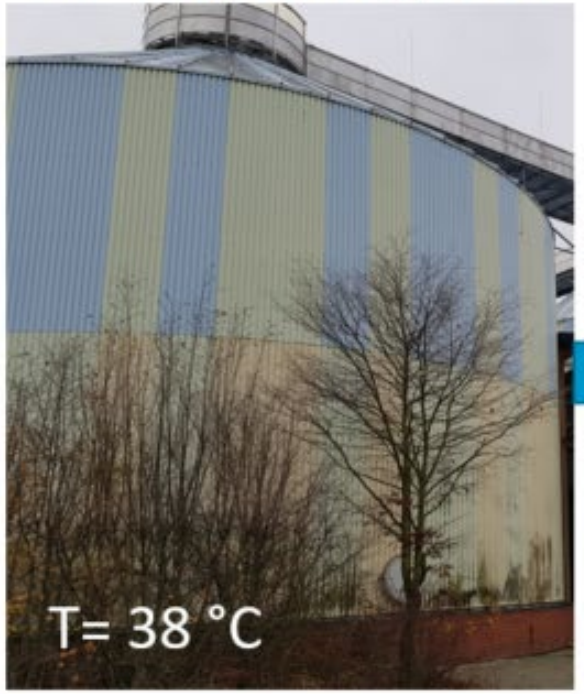
Technology Evidence Base (TEB).

Braunschweig



2. New NextGen solutions: Two-stage digestion system and TPH

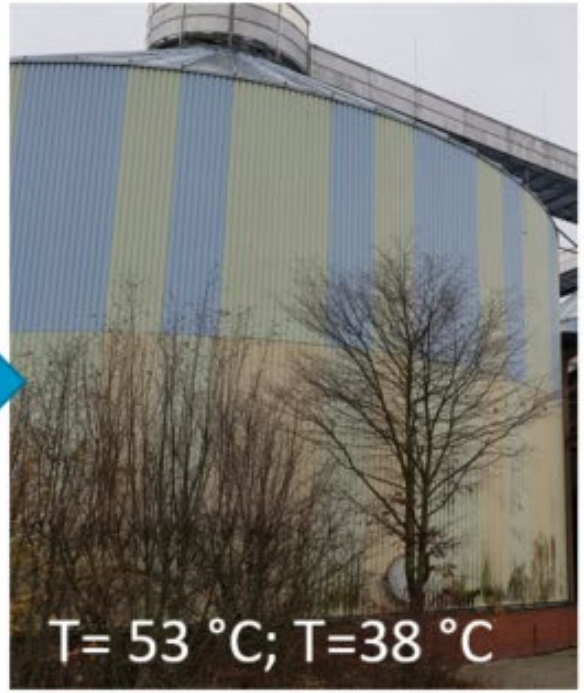
1st stage: 1 digester



Thermal pressure hydrolysis (TPH)

T= 150 °C, p= 4.5 bar

2nd stage: 2 digesters



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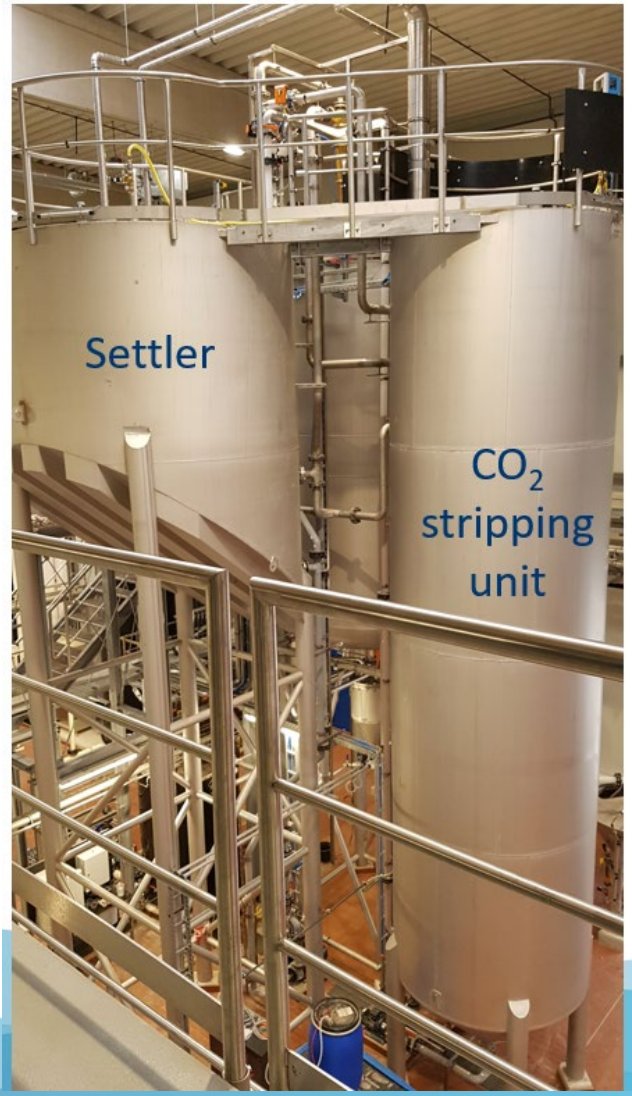
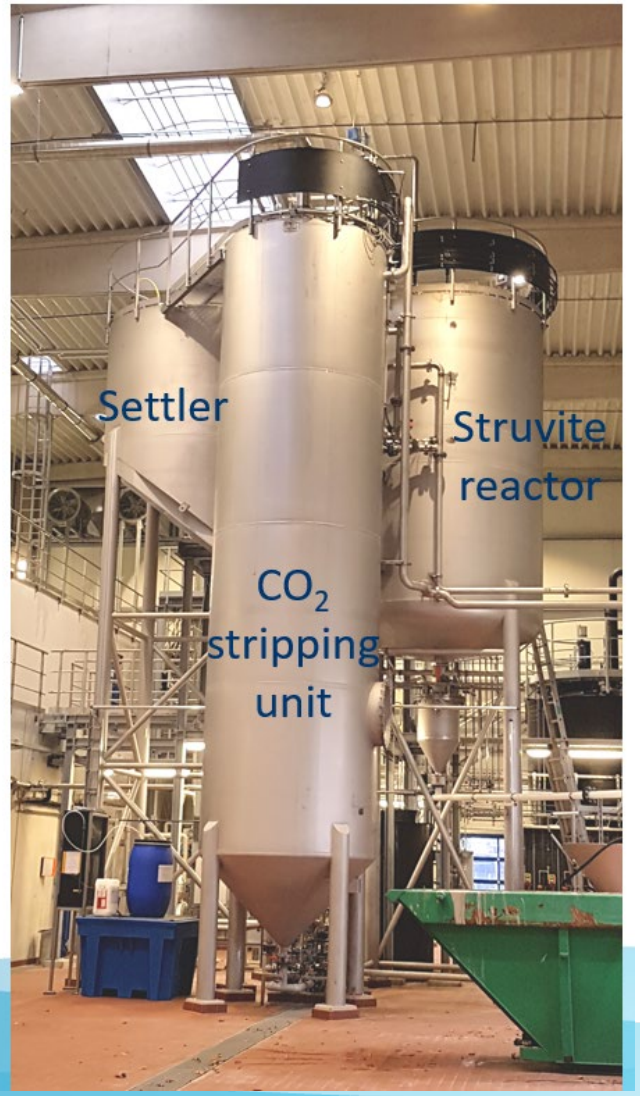
2. New NextGen solutions: struvite production





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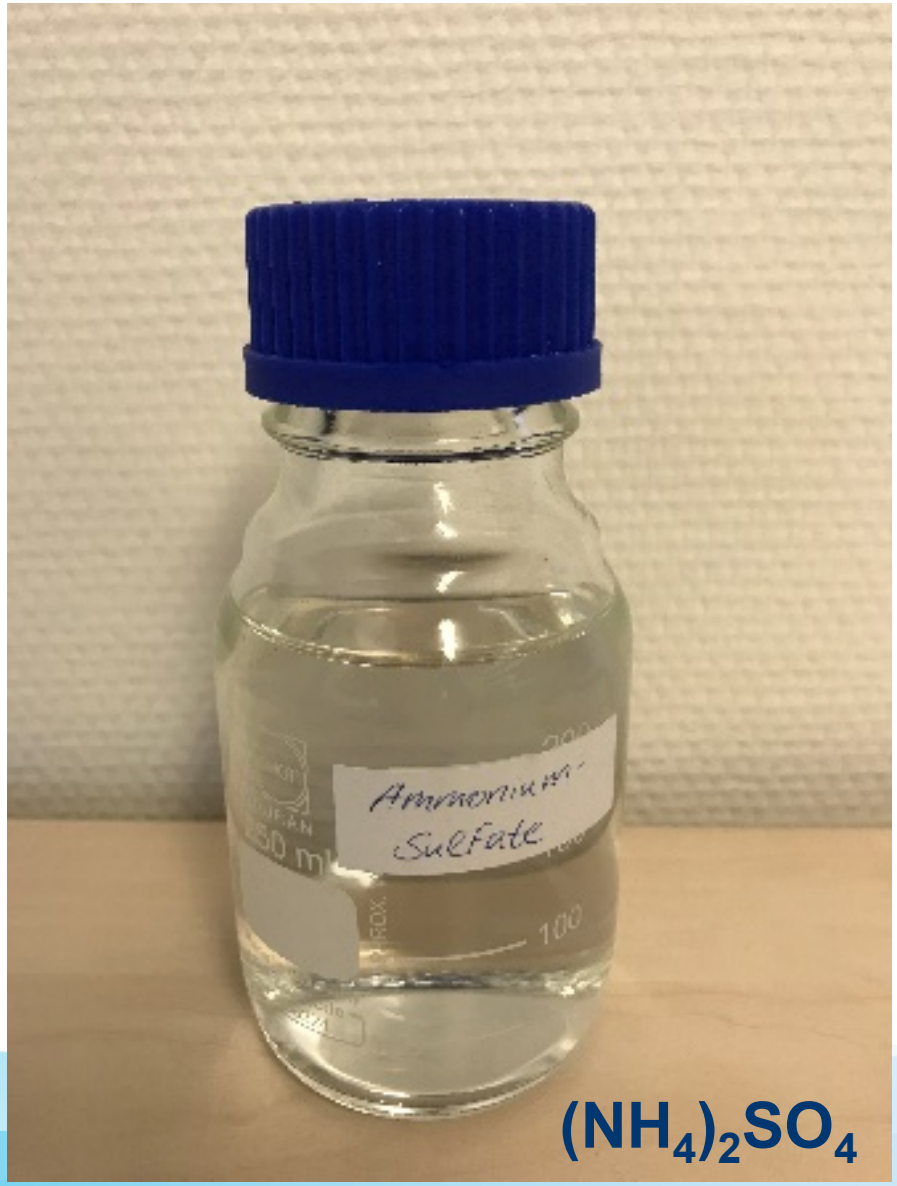
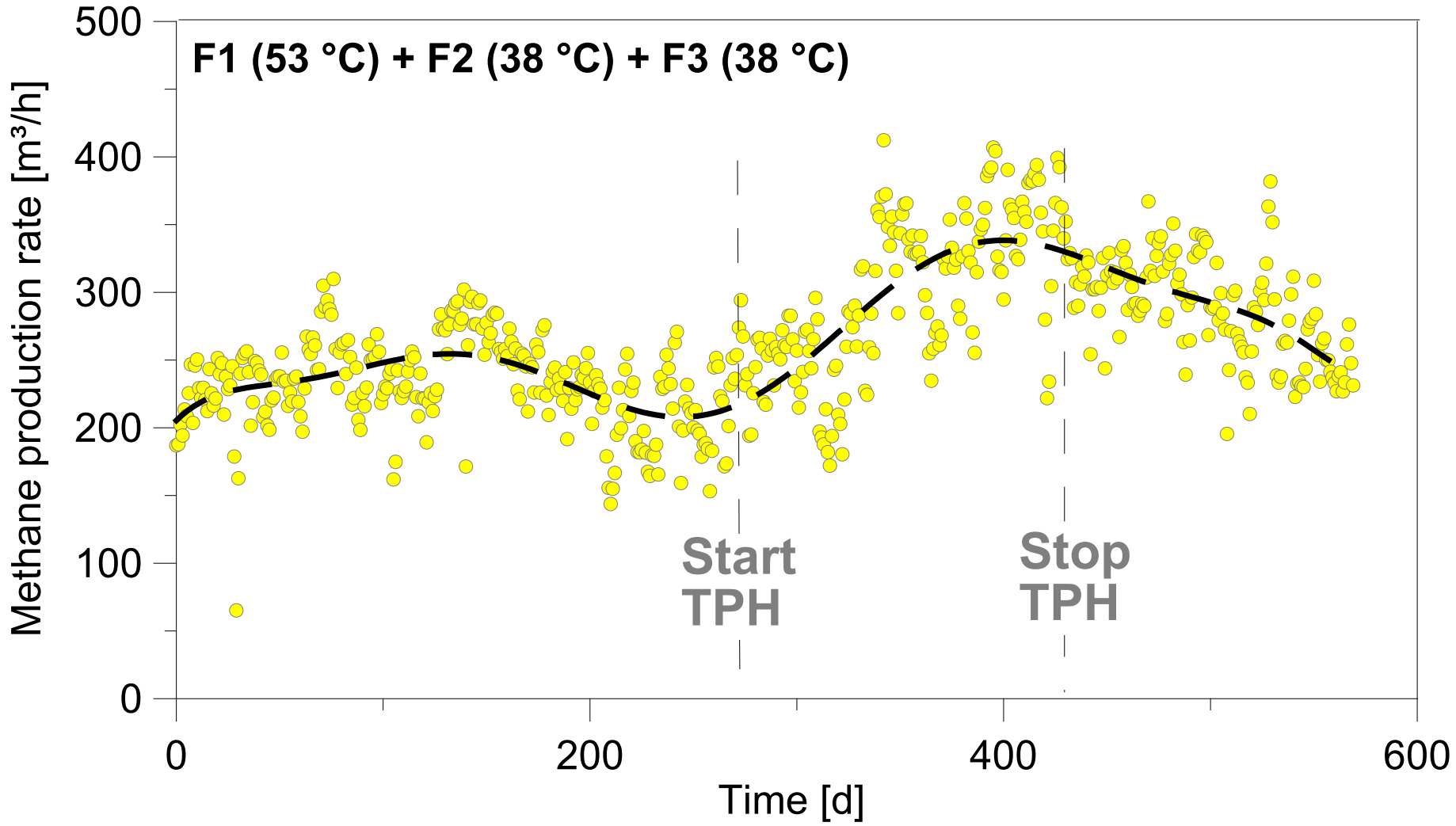
2. New NextGen solution: Ammonium sulphate production



3. Results and key performance indicators (KPIs)

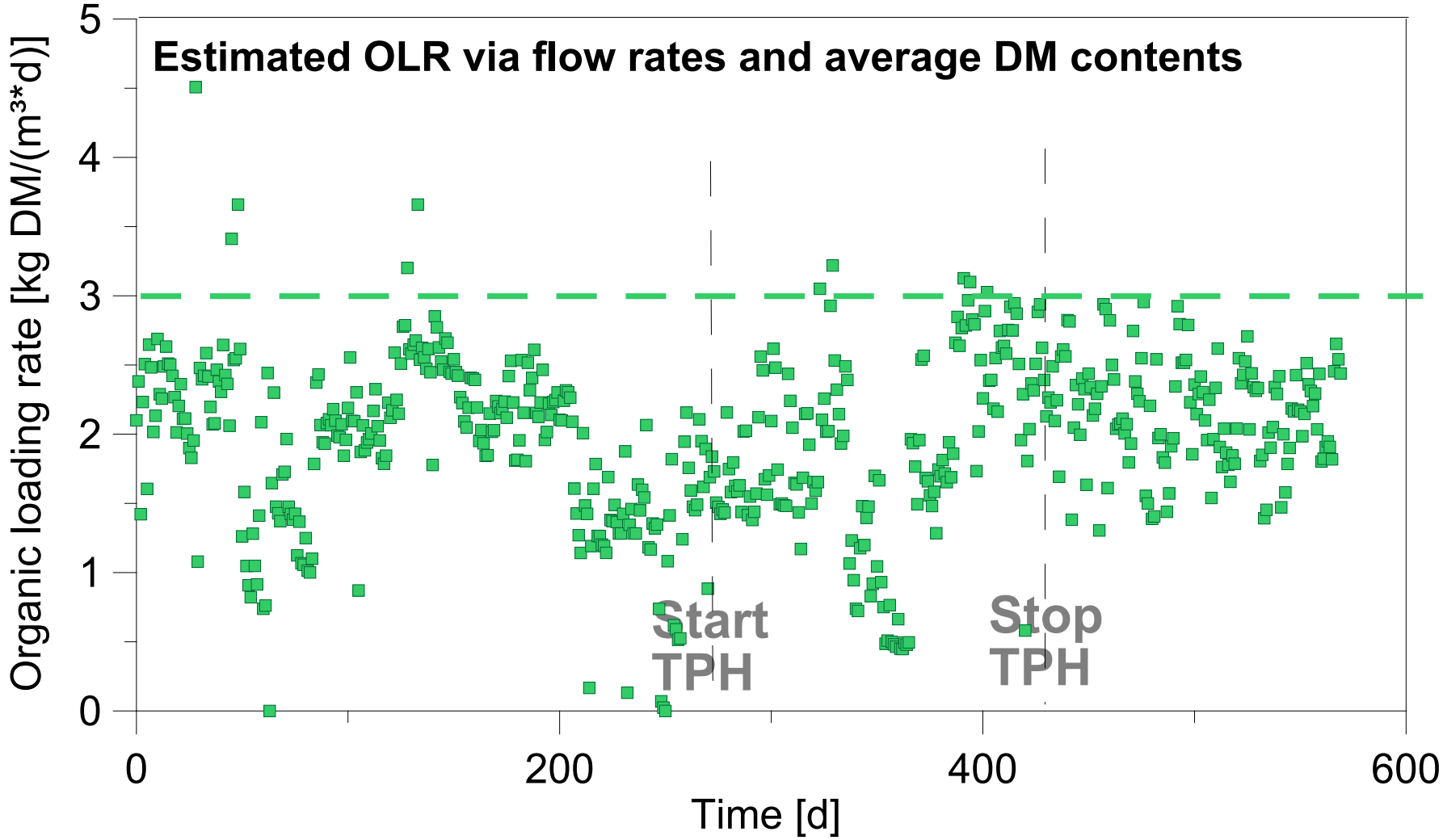
Up to 25% increase in methane production rate during TPH operation



3. Results and key performance indicators (KPIs)

Organic loading rate ranges mainly between 1 and 3 kg DM/(m³*d)

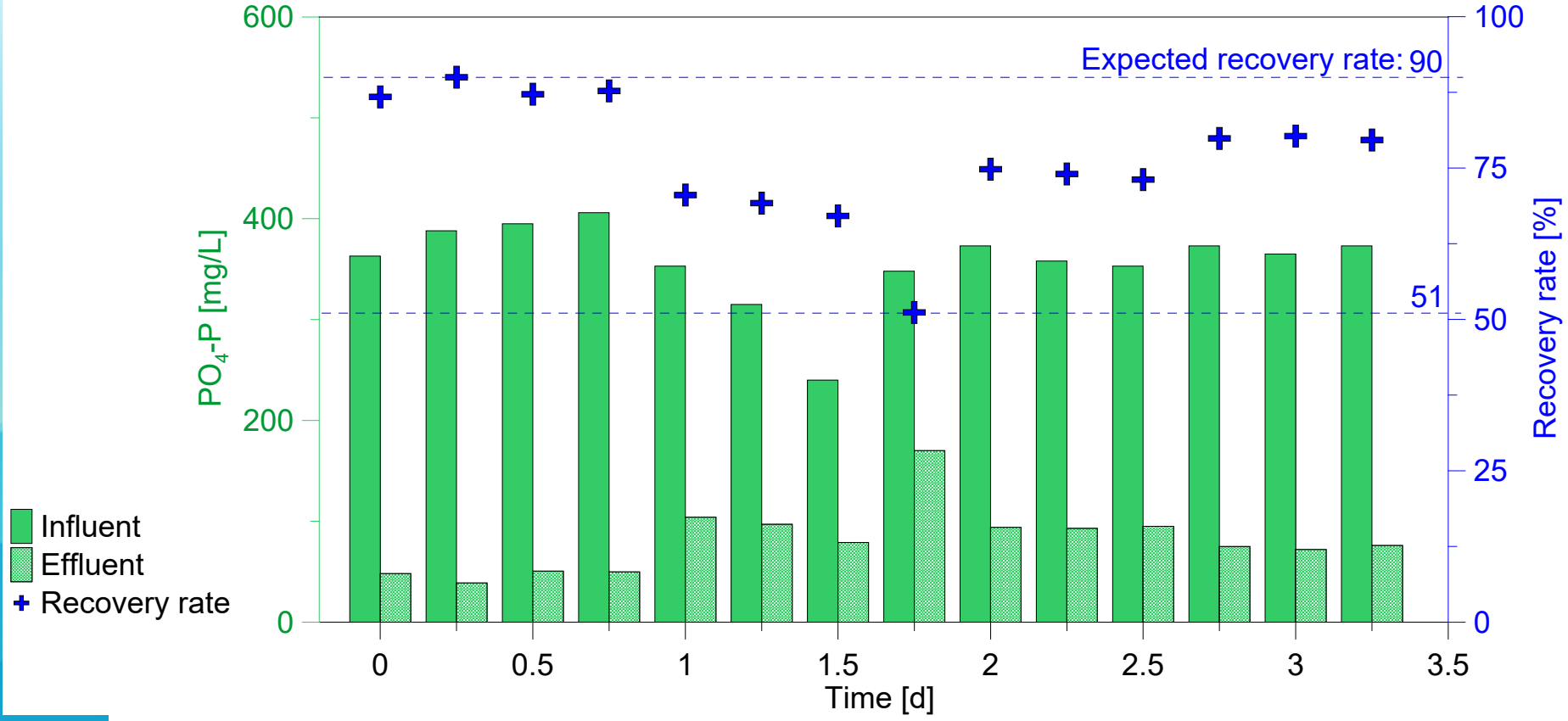
→ **Increase in methane production rate due to TPH**

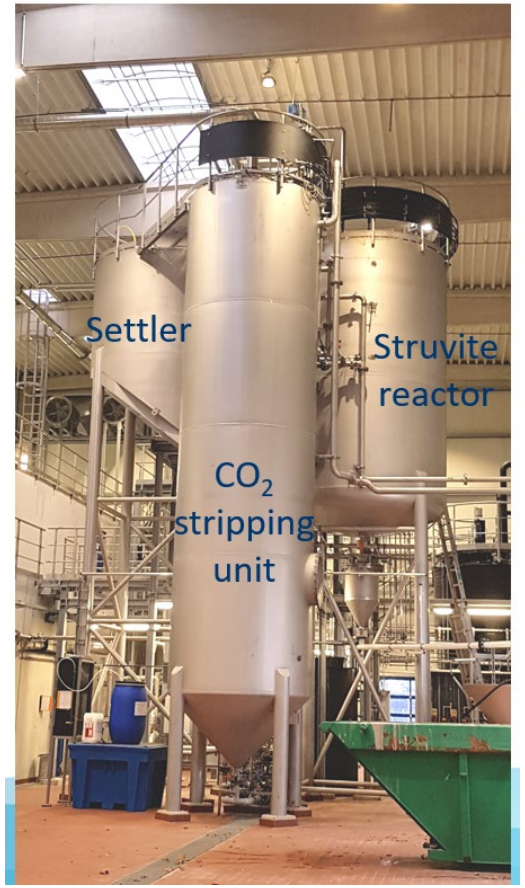


3. Results and key performance indicators (KPIs)

Full-scale nutrient recovery

GOAL: Phosphorus recovery



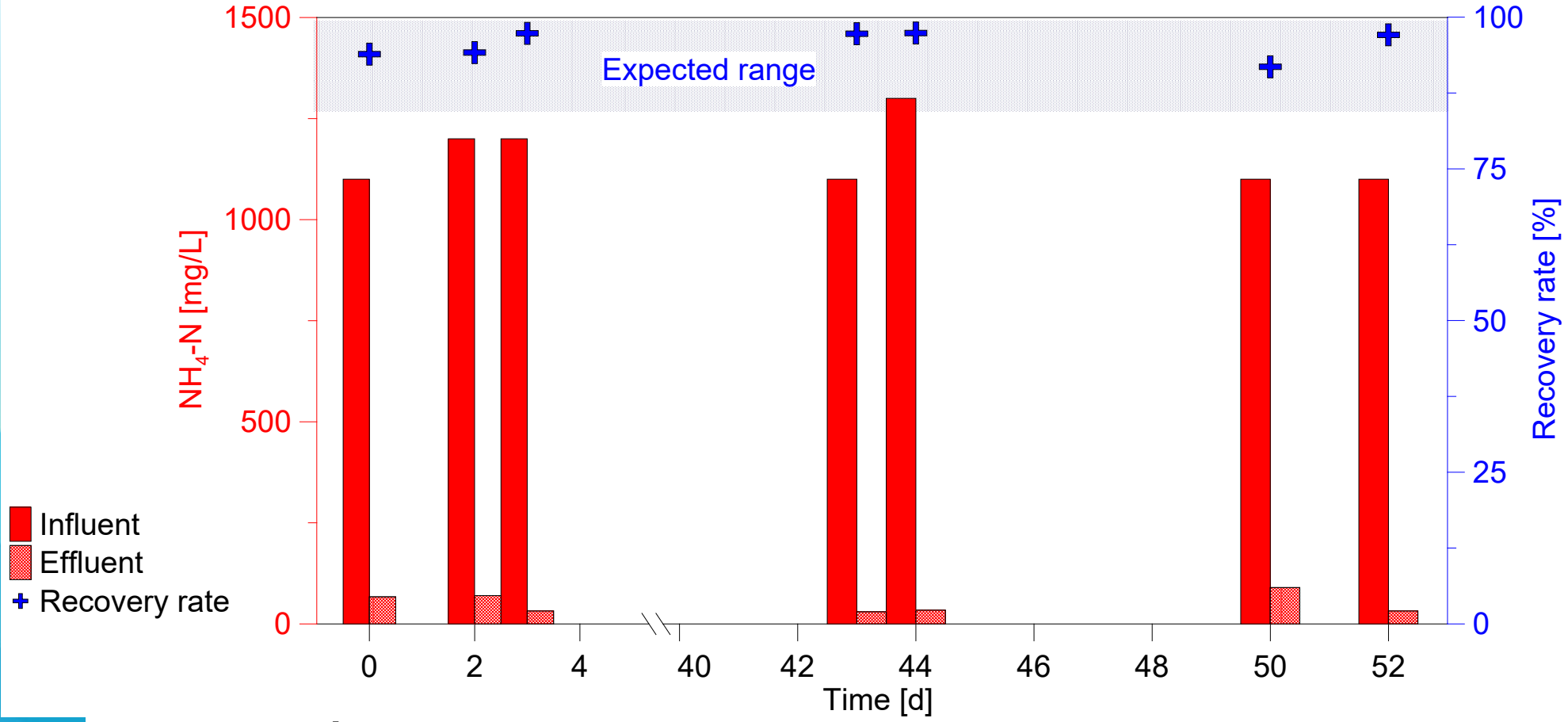


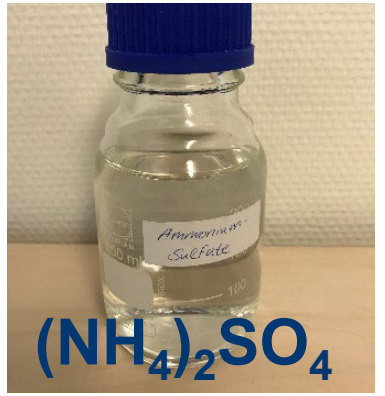
→ **Recovery rate is still too low: crystal size is too small**

3. Results and key performance indicators (KPIs)

Full-scale nutrient recovery

GOAL: Nitrogen recovery





→ **Recovery rate is higher than required**

→ **Optimization in order to save energy and chemicals**

4. Lessons learned so far

- **Thermal pressure hydrolysis:**
  - High-maintenance product
  - Constant high gas quality for steam generator -> avoiding higher fluctuations of system pressure **(< 20 – 30 mbar**)
- **Struvite precipitation**
  - Very low concentration of suspended solids in process water needed (**TSS < 600 mg/L**)
  - Long commissioning time for increasing particle size **> 3 mm**
- **Ammonium sulfate production**
  - Well-established + fail-safe technique
  - Very high recovery rates possible: **up to 98%**
- **System control**
  - Interaction of single technical units complex -> to be considered in system design

5. Outlook

Struvite production:

Optimization of production process aiming at the increase in grain size and a high P recovery rate via changes in hydrozyclone geometry, different $MgCl_2$ dosages, varying HRT

Ammonium sulfate solution production:

Optimization of production process aiming at a high N recovery rate and low energy and chemicals consumption (→ varying temperature & NaOH addition)

Heat management:

Analysis of internal heat management for TPH & two stage digestion system

nextGen

Thank you!