



European Sustainable  
Phosphorus Platform



This project has received funding  
from the EU Horizon 2020  
research and innovation  
programme under grant  
agreement No. 690323



SMART-Plant



Green & Circular Economy

6-9 Novembre 2018

Rimini Italy

IN CONTEMPORANEA CON

KEY ENERGY

22<sup>a</sup> Fiera internazionale  
del recupero di materia ed energia  
e dello sviluppo sostenibile

# AirPrex<sup>®</sup>

## Success stories in nutrients recovery and recycling in Europe and Med area

Rudolf Bogner

CNP CYCLES

3rd EUROPEAN NUTRIENT EVENT @ ECOMONDO 2018

8 - 9 November 2018, Rimini, Italy

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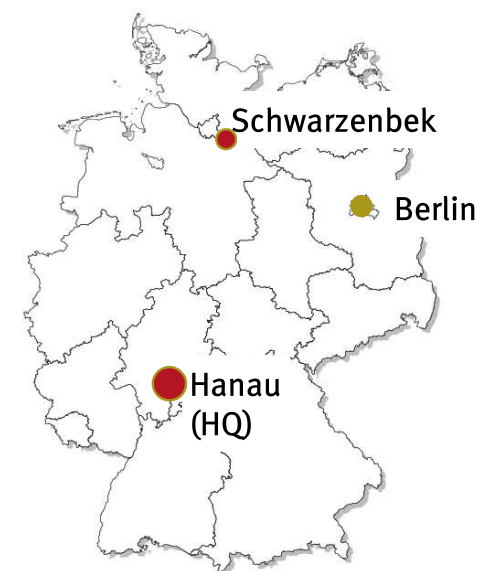
CNP CYCLES  
watering life



In the field of urban water treatment, we are one of the world leaders in technological processes for the recovery of carbon (C), nitrogen (N) and phosphorus (P).

For you – our customers and partners – we develop reliable process solutions that not only meet legal requirements, but deliver real added value for people and the environment.

At the same time we gain energy and close the water and nutrient cycles. Your benefits are cost and resource efficiency.



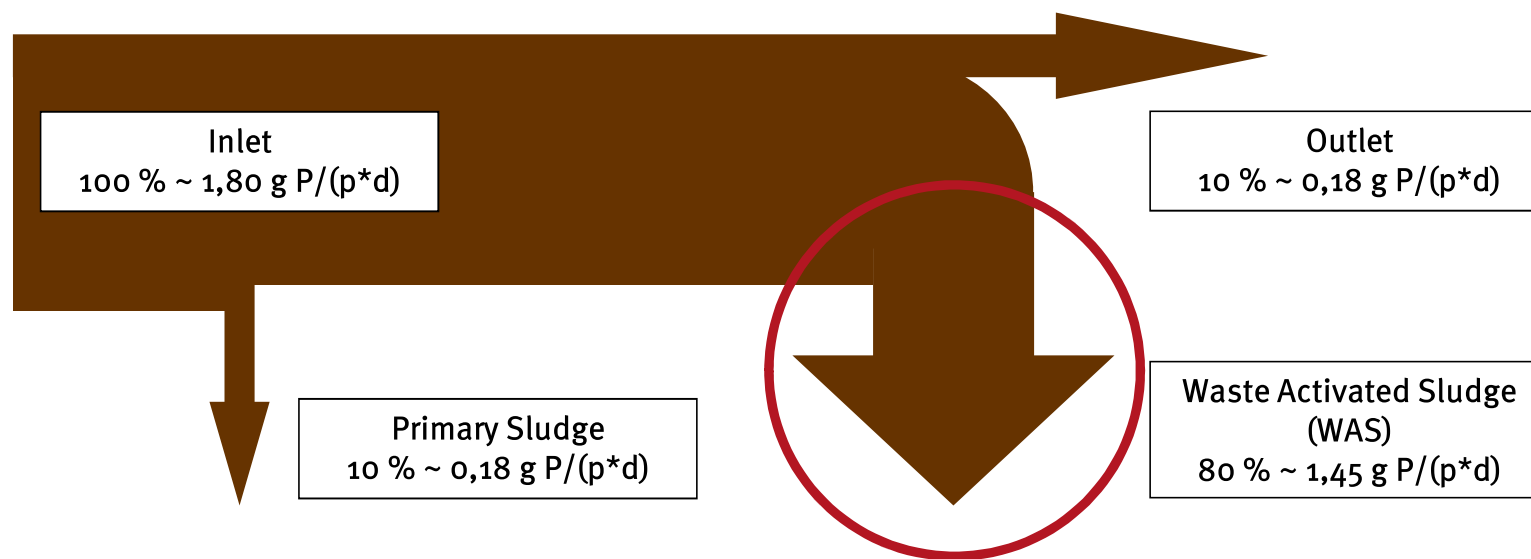
# Content



- Chemical and Biological Background
- Phosphate-Recovery and Sludge Treatment:
- Implementation of the AirPrex<sup>®</sup>-Process in the WWTP-System
- Details of CNP's P-Recovery Processes
- Economical Aspects
- References

# Chemical and Biological Background

## P-flow and P-concentrations in a WWTP with EBPR (Bio-P)



**WAS is main carrier of phosphates !**

# Chemical and Biological Background

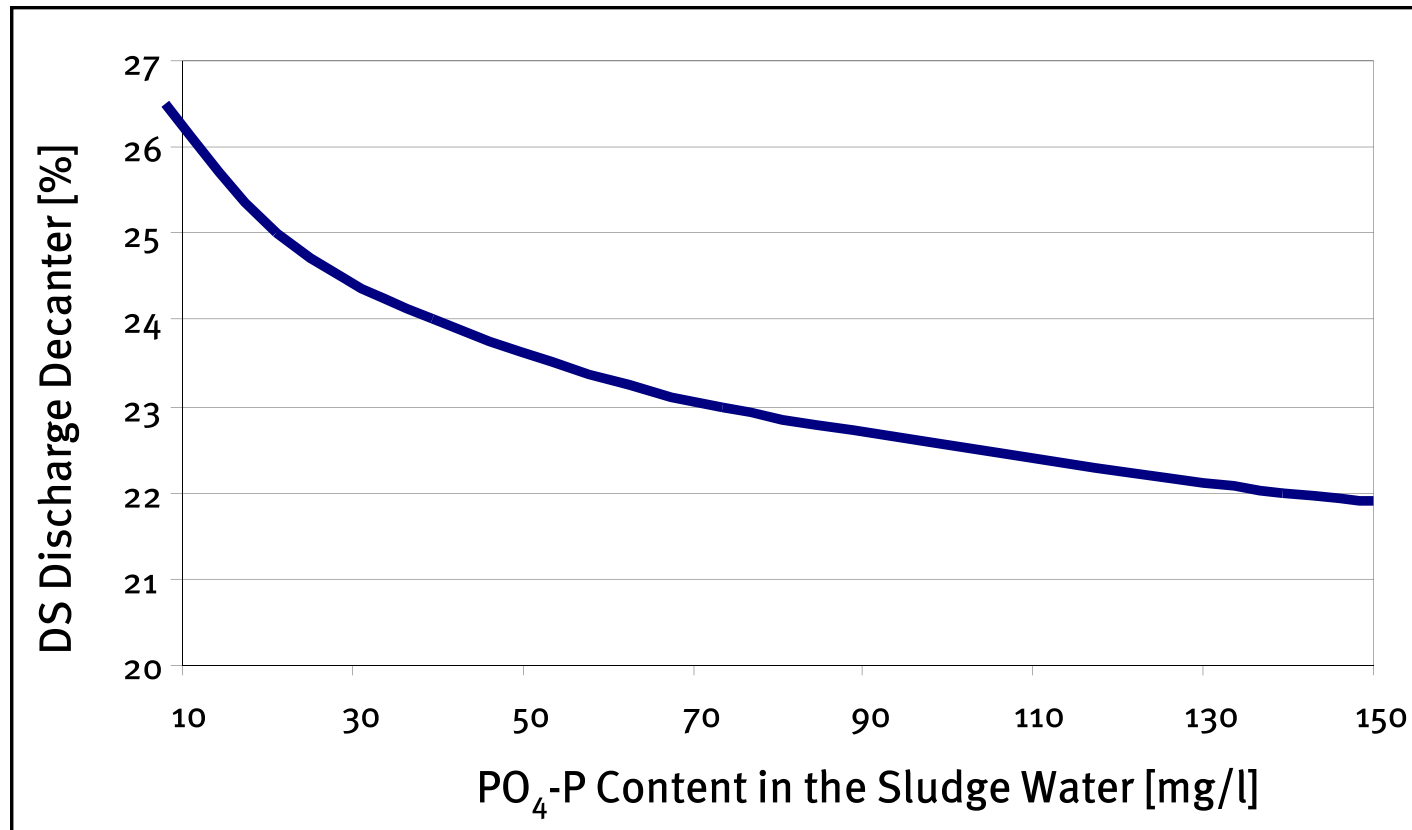
## Effects of the EBPR (Bio-P):

- Anaerobic release of ortho-Phosphate ( $\text{PO}_4\text{-P}$ ) in the digester
- Uncontrolled Struvite crystallization and deposits (scaling)
  - > pipework after digester
  - > retarded crystallization (e.g. centrifuges)
  - > scaling effects
- Negative effects on sludge dewatering (lower DS and higher polymer consumption)
- High internal P-recycling caused by the sludge liquor

# Chemical and Biological Background



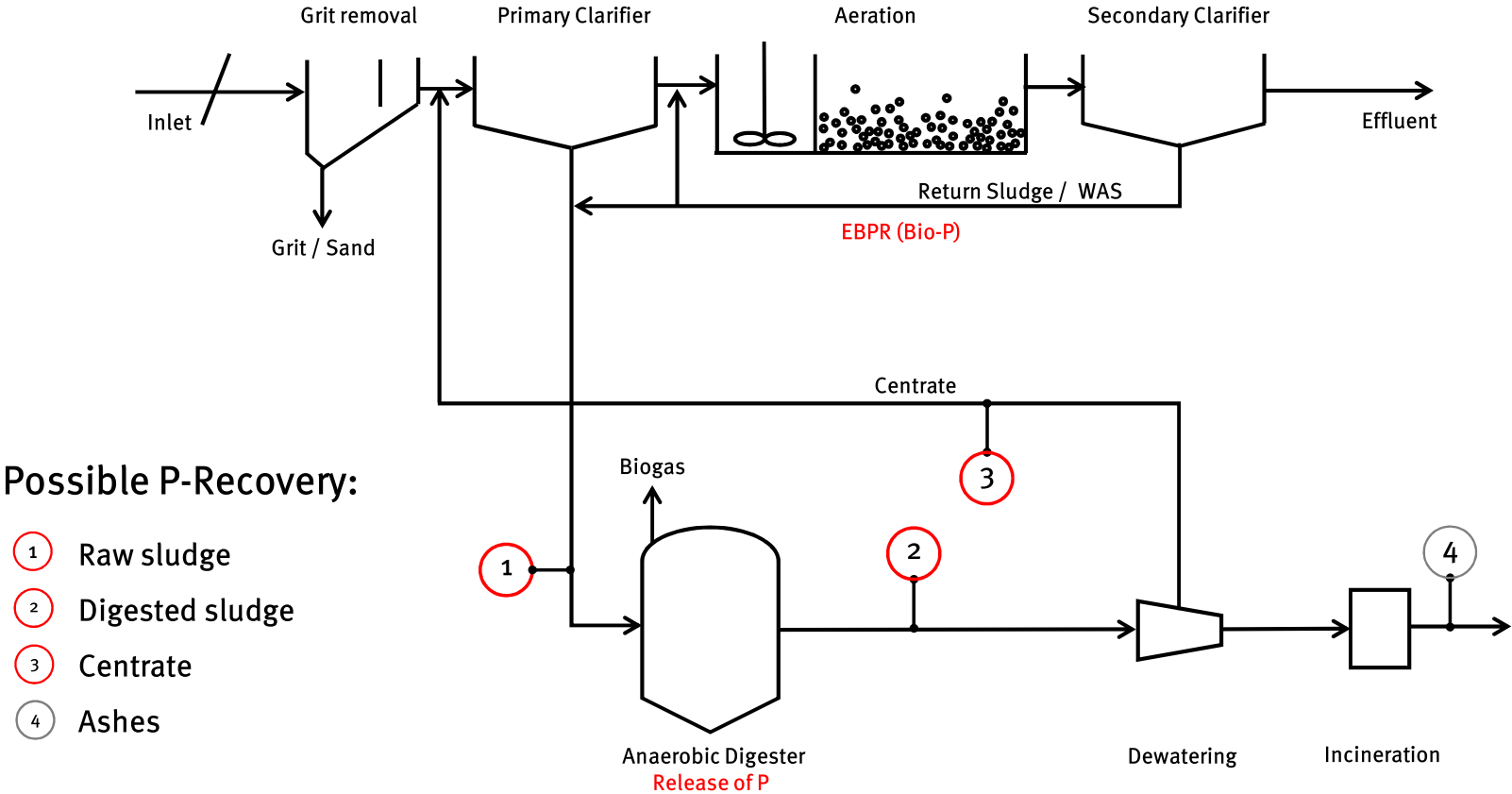
## Effect of PO<sub>4</sub>-P concentration on sludge cake quality (DS-concentration)



Quelle: Niersverband, KA Mönchengladbach-Neuwerk

# Phosphate-Recovery

## Implementation of P-Recovery in the WWTP-System



# CNP's P-Recovery Technologies



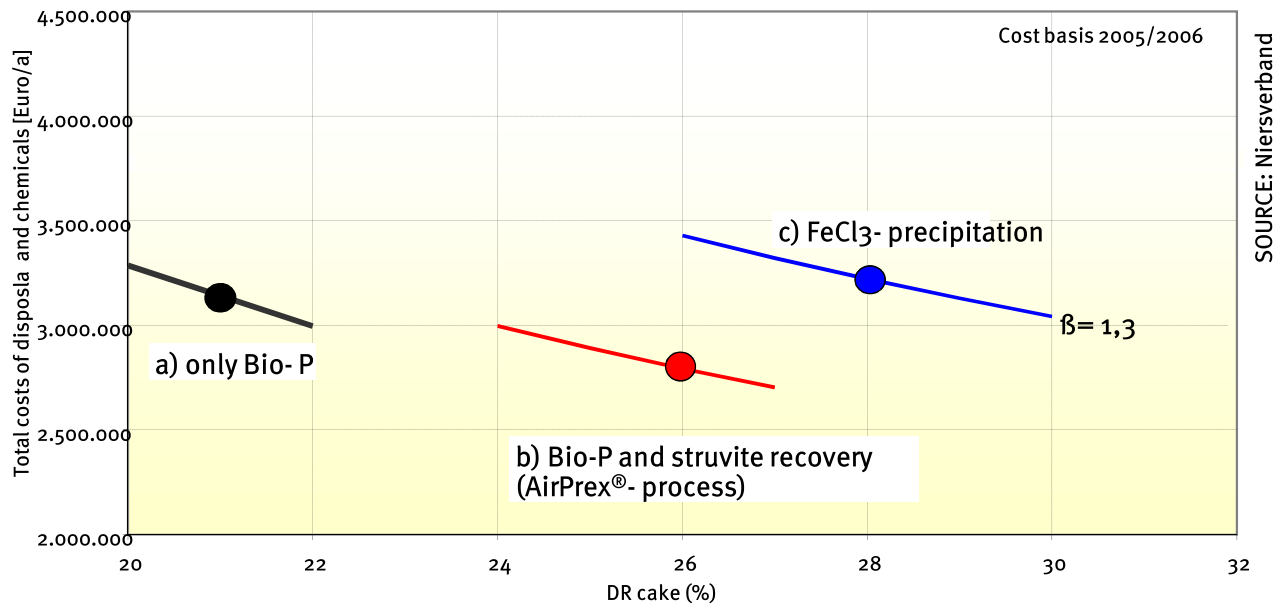
§	Technologies	Application of CNP Technologies in Sludge Treatment Line	Achievements
< 20 g P per kg DS in sludge	AirPrex® Macro Post-Digestion Struvite (MAP)		<ul style="list-style-type: none"> <li>Improved dewatering</li> <li>Reduced scaling</li> <li>95% reduced P in centrate</li> <li>50% MAP recovery</li> </ul>
> 50% P recovery from sludge	CalPrex® Pre-Digestion Brushite (DCP)		<ul style="list-style-type: none"> <li>Improved dewatering</li> <li>Reduced scaling</li> <li>95% reduced P load in centrate</li> <li>&gt;50% P recovery</li> </ul>
> 80% P recovery from dry ash	AirPrex® Micro Post-Digestion Struvite (MAP)		<ul style="list-style-type: none"> <li>All AirPrex® advantages above</li> <li>P recovery from ash</li> <li>High plant availability (no FeCl<sub>3</sub> dosing)</li> </ul>

§ = German legislation for sludge disposal

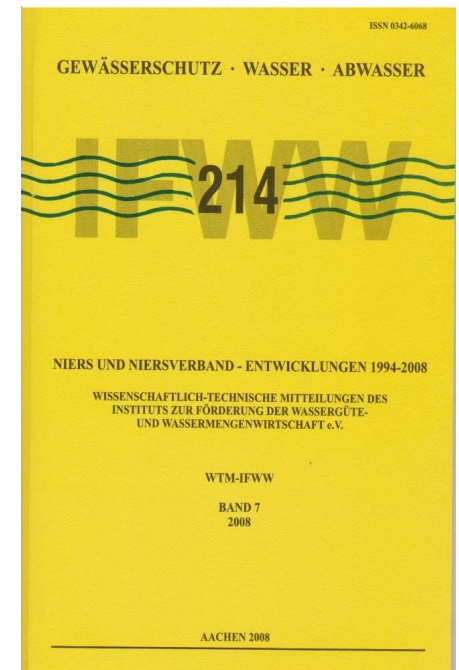


# Economical Aspects

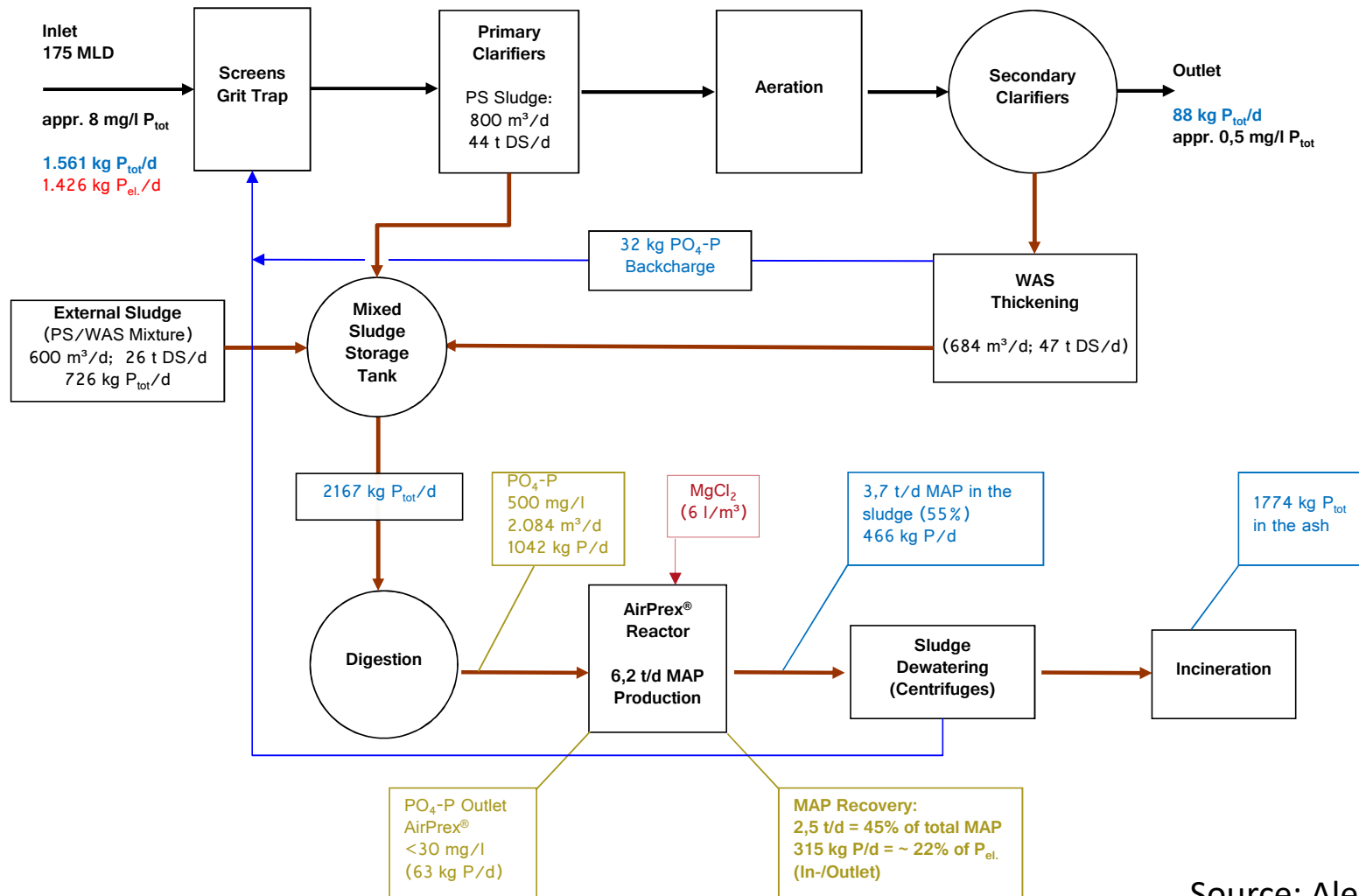
## Moenchengladbach-Neuwerk / Economical Calculations



- a) Only Bio-P: 3.150.000 €/a
- b) Bio-P and P-Recovery: 2.600.000 €/a
- c) Chem. P-Removal: 3.200.000 €/a



# Daily Phosphorus Balance of Amsterdam West WWTP



- No chemical dosing
- Dewatering increased up to 4% DS

Source: Alex Veltman, Waternet, NL

# AirPrex® - installed Plants/References



MG-Neuwerk WWTP, GER  
Capacity AirPrex®:  
MAP- Capacity:  
Start-up:

995.000 P.E.  
1.500m<sup>3</sup> digested sludge/d  
ca. 1.500kg/d  
2010



ASG Salzgitter WWTP, GER  
Capacity AirPrex®:  
MAP- Capacity:  
Start-up:

120.000 P.E.  
240 m<sup>3</sup> digested sludge/d  
ca. 140 kg/d  
2015



Berlin-Waßmannsdorf, GER  
Capacity AirPrex®:  
MAP- Capacity:  
Start-up :

1.000.000 P.E.  
2.000m<sup>3</sup> digested sludge/d  
ca. 1.500 - 2.500kg/d  
2011



Wolfsburg WWTP, GER  
Capacity AirPrex®:  
MAP- Capacity:  
Start-up:

175.000 P.E.  
280 m<sup>3</sup> digested sludge/d  
ca. 150 kg/d  
2017



RWZI Echten, NL  
Capacity AirPrex®:  
MAP- Capacity:  
Start-up :

190.000 P.E.  
400m<sup>3</sup> digested sludge/d  
ca. 500kg/d  
2013



Pirmasens WWTP, GER  
Capacity:  
MAP- Capacity:  
Start-up:

102.000 P.E.  
50 m<sup>3</sup>/d  
2019



RWZI Amsterdam-West NL  
Capacity AirPrex®:  
MAP- Capacity:  
Start-up:

1.000.000 P.E.  
2.500m<sup>3</sup> digested sludge/d  
ca. 3.000 – 5.000kg/d  
2013



Uelzen WWTP, GER  
Capacity AirPrex®:  
Start-up:  
Sequestration  
AirPrex® Micro

83.000 P.E.  
120 m<sup>3</sup> digested sludge/d  
2015

**Overseas installations**



Liverpool WWTP , USA Capacity AirPrex®: Start-up:	11 155 m <sup>3</sup> digested sludge/d 2018
Little Patuxent WRP, USA Capacity AirPrex®: Start-up:	800m <sup>3</sup> digested sludge/d 2018
Tijanjin, China Capacity AirPrex®: Start-up:	155 m <sup>3</sup> digested sludge/d 2018



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# Questions?

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