



**nijhuis**  
INDUSTRIES

# AMMONIA RECOVERY FROM AD

BY THIJS WOLBRINK

SOLID SOLUTIONS IN A FLUID WORLD

# ABOUT **nijhuis**

**OUR VISION:**  
**SOLID SOLUTIONS IN A FLUID WORLD**

**OUR MISSION:**  
*“ We turn your cost center into a **PROFIT** center! ”*

**OUR STRATEGY:**  
*Sustainable Water Use & Resource Recovery*







# GLOCAL NETWORK

WHERE CAN YOU FIND OUR OFFICES?



**HQ NETHERLANDS**  
DESIGN & PRODUCTION



# Nijhuis

- Since 1904
- Over 110 years of heritage
- 2500 references
- 250 employes
- State of the art manufacturing



# NEW DEVELOPMENTS

**NEW** SYSTEMS & SOLUTIONS - SUSTAINABLE WATER USE



## AECO-NAR

*Nijhuis Ammonia Recovery*



## AECOMIX™-DGF

*Wastewater + waste streams → energy*



## AECO-FAT

*Nijhuis Flotation Fat Recovery System*



## GENIUS

*Manure → N + P+ K fertilizer + clean water*



## CIP Recovery

*Reuse and Recovery of waste CIP fluids*



## MODULATIONS

*Modulair and mobile treatment*







nijhuis  
INDUSTRIES

## EXAMPLE PROJECTS

*> 2500 references around the globe in various industries*

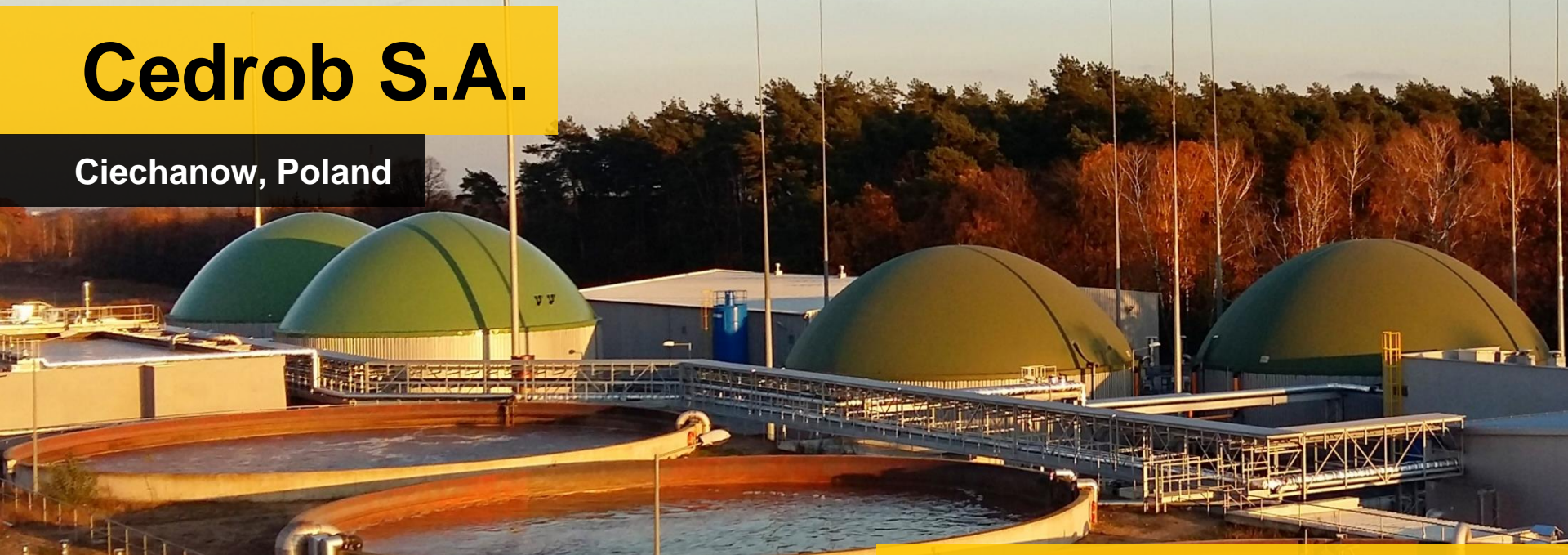
SOLID SOLUTIONS IN A FLUID WORLD





# Cedrob S.A.

Ciechanow, Poland



## Installation Facts:

**Industry:** Poultry wastewater

**Design Flow:** 9,000 m<sup>3</sup>/d

**Biogas:** approx. 15,000 m<sup>3</sup>/d

**Delivery WWTP:** Filter-flotation-biological

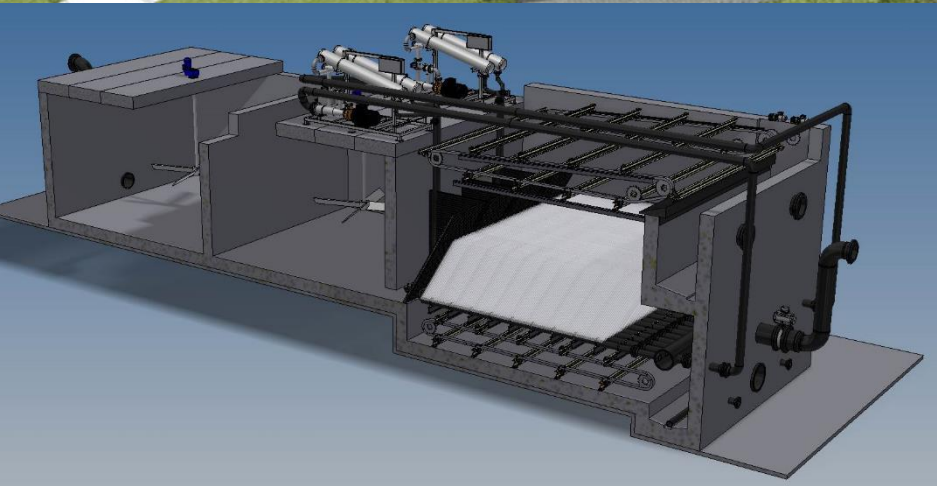
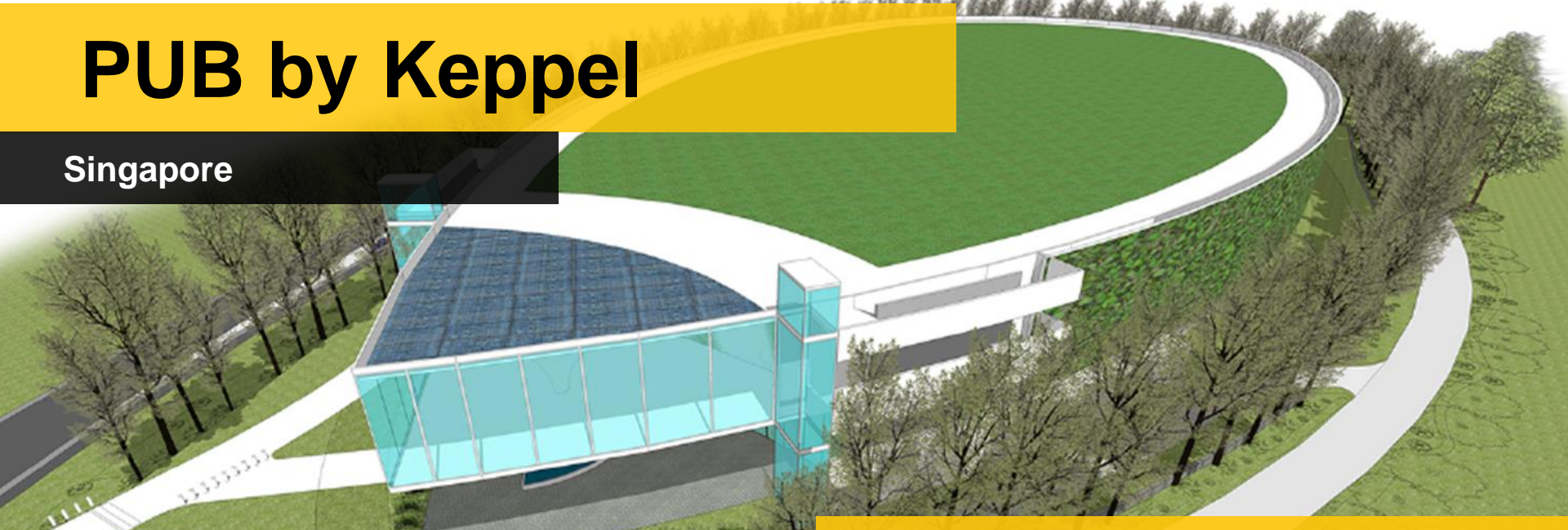
**Delivery biogas:** Hydrolysis tank-digesters-decanter- gas scrubbers-flare-bioler

**Start date:** 2013 (phase 3 - 2017)



# PUB by Keppel

Singapore



## Installation Facts:

**Industry:** Municipal

**Flow:** 15,000 m<sup>3</sup>/h

**Technology:** Desalination to drinking water

**Solution:** High Rate DAF in concrete

**Installation date:** 2018





# Oril-Leader

Yelyzavetivka, Ukraine

## Installation Facts:

**Industry:** Poultry waste & wastewater

**Design Flow:** 800 ton/d

**Electricity:** 5,5 Mwh

**Delivery:** Digesters-H<sub>2</sub>s scrubbers-CHP

**Start date:** 2013





# IKEA

Krasnodar, Russia



## Installation Facts:

**Industry:** Wastewater from shopping mall

**Design Flow:** 1000 m<sup>3</sup>/d

**Technology:** Organica

**Application:** Sanitary wastewater to surface water

**Start date:** 2017





**nijhuis**  
INDUSTRIES

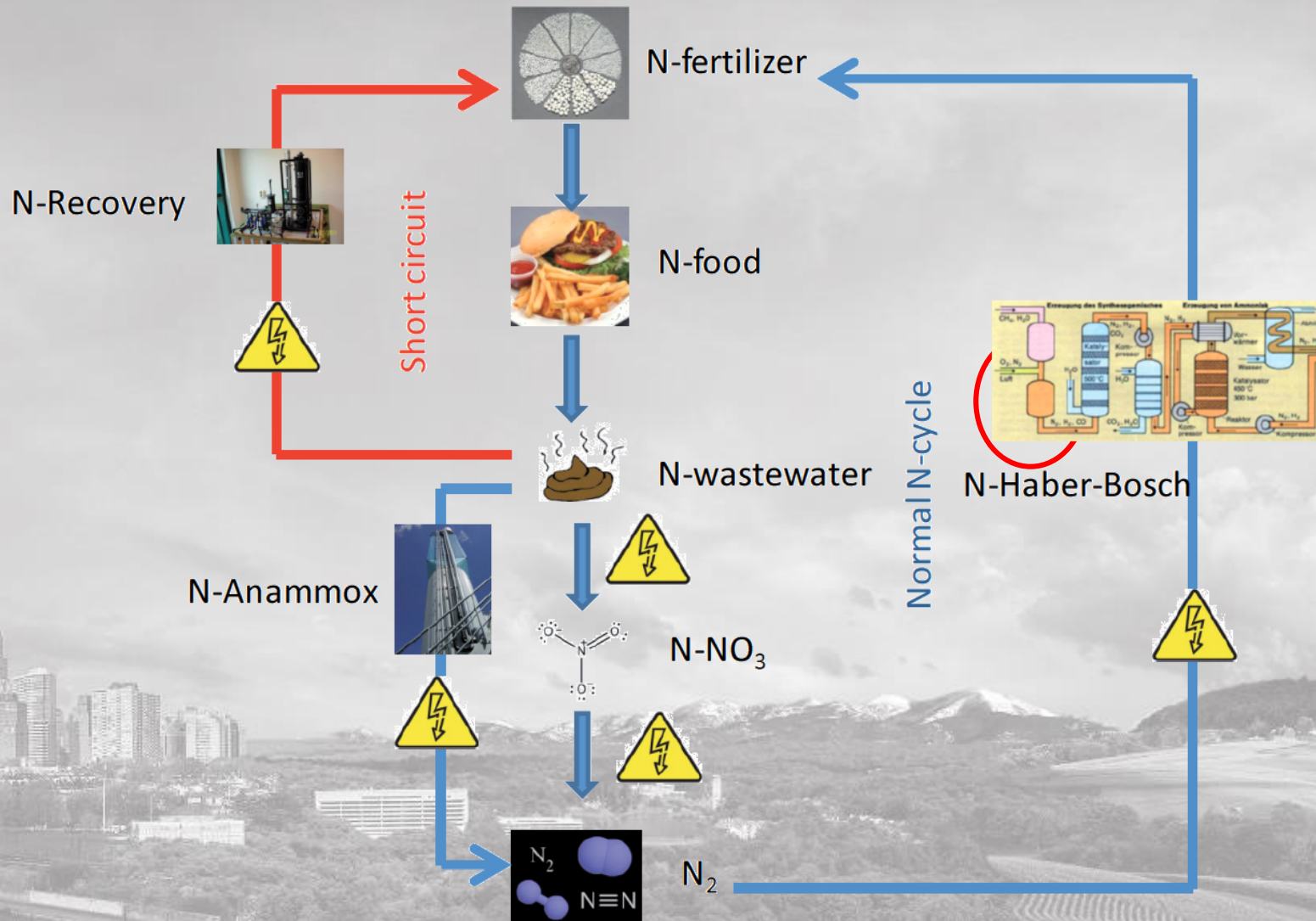
# AMMONIA RECOVERY FROM AD

ENABLING SUSTAINABLE LIVING

SOLID SOLUTIONS IN A FLUID WORLD

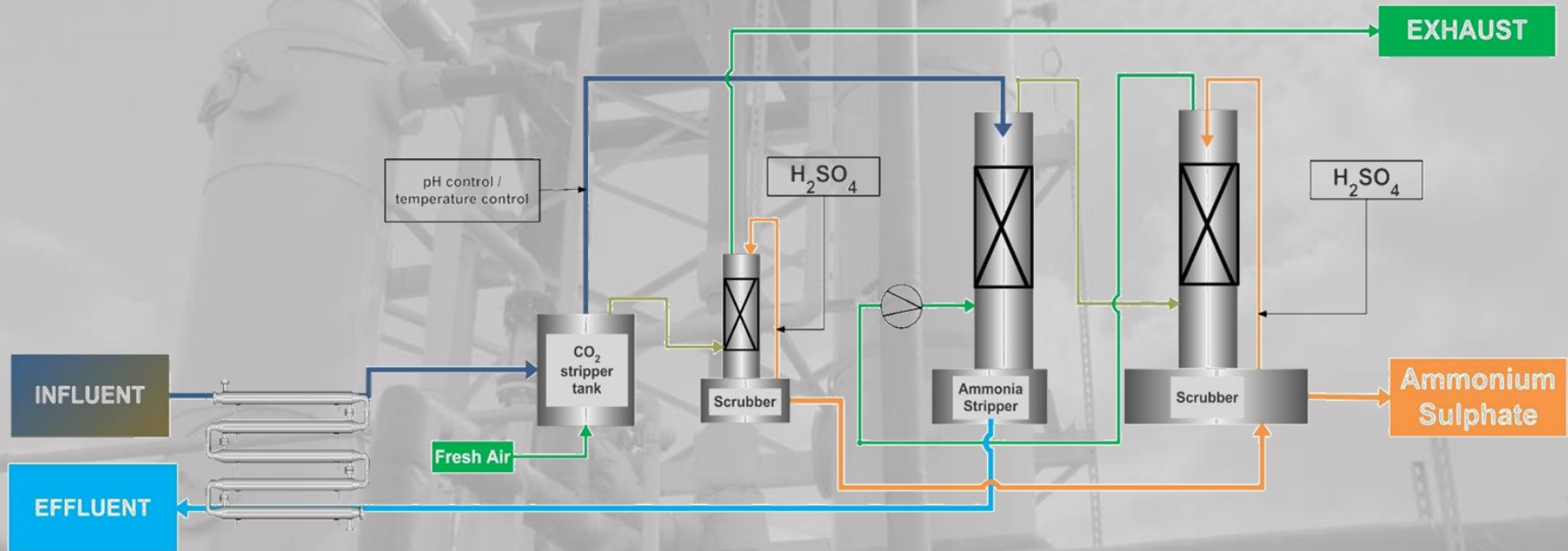


# CYCLE OF N FERTILIZER PRODUCTION





# AMMONIA RECOVERY



- Convert ammonium ( $\text{NH}_4^+$ ) to ammonia ( $\text{NH}_3$ ) at **without caustic** at
  - pH 8,5 – 9,5
  - Temperature of 60 - 70 °C
  - 50 - 70% recovery of ammonia
- Increased yield with supportive caustic dosing (70 – 90%)
- Stripping of ammonia ( $\text{NH}_3$ ) out of the liquid with 100% recirculated air
- Either Ammonium sulphate ( $(\text{NH}_4)_2\text{SO}_4$ ) or other fertilizer products possible

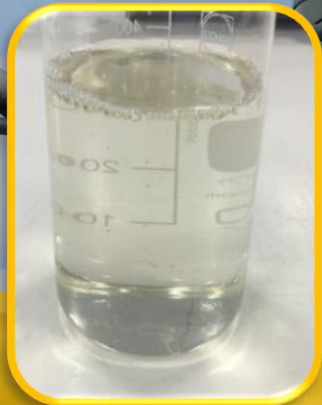






# Bernard Matthews

Norfolk, U.K.



Reduced sewer disposal cost by N-recovery

## Installation Facts:

**Industry:** Turkey processing

**Design Flow:** 75 m<sup>3</sup>/d digestate

**Delivery:** Ammonia Stripping / Recovery

**Efficiency:** > 80% ammonia removal

**Fertilizer:** 25-40% ammonium sulphate

**Start date:** 2014

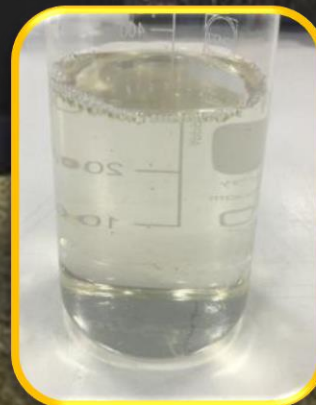
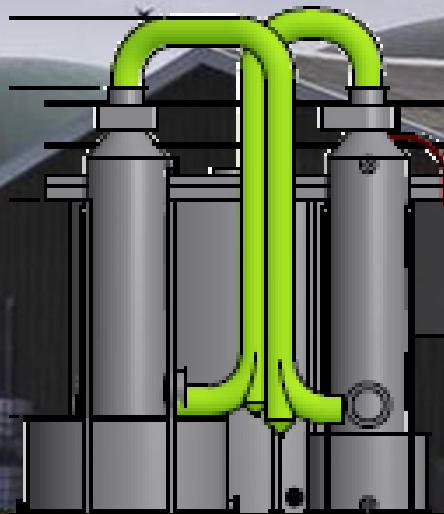




# SCHAAP Agri

Tirns, The Netherlands

Increased capacity  
and toxicity reduction  
by N-recovery



## Installation Facts:

**Industry:** Manure digestion

**Design Flow:** 173 m<sup>3</sup>/d digestate

**Delivery:** Ammonia Stripping / Recovery

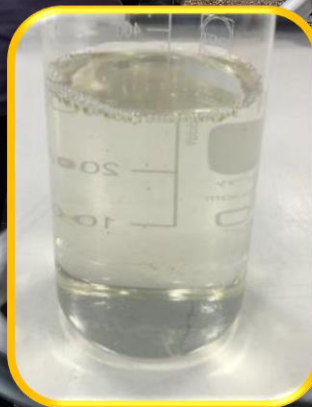
**Efficiency:** > 80% ammonia removal

**Fertilizer:** 35-40% ammonium sulphate

**Start date:** 2018

# Danone Dairy Farm

Belgium with VCM



Reduced N-fraction in  
manure to maximize  
land application

## Installation Facts:

**Industry:** Cow manure dairy farm

**Design Flow:** 20 m<sup>3</sup>/d digestate

**Delivery:** demo Decanter + Ammonia  
Stripping / Recovery

**Efficiency:** > 80% ammonia removal

**Fertilizer:** 15% ammonium nitrate

**Start date:** 2018





# Groot Zevert Digestion

GZV Beltrum, the Netherlands

Increased water reclamation and reduced transport costs by N-recovery

## Installation Facts:

**Industry:** Manure & Organic waste AD

**Design Flow:** 140.000 ton per year

**Green minerals:** Nitrogen, Potassium, Phosphate

**Blue minerals:** Clean water

**Delivery:** Decanter, Hygenisation, Flotation unit, Nitrogen Stripper (AECO-NAR), Multi Membrane filtration (MF-RO-RO)

**Installation date first phase:** Summer 2018





nijhuis  
INDUSTRIES

WHERE TO GO TODAY ?  
WITH RECOVERED N-PRODUCT

SOLID SOLUTIONS IN A FLUID WORLD



# SMART FARMING

## Precision Agroculture



→ calls for individual N P K fertilizers



# ACHTERHOEK WITHOUT ARTIFICIAL FERTILISER

PART OF THE 6TH nitrate action program.

- Launch spring **2018**
- **15 farmers**

**Go local  
Start small**





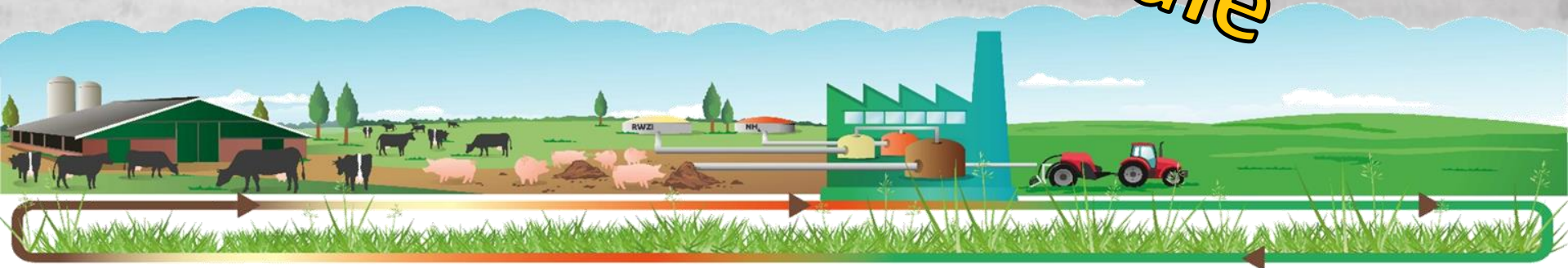
# ACHTERHOEK WITHOUT ARTIFICIAL FERTILISER

PART OF THE 6TH nitrate action program.

## Continuation 2019

- Total **150** farmers
- 7500 hectares
- 50% traditional
- 50% recovered nutrients (“Green Fields”)
- Monitoring program

Grow believe  
Increase  
Scale



# WHERE TO GO TOMORROW ?





# WHAT IF....



Disaster relief



Remote rural area



Smart Cities



Plug and play villages



Food production



Remote holiday resorts



Themepark sanitation



Public Bathrooms

# LET'S BUILD!



Plant growth chamber

Women toilets

Men toilets

Machine room



# FROM WASTE TO TASTE



# TESTING & IMPROVING



DGTL

Amsterdam, March 2018

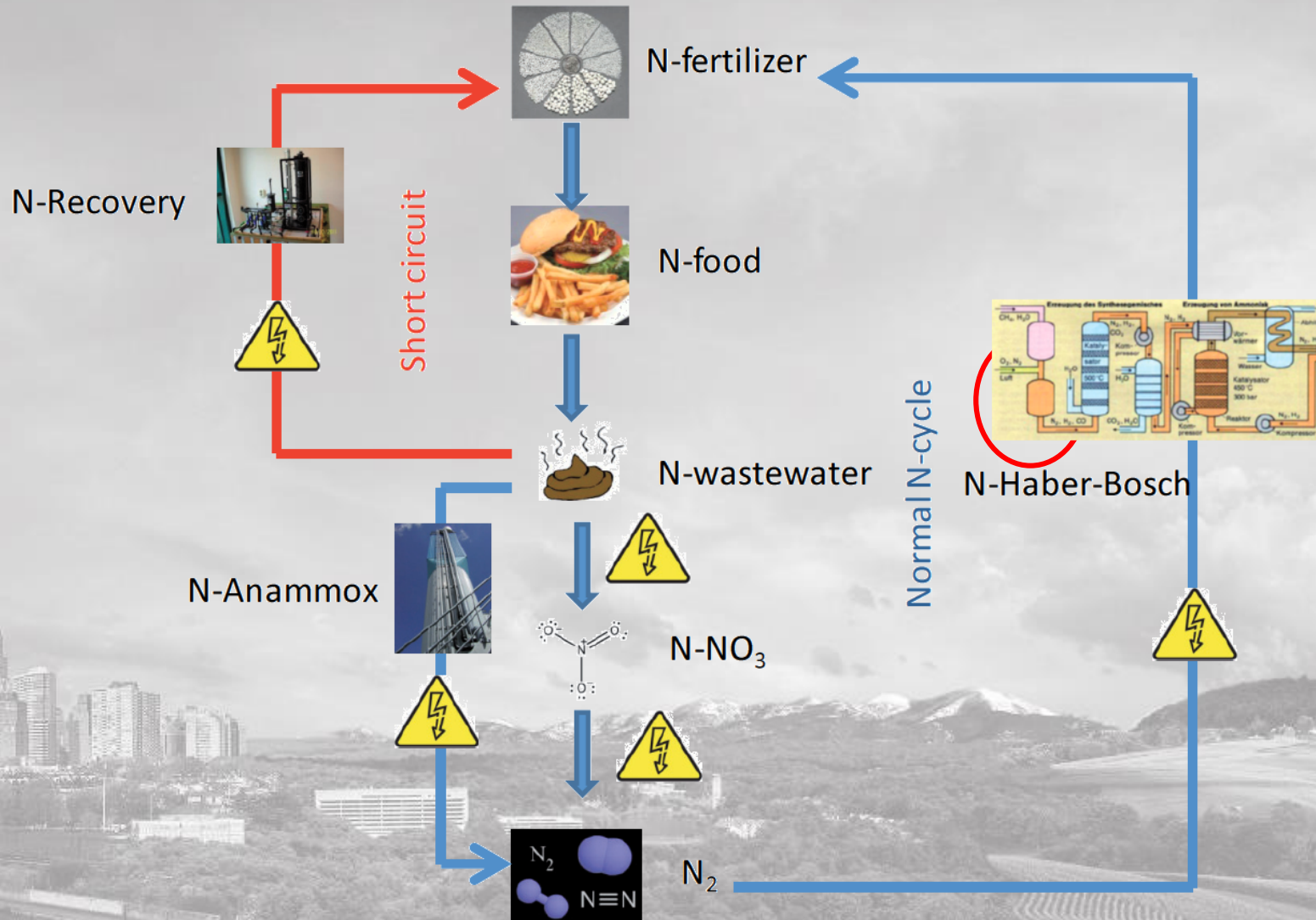




# EDUCATING & INSPIRING

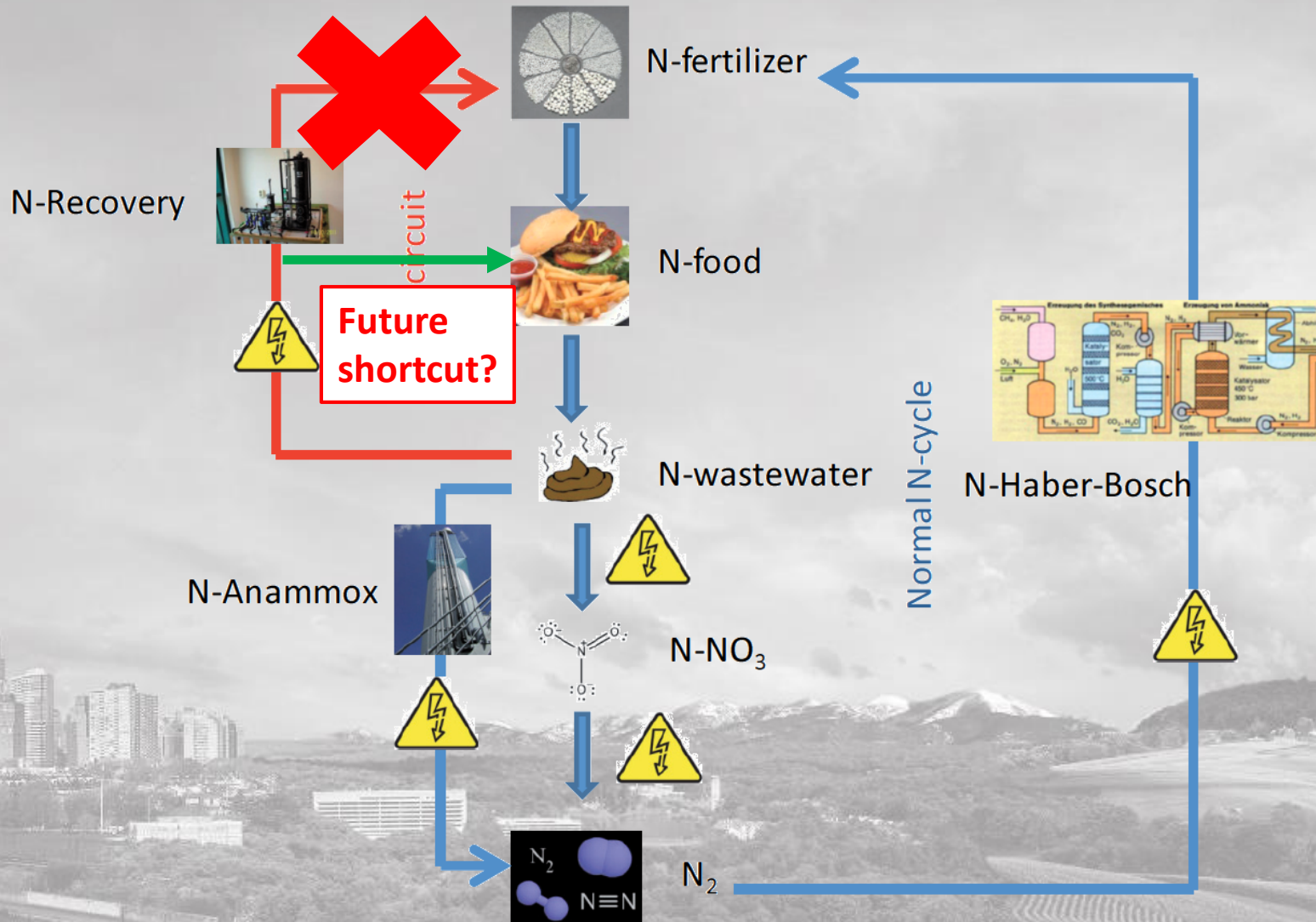


# CYCLE OF N FERTILIZER PRODUCTION





# CYCLE OF N FERTILIZER PRODUCTION



# RECOVERY ENABLES FUTURE TECHNOLOGIES





**INSPIRED ?**



**[thijs.wolbrink@nijhuisindustries.com](mailto:thijs.wolbrink@nijhuisindustries.com)**

**+31 6 2950 1591**

**SOLID SOLUTIONS IN A FLUID WORLD**