



# Solid and Adaptive Solutions

for a **Sustainable** and **Resilient** future



**Sustainable Water Use and Resource Recovery**  
in the commercial sector, towards lowering the environmental and  
water footprint

**By Dimitra Aravani | Environmental Engineer at Nijhuis Industries**

**SOLID SOLUTIONS IN A FLUID WORLD**

“

Sustainable **Reuse** technologies can be successfully commercialized in the industrial sector

”



# CONTENT

- 1** Challenges and Trends - “combatting a major societal challenge”
- 2** About Nijhuis
- 3** Business cases for sustainable water reuse in the commercial sector

*Adopt game changing innovations in sustainable water reuse & resource recovery*

# CHALLENGES AND TRENDS

“COMBATting A MAJOR SOCIETAL CHALLENGE”



2030 → 10 billion people

60% more food

80% more energy

55% more water

# WATER AND 10 BILLION PEOPLE

## CLIMATE CHANGE - WATER SCARCITY & FLOODING



# TRENDS AND DEVELOPMENTS

## CHALLENGES ↔ SOLUTIONS



© FAO/Xavier Bouan

### UN agency sounds alarm: Dwindling agrobiodiversity 'severe threat' to food security

14 November 2019 | Global

To help ensure the most-consumed foods don't disappear in the face of the climate crisis, farmers must cultivate crops able to resist environmental shocks and other stresses, the Food and Agriculture Organisation (FAO) highlighted in a new set of conservation guidelines published on Thursday.

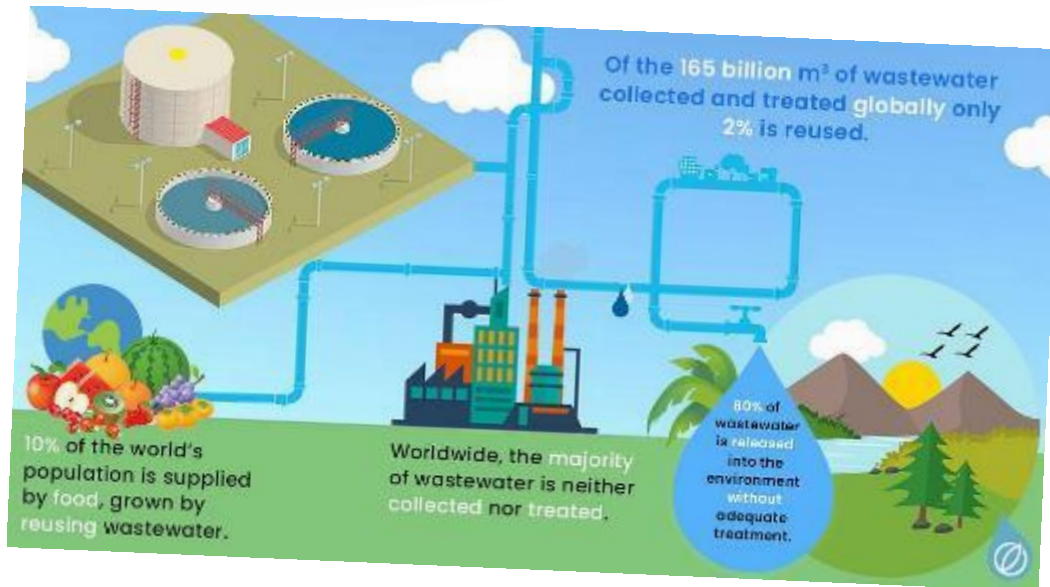


### ING commits EUR 100 million to fund Sustainable Investments

1 min read • 0 Listen

Amsterdam, 10 January 2019

ING has launched Sustainable Investments, committing EUR 100 million of capital for investments to support sustainable 'scale-ups' with a proven concept and a positive environmental impact.



### While Companies Like Pepsi See Success from Water Conservation Efforts, More Work Is Needed, Says Frost & Sullivan

MARCH 22, 2019 BY JENNIFER HERMES

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# KEY INDUSTRY MARKET TRENDS



1. Business case oriented;  
introducing new business models, strong focus on ROI



2. Water scarcity



3. Stricter environmental regulations; restriction on effluent disposal, license to operate



4. Flexibility required; modular design, easy to relocate and scale-up or scale-down if required



5. Investors: Water - Energy - Food



6. Green image, lowest possible environmental footprint and sustainable development goals



7. Reliability, always in control, no surprises

# REALIZATION OF THE SUSTAINABLE DEVELOPMENT GOALS



## SUSTAINABLE DEVELOPMENT GOALS

17 GOALS TO TRANSFORM OUR WORLD

<b>1</b> NO POVERTY 	<b>2</b> ZERO HUNGER 	<b>3</b> GOOD HEALTH AND WELL-BEING 	<b>4</b> QUALITY EDUCATION 	<b>5</b> GENDER EQUALITY 	<b>6</b> CLEAN WATER AND SANITATION 
<b>7</b> AFFORDABLE AND CLEAN ENERGY 	<b>8</b> DECENT WORK AND ECONOMIC GROWTH 	<b>9</b> INDUSTRY, INNOVATION AND INFRASTRUCTURE 	<b>10</b> REDUCED INEQUALITIES 	<b>11</b> SUSTAINABLE CITIES AND COMMUNITIES 	<b>12</b> RESPONSIBLE CONSUMPTION AND PRODUCTION 
<b>13</b> CLIMATE ACTION 	<b>14</b> LIFE BELOW WATER 	<b>15</b> LIFE ON LAND 	<b>16</b> PEACE, JUSTICE AND STRONG INSTITUTIONS 	<b>17</b> PARTNERSHIPS FOR THE GOALS 	





# Solid and Adaptive Solutions

for a **Sustainable** and **Resilient** future



## About Nijhuis

SOLID SOLUTIONS IN A FLUID WORLD

# ABOUT nīhūis

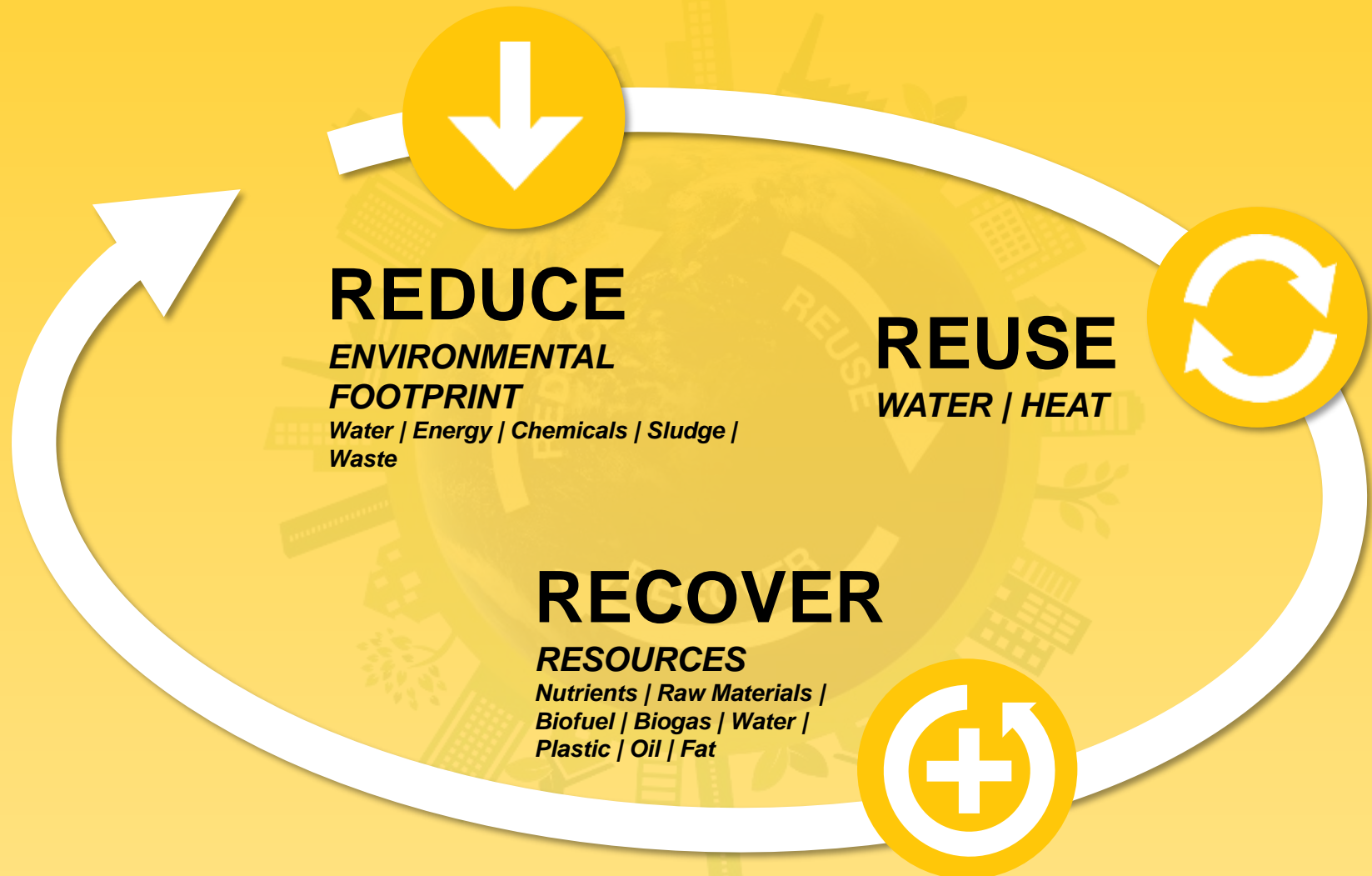
**OUR VISION:**  
**SOLID SOLUTIONS IN A FLUID WORLD**

**OUR MISSION:**  
*“Solid and Adaptive Solutions for a  
**SUSTAINABLE** and **RESILIENT** future”*

**OUR PORTFOLIO:**  
*Sustainable Water Use, Energy and  
Resource Recovery **Solutions and Services***



# Solid and Adaptive Solutions for a **SUSTAINABLE** and **RESILIENT** future



# GLOCALIZED INTEGRATED SOLUTIONS

## Proprietary Technologies

### Innovative portfolio



**Pre-treatment**



**(An)aerobic Treatment**



**Effluent Polishing and Disinfection**



**Water Reuse**



**Sludge management**



**Process Water**



**Cooling Water Treatment**



**Waste to Value and Resource Recovery**

# NIJHUIS MEMBRANES SOLUTIONS

## SUSTAINABLE water (re)use

Microfiltration  
NMS-MF



Ultrafiltration  
NMS-UF



Direct nanofiltration  
NMS-dNF



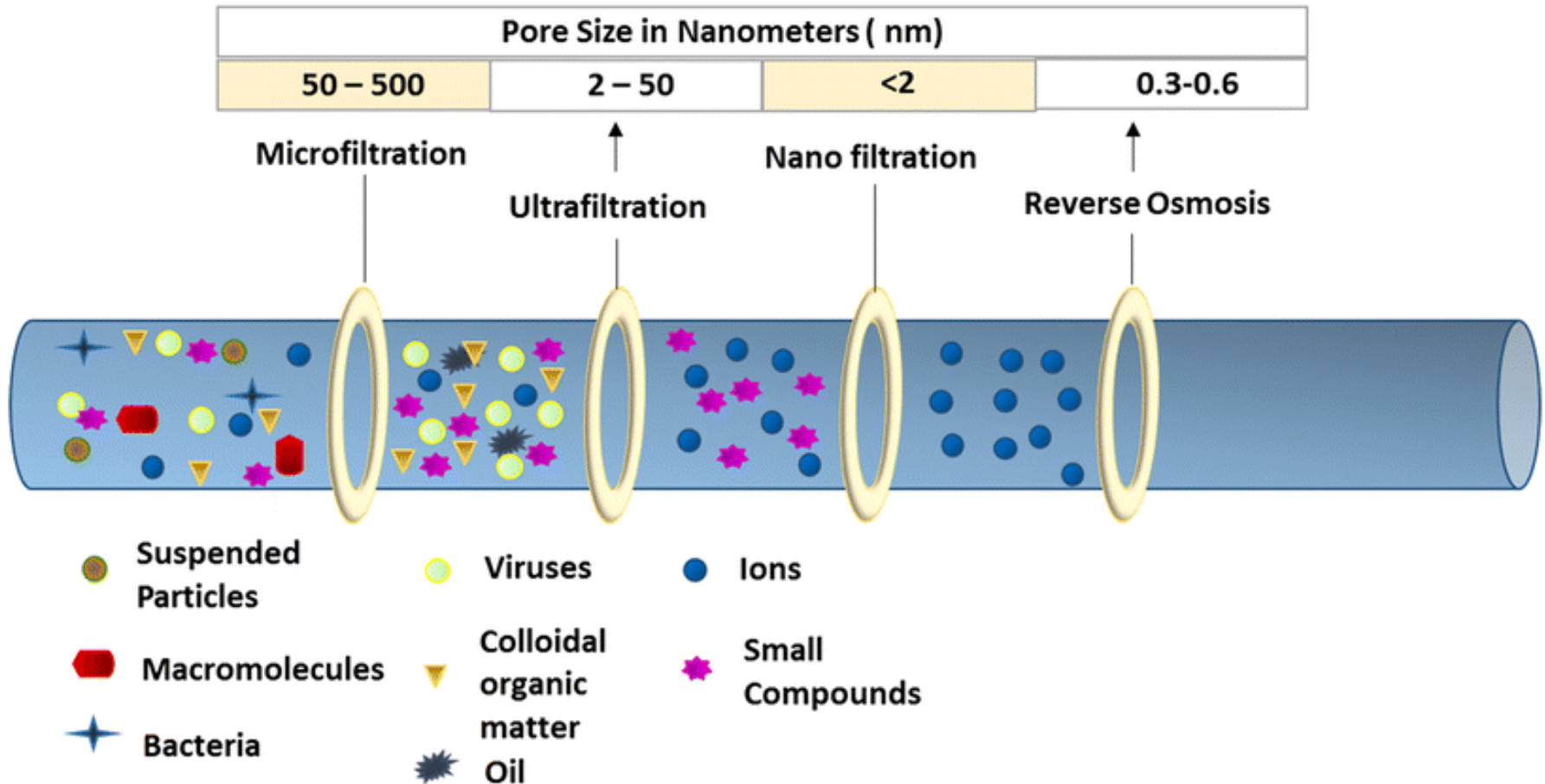
Reverse Osmosis  
NMS-RO



Electrodialysis  
Reversal NMS-EDR



# NIJHUIS MEMBRANE SOLUTIONS - RANGE



# NIJHUIS MEMBRANE SOLUTIONS



## BENEFITS

- Create the best business case
- In-house manufacturing / Dutch craftsmanship
- Plug & play design
- Highest possible industry standards and quality
- Reduce the water consumption and environmental impact of wastewater discharge
- Drinking water certified



# Solid and Adaptive Solutions

for a **Sustainable** and **Resilient** future



## **Business Cases and Sustainable Reuse Projects in the commercial sector**

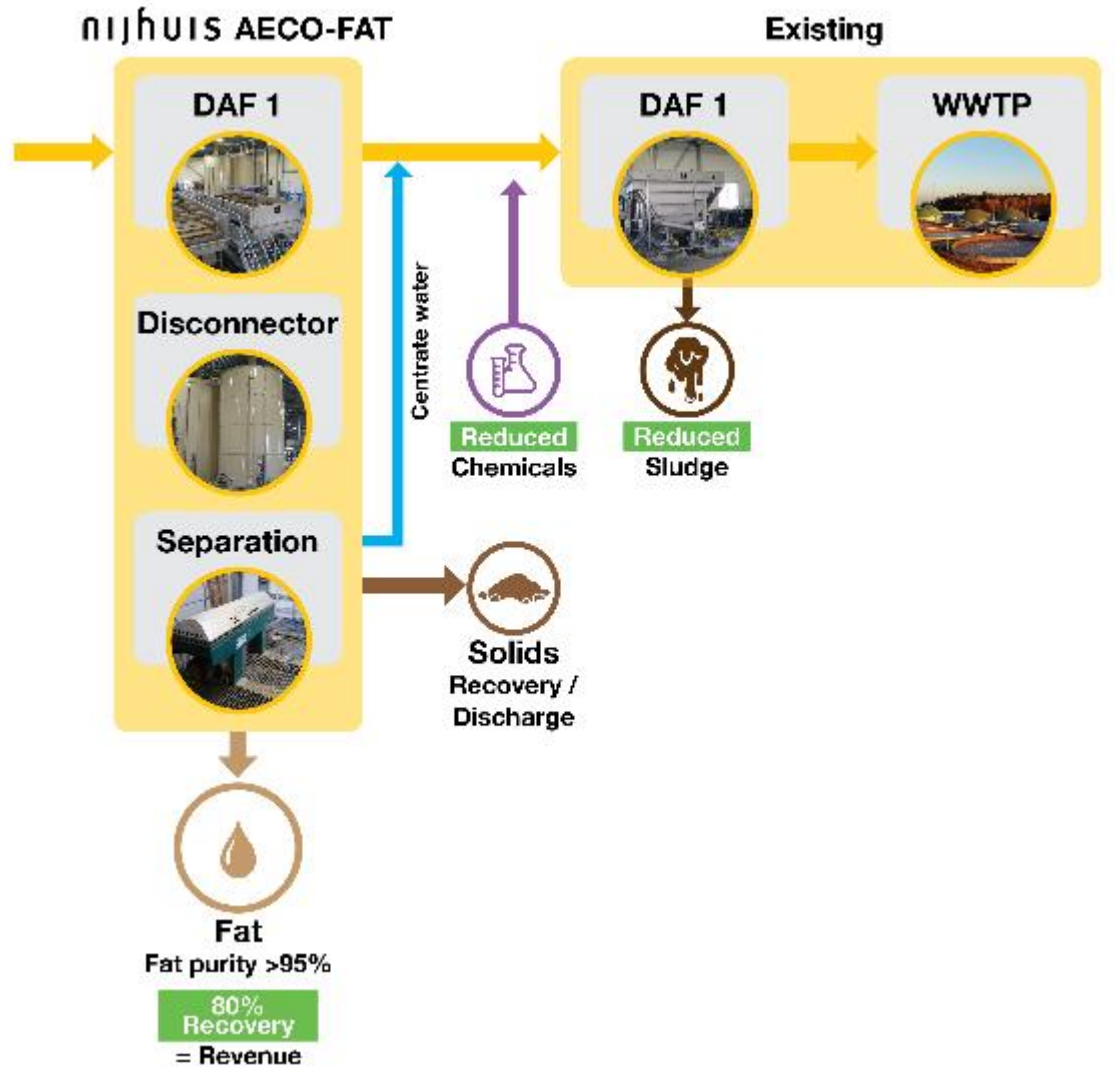
*Adopt game changing innovations in sustainable water reuse & resource recovery*

**SOLID SOLUTIONS IN A FLUID WORLD**



# NIJHUIS AECO-FAT

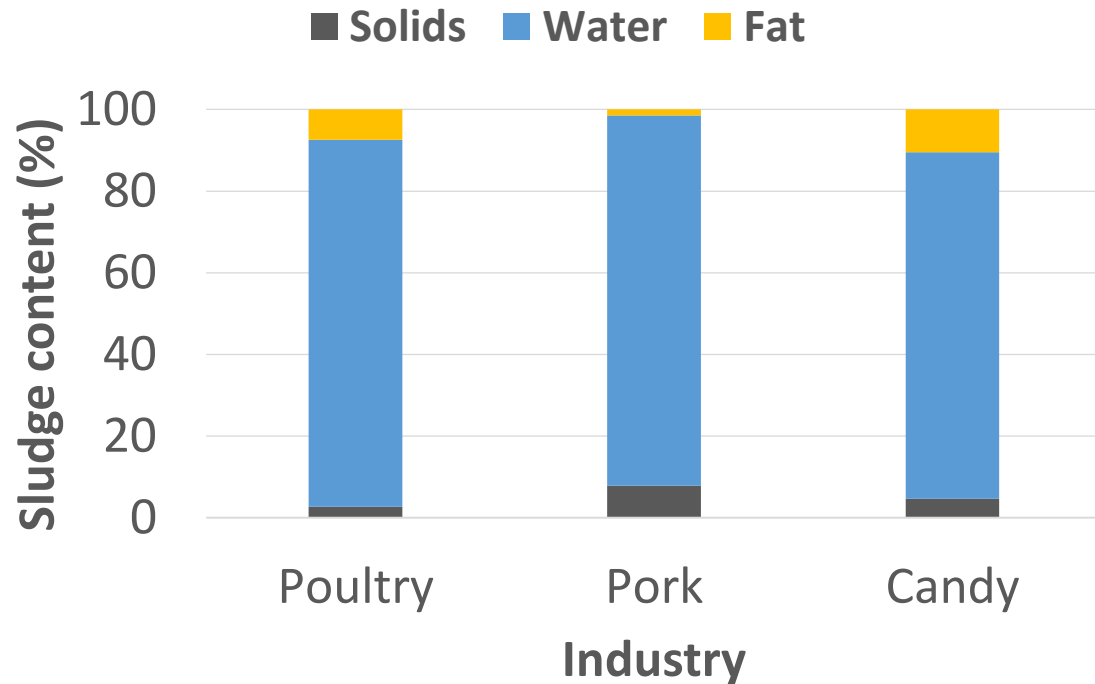
## FAT RECOVERY



# TYPES OF WASTEWATER - APPLICATIONS

## Industries with high fat content:

- Meat industry: poultry and red meat
- Food industry e.g. candy, sauces, ice cream and bacon processing
- Palm oil and edible oil



# BUSINESS CASE AECO-FAT

## Poultry slaughterhouse & further processing

Two scenarios

1) **No fat recovery** → only floc-flot DAF

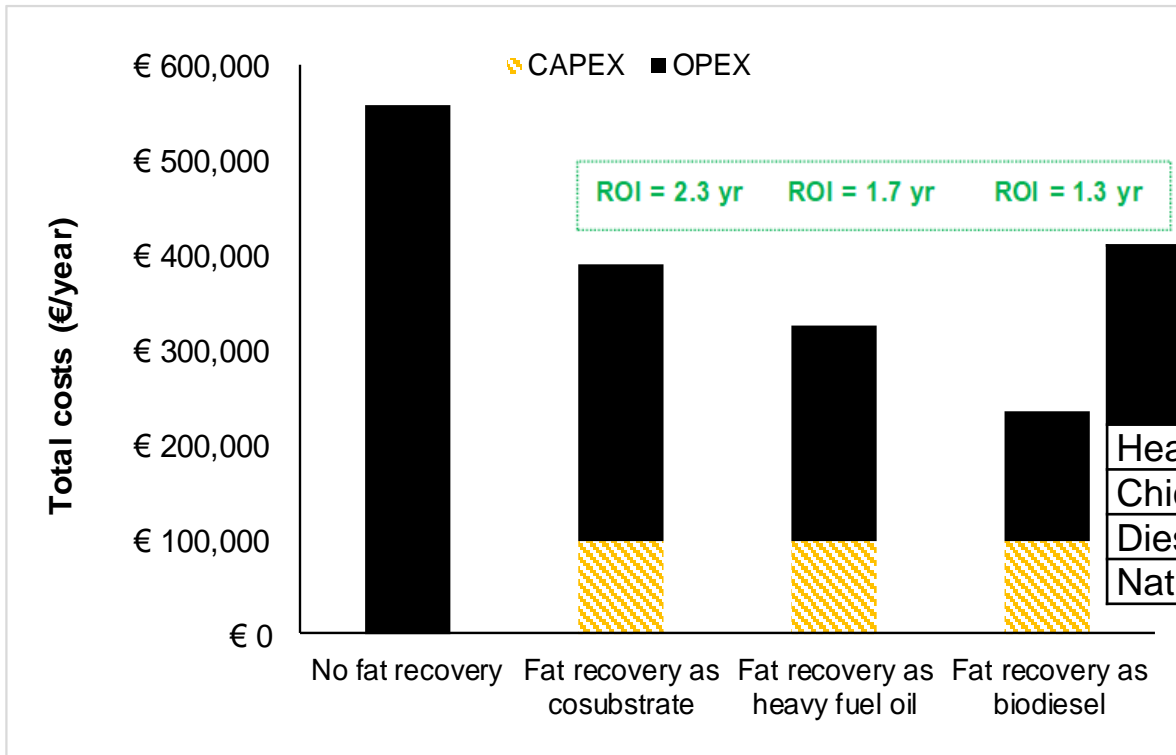
2) **Fat recovery** → flot DAF + fat recovery + floc-flot DAF

Parameter	Unit	Assumption
Wastewater flow (22000 chicken/h)	m <sup>3</sup> /d	3772
Solids content sludge	% w/w	4.0
Fat content sludge	% w/w	7.0
Costs sludge disposal	EUR/ton	15
Profit fat co-substrate	EUR/ton	160
Profit fat biodiesel	EUR/ton	300
Fat as heavy fuel oil	EUR/kg	0.49
Costs electricity	EUR/kWh	0.08



# BUSINESS CASE – AECO-FAT

## Poultry slaughterhouse & further processing



	Higher calorific value (MJ/kg)	Equal energy content (m <sup>3</sup> )
Heavy fuel oil	43.0	1.0
Chicken fat	38.7	1.1
Diesel fuel	45.3	1.2
Natural gas		1078



# ESBRO POULTRY

Wehl, the Netherlands



## Installation Facts:

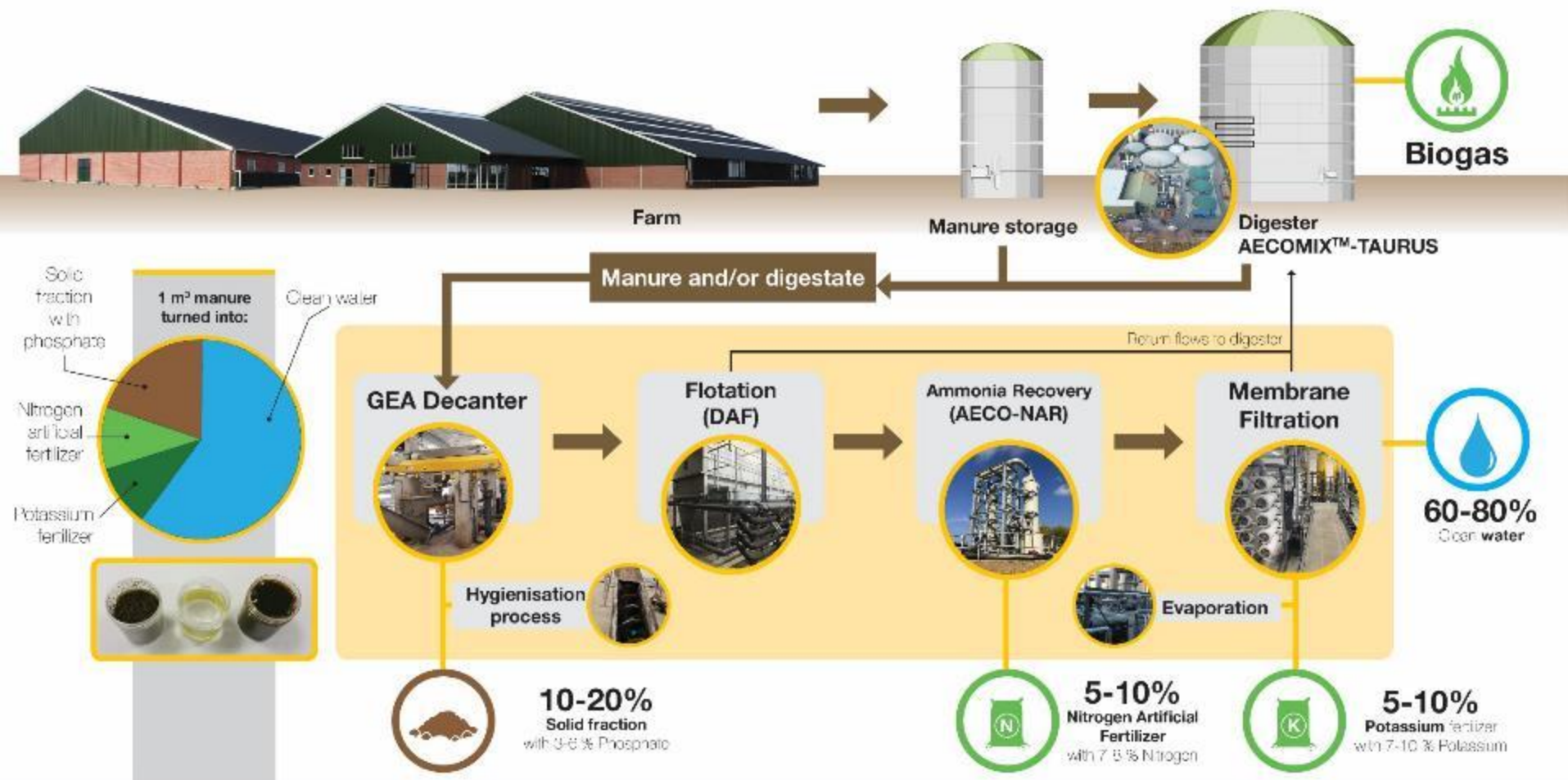
**Industry:** Poultry Slaughterhouse

**Design Flow:** 2170 m<sup>3</sup>/d

**Delivery:** Filter, balance tank, AECO-FAT (fat flotation-disconnector-separation), flotation.

**Startdate:** Dec. 2019

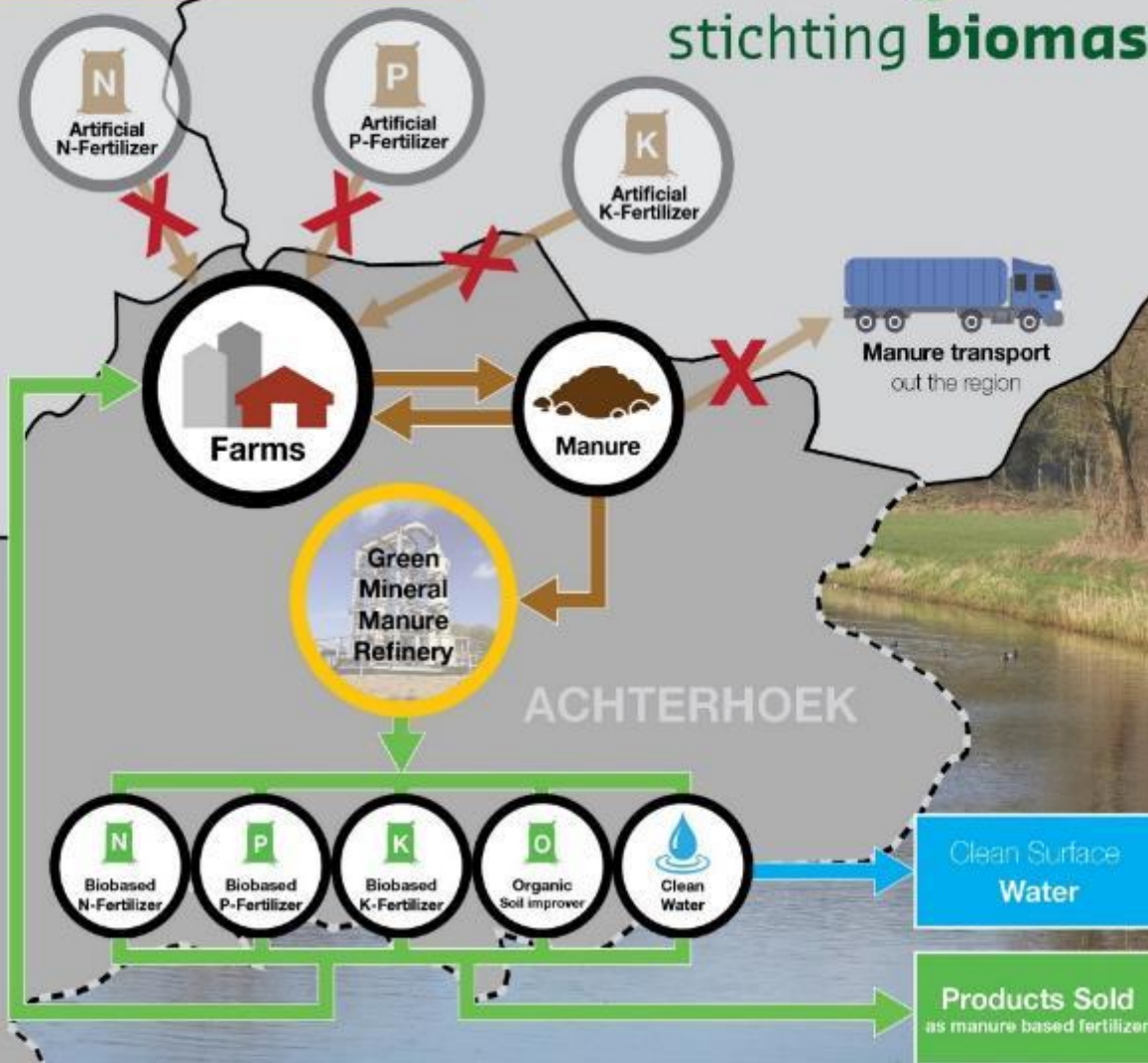
# NIJHUIS GENIUS RESOURCE RECOVERY



“An Achterhoek **without artificial** fertilizer”



stichting **biomassa**



“Regional biobased fertilizer production **reduces** the regional emissions of the greenhouse gas CO<sub>2</sub> by **5-10%**”



# Groot Zevert Vergisting

Beltrum, the Netherlands



## Installation Facts:

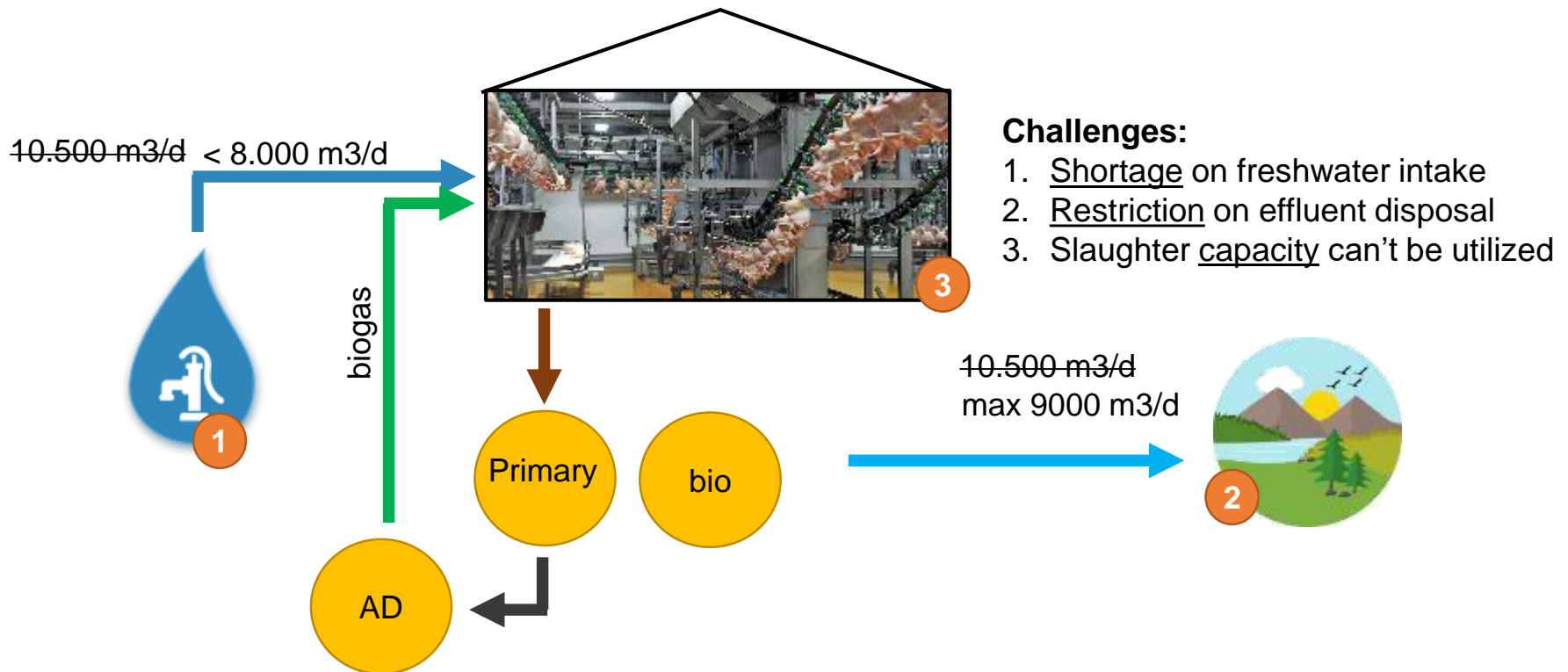
- Industry:** Manure treatment + cosubstrate
- Design Flow:** 100.000 ton per year
- Green minerals:** green meadow (Nitrogen-Potassium), phosphate, organic soil improver
- Blue minerals:** Clean water
- Delivery:** Decanter, Flotation unit, 2 stage Membrane filtration, Reverse Osmosis, ion-exchange
- Start date:** Dec. 2018



# NIJHUIS REUSE SOLUTIONS

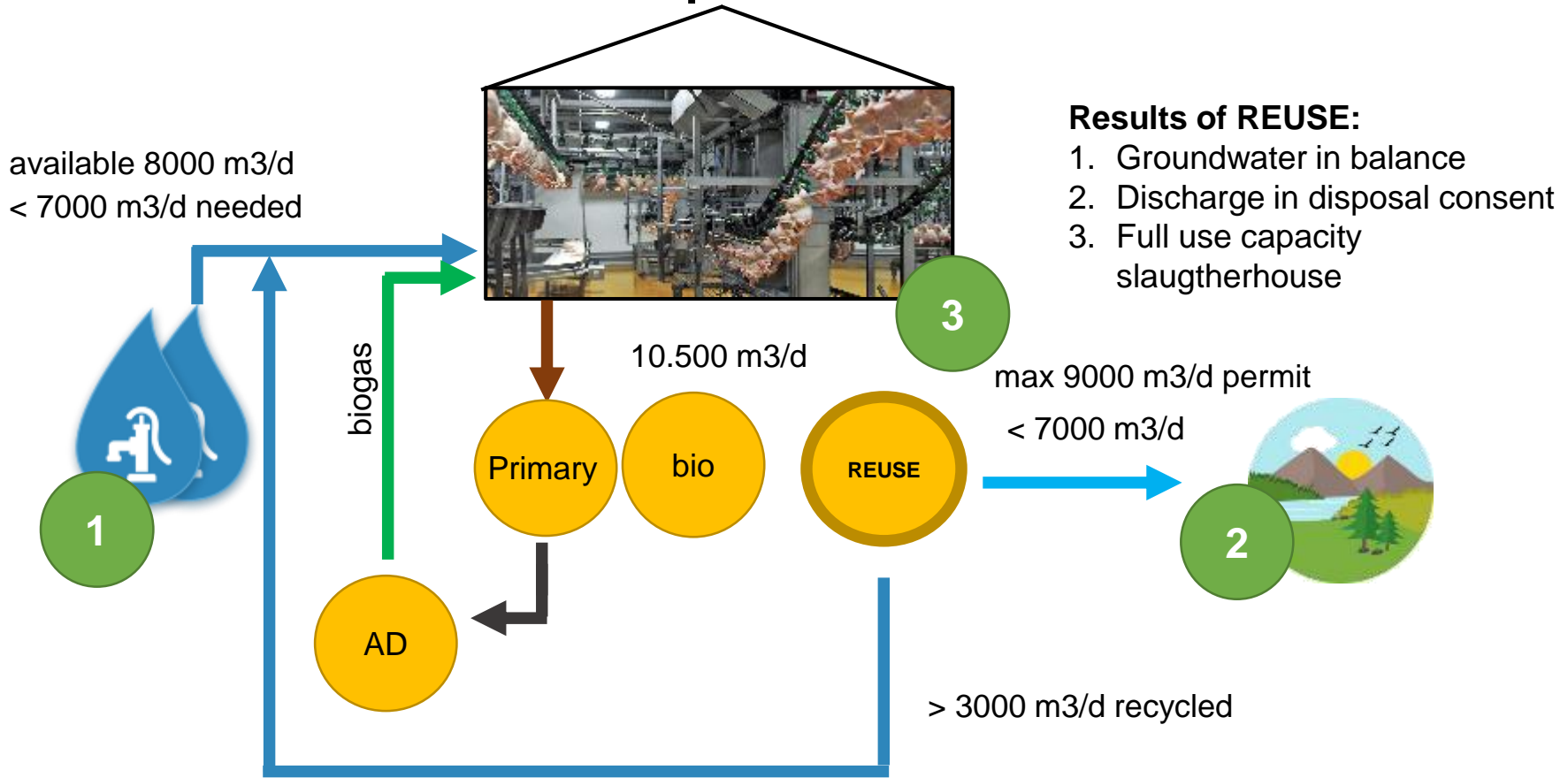
## CENTRAL EUROPE CASE: MEAT PROCESSING PLANT

### 2018 in practice: DROUGHTS & EFFLUENT limitations



# Central Europe case: Meat processing plant

## 2019 with REUSE: Licence to operate



# Nijhuis WWTP (Pre-treatment & Biological system)



NTF drum screens



IPF DAF

BIOCTOR - Aerobic treatment

NOF AS-DAF

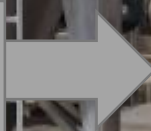




**Sandfilter**

UF

RO



# Membrane Solutions

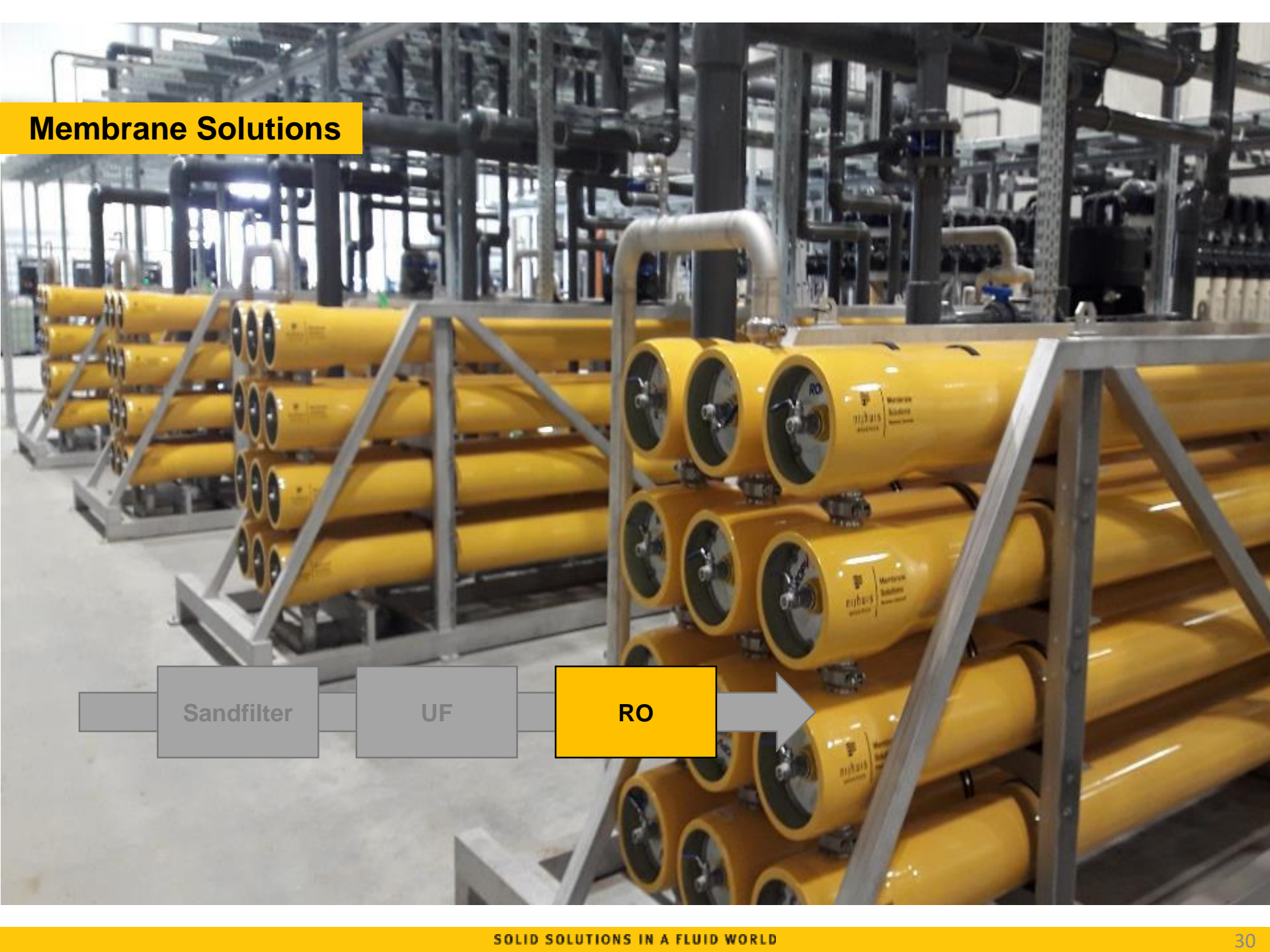


Sandfilter

UF

RO

# Membrane Solutions



# 4. Other Water Reuse examples

## Meat Processing



4000 m3/d

Drinking water production  
PRIM-BIO-SF-UF-RO  
60% water footprint reduction

## Cosmetics



400 m3/d

Process water production  
PRIM-MBR-RO  
75% water footprint reduction

## Paper



2850 m3/d

Process water production  
PRIM-MBBR-UF-EDR  
90% water footprint reduction



# L'ORÉAL

Warsaw, Poland



## Installation Facts:

**Industry:** Reuse of cosmetic wastewater (shampoo, surfactants, nanoparticles, micropollutants)

**Design flow wastewater:** 400 m<sup>3</sup>/d

**Technology:** Filter-flocculation-flotation-biological treatment (MBR)-UF-RO- Chlorination

**Application:** 50% wastewater reuse as process water.

**Start date:** 2019 start-up





# Coffee

Saint Petersburg, Russia



## Installation Facts:

**Industry:** Coffee

**Design Flow:** 2700 m<sup>3</sup>/d 24hrs d

**Technology:** Filter Floc-Flot-Anaerobic treat.  
Aerobic-treatment-Activated sludge Flot.  
Cooling tower.

**Solution:** AECOMIX™ -HR Reactor

**Start date:** 2017

# Take Home Message

“  
**Water reuse** - an ideal circular concept which is becoming an operational key for industrial growth  
”



**Thank you for your attention!**



**Questions?**

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# Confectionary

Russia, Perm



## Installation Facts:

**Industry:** Cereals and confectionary production wastewater

**Design Flow:** 220 m<sup>3</sup>/day - average (waste water)  
315 m<sup>3</sup>/day - maximum (waste water)  
2 m<sup>3</sup>/day (waste products)

**Biogas:** approx. 1400 Nm<sup>3</sup>/day

**Delivery:** Filter (NTF) -anaerobic treatment (AECOMIX™-DGF)  
aerobic treatment (BIOCTOR)-sludge screw press (NSP)

**Start date:** 2019

# Solid and Adaptive SOLUTIONS

## Reduce, Reuse and Recover

Lower  
**CAPEX**



*Design the most optimal process to meet clients expectations against the lowest possible CAPEX*



*Standardized, modular, plug & play designed equipment and treatment concepts*

Lower  
**OPEX**



*Lower energy consumption, lower chemical consumption, reduction of sludge volume*



*Nijhuis i-CONTROL, i-MONITORING and NI-Connect, combining smart controls and online data analysis supporting clients around the world*

Sustainable  
**PROFIT**



*From Waste to Value (nitrogen, fat, protein, biogas)*



*Chemical free waste- and process water treatment*