IBBA - Biogas and Biomethane

Norrköping - 06/11/2018

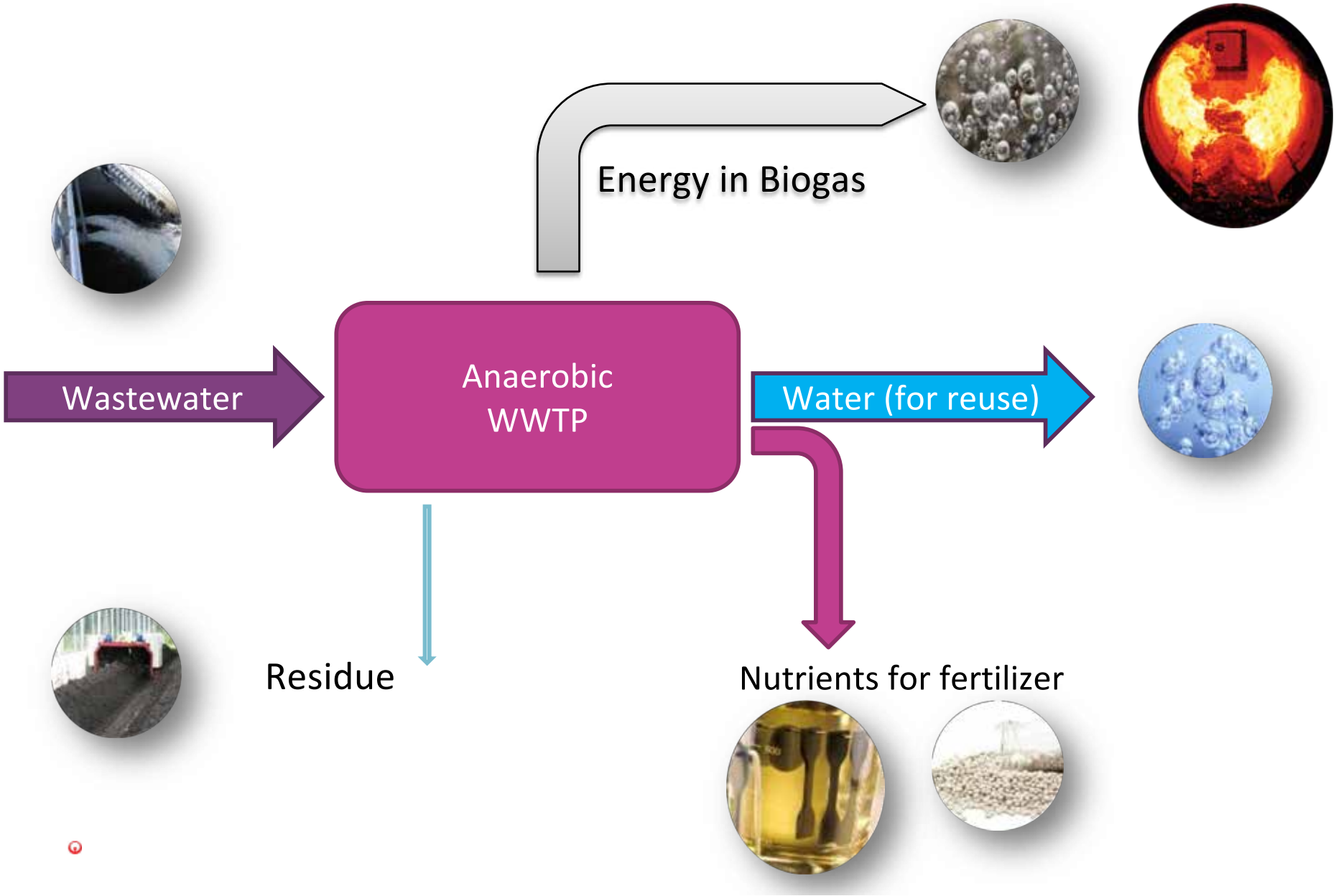
by VEOLIA
Water Technologies

BIOTHANE

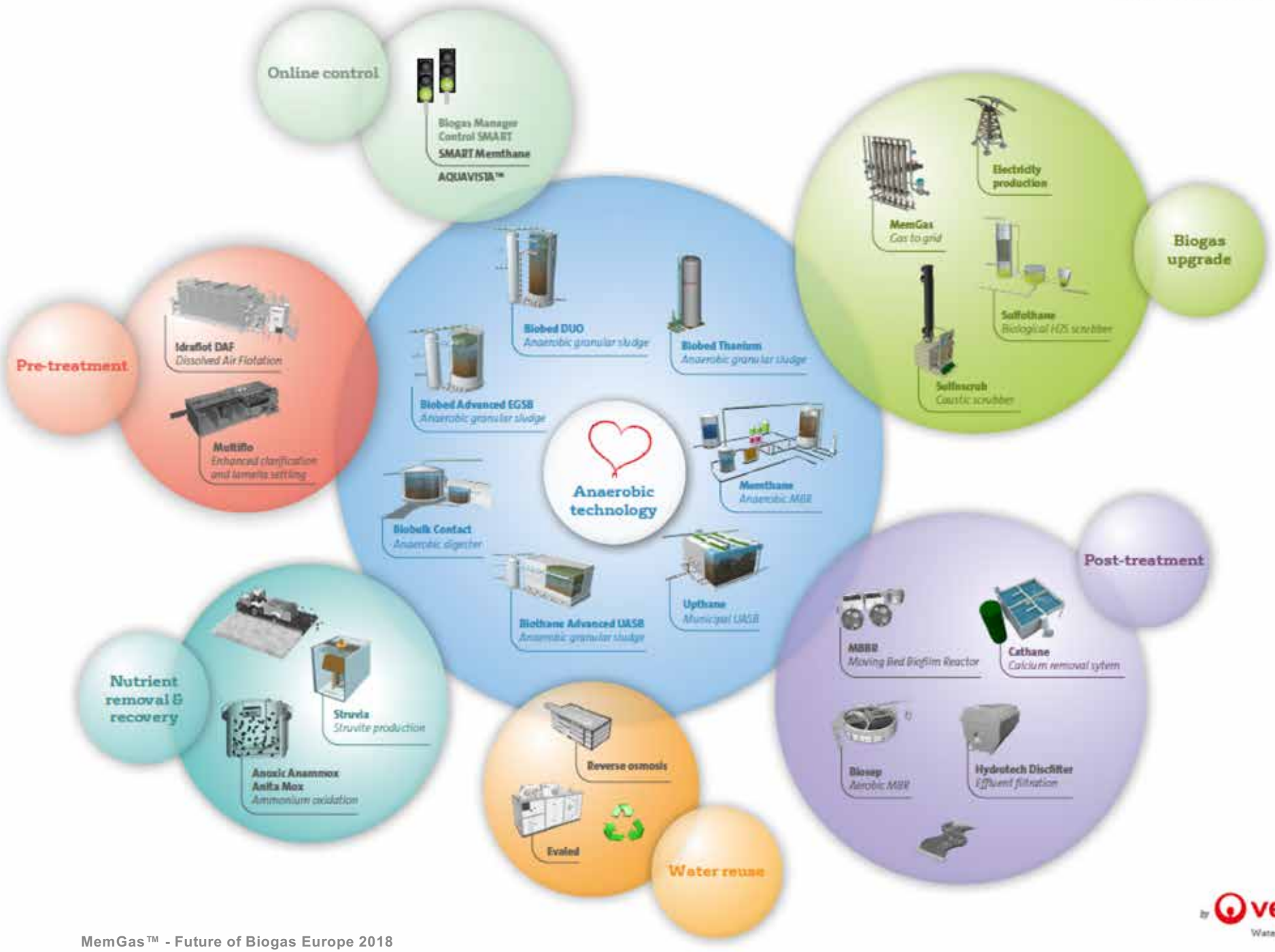
Leading Anaerobic Technologies

- 35 years experience in anaerobic technologies
- Design and Build plants for industrial wastewater with over 600 plants built in 62 countries across the globe
- 11 technologies with international patents
- Strong focus on R&D and technology development, more than 15 pilots
- **Veolia Technology Centre for Anaerobic Treatment of Industrial Wastewater**

From wastewater treatment plant to ….Bio-Refinery



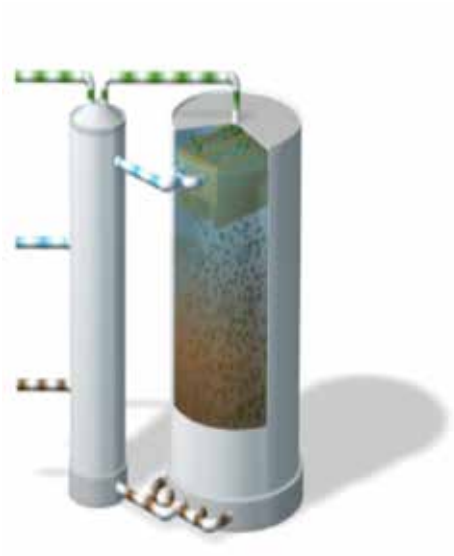
BIOTHANE



by VEOLIA Water Technologies

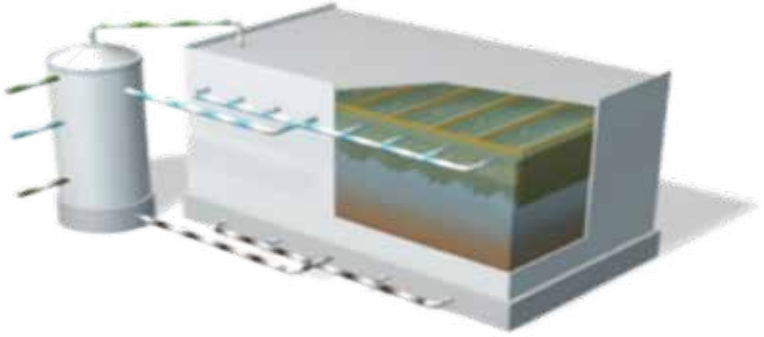
Biothane anaerobic technologies

- Biobed® Advanced EGSB



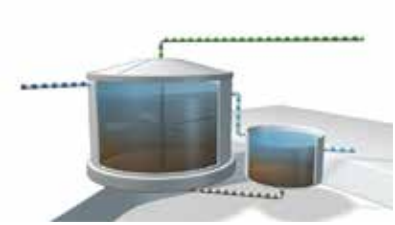
  - *Granular Sludge Bed*

- Biothane Advanced UASB



Biothane anaerobic technologies

- **Biobulk CSTR**
  - *Solid / Slurry waste digestion*
  - *With or without sludge recirculation*
  - *Suitable for high COD / SS / FOG waste (water)*



- **Memthane® Anaerobic MBR**
  - *Anaerobic treatment for high strength wastewater*
  - *Using Cross-flow UF membranes*
  - *Crystal clear effluent, ready for reuse*

Biothane biogas technologies

- **Sulfothane™ biogas desulphurization**
  - *Biological regenerated scrubber*
  - *Low caustic demand , elemental sulphur production*
  - *Suitable for high H_2S loaded biogas*

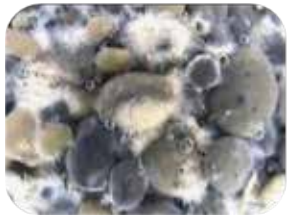
- **MemGas™ biogas upgrading**
  - *Separation of CO_2 and CH_4 by selective membranes*
  - *High efficiency (>99%) at low cost*
  - *Easy to operate and maintain*

Biothane Services

- **Laboratory**
  - *Analytical & Application*
  - *Research & Development*
- **Technological Support Services**
  - *Feasibility Studies & Development Technology Roadmap*
  - *Plant Upgrade*

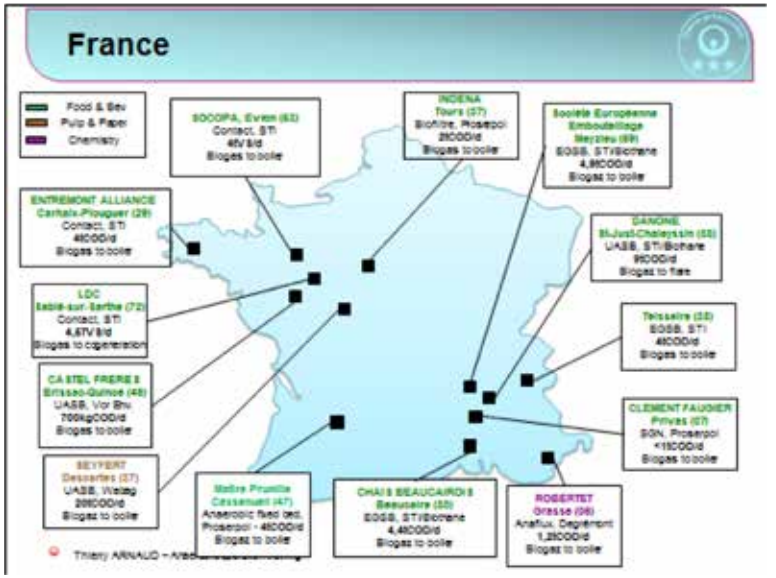
- **Service contracts & Web-based SMART control**

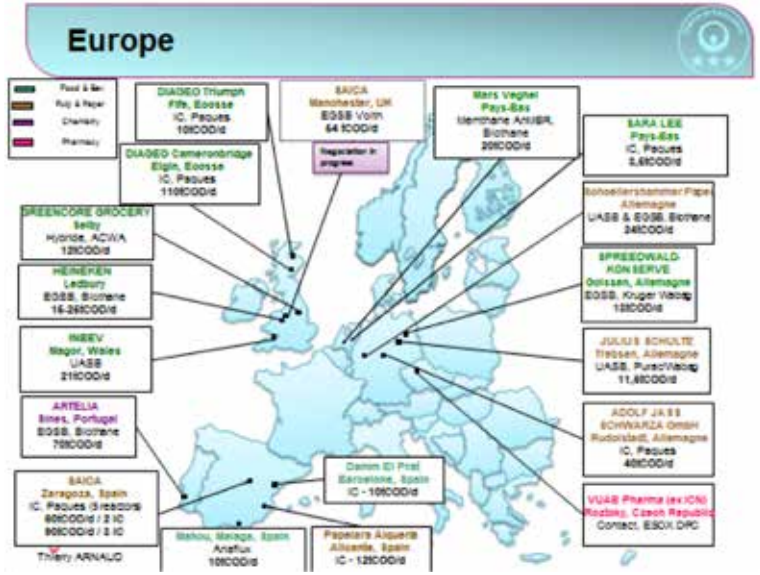
- **Biomass & Nutrients**



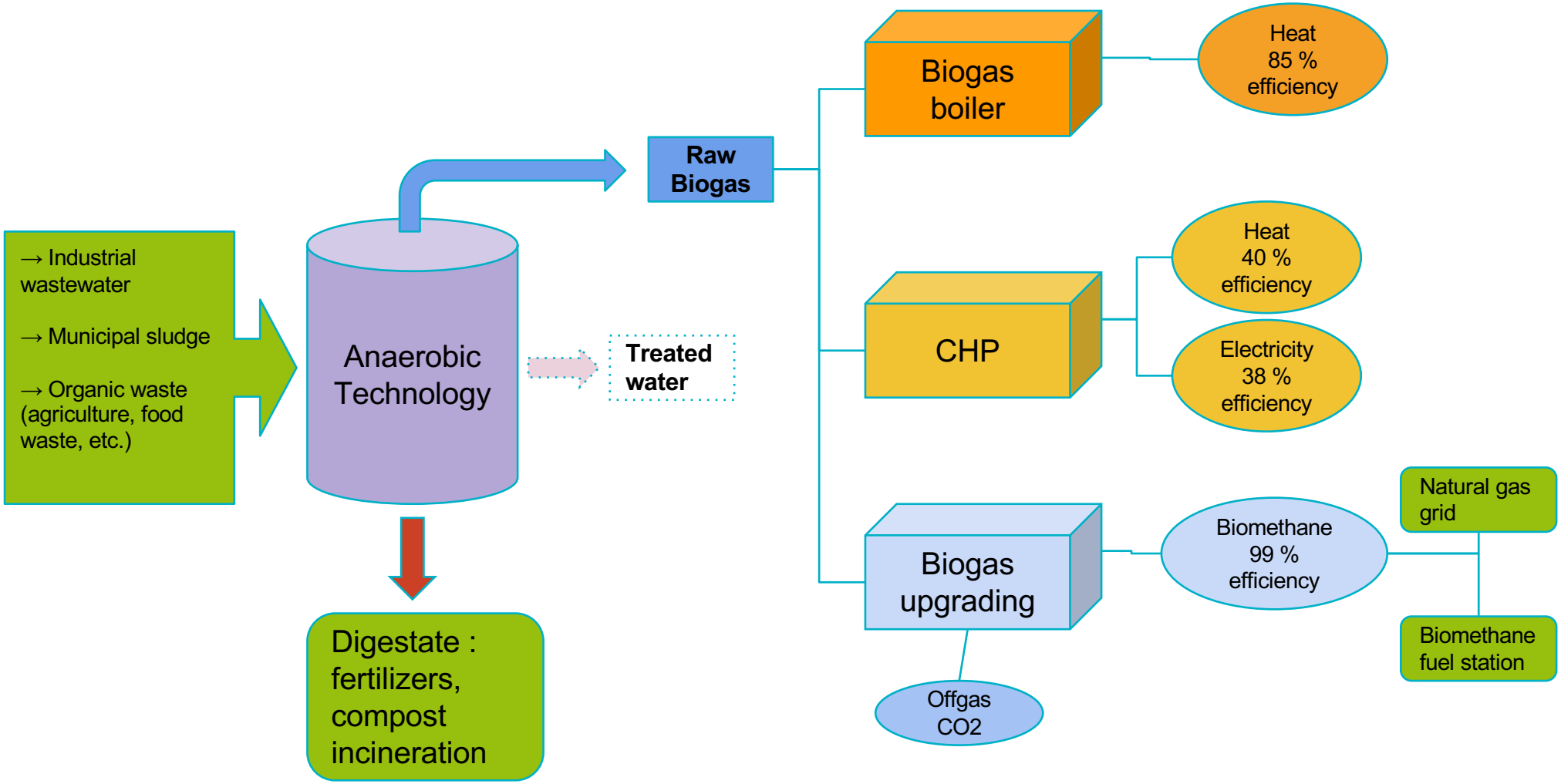
Veolia is operating P&P treatment plants worldwide

- Veolia is currently **operating** **15** anaerobic reactors in Europe for P&P industries.
  - *Our operators have **proven** their **expertise in operating** all kind of technologies (UASB, EGSB, IC, R2S, etc.).*
  - *With more than **10 years** of feedback experience in operation, Veolia is able to establish advantages and limits of each technology and bring all **benefits** for improving our patented*
  - ***Advanced EGSB reactor.***





Biogas valorization : Potential Applications



Rottneros Bruk, Rottneros, S

Project Prerequisite

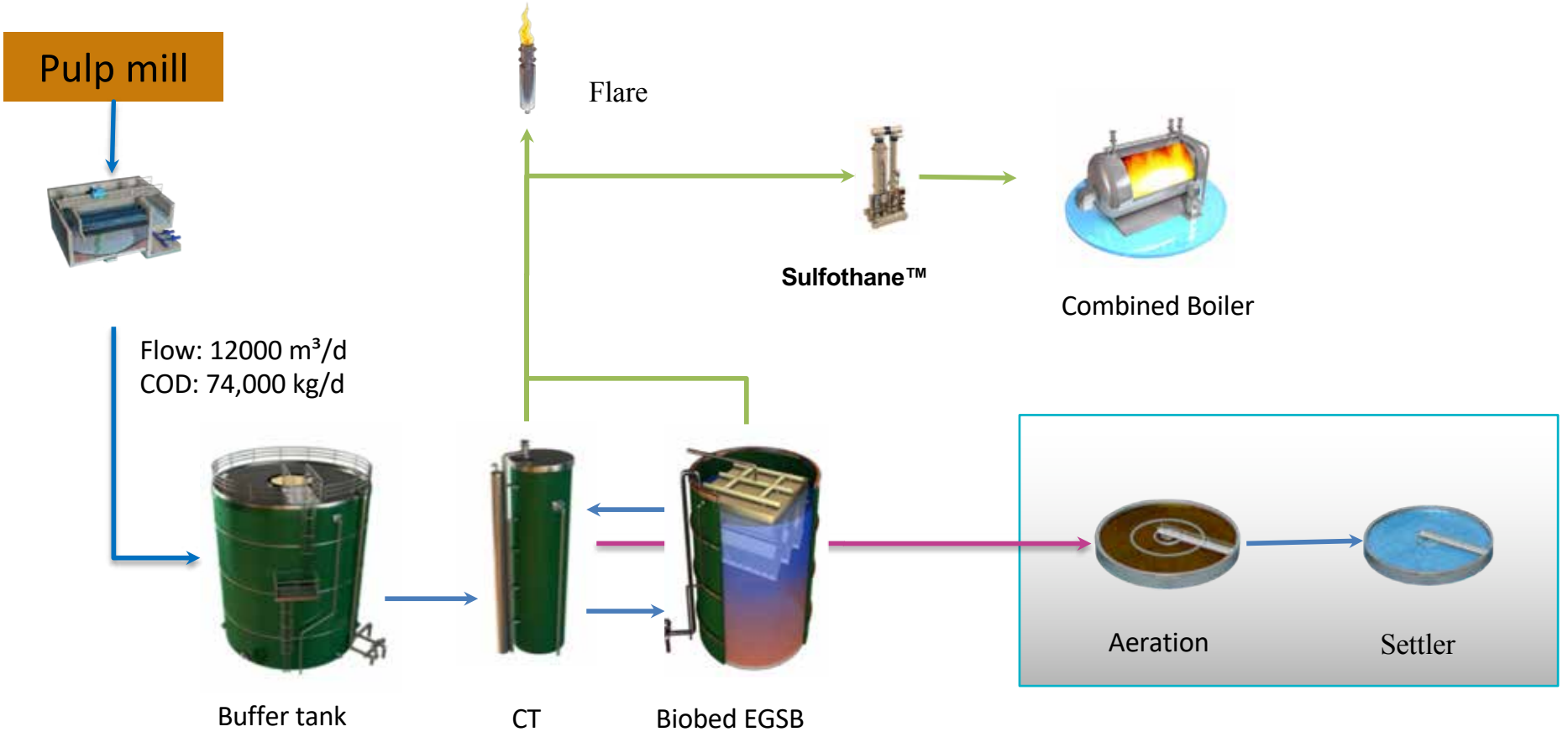
- Production of 177 to/d of CTMP and groundwood pulp from soft wood
- 12,000 m³/d pulp wastewater; 74,000 kg COD/d; SO4: 900 mg/l

Solution

- Anaerobic Biobed Advanced EGSB pre-treatment plant (4,000 m³ reactor)
- Sulfothane Desulphurization 1,000 m³/h biogas with 3.5% H2S (D&B bioreactor design)

- Commissioned: 05 - 2018

Rottneros Bruk (S)



Project information

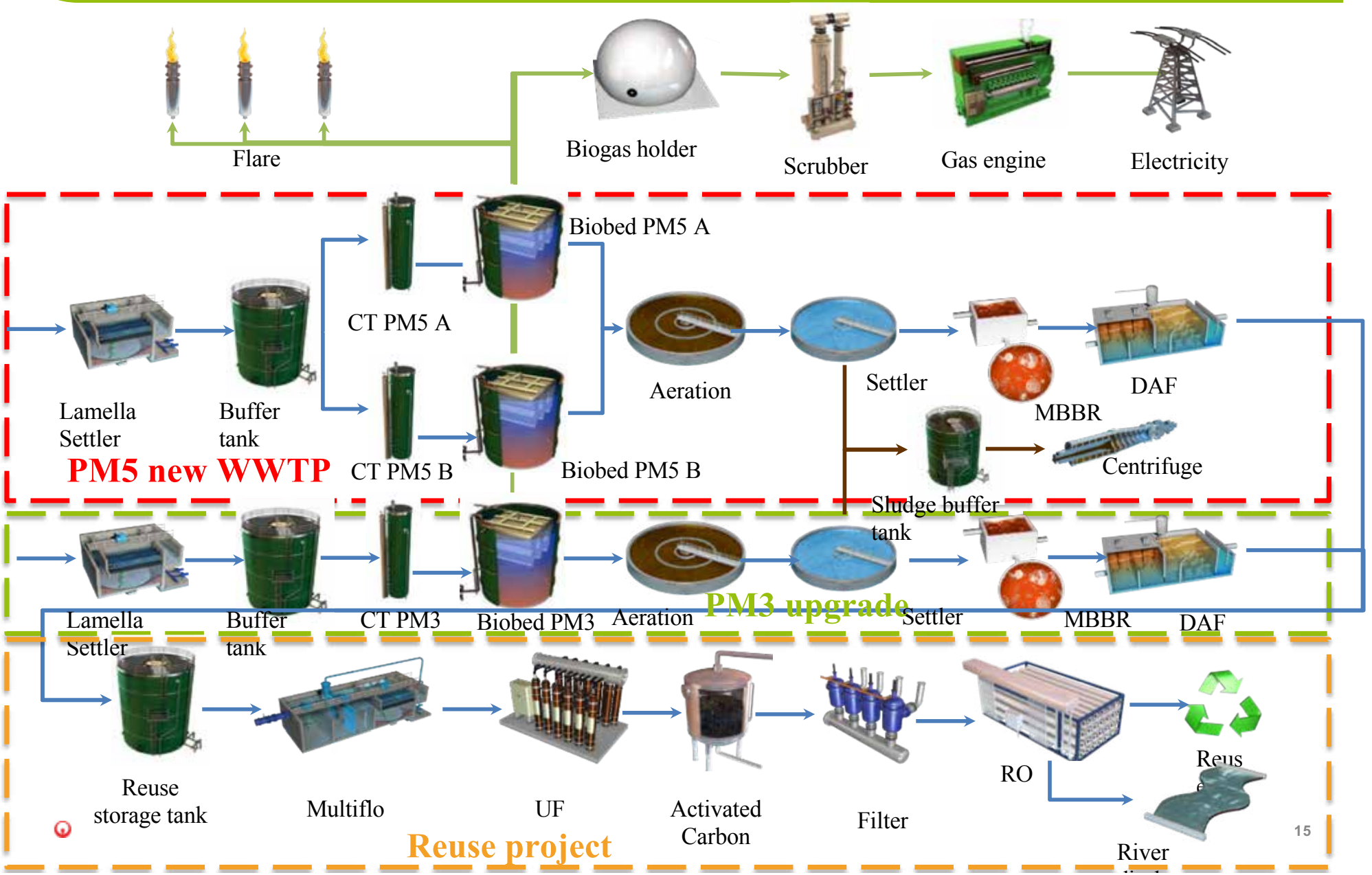
- Paper mill has two existing paper machines
  - *PM3 – Biothane*
  - *PM4 – Paques*
- New project
  - *Construction new paper mill PM5*
  - *Client cannot take anymore ground water*
  - *3 separate projects*
    - Reuse plant – By VWT Turkey
    - Gas scrubber – By ARBiogas
    - New wastewater treatment plant for PM5 and renovation of PM3
  - *Other considerations*
    - High calcium concentration

Project Information	
Industry	: Recycle Paper
Enduser	: Modern Karton
Client	: VWT Turkey
Country	:Turkey, Corlu
Technologies	: Biobed Advanced EGSB, Calthane, MBBR, DAF

Modern Karton, Corlu (TR)
Recycle paper mill and reuse

- Waste water
  - *Test liner & paperboard production from recycle pulp*
- Capacity
  - *PM5: 72000 kg COD/d, 12000 m³/d, SO4 300 ppm , Ca 800 ppm*
  - *PM3 52000 kg COD/d, 7200m³/d, SO4 300 ppm, Ca 800 ppm*
- Commissioning: 2015 - 2016
- Process:
  - *Anaerobic BIOBED® Advanced Process (2+1 reactors)*
  - *Aerobic Ca removal step (2 x) Calthane and recycle to dilute Biobed influent Ca levels*
  - *Water Reuse in production with MBBR/DAF, Actiflo, UF and RO*

Modern Karton
Overall PFD



2. Case Study 1 - *Municipal Project*

Treatment Process - Veolia Line

WWTP capacity	950 000 PE
Sludge quantity	20 000 TDS/y
%VM	83 %
Biogas CH_4 content	65 to 70 %

Gasholder

Sulfothane™c

MemGas™

Biomethane into gas grid

Primary and biological sludge

Centrifuge

Thermal hydrolysis Biothelys™

Centrifuge

Incineration

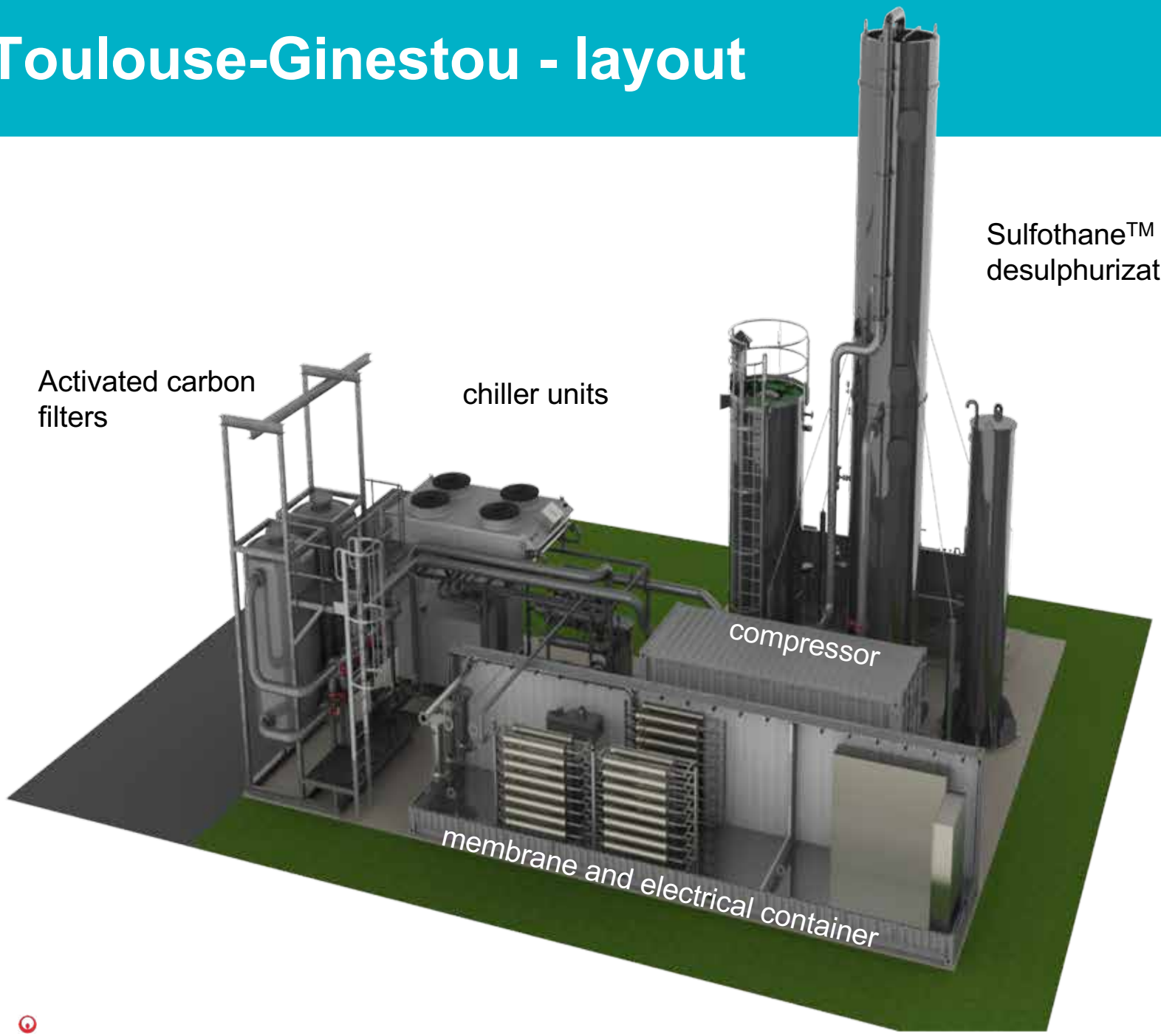
Thermal hydrolysis flowrate	180 m^3/day
Digesters volume	2 x 5 700 m^3
Biogas treatment flowrate	1 500 Nm^3/h
Digestion returns	710 m^3/day

2 mesophilic digesters with GASTOP™

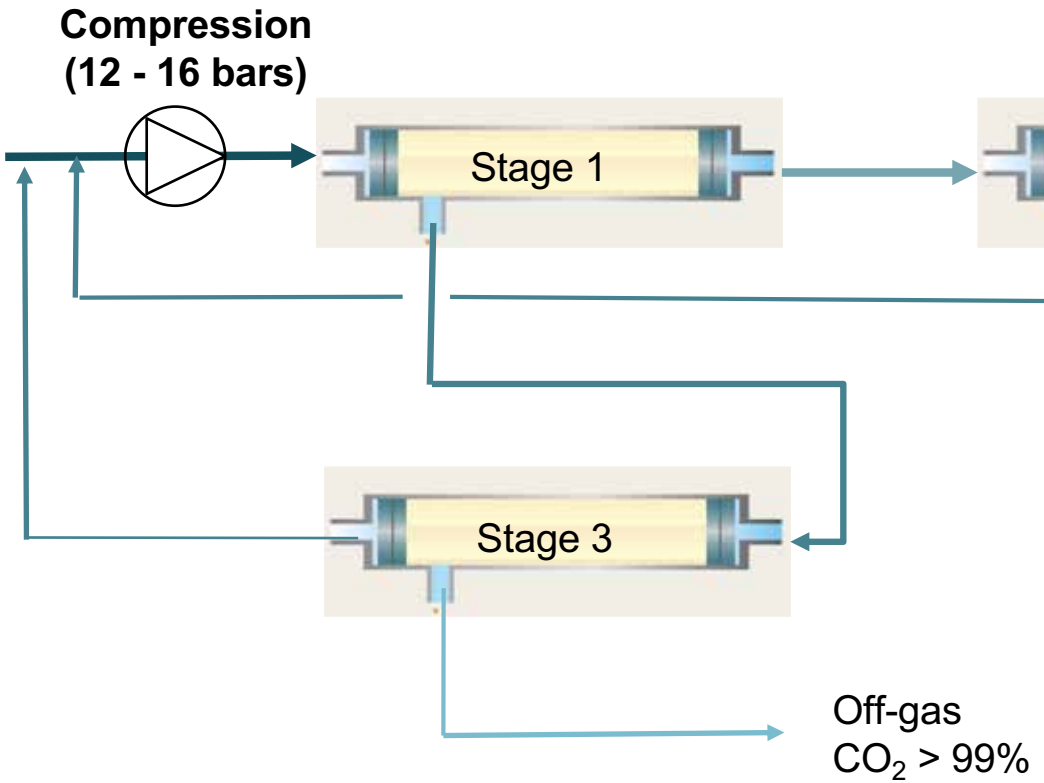
Digestion returns treatment Anitamox™

Back to the water treatment line

Toulouse-Ginestou - layout



MemGas™ - patented multi stage process



- **Advantages**
  - *High methane yield (> 99%)*
  - *Low Methane slip (< 0.5% CH4 in off-gas)*
  - *no heat requirement, no chemical disposal*
- **Weakness**
  - *Reliable pre-treatment*
  - *No separation between CH4 and N2*

Main Advantages of the combination of VEOLIA technologies

- **Biothelys™:**
  - - 60% of digesters volume
  - - 51% of DS content of sludge
  - + 14% of biogas production
- **Anitamox™:**
  - - 60% of electrical consumption for nitrogen removal compared to conventional treatment
- **Sulfothane™:**
  - - 80% of OPEX compared to caustic scrubber or activated carbon treatment
- **MemGas™:**
  - 99.5 % of efficiency

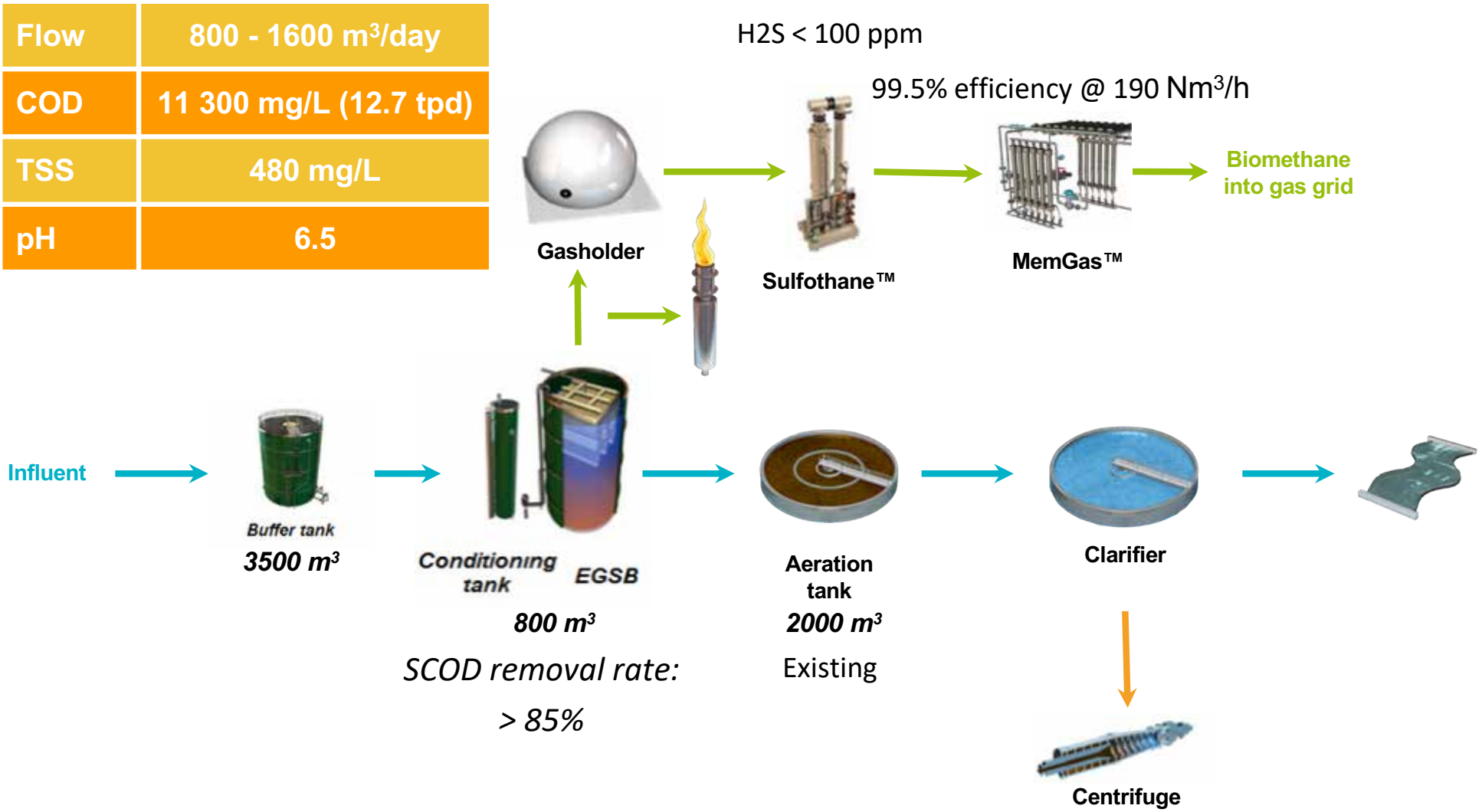
Key Figures

- **Digested sludge quantity: 8 000 TDS/year**
- **Average biomethane injection: 620 Nm^3/h, equivalent to 33700 oil barrels per year**
- **Biomethane income: 60 M€ over 15 years (fixed feed-in tariff in France)**
- **Positive carbon balance over 15 years: 170 000 tCO_2 avoided**

3. Case Study 2 - *Industrial Project*

Treatment Process

Flow	800 - 1600 m^3/day
COD	11 300 mg/L (12.7 tpd)
TSS	480 mg/L
pH	6.5



Performances

- EGSB
  - SCOD removal rate: > 85%
- Sulfothane™
  - H2S < 100 ppm
- MemGas™
  - 99.5% efficiency
  - Biogas quality compliant with French regulation
- Effluent

COD	mg/L	90
TSS	mg/L	35
BOD	mg/L	30
TN	mg/L	10
TP	mg/L	2
Potassium	mg/L	100
Sulfate	mg/L	500

Key Figures

- **Sludge quantity: 1800 T/year**
- **Average biomethane injection: 825 000 Nm^3/year**
- **Biomethane income: 18 M€ over 15 years (fixed feed-in tariff in France)**