



**BIOTHANE**

## *Shaping the Energy Systems of the future, Brussels, 2020*

Municipal and Industrial market a source for BioMethane...

*Dennis Korthout*

# VEOLIA – Resourcing the World ... #weareresources

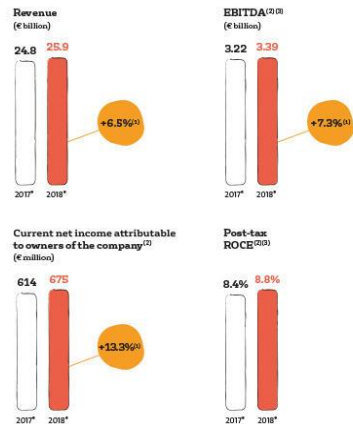
## OUR 3 ACTIVITIES



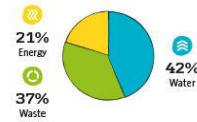
**€25,911**  
MILLION REVENUE  
WORLDWIDE

**171,495**  
EMPLOYEES  
WORLDWIDE

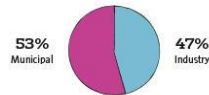
## RESULTS, PERFORMANCES AND PROGRESS



## BREAKDOWN OF REVENUE BY ACTIVITY



## BREAKDOWN OF THE GROUP'S CUSTOMERS



## BREAKDOWN OF THE WORKFORCE BY ACTIVITY



<sup>(1)</sup> All a constant exchange rates.  
<sup>(2)</sup> See chapter 3, section 3.2.3 "Definitions" of the 2018 Registration Document.  
<sup>(3)</sup> Including IFRS 15 impacts.  
 \* Exclusion of Urbiana in discontinued operations (IFRS 5) from 2016 and of Gabon in 2017 and 2018.

# VEOLIA – Resourcing the World ... #weareresources



+100  
Technologies



7,200 Patents



4 Regions  
41 Countries



8,750  
Employees



60% industry  
40% municipal





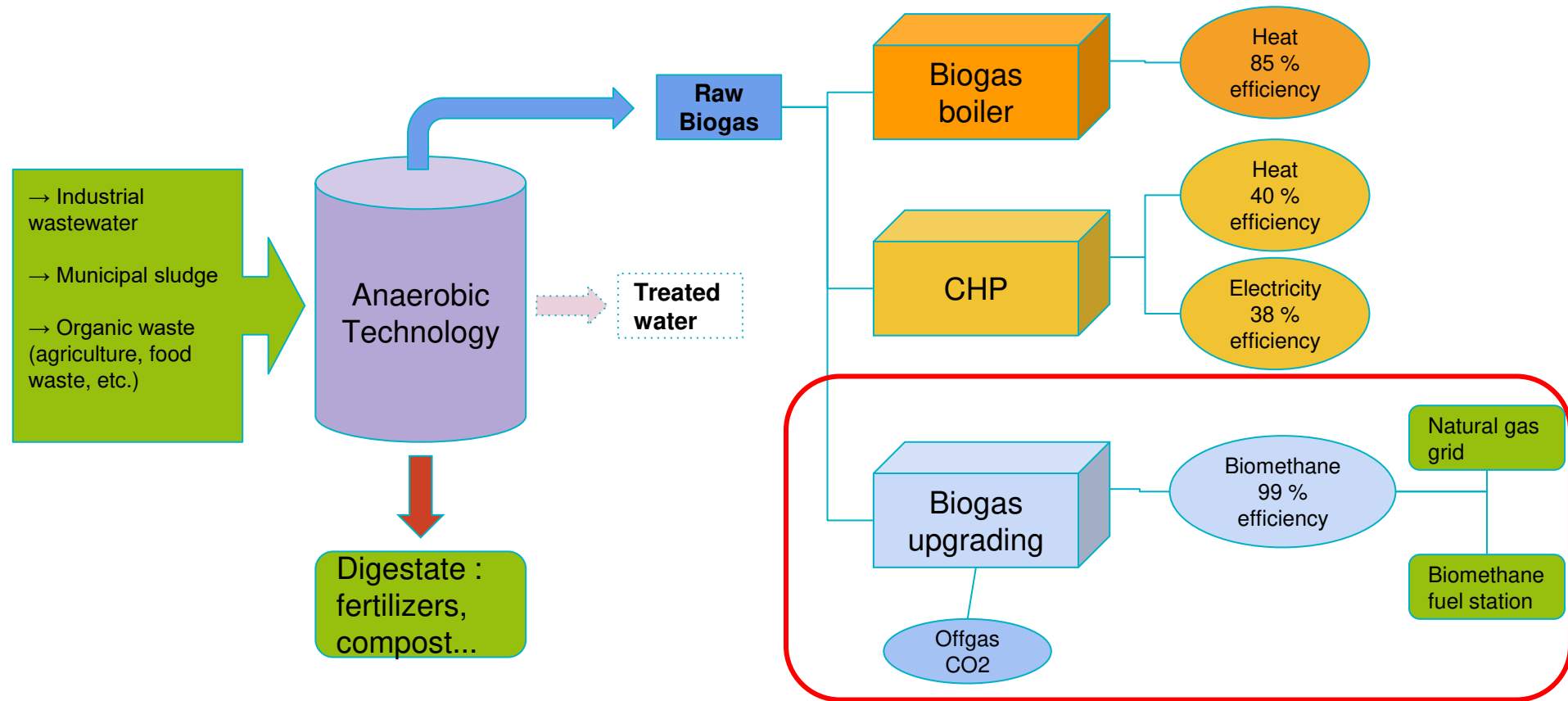
# Focus on “Techno BUs”



# Biothane anaerobic technologies



# BIOMETHANE - Highest energy recovery...



## MARKETS & APPLICATIONS

### Municipal:

Case Study: Reyran Fréjus

Case Study: Ginestous

### Industrial:

Case Study: Fruit processing - Avignon

### Waste Processing

*Reyran Fréjus (France)*



# Case Study 1 - Municipal Project - Sludge Digestion

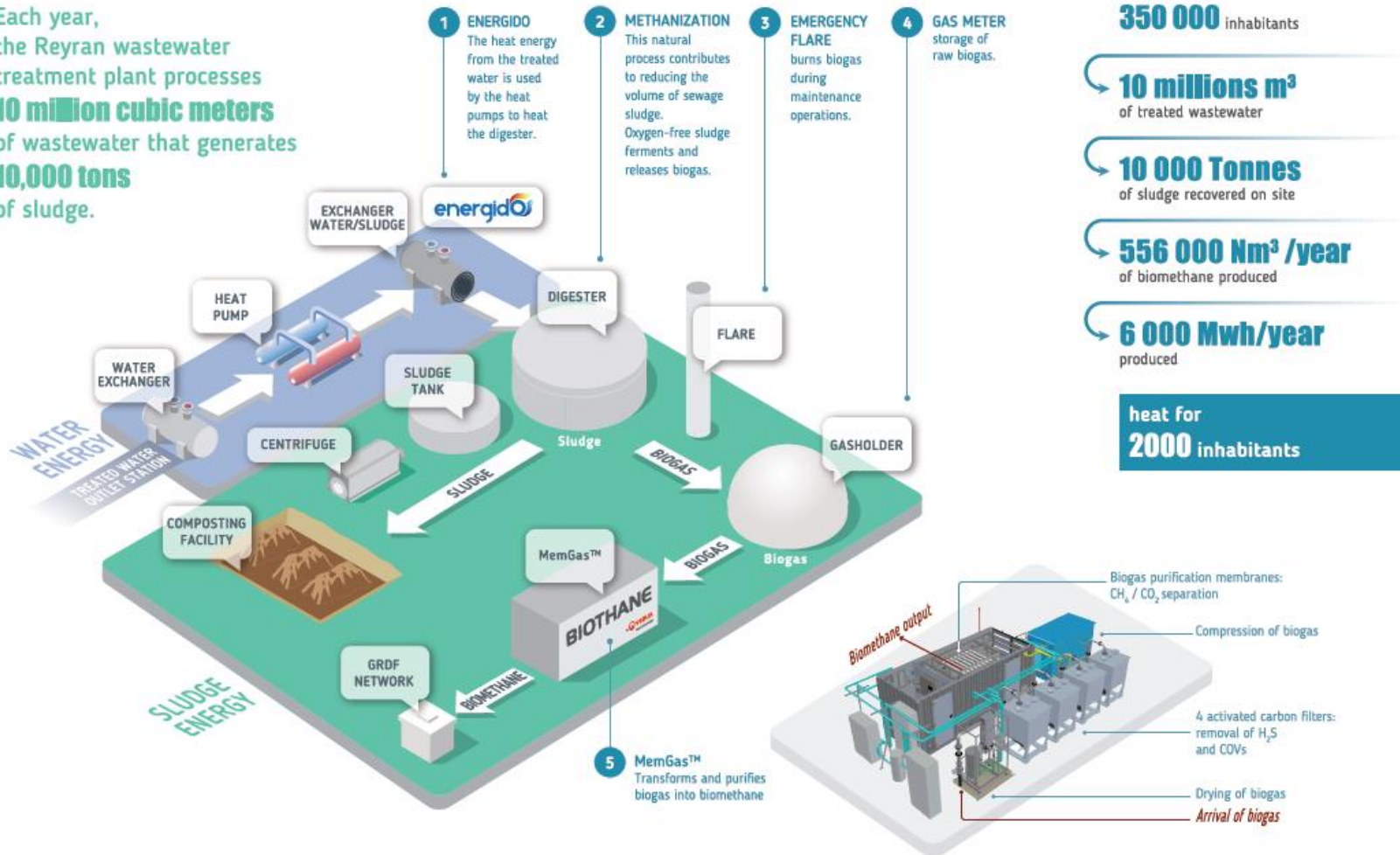


- Municipal WWTP - 350 000 PE
- Sludge digester (primary and biological)
- Biogas treatment 60 to 160 Nm<sup>3</sup>/h

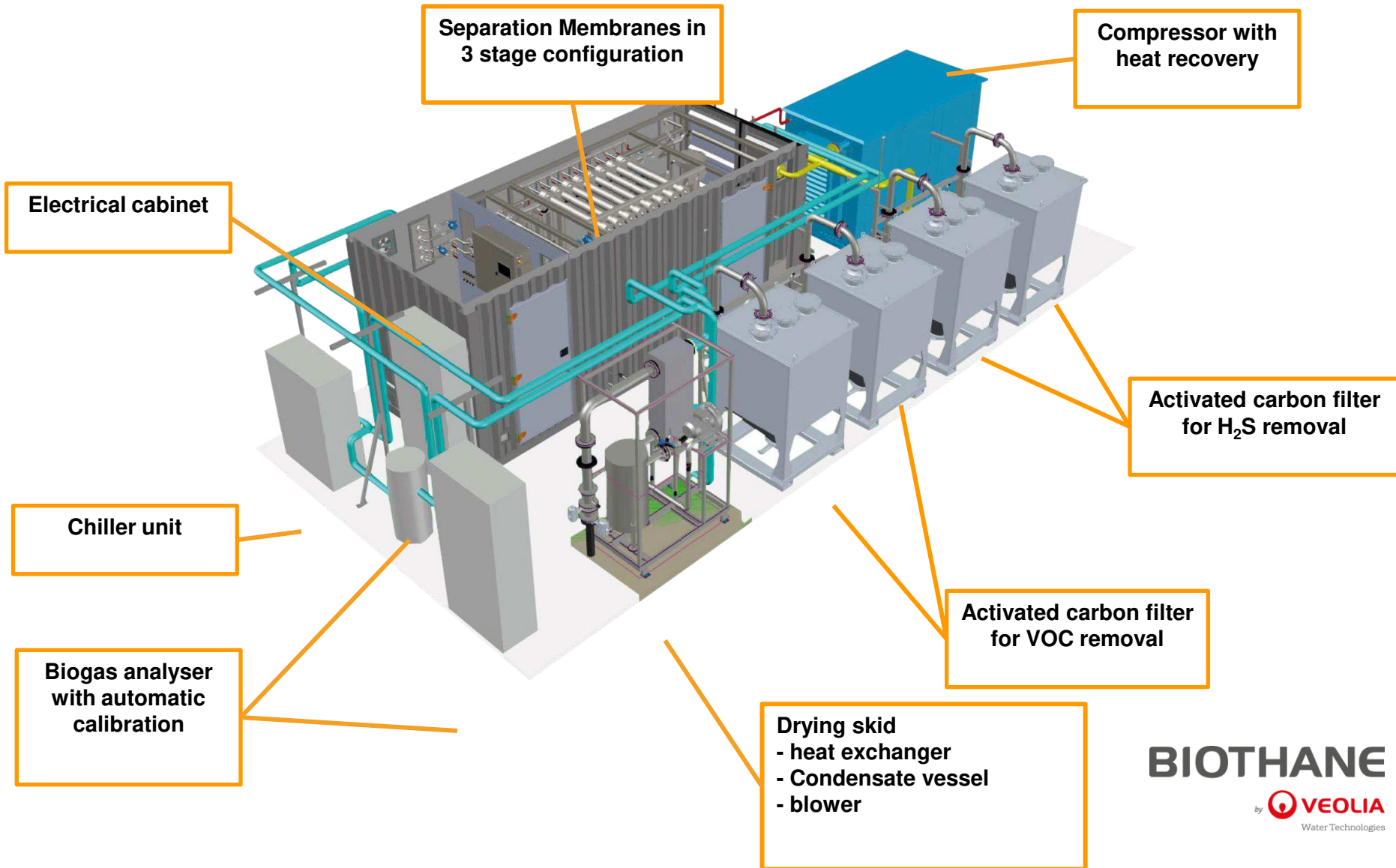


# The Reyran Fréjus wastewater treatment plants turns sludge into energy

Each year, the Reyran wastewater treatment plant processes **10 million cubic meters** of wastewater that generates **10,000 tons** of sludge.

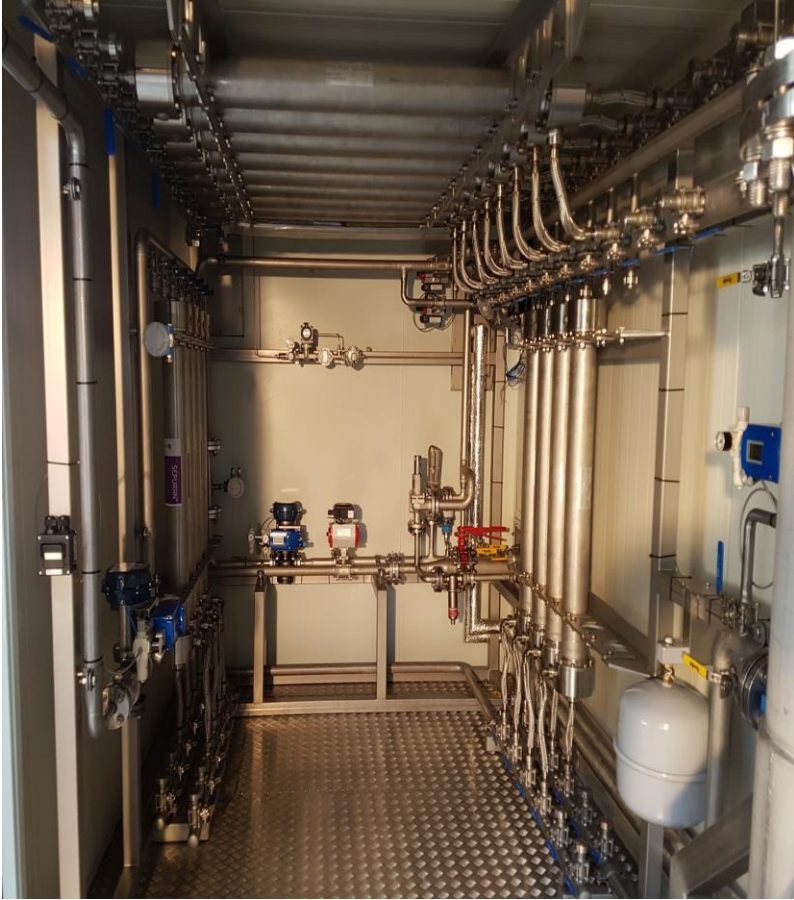


# Reyran Fréjus - plant layout





# Reyran Frejus



*Toulouse - Ginestous (France)*

## Case Study 2 - Municipal Project - Sludge Digestion



- Municipal WWTP - 950 000 PE
- Sludge digester (primary and biological)
- Biogas treatment 1600 / 1400 Nm<sup>3</sup>/h

<https://youtu.be/wgnxrsEg-I0>



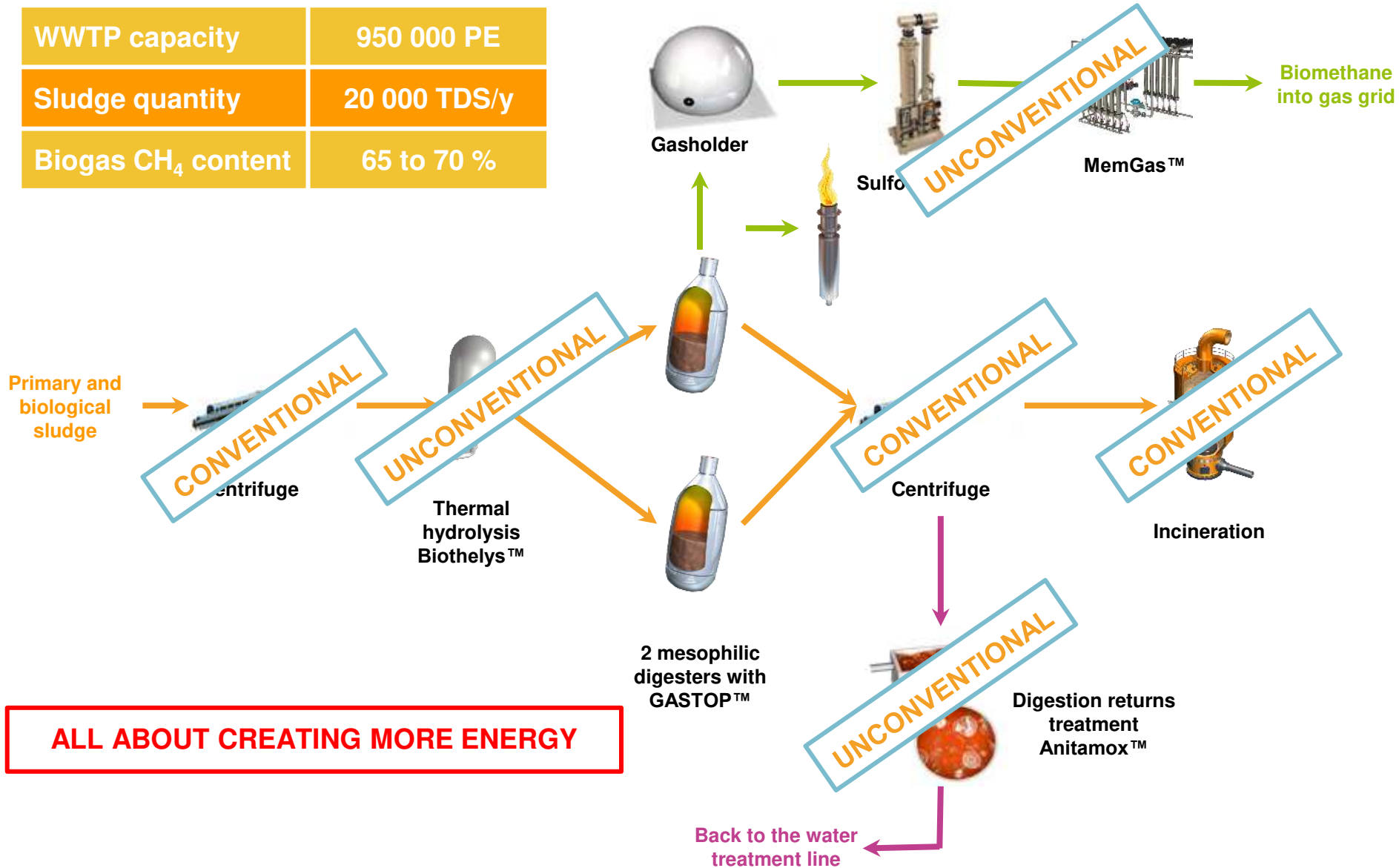


# Toulouse - Ginestous



# Process Line and how to create energy

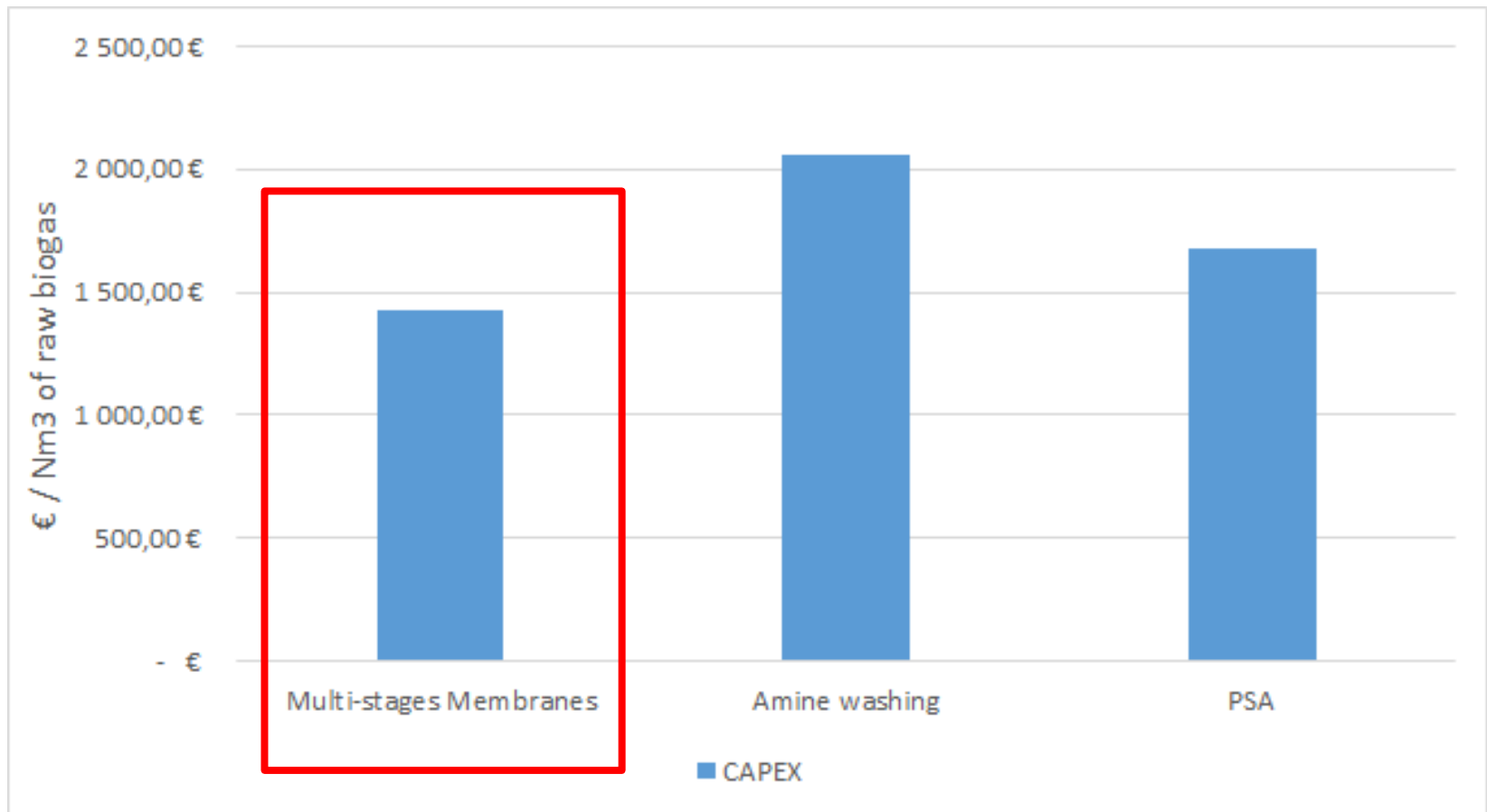
WWTP capacity	950 000 PE
Sludge quantity	20 000 TDS/y
Biogas CH <sub>4</sub> content	65 to 70 %



**ALL ABOUT CREATING MORE ENERGY**

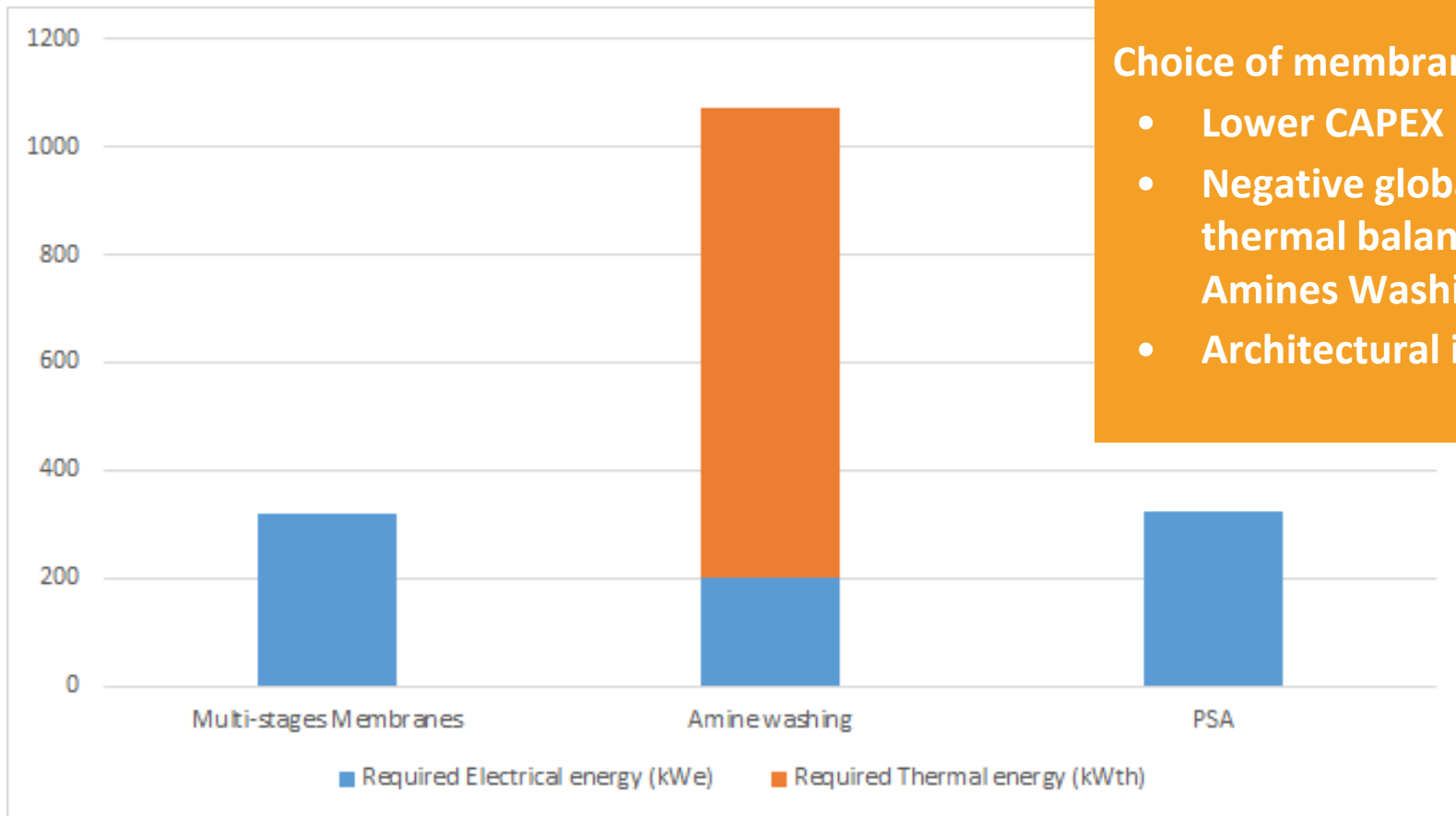
# Choice of Biogas Upgrading Technology - CAPEX

Biogas upgrading plant 1500 Nm<sup>3</sup>/h - Operation time 8 580 h/year



# Choice of Biogas Upgrading Technology - ENERGY

Biogas upgrading plant 1500 Nm<sup>3</sup>/h - Operation time 8 580 h/year



Choice of membranes:

- Lower CAPEX
- Negative global thermal balance with Amines Washing
- Architectural impact



# Creating energy with 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
  - min 10.7 kWh HCV/Nm<sup>3</sup> of biomethane

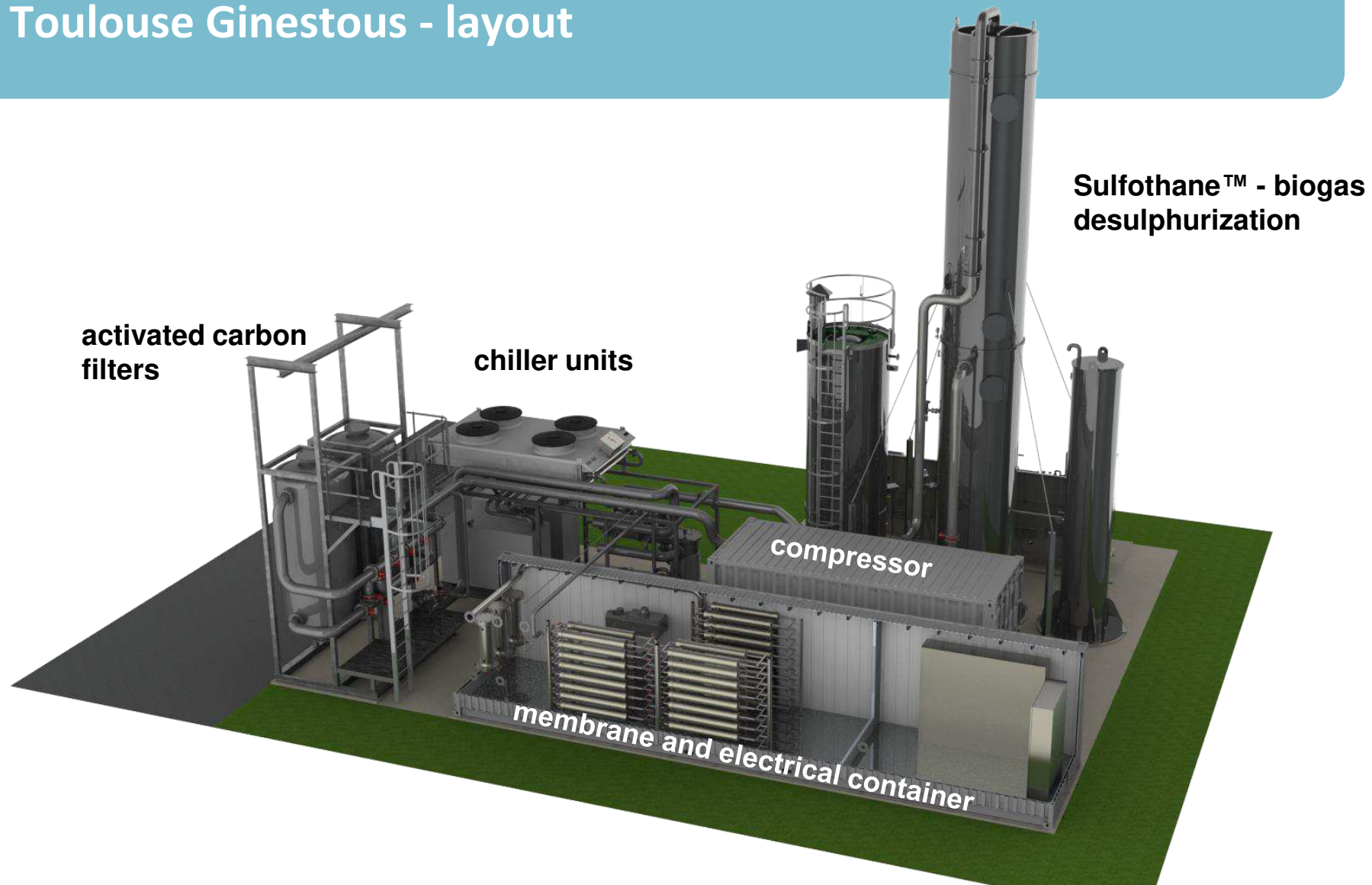
# Energy Balance - Key Figures



- **Average biomethane injection: 620 Nm<sup>3</sup>/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<sub>2</sub> avoided**



# Toulouse Ginestous - layout



# Toulouse - Ginestous (Fr)



*Fruit Processing, Avignon - France*



# Case Study 3 - *Industrial Project - Fruit Producer*





# Context

- Effluents to be treated
  - Wash water
  - Sulfur brines
  - ~ 250 000 m<sup>3</sup>/y with peak flows of 1,100 m<sup>3</sup>/d
  - ~ 12 000 to COD/d
- Existing aerobic treatment plant at the limit
  - 1. extension completed in 2012 (aerobic MBBR)
  - Periodic non-compliance with discharge limits requires spreading (not acceptable anymore)
  - **Limiting factor for production extension**
- High environmental COST: ~ 1,5M°€/y
  - Disposal of aerobic surplus sludge
  - Electrical consumption for aeration
  - Sulfur brines : send to external treatment



 **Solution needed to ensure factory site sustainability**

# Process line



Flow	800 - 1600 m <sup>3</sup> /day
COD	11 300 mg/L (12.7 tpd)
Biogas CH <sub>4</sub> content	65 to 70 %



**ALL ABOUT CREATING ENERGY**  
**1 T COD removed = 350 Nm<sup>3</sup> CH<sub>4</sub>**  
**= 3.75 MWh HCV = 330 to 500 € (France)**



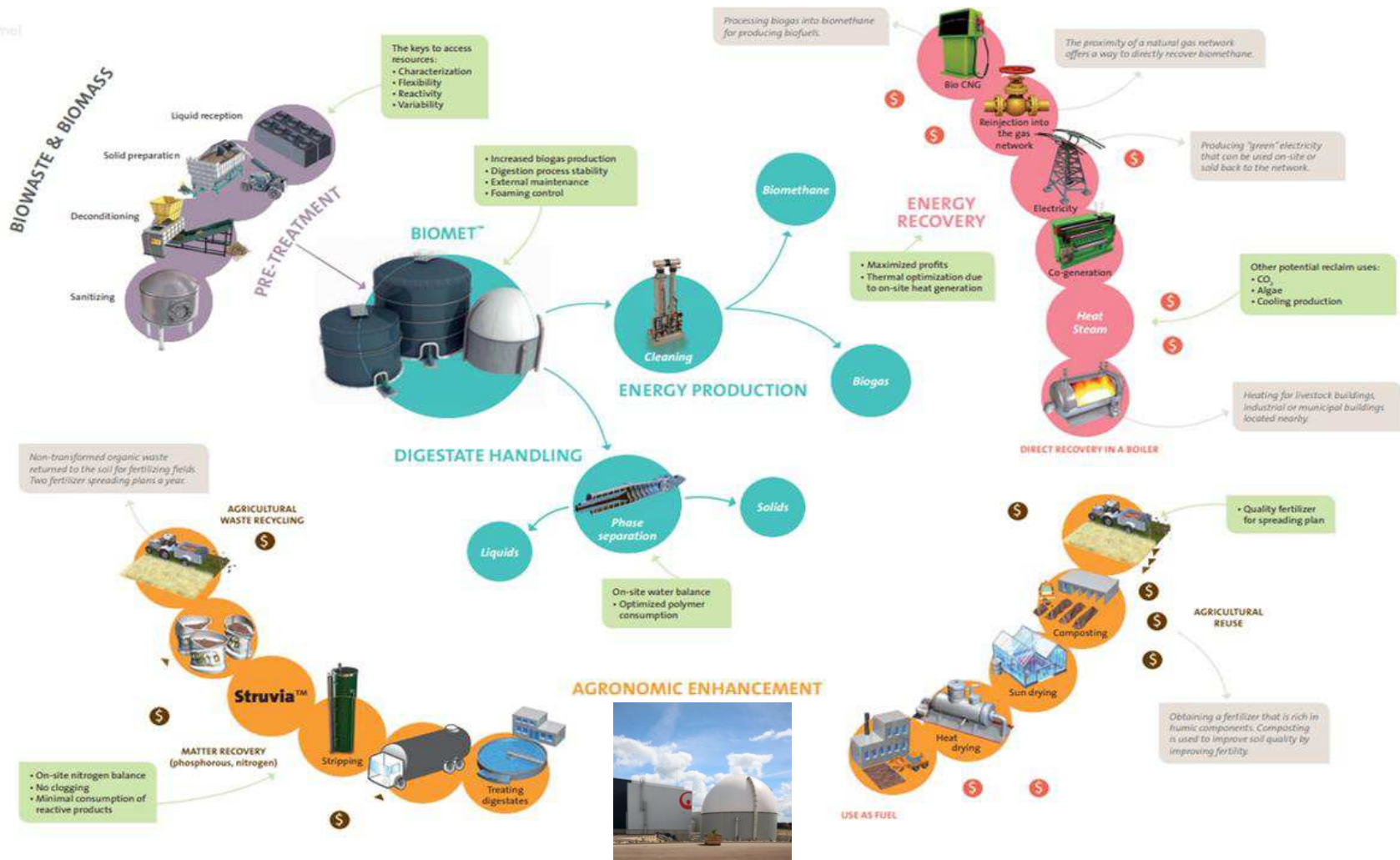
# Key Figures



- **Average biomethane injection:**
  - 99.5% efficiency
  - 825 000 Nm<sup>3</sup>/year
  - 8830 MWh HCV/year
- **Biomethane income: 18 M€ over 15 years (fixed feed-in tariff in France)**

# Waste to Energy

# Waste to Energy



## Take aways

- Bio Methane production provides highest energy recovery rate to alternative biogas utilization, as such to play in a role in future energy structure
- Memgas techno proves cost effective Membrane solution for upgrading of biogas
- Both Municipal and Industrial treatment plants, provide valuable organic source for biomethane production
- Biomethane recovery more and more applied by industry, as integral part of Effluent Treatment Plant as to support sustainable ambitions
- Innovation in Techno solutions as: Excelys, AnitaMox and Memgas allow to maximize energy recover from wastestreams and make recovery most cost effective

## Thank you....

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