BEIC BIOGAS SEMINAR

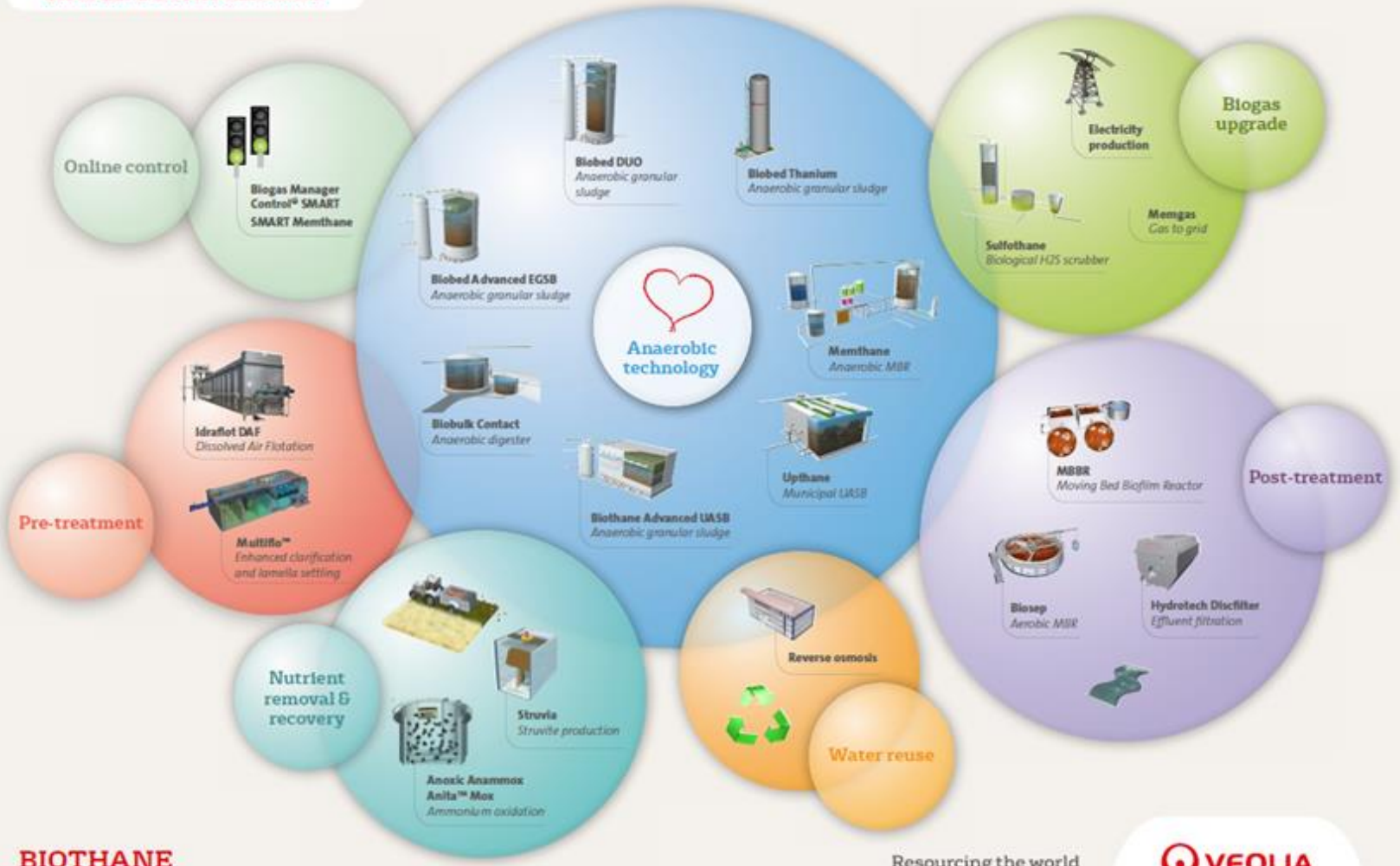
Malmo - 14/08/2018

by VEOLIA
Water Technologies

BIOTHANE

Complete range of solutions for industrial wastewater treatment with anaerobic at the

WATER TECHNOLOGIES

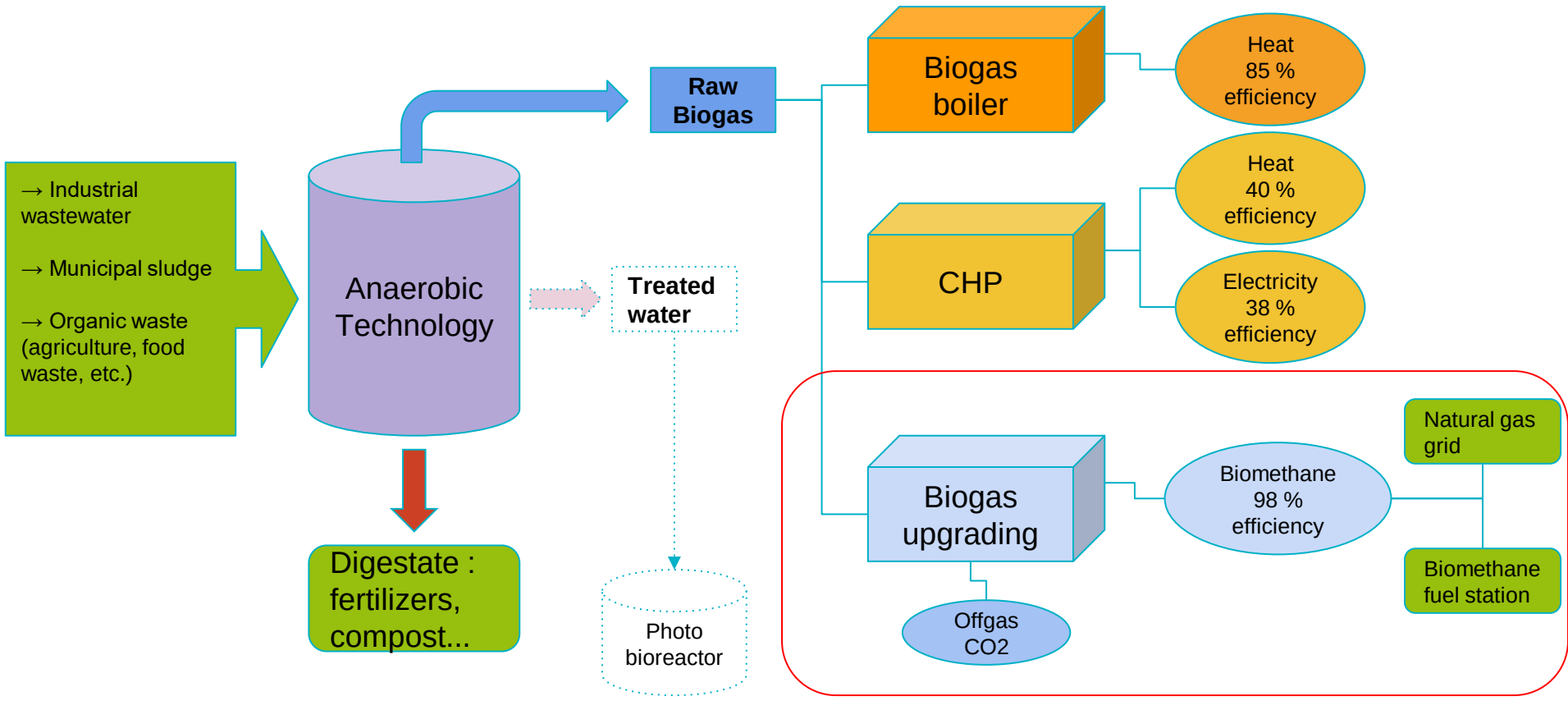


BIOTHANE

Resourcing the world

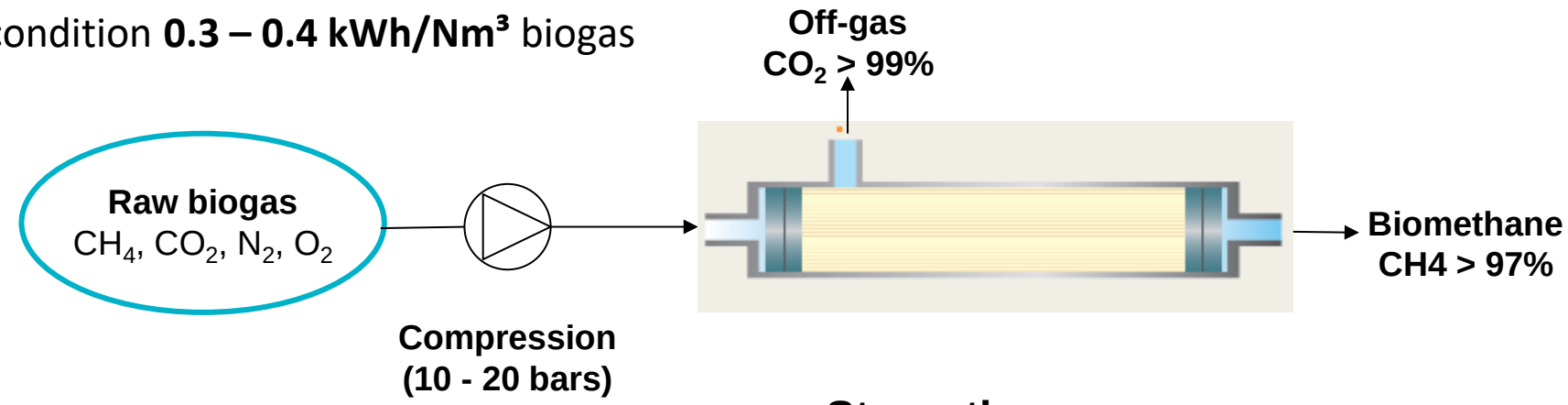
VEOLIA

Biomethane : Potential Applications



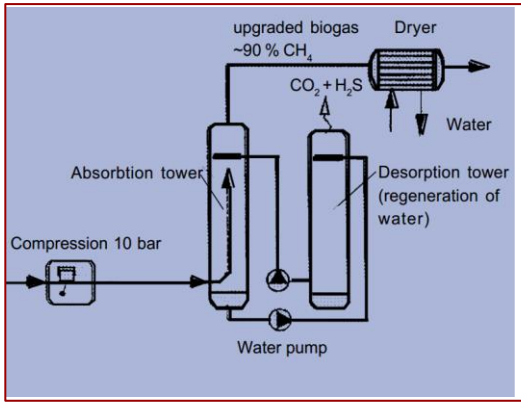
Multi-stages Membranes

Overall energy consumption at design condition **0.3 – 0.4 kWh/Nm³** biogas

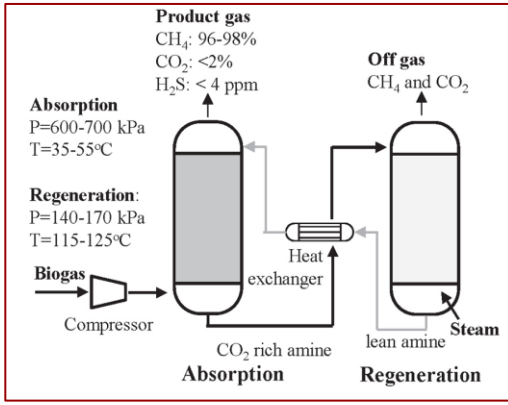


- **Strengths:**
  - No heat demand
  - No liquid discharge
  - Biomethane already compressed
- **Weaknesses:**
  - Reliable pre-treatment
  - Biomethane quality depends on N_2 in biogas
  - Min CH_4 in off-gas 0.5 %

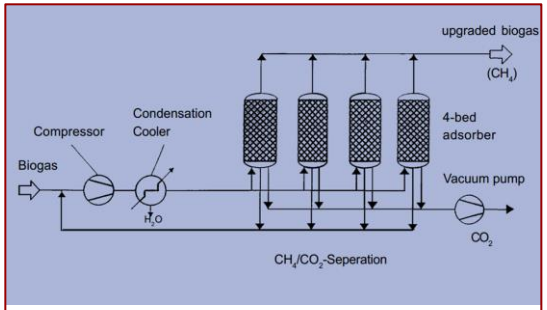
Other technologies : Water scrubber, Amine Washing, PSA



- **Strengths:**
  - Low heat demand
  - Can work without pretreatment
- **Weaknesses:**
  - High water demand
  - High polluted water discharge
  - Compression of biomethane according to the end use



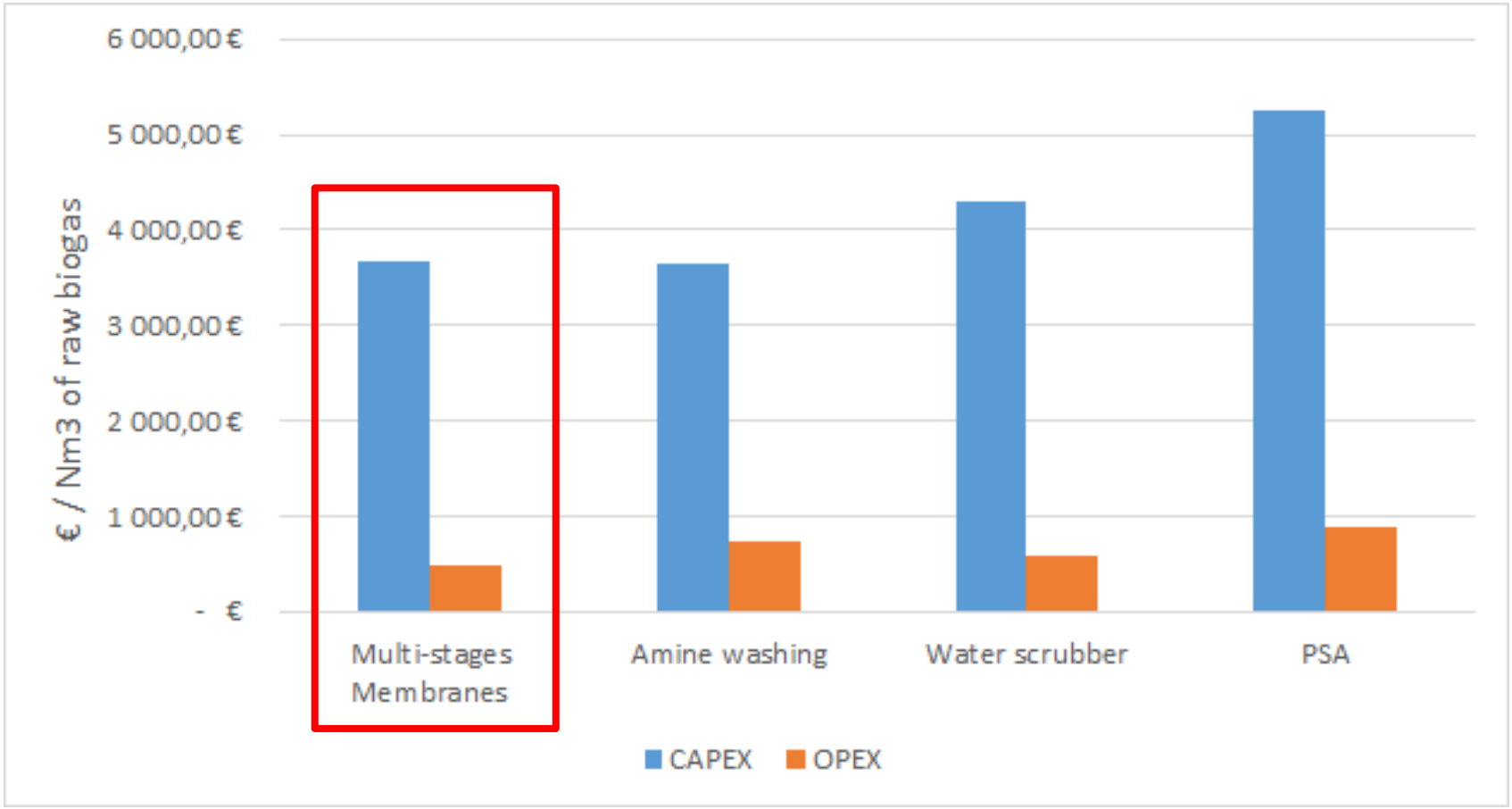
- **Strengths:**
  - High methane recovery rate
- **Weaknesses:**
  - Amine discharge cost
  - High heat demand for regeneration
  - Compression of biomethane necessary



- **Strengths:**
  - Adapted to high flowrate
  - No liquid discharge
  - Low heat demand
- **Weaknesses:**
  - Reliable pre-treatment
  - Irreversible damage in case of H_2S
  - Compression of biomethane according to end use

CAPEX and OPEX comparison

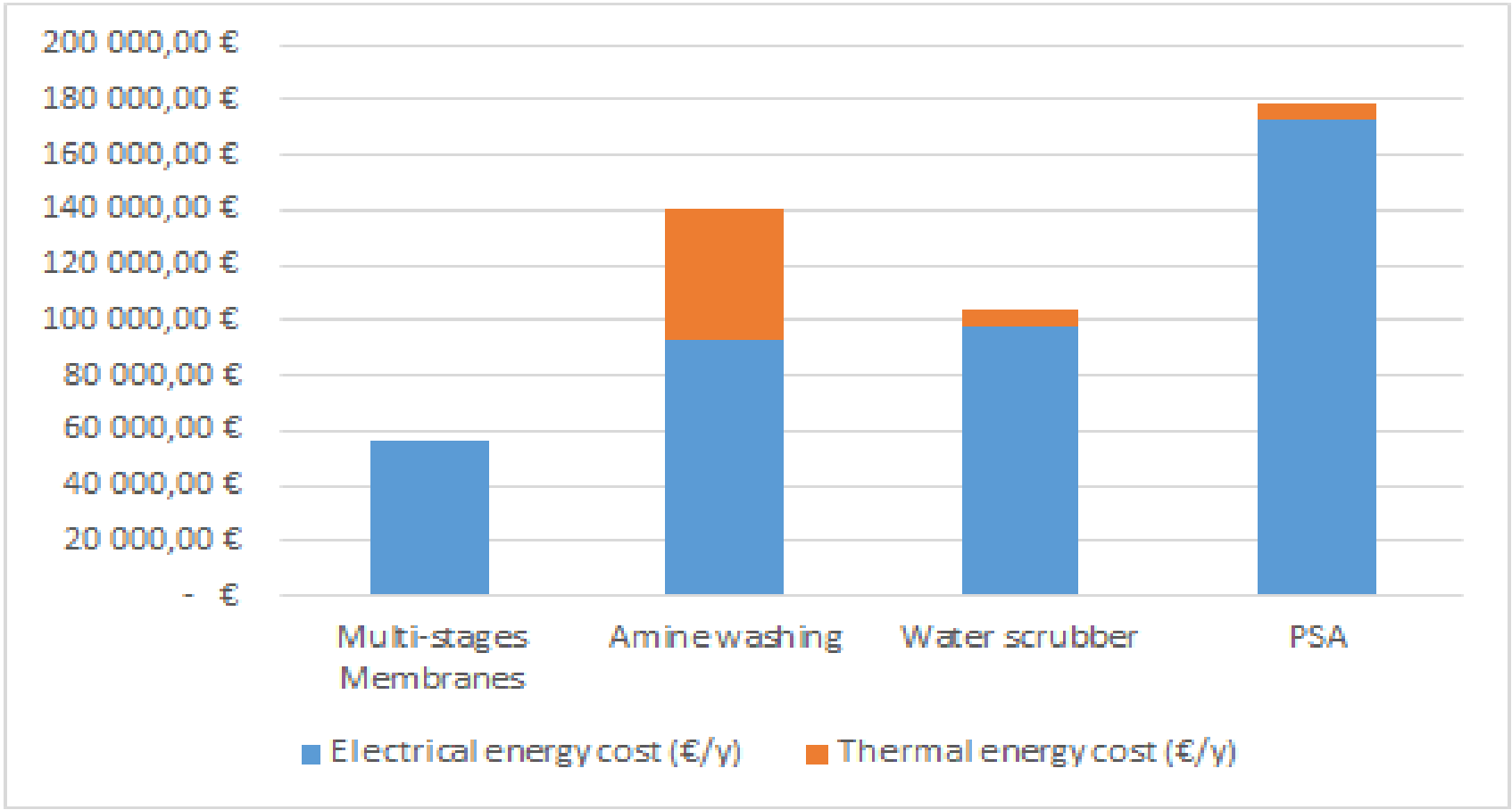
Biogas upgrading plant 280 Nm³/h - Operation time 8 200 h/year



Source: Aquantis feasibility study (2012)

Energy cost comparison

Biogas upgrading plant 280 Nm³/h - Operation time 8 200 h/year

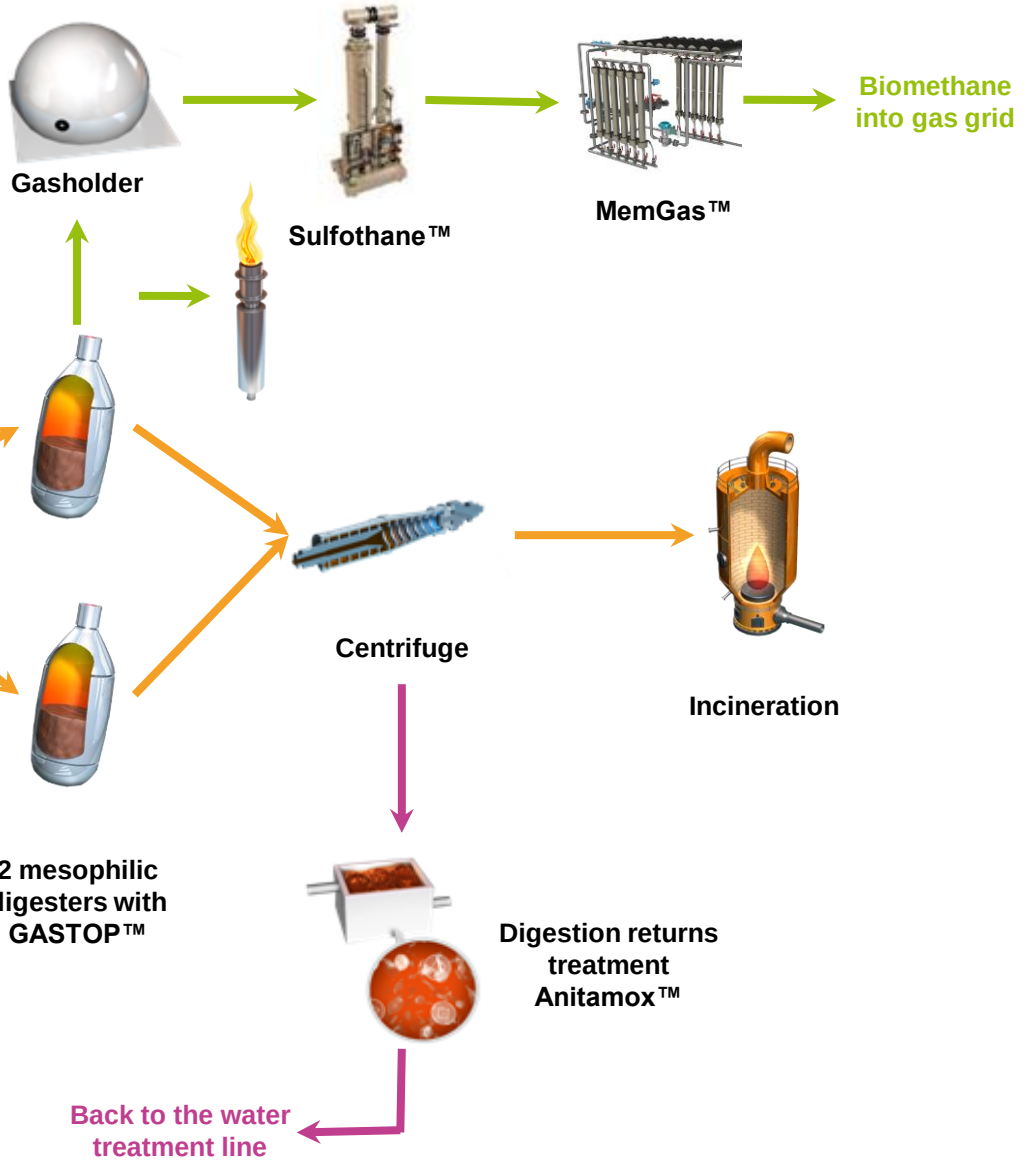


Source: Aquantis feasibility study (2012)

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 %



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

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

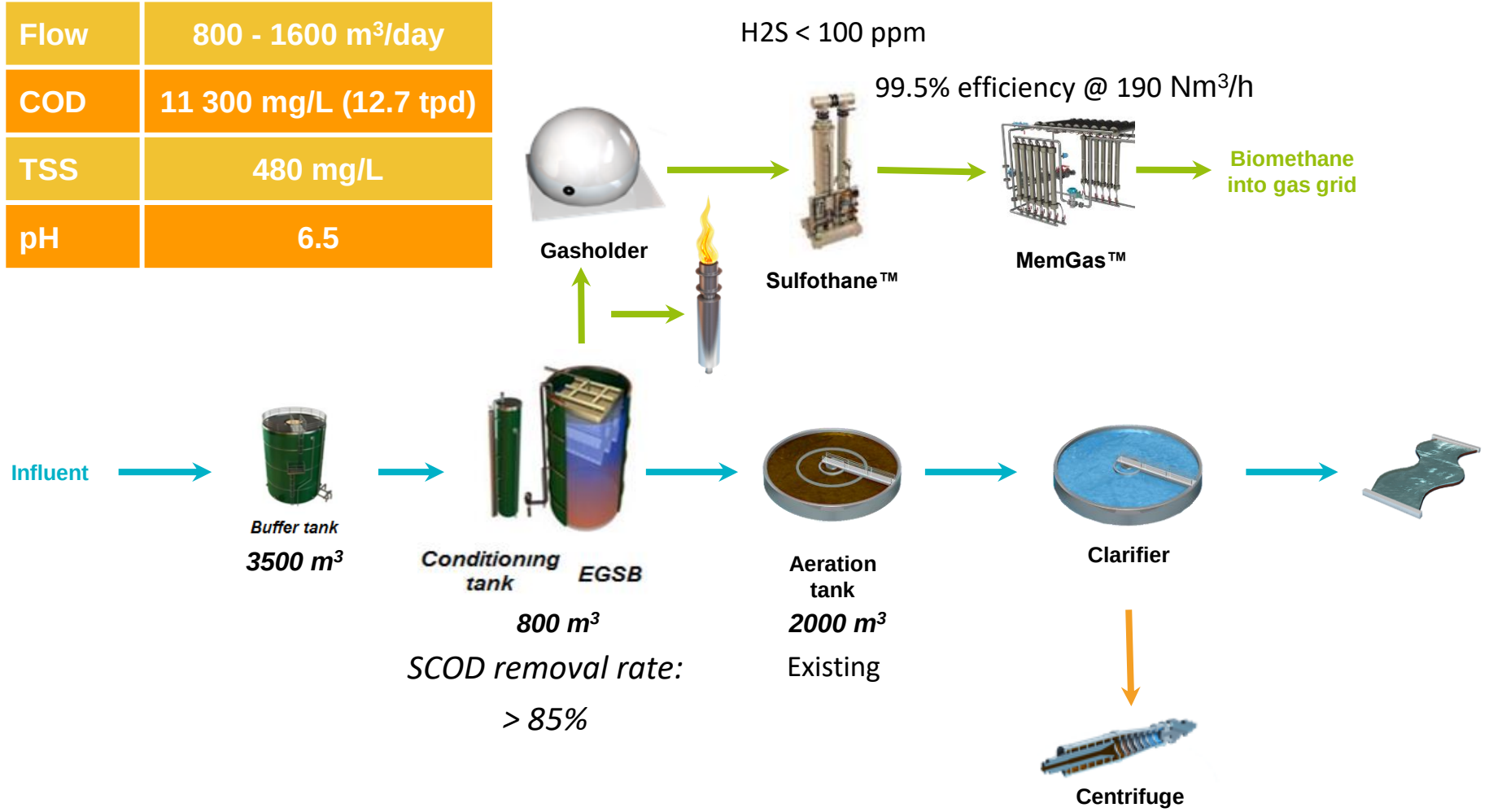
- **Digested sludge quantity: 8 000 TDS/year**
- **Average biomethane injection: 620 Nm^3/h, equivalent to 33700 oil barrels per year**
- **Biomethane income: 60 M€ over 15 years (fixed feed-in tariff in France)**
- **Positive carbon balance over 15 years: 170 000 tCO_2 avoided**

Return on Investment : 12 years

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



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)**

Return on Investment < 4 years


MemGas™
the ultimate valorisation of biogas to biomethane

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