Industrial Experiences With Anaerobic Digestion Plants in Europe

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Ros Roca Envirotec

Structure of presentation

- Presentation of company
- Case studies AD projects in Europe with wet fermentation technology
- Biogas utilization

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Products and technologies for environmental protection

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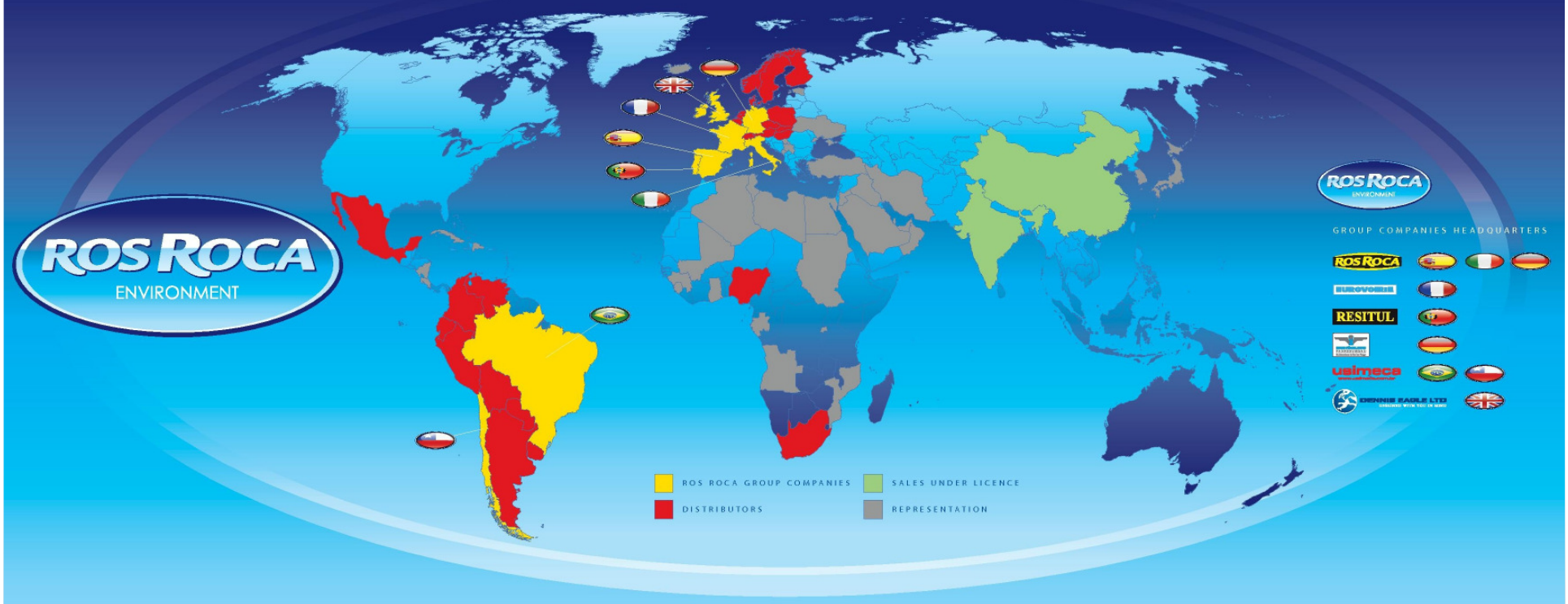

Collection and cleaning equipment

Pneumatic waste collection

Technologies waste, biomass utilization

Cryogenic products and technologies

Technologies




- Biogas plants (Wet and dry digestion technology)
- Biogas treatment (Drying, Desulphurization, Upgrading, CNG, LNG)
- Biogas utilization (CHP, Boiler, Grid injection, Filling stations)
- Composting (Tunnel, Drum, Turning machine)
- Mechanical-biologcal waste treatment with digestion and / or aerobic stabilization
- Mechanical sorting plants
- Manure treatment






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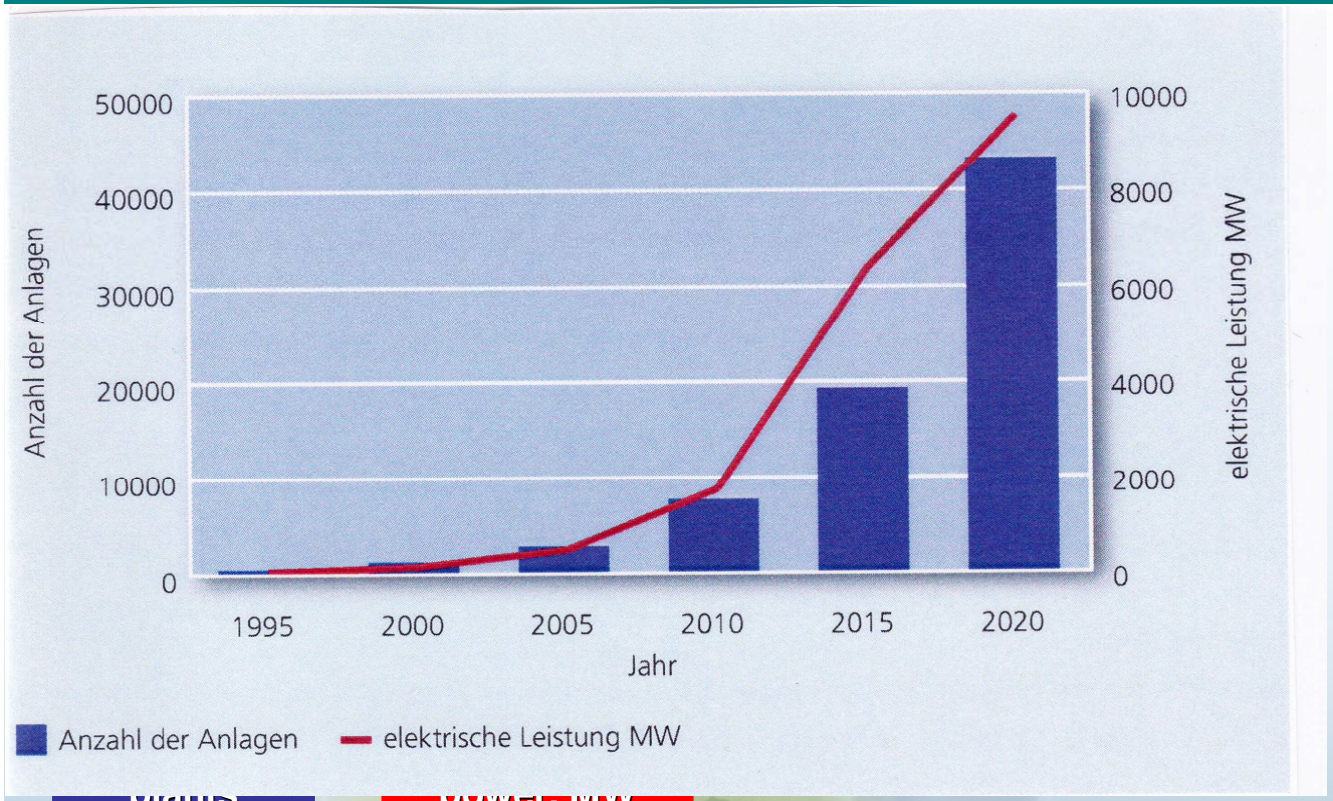
Experiences
Anaerobic Digestion

Development of AD plants in Europe



- EU requirements for increasing renewable enregy production to reduce emission of green house gases (CO_2, CH_4)
- EU requirements for waste treatment (reduction of organics to landfils)
- Regulatory conditions for renewable energy production are defined (Fixed infeed tarifs for electricity and heat, tax benefits for biofuels)

Input material for Ros Roca AD technology

Municipality

- Source separated organic waste (SSO)
- Organic fraction MSW
- Sewage sludge

Industry

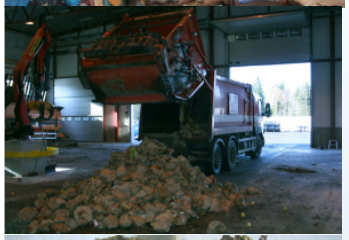
- Packaged food
- Residues from food and beverage production
- Food leftovers
- Grease
- Slaughterhouse waste
- Residues from ethanol fermentation
- .....

Agriculture

- Manure
- Dung
- Energy crops

Ros Roca AD process is flexible and treats organic waste independent of humidity

Process flexibility is important



- Waste quality is subject to strong variations
- Efficient utilization of fermenter for biogas production (no feeding of non bio-degradable organic material)
- Political frameworks change (e.g. renewable energy act Germany)
- Market conditions change

Ros Roca biogas plants in Europe

New contracts recently signed: Portugal 2 MBT plants with AD, Italy 1 AD plant for biowaste, Spain 1 agricultural AD plant, UK 1 AD plant for packaged food waste

Selected bidder in Mumbay, India for AD plant treating biowaste

1 Gran Canaria, Spanien Hausmüll *Houshold Waste* 60.000 to/a	6 Tudela, Spanien Hausmüll *Houshold Waste* 28.000 to/a	11 Gescher, Deutschland Bioabfall, Klärschlamm *Biowaste* *Sewage Sludge* 17.500 to/a	16 Västeras, Schweden Bioabfall, NaWaRo, organische Gewerbeabfälle *Biowaste, Energy Corps* *Industrial Organic Waste* 23.000 to/a
2 Lanzarote, Spanien Hausmüll, Klärschlamm *Houshold Waste,* *Sewage Sludge* 36.500 to/a	7 Barcelona, Spanien Hausmüll *Houshold Waste* 90.000 to/a	12 Voghera, Italien Bioabfall, Klärschlamm *Biowaste* *Sewage Sludge* 27.000 to/a	17 Krosno, Polen Hausmüll *Houshold Waste* 10.000 to/a
3 Jaén, Spanien Hausmüll *Houshold Waste,* 20.000 to/a	8 Palma de Mallorca Spanien Bioabfall, Hausmüll, Klärschlamm *Biowaste* *Houshold Waste,* *Sewage Sludge* 32.500 to/a - 96.000 to/a	13 Deißlingen Deutschland Bioabfall *Biowaste* 24.000 to/a	18 Saaremaa, Estland Schweinegülle, Klärschlamm *Pig Manure* *Sewage Sludge* 40.000 to/a
4 Avila, Spanien Bioabfall, Hausmüll, Klärschlamm *Biowaste* *Houshold Waste,* *Sewage Sludge* 36.500 to/a	9 Lommel, Belgien Abfälle aus der ind. Kartoffelverarbeitung *Waste from Potatoe* *processing* 150.000 to/a	14 Volkenschwand Deutschland Bioabfall, organische Gewerbeabfälle *Biowaste* *Industrial Organic Waste* 75.000 to/a	19 Skellefteå, Schweden Bioabfall *Biowaste* 10.000 to/a
5 Alicante, Spanien Hausmüll *Houshold Waste* 52.000 to/a	10 Kleien, Luxemburg Rindermist, Rindergülle Bioabfall, NaWaRo *Cow Manure, Cow Dung* *Biowaste, Energy Corps* 48.400 to/a	15 Wien, Österreich Bioabfall, Speisereste, verpackte Lebensmittel *Biowaste* *Food Waste* *Packaged Food Waste* 17.000 to/a - 34.000 to/a	20 São Martinho do Porto, Portugal Schweinegülle *Pig Manure* 60.000 to/a

The AD technology of Ros Roca – Main process steps

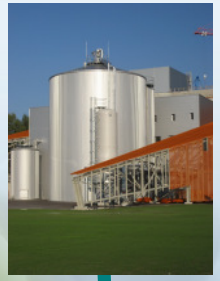
Wet Pretreatment
Adjust water content
Separation of impurities and non bio-degradable material

Minimizing wear in the plant
Avoid sedimentation and floating
Production of high quality fertilizer

Pasteurization (ABPR 1774/2002)
> 70 °C, > 1 h,
particle size < 12 mm

Kill pathogens
Production of pasteurized fertilizer for direct agricultural utilization

Anaerobic digestion
Mesophilic or thermophilic operation



Completely biogas mixed digester
No moving elements inside
High specific biogas production

Dewatering
Separation in high quality solid and liquid fertilizer

Reliable, effient dewatering with centrifuges
Low solid concentration in process water
Operation without polyelectrolytes possible

Biogas utilization
Energy production from biogas

Solutions with highest possible efficiency

Efficient biogas utilization: Ros Roca solutions

Raw biogas | CH_4 55 – 70 %

On-site CHP

Biogas upgrading

On-site heating boiler

Bio methane
CH_4 > 97 %

Natural gas grid

Bio fuel production

Central power plant

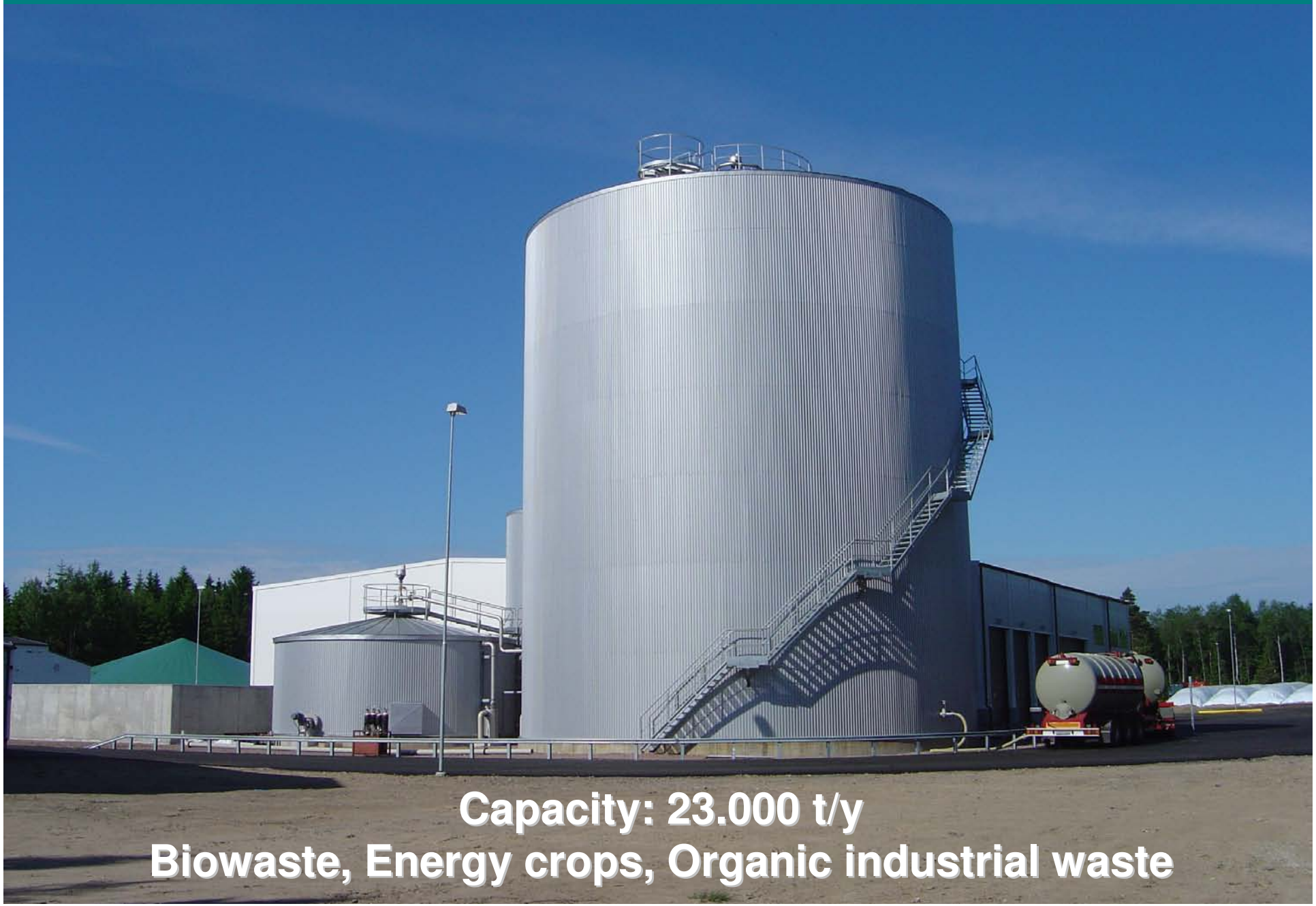
Consumer

Vehicles

Biowaste AD plant Vienna, Austria

Capacity: 17.000 t/y (34.000 t/y 2nd step)
Biowaste, Food leftovers, Packaged food

Co-digestion biogas plant Västerås, Sweden



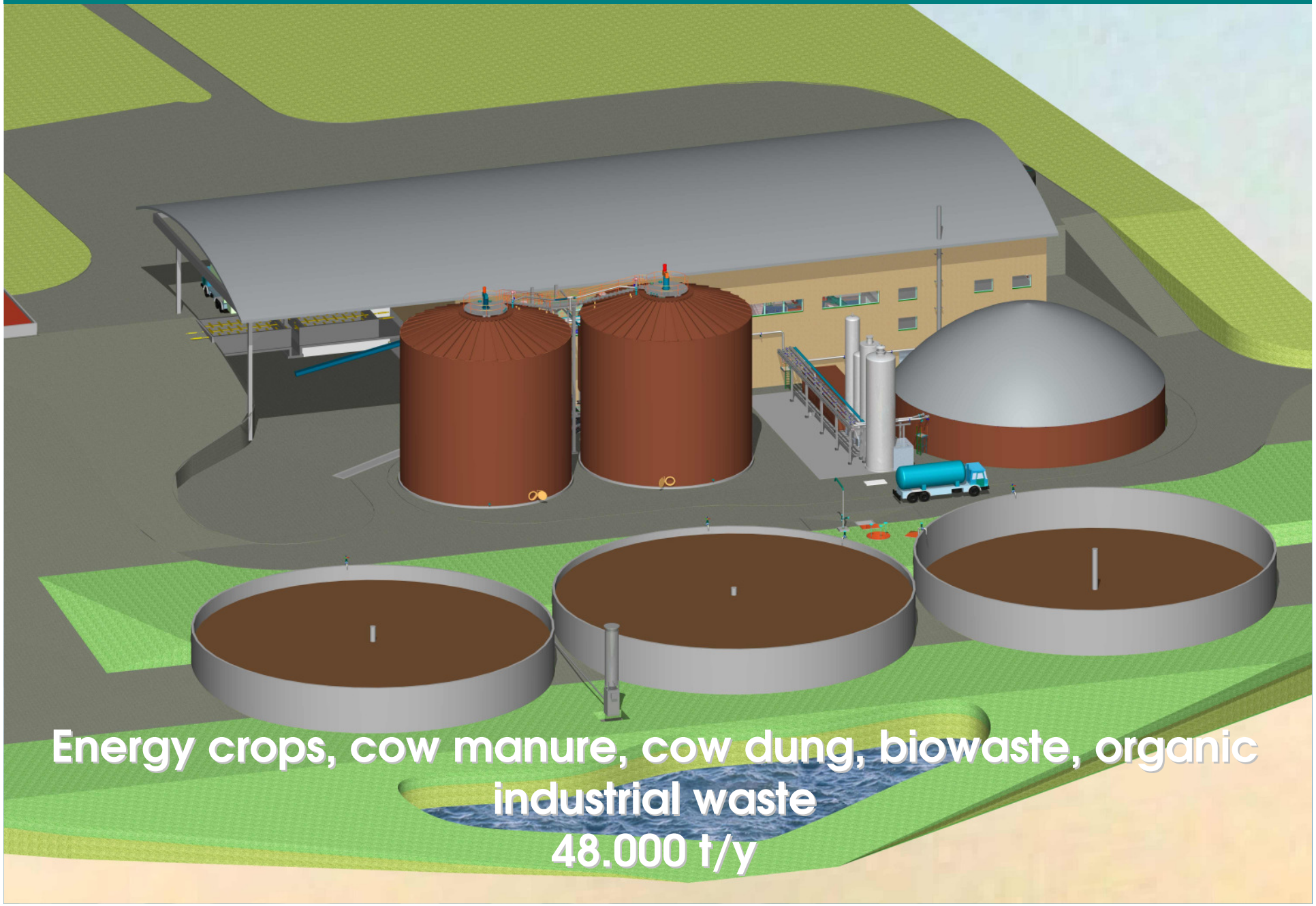
Capacity: 23.000 t/y

Biowaste, Energy crops, Organic industrial waste

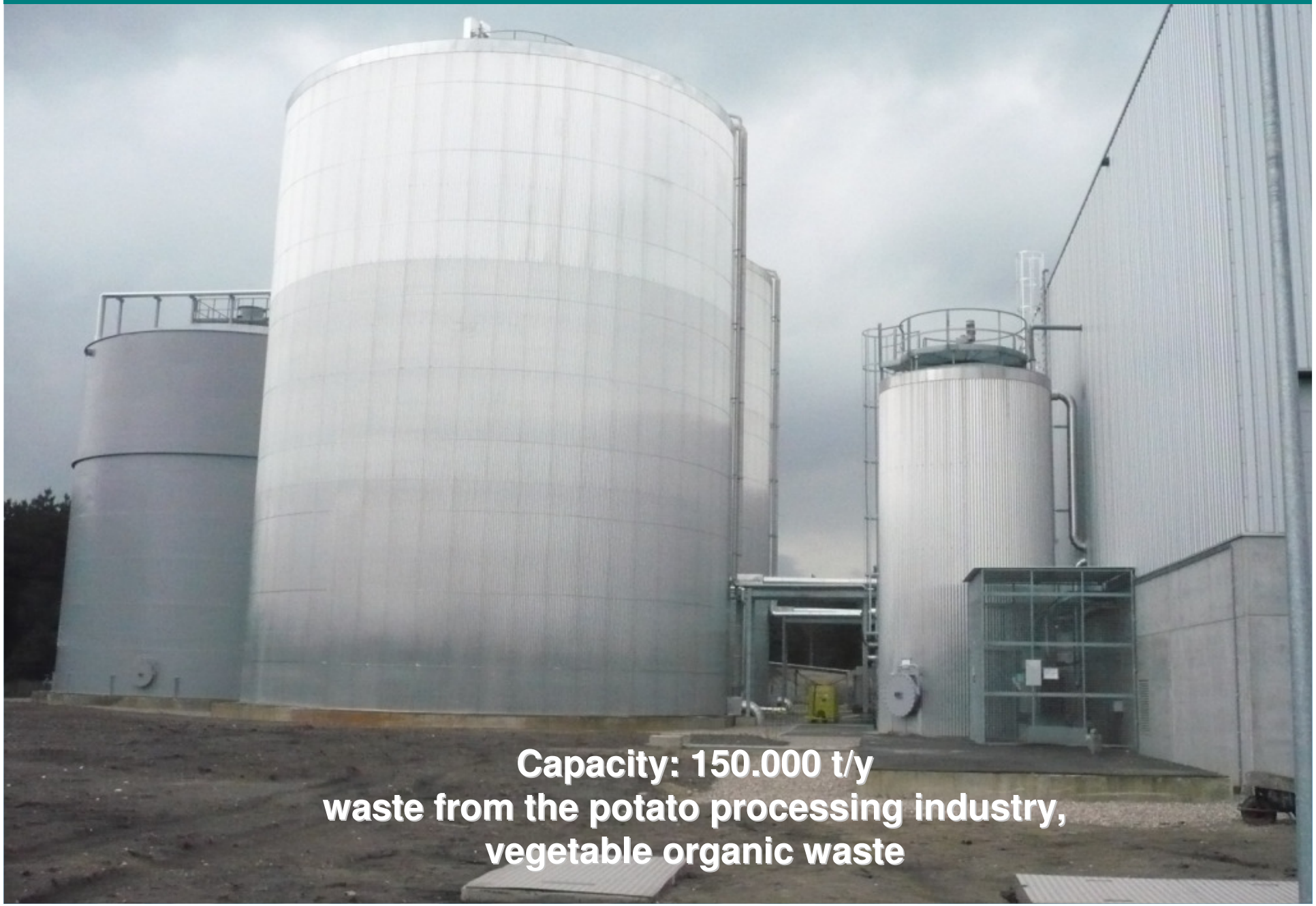
Co-digestion biogas plant Voghera, Italy

MBT with biogas plant, Alicante, Spain

Agricultural biogas plant Kielen, Luxemburg



Biogas plant for potato slurry Lommel, Belgium



Quality of fertilizer from biowaste

Parameter	Unit	Biogas plant Germany	Quality requirements for digestate Germany	Biogas plant Sweden	For the use in organic farming according to EEC 2092/91
Lead (Pb)	(mg/kg DM)	44,5	150	8,9	45
Cadmium (Cd)	(mg/kg DM)	0,6	1,5	0,3	0.7
Chrome (Cr)	(mg/kg DM)	36,0	100	28,0	70
Copper (Cu)	(mg/kg DM)	50,0	100	50,0	70
Mercury (Hg)	(mg/kg DM)	0,0	1,0	0,0	0.4
Nickel (Ni)	(mg/kg DM)	22,5	50	17,0	25
Zinc (Zn)	(mg/kg DM)	216,0	400	150,0	200
Dry matter	(% wet weight)	31,5	20	24,2	-
Organic dry matter	(% DM)	58,3	40	74,4	-

Main advantages wet digestion process of Ros Roca

- Process works independent from humidity of biomass
- Treatment of liquid and solid organic biomass from municipality, agriculture, industry
- Completely automized process
- Minimum manpower requirements
- Separation of impurities in front of digester
- Low maintenance requirements
- High quality digestate / compost
- Pasteurisation of waste according to ABPR (EU directive 1774/2002)
- High biogas quality
- Modularly extendable
- Technology approved in numerous big scale industrial plants

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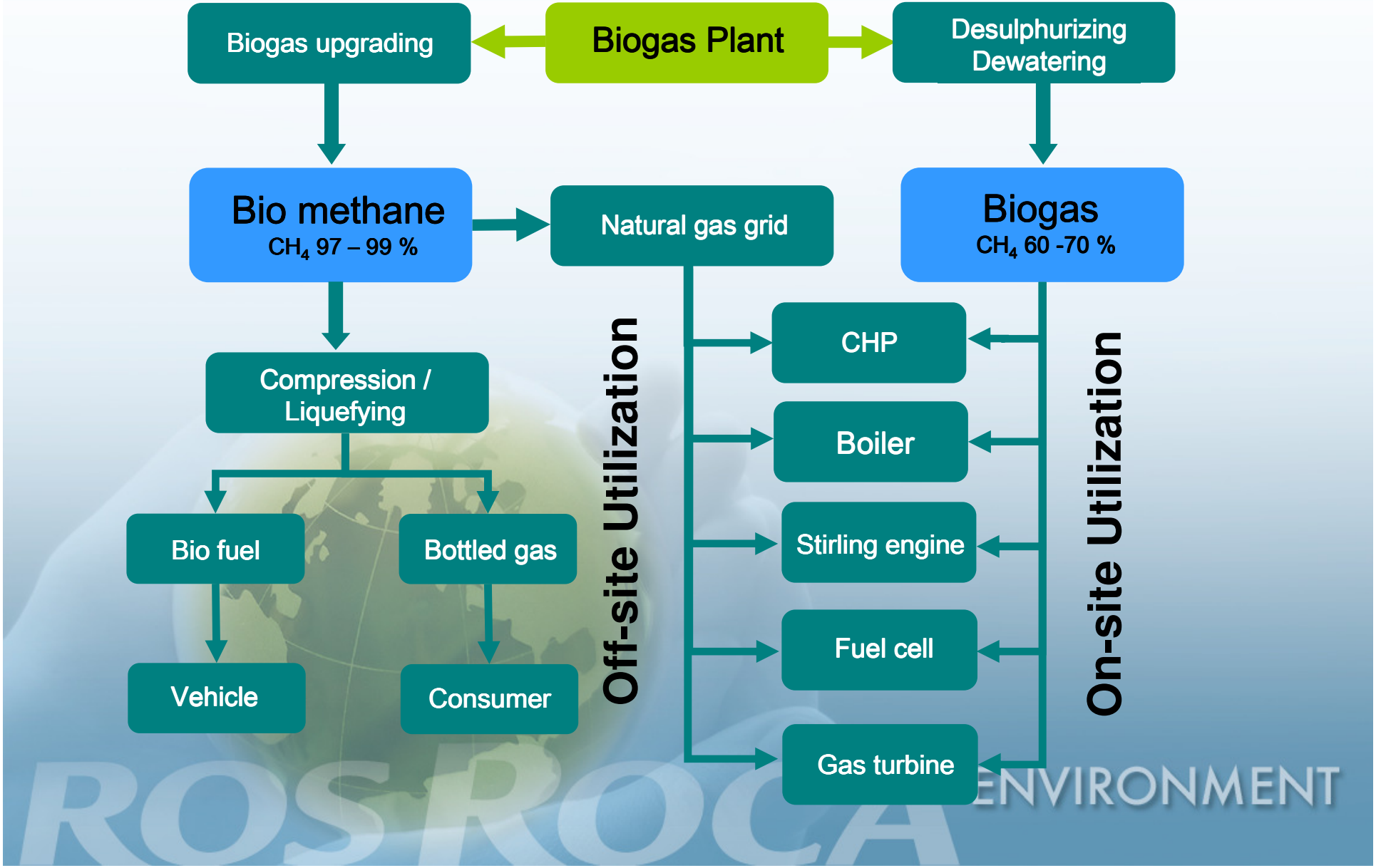
Biogas utilization

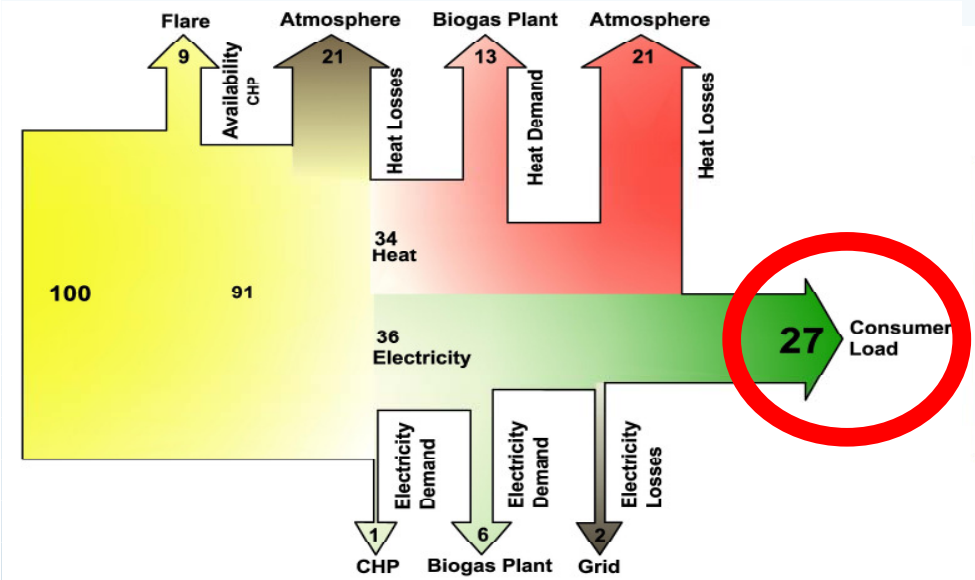



Biogas utilization

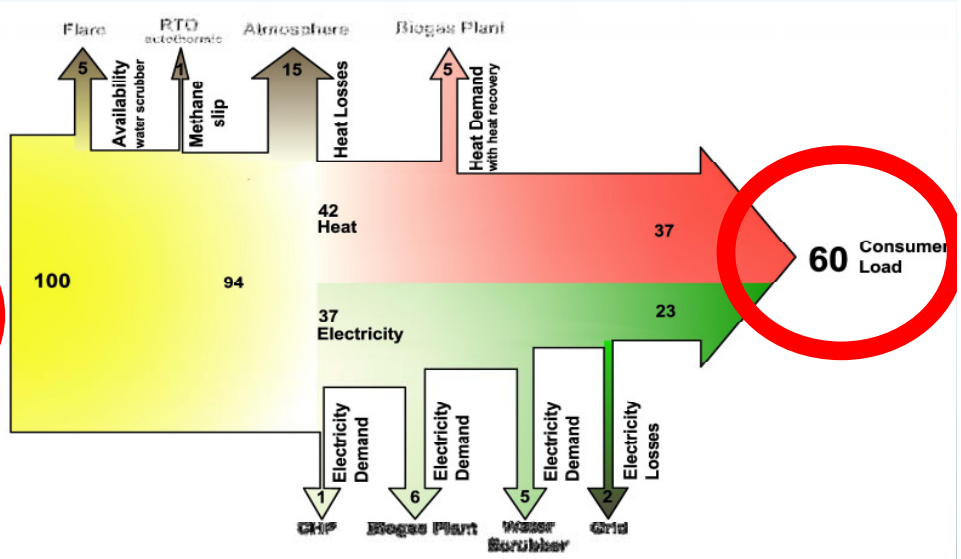


Why biogas upgrading ?

Energy balance of CHP on-site utilization



Energy balance of biogas upgrading & CHP off-site utilization



Energetic efficiency in biogas utilization is normally higher if biogas is upgraded to bio methane and utilized in off-site CHP-installations

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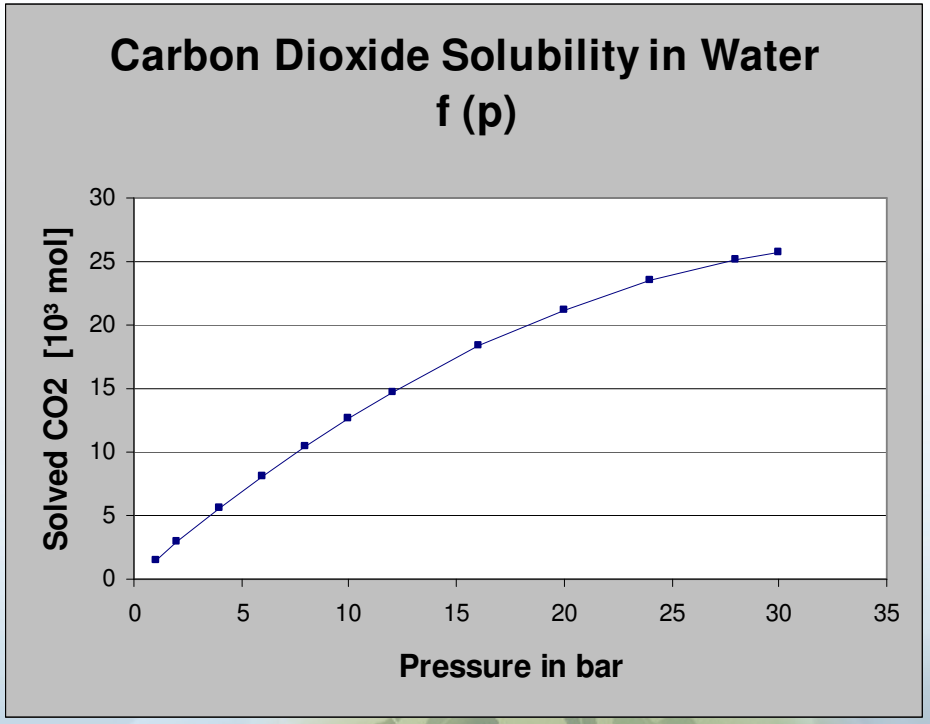
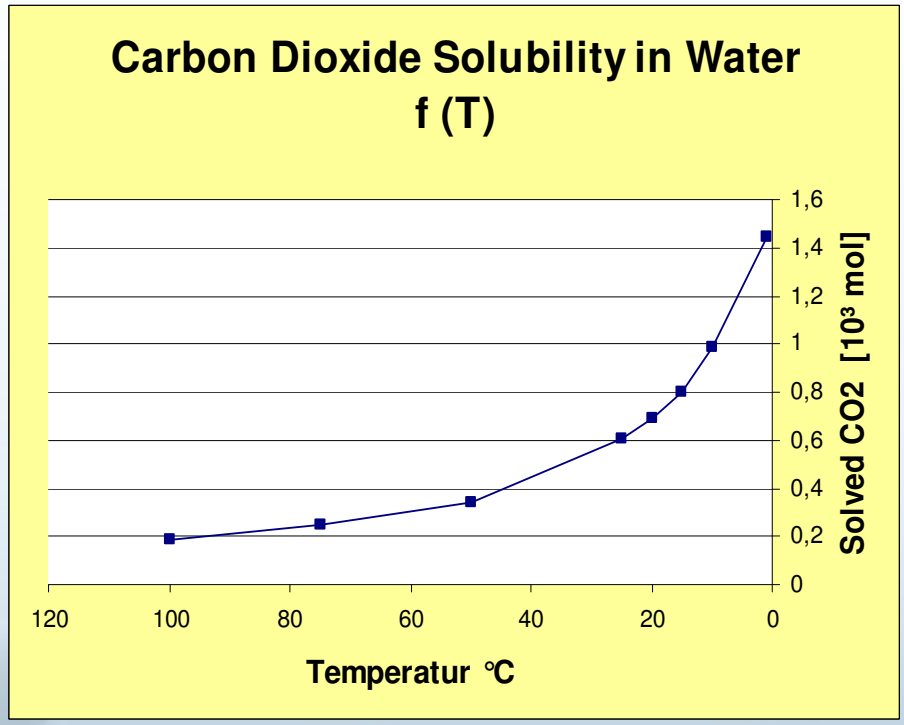
Biogas upgrading: Pressurized water scrubber technology (PWS)





CO_2 – solubility rises under high pressure & low temperature

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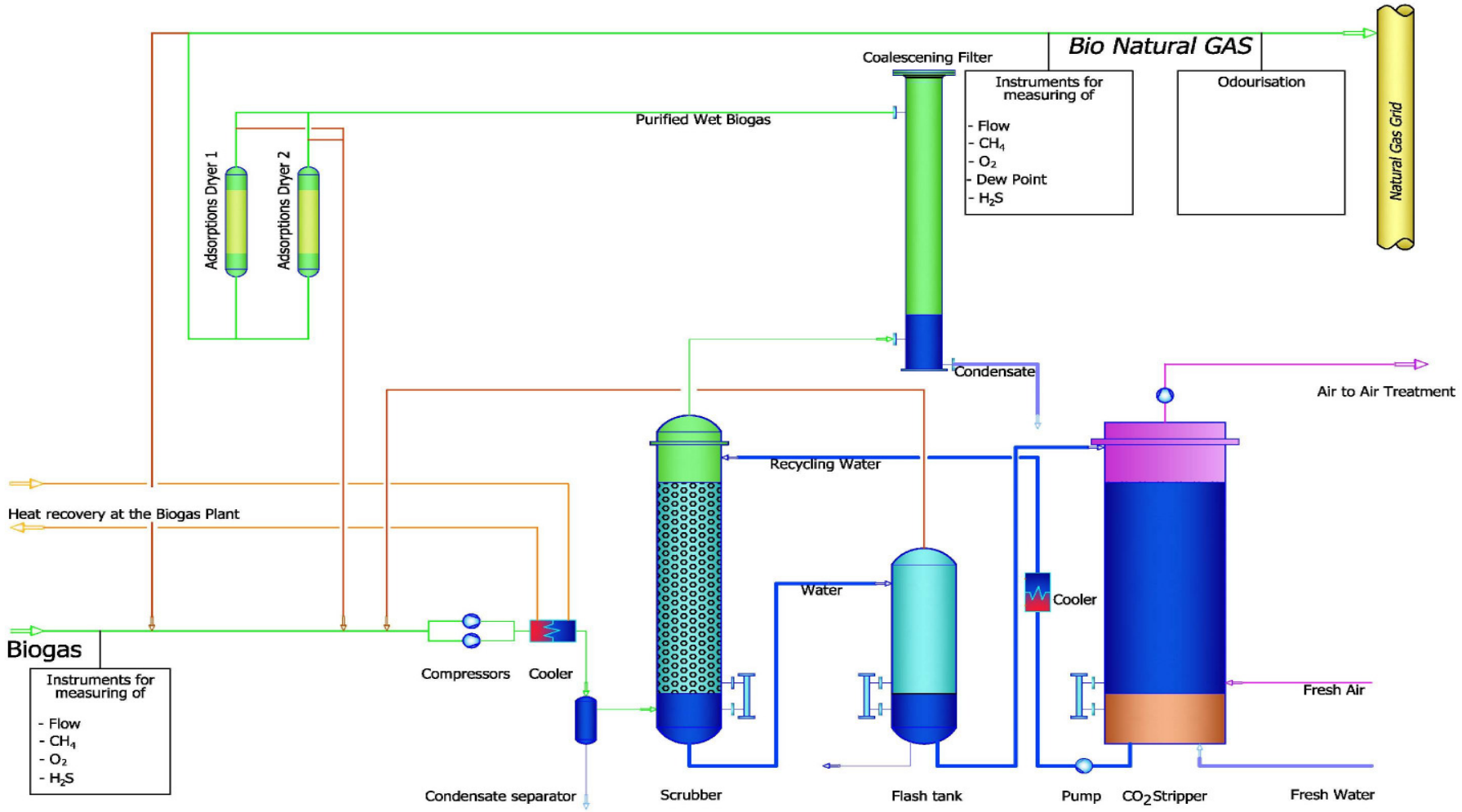
Biogas Upgrading (YIT water scrubber technology)



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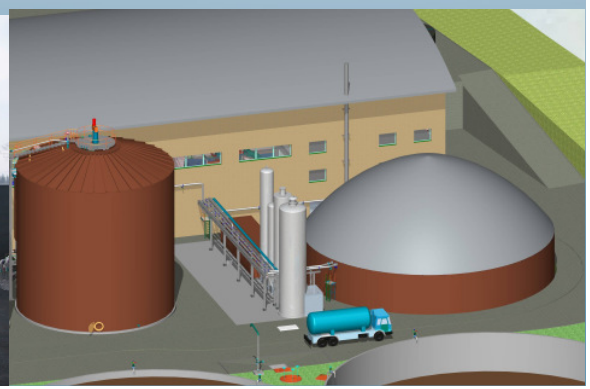
Experiences

Biogas upgrading



References biogas upgrading plants (YIT technology)

Location	Capacity, Nm^3/h	in operation since
Eskilstuna, Sweden	330	2003
Linköping, Sweden	1.400 (2 * 700)	2002
Västerås, Sweden	550	2004
Norrköpping, Sweden	400	2006
Boden, Sweden	250	2007
Altenstadt, Germany	1.250	Start-Up 2009
Kielen, Luxemburg	600	Start-Up 2009




Västeras, Sweden

Capacity: 550 Nm^3/h
Biomethane quality CH_4 97 +/- 2%
According SS 15 54 38
Utilization of biomethane as fuel

Methane concentration is increased from 60 Vol.- % to 98 Vol.- %

No biogas desulphurization is necessary

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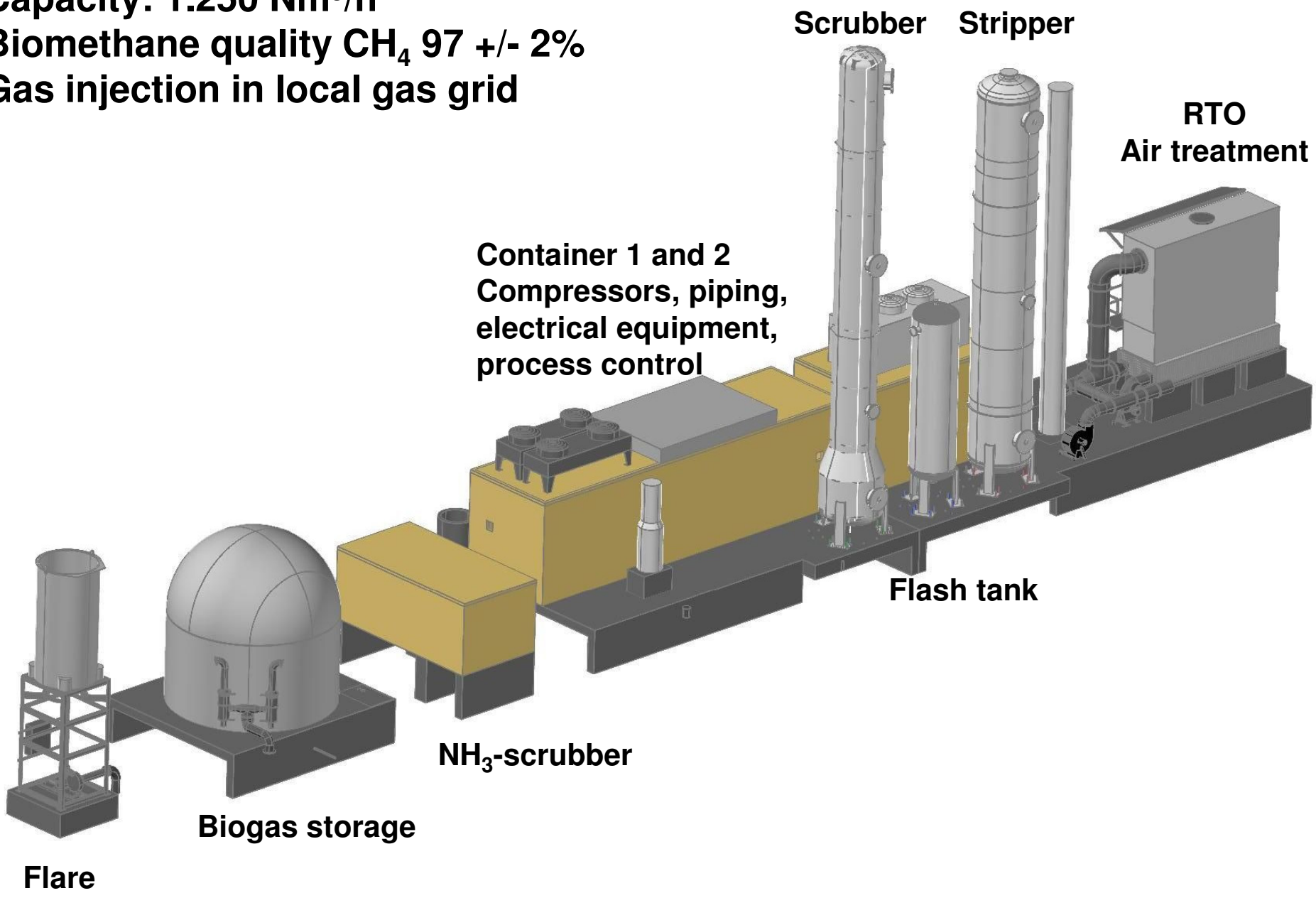
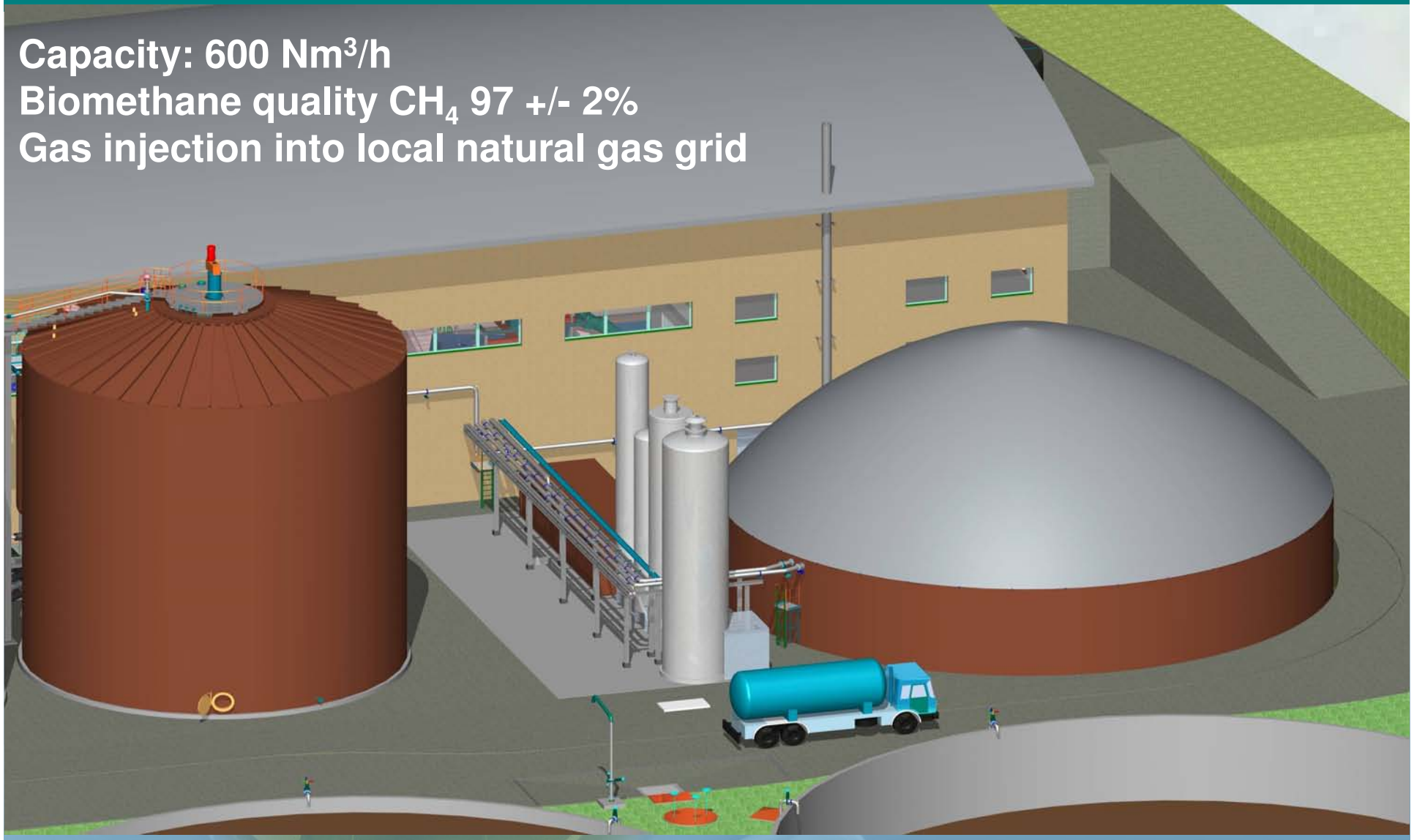
Biogas uprading project Altenstadt, Germany

Capacity: 1.250 Nm^3/h
Biomethane quality CH_4 97 +/- 2%
Gas injection in local gas grid



Kielen, Luxemburg



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LNG / CNG gas stations

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LNG Trucks

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