Agricultural based Biogas Plants in Europe

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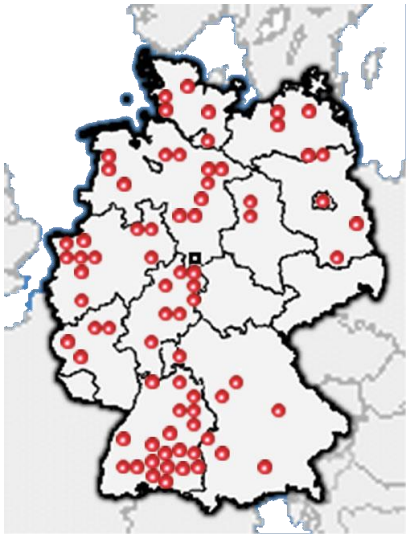
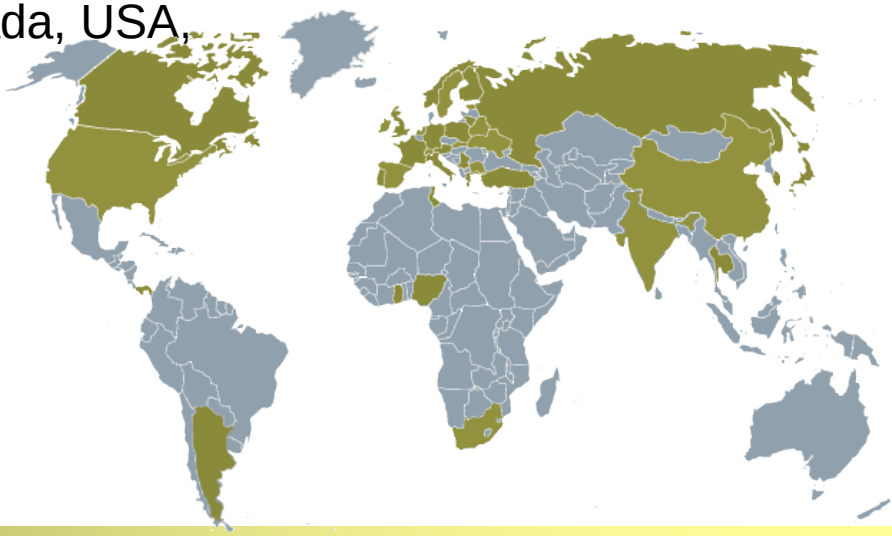
Taiwan
December 2, 2017

Krieg & Fischer Ingenieure GmbH

Engineering Office, specialized in Design and Engineering of Biogas Plants

Foundation:	1999
Team:	20
Experience:	> 30 Years
References:	ca. 150 Biogas Plants
in:	Germany, Japan, Netherlands, Austria, Switzerland, Lithuania, Italy, Slovakia, Canada, USA, Spain, France, Ireland, Russia, India, China and Argentina
Partner in:	Japan, Canada, Bulgaria, France, Poland, Italy, Spain, Serbia, Greece and China





Service offerings of Krieg & Fischer in the field of Biogas

- Studies
- Concept Development
- Calculations
- Permits & Approvals
- Engineering
- Tendering and Commissioning
- Supervision of Construction
- Start-up
- Optimization/Retrofits
- Supervision and Consulting

Key account, selected

Krieg & Fischer Ingenieure GmbH

ALBA
SERVICE | MIT SYSTEM

BIOENERGIE RUHRTAL

VEOLIA

Allianz

TAISEI

posco e&c
POSCO Engineering & Construction Co.,Ltd.

VATTENFALL

SUIKER UNIE

FAIRY LAND 时代桃源

ECO HEART INC.
ECOsystem, Harmony of EArth and Recycling Technologies

Big Dutchman

Bundesministerium
für Ernährung
und Landwirtschaft

giz Deutsche Gesellschaft
für Internationale
Zusammenarbeit (GIZ) GmbH

Rabobank

RWE

Development of Biogas in Germany

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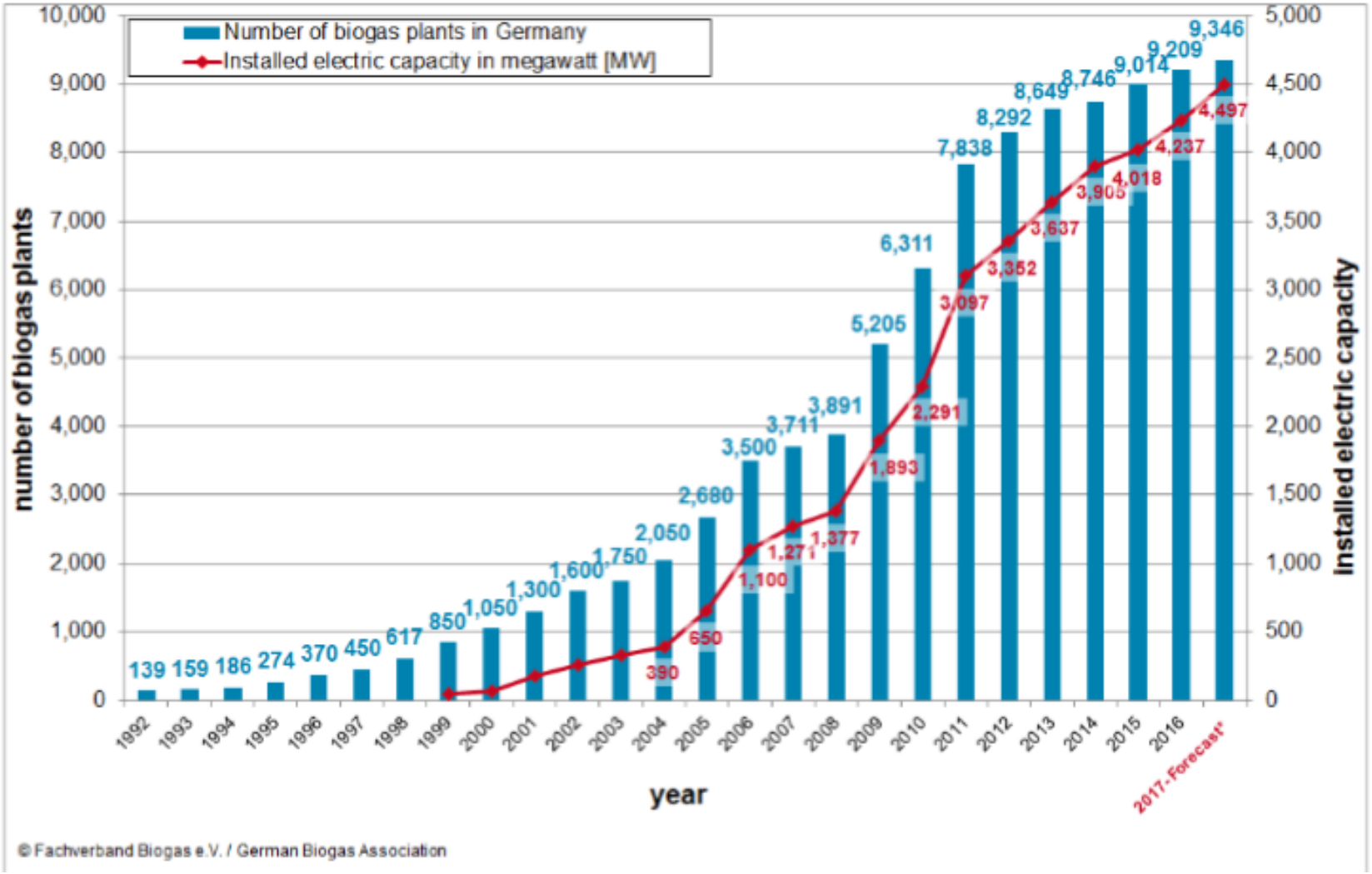

Biogas Plants in Europe

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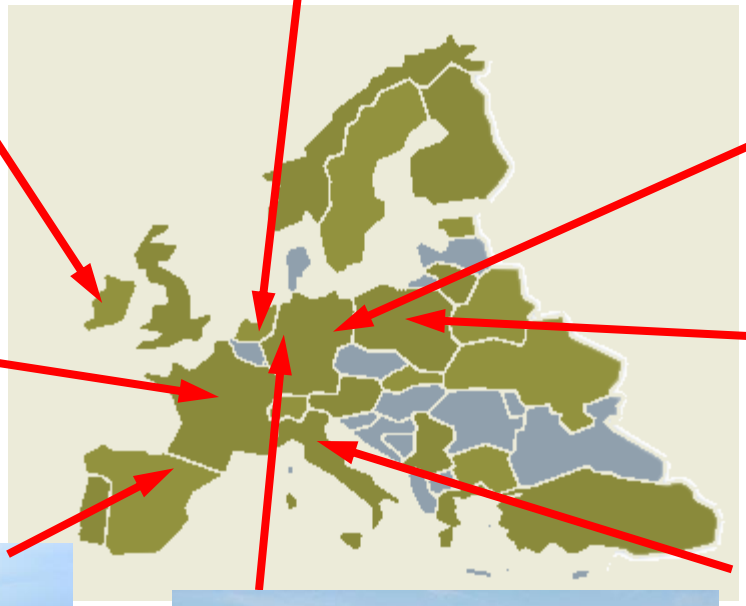
Dinteloord

Mc Donnell

Wiesenau



Noyon

Szepietowo

Montargull

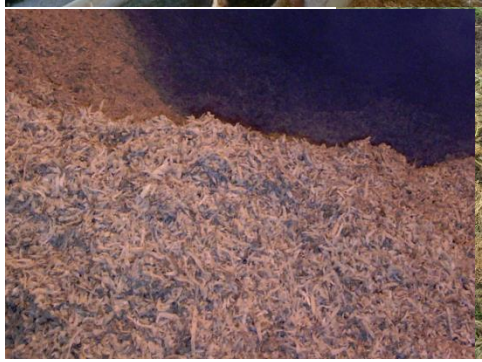
Im Brahm

Forcate

Agricultural substrates

- Manure, dung
  from cattle, pig, poultry etc.


- Agricultural wastes as
  sugar beet pulps, straw,
  green cut, crop residues,
  food remains



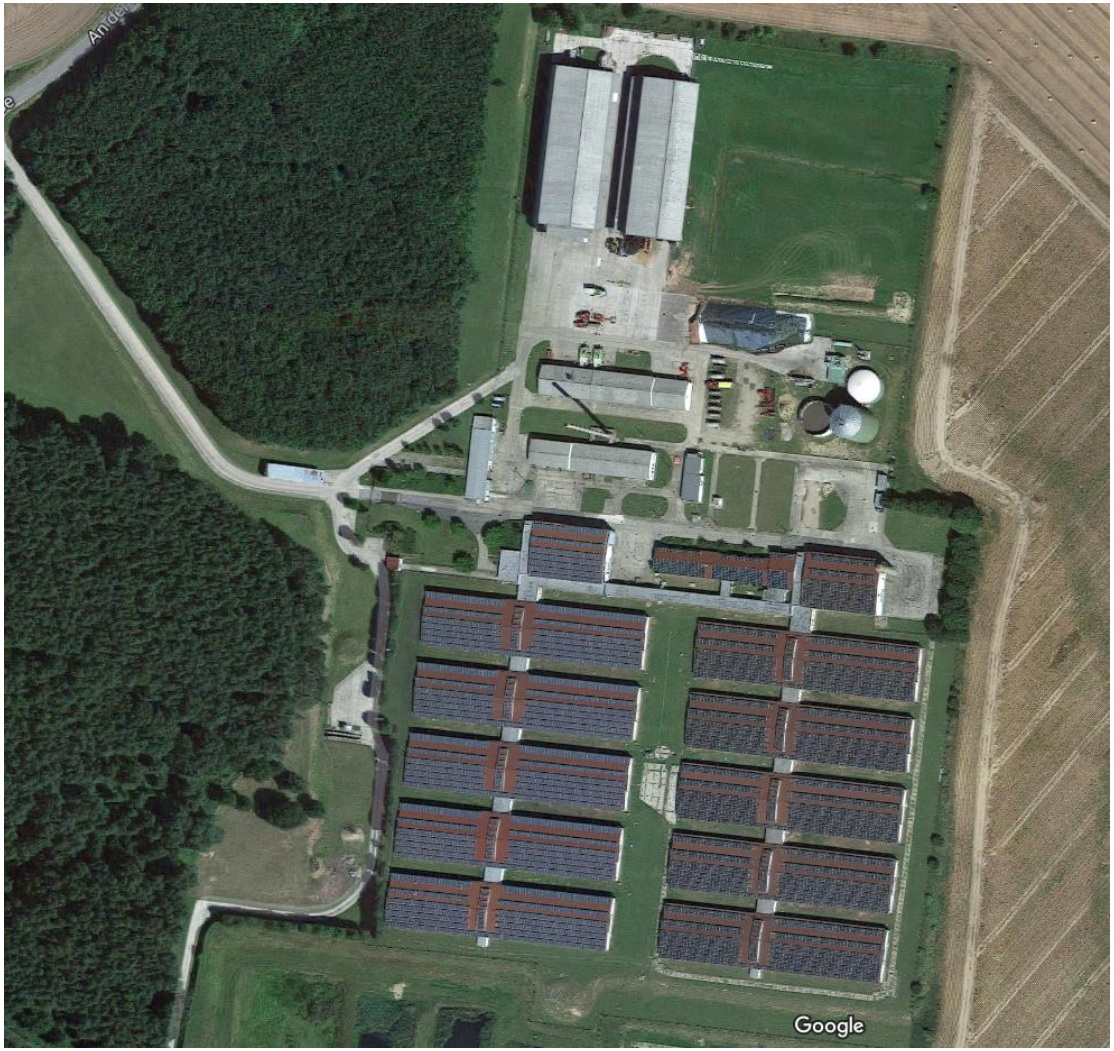
- Energy crops as
  corn silage, whole plant silage, or grass silage



Biogas Plant Todendorf, Germany

- Built: 2002/2003
- Substrate: Pig manure, grass silage
- Digester: 2,400 m^3 Steel tanks
- CHP: 2 x 180 kW_e dual fuel engine
- Digester, secondary digester with gas holder roof
- Heat utilization in the pig farm

Biogas Plant Todendorf, Germany



Todendorf with 20.000 pigs, belongs to the biggest pig farms in Germany

Biogas Plant Todendorf, Germany

In the biogas plant pig manure is digested together with grass silage

Biogas Plant Todendorf, Germany

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Biogas

CHP

Electricity
Heat

The produced electricity is fed to the public grid.

The heat produced in cogeneration is used in the farm.

In Todendorf the produced biogas is used in two dual fuel engines with 180 kW_{el} each.

Biogas Plant Todendorf, Germany

The heat produced in cogeneration is used in the farm

Biogas Plant Wiesenau, Germany

- Built: 2007
- Input: Cattle manure, cattle dung, corn-, grass-silage
- Digester: 4.300 m^3 steel tank
- CHP: 2 x 526 kW_e gas engine
- Gasholder above secondary digester and storage tanks

Biogas Plant Wiesenau, Germany

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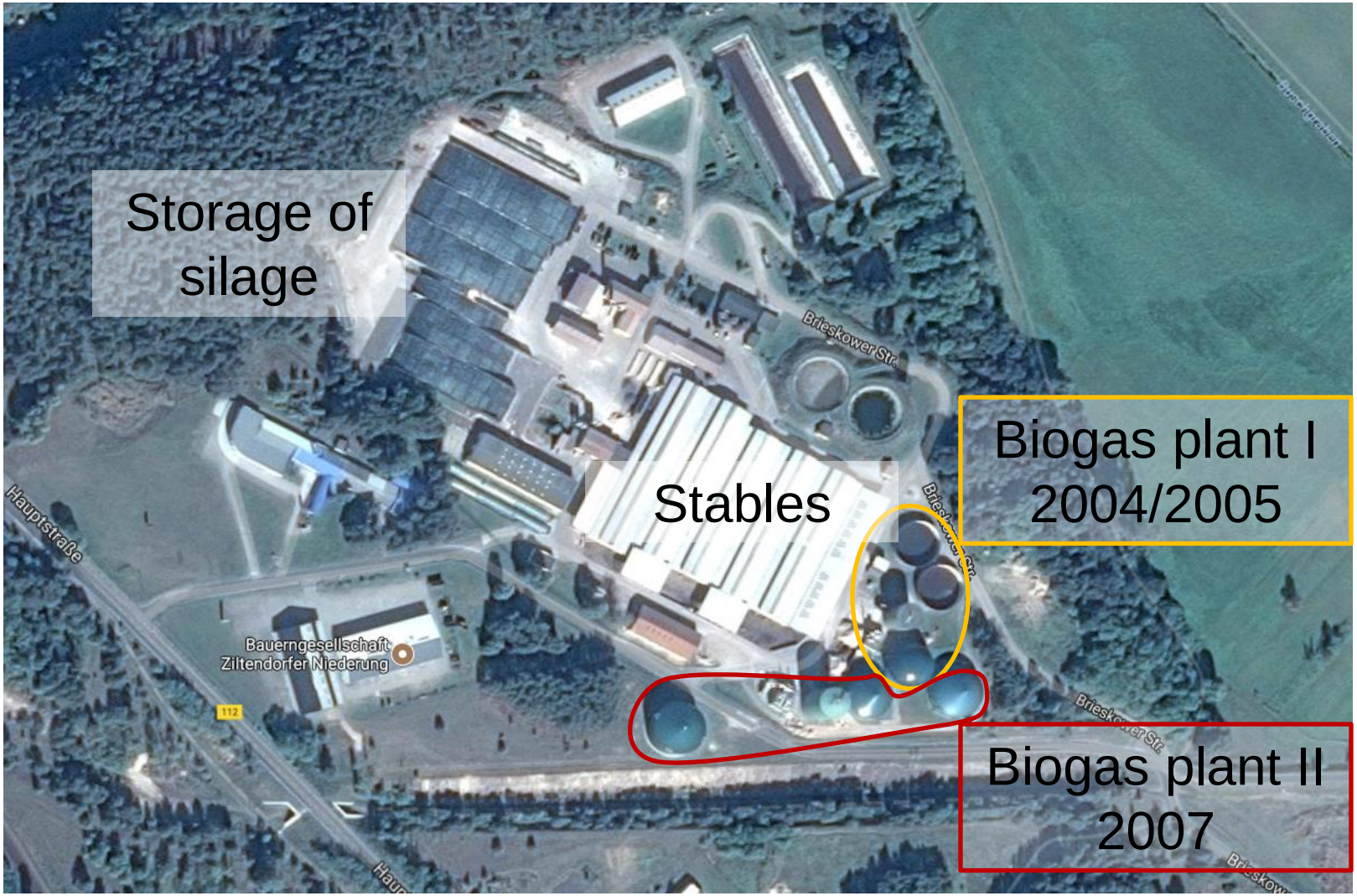
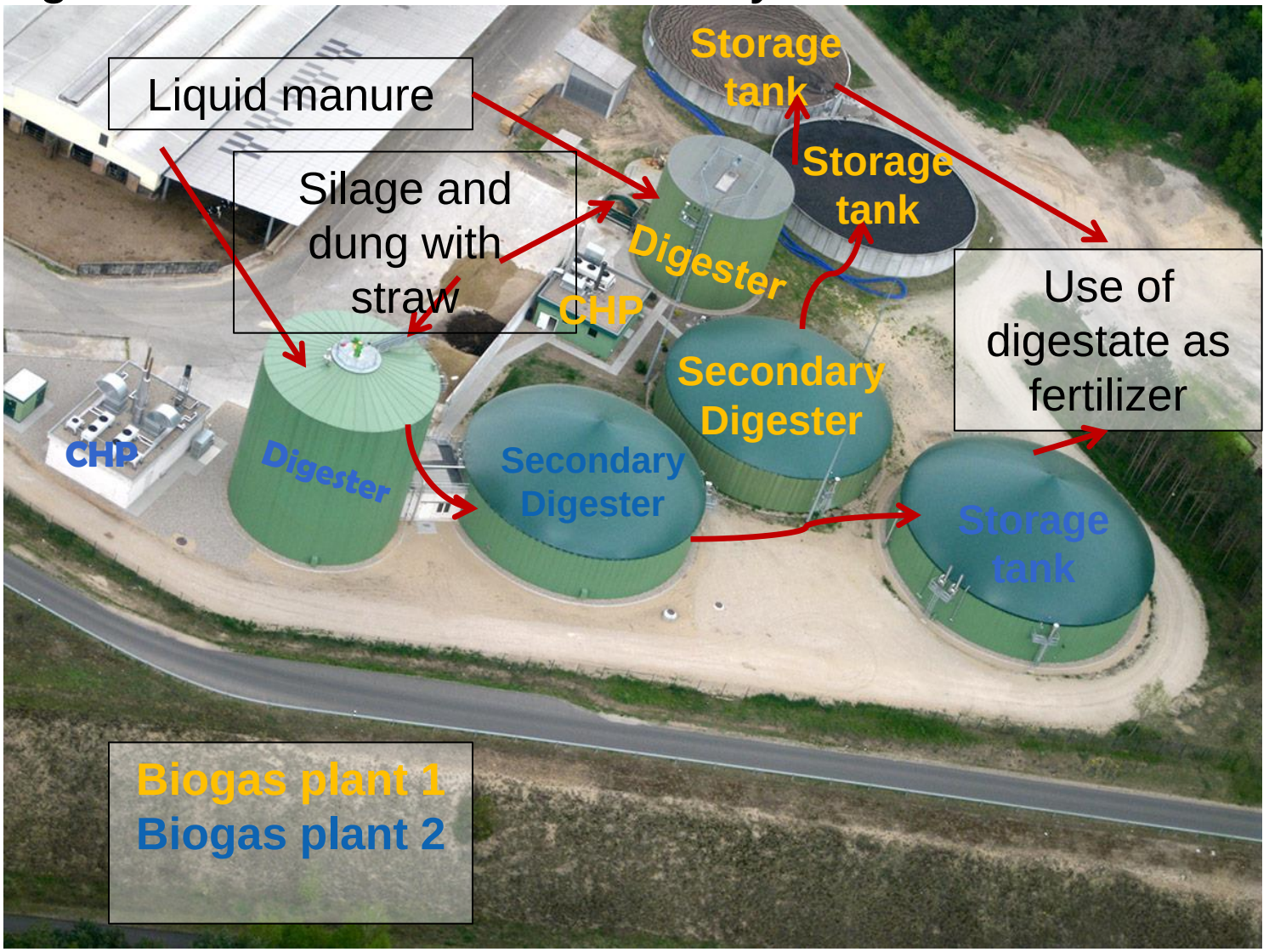


Biogas Plant Wiesenau, Germany



Biogas Plant Wiesenau, Germany

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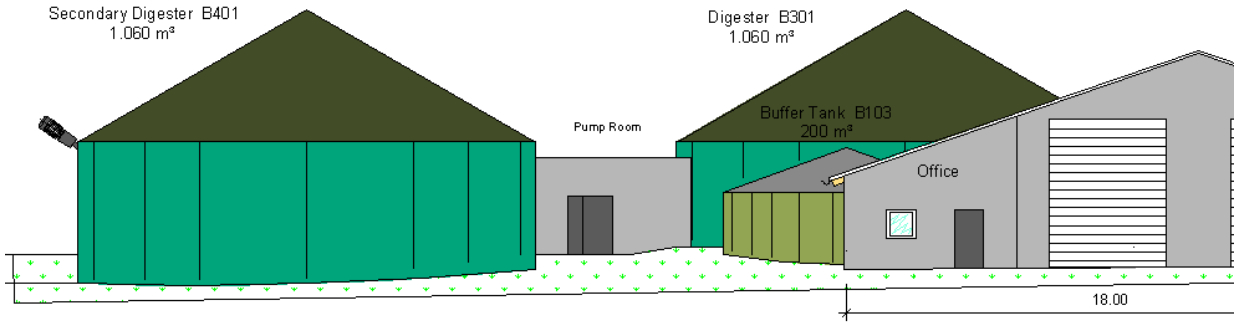
Dairy farm
Wiesenau

Biogas Plant Bretagne, France

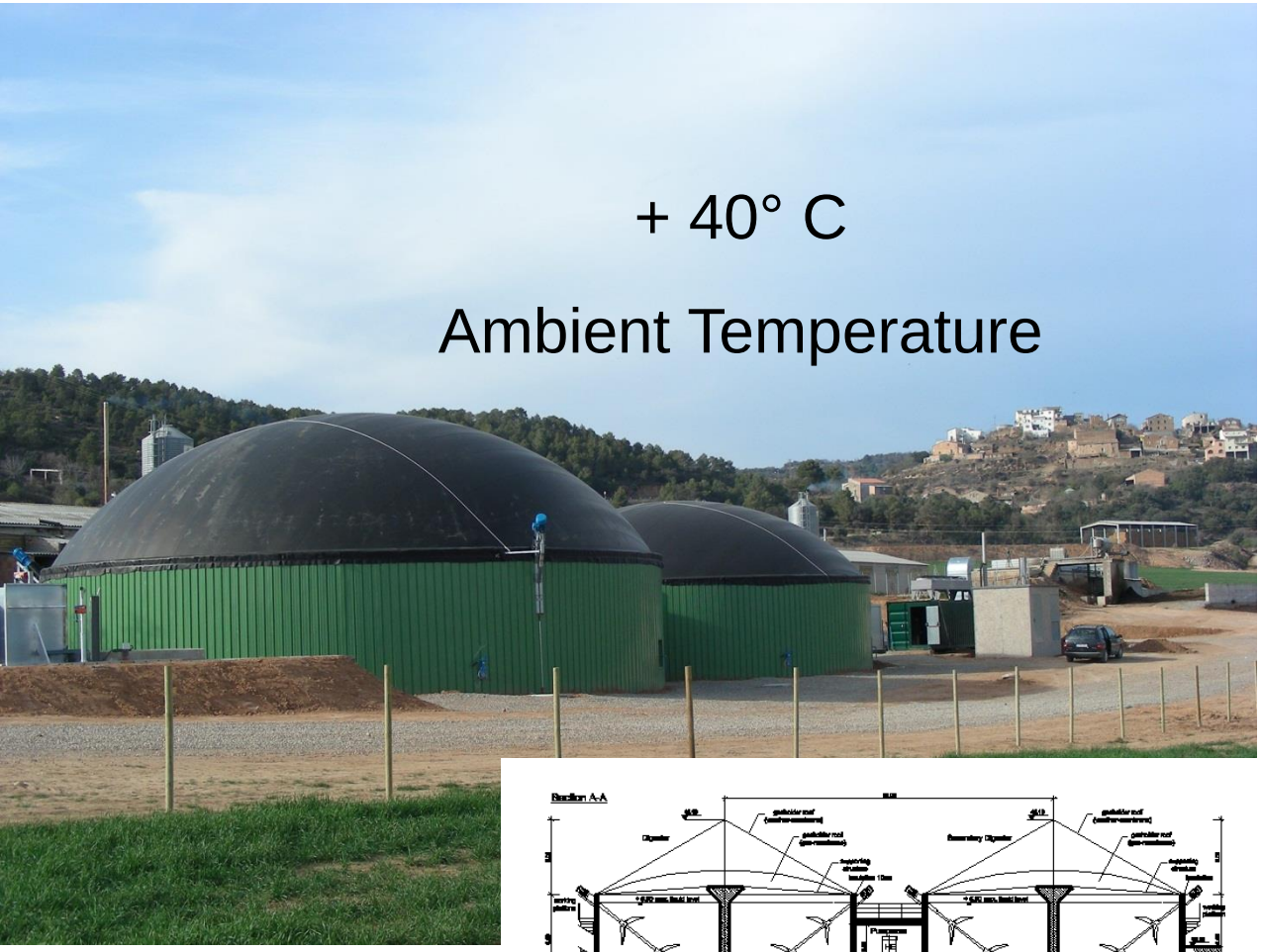


- Built: 2012
- Substrate: Pig manure, sewage sludge, fats, food residuals
- Digester: 2 x 1,100 m³ concrete tanks
- CHP: 400 kW_e gas engine
- Two digester and secondary digester with gas holder roof
- Digestate treatment with separation, heat utilization

Biogas Plant Böckermann, Germany

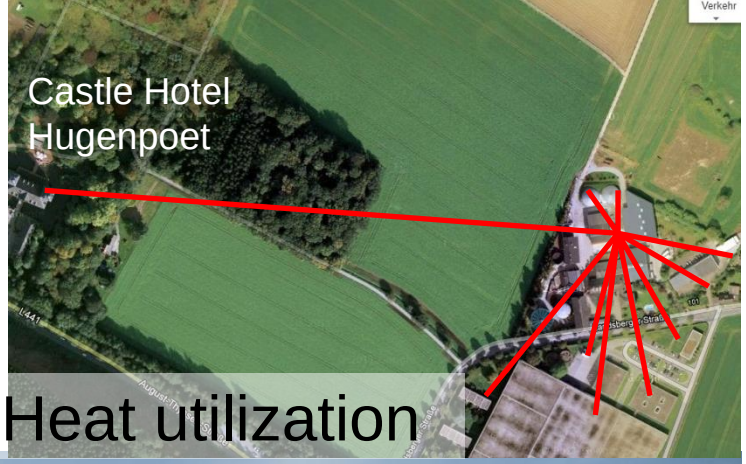
- Built: 2004/2005
- Input: Corn silage
- Digester: 4.079 m³ steel tank
- CHP: 2 x 536 kW_e gasengine
- Gasholder above secondary digester, heat usage

Biogas Plant Montargull, Spain



- Built 2007
- Input: Pig manure, FOG, slaughterhouse waste water sludge
- Digester (2,080 m³) and secondary digester with gas holder roof
- Special gas cooling system adopted to high ambient temperature
- CHP: 364 kW_e
- Invest 820,000 €

Biogas Plant Im Brahm Germany



Heat utilization

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- Built: 2005
- Substrate: Kitchen waste, pig manure, horse dung
- Digester: 2 x 1,205 m^3 concrete tank
- CHP: 4 x 190 kW_e gas engine
- Mesophilic process, engineering with hydrolysis
- Distribution of heat in heating pipes beside others to the castle hotel with thermal bath

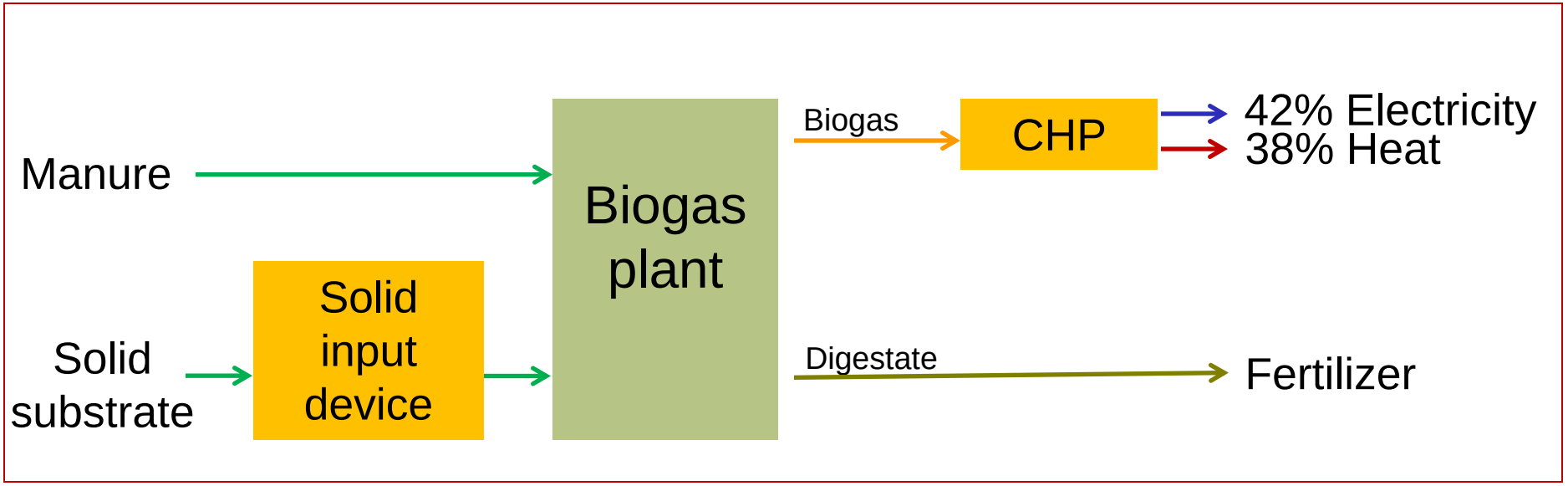
Biogas Plant Forcate, Italy

- Built: 2010
- Input: Grass- and corn-silage
- Digester: Concrete tank 1,700 m³
- CHP: Gas engine 365 kW_e
- Separation, thermophilic operation

Biogas Plant Belgorod, Russia

- Build: 2012
- Substrate: Pig manure, sewage sludge, slaughterhouse waste (entrails, rests of skin with bristles, meat particles), corn silage
- Digester: 2 x 3,035 m^3 steel tank
- CHP: 2 x 1.2 MW_e
- Two primary digester, two secondary digester, mesophilic
- Adoption to cold climate

Biogas concept



Biogas concept with upright digester

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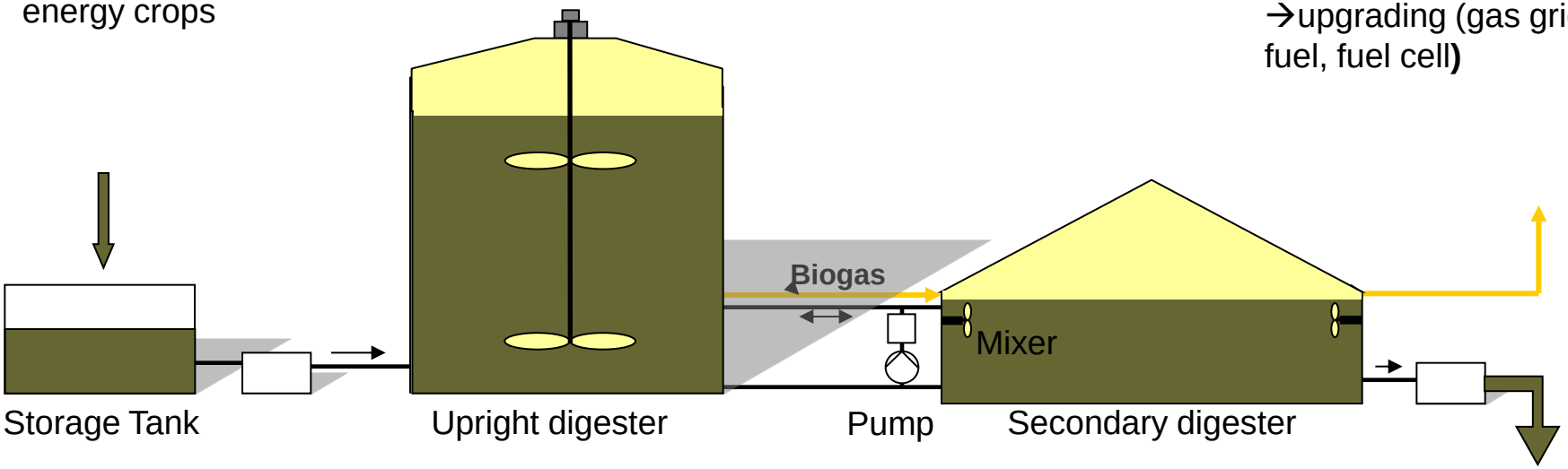
Substrate

manure
organic waste
energy crops



Gas utilization
→CHP (power, heat)
→direct use (heating, cooking, light)
→upgrading (gas grid fuel, fuel cell)

Input device
→piston pump, screw etc. (solids)
→pump (fluids)

Heat exchanger

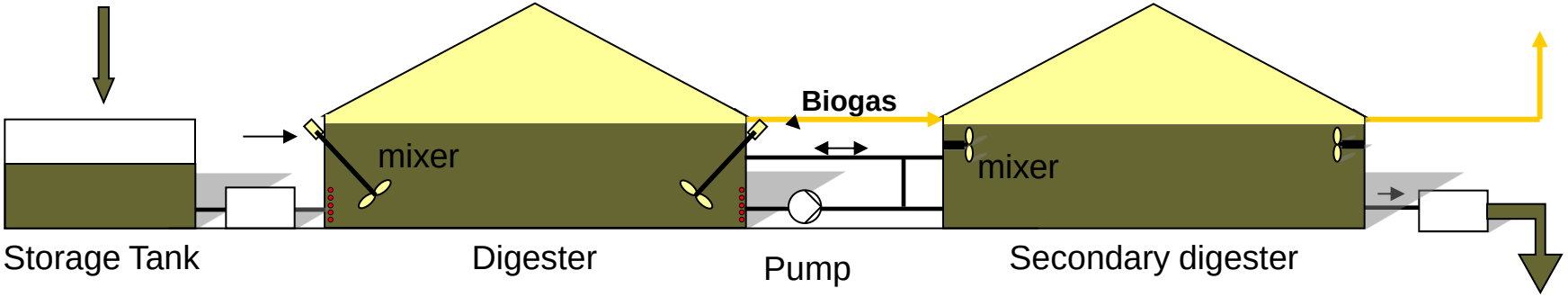
Digested substrate
→storage and use as fertilizer
→treatment

Biogas concept with flat digester

Substrate

manure
organic waste
energy crops

Gas utilization
→CHP (power, heat)
→direct use (heating, cooking, light)
→upgrading (gas grid fuel, fuel cell)



Input device
→piston pump, screw etc. (solids)
→pump (fluids)

Digested substrate
→storage and use as fertilizer
→treatment

Biogas concept with a horizontal digester

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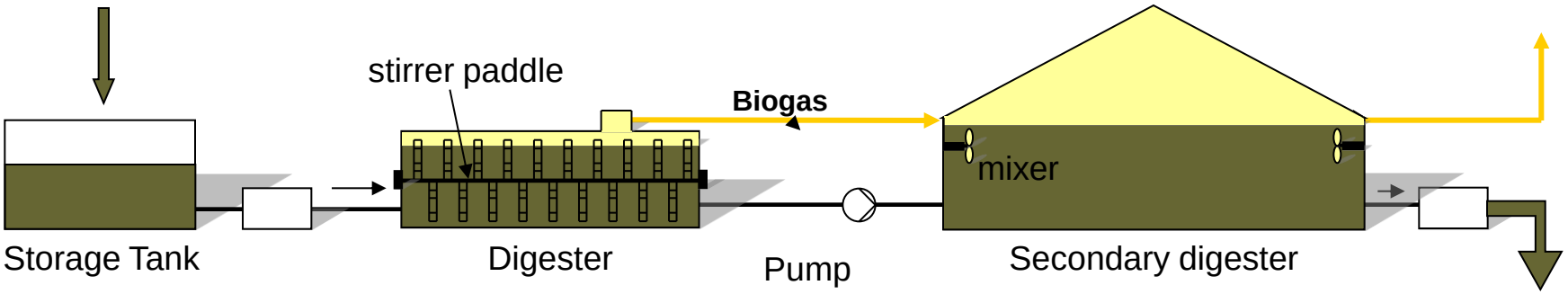
Substrate

manure
organic waste
energy crops

Gas utilization
→CHP (power, heat)
→direct use (heating, cooking, light)
→upgrading (gas grid fuel, fuel cell**)**

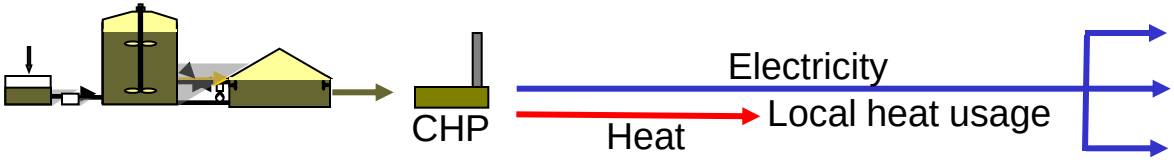


Input device
→piston pump, screw etc. (solids)

Digested substrate
→storage and use as fertilizer
→treatment

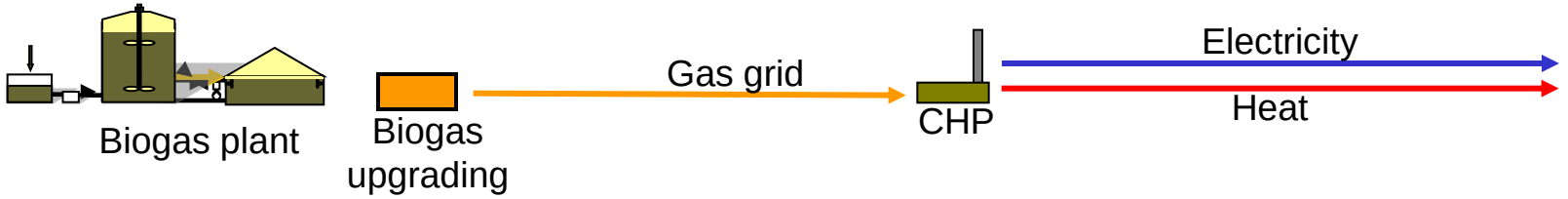
Biogas concepts

Local usage



Transport of biogas

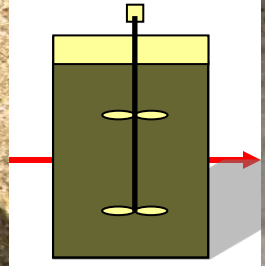
Transmission of biomethane



Biomethane feeding-in

Digestate

before



Digester

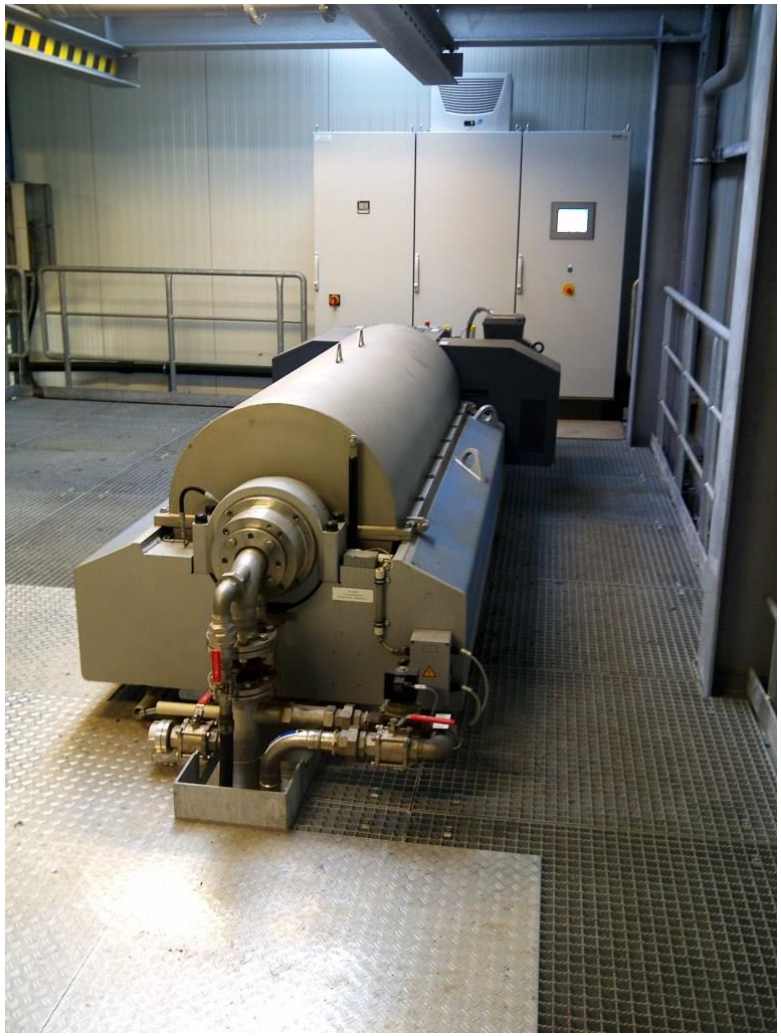
after

Digestate

- Use as liquid fertilizer and spread on land

- Treatment
  - solid digestate → composting (solid fertilizer)
    → drying (fuel…)
  - fluid digestate
    - use as process water
    - further treatment (reverse osmosis, ultra filtration)

Treatment of digestate
Decanter



Treatment of digestate
Separator

Treatment of digestate
Reduction of liquid

Treatment of digestate
Belt dryer

Treatment of digestate
Drum dryer

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