

More than
30 years
experience



Krieg & Fischer Ingenieure GmbH



Biogas Plants

Engineering · Construction
Operation · Optimization

The sustainable and
intelligent way of producing
renewable energy
and managing waste

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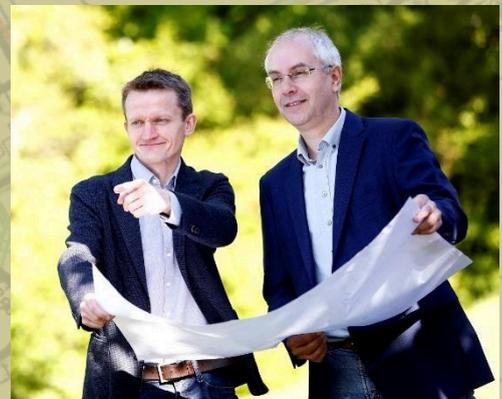


Krieg & Fischer Ingenieure GmbH



Krieg & Fischer Ingenieure GmbH is an engineering firm with extensive experience in biogas plant design, engineering and construction.

Our expertise focuses on anaerobic digestion, process design, and biogas related technology. Krieg & Fischer has a highly qualified team with diverse backgrounds from engineering (civil, process, agricultural) to biology and other natural sciences.



Andreas Krieg and **Torsten Fischer** (managing director), founded Krieg & Fischer Ingenieure GmbH in 1999. Torsten is a professional engineer, working in the field of biogas since 1993. He worked for two plant construction companies prior to founding Krieg & Fischer. His specific expertise is in industrial biowaste digestion and large-scale co-fermentation plants. Andreas designed and constructed his first biogas plant in 1986. In the subsequent years he worked for biogas construction companies and biogas engineering consulting firms. His focus has been on agriculture engineering applications. Raphael Thies is working for Krieg & Fischer since 2007. Starting out as an engineer in the field of planning and processing, he now also works in the field of sales. Alongside founder and shareholder Torsten and Raphael are General Manager.

Engineering & Construction of Biogas Plants



- We have more than 20 years' experience in the field of biogas with over 160 references worldwide.
- We don't build cookie-cutter biogas plants, but design customer specific, flexible solutions based on our experience and the customers needs.
- We are a leading firm in the field of complex, co-substrate, anaerobic process technologies for fermentation.
- Our team is highly qualified and interdisciplinary (process engineers, civil engineers, environmental engineers, agricultural engineers, and natural scientists).
- Worldwide we work together with our partners or cooperate with local engineering companies to promote our clients in the most efficient way.
- We are independent providers with knowledge of experienced suppliers.
- Our know-how goes from feasibility assessments and through design, operation and optimization.
- We provide sustained after sales service and train our clients.



industrial-scale biogas plant



farm-scale biogas plant

Our Service Offering



Krieg & Fischer Ingenieure GmbH

Studies

Feasibility studies – pilot studies
– expert opinions – evaluation – survey reports – arbitration opinions – opinions for insurance purposes

Concept development

Choosing the best process technology from both a technical and economical point of view depends largely on the input substrate.

Krieg & Fischer has extensive experience with different technologies and in the treatment of all types of manure, biowaste, kitchen waste, sludges, silage from energy crops or grass, etc.

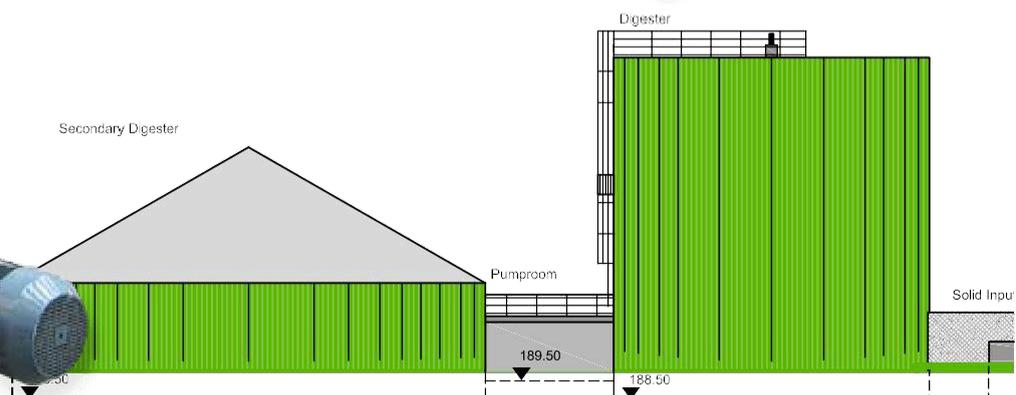
Calculations

The calculation of the energy (biogas) yield and cost assessments for biogas plants is Krieg & Fischer's daily business.

Permits & Approvals

We help our clients to obtain the required permits for their biogas plant and prepare all necessary approval documents.

- Feasibility Studies
- Concept development
- Calculations (Mass & Energy Balances, Cost Assessments)
- Permits & Approvals
- Engineering
- Tenders and Commissioning
- Construction
- Start-up
- Optimization/Retrofits
- Supervision/Consulting



Engineering

We provide the engineering for a variety of biogas and digestion plants, including pre and post-treatment of the substrate.

Tendering and Commissioning

Krieg & Fischer gives competent advice on obtaining equipment from experienced companies. We know who delivers the best equipment at the best rates. We will help to invite qualified bidders and help to analyze offers to determine the best solution for each plant.

Construction

We do all the construction management, for both domestic and international projects.

Start-up

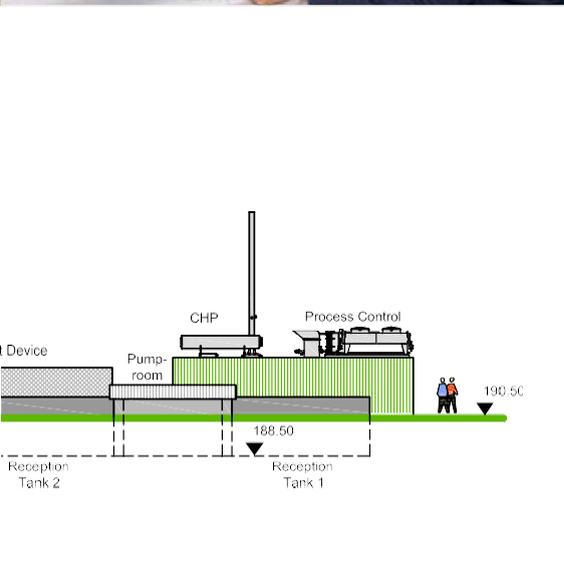
We manage the start-up for all types of biogas and digestion plants.

Optimization / Retrofits

We optimize existing biogas plants to increase the biogas yield and the energy efficiency.

Supervision and Consulting

We increase the efficiency of your biogas plant and minimize interruptions.



Technical Details



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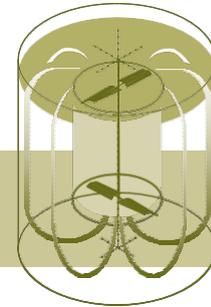
There are 3 main possible ways to construct a digester for a biogas plant:



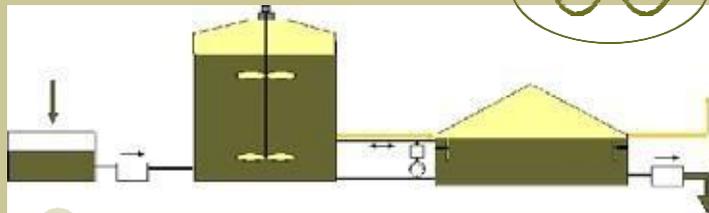
High upright digester

1. High upright digester/CSTR

- Designed for large plants up to 10,000 m³.
- Mixing is by means of a top-mounted mixer which operates continuously.
- Reinforced concrete or bolted steel depending on size.
- Constant gas production
- Low heat loss
- Internal/External Heat Exchanger
- One-stage/two-stage digestion



- Concrete/steel tank
- Internal/external heat exchanger
- Top mounted/side mounted/submersible mixer
- Mesophilic/thermophilic
- One stage/two stage digestion
- Double membrane/single membrane gas holder roof



1. High upright digester



Dry Feeder

A dry feeder (screw or piston pump) allows for direct feeding without the use of dilution water.

Pasteurization

Pasteurization at 70° C for one hour is normally sufficient with two tanks used for heat recycling.



Flat digester with gas holder roof



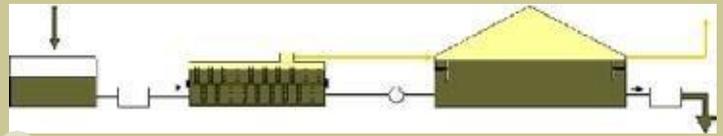
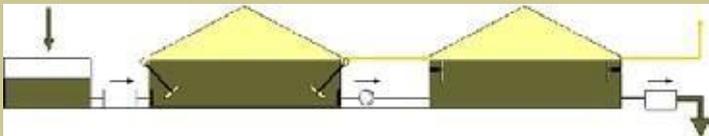
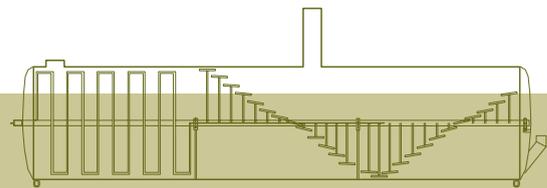
Horizontal/Plug flow digester

2. Flat digester

- Best suited for small to medium biogas plants with low dry matter substrates that are easy to mix.
- Integrated gas storage in the gas holder roof
- Cost saving digester tank design
- Easy mixing and heating conditions

3. Horizontal / Plug flow digester

- Optimum mixing
- High dry matter content
- High content of sedimenting material
- For special substrates
- Plug flow
- Paddle mixer



2. Flatdigester

3. Horizontal/Plug flow digester



Pumping room

Pumps, valves and pipes specific to the plant substrates



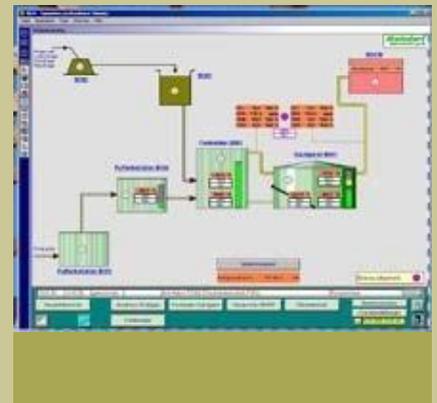
External heat exchanger

to heat the substrate



Overpressure-vacuum relief valve

for safety reasons



Process control systems

Provides system control, monitoring and worldwide access to the biogas plant

Utilization of digestate

- Use directly as liquid fertilizer
- Separation
- Solid phase
 - Solid fertilize > Composting
 - Solid fuel > Drying
- Liquid phase:
 - Purified water, liquid fertilizer

Biogas utilization

- Production of electricity and heat from CHP or fuel cell
- Direct use for heating, cooking or lighting
- Purification and use as fuel or injection into gas grid
- Direct injection into a biogas grid

References in Germany



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Choosing the best process technology depends largely on the input substrate.

Krieg & Fischer has a wide variety of experience with digestion of all kinds of substrates such as manure, industrial organic waste, biowaste, kitchen waste, sludges, etc.

- Municipal
- Industrial
- Agricultural



Germany: Anklam 2013/14

Substrates:	Sugar beet, vinasse
Gas utilization:	Injection into the grid
Highlights:	2 high pressure water scrubbing units with recovery and Gas injection

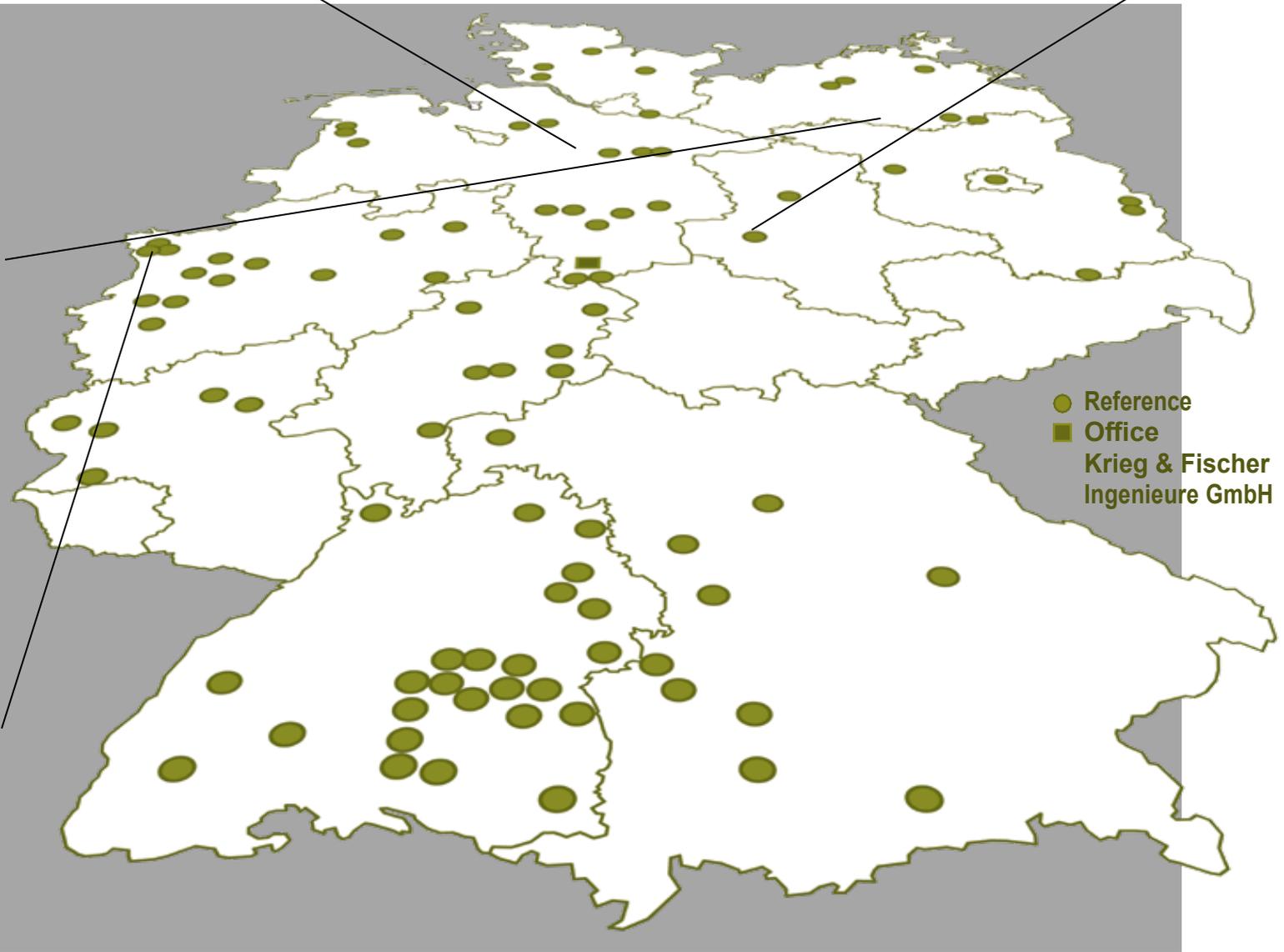


Germany: Wietzendorf, 2003

Substrates: Waste water of a starch-producing plant (potato-starch), potato residues
Cogeneration unit: 4 x 2,1 MWe
Highlights: Protein recovery, reverse osmosis, ammonia stripping and in 2003 it was the world's largest biogas plant

Germany: Falkenstein, 2008

Substrate: Corn silage, whole cropsilage, sweet sorghum silage
Cogeneration unit: 2 x 716 kW



Germany: im Brahm, 2005

Substrate: pig manure, kitchen waste, horse dung
Cogeneration unit: 2 x 190 kW_{el} + 2 x 190 kW_{el} extension

Over 160 References

Activities worldwide



Krieg & Fischer Ingenieure GmbH

Krieg & Fischer has engineered many biogas plants outside Germany.

The technology had to not only be adapted to the different and specific substrates but also to the special environmental and regulatory conditions of the particular country.

- Partner in Japan
- Partner in Serbia
- Partner in USA
- Partner in Canada
- Partner in Bulgaria
- Partner in Poland
- Partner in Spain
- Partner in Italy
- Partner in Ukraine

References:

- Canada
- USA
- Switzerland
- Spain
- Italy
- The Netherlands
- Lithuania
- Slovakia
- Austria
- Japan
- France

Plant design, Feasibility studies:

- Thailand
- Tunisia
- Portugal
- Korea
- Sweden
- Belarus
- Nigeria Südafrika Ghana Ukraine Turkey



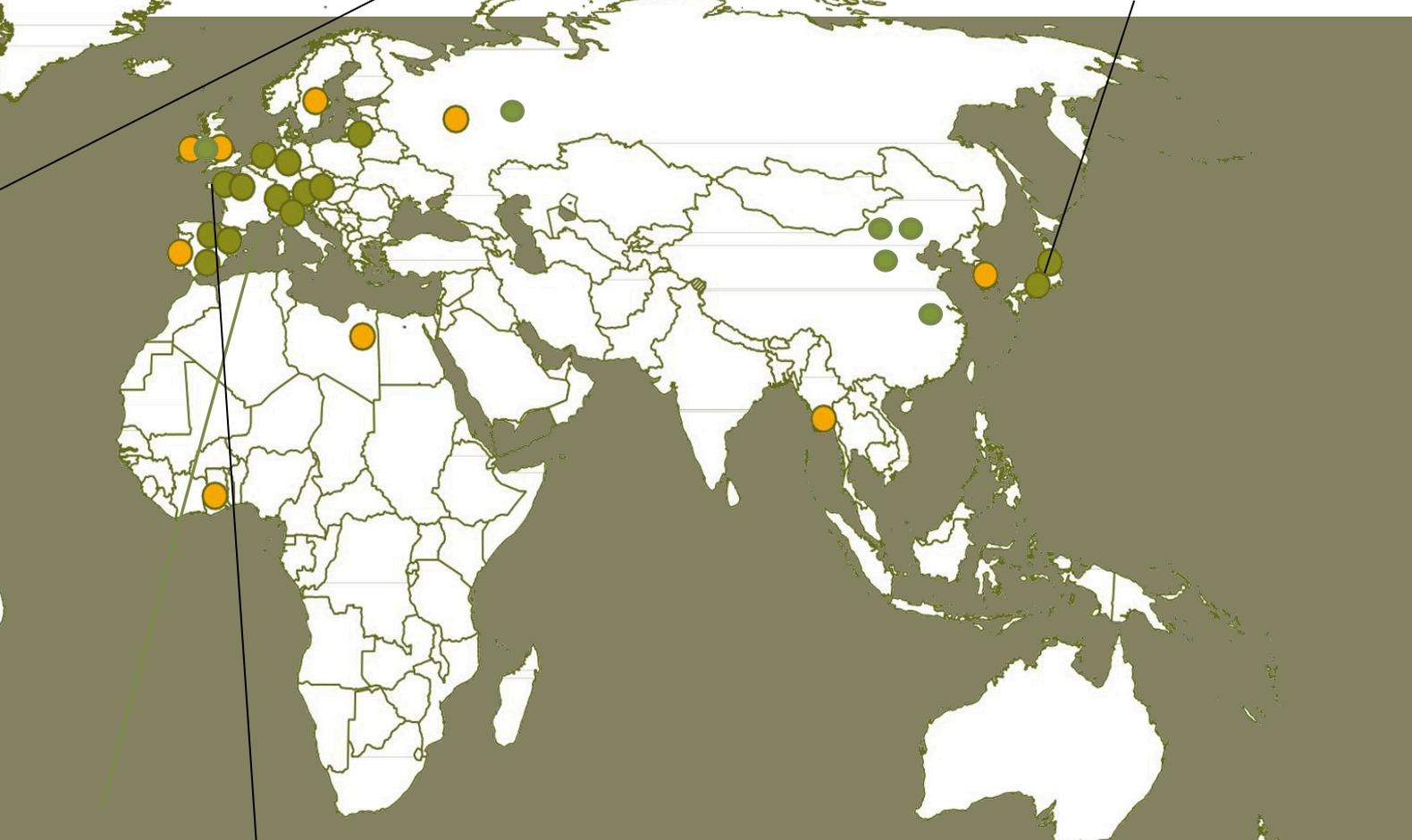
USA: Inland Empire, 2007

Substrate: Manure, liquid waste
Highlights: Designed in a seismic zone 4, and the biogas was fed into a local biogas grid.



Canada: Cudworth Pork, 2004

Substrate: Manure, potatoes,
Cogeneration unit: Microturbines 4 x 30 kW_e
Highlights: Designed to handle up to -40° C temperatures



Japan: Fukuoka, 2017/18

Substrate: Hydrolised kitchen Cat. 2, paper and cardboard waste Treated by THP), water (recycled, rain, mains)
Cogeneration unit: Gas-upgrad system



UK: JCBE Derby, 2017/18

Substrate: kitchen Cat. 2, paper and cardboard waste Treated by THP), water (recycled)
Cogeneration unit: Gas-upgrading system
Highlights: Thermal pressure hydrolysis (THP)



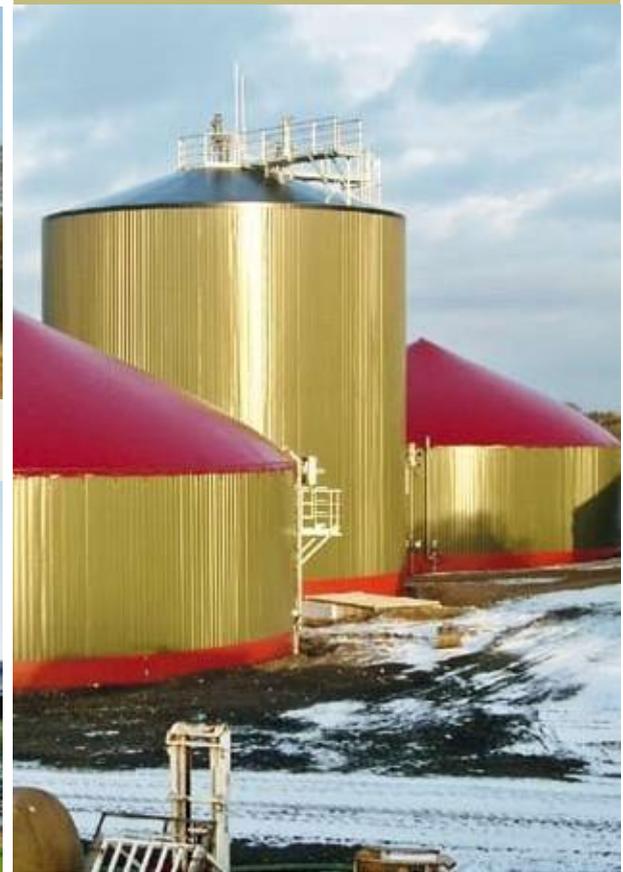
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Wietendorf

im Brahm



Schornbusch

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