



**Biogas plants supply**

# Utilization of a biogas plant



## **Biogas = an energy feedstock**

Renewable energy produced from biogas is a means of providing long-term sustainable energy. Biogas technology involves a complex system of processes, ability to use organic waste or raw material for energy purposes and for the production of organic fertilizer.

## **How is biogas produced?**

Biogas is a mixture of gases. The basic components are methane (55% - 60%) and carbon dioxide (39% - 44%). Organic materials resulting from livestock or crop production, with the absence of air and under the optimum conditions are decomposed by bacteria in the fermentor. During the decomposition biogas is produced and desulphurised.

# Utilization of a biogas plant



## Sorts of an anaerobic fermentation

**Mesophilic**      **30°C – 42°C**

Especially for agricultural crops (maize, rye, ...)

**Thermophilic**    **45°C – 60°C**

For organic residues (fats, municipal waste, ...)  
and agricultural crops



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## How is energy obtained from biogas?

Biogas produced by fermentation is led to the cogeneration unit, which converts it to electricity and thermal energy. Cogeneration units can operate in a power range from 250kW to several MW.

**Biogas is an economically profitable technology with a fast return on investment. Significantly contribute to environmental protection and climate.**



*The cogeneration unit is the heart of a biogas plant*

# Utilization of a biogas plant



## How is electricity used?

The electrical energy generated in the cogeneration unit can be supplied to the grid and use for own consumption in the biogas plant or in the adjacent farm.

## How is a thermal energy used?

Part of the heat (about 20%) produced in the cogeneration unit is returned back to the fermentation process. The remaining heat can be used for other needs of the farm or industrial enterprise.



# Utilization of a biogas plant



## Available for business development - supply of heat / cooling:

- Residential and administrative buildings
- Greenhouses
- Livestock
- Fish
- Dairy
- Food stores
- Lumber
- Production of pellets

## How is material used for fermentation – called digestate?

- Liquid fertilizer is applied directly to sheet plants. Refilling and return minerals to the soil.
- Production of fertilizer from the solid component. Possibility distribution to consumers.



# Control options of a biogas plant



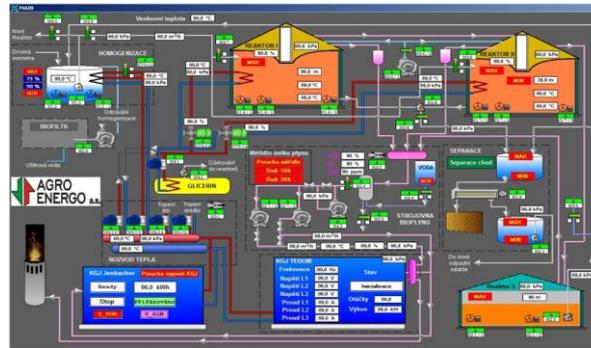
**A biogas plant contains complicated processes that require constant supervision. Therefore a reliable control of technological processes is a fundamental requirement to ensure trouble-free procedures as follows:**

- Disintegration of raw materials, mixing, crushing
- Hygienization (pasteurization), sterilization
- Fermentation of organic matter
- Air conditioning of the engine room
- Measurement of gas concentration in the engine room
- Data recording (archiving)
- Collection and treatment of biogas
- Utilization of biogas, heat recovery, utilization of digestive
- Web interface, possibility to control from anywhere in the world

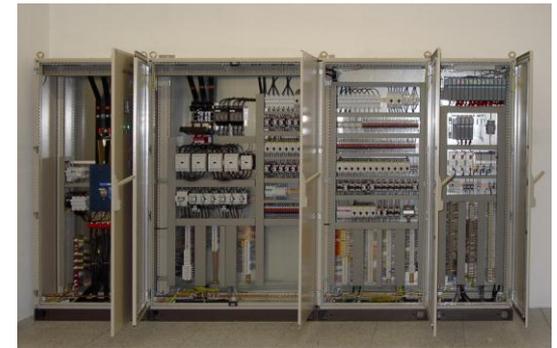
# Control options of a biogas plant



The Control system is a brain  
of a Biogas plant



Example of visualization of a  
Biogas plant



Example of installation  
I&C and electro part

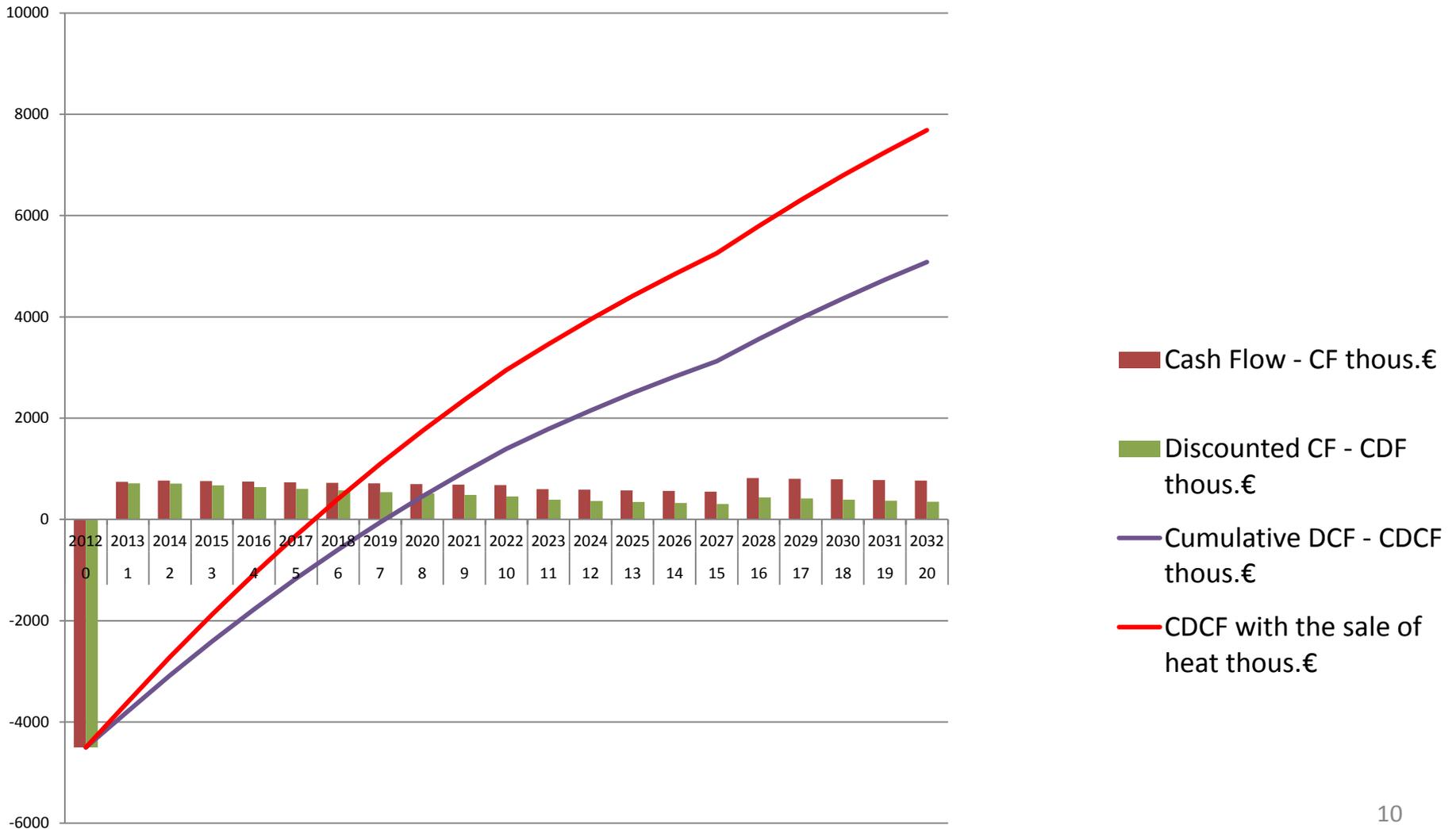
# Our support



- Advise on the design of a biogas plant
- CBA Cost-Benefit Analysis
- Europe grants service
- Comprehensive design documentation
- Implementation of a biogas plant construction
- Installation of technological equipment including an electronic control system
- Supervision
- Putting constructions into operation and an evaluation of the test operation
- Operator training
- Providing technical support
- HOTLINE services
- Biological support

# Our support

## Cost-Benefit Analysis



# Our support from European grants

In collaboration with our key partners we provide comprehensive services and consultancy within the guidelines of the EU Structural Funds. Our experts will evaluate the project and suggest the optimal method of financing, including the processing of grant applications and their uses. Our goal is to minimize the administrative burden on the customer's side.

At construction sites co-financed by EU funds, or private entities, we provide services from an FIDIC engineer (construction manager - consultant), whose particular role is the application of rules for the Federation of French engineers and the common EU provisions (Practical Guide) in managing buildings financed from EU sources.



## Description of a technology for a biogas plant



The biogas plant is based on so-called thermophilic technology operating at 50 – 55 °C.

It can serve either as an agricultural biogas plant or a biogas plant for the disposal of municipal waste and animal remains.

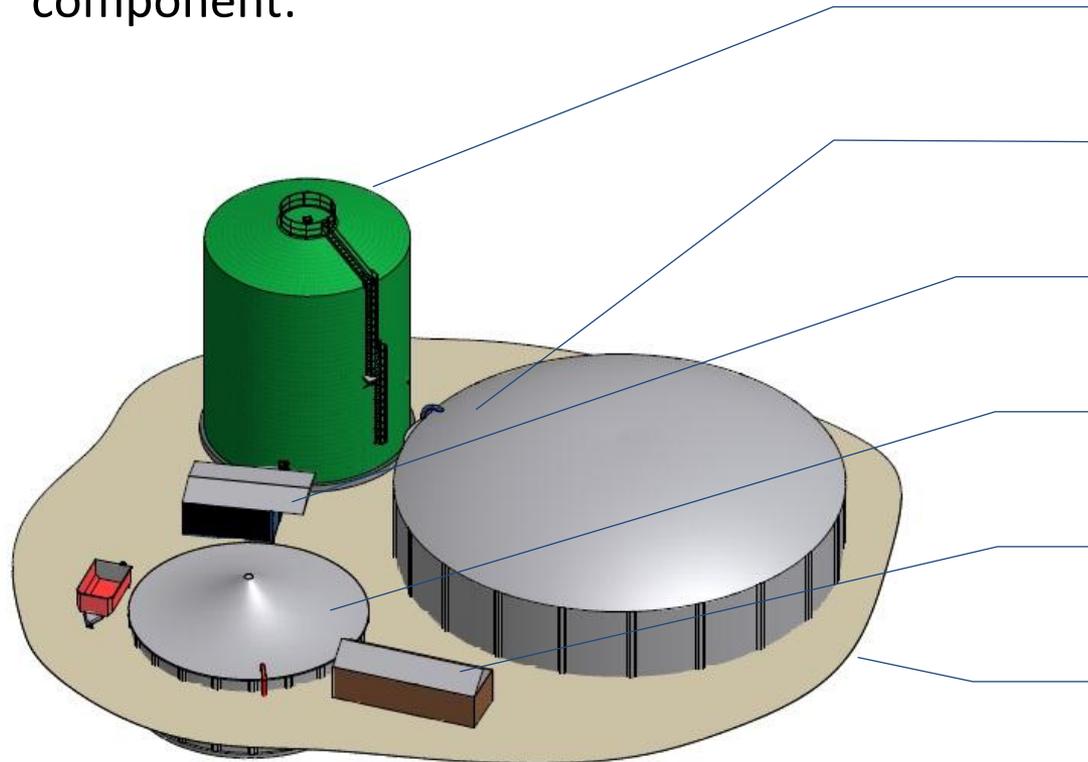
Biogas plants based on this technology can be designed for a wide range of performance. Everything depends on the availability of feedstock and the possibilities of energy products (electricity, heat, gas) of the plant. No exception and equipment with  $2\text{MW}_{\text{el}}+2\text{MW}_{\text{th}}$  and above..

# Description of technology for a biogas plant



## Biogas production

A biogas plant based on this technology contains these technological component:



Primary digester

Secondary digester

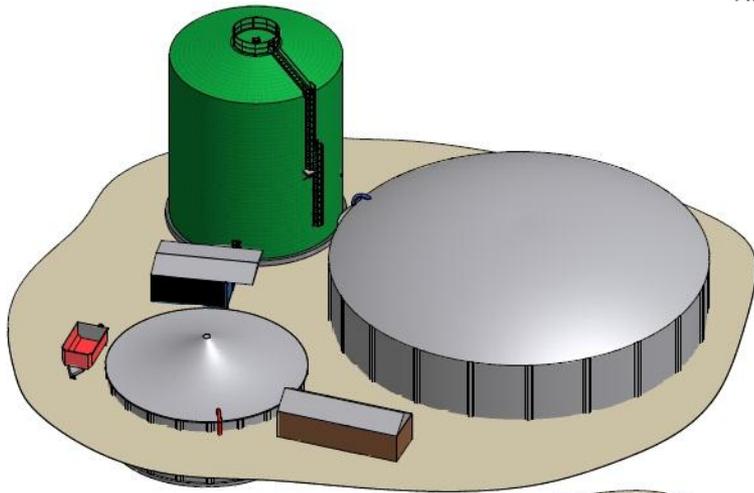
Technological centre

Primary intake mix - tank

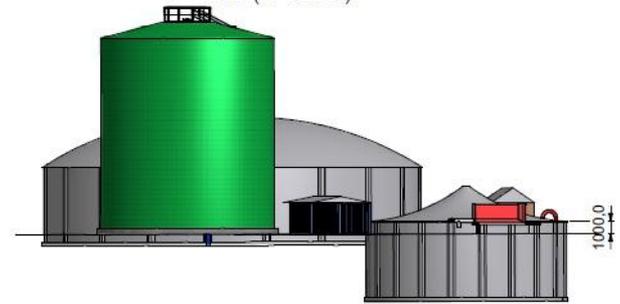
Container with a cogeneration unit (CHP)

Storage for digester (not drawing)

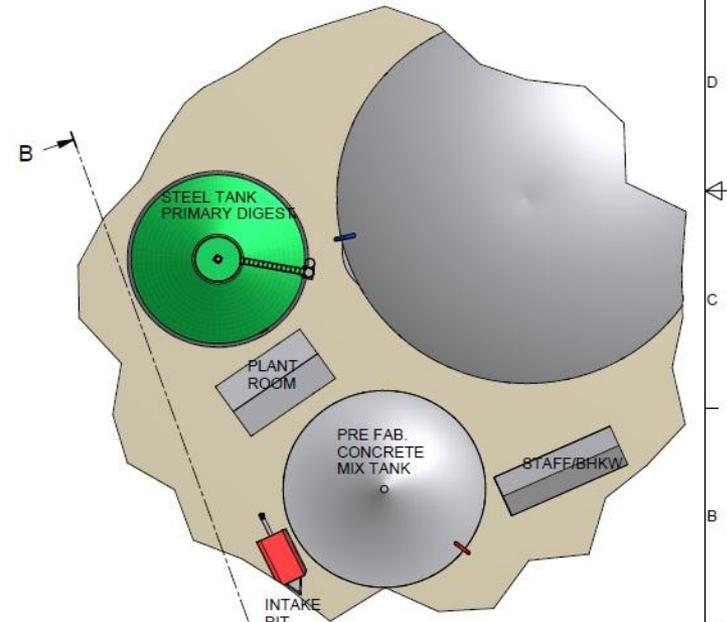
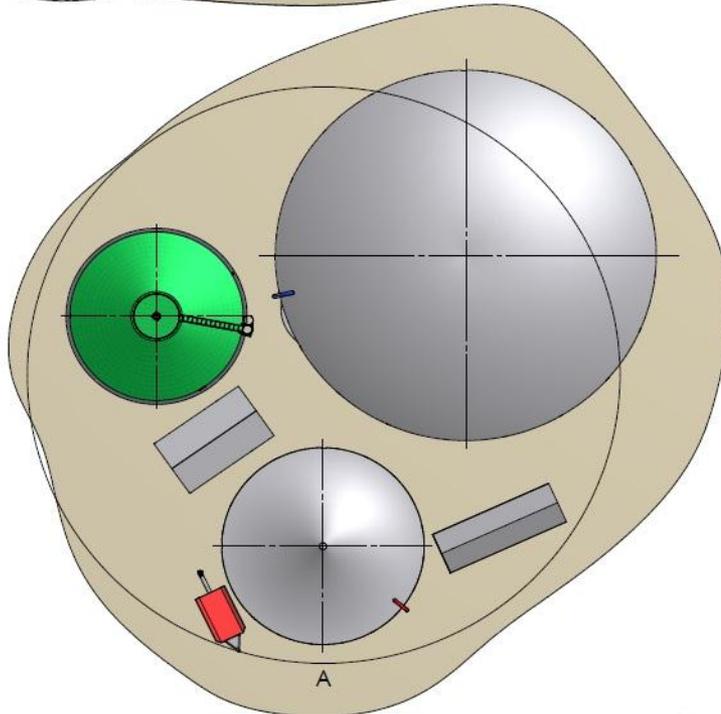
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B-B ( 1 : 250 )



A ( 1 : 250 )



MÅLSÆTNING MÅ IKKE BRUGES  
TIL AFSÆTNING PÅ  
BYGGEPLADS.

SAMTLIGE MÅL ER SKALERET  
FRA ANDEN TEGNING OG ER  
DERFOR KUN  
RETNINGSGIVENDE

**Assentoft silo**

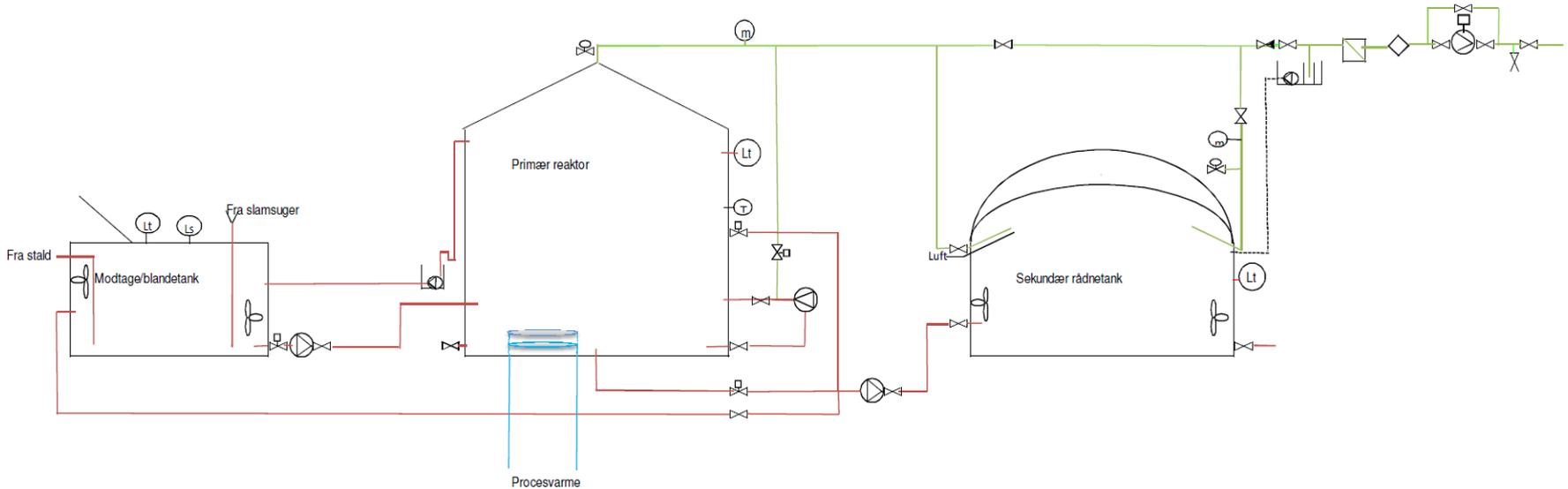
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Example of 3D view of a biogas plant

# Description of technology for a biogas plant

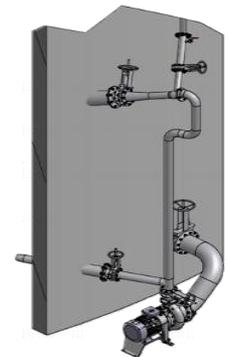
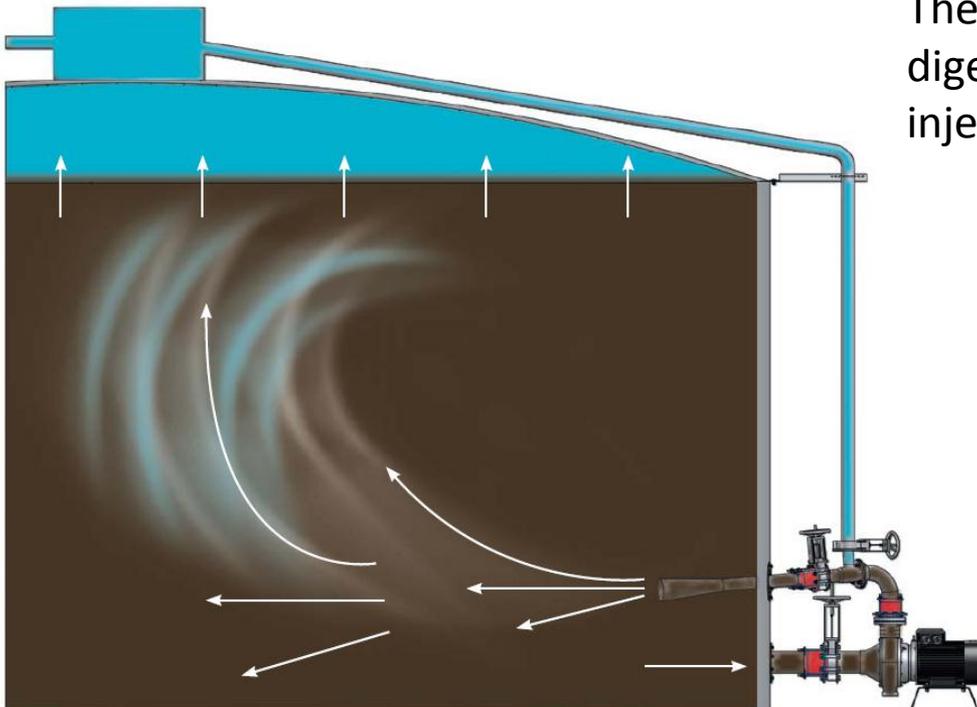


*Example of a technological scheme of a biogas plant based on thermophilic fermentation*

# Description of technology for a biogas plant



The chopper pump draws sludge from the digester and pumps it through the aspirating venturi chamber. The biogas is aspirated from the top of the digester, mixed with the sludge and injected into the tank.



# Comparison of a Danish and a German technology

Issue	German	Danish	Marks
Economical conditions	High electricity prices. Bonus for small plants.	Low electricity prices (0,10 € cent). All plants same price.	Low possible income means high demand for optimizing.
Energy conditions	Based on electricity sales.	Have to based on electricity and heat sales.	Danes are used to work with the heat sales as a part of the project so this can be included.
Biomass	Manure + maize silage.	Manure + industrial residuals, crops.	Much more experience in waste handling in Denmark as well as the plants are prepared for this.
Plant size	Relatively small plants.	Medium and large scale plants.	The Danish development has been in a more industrialized way than the German.
Digester type	Concrete manure tanks.	Steel silos combined with concrete tanks.	Optimizing operation cost by reducing heat demand and electricity demand for mixing.
Process	Mesophilic	Thermophilic	The thermophilic process is faster and can easier digest fat. It is also more sensitive so it has to be controlled in a better way.
Retention time	Very high	Lower	Lower retention time possible because of thermophilic operation. Lower retention time means less mixing per ton of the biomass treated.
Own electricity demand	High (mixing in large flat tanks).	Lower (mixing in silo digesters).	Mixing in the large flat tanks uses approx. 3 times more electricity than mixing in the silo digesters.
Sanitation	Not an issue – own manure and maize.	An important issue. Manure from more farms with a very high hygienic standard and treatment of Cat 3 waste.	Danes are used to fulfill EU Reg. 1774/2002 on animal residuals which will be relevant in Poland as well.
Demand for space	High	Lower	Silo digester takes up less space than flat tanks. Danish plants need a permission to construct higher than the German plants.

# Realized projects with thermophilic fermentation



## Realized projects with Danish technology based on thermophilic fermentation

- Blåbjerg, Danish, power 1,5 MW<sub>el</sub>
- Ølstrup, Danish, power 600 kW<sub>el</sub>
- Thorsø, Danish, power 1,6 MW<sub>el</sub>,
- Ribe, Danish, power 2 MW<sub>el</sub>
- Filskov, Danish
- Hegnda, Danish, power 550kW<sub>el</sub>





**Thank you for your attention**

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