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Biogas plant „Ebersdorf“ Biogasanlage Niederl – Ebersdorf

The Niederl family operates a pig breeding and pig fattening business (250 breeding pigs) as well as a stable furnishing company in the community of Poppendorf. Since the beginning of 2004 they also operate a biogas plant that uses renewable resources and the liquid pig manure. The biogas plant of the Niederl family is characterised by the two horizontal high performance fermenters (400 m³ each) with paddle stirrers. This system is unique in all of Styria. Maize, sugar beet chips and corn cob mix are mixed in the mixing pit (25m³, filled twice a day), a part of the substrate is extracted on an hourly basis and added to the horizontal fermenter. The liquid pig manure is automatically pumped from the neighbouring pigpen into the slurry store (100 m³) of the biogas plant. The liquid pig manure from the slurry store as well as the substrate from the mixing vessel is continuously added to the horizontal fermenter. A continuous removal into the two post fermenters (1,200 m³ each) also takes place which ensures that the horizontal fermenters always have the same amount of substrate for fermentation and always run at the maximum biological capacity. In this system this leads to a better decomposition of the substrate and a higher biogas yield. The substrate remains in the EUCO-fermenters for about 10 days and for further 20 days in the post fermenters at a fermentation temperature of 40 – 42°C. The post fermenters are equipped with inclined and submersible motor agitators which ensure the proper mixing of the contents in the fermenter. The produced biogas is stored in two gas holders (400 m³ each) above the two post fermenters and converted into electricity and heat using two gas engines (170 kW_{el} and 330 kW_{el}). The generated thermal energy is used to heat the own business (residential house, agricultural buildings), a further possibility for using the heat is already being planned. The electricity generated through co-generation is fed into the public grid. After the fermentation process, the “biogas manure” is open enough to be spread on the own fields as well as on areas owned by cooperating farmers (200 ha total) in a nutrient rich and minimal smell nuisance causing way. By doing this the family is able to save commercial fertilisers causing for the cycle to close itself.



Biogas Plant Ebersdorf © LEA

Alois Niederl (operator)

“A further expansion of my pig breeding and fattening business is no longer possible; the full potential has been tapped. That’s why I started looking for an economically and ecologically viable alternative for the expansion. The decision to build and operate a biogas plant was also made because of the environmental aspects. The fermented “biogas manure” can be directly spread in a nutrient rich way with minimal smell nuisance on the own fields. This leads to the reduction of the use of commercial fertiliser and for the added value to remain in the agricultural sector. I am very pleased with the nicely working system of my biogas plant that is unique in Styria.”

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Biogas Regions Shining Example



key data

Start of Operation	2004
Type of corporation.....	sole proprietorship
Amount of gas produced	approx. 6700 m³ per day
Investment costs	1 650 000 €

feedstock

Liquid manure (pig).....	5760 m³ per year
Maize silage	6480 m³ per year
Corn-cob-mix	1440 m³ per year
Sugar beet chips.....	4320 m³ per year

production data

Available area for the output of the biogas fertilizer	200 ha
Generated thermal energy	5 400 000 kWh/a
Utilisation of heat	Residential house agricultural buildings further use planned
Electric power rating of the gas engine	170kW, 330 kW
Generated electric energy.....	4 300 MWh per year
Power consumption (electricity) of the plant itself	7% of production
Annual delivery of electricity to the (regional) electric grid company	4 000 MWh per year

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Biogas Regions Shining Example



technical plant description

Clamp silo	2x7000 m³
Digester	2x400 m³
Second digester	2x1200 m³
Gas storage tank	2x400 m³
Slurry tank.....	3 600 m³
Mixing vessel.....	25 m³
Residence time in the digester	~ 30 days (10/20)
Temperature of the anaerobic digestion (operational)	40 - 42°C
Average expenditure of human labour	4 hours per day

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Biogas plant „Gosdorf“ BIO ENERGIE Lukas-Pfeiler-Tscherner GmbH & Co KG

The biogas plant owned and operated by BIO ENERGIE Lukas-Pfeiler-Tscherner GmbH & Co KG started its operation in August 2004 after a construction time of 6 months. The operators of the plant own agricultural businesses specialised on pig, chicken and vegetable production.

The plant operates in a continuous process with completely mixed digesters with a main and a post digester made of reinforced concrete, both digesters have a volume of 2500 m³ each. The fermentation substrate is made up of around 2000 m³ liquid pig manure, 1000 m³ surface water, 30 t grass silage, 2700 t maize silage, 180 t rye and 160 t sunflowers annually, which are produced in part by the plant operators but also supplied to the biogas plant by other farmers in the region. The fermentation substrate is added to the main digester using a spiral screw (auger) system. Lying paddle agitators in each digester prevent the formation of floating layers. An additional agitator which is operated using a tractor is also installed in the digesters. The liquid (liquid pig manure and surface water) is pumped into the main and post digester.




Biogas Plant Gosdorf © LEA

The biogas plant produces around 6000 m³ of biogas per day. 100% of the generated electricity is fed into the public grid; the amount needed for personal consumption and use in the agricultural businesses by the operators (residential buildings, stables and a maize drying plant) is then bought back.

Markus Lukas (one of the three CEOs)

“Operating a biogas plant is a new challenge and further offers the possibility to keep the added value in the region. This way it is also possible for many small projects and initiatives to do something against the rising amount of CO₂ emissions.”

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Biogas Regions Shining Example



key data

Start of Operation	2004
Type of corporation.....	Ltd. Company & Co KG
Amount of gas produced	6000 m³ per day
Investment costs	1 700 000 €

feedstock

Liquid manure (pig).....	2000 m³ per year
Surface Water.....	1000 m³ per year
Grass silage.....	30 tons per year
Maize silage	2700 tons per year
Rye.....	180 tons per year
Sunflowers (whole plant).....	160 tons per year

production data

Thermal power rating of the gas engine	568 kW
Generated thermal energy	2 368 MWh per year
Utilisation of heat	Residential buildings stables maize drying plant
Electric power rating of the gas engine	500 kW
Generated electric energy.....	4 000 MWh per year
Power consumption (electricity) of the plant itself	434 000 kWh per year
Annual delivery of electricity to the (regional) electric grid company	3 566 000 kWh per year

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Biogas Regions Shining Example



technical plant description

Clamp silo	10 000 m³
Digester	2500 m³
Second digester	2500 m³
Gas storage tank	900 m³ each
Slurry tank.....	350 m³
Surface water tank.....	250 m³
Residence time in the digester	~ 80 days
Temperature of the anaerobic digestion (operational)	38 -40°C
Average expenditure of human labour	5 - 6 hours per day
Liquid manure pond	8 000 m³

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Biogas plant „Hainersdorf“ Kurt Tauschmann Biogasanlagen GmbH

The Tauschmann family owns a business with about 1,100 fattening pigs in Obgrün near Hainersdorf in the political district of Fürstenfeld. After passing an agricultural business seminar they came up with the idea of constructing a biogas plant. The plant (250 kW_{el}) was started up in July 2005 after only one year of construction. The plant allows for the “dream of autonomy” to come true and for the business to supply itself with heat and electricity.

The biogas plant is operated in a continuous process with completely mixed digesters and uses the liquid pig manure from the pig fattening business (approx. 2,000 m³/a) and maize silage (approx. 5,100 t/a). The feedstock is added to the first digester using a feeder for solids. The first digester is equipped with a lying and the second digester with a standing agitator in order to avoid the formation of floating or bottom layers. Underground drains were built for the liquid pig manure (there are two slurry tanks with a total of around 1,700 m³) to prevent any smell nuisance to neighbours. The digesters (each around 2,000 m³) are covered with sheet metal panels on the outside. After a retention time of around 40 days and an average fermentation temperature of 39,5° the substrate is pumped into a repository (3,000 m³) that is equipped with a tractor agitator and stores the produced biogas in a gas retention hood (approx. 2,400 m³).



Quelle: Energieregion Oststeiermark, RMO

Biogas Plant Hainersdorf © Energieregion Oststeiermark, RMO

Around 150 m³ of biogas are produced and used to generate electricity and heat in the CHP plant. The “biogas fertilizer” is spread on an area of around 120 ha and represents a valuable and natural fertiliser for agriculture. The generated heat is used to heat the residential building, the piggery and the neighbouring houses. The electricity is fed into the public grid.

Kurt Tauschmann (operator)

“We chose to operate a biogas plant because on the one hand we have access to renewable resources and on the other hand we had a desire to become autonomous. The goal was to supply 100% of the energy needed by the business ourselves.”

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Biogas Regions Shining Example



key data

Start of Operation	2005
Type of corporation.....	Ltd. Company
Amount of gas produced	150 m³ per hour
Investment costs	1 400 000 €

feedstock

Liquid manure (pig).....	2000 m³ per year
Maize silage	100 tons per year

production data

Available area for the output of the biogas fertilizer	120 ha
Thermal power rating of the gas engine	300 kW
Generated thermal energy.....	2 500 MWh per year
Utilisation of heat	residential buildings piggery neighbouring houses
Electric power rating of the gas engine	250 kW
Generated electric energy.....	2 000 MWh per year
Annual delivery of electricity to the (regional) electric grid company	2 000 MWh per year

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Biogas Regions Shining Example



technical plant description

Clamp silo	5 000 m³
Digester	2x2 500 m³
Repository (with gas storage tank).....	3 000 m³
Gas storage tank	2 400 m³ each
Slurry tank.....	1 700 m³ total
Residence time in the digester	~ 40 days
Temperature of the anaerobic digestion (operational)	39.5°C
Average expenditure of human labour	2 hours per day

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Biogas plant „Hartberg-Habersdorf“ Biokraft Hartberg Energieproduktions GmbH

The biogas plant “Hartberg-Habersdorf” is one of 2 plants within the operating company of the Biokraft Hartberg Energieproduktions GmbH. The existing sewage plant and the produced sewage sludge as well as a system for collecting biogenous residues like organic waste and leftovers provided the basis for the development of the plant concept for the biogas plant. The resources (dairy sludge and fat) are mixed in the mixing pit (130 m³) and then pumped into the main digester (1500 m³).

The sewage sludge is directly added to the digester (approx. 27 t/d) and then pumped into the second digester (1500 m³) after a retention time of around 20 days (total retention time around 60 days). The temperature of the anaerobic digestion is 38°C (mesophilic operation), the contents of the digesters are agitated using angular agitators in order to prevent floating and bottom layers. The gas holder in the form of a “gas bag” (300 m³) is located in a separate room. The fermented substrate from the second digester is then pumped through a filter press and the liquid fraction returned to the sewage plant. The solid fraction is used as an agricultural fertiliser. The CHP (124 kW_{el}) is made up of a gas-engine. The generated electricity is used to power the power trains of the sewage plant as well as the processing plant for the biogenous residues; the rest of the electricity is fed into the public grid. The generated heat is used to heat the halls of the sewage plant Habersdorf, the processing plant and for hygienisation.

The pasteurised and processed substrates are also delivered to the other biogas plant in Hartberg – this way the expensive hygienisation unit is needed only once and bad smell nuisance is reduced. The transport containers for leftovers and organic waste can be cleaned in an automated washing plant and immediately reused.

Another special feature of this plant is the bio filter that is installed directly above the smell causing sources and filters 3500 m³ of air per hour (bark mulch and sodium hydroxide is used to neutralise the water). Another measure taken to prevent smell nuisance are the pits that operate using low pressure.



Biogas Plant Hartberg-Habersdorf © LEA

Mag. Hannes Köck (operator)

“The existing sewage plant as well as a collection system for biogenous residues like organic waste and leftovers provided the basis for the construction of the biogas plant. We developed a comprehensive concept with our project partners at Biokraft Hartberg that complies with legal regulations, optimally uses the available resources and reintroduces the nutrients into the natural cycle. Close attention was paid to the safe utilisation of the resources and ensuring a state of the art plant. This way we can generate electricity out of available residues and contribute to climate protection.”

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Biogas Regions Shining Example



key data

Start of Operation	2005
Type of corporation.....	Ltd. Company
Amount of gas produced	approx. 1032 m³ per day
Investment costs	1 800 000 €

feedstock

Fats/greases (dairy).....	1000 t per year
Dairy sludge	1460 t per year
Sewage sludge.....	10000 t per year

production data

Thermal power rating of the gas engine	190 kW
Generated thermal energy.....	1 200 MWh/a
Utilisation of heat	Hygienisation
	Digester
	Hall heating
Electric power rating of the gas engine	124 kW
Generated electric energy.....	800 MWh per year
Power consumption (electricity) of the plant itself	100 MWh/a
Annual delivery of electricity to the (regional) electric grid company	720 MWh per year

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Biogas Regions Shining Example



technical plant description

Mixing vessel	130 m³
Digester	1500 m³
Second digester	1500 m³
Gas storage tank	300 m³
Residence time in the digester	~ 60 days (20/40)
Temperature of the anaerobic digestion (operational)	38°C
Average expenditure of human labour	4 hours per day

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Biogas plant „Mureck“ Ökostrom Mureck GmbH

The idea of building a biogas plant in addition to the already existing biomass district heating plant and the bio diesel plant in Eichfeld near Mureck arose in 2001. The plant owned by the Ökostrom GmbH Mureck started its trial run in November 2004.

The biogas plant consists of the mixing pit (300 m³), the hydrolysis tank (230 m³), four liquid tanks (1000 m³ each), four digesters (1000 m³ each), the digester drain tank and two repositories (3600 m³ each).

The liquid manure, silage- and grain maize are mixed in the mixing pit and directly added to the hydrolysis tank in order to speed up the fermentation process. The fermentation substrate is subsequently pumped into the four digesters and gasified. After a retention time of around 60 days, the substrate is pumped into a digester drain tank and from there into the repositories. There are plans to separate the solid matter in the digester drain tank using a separator and sell it as a valuable fertiliser (e.g. for gardening). The by-product glycerine from the bio diesel production is added directly to the digesters. Liquid pig and cattle manure, grass silage, milled corn cobs and draff (brewer grains) are also used. The system mashes the grain maize, pastes and stores it.

The combination of the green energy plants in the region (biomass district heating, bio diesel and biogas plants) allows for an efficient use of the energy, since the CHP of the biogas plant for example is located at the biomass district heating plant which leads to the thermal energy being used in an optimal way.



Biogas Plant Mureck © LEA

The Ökostrom GmbH Mureck is made up of 7 partners that provide around one third of the resources. A further third is provided by external agreements with regional farmers and the rest of the substrate comes from the glycerine phase from the bio diesel production which has a yearly output of around 6 million litres of bio diesel.

Ing. Breitenhuber / Ing. Totter (operators)

“The motivation for the erection of the biogas plant was the goal to make Mureck an energy self-sufficient region solely using renewable resources in order to ensure a sustainable and liveable future. The farmers of the region take up a role as energy farmers giving them an additional income source next to agriculture. The location of Eichfeld combines different types of bio energy systems allowing for the energy to be used efficiently.”

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Biogas Regions Shining Example



key data

Start of Operation	2004
Type of corporation.....	Ltd. Company
Amount of gas produced	3 333 000 m³ per year
Investment costs	5 400 000 €

feedstock

Liquid manure (pig).....	6000 m³ per year
Liquid manure (cattle).....	2000 m³ per year
Glycerine phase.....	2000 m³ per year
Maize silage	3000 m³ per year
Milled corn cobs	2000 m³ per year
Draff.....	2000 m³ per year

production data

Available area for the output of the biogas fertilizer	500 ha
Thermal power rating of the gas engine	1 165 kW
Generated thermal energy.....	6 000 000 kWh/a
Utilisation of heat	Supply of the plant 80% for district heating
Electric power rating of the gas engine	999kW
Generated electric energy.....	8 000 MWh per year
Annual delivery of electricity to the (regional) electric grid company	8 000 MWh per year

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