



SYSTEMIC
Circular solutions for biowaste

Biogas Bree (Bree, Belgium)

A short introduction to Biogas Bree

Biogas Bree is Belgian biogas plant located in Bree, in the province of Limburg near the Dutch border. The region (North-East Limburg) is characterized by intensive livestock farming, mainly pigs and cattle. Like in almost all provinces in Flanders, the soil is P rich and strict national fertilization limits contribute to a

Surplus of manure in this area. The plant is operational since 2013 and has a treatment capacity 85.000 tonnes/year. 25.000 MWh of electricity is produced per year (Table 1) The heat from the CHP is used to evaporate the manure and to dry and hygienize the digestate.

Table 1. Technical information of the biogas plant

Date of construction	2013
Size (MWel)	3,6
Volume (m ³)	13.500
Digester type	Mesophilic digestion



Feedstocks

Biogas Bree receives pig slurry from pig farmers in a radius of 20 km. The manure is 30% of the total amount of feedstock yearly processed (Table 2). All animal manure is treated in a separate line without contamination with the anaerobic digestion of animal related line and the vegetable waste line.

Both are 70% of the total feedstock, and they consists of products with a high biogas potential like agricultural waste products and f.e. molasses and glycerine.

Biogas production

Due to the high quality of the feedstock, 12 Mm³ of biogas is produced every year. The biogas is converted in a CHP into electrical and thermal energy. 6% of the electricity produced is used on site and 94% is put on the grid. All heat is re-used on the plant in the evaporator (1350 kW) and the belt dryer (2700 kW).

Table 2. Origin of feedstock

Type	Mass per year
Pig slurry	27 kt
Agriculture related products	24 kt
Biowaste	
sludge WWT	
pet food (animal related)	34 kt
molasse	
glycerine	
Total	85 kt

Table 3. Yearly biogas production and average composition

Component	Estimation
CH ₄ (%)	54
CO ₂ (%)	35
H ₂ S (ppm)	50
O ₂ (%)	0
Total biogas production (Mm ³)	12
Biogas per tonne of feedstock (not manure) (m ³ /t)	200

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Current process and disposal routes for end products

Pig manure is first dewatered by evaporating the water, by and in-house designed evaporation system that has been also certified as hygienisation method. This sanitized stream is anaerobically digested producing sanitized digested manure.

In a separate digester, yearly 4,2 kt 'animal-related' digestate is produced and afterwards dried in a belt dryer to 0,8 kt.

The 'vegetable' digestate undergoes a separation with a centrifuge to remove the phosphorus from the liquid fraction.

The liquid and solid fraction are used on Biogas Bree's own lands (100 ha) or sold (negative value) to arable farmers directly or indirectly through contractors.

The air from the evaporation system and the belt-dryer is scrubbed by a combi-air washer (acid and biological) and a bio-bed, producing ammonium sulphate solution.

Table 4. Average composition of the recovered products

	Ammonium sulphate	Digested manure	Dried animal-related digestate	Vegetable digestate	
			After belt dryer	Liquid fraction after centrifuge	Solid fraction after centrifuge
Dry matter (%)		10	95	8	30
Nutrient ratios					
N	8,5	0,7	2,2	0,6	0,8
P	0	1,25	3,3	0,2	1,1
K	0	0,58	6	0,5	0,5
S	10	/	/	/	/

Future plans

The P and N content of the digestate (products) is too high to be profitable and easily marketed in the surroundings. Also the large volume of digestate and the prospect of more stringent fertilizer application limits makes Biogas Bree think about their next move to be prepared for the future.

To optimize the ammonium sulphate they created a new type of air scrubber which allows them to create an ammonium sulphate solution with 9% N and a pH of 7. This will be implemented in February 2020.



To increase the drying capacity, a fluidized bed dryer will be implemented instead of the belt dryer. This dryer is specific designed to create an end product that is dust free and granulated. Because of the higher drying capacity, it will be possible to blend their 4 liquid end products into a custom-made, dried and granulated digestate product. The fluidized bed dryer will also be implemented in February 2020.

Table 5. Estimated composition of the custom-made blend from recovered products

	Dry matter (%)	N	P	K
Expected composition of dried Blend	85	6	2	5



The last step in the future plans is to evaporate even more water from their digestates, but avoiding the production much ammonia rich air (which needs to be scrubbed) and the use of chemicals like polymers, anti-foaming agents, etc. Therefore they are developing a new type of evaporator.