SYSTEMIC
Circular solutions for biowaste

Factsheet
SYSTEMIC Outreach Location

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 (Northern 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. 28.000 MWh of electricity is produced per year (Table 1) The heat from the CHP is used to evaporate the manure and to dry 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 organic biological waste.
70% of the feedstock consists of products with a high biogas potential like agricultural waste products and f.e. molasses and glycerine.

Table 2. Origin of feedstock

Type	Mass per year
Pig slurry	25 kt
Agricultural waste	26 kt
Organic biological waste	
sludge WWT	
pet food	34 kt
molasse	
glycerine	
Total	**85 kt**

Biogas production

Due to the high quality of the feedstock, 12 Mm^3 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 (2500 kW) and the belt dryer (2300 kW).

Table 3. Yearly biogas production and average composition

Component	Estimation
CH_4 (%)	58
CO_2(%)	35
H_2S (ppm)	50
O_2 (%)	0
Total biogas production (Mm^3)	12
Biogas per tonne of feedstock (not manure) (m^3/t)	200

BioGas-Bree
Horizon 2020

*The H2020 EU-project SYSTEMIC (**Sy**stemic large **s**cale eco-innova**t**ion to advance circular **e**conomy and **mi**neral re**c**overy from organic waste in Europe) receives funding from the European Union's Horizon 2020 Framework Programme for Research and Innovation under Grant Agreement no. 730400*

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Current process and disposal routes for end products

Pig manure is first dewatered by evaporating the water(in-house design) and is anaerobically digested in a separate digester. Yearly 4,2 kt 'animal' digestate is dried in a belt dryer to 1,5-2 kt.
The organic biological waste is digested in 3 connected digesters. The 'vegetal' digestate (43.000 tonnes/year) undergoes a separation with a centrifuge to remove the phosphorus from the liquid fraction (37.000 tonnes/year).
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.

Table 4. Average composition of the recovered products and estimiated separation efficiency

	Animal digestate			Vegetal digestate		
	Before drying	After drying		Before separation	Liquid fraction	Solid fraction
Mass (kt)	4,2	1,5-2		43	37	6
Dry matter (%)		92	DM separation efficiency (%)			80-85
N-total g/kg		20	N separation efficiency (%)		80-90	10-20
P_2O_5-total g/kg		35	P_2O_5 separation efficiency (%)		60	40
K_2O-total g/kg		43	K_2O separation efficiency (%)		90-95	5-10

Current drivers for interest in Nutrient Recovery and Reuse (NRR) Technologies

The P and N content of the digestate (products) is too high for profitable and easy marketing in the surroundings. Also the large volume of digestate (43 kt per year) and the prospect of more stringent fertilizer application limits makes Biogas Bree think about their next move to be prepared for the future.

Current problems and obstacles

The OBW feedstock with high biogas potential renders the digestate very sticky and viscous. This contributes to a suboptimal separation of the digestate by the centrifuge (only 40% P-removal to the solid fraction) at a high cost due to polymer use and maintenance.
Biogas Bree would like to find a solution that includes optimizing their current separation technique with as little chemicals and polymers as possible.

Centrifuge: Pieralisi Jumbo 2

To lower the ammonia content of the liquid fraction of the digestate, Biogas Bree sees potential in an ammonia stripping/scrubbing technology with biogas as a stripping gas.

The question remains if an evaporation step should be included somewhere in the process to also lower the volume and concentrate potassium.

Biogas Bree finds all current innovative (NRR)techniques too expensive or not technically stable enough to consider investment yet.

They hope SYSTEMIC can provide guidance and support in solving these problems.

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