



SYSTEMIC
Circular solutions for biowaste

Factsheet
SYSTEMIC Outreach Location

GMB BioEnergie (Lichtenvoorde, The Netherlands)

A short introduction to GMB

GMB is a company supplying services in design & construction, management & maintenance and operation. One of the six clusters of their organizational structure is GMB BioEnergy, which includes their biogas plant in Lichtenvoorde, named BIR BV.

BIR BV is a joint venture between Waterstromen BV and GMB BioEnergy BV.

Feedstocks

Waste streams from chemical, pharmaceutical and food industry are used as feedstock (75%), also waste streams from the catering industry are digested (25%) (Table 2).



Table 1. Technical information of the biogas plant

Date of construction	2004
Size (MWeI)	1,2
Volume (m ³)	1600
Digester type	Mesophilic digestion

Biogas production

The anaerobic digestion process produces yearly over 4 Mm³ of biogas which is valorised in a CHP to electricity and heat.

The electricity is used on the waste water treatment site (next to the biogas plant) and 78% goes to the grid.

Heat from the CHP is used to heat up the waste water for optimal biological treatment and to pre-heat the feedstocks and keep the digesters on temperature. The rest of the heat (app. 21%) goes through an underground pipeline to the public swimming pool of Lichtenvoorde and plans are made to make the heat also available for other public buildings.

Table 2. Origin of feedstock

Type	Mass per year
Food waste from catering industry	12 kt
Waste streams from chemical, pharmaceutical of food industry	28 kt
Total	40 kt

Table 3. Yearly biogas production and average composition

Component	Estimation
CH ₄ (%)	67
CO ₂ (%)	33
H ₂ S (ppm)	250
O ₂ (%)	0,2
Total biogas production (Mm ³)	4
Biogas per tonne of feedstock (m ³ /t)	100



Current process and disposal routes for end products

GMB trucks unload the waste streams and manure in 1 of the 4 available buffers. The feedstock is then pumped to the 2 digesters. During a residence time of 20 days, part of the organic components is converted to biogas. The digestate transported to GMB Zutphen where it is further processed. There, the digestate is separated together with sludge from WWT (industrial and communal) in a decanter centrifuge.

The liquid fraction is processed in the WWTP of Waterschap Rijn en IJssel (located next to the site of GMB in Zutphen).

The solid fraction, together with sludge from several other communal WWTP's is composted in enclosed tunnels under carefully controlled conditions. The heat from biological processes is used these to heat up the newly filled tunnels and for hygienisation. After 25 days of biological drying, the compost is sieved. The dry compost has a granular form and can be used as biofuel in f.e. power plants. In countries where this is possible in terms of legislation, bio-granulate is also used as a nutrient rich fertilizer.

The air with which the compost is aerated still contains a lot of ammonia and is therefore cleaned with an air scrubber by adding sulfuric acid. This sulfuric acid binds the ammoniacal nitrogen, resulting in ammonium sulphate. A nitrogenous sulfur fertilizer that is officially recognized and traded as such.

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

		Mass (kton/year)	Dry matter (%)	N- total (g/kg)	P-total (g/kg)	K ₂ O-total (g/kg)	
D i g e s t a t e	Raw digestate	40	5,8				
	+ s l u d g e	Digestate + sludge	250	4,5			
		Solid fraction after centrifuge	20	20-24	28	18	6
		Biogranulate	13	65	27	23	7
		Liquid fraction after centrifuge	190	0,4			
		AmmS-solution	1,1		80	-	-
	Dischargeable water	190	0,1				

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

The dried digestate from sewage sludge contains a lot of nutrients and organic matter but also heavy metals, pharmaceuticals, hormonally active substances, persistent organic pollutants, etc. The partition of these substances in digestate or composting products are not yet clear and the risks and effects when these products will be applied are unknown.

Dutch and European (waste) legislation and risk perception of customers and consumers prevents us from closing the nutrient cycles.

Therefore GMB is interested in technology which could deliver products with clearly defined properties regarding environmental and health impact and risks and that could be sold on the European market.