



# Energy plants with G2G solution or special heat concept

REFERENCE PLANTS



Organic energy worldwide

## Worldwide references

Since 2001, WELTEC BIOPOWER has designed and implemented more than 300 biogas plants, whereof about 20 plants are located in UK. In more than 25 countries, WELTEC plants deliver energy from organic substances.

Excerpt from the reference list of our international projects:

Aurora | Australia | 1 MW

Food, brewery and dairy leftovers, fats and oils, fruit + vegetable waste, sludge  
The heat is used to heat the facilities of a sewage treatment plant and the AD site.

Durazno | Uruguay | 6.2 MW

Cow slurry, fodder leavings  
The whole biogas produced is used in biogas boiler to produce heat for a milk powder production.

Ottonville | France | 190kW

Food waste, cow manure and slurry, whole crop silage, cereal dust, sewage sludge  
The heat is used to heat buildings on-site.

Erd | Hungary | 500kW

Sewage sludge  
The heat is used at the wastewater treatment plant.

Suring | USA | 250kW

Cow slurry, mixed fats  
Due to low temperatures in Wisconsin the heat is mainly used for own processes.

Cypra | Cyprus | 1.8 MW

Abattoir waste, food leftovers, fish leftovers, pig slurry  
The heat is used for drying wood.

Vechta | Germany | 770kW

Maize silage, cereals, straw, cow and pig slurry  
The heat produced by the CHP units is used to heat a hotel, an industrial site, stables and to dry wood.

Cullompton | England | 500kW

Pig and cow slurry, maize silage, sugar beets, chicken manure, grass silage  
The agricultural site with different buildings is using the heat produced.

**Durazno, Uruguay**  
6.2 MW



**Vechta, Germany**  
770 kW



Flexible stainless-steel  
energy plants:  
As individual as you!

▶ Long plant life

▶ Permanently high yield

▶ Individual planning

▶ Flexible, modular structure

▶ Cutting edge technology

▶ Variable raw material input

▶ 24/7 service

Modern AD plants from WELTEC BIOPOWER produce green energy from diverse organic materials. Customised solutions are the strength of WELTEC BIOPOWER: The engineering expertise is reflected both in the technical plant design and in the substrate mix. In this way, flexible concepts can be developed for every customer.

The digesters of WELTEC BIOPOWER are made of stainless steel. This high-quality material ensures a long plant life. At the same time, the building costs are minimised by means of the smart modular setting. This quality standard also applies to the production. Most of the plant and control modules are self-developed and tuned to each other.

Upon completion of the plant, the biological and mechanical service team of WELTEC BIOPOWER continues to provide the customer with competent support. This is a key factor that ensures the profitability of the energy plant.

Every WELTEC plant is as individual as the operator. But in one area, all plants are equal: Day by day, they deliver top performance!



# Biogas upgrading with membrane technology

## Easy and flexible gas processing

In the first stage of the biogas processing, the biogas is pre-dried, scrubbed and desulphurised with active carbon. Before the actual gas separation process takes place, the gas must be compressed to 8-15 bar. Subsequently, the CO<sub>2</sub> and water vapour are separated from the methane. Special polymer membranes through which the raw gas is forced have been developed for this process stage. The membranes are able to separate the CO<sub>2</sub>, H<sub>2</sub>O and

CH<sub>4</sub> molecules due to their different sizes and solution behaviours. For instance, CO<sub>2</sub> molecules are smaller than methane and pass through the micro-pores of the membranes faster than methane. The three-stage separation of WELTEC BIOPOWER can reduce the methane slip to less than 0.5 percent.



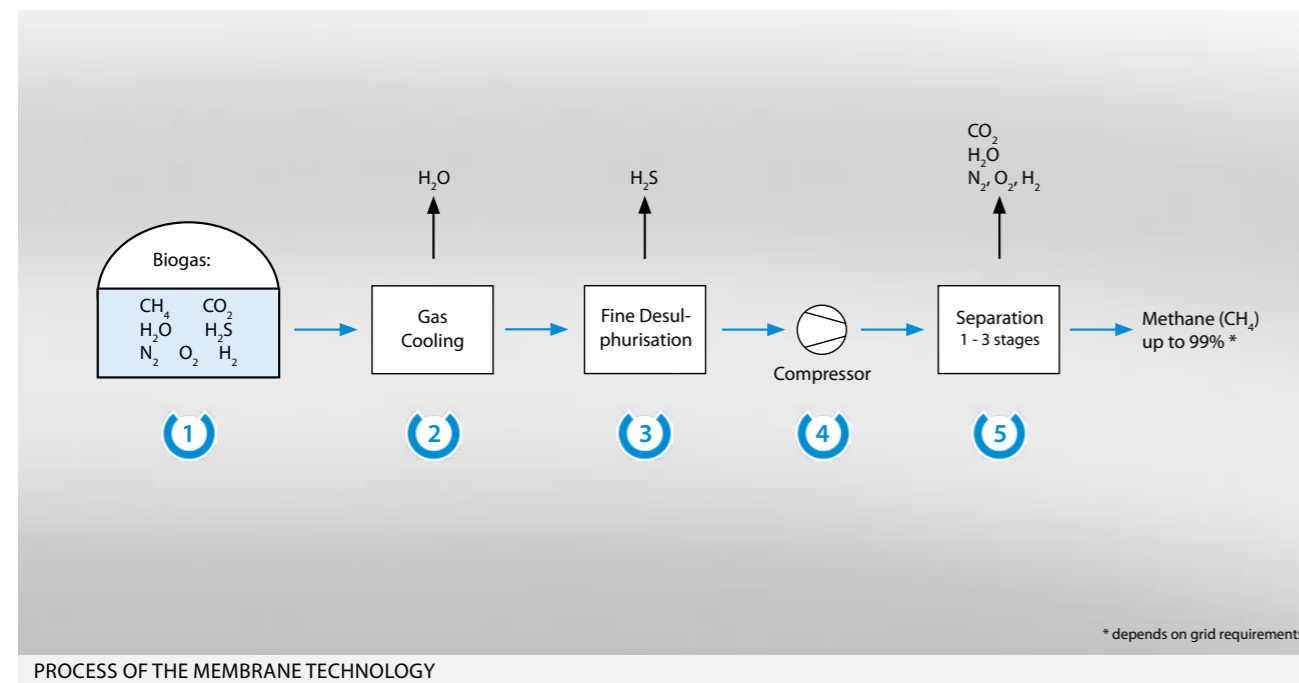
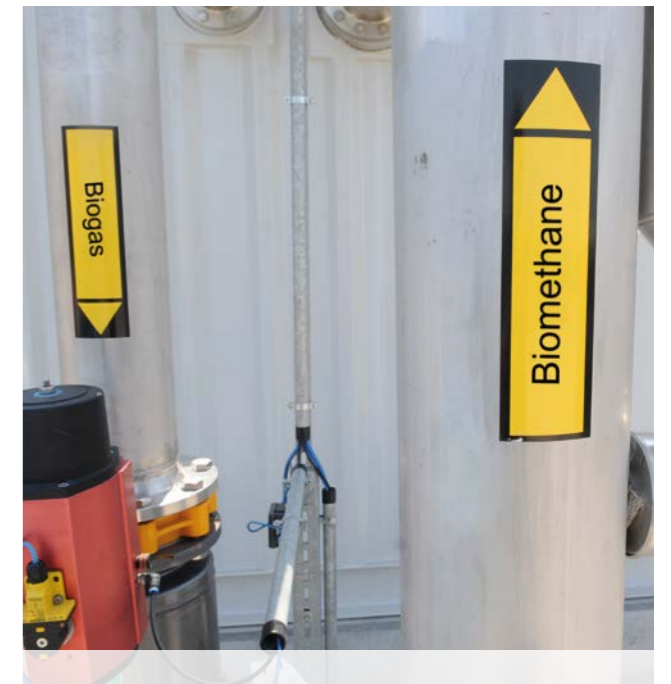
MEMBRANE TECHNOLOGY

MEMBRANE CARTRIDGES

## Benefits

- Methane yield of up to 99 percent through multi-stage procedure
- Intelligent control ensures uninterrupted gas feed-in
- Extremely high plant availability & low maintenance overhead thanks to durable membranes
- Easy to operate
- Modular structure enables extensions
- Quick installation thanks to compact container setup
- Separation of the molecules without any additional aids such as chemicals or water
- Separation without any further need for heat
- No downstream dryer required
- Feed-in into the natural gas grid possible without additional compressor

These benefits mean low plant and operating costs for you!



PROCESS OF THE MEMBRANE TECHNOLOGY



THE TECHNOLOGY FITS IN ONE CONTAINER



# Plant for organic wastes

## Gilfresh Produce in Loughgall (NI)

### Project data

Start of construction: January 2015  
 Commissioning: October 2015  
 Input materials: Vegetable waste from processing factory and packaging unit  
 Cattle slurry  
 Vegetable wash water  
 Small amounts of whole crop, maize & grass silage

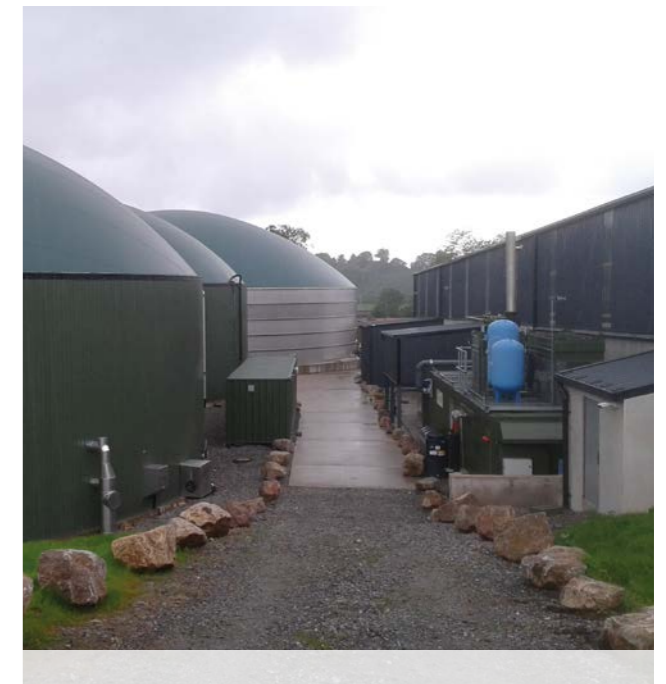
### Technical data

Input technology: 80m<sup>3</sup> dosing feeder  
**MULTIMix**  
 Pre-storage: Underground liquid wastes reception tanks  
 Digester: 2x 2,625m<sup>3</sup>  
 (Ø 23.03m, H 6.30m)  
 Storage tank: 5,908m<sup>3</sup> (Ø 34.55m, H 6.30m)  
 CHP: 2x 500kW<sub>el</sub> (2015 & 2017)  
 total output 900 kW<sub>el</sub>

### Characteristics

The plant belongs to a long-established vegetable growing, packaging and distribution company. Vegetable wastes from the washing, sorting and packaging are topped up with chicken litter, cattle slurry, grass silage and small tonnages of hybrid rye and maize. Electricity is utilised in the vegetable processing and packaging factory next door, meaning the business can utilise its own wastes to insulate itself from increasing energy costs. Excellent quality digestate is used to grow more vegetables, saving money (and carbon) by reducing the use of artificial inorganic fertilisers.

In early 2017 a second 500kW<sub>el</sub> CHP was added, and the feedstock mix and feeding schedule was changed. The second CHP provides electricity and heat to a nearby greenhouse business. This enables the local production and year-round supply of vegetable products usually imported from warmer climates.



VEGETABLE WASTE



GRASS SILAGE



DOUBLE PROPELLER MIXER



# Biomethane plant Longchamps in Andelnans (France)

## Project data

Commissioning: Summer 2015  
 Input materials: Cow manure, energy plants, pig slurry, leftovers

## Technical data

Entry system: 30m<sup>3</sup> dosing feeder  
 Digester: 1,543m<sup>3</sup> (Ø 17.66m, H 6.30m)  
 Storage tank: 3,300m<sup>3</sup>

Produktion of raw biogas: approx. 150 Nm<sup>3</sup>/h  
 processed biomethane: 85Nm<sup>3</sup>/h  
 Methane content (CH<sub>4</sub>): >99%  
 Kind of processing: Membrane technology  
 Heat supply: Biogas boiler plant for digester heating and natural gas boiler for sanitation  
 Miscellaneous: Separation, sanitation, LoMOS PLC system

## Characteristics

The operator has opted for a flexible membrane processing technique. The technology is compactly installed in a container, which saves time and money in the assembly. In addition, the molecules are separated at room temperature and without the addition of chemicals. The WELTEC membrane procedure is highly efficient and delivers a methane yield of about 99 percent.

The upstream compression is another advantage of the procedure. In this way, the separated methane already has the needed pressure for feed-in to the natural gas grid without being compressed again. This saves costs by eliminating the need for an additional compressor and enables economic use of WELTEC biogas processing even for smaller plants.

To optimise the plant synchronisation, WELTEC integrated the custom-developed LoMOS SPS control. One of the special features of this system is an SQL database-based task management.



# Biomethane plant Nordmethan in Könnern (Germany)

## Project data

Commissioning: September 2009  
 Input materials: Maize silage, sugar beet cuttings cereals, whole crop silage chicken dry manure

## Technical data

Pre-storage tank: 4x 500m<sup>3</sup>  
 Digester: 16x 3,500m<sup>3</sup>  
 Second stage digester: 4x 3,500m<sup>3</sup>  
 Storage tank: 16x 4,600m<sup>3</sup>

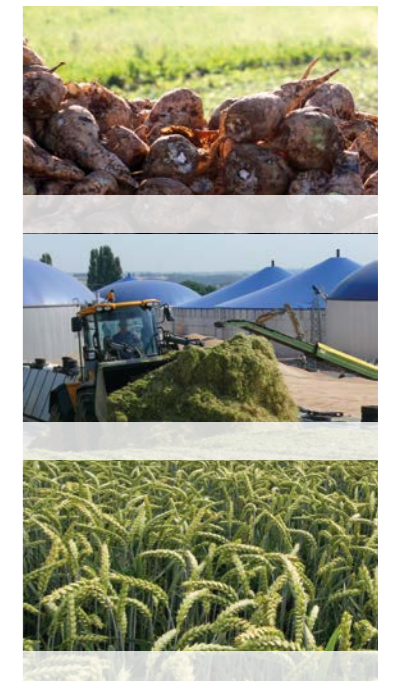
Produktion of raw biogas: 3,300Nm<sup>3</sup>/h  
 processed biomethane: 1,750Nm<sup>3</sup>/h  
 Methane content (CH<sub>4</sub>): >99%  
 Kind of processing: Amine gas treating  
 Plant room: 4 buildings with separation, control system, substrate-, water- & heat distribution, gas compressor  
 Heat supply: Boiler plant (natural and biogas) + wood pellet stoves

## Characteristics

The biomethane park in Könnern is one of the world's largest facilities of its kind. The capacity of this system corresponds to a electrical capacity of 8 MW. The entire design and construction process, including approval procedures, earthworks and civil engineering, infrastructure, silo and drainage was performed or directed by WELTEC BIOPOWER.

The biogas produced is upgraded with amine gas treating. Afterwards the biomethane is feed-in into the public natural gas grid, so the biomethane is available throughout Germany.

A part of the biomethane is used for heat contracting at residential areas, greenhouse complexes and industrial sites.





# Plant for organic wastes with gas processing Jeppo Biogas in Jeppo (Finland)

## Project data

Commissioning: November 2013  
Input materials: 52.000t slurry  
7.000t potato peels and vegetable waste  
5.000t fresh and old grass  
3.500t waste water  
2.500t straw

## Technical data

Input technology: 60m<sup>3</sup> dosing feeder  
**MULTIMix**  
Digester: 3x 4,000m<sup>3</sup>  
CHP: 750kW<sub>el</sub>  
Miscellaneous: Sanitation  
Separation  
Gas processing

## Characteristics

The pig slurry is pumped out of a total of three stables over several kilometers of pipelines to the biogas plant. The use of fibrous substrates such as straw and grass is made possible by the use of the **MULTIMix**.

The biogas is partially converted in the CHP to electricity and heat. The other part of the biogas is processed to bio-methane by water scrubbing process.

The gas is compressed in gas bottles, a mobile gas tank and also used the own gas station.



GAS STATION



BIOGAS PROCESSING



MULTIMIX



GAS BOTTLES



FEEDSTOCK DELIVERY





## Plant for agricultural products McCulla in Lisburn (Northern Ireland)

### Project data

Commissioning: December 2016  
 Input materials: Cow slurry  
 grass silage  
 hackled potatoe  
 dry chicken manure  
 permeate whey

### Technical data

Input technology: 80m<sup>3</sup> dosing feeder  
**MULTIMix**  
 Pre-storage: Underground pits  
 Digester: 2x 2,625m<sup>3</sup>  
 (Ø 23.03m, H 6.30m)  
 Storage tank: 3,432m<sup>3</sup>  
 (Ø 26.38m, H 6.30m)  
 CHP: 500kW<sub>el</sub>

### Characteristics

The owner and operator of the AD plant has not only a farm, but also a company for refrigerated transports. Therefore they are currently considering the option of gas upgrading to vehicle fuel for their own trucks.

Right now the electricity is used at site for the cold store unit. The excess heat is used to heat the office units.

The WELTEC **MULTIMix** ensures the optimal maceration of manure and fibrous silage, and enhances digestion and reduce wear and tear as well as energy use within the digester.



MULTIMIX



## Plant for organic wastes Eco Sustainable in Piddlehinton (England)

### Project data

Commissioning: May 2012  
 Extension in Autumn 2014  
 Input materials: 30,000t incl. commercial  
 and industrial food wastes  
 from restaurants and  
 canteens as well as out of  
 date packaged food  
 materials from the retail  
 and supermarket industries

### Technical data

Pre-storage tank: 2x 342m<sup>3</sup> (Ø 9,31m, H 5,03m)  
 Digester: 2.496m<sup>3</sup> (Ø 22,50m, H 6,30m)  
 2.625m<sup>3</sup> (Ø 23,03m, H 6,30m)  
 Storage tank: 7.081m<sup>3</sup> (Ø 34,54m, H 7,55m)  
 CHP: 2x 250kW<sub>el</sub>  
 2x 550kW<sub>el</sub>  
 Miscellaneous: De-packaging unit  
 Pasteurisation  
 Separation

### Characteristics

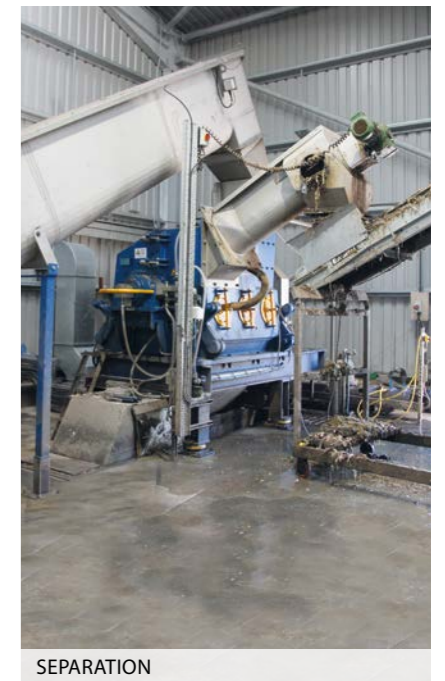
The plant was built in the first step for 20,000t of feedstock per year and an electrical output of 500kW. Two tanks, gas-mix agitators, a separation and two more CHP units were installed with the expansion in 2014.

The heat generated is transported through an underground pipeline to a neighboring feed mill. Most of the electricity produced is also used by the mill. Excess electricity is fed directly to the national grid.

The digestate with PAS 110 accreditation is used by local farmers as fertiliser.



RECEPTION BUNKER



SEPARATION



# Biomethane plant

## Nordmethan in Barsikow (Germany)

### Project data

Commissioning: September 2011  
Input materials approx. 40,000t solid substrates  
(Maize silage, whole plant silage, grass silage, chicken dry manure)  
approx. 10,000t liquid substrates  
(Rainwater, silo water, slurry)

### Technical data

Digester: 3x 3,500m<sup>3</sup>  
Second stage digester: 1x 3,500m<sup>3</sup>  
Storage tank: 3x 4,600m<sup>3</sup>  
Produktion of raw biogas: approx. 1,300Nm<sup>3</sup>/h  
(thereof 1,000Nm<sup>3</sup>/h for the processing and the rest for the micro gas turbines)  
processed biomethane: 550Nm<sup>3</sup>/h  
Methane content (CH<sub>4</sub>): >99%  
Kind of processing: Amin gas treating  
Heat supply: Micro gas turbines (3x200kW<sub>el.</sub>)

### Characteristics

The biomethane park in Barsikow was planned and built by WELTEC BIOPOWER as well as brought through the approval process. The refinery is operated by the WELTEC subsidiary called Nordmethan.

Three micro gas turbines produce enough heat with a high temperature to heat the amine wash process. The electricity produced is feed into the public grid.

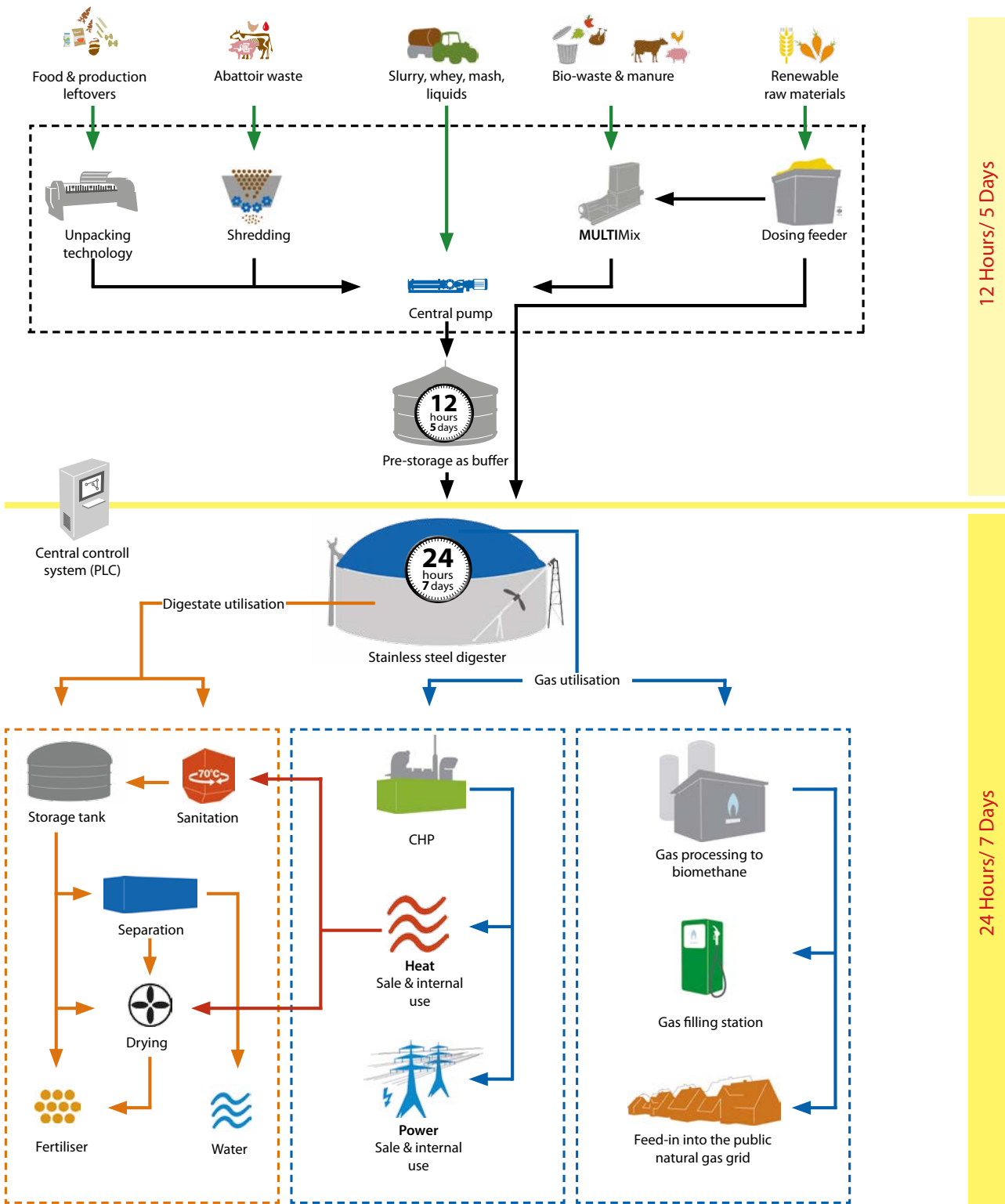
The amine wash discharge temperature is sufficient to heat the digesters.

The biomethane is feed into the public natural gas grid.





# Biogas production and utilisation process



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