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Anaerobic waste recycling with the FITEC system





„Making value of Waste“ – the fermentation of different waste materials and residues becomes more and more important. Waste tipping fees are increasing; disposal options and storage places are becoming rare. In addition alternative ways of producing energy have to be found. Why not kill two birds with one stone and use organic waste to generate electricity and heat?

Finsterwalder Umwelttechnik GmbH & Co. KG has designed and consulted biogas plants of different sizes and input materials for 13 years and has run our own plant for 11 years. With these long-time experiences we know what kind of technologies are needed for the treatment of contaminant-rich wastes to create a smooth waste-to-energy process.



Biogas plant Langage Farm, UK – Plymouth:
12,000 t/y food waste, 3,000 t/y manure

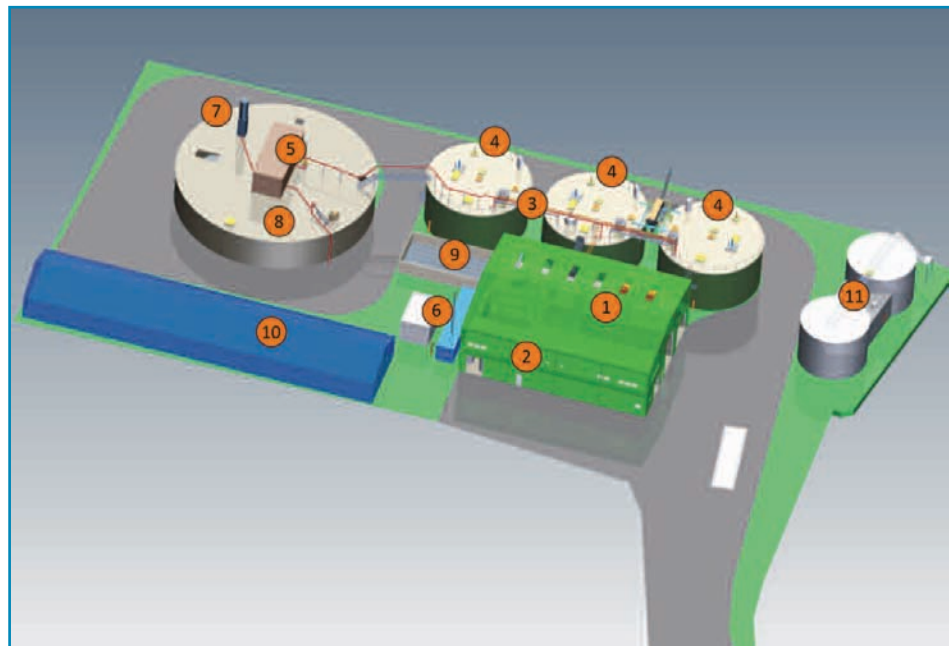
We realize projects in Germany and abroad by cooperating with local and international partners.

We offer the complete design of your plant with typical capacities of 10,000 - 100,000 t/y. In this plant we also equip our unique components and machinery for waste treatment and contaminant separation and deliver individually designed control software.

With our special simulation software BioTip we are able to assess the development of the biochemical parameters in the digesters up to 180 days in advance. Thereby we can identify negative influences on the gas yield and the process stability at an early stage.

The FITEC biogas plant

The graphic shows a typical plant for continuous wet fermentation:



- ① Receiving and Pre-treatment Hall with double door airlock system
- ② Administration and Visitors Area
- ③ Pasteurisation and Feeding Pipeline
- ④ Digesters
- ⑤ Gas Storage
- ⑥ CHP and Transformer
- ⑦ Flare
- ⑧ Digestate Storage
- ⑨ Biofilter
- ⑩ Solar Dryer
- ⑪ Process Water Treatment Plant (SBR)

All single components are matched modularly. Therefore existing plants can be enlarged easily.

Usable fermentation substrates are

- Food waste
- Bio-waste from source separated organics collection (SSOs)
- Expired food from supermarkets
- Residues from the food industry
- Separated organic fraction of municipal waste with contaminations less than 20% of weight
- All farm waste like manure



shredding and separation



floor scraper



Process description

All waste materials are collected in a **receiving bunker**. Packed food waste does NOT have to be unpacked or pretreated. The material is dropped into a **shredding unit** e.g. a Querstromzersetzer or a hammer mill by a crane and then divided into an organic and an inorganic fraction by a patented press system.

The organic fraction is **pasteurized** and afterwards **fermented** in the **mesophilic** digesters while the separated contaminants like plastic, cullet and bone pieces are discharged.

The resulting biogas is used in a **CHP** to generate electricity and heat.

To assure a long-term use of the digesters, it is necessary to remove unavoidable remaining contaminants from the digesters.

Sedimenting materials like sand, bone fragments, clam and egg shells are periodically pushed into a bottom outlet by a **floor scraper**. Analog floating materials like plastic foils, styrofoam and cork are sucked off by a **skimmer**.

The digestate can be used as agricultural fertilizer or – after an appropriate **post treatment** – as compost.

Input – Output

The success of a plant is fundamentally based on a previous close analysis of the substrates that should be digested. At first the amount and kind of contamination is determined in a waste audit. The characteristics of the organic fraction are defined by feed analysis and fermentation tests. Afterwards detailed information about the waste composition, contamination content and possible biogas yield are known for the dimensioning of the plant. We are pleased to arrange the implementation of this analysis for you.

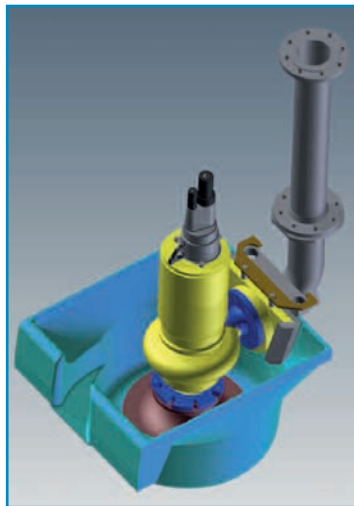
Example: Depending on substrate and contaminant content, about 165 Nm³ biogas can be generated out of one ton of food waste. That means an electrical power of ca. 16 kW and a thermal output of ca. 20 kW.

	Input	Output
material	Food waste Bio-waste (SSOs) Packed groceries	digestate
Total solid content	20-35%	5-9%
contaminants	up to 35% of total solid content	none
usage	anaerobic mesophilic wet fermentation to methane, carbon dioxide and water	Agricultural fertilizer, compost

The FITEC components

Double-tube pasteurizer

- System of double-tube heat exchanger and storage tanks
- Double tube pasteurizer: „just in time“
- Fulfills the requirements of the EG regulation Nr. 1069/2009
- modular extendable and easy to clean

Scum discharge system

- System of swirl tank, lowering device and scum discharge pump
- removes floating materials like plastic foils, styrofoam and cork of the digester continuously
- Contaminants are sucked from the surface
- Transportation to an external sieving machine
- Self-regulating, gasproof system
- Post-implementation in existing digester possible

Grit discharge system

- System of Floor Scraper, pump and grit separator
- active protection from sedimentation
- mechanical discharge of sinking materials like sand, bone fragments and shell pieces to a drain in the digester
- Grit is transported to an external gravity separator
- Floor Scraper and pump SPS-controlled
- For digesters with diameters up to 18 meters
- Requires: solid digester ceiling, no middle column

The FITEC components

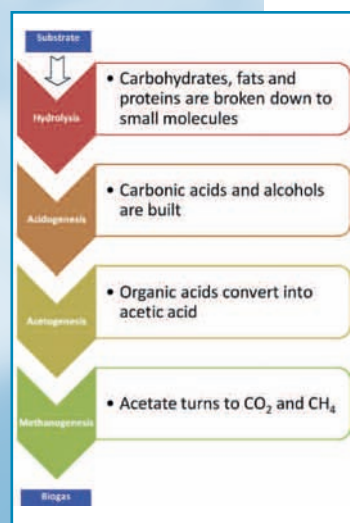
Post treatment of the digestate



- Separation of the centrate water
- Energy saving treatment of the centrate water in a SBR plant for nitrogen elimination
- Processing possible up to indirect discharge quality
- Drying of the solid digestate

Basics

Basics of anaerobic fermentation



Under oxygen free conditions the organic parts of the waste like fats, carbohydrates and proteins are converted to biogas by several interlocking bacterial processes.

In the first step the longer molecules are degraded to single components like sugars, amino acids and fatty acids.

From these components carbonic acids and alcohols are built and degraded to acetic acid, hydrogen and carbon dioxide in a further step.

The acetate and the hydrogen convert to biogas in the last, very sensitive step.

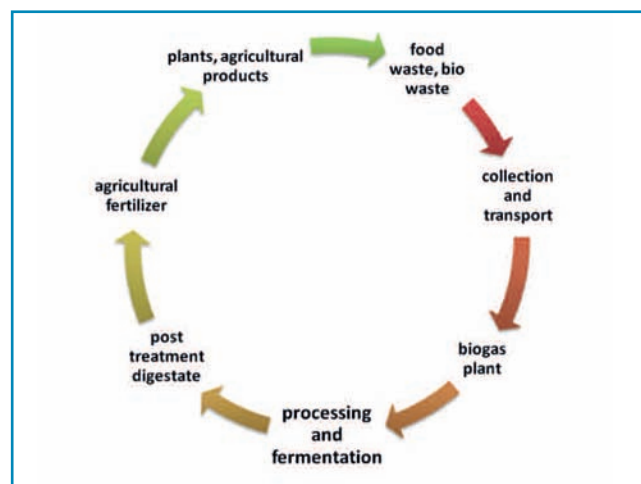
Biogas is a mixture of methane (CH_4), carbon dioxide (CO_2) and trace gases like hydrogen sulfide (H_2S) and ammonia (NH_3). It is produced from the metabolism of short chain organic acids by methanogenic bacteria. The methane content and the generated quantity of biogas correspond with the composition of the input material.

Summary

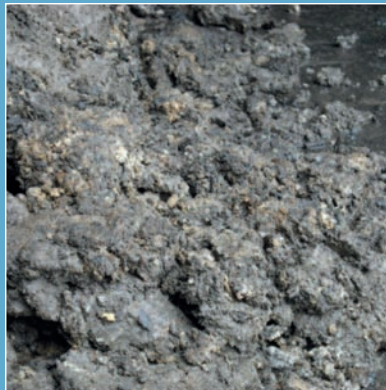
At one glance



- **Recycling of organic waste**
Unused organic residues are used reasonably
- **Energy generation from organic biomass**
Electricity and heat are generated from alternative resources
- **Recovery of organic fertilizer**
- **No hand-sorting waste separation**
Integrated into processing technology
- **Self-sufficient power supply for the plant**
- **CO₂ saving.** *Contribution to reduce greenhouse gases – up to 7,000 t saved per year at a 60,000 t/y plant*



- **Modular plant concept**
Individual design tailored to your needs, capacity starting at 10,000 t/y
- **long-lasting technology**
Special technology to avoid abrasion and silting
- **Closed cycle of matter**
re-use of nitrogen rich digestate as agricultural fertilizer



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