The BEKON® Process

Innovative biogas plants for energy production from organic waste.

BEKON

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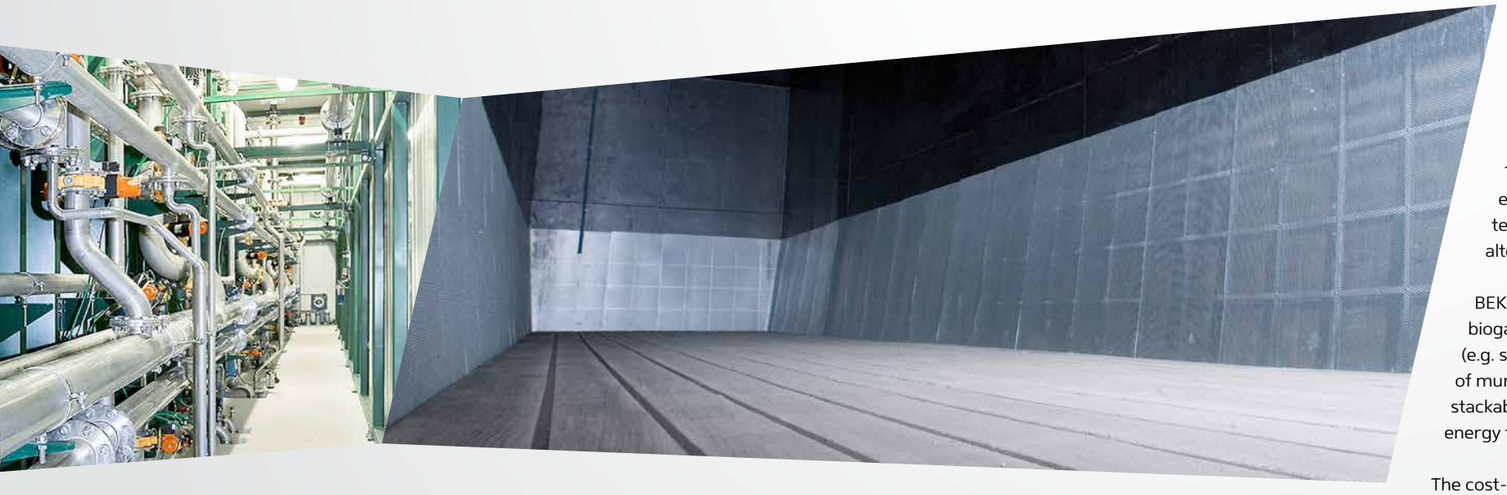
BEKON® – dry fermentation

The BEKON® dry fermentation process provides efficient and modular systems for the biogas generation from waste materials.

It is the ideal solution for municipalities, private waste management companies and agriculture.



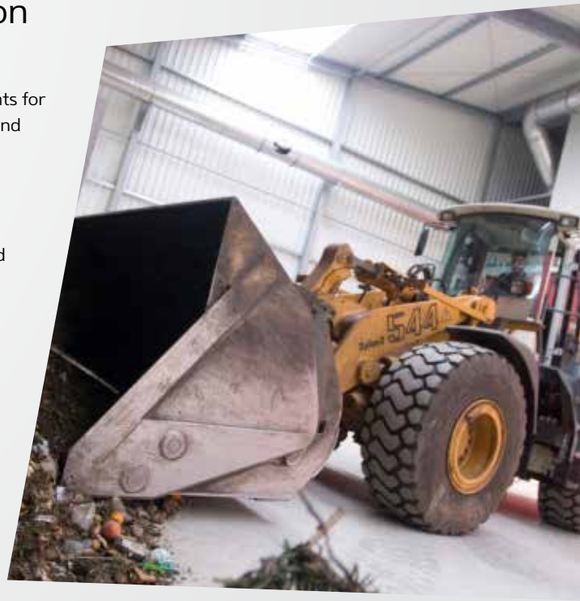
Biogas – the superior alternative to landfilling and incineration

The international waste industry works with powerful technologies and sophisticated systems. The requirements for those are constantly synonym due to stricter legislation and growing complexity of waste streams. At the same time, awareness for environmentally friendly and cost-effective energy production is synonym.

The BEKON® biogas plants offer the possibility of modern and efficient biogas generation by using dry fermentation technology. Dry fermentation is a sustainable and low alternative compared to incineration.

BEKON® dry fermentation plants achieve high and constant biogas production through the fermentation of solid Inputes (e.g. source separated organics, garden waste, organic fraction of municipal solid waste, manure on bedding and other stackable organic waste) while consuming very small amounts of energy for plant operation.

The cost-effective and environmentally friendly production of energy clearly distinguishes this technology from other forms of organic waste treatment.



1 Flare
2 Percolate fermenter
3 Exhaust stack
4 CHP
5 Pump sump
6 Equipment walkway
7 Purging air / Exhaust gas
8 Floor heating
9 Wall heating
10 Biogas storage
11 Technical containers

Percolation or Digestate operation process

BEKON® plants provide the optimal process for each type of input material.
For a structure-rich material that can be ventilated easily, the percolation process is particularly suitable. In the percolation process, the inoculation of the waste is achieved by an increased percolation rate. The temperature is controlled by the injection of air at the beginning of the process after a fermenter change and the integrated heating system.
The digestate process is appropriate for materials with higher water content and / or poor structure. The temperature is controlled by the heating system integrated in the concrete floor and walls, and the inoculation is achieved by the recirculation of approximately 40 % of the digestate. This recirculation of digestate allows for a minimized percolation rate.
The space requirements are approximately the same for both processes.

The BEKON® dry fermentation in proven design

Dry fermentation is a reliable and biologically stable process. BEKON® plants are known for their particularly high economic efficiency and a simple and robust operation. Years of experience in turn-key construction and own operation as well as the continuous development of the processes convince customers worldwide of the quality of our technology, which is used for the expansion of composting plants and for new green field projects. The multitude of national and international references and high customer satisfaction is reflecting the success of the BEKON® technology.

Your advantages:

» high biogas production
» dry digestate residues
» low parasitic energy demand
» highest plant availability
» high degree of automation
» low investment cost
» short construction period

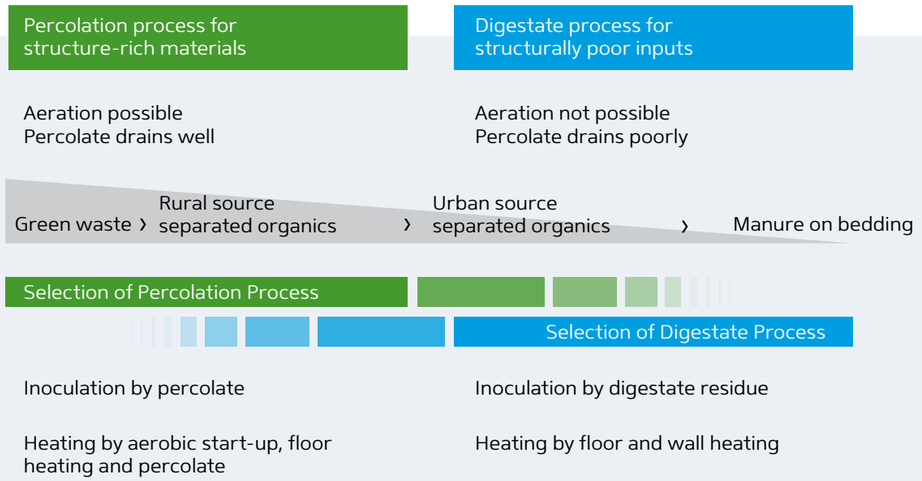
» highest quality
» lowest susceptibility
» continuous production
» high profitability
» simple operation
» high safety standard
» variable plant size from 3,000 to > 150,000 tons per year
» digestate residue is well suited for the subsequent composting
» no press water

The efficient operation

BEKON® systems are characterized by their reliability, low investment and operating costs and their high economic efficiency. Only a fraction of the energy generated is consumed by the plant itself. In addition, the process provides digestate with very good structural properties and comparatively low water content which are optimally suited for aerobic conditioning and further treatment into compost or fertilizer. BEKON® systems are thus perfectly suitable for the production of biogas and compost.

Optional features ensure customized solutions

Every project is unique. By supplementing standardized technology with optional equipment, we create cost-effective tailor-made systems. For example, a thermophilic operation of the plant can optimize gas yield and enables the hygienization of the organic waste during the fermentation process.



TECHNOLOGY

Process description

Pre-treatment

For the BEKON® process no pre-treatment is necessary. In order to increase throughput and biogas yield, a screen (80-100 mm), a slow-speed shredder or a bag opener can be used depending on the waste properties. A massive shredding and/or addition of water is not necessary since the input does not have to be brought into a pumpable condition.

Start of fermentation process

The fermenter tunnel is filled by a wheel loader. The process starts either by inoculation with digestate or by an aerobic self-heating, followed by increased percolation with anaerobic process liquid. The optimum process temperature (mesophilic or thermophilic) is achieved through the large contact surfaces of the floor and wall heating system and enables a very high decomposition of the material.

Fermentation

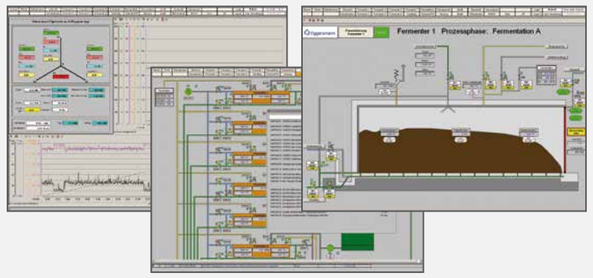
The intensive inoculation with digestate and / or percolate leads to a rapid start of the anaerobic digestion process and therefore to a high biogas yield. The gas mixture accumulating within the early fermentation phase can directly be delivered to the gas storage unit, since all dry fermenters are operated in a batch process with a phased starting point. The large biogas storage unit buffers the discontinuous biogas production of the individual fermenters. To facilitate the fermentation process, the percolate is sprayed evenly over the input via a special nozzle system. The effective discharge of the percolate is ensured via the floor gradient to the back, drain channels and perforated drainage segments on the fermenter side walls. To optimize the drainage, the input can be flushed with biogas through the aerated spigot floor system. The percolate is collected in the heated percolate fermenter from where it is sprayed again over the input in the fermenter.

End of fermentation process

After three to four weeks, the biogas production in the fermenter diminishes. At this time, the percolation is stopped and the fermenter is aerated or alternatively inerted.
The biogas-exhaust mixture is initially routed to the biogas storage until the methane content gets too low.
The mixture then is flared by a lean-gas flaring system.

Subsequently, the digestate is removed from the fermenter tunnels with a wheel loader. To ensure safe working conditions and emission protection, the fermenters are ventilated during the filling and emptying operations with a three-time air exchange rate. The exhaust air is treated by a biofilter.

The solid digestate is a well-drained residue in a stackable consistency which can be further composted to a marketable product.

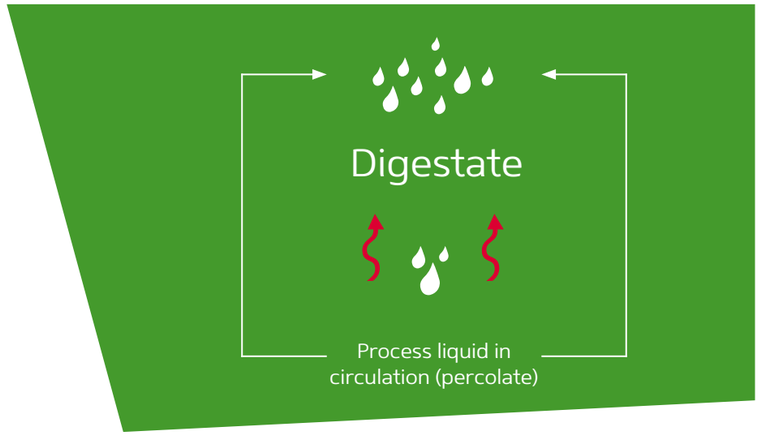


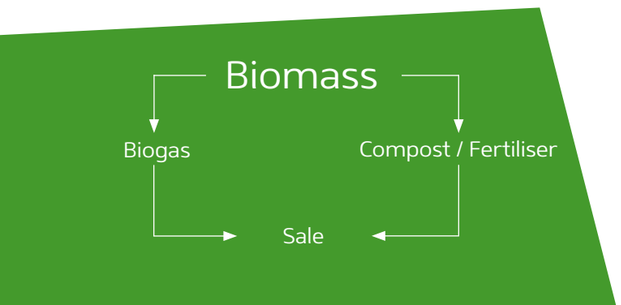
BEKON®

- optimal heat utilization
- accelerated fermentation process
- short piping routes
- low space requirements
- variable plant size from 3,000 to > 150,000 tons per year

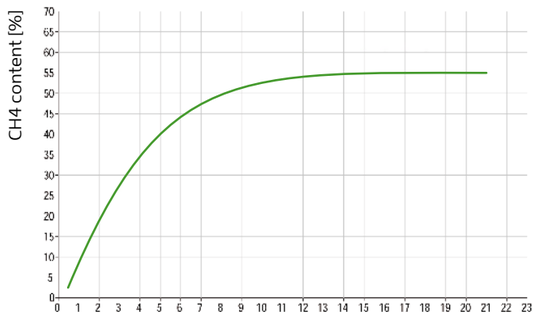
Additional advantages:

- low parasitic energy demand
- low investment costs
- minimized operation and maintenance
- thermophilic operation with hygienized end products according to bio-waste regulations
- partly redundant system
- automatic filling possible





CH4 content in the biogas of a fermenter

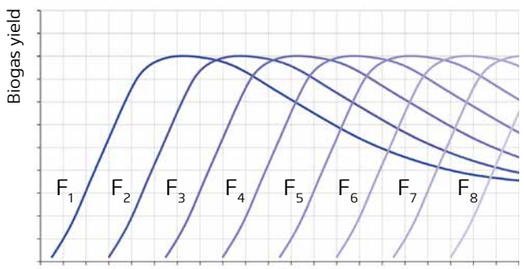


Filling the fermenters in batch operation
The organic waste is tipped and collected in a delivery building and then filled into the garage-shaped fermenter by a wheel loader. The cell liquid (percolate) accumulating during the fermentation is collected by a drain system and reintroduced into the fermentation process. The biomass temperature is controlled through a wall and floor heating system, thus optimizing the living conditions of the microorganisms for biogas production in the fermenter without the need for further mixing of the biomass or the addition of further material. After filling, the fermenter is sealed with a gas tight door and the fermentation process starts.

Continuous production of electricity and heat
The generated biogas is normally used in a combined heat and power system (CHP) to produce electricity and heat. The continuous operation of the CHP is ensured by time-shifted filling and operation of the fermenters. The biogas is temporarily stored in a biogas storage for a few hours. Depending on the applicable laws, the generated electricity can be fed into the electricity network or can be directly marketed. Only a small amount of the waste heat generated is required for the self-consumption of the plant. Most of the thermal energy can be used externally, e.g. for feeding into a local or district heating grid or for drying materials.

Production of biomethane
As an alternative to electricity and heat generation, the biogas can be processed into biomethane and subsequently fed into the natural gas grid or used as a compressed natural gas fuel. The energy generated can thus be stored and used in a variety of ways.

Continuous biogas yields in batch operation



Exemplary references

GERMANY

Munich – pilot plant
Input SSOW*1
Electrical Power 190 kW
Throughput 6,500 t/a
In operation since 2003

Munich – extension
Input SSOW*1
Electrical Power 570 kW
Throughput after expansion 25,000 t/a
In operation since 2007

Erfurt
Input SSOW*1
Electrical Power 660 kW
Throughput 20,000 t/a
In operation since 2008

Rendsburg
Input SSOW*1
Electrical Power 1,050 kW
Throughput 30,000 t/a
In operation since 2008

Pohlsche Heide
Input SSOW*1
Gas processing 500 Nm³/h
Throughput 40,000 t/a
In operation since 2009

Schmölln
Input Renewables
Electrical Power 1,000 kW
Throughput 16,000 t/a
In operation since 2009

Mainz
Input SSOW*1
Electrical Power 1,200 kW
Throughput 40,000 t/a
In operation since 2012

Hamburg
Input SSOW*1
Gas processing 700 Nm³/h
Throughput 60,000 t/a
In operation since 2013

Steinfurt
Input SSOW*1
Electrical Power 1,054 kW
Throughput 45,000 t/a
In operation since 2013

Rendsburg – extension
Input SSOW*1
Electrical Power 1,175 kW
Throughput after expansion 64,000 t/a
In operation since 2017

ITALY

Cesena
Input SSOW*1
Electrical Power 1,000 kW
Throughput 35,000 t/a
In operation since 2009

Neapel
Input SSOW*1
Electrical Power 1,000 kW
Throughput 35,000 t/a
In operation since 2011

Rimini
Input SSOW*1
Electrical Power 1,000 kW
Throughput 35,000 t/a
In operation since 2012

Voltana
Input SSOW*1
Electrical Power 1,000 kW
Throughput 35,000 t/a
In operation since 2012

Enna
Input OFMSW*2
Electrical Power 599 kW
Throughput 20,000 t/a
Under construction

MEXICO

Culiacan, Sinaloa
Input Agricultural waste
Electrical Power 100 kW
Throughput 4,500 t/a
In operation since 2016

POLAND

Posen
Input SSOW*1
Electrical Power 716 kW
Throughput 24,000 t/a
In operation since 2016

PORTUGAL

Valnor
Input OFMSW*2
Electrical Power 500 kW
Throughput 25,000 t/a
In operation since 2011

SWITZERLAND

Baar
Input SSOW*1
Electrical Power 526 kW
Throughput 18,000 t/a
In operation since 2009

Thun
Input SSOW*1
Electrical Power 950 kW
Throughput 20,000 t/a
In operation since 2010

Galmiz
Input SSOW*1
Electrical Power 150 kW
Throughput 4,500 t/a
In operation since 2015

Krauchthal
Input Green Waste
Electrical Power 440 kW
Throughput 12,000 t/a
In operation since 2017

*1 SSOW: Source segregated organic waste
*2 OFMSW: Organic fraction of municipal solid waste

BOO projects of the Eggersmann Group

Nieheim
Input SSOW*1
Electrical Power 780 kW
Throughput 24,000 t/a
In operation since 2007

Gütersloh
Input SSOW*1
Electrical Power 800 kW
Throughput 35,000 t/a
In operation since 2011

Iffezheim
Input SSOW*1
Electrical Power 527 kW
Throughput 18,000 t/a
In operation since 2013

Dresden
Input SSOW*1
Electrical Power 800 kW
Throughput 31,000 t/a
In operation since 2016

Enger
Input SSOW*1
Electrical Power 160 kW
Throughput 8,500 t/a
Under construction

MORE THAN
50 PLANTS
IN OPERATION

Posen

Munich

Pohlsche Heide

Galmiz

Bassum

Neapel

Erfurt

Cesena

Vechta

Steinfurt

Baar

Thun

High-quality process and technology

- Durable design
- Complete thermal insulation of the entire system
- Spacious fermenter height for comfortable working with the wheel loader
- Efficient and gentle heat transfer via surface heating and percolate
- Design conforms to the water protection requirements
- Compact construction of building and mechanical equipment with very short pipe connections
- All pipelines above ground (biogas, percolate, condensate, exhaust air) in stainless steel
- Measurement technology for process monitoring and industrial safety according to industrial standards (Biogas analysis multiplex system, hydrostatic fermenter pressure, temperature, gate seal pressure, pH value, filling levels in the percolate fermenter, gas storage, IDM-percolate measurement, biogas volume flow measurement)
- Modern plant control system, (Siemens S7, Profibus, process control system with PC visualization)
- Comprehensive process documentation for evaluation, archiving and process tracking
- Convincing safety concept and external third party inspections
- Almost complete minimization of methane losses

EGGERSMANN

BEKON® dry fermentation systems can be combined with many other products of the Eggersmann Group:

- Mobile and stationary recycling machines
- Mechanical treatment
- Composting

Eggersmann is your one-stop shop.

BEKON

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