Local energy production from biowaste
Biogas in general
The BIOFerm system creates biogas from organic waste

30 to 40 per cent of the volume of residential waste in Germany is organic waste. The nationwide collection of biowaste offers enormous potential. This waste can be converted to energy in biogas plants at minimal cost.

The largest as yet untapped potential lies in the field of biowaste and landscape conservation material. These elements have so far been to a large extent composted or sent unsorted to landfill sites instead of being used to generate energy.

Waste is a resource – as part of the economic cycle
BIOFerm offers a comprehensive range of dry fermentation services. Clients have a single point of contact for the entire project execution. BIOFerm provides all services from a single source, from the initial planning and consultation through to project implementation and commissioning. With sites in Germany and abroad, we can also realise international projects in the closest proximity to our customers.

BIOFerm technology enables the generation of primary energy from organic waste material: environmentally friendly, regenerative and CO₂ neutral. Only the most rudimentary demands are made on the source material.

The system is suitable for:
- Local authorities:
  Biowaste, green waste from gardens and parks and material from landscape conservation
- Restaurants or canteens:
  Food waste
- Food trade and industry:
  expired goods from the retail food trade and residues from food production

The fermentation residue in liquid form is used directly for agricultural purposes or can be turned into high grade organic fertiliser or compost. Composts and digestates supply basic plant nutrition while at the same time improving the humus balance of our soil.

Biogas is regional and can be stored
The fermentation of biowaste and domestic raw materials has a positive long-term impact on the handling of fossil fuels. Short transport distances and independence from expensive energy imports also have a part to play here.

Biogas is an energy source that can be stored, enabling it to be used flexibly where and when it is required. Last but not least, the construction of biogas plants creates jobs in rural areas with poor infrastructure.
Technology
Schmack Biogas offers the BIOFerm dry fermentation technology in its portfolio for non-pumpable feedstock. The demands made on the source material are extremely low.

The process is ideal for stackable, organic solids, such as biowaste, green matter and solid manure containing up to 60 per cent dry matter content. Common features of industrial or municipal biowaste include:
- high proportion of impurities (plastic, wood, metal etc.)
- high dry matter content
- heterogeneous substrate composition
- not always separated in advance
- seasonal variations in composition

Different feedstock characteristics place different demands on the plant technology. The system is tolerant of impurities, eliminating the need for sorting or pre-treatment of the biomass.

In dry fermentation plants, the fermentation process is divided into individual digesters (garage digesters), where the biomass is fermented anaerobically. The BIOFerm system ensures constantly high gas yields with a methane proportion up to 60 per cent. The modular structure provides greater security of supply and therefore a higher overall process stability.

The integration of BIOFerm in Schmack Biogas makes it possible to offer a complete range of dry fermentation services. From the initial consultation regarding economic feasibility and overall concept design through to project implementation and commissioning, we do everything for you.

**High plant security**

The technologies and processes used in the BIOFerm system have been tried and tested worldwide. All plants are TÜV-approved, can be extended on a modular basis and meet the highest requirements in terms of operational reliability.

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Top:
Bio exhaust system on the digesters,
Gas tank COCCUS in background

Bottom:
Hellabrunn Zoo, Munich:
Fermentation of zoo waste to create biogas
The BIOFerm system works on a batch process, which means that the digesters are periodically emptied and then refilled. In the reception hall a wheeled loader mixes the stackable fresh material with the previously fermented material (a process also known as „seeding“) and feeds it into the garage-shaped digesters. After approx. four weeks the digester is completely emptied and refilled with a seeded mixture.

Accelerated fermentation process
Seeding the fresh mass speeds up the decomposition process, which greatly accelerates gas production. The fermentation of the material takes place in a closed system with no oxygen (anaerobic). During this process, liquid forms as a so-called percolate. A sprinkler system feeds the percolate through the contents of the digester on a continuous basis. The conversion of the organic mass to biogas happens partly in the digesters, and partly in a separate percolate storage tank.

Technically advanced systems
As the digester heats up, it creates an optimal temperature for bacteria of approx. 40°C. An additional heat input comes from sprinkling the percolate. The retention time per digester is about 28 days, depending on the input material properties. The resulting biogas is collected in a membrane gas tank, which leads off the percolate tank as a double membrane roof (COCCUS system). There the biogas is desulphurised by the addition of oxygen and then sent to the biogas consumer for use.

Certain atmospheric conditions must prevail within the garage fermenter for it to be opened. To that end, the digester is flushed with fresh air and the resulting waste air (known as lean gas) is tested using a so-called lean gas flare.

All the waste air from the biogas plant (mixing hall, waste air from the digester) is channelled through a biofilter system to clean it.

With the exception of the loading and emptying of the digester using a wheeled loader, the entire plant is automatically controlled and regulated using a programmable logic controller (PLC). Any faults are detected at an early stage by the controller, which records the problem and reports it to the operator via phone, fax or SMS.

Biowaste fermentation technology
Recycling waste – the BIOFerm system
Dry fermentation technology is constantly evolving in terms of efficiency, ease of maintenance and economic viability. A great many tried and tested components from the Schmack wet fermentation system were transferred to the BIOFerm system as a result.

**Technical adaptation**
- Garage digester roof structure
- Optimised drainage system
- Percolate tank as round fermenter with double membrane roof
- External gas storage

**Optimised roof structure**
The digester’s roof has no housing, following the design of the Schmack EUCO high performance digester. Only the front three metres of the digester are covered to form a technical area, which houses the majority of the plant and measurement technology.

**Comprehensive drainage**
The optimised drainage system absorbs the percolate and draws it away from the digester in a controlled manner through a header pipe. The header pipe of each digester is frost proof and leads to the drainage shaft.

**Percolate storage tank with double membrane roof**
The percolate storage tank is designed as a round COCCUS-type digester with a double membrane roof (as used for gas storage tanks). The biogas from the individual digesters is drawn off to a gas dome, which has built-in overpressure and underpressure safety valves, and then fed to the gas tank via a gas header pipe. The biogas is desulphurised to the desired H₂S value through the internal wooden roof structure.

**Substrate barrier and digester gate**
The gas dome is not our only in-house development: we have also designed the substrate barrier and the digester gate. Their key features are secure operation and high stability.

Substrate barrier – simple and robust:
- The barrier is locked and unlocked by the wheeled loader
- Made of wood on a stainless steel frame
- Additional floor support

Gate system – innovative technology:
- Welded stainless steel construction
- Decoupled from concrete structure to make it an independent component
- Operated from a central locking unit
- Redundant seal system, charged and monitored with compressed air
Flexible substance handling thanks to combined technology

Integrating different biogas technologies enables the maximum exploitation of all source materials

In conventional biowaste fermentation, the source substrate is extremely heterogeneous. Furthermore, the material input varies according to the season. The expected gas yields from biowaste are therefore highly variable.

**Hybrid system: Tried and tested technology, new process benefits**

Since not all biogenic residues are suitable for dry fermentation, they have to be used in so-called hybrid systems (combined wet and dry fermentation). The combination of these two tried and tested technologies means that the best use can be made of a wide range of source materials with different levels of impurity and different dry matter content. The various input materials are sent to the most efficient fermentation type in each case. These are two separate systems with different feedstock and procedures. Intersection points for both systems include gas collection, heating distribution and gas treatment.

The benefits of the hybrid system

- Most efficient use of input materials
- Balancing out of seasonal variations compared to dry fermentation alone
- Synergies in processing/electricity generation technology
- Joint heat utilisation

The combination of the individual value added stages (dry and wet fermentation) produces the most efficient exploitation of heterogeneous source material.
Schmack Biogas Service GmbH

Even after the biogas plant has been built, BIOFerm customers can rely on a comprehensive technical and biological service. With the Schmack service concept, our customers secure the operational reliability of their plant and keep their performance at a permanently high level.

Technical service: Professional and fast
For us, customer service begins long before any component wears or needs replacement – through qualified advice, preventative maintenance and appropriate planning by our in-house customer service team. Our service engineers safeguard the function of your biogas plant through predictive spare parts logistics and a highly efficient customer service team.

Laboratory service
Apart from safe, reliable plant technology, another factor exerts a decisive influence on the viability of a biogas plant: a stable fermentation process. Our biological service takes care of monitoring and supporting biogas plants from commissioning onwards.

Complete operational management
As an investor you want to keep the costs of your biogas plant as low as possible. That’s no problem. Our all-round service offers complete operational management. We supervise the biological and technical maintenance, including remote monitoring. This includes all the other services that are required for the operation of the plant, from staff and raw material management to maintenance measures.

Reliability
Remote monitoring round-the-clock from our EUVIS control centre reduces downtimes to a minimum. The minimisation of downtimes and the elimination of time-consuming service calls lead to continuous and reliable plant operation. The high security standards during construction and operation protect people, the environment and, naturally, the plant itself.

Consulting: We are the feed consultants for your biogas plant
Scientific experts determine, in our own laboratory, the quality of the matter to be used and check the fermentation contents by means of process-specific parameters. The results form the basis for individual advice and feed recommendations to maintain and/or improve the capacity of your plant. We also train our customers on an individual basis and tailor the training to the specific plant to enable optimum and economical operation.


Our responsibility: maximum availability for your plant

Accreditation of the laboratory maintained by Schmack Biogas Service GmbH.
This accreditation applies to the scope defined in the certificate annex D-PL-14051-01-00.

Laboratory at Schmack Biogas Service GmbH

All-round service – not just for their own plants
Quality and Viability

Our specialists ensure a perfect result
**Expertise in biogas**

The actual hours run under full load each year is the crucial dimension for checking the viability of a biogas plant.

Schmack Biogas is committed to standard plant technology and extensive process biological know-how. Many years of experience in both sectors enable the company to guarantee above average utilisation to both investors and operators.

**Wide-ranging services**

Those deciding in favour of Schmack Biogas can rely on professional support, right from the first consultation. Planning, obtaining permissions and the complete build are taken in hand by Schmack. As soon as the test run (for which an output certificate is issued) has been completed after commissioning, a further output commitment will be given. This assures you that your biogas plant will operate at a constantly high output level.

**Reliability**

With round the clock supervision through the EUVIS control centre, downtime of supported plants can be reduced to a minimum. Prevention of idle times through scheduled and specific service and maintenance deployments result in a constant and reliable plant operation. The high standard of safety applied during construction and operation protects the plant as well as its operators and the environment.

**Benefits at a glance**

- Professional support covering all technical and biological aspects
- Continuous supervision for reliable and profitable plant operation
- Assured output to safeguard your investment
- Minimised operating costs

![Utilisation curve of a Schmack biogas plant](image)
BIOFerm biogas plants – Full output in constant use

Their good performance makes our biogas plants stand out year after year. They operate with great reliability, whatever their size or system design.

**Sogliano Ambiente (Italy)**
- Installed output: 1 MW (electrical)
- Throughput p. a.: 40,000 t bio-waste and household refuse
- Number of digesters: 11
- Digester size: 30 x 7 x 5 m (Length x Width x Height)
- Construction started: July 2011
- Commissioning: February 2013

**Viessmann Biomasse KG (Germany)**
- Installed output: 190 kW (electrical)
- Throughput p. a.: 4,500 t (landscape conservation material)
- Number of digesters: 4
- Digester size: 20 x 7 x 4.50 m (Length x Width x Height)
- Construction started: September 2009
- Commissioning: August 2010

Comprehensive range of fermentation technologies and gas upgrading systems:
The Allendorf site includes not only the dry fermentation plant, but also a wet fermentation plant with a gas upgrading and power-to-gas installation.
**Fife (Scotland)**
Installed output: 1.8 MW (electrical)
Throughput p.a.: 40 000 t biowaste (brown bins) and 3 000 t food waste
Number of digesters: 14
Digester size: 30 x 7 x 5 m
(Length x Width x Height)
Construction started: February 2012
Commissioning: July 2013

**Stausebach (Germany)**
Installed output: 4 MW$_{Gas}$
Throughput p.a.: 30 000 t/a biowaste and 15 000 t/a Energy crops (combi-plant)
Number of digesters: 8
Digester size: 35 x 6.75 x 5 m
(Length x Width x Height)
Construction started: May 2013
Commissioning: August 2014
The company
Viessmann – climate of innovation

Viessmann is one of the world’s leading manufacturers of intelligent, convenient and efficient systems for heating, cooling and decentralised power generation.

As a third generation family run business, Viessmann has been supplying highly efficient and clean heating systems for many decades.

**A strong brand creates trust**
Together with our brand label, our key brand message is an identifying feature throughout the world. "Climate of innovation" is a promise on three levels: It is a commitment to a culture of innovation. It is also a promise of enhanced product benefits and, at the same time, an obligation to protect the environment.

**Acting in a sustainable manner**
For Viessmann, taking responsibility signifies a commitment to acting sustainably.

This means harmonising ecology, economic concerns and social responsibility so that the needs of today are met without compromising the quality of life of future generations.

We consider climate protection, environmental responsibility and resource efficiency to be key priorities throughout our company, which has more than 11,500 employees worldwide.

**Example of Best Practice**
With its strategic sustainability project, Viessmann demonstrates at its own head office in Allendorf (Eder) that the energy and climate policy goals set for 2050 can in fact be achieved today with commercially available technology. The results speak for themselves:

- Expansion of renewables to 60 percent
- CO₂ emissions reduced by 80 percent

The long term goal is for the company to meet all its own heating energy requirements by sustainable means.

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**Viessmann Group**

**Company details**
- Established in: 1917
- Employees: 11,500
- Group turnover: 2.2 billion euros
- Export share: 56 percent
- 22 production companies in 11 countries
- 74 countries with sales companies and branches
- 120 sales offices worldwide

**The comprehensive product range from the Viessmann Group for all energy sources and output ranges**
- Boilers for oil or gas
- Combined heat and power generation
- Hybrid appliances
- Heat pumps
- Wood combustion technology
- Biogas production plants
- Biogas upgrading plants
- Solar thermal
- Photovoltaics
- Accessories
- Refrigeration systems