Kompogas® dry anaerobic digestion
Energy from organic waste
From a waste to a resource economy

The Kompogas® technology converts organic waste from municipal, commercial and industrial sources into electricity and heat or biomethane. Kompogas® is synonymous with continuous dry anaerobic digestion (AD) technology. When it comes to developing and building dry AD plants HZI is the market and technology leader. The modular construction of Kompogas® plants makes it possible to design and deliver solutions precisely tailored to the needs of individual clients.

| Closing the ecological cycle |
Kompogas® plants generate carbon-neutral biogas from organic waste. Organic waste is available in large quantities all over the world, most of it in the form of green waste from cities and local communities, garden and kitchen waste from homes, and food waste and scraps from industrial and commercial operations. Unlike approaches that merely dispose of biowaste, recovering resources from waste in a Kompogas® plant closes the materials cycle. The environmental benefits of the Kompogas® process are proven: the technology closes the natural ecological cycle.

| The Kompogas® process |
The Kompogas® process is based on the continuous dry anaerobic digestion of organic waste in an anaerobic environment. Carbon-neutral biogas is produced, which is transformed into green electricity and heat or upgraded to biomethane equal to natural gas quality. By combining the Kompogas® process with the HZI BioMethan® technology, HZI is able to offer a comprehensive, one-stop solution. This saves fossil fuels. Thanks to this tried-and-tested technology, Kompogas® facilities make maximum use of the organic waste’s energetic potential, producing up to 1,000 kilowatt-hours of energy from one metric tonne of waste, depending on the type of biowaste used. Some 900 kilograms of natural fertilizer in both solid and liquid form are also produced as a by-product – reducing the need for artificial fertilizers and natural nutrients.

| Leading technology since 1991 |
The use of biogas as a fuel and digestate as a certified natural fertilizer plays a significant role in the efforts to cover global resource requirements in a way that makes both environmental and economic sense. With the process already in use at more than 75 facilities all over the world and incorporating 150 Kompogas® digesters, HZI leads the global market. For 25 years, the Kompogas® process has been the most proven and reliable technology for utilizing biowaste.

One of the latest references of HZI Kompogas®: turnkey dry anaerobic digestion plant for source segregated organics in Vétroz, Switzerland
Closed materials cycle

The ecological cycle in the Kompogas® process

Utilization
- Liquid
- Dry

Energy use
- Biogas upgrading HZI BioMethan® technology
- Gas engine

Organic waste turned into energy
- Reception
- Shredding
- Anaerobic digestion

Kompogas® digester

Biogas
- Feeding into electricity grid
- Feeding into district heating network
- Injection into natural gas grid

Vehicle fuel
- Feeding into district heating network
- Injection into natural gas grid

Fertilizer
- Feeding into electricity grid
- Feeding into district heating network

Sustainable products
- Fertilizer/compost
- Vehicle fuel
- Biomethane
- Electricity
- Heat
Organic waste from a variety of sources

Organic waste is recovered differently depending on the waste management regime. Basically a distinction is made between source segregated organic waste and the organic fraction of municipal solid waste. The Kompogas® process can handle both types of waste. There are, however, differences in the process technology and the design of plants.

| SSO – Source Segregated Organics
When households or restaurants produce organic waste it is collected separately from residual waste. This ensures that the source segregated organics do not come into contact with any contaminants that might be in the residual waste. The Kompogas® process recovers both the nutrients and the energy contained in this organic waste. Hence, the digestate produced from the Kompogas® digester can be used as a high-quality fertilizer in agriculture. And the solid structure of the compost produced makes it a good soil conditioner. This closes the materials cycle – sustainably.

| OFMSW – Organic Fraction of Municipal Solid Waste
In cases where waste isn’t segregated at the source, the organic fraction is collected mixed in with residual waste. Therefore the entire municipal solid waste stream is mechanically sorted to recover recyclable materials such as metal, glass and PET. What remains is a fraction with a high calorific value, plus an organic fraction for biological treatment in the Kompogas® digester. Biogas is produced, and the digestate can be used for landscaping or to recultivate landfills.

Both material flows produce biogas, an ecologically high-grade fuel that makes a significant contribution to long-term environment and climate protection efforts by reducing fossil carbon emissions.

What organics can be processed?

<table>
<thead>
<tr>
<th>Green waste</th>
</tr>
</thead>
<tbody>
<tr>
<td>– Lawn and tree cuttings</td>
</tr>
<tr>
<td>– Mixed plant material</td>
</tr>
<tr>
<td>– Mixed garden waste</td>
</tr>
<tr>
<td>– Shrub trimmings and leaves</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Household waste</th>
</tr>
</thead>
<tbody>
<tr>
<td>– Fruit and vegetable waste</td>
</tr>
<tr>
<td>– Peelings</td>
</tr>
<tr>
<td>– Food scraps</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Commercial and industrial waste</th>
</tr>
</thead>
<tbody>
<tr>
<td>– Food production residues</td>
</tr>
<tr>
<td>– Food processing residues</td>
</tr>
</tbody>
</table>
Proven Kompogas® dry anaerobic digestion technology in operation since 2014 in Vétroz, Switzerland.
| Reception and pre-treatment | All organic waste is unloaded in a pit bunker using an odor trap. An automated crane is used to convey the organic mass to the next station. Employing a pit bunker and crane enables fully automated feeding of the Kompogas® plant, also at night and weekends. Alternatively, arriving organic waste can be received in a special tipping and delivery flat area. To prepare for anaerobic digestion, a shredder chops the organic matter into small pieces which then are sieved to a maximum particle size of 60 mm. The prepared substrate is then automatically conveyed to the digester feed-in point. |

| Anaerobic digestion process | The digester is the heart of the Kompogas® facility. Here, thermophilic microorganisms decompose the organic matter and produce carbon-neutral biogas in an anaerobic environment. A temperature of 55°C and an anaerobic digestion period of 14 days ensure that spores and bacteria are eliminated. This way the digestate is completely sanitized during processing, and the gas potential is fully exploited. |

A specially developed heating system regulates the temperature during processing.

The organic material is transported inside the digester in what is known as the plug-flow process. Here the material moves horizontally through the digester before it is discharged. A slowly turning agitator ensures that the digestate is optimally mixed and that biogas is released.

The digester is available in two patented models: the PF1300 in concrete and the PF1500 in steel only with a throughput capacity of about 20,000 t/a. Multiple digesters are installed in parallel to process higher waste quantities in larger plants. Thanks to their compact design, individual Kompogas® digesters are also ideal for expanding existing composting facilities.

| Energy utilization | After pre-treatment, the raw biogas from the Kompogas® digester is either upgraded and fed into the gas grid as biomethane or used directly to generate electricity and heat in a combined heat and power unit. Burning natural gas, a fossil fuel, would produce five times the greenhouse gas emissions for the same amount of electricity and heat. A certain amount of the heat produced is used to maintain the temperature in the digester, and the rest can either be used to heat buildings nearby or be fed into district heating networks. |
**Discharge and post-treatment**

**Dewatering:** A screw press separates the fermented residue into solid and liquid digestate. The press can be set to produce the desired amount of dry matter in the solid digestate. Once it has been sieved, the solid digestate can be used directly in agriculture as an organic fertilizer or soil conditioner. Alternatively, it can be further processed into compost. The liquid digestate can be used directly as organic fertilizer.

**Partial stream anaerobic digestion:** An alternative is partial stream anaerobic digestion, where only the energy-rich component of the organic waste is fed into the digester, with highly structured material bypassing the anaerobic digestion process and subsequently being mixed into the digestate leaving the Kompogas® digester. This mixture then undergoes anaerobic treatment in a composting process. Depending on the plant’s design, the mixture can also be processed further. In this case it undergoes closed composting to stabilize it and enhance its quality.

**Exhaust air treatment**

The entire process takes place in a completely enclosed system to prevent the emission of gases and odors. To ensure nothing escapes untreated into the surrounding environment, all exhaust air from the plant’s work areas and other spaces is collected and cleaned in an acid scrubber. A biofilter made of torn root wood and tree bark then neutralizes all odors biologically. The purified air is subsequently released into the atmosphere.