Quality Products & Technical Solutions

The Alpha and Omega of Biogas Technology
PlanET Biogastechnik –
Everything from a Single Source

PlanET Biogastechnik GmbH is one of the world’s leading biogas plant suppliers. Founded in 1998, the company’s service portfolio covers all fields of biogas technology and component distribution: from planning, plant construction, refinement of biogas to natural gas quality and all the way to service and biological support from our in-house laboratory. PlanET’s RePowering division enables customers to increase the efficiency of their existing plants in a targeted fashion. At the same time, the modularly developed SYSTEMBIOGAS functional principle allows biogas plant operators and investors to react to new developments on the biogas market at any time. Over 200 employees currently work at the company headquarters in Münsterland alone. Other employees work in the international subsidiaries in the Netherlands, France, the United Kingdom, Italy and Canada. We are also represented in Spain and Japan. PlanET already has successfully realised more than 300 biogas plants worldwide on a scale from 40 kW to several megawatts.
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The PlanET Vario can convey chopped energy crops, solid manure, feed remains as well as solid organic waste directly into the digester. The modular system offers containers from 11 to 120 m³, which can also be expanded. Thanks to PlanET’s Vario conveyor technology, the plant saves energy and keeps wear to a minimum. The conveyor lines are made entirely of stainless steel, propelled individually and fit with side flaps so that the substrates can be transported effectively. The front side is fitted with an opening cylinder and auger system which transports the substrate into the digester. A second opening cylinder ensures processing of up to 100% manure and grass.

Due to the exceptional survey results with top marks, PlanET Biogastechnik is offering you a five-year warranty for the PlanET Vario’s conveying strings as a highlight. After all, our customers have absolutely assured us: PlanET Vario technology is unbeatable and dependable in daily use.

**The Benefits at a Glance:**

- conveyor system entirely made of stainless steel and high quality plastic in the substrate area
- base module made of stainless steel; all modules are available in stainless steel as an option
- future-proof investment – expandability thanks to modular construction of SYSTEMBIOGAS
- low susceptibility to failure; simple and reliable components
- extremely maintenance friendly; individual elements can be shut down separately
- low energy consumption, depending on the version below 0.9 kWh/t (including control and feed system)
- savings of up to 15,000,-€/year for energy and maintenance (feeding 301/day, electricity costs 16 €ct/kWh) in comparison to other solid feeding systems
### General Data

<table>
<thead>
<tr>
<th>Volume holding container in m³</th>
<th>11</th>
<th>16</th>
<th>21</th>
<th>28</th>
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<th>50</th>
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<td>8.8</td>
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<td>Maximum payload in t (depending on the equipment package)</td>
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<td>16</td>
<td>21</td>
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### Dimensions

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<tr>
<td>Height (C) in m</td>
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<td>2.45</td>
<td>2.45</td>
<td>3.15</td>
<td>2.45</td>
<td>3.15</td>
<td>2.45</td>
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</tr>
</tbody>
</table>

### Holding System

- Separate hydraulically driven conveying strings
- Efficient conveying through hinged flaps
- Hydraulic with electrical switching
- Loosening auger 1.5 kW

### Control System

- Electrical panel with industrial PLC
- Wiring ready to connect
- Manual and automatic operation possible
- Interfaces for status messages and remote start (ProfiBUS possible)

### Further Advantages

- Expandable to up to 120 m³ thanks to modularity
- Operational safety
- Optimised emptying also with difficult substrates

### Extras

- Holding container available completely in stainless steel
- Weighing system with large display
- 2nd loosening auger for up to 100% manure and grass
- Lid available to reduce rain water entry

### Charging Technology

<table>
<thead>
<tr>
<th>Charging Technology</th>
<th>NawoRotor</th>
<th>MultiRotor 360</th>
<th>MultiRotor 450</th>
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<tbody>
<tr>
<td>Drive in kW</td>
<td>feeding auger 7.5</td>
<td>horizontal auger 7.5</td>
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<td></td>
<td></td>
<td>vertical auger 5.5</td>
<td></td>
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<td></td>
<td></td>
<td>charging auger 2.5</td>
<td>vertical auger 6.8</td>
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<td></td>
<td></td>
<td></td>
<td>charging auger 3.6</td>
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<tr>
<td>Auger diameter in mm</td>
<td>330</td>
<td>280</td>
<td>360</td>
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<tr>
<td>Max. throughput maize silage in t/h</td>
<td>10 - 12</td>
<td>8</td>
<td>15</td>
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### Technical Drawing:
The Liquid Flushing System for the PlanET Vario

The PlanET eco® flow is a liquid flushing system with a progression cavity pump, perfectly tailored for combined use with the PlanET Vario. Liquid flushing provides you with great flexibility in selecting substrates and makes it possible to mix the tank contents thoroughly. The mixing pump is operated continuously.

The feed pump is equipped with a speed regulator which adjusts the feed rate in the pipeline under constant flow pressure. The feed screw also has a speed regulator to ensure variable solids feeding in the chute. Remote installation of the PlanET eco® flow is possible, as is the feeding of multiple digesters. The liquid flushing system minimises wear, resulting in a long service life.

The Benefits at a Glance:
- liquid flushing system with progression cavity pump
- great flexibility in substrate selection
- control and regulation from a single source
- low energy consumption demonstrated in practical tests
- additional integration of the PlanET Gorator® is possible
PlanET RePowering Charging Technology

**Old Feed Auger, New Feed System**
Coupling pieces make it easy to connect the PlanET Vario to conventional auger systems available on the market. This includes mechanical adaptation and electrical connection.

**PlanET augers**
The PlanET NawaRotor is the best option for direct input. Thereby the substrate from the solid feeder will be inputted 2 m below the substrate level in the container. The seal is created by clogging with a collar.
PlanET MultiRotor is a multi-part charging system with insertion of the substrate on the upper level of the digester. The material is introduced here very loosely, the height adjustment is made individually to fit your biogas plant.

**RePowering to Digestation tanks with Concrete Covers**
The PlanET Vario can be installed on top of the digestion tank in the case of digesters with concrete covers. In this case, the auger is run into the tank from the top through the digester cover and ends below the fill level.

**Standard Control Unit and Control Unit Plus**
All PlanET Vario are delivered with the standard control unit and all components are perfectly matched. Manual and automatic operation, control via an external process control and signal outputs are included.

In addition to the standard control units for the input augers NawaRotor, MultiRotor and PlanET eco® flow, the Control Unit Plus is now available as well. The Control Unit Plus provides plant operators with a greater scope of functions, as well as more possibilities of monitoring and setting control functions. The internal database can be read via network. The Control Unit Plus is a self-contained system with a Profibus interface, teleservice, database and network connection.
The PlanET Gorator® grinds, shreds, mills, mixes and conveys – in short, it conditions your substrate in many different physical and mechanical respects. The decomposition of the organic material in your biogas plant primarily depends on the surface of the material, i.e. the surface of attack for the bacteria. This makes the PlanET Gorator® a suitable instrument for increasing the quality and quantity of the gas yield. Micro-grinding has proven itself as a worthwhile investment with a retention period of less than 70 days, a manure or grass proportion of over 30 percent, or long-fibred substrate. Wet grinding has the added advantage that the wear and operating current on mixers and pumps is reduced so that your biogas plant works more efficiently, thus reducing operating costs.

PlanET is now offering you a unique guarantee of satisfaction for the PlanET Gorator® – because we are thoroughly confident of our products' performance.

**The Benefits at a Glance:**
- enlarges the material transition surfaces in the substrate
- increases gas yield
- mobilises enzymes and trace elements
- reduces the viscosity and homogenisation of the substrate
- reduces internal power consumption in the biogas plant
- reduced quantities of substrate, lower operating costs
- no additional pump necessary
A diagonal disc rotates inside a cylindrical housing; the resulting tumbling motion accelerates the substrate in the axial and radial direction. The overlapping movements of the material create transverse and shear tensions which result in more intensive mixing and conveyance.

Solids are transported into the radial and axial grooves and ground up by the tooth geometry of the diagonal disc. The substrate receives centrifugal acceleration and is pumped out of the pressure nozzle with the PlanET Gorator®.

**The PlanET concept:**
For use with long-fibred material which is difficult to digest, such as manure or grass silage.
- First step: The bacteria decompose the substrate in the digester – natural organic decomposition is a fundamental prerequisite for the efficient operation of your biogas plant.
- Second step: Integration of the PlanET Gorator® for material which is difficult to decompose or in the case of short hydraulic retention times.

**Technical Data & Information**

**Throughput: 3 - 50 m³/h**
- Depending upon DM concentration and fibre content of the substrate, i.e. with dry matter (DM) of 8% throughput 40-50 m³/h

**Power Supply: 22 kW**
- Power consumption depending upon DM and fibre content, i.e. with 8% dry matter (DM) 15 kW
Increase Your Biogas Yield with Ultrasound

The PlanET DesiUs functions using ultrasound. The sound waves generate extreme heat and enormous pressure, which causes the plant cell walls to burst, thus releasing liquid. This technology improves the fluidity, which relieves the burden on the mixers, thus saving energy. However, its most important effect is that it dramatically increases the biological performance in the digester, thus increasing gas yield and plant efficiency. In contrast to the PlanET Gorator®, ultrasound treatment provides high efficiency for short-fibred substrates with a retention time of less than 70 days and a low proportion of manure and grass (under 30 percent).

PlanET is now offering you a unique guarantee of satisfaction for the PlanET DesiUs – because we are thoroughly confident of our products’ performance.

The Benefits at a Glance:
- increases the biogas yield by up to 25%
- provides the same performance while reducing substrate volume
- reduces digestion duration by up to 15%
- reduces the viscosity of the substrate
- reduces internal power consumption in the biogas plant
Ultrasound treatment accelerates the anaerobic conversion of the digestion substrates. In addition, it decreases the energy expended for the mixers by reducing the viscosity of the substrates. This means that conducting the ultrasound treatment is virtually energy-neutral. The PlanET DesiUs can be flexibly adapted to the existing process technology in consideration of specific substrate properties.
More Performance Through a Wider Range of Substrates

Pasteurisation is an essential step for substrates that contain potentially hazardous micro-nutrients which could include animal slaughter waste and post-consumer FOG (fats, oils & greases). These are usually high-energy substrates with a relatively high proportion of fats, proteins and sugars.

Before being fed into the biogas plants, the materials are heated up to 70 °C and kept at this temperature for a duration of at least 60 minutes in a batch process, without interruption.

Once this retention time has elapsed, the input materials are pumped into the digester tank by a rotary piston pump. This technology allows for the digestate to be spread onto agricultural land after it has been further treated in an anaerobic digester.

The Benefits at a Glance:
- the pasteurisation process is conducted intermittently in batch processes
- slow-running mixers prevents caking and keeps sediments suspended
- the substrate flow can be divided up amongst several different digestion tanks
- an intelligent control unit logs the individual cycles
- protects against overflowing and overfilling
The PlanET pasteurisation unit is available in two performance sizes, each of which fits into one of the 6-metre containers which is preassembled at the PlanET workshop.

Additional pasteurisation components include a heated pre-tank and grinders. The substrate is heated to up to 25°C in the pre-tank, which keeps it fluid and increases pasteurisation performance. Grinders can be used in the substrate feed for pasteurisation depending on the type of FOG being fed.

**Pasteurisation 12 m³/d - Profi**
- one pasteurisation tank à 2 m³
- manual gate valves

**Pasteurisation 12 m³/d - Premium**
- one pasteurisation tank à 2 m³
- pneumatic gate valve
- an additional hygienisation tank can be installed
- distribution of substrate between different digesters possible

**Pasteurisation 24 m³/d - Premium**
- two pasteurisation tanks à 2 m³
- pneumatic gate valves
- distribution of substrate between different digesters possible
Concrete Tanks

Plenty of Room for Your Substrate

Well-built concrete tanks form the basis for the long-term effectiveness and efficiency of a biogas plant. PlanET biogas plants are based on monolithic reinforced concrete tanks which are poured on-site and configured to meet the specific requirements of the site in question. Reinforced concrete has proven itself as a base material in digester construction thanks to its long-term structural integrity and flexibility. Our reinforced concrete tanks are designed in accordance with the latest standards.

The concrete-encased heating lines ensure suitable concrete core temperature and optimal biological process conditions in conjunctions with heat insulation.

To withstand the attack of chemical compounds, which the digestion process causes, the gas exchange zone in the digestion tank is protected by an especially developed coating system.

The Benefits at a Glance:

- tanks made of quality-controlled reinforced concrete
- conical base plate
- heating encased in concrete
- floor/wall insulation (WLG 035)
- large stainless steel pressure-resistant door for maintenance and inspection work
- watertight reinforced concrete in accordance with DIN 11622 and DIN 1045-1

Volume Overview PlanET Digesters (gross)

<table>
<thead>
<tr>
<th>H</th>
<th>Ø</th>
<th>12 m</th>
<th>14 m</th>
<th>18 m</th>
<th>21 m</th>
<th>23 m</th>
<th>25 m</th>
<th>28 m</th>
<th>30 m</th>
<th>32 m</th>
<th>34 m</th>
<th>35 m</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 m</td>
<td></td>
<td>678 m³</td>
<td>923 m³</td>
<td>1.526 m³</td>
<td>2.078 m³</td>
<td>2.492 m³</td>
<td>2.945 m³</td>
<td>3.694 m³</td>
<td>4.241 m³</td>
<td>4.825 m³</td>
<td>5.447 m³</td>
<td>5.770 m³</td>
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<tr>
<td>8 m</td>
<td></td>
<td>904 m³</td>
<td>1.231 m³</td>
<td>2.035 m³</td>
<td>2.770 m³</td>
<td>3.323 m³</td>
<td>3.926 m³</td>
<td>4.926 m³</td>
<td>5.654 m³</td>
<td>6.433 m³</td>
<td>7.263 m³</td>
<td>7.693 m³</td>
</tr>
</tbody>
</table>

The sizes given are sample digesters, different sizes upon request. Prestorage tanks are available in sizes 8 / 3 m and 10 / 4 m.
The PlanET compact distributor is a modularly configured pump distributor consisting of a distributor block, a rotary piston pump and suitable slide valves (manual or pneumatic industrial slide valves). A flow meter (available separately) can be installed to record the material flow quantities.

Substrate can be sucked out of three to six tanks and pumped accordingly using the rotary piston pump suitable for clockwise and counter-clockwise rotation. Subsequent expansion to connect additional tanks is also possible, meaning that a pump concept adapted for each operation can be created.

The compact manifold is a module of the functional principle SYSTEMBIOGAS developed by PlanET.

The Benefits at a Glance:
- virtually odour-free slurry transfer from one tank to the next
- compact configuration (h=1.5 m / w=1.4 m / l=2.7 m)
- robust rotary piston pump
- “suction” and “pressing” selectively from a single line
- 3 to 6 tanks can be connected
- corrosion-free stainless steel pipelines
- choice of pneumatic industrial slide valves or easy-moving manual slide valves
- internal or external control unit as requested
Well Mixed is Half Digested

The right selection of mixing technology makes an important contribution to achieving the best possible gas yields. You won’t achieve satisfactory plant efficiency without ideally configured mixer technology. You can only get the most out of your plant if the digestion substrate is mixed homogenously – and this is only possible when the mixers match the tank size and substrates.

The adjustment systems for mixers designed by PlanET ensure proper lateral and vertical adjustment for all movable mixers. Thus, floating and sinking layers are well mixed and the substrates are always mixed evenly.

The PlanET eco® mixing series offers you all time-tested mixer technologies, from submersible motors to large-wing and paddle mixer – all of which feature economical power consumption. And always durable and wear-resistant.

Ask us about the right combination of mixers, this offers the possibility to even stir digestion substrates with higher dry matter content most efficiently.

The Benefits at a Glance:
- optimally configured mixing technology in your biogas plant
- mixer components developed based on experience
- high and low speed
- durable and energy-efficient
Technical Data & Information

**PlanET eco® mix**
- low energy consumption of max. 7.5 kW
- high torque of 3,000N, 70rpm
- 1.4 m blade diameter
- laterally and vertically adjustable
- mixing process which preserves bacteria and prevents crusting

**PlanET eco® prop**
- max. 5.7 kW output
- best mixing thanks to 5,000N torque, 40 rpm
- optimal for the widest variety of input materials
- 2.5 m blade diameter, fixed installation
- prevents crusting

**PlanET eco® turbo**
- max. 13 kW output, 365 rpm
- effective for breaking up floating layers thanks to 2,000N torque
- high-speed mixer with only 34.25" blade diameter
- flexible use, laterally and vertically adjustable

**PlanET eco® paddel**
- max. 15 kW output, 11 rpm
- suitable for long-fibred materials
- slow-speed mixer with 4 m blade diameter
- diagonally positioned paddles ensure optimal mixing and breaking up crusting

**PlanET eco® stabmix**
- max. 22 kW output
- up to 10,000N torque breaking up crusting
- slow-speed mixer with 1.5 m blade diameter
- installation through the tank wall allows a stageless inclination adjustment
Desulphurisation with Close-Meshed Fabric

PlanET eco® cover polyethylene (PE) fabric combines various properties for achieving optimal biogas plant operation. This is not a conventional net, but a very close-meshed fabric.

The biogas is desulphurised in the digester by means of a biocatalytic procedure using air injection. The fabric’s great surface area (much greater than that of the previous wooden ceiling) offers an ideal habitat for the bacteria which desulphurise the gas. In addition, the PlanET eco® cover serves as a thermal barrier and support for the gas holder membrane.

The Benefits at a Glance:

- greater desulphurisation area than with the wooden ceiling
- very resilient materials made of PE or V4A (stainless steel)
- flexible and resistant to chemicals – no wood in the digestion tank
- good thermal barrier; no additional insulation necessary
- revision work in the tank can be conducted from the PlanET eco® cover
- structurally configured up to snow load zone 3 (≥ 1.10 kN/m²)
- protected as a utility model
Digester Desulphurisation with Non-Woven Fabric

The PlanET eco® cover plus is the enhanced version of the PlanET eco® cover. The non-woven fabric has the properties of even greater thermal insulation and desulphurisation performance.

The desulphurisation fabric is optimally stretched over the digestion tank with tension belts which were specifically developed for this application. The stainless steel column in the centre of the tank provides an additional point of support and simultaneously serves to deflect the belts. The belts are fastened to the exterior wall of the digestion tank by patented anchor elements made of stainless steel.

The Benefits at a Glance:

- even greater desulphurisation performance than the PlanET eco® cover
- very resilient materials made of PE or V4A
- flexible and resistant to chemicals – no wood in the digestion tank
- even better thermal barrier than the PlanET eco® cover
- service work in the tank can be conducted from the PlanET eco® cover plus
- structurally configured up to snow load zone 3 (≥ 1.10 kN/m²)
- protected as a utility model
PlanET Flexstore XL

More Storage Volume for Your Biogas Plant

Thanks to their round shape, the air-supported roof PlanET Flexstore XL possess a much greater gas storage volume than conical roofs do. But the shape isn’t the only benefit – the film material is designed for durability and is reliably fastened to the plant by an innovative new sealing system – which is easy to maintain at the same time.

The air-supported roof is mounted to your biogas plant in time-tested PlanET quality. In conjunction with the PlanET eco® cover or PlanET eco® cover plus, the roof is an absolute innovation in the world of biogas components. The shape and colour of the PlanET Flexstore XL also blends harmoniously into the landscape. The roofs are available in dust grey or moss green upon request; the dust grey roofs offer even greater advantages in terms of solar radiation and heating.

The Benefits at a Glance:
- five years warranty worldwide
- up to 20% more gas storage volume
- the compressed air in the sealing hose is divided into two semi-circles, meaning that only one side of the roof has to be opened during maintenance work
- fan unit completely embedded in PE; safe from corrosion and external influences
- withstands hurricane-strength winds
- particularly sturdy 900 g/m² weather protection foil
- two standard colours which blend in well with the environment: dust grey and moss green
Sealing System
The special feature of the innovative new sealing system are the two compressed air circles of the sealing hose. This makes it possible to keep one semi-circle of the tank pressurised during maintenance work, which makes it easier to conduct inspections more quickly. The compressed air monitoring unit is installed in the heating cabinet or interspace, protecting it from frost. This ensures ideal protection in cold or wet conditions.

Fan Unit
The fan unit is made of PE, making it especially durable and UV-resistant. The fan is explosion protected and mounted directly above the work platform so that it is easily accessible for service. This way, the installation position reduces the explosion zone of the gas storage. Less foreign matter and fouling gets into the system thanks to the high installation position. The new development of the throttle valve on the air supply unit allows active control of the gas storage fill levels, thus increasing the effectively usable gas storage volumes, enabling gas storage management.

Reinforced Material
In contrast to conventional air-supported roofs, we use a particularly durable PVC weather protection foil with a thickness of 900 g/m² (competitors often use a foil thickness of only 680 g/m²). This means that the roof is approved for hurricane-strength winds. The PE gas storage foil is particularly durable and impermeable to odours.

Stainless Steel Seal and Sealing Hose
The stainless steel rail can be used in both single- and double-layer roof systems. The grey EPDM sealing hose will maintain clamping force under heavy solar radiation, since the material reduces the surface temperature.

Connection Flange
Another new item is the design of the connection flange for the fan unit and the cross-ventilation for the PlanET Flexstore XL on the opposite side. The connection was designed to minimise the risk of the foil tearing thanks to a great number of fastening elements.
There is a new development in gas storage technology which may be of interest to biogas plant operators with a single membrane roof on their digester who are interested in expanding their plant to include the more reliable double membrane roof. Because different gas pressures under single and double membrane roofs do not allow an independent, equal redistribution of the gas between the different tanks, less new gas can be produced in digesters with single membrane roofs. Through the pumping of the gas and the associated equal distribution of the gas filling levels new gas can constantly be produced and stored under both roofs.

The Benefits at a Glance:
- automatically synchronise your gas levels between single and double membrane roofs
- independent, equal distribution of the gas
- increases the storage capacity of your gas storage membranes
To compensate the different gas filling levels in different tanks, a gas booster is installed on a frame between the different gas storages. In order to pump the gas from the digester with a single membrane roof into the double membrane roof, the compressor pushes the gas pressure to the same level in both tanks.

The valve for the gas overflow works automatically; the gas level sensor therefore sends a signal to the valves which open themselves and starts the gas compressor if needed. When the signal turns off, the valves are automatically closed and the compressor turns off.

The gas pumping station is operating at the maximum of 400m³/h.
The plant control unit can generally be connected to supply power as required via DSL or mobile phone. A DSL connection is the first choice. The biogas plant reports its availability and gas fill level to the direct marketer. The power output is then determined and you will receive a report from the direct marketer indicating whether your biogas plant (now a virtual power plant) is ready for operation and how great the output is.

Additional features of the control technology installed by PlanET include malfunction alerts via fax, SMS, E-mail or telephone, as well as a live view of the plant situation. The control technology for direct marketing is simple and can be fitted to virtually any biogas plant.

The Benefits at a Glance:
- external plant control via DSL or mobile phone
- automated biogas plant start-up and shutdown
- easily retrofitted
- low effort, great benefit
- additional features such as automated malfunction alerts are also available
The Solution for Emergencies

In the event of a power failure, your biogas plant will grind to a halt, too. Moreover, power failures can lead to dangerous situations such as uncontrolled foam formation when mixing stops.

In order to prevent this and avoid unnecessarily disturbing your biology, PlanET offers the integration of an emergency power switch in your (existing) biogas plant. An additional switch is installed which can be used to switch your plant over to back-up power in the event of a power failure.

A small back-up power generator (approx. 21 kW) will then supply power to the agitator, air-supported roof, emergency flare stack and plant control unit. PlanET Biogastechnik’s product line includes a manual and an automatic module. With the manual module, the components to be supplied must be switched on by hand. The automatic back-up power module automatically recognises the need to switch over to back-up power and automatically controls the necessary biogas plant components with the plant control unit.

The Benefits at a Glance:
• easily retrofitted into virtually any control unit
• continued supply of the necessary components
• selection of manual or automatic back-up modules
PlanET Biogastechnik offers you complete technical containers as part of the modular SYSTEMBIOGAS. The use of this type of container reduces the construction time on site, meaning that the plant can be commissioned quickly.

The technical container is assembled in our in-house workshop in Vreden and contains precisely the components which you need to ideally run your biogas plant. The container is then shipped out and connected.

The container can easily be modified, retrofitted or converted for future expansion. The technical container supports the smooth operation of the plant. For instance, it makes for short line routes, simple heat distribution with low heat loss, as well as safe and weather-protected housing of the control cabinets.

The Benefits at a Glance:

- components are installed in the container at the workshop
- trouble-free connection to existing plant components on-site
- positive synergy effects thanks to standardised container variants
Technical Data & Information

3 m (10 ft.) Technical Container
- 3 control panels
- compressors

3 m (10 ft.) Technical Container
- pumping station
- compressors

6 m (20 ft.) Technical Container
- 3 control panels
- pumping station
- heating manifold (max. 300 kW)
- compressors

6 m (20 ft.) Technical Container
- 5 control panels
- heating manifold (max. 550 kW)
- compressors

6 m (20 ft.) Technical Container
- compact manifold
- compressors

12 m (40 ft.) Technical Container
- 5 control panels
- compact manifold
- heating manifold (max. 550 kW)
- compressors
The PlanET Separator offers a simple solution for utilisation of digestate. Quite often the separated liquid is recirculated and used for dilution of the substrates in the digester. The results are less crusting floating layers, and the dry matter content is reduced.

The separated solids of a biogas plant with healthy biology can be applied as a fertilizer. However, if the substrate is not utilised well, for example because of a short retention time in the digester, the re-use of the digestate may be useful. Therefore, the digestate is first stored in air under aerobic conditions to open cellulose and lignin structures through fungi. This process is not possible in the digester under anaerobic conditions, but these structures still contain energy that can be used. A third possibility is to ensilage the separated solids with fresh substrates. These usually produce seepage which is absorbed by the separated solids and can then be fed into the digester together through the solids charger.

**The Benefits at a Glance:**
- nutrient export from the operation
- prevents the need for an additional pasture lease
- improves fluidity in the digester
- no floating layers in the digestate storage tank
- less energy for mixing required
- reduces storage costs
Dry Gas is the Way to Go

Central gas drying is a must for biogas plant operators who have one or several CHPs at the biogas plant site or who want to feed their biogas to a satellite CHP via long-distance lines. The biogas has to be dried before entering the lines in order to reliably prevent condensate from forming in the gas transport lines. Condensation drying cools the biogas down to 3-4 °C. Cooling down the gas condenses the moisture in the gas. After the gas drying process, the biogas is compressed and cleansed of hydrogen sulphide by an active carbon filter. The biogas can then be reheated for long-distance transport, so that it doesn’t have to be condensed again. PlanET offers the gas drying system in sizes 160 m³/h, 300 m³/h and 500 m³/h. The containers have the advantage of minimising temperature fluctuations, and the active carbon filters have a long service life thanks to their great filter volume.

The Benefits at a Glance:
- fewer parts requiring maintenance
- low costs of operation and maintenance
- service conducted by PlanET
- minimises temperature fluctuations thanks to installation in the container
- the active carbon has a long service life thanks to its large filter volumes
- the active carbon is easy to replace
Combined heat and power plants (CHP) from 2G Energy AG have been proving their value for years through environmental friendliness and reliability, and ensure the profitability of your biogas plant through high efficiency. Engines of well-known manufactures find use in the series of agenitor® and filiUS® which are modified by 2G for higher electrical efficiency. In addition, there are Jenbacher CHP units which are installed in the series of avus® for proven technology.

High-quality and genuine components guarantee trouble-free and therefore cost-effective operation of the CHP unit. Since the thermal efficiencies are very high, 2G CHP units are ideally suited for projects with heat concepts such as the supply of hospitals, retirement homes, public buildings or your own farm with stables, digestate dryer or residential buildings.

**The Benefits at a Glance:**
- CHP available in a container or a engine room
- for special acoustic requirement the CHP is also available in a super-silent container or concrete acoustic enclosures
- Remote control technology for CHP monitoring and rapid problem solving
- 2G CHP units are independent of markets and suppliers as no additional ignition oil is needed
- 2G CHP have very high thermal efficiencies
- 2G Energy AG, a leading provider of CHP stands for constant innovation
### Technical Data & Information

<table>
<thead>
<tr>
<th>Type</th>
<th>Cylinder</th>
<th>Capacity in l</th>
<th>el. Power in kW</th>
<th>el. Efficiency in %</th>
<th>th. Power in kW</th>
<th>th. Efficiency in %</th>
<th>Total Combustion in kW</th>
<th>Biogas Consumption in m³/h (at 50 % CH₄)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FiliUS R06</td>
<td>6</td>
<td>6.87</td>
<td>75</td>
<td>38.0</td>
<td>89</td>
<td>45.2</td>
<td>197</td>
<td>33.0*</td>
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<tr>
<td>FiliUS 106</td>
<td>6</td>
<td>6.87</td>
<td>100</td>
<td>38.0</td>
<td>121</td>
<td>45.8</td>
<td>263</td>
<td>44.0*</td>
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<tr>
<td>FiliUS 206</td>
<td>6</td>
<td>12.82</td>
<td>150</td>
<td>38.2</td>
<td>179</td>
<td>45.6</td>
<td>393</td>
<td>66.0*</td>
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<tr>
<td>Agenitor 306</td>
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<td>250</td>
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<td>43.5</td>
<td>610</td>
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<tr>
<td>Agenitor 212</td>
<td>12 V</td>
<td>21.93</td>
<td>400</td>
<td>40.1</td>
<td>445</td>
<td>44.6</td>
<td>998</td>
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<tr>
<td>Agenitor 312</td>
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<td>21.93</td>
<td>450</td>
<td>40.6</td>
<td>469</td>
<td>42.3</td>
<td>1,108</td>
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<tr>
<td>190 BGG</td>
<td>6</td>
<td>12.82</td>
<td>190</td>
<td>38.7</td>
<td>218</td>
<td>44.4</td>
<td>491</td>
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<tr>
<td>Avus 500a</td>
<td>12 V</td>
<td>29.20</td>
<td>527</td>
<td>41.1</td>
<td>534</td>
<td>41.7</td>
<td>1,282</td>
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</tr>
<tr>
<td>Avus 500b</td>
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<td>637</td>
<td>40.4</td>
<td>675</td>
<td>42.8</td>
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<tr>
<td>Avus 800b</td>
<td>12 V</td>
<td>36.66</td>
<td>889</td>
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<td>875</td>
<td>41.4</td>
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<tr>
<td>Avus 1000b</td>
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<td>48.80</td>
<td>1189</td>
<td>42.1</td>
<td>1166</td>
<td>41.3</td>
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<tr>
<td>Avus 1500b</td>
<td>20 V</td>
<td>61.10</td>
<td>1487</td>
<td>42.2</td>
<td>1458</td>
<td>41.3</td>
<td>3,526</td>
<td>588.0*</td>
</tr>
</tbody>
</table>

*at 60 % CH₄
Biogas Flare

Burn in Case of Emergency

PlanET offers manual as well as automatic biogas flares.
For the operation of a manual gas flare the shut-off valve must be opened and the flame must be ignited manually with propane.
Optionally, there are automatic flares which can be started with an external command, e.g. through a signal triggered by the level of the gas storage. Here, the opening of the gas pipe occurs via an electrical actuated quick-closing valve. Afterwards the flame is ignited automatically and monitored with a UV-sensor.
The fan is connected upstream, so that reliable consumption is entirely possible, even under adverse weather conditions. The PlanET biogas flare is activated and deactivated automatically using external signals or internal pressure switches; the start-up process in accordance with EN 746 assumes the EN-approved burner control.
We are happy to assist you with choosing your flare to drive your biogas plant securely.

The Benefits at a Glance:
- automatic or manual activation and deactivation
- can be operated as a self-sufficient system thanks to integration into a separate gas take-off line
- no under pressure in the system, fewer CHP failures
- flare can still be operated in the event of a power failure if a back-up power generator is on hand
- under pressure guard in the flare’s safety chain
Technical Data & Information

Manual Biogas Flares

<table>
<thead>
<tr>
<th>max. Gas Throughput in m³/h</th>
<th>60</th>
<th>120</th>
<th>200</th>
<th>350</th>
<th>500</th>
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<tbody>
<tr>
<td>Gas Flow Pressure in mbar</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
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<tr>
<td>Methane concentration in %</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>max. firing in kW</td>
<td>300</td>
<td>600</td>
<td>1.000</td>
<td>1.750</td>
<td>2.500</td>
</tr>
</tbody>
</table>

Sizes

- gas connection to gas fittings route: DN 50, DN 80, DN 100, DN 125, DN 150
- overall height in mm (top of foundation): 5.280, 5.310, 5.410, 5.340, 5.420
- Fire tube length in mm: 1.300, 1.300, 1.250, 1.250, 1.300
- Fire tube diameter in mm: 500, 500, 500, 500, 500

Combustion conditions
- exhaust gas temperature: 600-800 °C
- semi-concealed combustion, visible flame

The manual gas flare consists of a flame protection tube, a mixing tube, the flare base frame, the gas line with flame trap and the manual shut off valve as well as an emergency ignitor lance. In addition, the automation of this flare is possible.

The automatic flare is made up of a burner and a stainless steel flare tube, a hot-dip galvanised stand console, gas fan, gas valve line, ignition device and switching system; weather protection housing is available as an option.

Automatical Biogas Flares

<table>
<thead>
<tr>
<th>max. Gas Throughput in m³/h</th>
<th>40</th>
<th>75</th>
<th>150</th>
<th>300</th>
<th>500</th>
<th>750</th>
<th>1.000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gas Flow Pressure in mbar</td>
<td>35</td>
<td>35</td>
<td>35</td>
<td>35</td>
<td>35</td>
<td>35</td>
<td>35</td>
</tr>
<tr>
<td>Methane concentration in %</td>
<td>55</td>
<td>55</td>
<td>55</td>
<td>55</td>
<td>55</td>
<td>55</td>
<td>55</td>
</tr>
<tr>
<td>max. firing in kW</td>
<td>415</td>
<td>450</td>
<td>825</td>
<td>1.650</td>
<td>2.750</td>
<td>4.125</td>
<td>5.500</td>
</tr>
</tbody>
</table>

Sizes

- gas connection to gas fittings route: DN 40, DN 40, DN 50, DN 80, DN 100, DN 125, DN 150
- overall height in mm (top of foundation): 4.000, 4.000, 4.500, 5.000, 5.500, 7.000, 8.000
- Fire tube length in mm: 1.000, 1.000, 1.000, 1.500, 1.500, 2.000, 2.500
- Fire tube diameter in mm: 350, 350, 400, 500, 800, 900, 1.000

Combustion conditions
- exhaust gas temperature: 800 °C
- semi-concealed combustion, visible flame (concealed combustion upon request)
- incl. flame view protection tube

Switching system
- Electrical cabinet made of plastic, including operation/malfunction display on burner control unit
- Power supply via CEE electrical outlet (back-up power generator connected for emergency power operation)
The planning application of a biogas plant needs different steps in each country, different requirements must be respected depending on the country. Therefore, PlanET provides all supporting documentation for the planning that is needed.

The supporting documentation includes the provision of drawings as well as the block plan and the floor plans. Moreover, data sheets and technical details are provided to give detailed information about the different components included into the biogas plant. We are also open to visit the planned site of the biogas plant before supporting the documentation.

The Benefits at a Glance:

- Site visit upon creating supporting documentation
- Provision of drawings and data sheets
PlanET proposals for the planning application include:

- Location Plan
- Site Plan
- Block Plan
- Elevation (four directions)
- Floor Plans
- Roof Plans

PlanET supports the following data sheets and technical details:

- Solid Charging System
- Overfill Protection
- Leak Detection
- CHP Units
- Instrumentation and Safety Equipment

Please note that the scope of services might vary from country to country. Our consultants would be pleased to advise you on details.
Providing a technical service, of professional standard, has a price, but the investment quickly pays for itself. For the biogas plant to run smoothly, with little downtime, it is absolutely crucial that the plant components work perfectly.

PlanET offers technical service:
- on a one-stop basis: PlanET employees know how the entire biogas plant works. Since we are the service partner of 2G Energy AG and of SCHNELL Motoren AG, PlanET takes care of the maintenance and repairs of the aggregates
- at any time: our service hotline is available 24 hours a day, 7 days a week. Our service team will help you to fix the breakdown or will be on site within a few hours
- anywhere: PlanET has service branches throughout the UK, Germany, France, Canada and Italy, so that we can reach your biogas plant even more quickly in the event of a breakdown

Our clients have differing demands, so we have developed a range of service agreements

The Benefits at a Glance:
- a one-stop technical service available anytime, anywhere
- greater returns thanks to less downtime and increased efficiency
- long life expectancy of the plant components and therefore of the entire biogas plant
Basic-Service Contract:
• PlanET takes care of scheduled maintenance for the entire biogas plant or individual components, for a fixed annual charge (with monthly instalments)
• travel to the site is included in the price
• a 24/7 emergency service is provided
• repair work and troubleshooting will be charged on material and labour basis
• spare parts used will be invoiced

Full-Service Contract
• PlanET takes care of scheduled maintenance for the entire biogas plant or individual components, for a fixed annual charge (with monthly instalments)
• travel to the site is included in the price
• a 24/7 emergency service is provided
• repair work and troubleshooting are included in the price
• replacement parts used are included in the price
• you know the exact cost – regardless of the work that has to be carried out on your site. This means that from the outset you can calculate exactly what you will have to pay, and you will also be more secure

Of course all services can also be ordered separately. We also supply spare parts, components and equipment.

Milestones for perfect utilisation:
• very low energy consumption
• good & fast full service
• specific biological support
• operator training
• innovative solutions
• robust and well-engineered technology
• years of experience in plant construction
The tanks and technology aren’t the only factors for successful plant operation. The actual players are the microorganisms which get the biogas process in gear. Samples are analysed and evaluated every day at the PlanET process laboratory. The results form the basis for optimal plant operation and quick commissioning. PlanET conducts the following examinations for you:

**Standard Analytics:**
- pH values (hydrogen ion concentration)
- EC value (electrical conductivity, salt content)
- VOA (volatile organic acids)
- TAC (buffering capacity)

**Additional Analytics:**
- Acid sample determination (acetic acid, propionic acid, butyric acid, isobutyric acid, valeric acid, isovaleric acid, caproic acid)
- Dry matter
- Organic dry matter
- Ammonium-nitrogen (NH₄-N)
- Inhibition test

**Digestion Substrate Examination:**
- pH value determination, dry matter content and organic dry matter determination and gas yield calculation
- Digestion test in accordance with VDI 4630 (duration: 4 weeks)
- Calorimetric yield rate determination

**Complementary Materials for Process Support:**
- Substrate S (mineral materials)
The Biological Process

It depends on the mixture:
The fluid enzyme product MethaPlus® L100 is an especially developed enzyme mixture which provides for an optimum substrate reaction in the biogas process. The enzyme activities contained in MethaPlus® L100 verifiably improve the degradation of polysaccharides (multiple sugar) which are difficult to decompose. With this, the viscosity of the substrate can be reduced and the gas yield can be increased.

Service-Contract Biology:
• PlanET regularly takes substrate samples and analyzes them in our own laboratory
• based on the analysis PlanET proposes any optimization and helps you to implement them
Produce Your Own Natural Gas

Treating biogas and feeding it into the natural gas grid considerably increases your degree of utilising the raw biogas, thus upgrading the overall efficiency of your biogas plant.

- Biomethane is flexible: New possibilities in the heat and fuel market
- Biomethane uses the existing infrastructure: Biomethane can be transported efficiently to the consumers via the natural gas grid
- Biomethane stabilises the energy system: It compensates for fluctuating renewable energies (such as wind and solar power) by producing energy from biomethane as required

That’s why feeding in biomethane, in addition to new construction projects, is also ideally suited for repowering projects or expanding existing biogas plants. In the process, a wide variety of business models makes it possible to enter into value creation with organic natural gas.

PlanET will provide you with independent consultation for selecting the right method, develop the business model that suits you best and bring strong project partners together. PlanET Biogastechnik has pursued the development steps in the field of biogas from the very outset and has thus succeeded in establishing a valuable and impartial information network of important contacts in the industry over the past years.

**The Benefits at a Glance:**
- continuous observation and analysis of relevant developments in the industry
- project-related, individual and site-specific concepts
- impartial, independent information network
- direct, personal contacts to technology leaders
- everything from a single source – from planning all the way to implementation
- plant tours upon request (national and international)
Several different methods are available for refining biogas to natural gas quality (methane enrichment). The following table shows the individual methods and their action.

<table>
<thead>
<tr>
<th>Method</th>
<th>Separation Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical washing, such as pressure water scrubbing, Genosorb washing, etc.</td>
<td>Dissolution of CO₂ in water or organic scrubbing solution</td>
</tr>
<tr>
<td>Chemical scrubbing, i.e. with monoethanolamine (MEA scrubbing)</td>
<td>Chemical reaction of CO₂ with MEA</td>
</tr>
<tr>
<td>Pressure swing adsorption (PSA)</td>
<td>Adsorption of CO₂ with a carbon molecular sieve</td>
</tr>
<tr>
<td>Membrane separation method</td>
<td>Greater membrane permeability with CO₂ than with CH₄</td>
</tr>
<tr>
<td>Low temperature separation (cryo-separation)</td>
<td>Phase separation of liquid CO₂ and gaseous CH₄</td>
</tr>
</tbody>
</table>

Source: Deutsche Energie-Agentur GmbH (dena) http://www.biogaspartner.de

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**Technical Data & Information**

You want to know more? Please ask for our biomethane brochure!
In 2011, the Münster University of Applied Sciences evaluated 23 PlanET biogas plants in order to be able to make statements on the efficiency of existing PlanET plants in the performance range between 180 and 500 kW with a wide variety of substrate mixtures.
PlanET Vario: 100 % Likelihood to Buy Again

A current survey conducted by the German open Business School in Ahaus made it clear: The modular expandable all-rounder received the top marks. The survey asked about fields of daily use, such as satisfaction in terms of the processing of the input materials, maintenance-friendliness and energy consumption. Over 88 percent responded to the question, “How satisfied are you with the Vario on the whole?” with “satisfied” or “very satisfied.” All respondents even said that would “probably” or “very probably” decide to by the PlanET Vario again.

Number 1 in Biogas

PlanET Biogastechnik scored the best overall results of all plant manufacturers in Germany’s largest biogas survey to date, conducted by the agricultural journal profi (starting with the 10/2008 issue). More than 9 of 10 of the operators asked said that they would buy their biogas plant from PlanET again. 2,580 operations in total were contacted for the survey in the spring of 2008. This is equivalent to about 70% of the biogas plants installed at that time.

Based on an above-average return rate of 25% (631 questionnaires), the respondents surveyed provided the first representative data on the quality standards in German biogas plant construction. In addition to very good test results for PlanET in the fields of service and customer satisfaction, the total of 130,000 individual data items recorded also indicate above-average results for the categories mixer, digester, plant control, pump technology, processing and maintenance.

The surveys of our customers are conducted on a regular and manufacturer-independent basis in order to steadily refine plant technology in a user-oriented manner. It’s not without reason that PlanET Biogastechnik’s quality is above average – what this ultimately means for our customers is durability, wear resistance and low internal power consumption.