Product overview

www.planet-biogas.com

Biogas. The Future = Your Benefit

1998 - 2018: 20 years of success in biogas

The PlanET Group is one of the world's leading biogas plant construction companies. This is no accident, because one thing sets us apart from many competitors – and that is our own product development. Of course, we also offer planning, approval application, plant construction, technical support, plant service, CHP service and biological service – all from a single source.

We are your partner in all areas of biogas production: from the agricultural biogas plant to the industrial plant for waste recycling. For biogas utilisation, we offer CHP and biomethane processing.

But we are not just concerned with building new plants for renewable energy, we also generate new energy through repowering. With the aid of modular components, we can help you achieving cost-effectiveness and optimum efficiency for your existing plants.

When it comes to choosing a component or building a new biogas plant of PlanET

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wherever you are located, over 150 employees will be at your side, with more than 20 years experience of constructing more than 450 biogas plants - generating several megawatts of power. This is our contribution to your success.

PlanET: Success in Figures

- Over 450 Biogas Plants Worldwide
- More than 180 Employees
- 5 International Locations
- 20 Years of Experience
- Various Awards

Desulphurisation System

PlanET eco® coverG 24

Air-Supported Roof System

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Gas Management

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Biogas plants

Agricultural plant

SAS Methalys | GAEC de la Croisière

Electricity, heat or biomethane - biogas has many advantages. Farmers use biogas to supplement their declining revenue from food and fodder production by feeding electricity into the public grid. If the agricultural biogas plant can be built close to settlements, it is advisable to develop local heat supply concepts and supply the residents with „green“ energy. The added value from biogas production remains in the region and creates new jobs. A good example is the award-winning project from the Thuringian community Schlöben, which aimed at heating its buildings in a climate neutral, regional and independant manner. Since 2011, the energy has been supplied by the biogas plant of a cooperative, which has brought together citizens of the town,a local agricultural holding, county and municipality as well as business enterprises. 90 of the almost 190 households, the elementary school and kindergarten, the gym and the community center are connected to the heating network. Commercial real estate and agricultural buildings also use the environmentally friendly energy. The biogas plant is located on the farm of Matthias Klippel, whose cattle manure and slurry, as well as silage maize produce biogas for three CHPs with a total power of 795 kW. Matthias Klippel is very satisfied with the results from the plant: “We produce 18,000 kWh of electricity per day which we feed into the grid. The heat produced is sufficient to cover a thermal demand of 500 kW.“ In addition, the parasitic consumption is with four to five percent even below the estimated value. With the result that energy costs of approximately €250,000 now remain in the region.

Advantages at a glance

- Generate additional revenue with power supply
- Cost reduction/savings due to self-supply with heat
- Residents can be supplied with „green“ energy

PlanET VALENTIN

BGA SARL Novalait

When PlanET developed VALENTIN they created a compact biogas plant for livestock farms (e.g. 280 head of cattle; alternatively 500 pigs) with a high slurry percentage. The small biogas plant is based on PlanET's years of experience in the planning and construction of biogas plants. It is in no way inferior to its larger relatives. VALENTIN opens numerous different revenue sources – for agricultural operations, part-time farms or bio-businesses. VALENTIN was developed as a modular construction and features a high level of prefabrication, which significantly reduces the construction time (2 weeks on existing floor panels) and at the same time, offers the possibility of the customer's own input. The construction is special: PlanET uses stainless steel instead of concrete. The non-corrosive material makes it a reliable partner in agriculture. Another advantage of the plant is that in addition to a fixed time and capital plan there is a low space requirement (max. 350 m3), with the result that operation of the plant is also possible when there is limited space on the farm. Income can be planned with PlanET VALENTIN: Our little power package PlanET VALENTIN creates long-term and secure revenue sources based on diverse revenue options, such as the proceeds from electricity and heat or as applicable CO_2 certificates.

Advantages at a glance

In addition to the advantages of a 75kW biogas plant, the VALENTIN plant is characterised by:

- Quick and easy installation / commissioning thanks to high degree of prefabrication. (Modular system)
- Value stable constructions
- Reduced heat demand thanks to floor and gas storage insulation
- Leasing capability

Prefabricated components for a short construction time and fast commissioning:

- Stainless steel digester: 16.5 m / 19.5 m diameter, 3 m height, net tank volume approx. 590m³ / 900 m³
- Stainless steel components with insulation and PP plastic sheeting
- Large-blade agitator (PlanET eco stabmix 15 kW)
- Insulated air supported roof and air blower
- Overfill protection, inspection window, substrate pipe, substrate extraction pump
- Standardised piping system and safety devices
- Process control
- CHP and gas treatment (including activated carbon filter, flare)

VALENTIN completely packed on a transporter

Agitator

Container with insulation

Finished VALENTIN

75 kW plant

BGA Bramert | BGA Dehling

Are you planning additional barn construction steps? Do you need additional storage space due to the fertilizer ordinance? Is the transition to organic farming an option? Then integrate the concept of a biogas plant into your plans. Biogas plants with an installed performance of 75 kW rank among the most attractive investments in the renewable energy sector from an economic perspective, and are highly environmentally friendly as well. These plants are particularly profitable when operated with a high percentage of slurry and dung. We take into account the limited work time in livestock farms with our tried and tested 75kW biogas plant concept. Entry into biogas technology is well worthwhile for a number of agricultural businesses: the marketing of electricity and the use of valuable heat means secure revenue for your business. You can successfully address market-related factors such as the fluctuating milk and raw material prices, or the changes in the fertiliser ordinance.

Advantages at a glance

- Safe income for compensating fluctuating milk prices
- Improved nutrients availability for plants of slurry and manure
- Cost savings through reduced use of chemical fertiliser
- Fermentation residues can be spread more homogeneously
- Low odour emission of the digestate
- High degree of automation, therefore only little workload
- Low parasitic consumption
- Robust components and proven design
- High overall efficiency
- Use of heat for heating barns or residential buildings

Biogas plants

Industrial plant

Singleton Birch front view | aerial view

The PlanET Biogas Group has a wide range of experience in designing tailor-made solutions for each client. The motivation for building a biogas plant can be driven by several factors, e.g. the need for thermal energy, electricity, the requirement to utilise and pasteurise certain waste or industrial by-products. One of PlanET's biggest clients is the British lime quarrying company Singleton Birch in Lincolnshire. Singleton Birch decided to build a biogas plant with a 2 MW installed electrical power as part of a commitment to control energy costs, lower carbon footprint and reduce reliance on grid electricity. Richard Stansfield, Managing Director, comments on the decision to invest in this technology: „Quarrying is a hugely energy intensive sector. We spend on average 10 million pounds a year on energy. In order to reduce those costs and limit our environmental impact ...using crops and on-farm waste to produce electricity seemed to be the most logical solution." Looking back, Martin Haworth, Technical Director at Singleton Birch, is happy to have chosen PlanET as technology provider: „Since commissioning began in March 2014 things have gone remarkably smoothly. The plant was delivered on time, on budget and has been running very well." In the meantime the capacity has been increased to 3 MW by two additional biogas plants. Today our power requirements are covered 100% by biogas.

Advantages at a glance

- Operating cost reduction through self-power supply possible
- Tailored concept
- Proven technology
- Interfaces with extended business; earthwork improvement

Success Story: Singleton Birch

Singleton Birch is a Lincolnshire based lime business with nearly 200 years' experience in one of the oldest industrial processes; quarrying. As part of a commitment to control energy costs, lower carbon footprint and reduce reliance on grid electricity, the company is embracing one of the latest and greenest agricultural technologies: electricity production from biogas. For Managing Director, Richard Stansfield, a small green area amidst the chalky white landscape of the quarry symbolizes the company's future. Commenting on the decision to invest in biogas technology he said: "Quarrying is a hugely energy intensive sector. We spend on average £10-million a year on energy. In order to reduce those costs and limit our environmental impact we considered various options for generating our own energy. However, we were looking for something we could control and given our location in a largely agricultural area, using crops and on-farm waste to produce electricity seemed like the most logical solution". Another positive part of the project has been the cooperation with nearby farmers who provide the agricultural input material for the plant, which includes poultry manure, maize, silage, vegetable waste, potato peelings and sugar beet silage. All of which are fed into 6m high and 25m wide in-situ concrete tanks via a PlanET Vario with additional loosening auger (muck and grass version). In addition to this, grass cuttings from the nearby Humberside Airport are regularly added to the feeder. Together with water, the material is digested and the resulting biogas is used to fuel eight 250 $kW_{el.}$ CHP units. The biogas is desulphurised by the PlanET eco® cover, a close-meshed fabric, which is installed beneath the double membrane roof (PlanET Flexstore). In the final step of the process, the digestate is separated to reduce the required storage capacity and make transportation easier.

The substrate is used as fertilizer by the local farmers to spread on their fields. With substrate requirements matching the farmer's crop rotation it is a win-win scenario for all and the basis for long-term cooperation between the industrial and agricultural parties. Commenting on PlanET's involvement, Stephan Hoffmann, UK Sales Manager said: "We knew when the facility was expanded just a few months after commissioning that this would become a long-term project, with the final set up still to be achieved. During our 16 years of building plants and delivering a biological service from our own laboratory we have developed the expertise and knowledge to design plants for long-term operation, even with slight changes in substrate". "Since Singleton Birch was first commissioned we have added six CHPs, a slurry tank, a secondary digester, 1.5MW dryer and prepared for the addition of a glycerine inlet. This is our fifth biogas plant in the UK and it's certainly one we are very proud to be a part of."

Biogas plants

Waste-to-Energy plant

Lethbridge in Canada

The digestion of waste can complete a circle of raw materials based on food production or food waste management. Waste is used for the production of biogas as a substitute fuel for the generation of electricity and heat - such a biogas concept provides double profit for its plant owner. PlanET Waste to Energy biogas plants can convert almost all biogenic waste materials into energy: slaughterhouse waste, fish processing residuals, animal carcasses, expired food or off-specification batches used in food production as well as agricultural residues, fats and oils. Especially in the food industry, anaerobic digestion offers significant cost advantages over traditional disposal methods - both to waste management companies and producers alike. The electricity and heat can be used in their own production facilities to make them independent of rising energy costs.

Advantages at a glance

- Sustainable energy production from waste
- Use of local energy resources
- Reduction of CO2 emissions
- Reduction of fossil fuels on the market
- Reduction of waste flow
- Autonomous energy supply of a region
- Additional income through tipping fees possible

Success Story: Buschhaus

An entrepreneur from Düsseldorf recognized ten years ago that biogas production and waste treatment are complementary. Since he has turned his idea of a lasting utilization cycle, something has done itself on the farm of Hans-Gerd Buschhaus. From the beginning, it was clear that Hans-Gerd Buschhaus' planned biogas plant would utilize food waste. This idea was very progressive for 2001. A biogas production solely on the basis of secondary raw and residual materials – with no energy crops whatsoever? Is this profitable? The economically- thinking farmer from Grefrath, along with his son Andre Buschhaus, has realized his vision and can now look back at more than 14 years of successful operation. The cooperation with a local waste management enterprise in 2013 was an initiative of his son Andre, providing savings for long-term economic success. A variety of food waste from canteens, restaurants and food markets is delivered by truck. A storage facility is used for receiving and temporary storage of the delivery until the mechanical processing. Up to 1, 000 tons monthly is directed into the depackaging machine. The depackaging machine operates approximately four to eight hours daily, reports Andre Buschhaus. This machine reliably separates the digestible content from other packaging components, thereby speeding up their process. The operator proudly reports that" extraneous material is barely existent". After pasteurization, the residue materials are supplied to the fermentation process. As the pasteurizer works at up to 70 degree Celsius the residue materials can be used as high-grade fertilizer. But why does he operate such a machine like this? The operator explains the choice to use this technology: "From the beginning we were a part of a big supply chain of the waste logistic sector, and the origin of the input materials of our biogas plant wasn't always known. In addition, we had extreme variations in quality of the material, most of the delivered batches were defatted before. This had a negative effect onf the gas yield, and therefore the whole efficiency of the biogas plant. To be able to guarantee a better control of the utilization cycle, we decided to invest in depackaging technology." The ability to process packaged food in this way has allowed the owners to begin receiving larger quantities, in the form of palette loads. The development of the partnership with the local waste management companies has been very successful over the years. From Drehkopf GmbH & Co. KG they obtain additional waste, which is much closer in location, allowing for higher efficiency, more climate protection and added value to their region recycling program.

Biogas plants

Biomethane plant

PlanET Biomethane

By processing and then feeding biogas into the natural gas network, you will considerably increase the rate of utilisation of the raw biogas and thus increase the overall efficiency of your biogas plant.

PlanET Biogas relies on selected methods for the processing of biogas to natural gas quality, which can be delivered as turnkey installations. In doing so, the customer's specific requirements are taken into account, as is the case with all of our biogas plants, and the system is configured to run economically and efficiently to the highest standards. Biomethane is flexible and offers new sales opportunities, for example in the heat and fuel market.

- Biomethane can be transported efficiently to the customers via the natural gas network, within the existing infrastructure.
- Biomethane stabilizes the energy supply: compensates for fluctuating renewable energies (eg wind, sun) via a demand-driven electricity generation from biomethane

This is why the feeding of biomethane into the grid is highly recommended for RePowering projects or as an extension to existing plants just as much as for newly built plants. Thus, various business models can introduce added value by producing biomethane. PlanET will advise you independently.

We will help you to select the right processes, develop the business model to suit your needs and bring you together with strong project partners.

Procedures	Separation principle
Physical washing (e.g. pressurised water wash, genosorb wasing, etc.)	CO_2 is dissolved in water or organic wash solution
Chemical treatment (amine scrubbing)	Chemical reaction of CO_2 with MEA
Pressure swing adsorption (PSA)	Adsorption of CO_2 via a carbon molecular sieve
Membrane separation processes	Permeability of CO_2 membrane higher than for CH_4
Low temperature separation	Phase separation of liquid CO_2 and gaseous CH_4

Advantages at a glance

- Consulting independent of process and manufacturer
- Individually tailor-made project design to suit specific location
- Everything from a single source: from planning to implementation

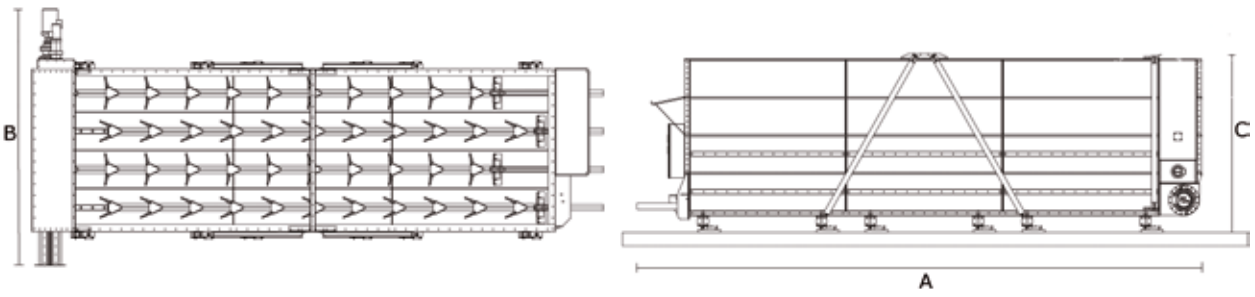
PlanET Vario

PlanET Vario | Variable substrate preparation. Rotacrex, flush-through or screw-conveyor | Inside view

With the PlanET Vario feeder, chopped renewable materials, solid manure, left-over feed, as well as solid co-ferments can be transported directly into the digester. This modular system offers containers ranging from 11 to 120 m³, which can also be extended later. The system works with the Vario conveyor system, which is particularly energy-saving and robust. The conveyor tracks are made entirely of stainless steel, individually driven and fitted with side flaps, so that the substrates can be effectively transported. A loosening roller is installed at the front, which conveys the substrate evenly to the auger – ensuring that optimum filling is achieved. The Muck & Grass kit plus, consisting of a second loosening roller, ensures the smooth processing of 100% dung or grass. As a result of positive feedback from customers, combined with the 100% likelihood of repeat purchases PlanET Biogas offer a 5 year warranty on conveyor blades for the PlanET Vario.

Advantages at a glance

- Conveyor system made entirely of stainless steel with plastic in the substrate area
- Basic module is made of stainless steel; with the option of all modules stainless steel
- Safe investment for the future thanks to expandable modular system
- Highly reliable and robust components
- Easy to service, components can be shut down individually
- Low energy requirements, starting at 0.6 kWh/t (including control technology)



Technical Details

General Data	Vario compact		(other sizes available upon request)						
Volume of feeder tank in m^3	11	16	21	28	38	50	55	74	120
Own weight in t	2.9	3.6	4.4	4.8	6.5	7.0	8.0	8.8	12.4
Acceptable load in t (depending on equipment package)	6	8	16	21	28	38	41	56	90
Dimensions									
Length (A) in m	4.66	4.66	4.66	4.66	7.59	7.59	10.5	10.5	13.4
Width (B) in m	3.57	4.27	4.97	4.97	4.97	4.97	4.97	4.97	5.67
Height (C) in m	2.45	2.45	2.45	3.15	2.45	3.15	2.45	3.15	3.15

Feeder System	PlanET Vario Conveyor System
	• Individually hydraulically driven conveyor elements • Side flaps for efficient transport • Hydraulic electronic switch • Loosening auger 1.5 kW
Control System	Control Cabinet with Industrial PLC
	• Connection-ready • Manual and automatic operation • Interfaces for operating messages and remote start (ProfiBUS possible)
Further Advantages	
	• Expandable thanks to modular design, up to 120 m^3 • Safe operation • Optimale clearing of residues, even with difficult materials
Extras (optional)	
	• Possible to have complete unit in stainless steel • Weighing scales with large-format display • PlanET Vario Muck & Grass Plus with 2nd roller for up to 100% dung or grass • Rain cover

Transport System (more on p. 9)	**MultiRotor 360**	**MultiRotor 450**	**eco® flow**
	Renewable raw materials, WPS up to 70 % dung and grass	Renewable raw materials, WPS up to 100 % dung and grass	Renewable raw materials, WPS up to 100 % dung and grass, pumpable substances, feeding several tanks
Throughput (Note bulk weights)	up to 15 m^3/h	up to 30 m^3/h	up to 20 m^3/h

PlanET MultiRotor

PlanET MultiRotor individually configured

The PlanET MultiRotor is available in various sizes. However, when it comes to feeding the digester, a vertical-climbing auger is usually the best option. The advantages are that the auger can be placed directly into the substrate and can be integrated into every system taking up the minimum of space. Sufficient motor power ensures that the system functions with up to 100% manure and grass. At the transfer points, the augers are close together to prevent clogging. Maintenance openings allow easy access to the equipment. Horizontal augers are lined with plastic as standard.

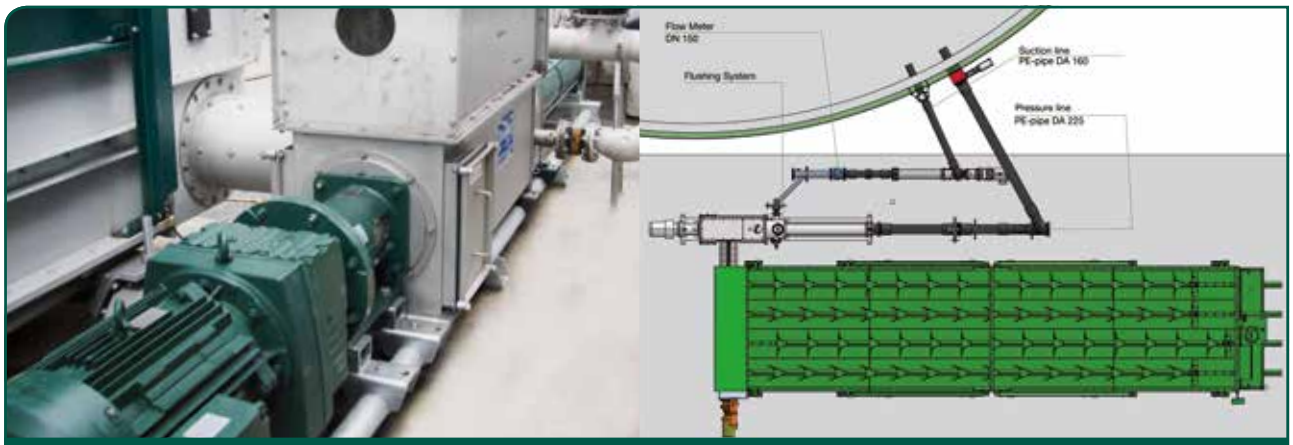
Advantages at a glance

- Reliable transportation thanks to auger configuration with screw-geometry
- Maintenance and inspection openings at all transfer points
- All augers that come in contact with substrate are made of stainless steel
- Transportation of the most difficult substrates
- ATEX-approved gear motors for use in hazardous areas
- Hard wearing due to vertical auger position

Technical Details

	MultiRotor Type 360	MultiRotor Type 450
Diameter of feed auger	280 mm	360 mm
Diameter of auger shaft	360 mm	450 mm
Flow rate (bulk density)	up to 15 m³/h	up to 30 m³/h
Daily throughput	up to 80 m³/day	up to 150 m³/day
Grain size	up to 40 mm	up to 80 mm
General fiber length	up to 100 mm	up to 130 mm

PlanET eco® flow



PlanET eco® flow | schematic drawing

The PlanET eco® flow is a liquid flushing system with a progressive cavity pump, designed for use with the PlanET Vario. This flushing through of liquids allows you greater flexibility when selecting substrate and enables better mixing of the tank contents. The mixing pump operates continuously while the feed pump has a rotation speed control so that the flow rate in the pipeline can be adjusted for a constant pressure flow.

The feed auger also has a rotation speed control to allow for variable solids feeding through the shaft. The PlanET eco® flow can be positioned remotely and is capable of feeding several digesters. This liquid flushing system is highly robust and has a long service life.

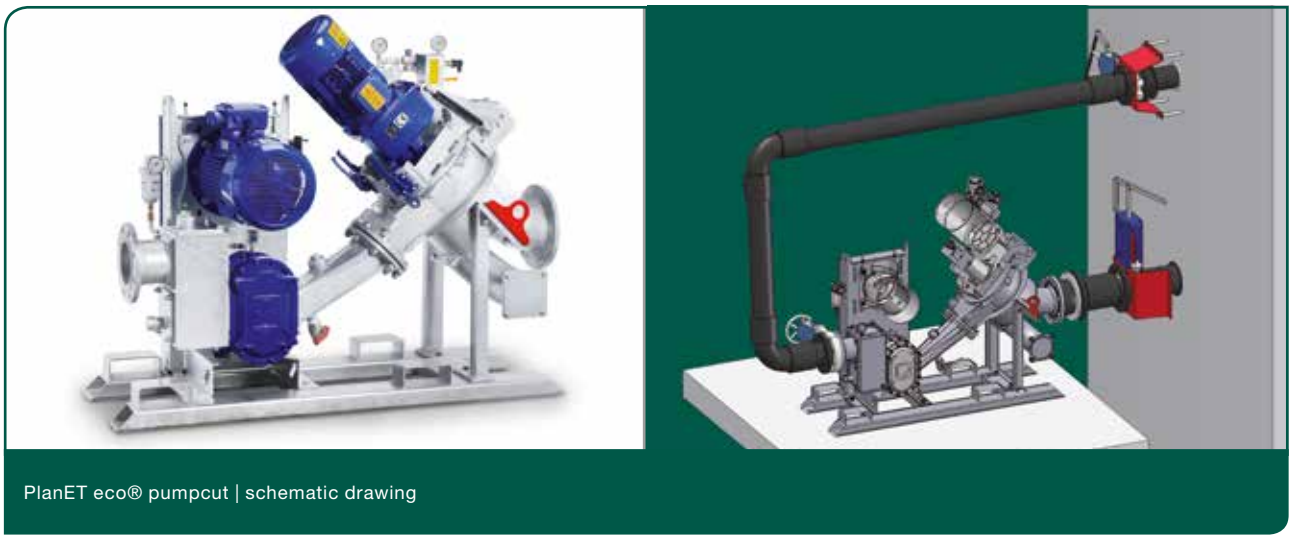
Advantage at a glance

- Liquid flushing systems with progressive cavity pump
- High flexibility in substrate selection
- Control & regulation from one source
- Low energy consumption
- Additional integration of shredding system possible

Technical Details

	PlanET eco® Flow 125.1 HD	PlanET eco® Flow 165.1 HD
Power input	18.5 kW	30 kW
Mixture throughput rate	40 m³/h	80 m³/h
Recommended total solids content	15% TS	15% TS
Throughput rate of solids in 1:3 mixture	10 m³/h	20 m³/h
Volume of solids daily	up to 80 m³	up to 150 m³
Maximum particle size	94 mm	124 mm

PlanET eco® pumpcut



PlanET eco® pumpcut | schematic drawing

The PlanET eco® pumpcut is a perforated disc shredder with an integrated separating container for stones, etc. The device is perfect for retrofitting and integration into your existing biogas plant and your individual application requirements. The rotary-piston pump, our tried and tested wet shredder, offers amazing opportunities for better energy efficiency and financial savings thanks to our new shredding technology and automatic cutting force control.

This compact unit consisting of stone collector, shredder and pump with adapted controls is highly reliable as the pump is protected from impurities by the upstream unit, which collects stones and removes foreign particles. This allows the shredding unit to operate uniformly through the downstream pump.

The cutting force of the shredding unit is adjusted automatically so that the knives chop evenly. When overloaded, the shredder is automatically put into reverse by the controls.

Advantages at a glance

- Highly reliable and stable
- Homogenisation of the digester material
- Separation of foreign particles, stone collector fitted beneath
- Additional pump protection
- Self-contained control unit for trouble-free operation

Technical Details

	PlanET eco® pumpcut
Flow Rate	up to 30 m³/h
Total solids content	up to 40 mm
Pre-shredding fibre length	up to 40 mm
Grain size	24 mm
Rotary piston pump drive power	7.5 kW
Power shredder drive power	5.5 kW

Digestion & Shredding Systems

PlanET Rotacrex

PlanET Rotacrex 750 in combination with PlanET Vario | Internal view | robust and service-friendly mallets

Substrate flexibility and cost reduction – two positive results from one intelligent product: The PlanET Rotacrex (750 or 1200) is a powerful and efficient substrate processing solution that can easily be integrated into existing biogas plants. Difficult substrate such as grass, straw or manure are efficiently crushed for optimal gas release, which results in a higher gas yield. It is therefore possible to integrate cheaper raw materials into the substrate mix without adversely affecting the gas yield. For you as an operator, this means: lower costs!

This powerful crushing technology has been proving its worth in the waste and food industry for many years. In particular, the experience gained from building-rubble recycling is paying off in terms of its tolerance for inpurities. The fact that the PlanET Rotacrex can be easily integrated into digester lines means that existing plants can be economically and ecologically re-powered.

cattle dung, untreated

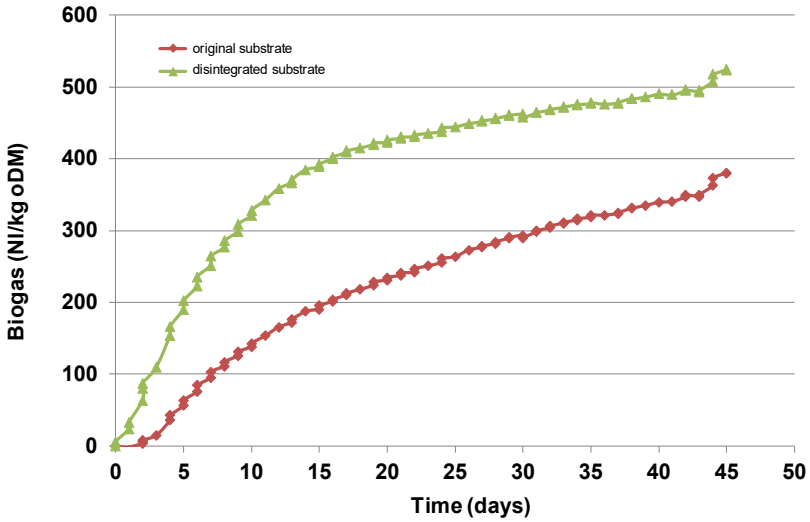
cattle dung, processed

Technical Details

	Rotacrex R750	Rotacrex R1200
Crushing chamber diameter x height	750 x 500 mm	1,200 x 1,200 mm
Drive power	45 kW	75 kW
Total weight	2,600 kg	6,500 kg
Rotation speed	1,200 rpm	1,000
Throughput (depending on the input material)	1 - 4 t/h	1 - 12 t/h

Digestion & Shredding Systems

General fermentation test with solid horse manure up to + 38 %



The amount of produced gas in this test (solid horse manure) is up to 38% higher.
Actual values depend on the degree of disintegration, substrate's characteristics and others.

Advantages at a glance

- Faster degradation of biomass
- Fast and higher gas yield
- Less substrate needed for same energy
- Less residuals due to better degree of degradation
- Smooth treatment of fibre-rich substrate
- Resistant to impurities
- Homogenous mixing within the digester
- Less creation of swimming layers
- Less energy consumption due to smoother pumping and mixing

Substrate Systems

PlanET eco® pumpmix

Efficient and tolerant of impurities: The PlanET eco® pumpmix unit is a centrifugal pump that can be installed in the pre-storage pit and is ideally suited to feeding the digester directly. Your main advantages:

- As the pump is installed at the lowest point it does not require any suction lift
- Pump is not susceptible to impurities and is suitable for fresh liquid manure
- Blockages avoided by means of substrate crushing via auger feed as well as direct transport to the pump impeller
- Optional installation of an agitator nozzle to eliminate floating layers in the pre-storage pit

Throughput rate is up to 80 m³/h.

PlanET Rotary Lobe Pump

Tried and tested and easy to maintain: rotary lobes are widely used, and the preferred choice for PlanET. Main advantages

- Maintenance-friendly with easy access to the rotary piston via the mounting cover - without disassembling the pipeline. ideal for inspection or exchange.
- Easy to change pumping direction
- Comparatively low cost

PlanET supplies pumps from 30 to 90 m³/h. Due to design, lobe pumps are used mainly for thin liquid substrates or shorter pipeline paths.

PlanET Progressive Cavity Pump

Higher pressures, longer service life: progressive cavity pumps can withstand higher pressures over long periods, and have a long service life. Their main advantages are:

- First choice for fiber-rich substrates, high viscosities (high TS content) or long pump paths due to higher pressures
- Longer service life
- Allows larger impurities to pass through

PlanET supplies progressive cavity pumps from 20 to 70 m³/h.

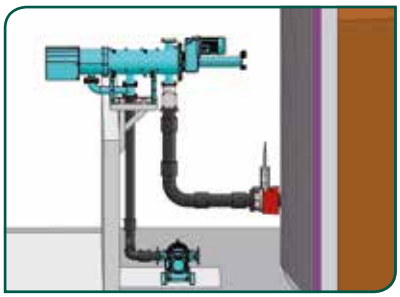
PlanET Separator

The PlanET separator has a seal on the discharge side which reliably prevents seepage. By means of the pump, which is connected to the filtrate side, the effluent (= filtrate) can be pumped directly back into the digester for dilution. It is also possible to connect a second tank (filtrate line into the digester or into digester storage). An independent system controls the interaction between the pump, pre-storage tank and the separator, including any shut-off valves.

PlanET Separator direct

Separator for direct connection to digester or secondary-digester. For a good feed to the separator, the height can be 1-4 m below the liquid level and the TS content can be up to 10%. The pipeline length must not exceed 4 m.

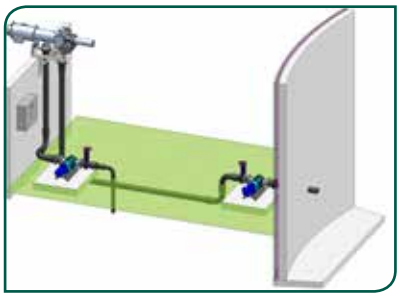
- Simple integration; 1m filling level
- Cost-effective
- Filtrate can be pumped into several digesters



PlanET Separator local

Separator for remote connection to the digester or secondary-digester. The substrate is fed to the separator via a controlled pump. Distances of more than 25 m are possible.

- Separation is possible directly at the lagoon
- Separation from several tanks is possible
- Tolerant of fluctuations in substrate



Technical Details

	RC30	RC 40
Input power	4 kW	5.5 kW
Throughput	up to 10 m³/h	up to 20 m³/h
Total solids content	up to 24%	up to 33%
Total solid content with optional post-pressing channel	not available	included
Standard mesh size	0.5 mm	0.5 mm
Integration	direct	direct (1 pump) or local (2 pumps)

PlanET offers two sizes which can be used "directly" or "locally" depending on the installation situation.

Advantages at a glance

- Robust technology and long service life
- Reliable sealing
- Transport via controlled filtrate pump with high throughput
- As pump is integrated no pump pit or lifting gear behind the separator required
- Remote conrol and visualisation of the controls possible
- Pump is protected against contaminants on the filtrate side
- Optional post-press channel for the production of secondary material

Mixing Systems

PlanET eco® Mixers

Replacing high-energy-consuming mixers with an energy-efficient model significantly reduces the power consumption of your plant. You will save as much as €10,476 per annum when you exchange a submersible mixer, with a power consumption of 13 kW for a PlanET eco® Mix with a power consumption of 7.5 kW based on 3,000 hours stirring time and an electricity price of 18 Cent/kW/h.

Advantages at a glance

- Optimum agitation of the substrate
- Fast and slow speeds
- Durable, energy-saving and hard-wearing

PlanET eco® mix

- Input power 7.5 kW
- High thrust 3,000 N
- 1.4 m blade diameter
- Height and lateral position fully adjustable
- Slow stirring speed to protect bacteria and avoid floating layers

PlanET eco® turbo

- Input power 5.5 kW (for installation in the pre-storage pit) and 13 kW
- Eliminates floating layers with the 2,500 N thrust
- Fast rotor with 87 cm diameter blade
- Flexible use; height and lateral position fully adjustable

Mixing Systems

PlanET eco® agitator

- Input power 17 kW
- Eliminates floating layers effectively with 2,500 N thrust
- Fast rotor, 80 cm diameter blade
- Flexible use, height and lateral position fully adjustable
- Economical mixer, for use in manure without fibers

PlanET eco® paddel

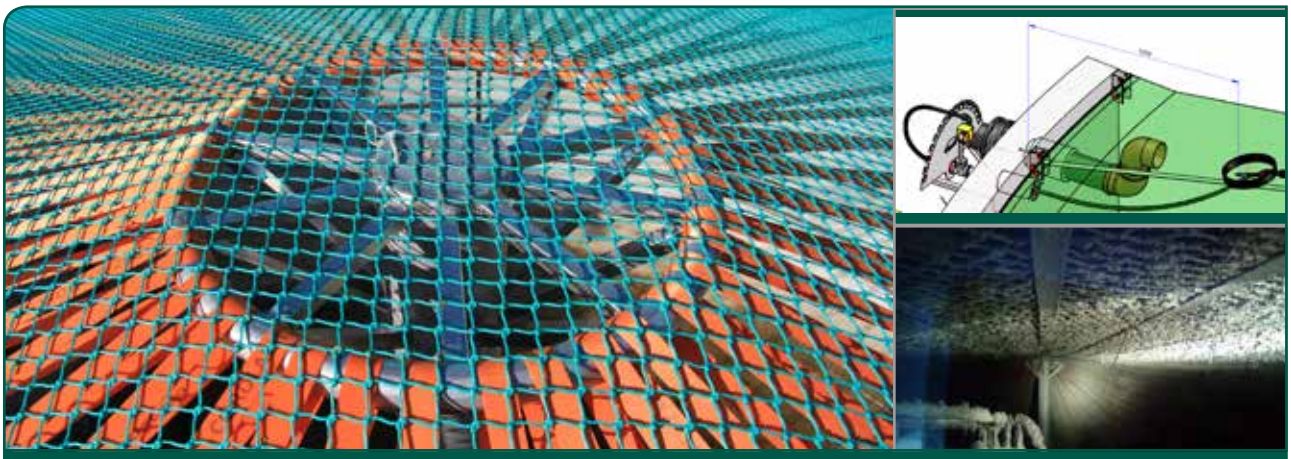
- Input power 15 kW
- Suitable for long-fiber substrates
- Low-speed rotor with a stirring diameter of approx. 4 m
- Angled paddles ensure optimum mixing and eliminate floating layers

PlanET eco® powermix

- Input power 22 kW
- Thrust forces of up to 10,000 N eliminate floating layers
- Slow rotor with a stirring blade diameter of 1.5 m
- Installation in the container wall allows easy adjustment of the inclination angle
- Easy maintenance without opening the air-supported roof

Desulphurisation System

PlanET eco® coverG and PlanET eco® jet



PlanET eco® coverG | PlanET eco® jet inside view | completely populated surface after inoculation with PlanET eco® jet (bottom right)

PlanET eco® coverG in combination with PlanET eco® jet is the new developed and improved desulphurisation system based on the positive experience of PlanET eco® cover and PlanET eco® cover plus which optimises the desulphurisation efficiency of the biogas plant by increasing the usable desulphurisation surface.

PlanET eco® jet enables a continuous nutrient supply during operation without any disruption. The nutrient solution is spread widely and covers a large desulphurisation area of PlanET eco® coverG. The wide meshes of the desulphurisation net (meshes 50x50x5) allows to inoculate the lower surface of the gas storage as well. Our improved desulphurisation system offers an additional living space for the bacteria to settle and to desulphurise the gas at the lowest possible cost.

Advantages at a glance

- Large desulphurisation area
- Simple and safe inoculation of desulphurisation surface
- Fast settlement of bacteria
- Nutrient supply during operation
- Continuous efficient desulphurisation
- Safe against overfilling and foam
- Simple service
- Uncomplicated access to desulphurisation net
- Tightening of straps possible
- Easy to clean
- Permeable to liquid

PlanET Flexstore XL | PlanET Flexstore XXL

PlanET Flexstore | Separate air circuits

One of the central technical components of demand-oriented electricity production is the gas storage. In particular, flexible operations with one or more CHPs require variable volume flow rates despite constant gas production. For this reason, gas storage facilities that allow variable gas filling levels are essential for participation in the ”balancing“ energy market. PlanET offers two advanced-technology solutions for operators: the PlanET Flexstore XL or XXL is a double-walled, air-supported roof which provides gas-tight cover, to the highest safety standards, for your digester or your digestion residue storage. The PlanET eco® gas battery is particularly suited to existing plants that do not plan to extend their slurry storage capacity. Installed on the ground, the PlanET eco® gas storage dome provides extra storage volume, ensuring a revenue-oriented solution to gas storage.

The weather-protection membrane comes in dust-grey, as standard, to blend in well with the environment. Other colors are available on request.

Advantages at a glance

- Up to 35% more storage volume than conventional cone-roof storage tanks
- The compressed air in the closure hose is divided into two half circles, so only one roof side has to be opened during service operations
- Fan unit is completely enclosed in PE, protecting against corrosion and external influences, pressure is regulated via throttle valve
- Storm-resistant to wind force 12 on the Beaufort scale (hurricane)
- Highly durable weather protection membrane (800-1,100 g / m² depending on the size of the air-supported roof)
- 5 years warranty on weather protection membrane

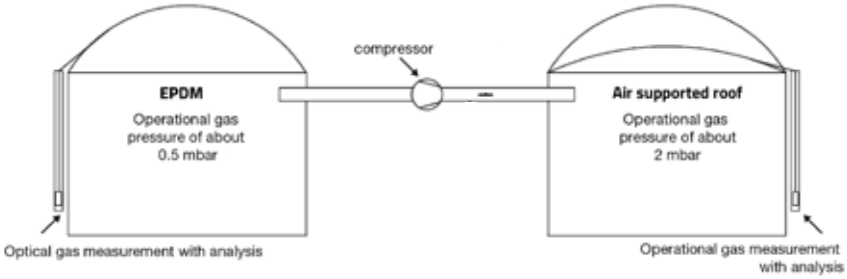
Technical Details

	Cone-roof Tank	Flexstore XL	Flexstore XXL
Digester Ø 21 m	V = 598 m³	V = 822 m³	V = 1,311 m³
Digester Ø 28 m	V = 1,397 m³	V = 1,915 m³	V = 3,054 m³
Digester Ø 34 m	V = 2,483 m³	V = 3,397 m³	V = 5,418 m³

Gas Management

PlanET Gas Management

The PlanET Gas Management system, consisting of PlanET eco® gasakku, PlanET eco® flexgas and self-sufficient control, provides the technology solution for flex operation. The PlanET gas management system can be fully functional with biogas plants built by our competitors.



Advantages at a glance

- Easy retrofit on all systems
- Cost-effective storage space
- Eliminates different operating pressures
- Storage of dry and purified gas
- Independent control

PlanET eco® gasakku

The PlanET eco® gas storage dome is installed on the ground. An expensive sub-structure is not necessary, since the storage dome sinks to the ground when completely empty.

Depending on the plant, when storing dry and purified gas, neither an extension of the drying process nor an activated carbon filter are necessary.

PlanET eco® flexgas

The control of the PlanET eco® flexgas gas compressor is demand-based. As existing line systems can continue to be used, this reduces the cost of additional pipeline construction.

PlanET Gas Drying & Purification

PlanET gas drying and cleaning system I Container solution with activated carbon filter

Biogas contains large amounts of water vapor. This vapor should be eliminated in order to avoid condensation in gas transport pipelines (SAT-CHP) and to increase the efficiency of your biogas CHP.

This is done by lowering the temperature to the dew point. The moisture in the gas condenses with the cooling of the gas.

After drying, hydrogen sulfide is removed from the biogas by means of activated charcoal filters, then the gas is reheated so that it cannot re-condense.

PlanET offers the following drying strengths: 40 m³/h, 160 m³/h, 300 m³/h and 500 m³/h. Further strengths are available on request.

These drying and purification units are available as framework solutions, or as compact container units.

Advantages at a glance

- Low cost of operation and maintenance
- Large filter volume allows for long service life
- Few parts require replacement or repair
- Activated carbon can be replaced easily

Gas Recovery & Power Generation

Combined Heat & Power Units (CHP)

Containerised CHP | CHP in engine room

PlanET offers gas and spark-ignition engines from leading manufacturers based on tried and tested but state-of-the-art technology with high electrical efficiency. As a plant manufacturer, we will of course also install and integrate a combined heat and power (CHP) unit into your existing plant on request. Whether you are expanding the gas network, connecting to existing heating systems or integrating into your existing PlanET plant control system, with us you can get everything from one source.
Depending on your requirements, the units can be delivered in a container or integrated into your engine room on site. For special sound-proofing requirements, we offer acoustic enclosures or super silent containers. With the aid of additional options our units can be optimally equipped for the ”balancing“ energy market, by protecting the engine and the system components during regular start/stop operations and keeping wear and tear as low as possible.

Containerised CHP

CHP in Sound Capsule

CHP with Concrete Cover

Gas Recovery & Power Generation

Technical Details

Type (other sizes available on demand)	Cylinder	Capacity	El. power* in kW	El. efficiency* in %	Thermal power* in kW	Thermal efficiency* in %	Total heat + power in kW
filius R04	4 R	8.0	80	38.1	89	42.6	210
filius 404b	4 R	8.0	100	38.6	110	42.4	259
filius 404c	4 R	8.0	160	41.5	155	40.2	386
agenitor 406	6 R	11.9	250	42.5	245	41.6	589
agenitor 408	8 V	16.6	360	42.5	345	40.7	847
agenitor 412	12 V	25	450	41,1	468	42,7	1096
avus 500 plus	12 V	25.0	499	41,8	499	41,8	1193
avus 500 plus	12 V	25.0	550	42,5	526	40.6	1295
Jenbacher 312	12 V	29.2	548	41.6	571	43.3	1317
Jenbacher 412	12 V	36.6	889	42.0	875	41.4	2116
Jenbacher 420	20 V	61,1	1501	42,4	1500	42,5	3538

Other providers and sizes available on demand.
** NOx < 500mg/Nm³*

Gas Flare

PlanET Gas Flare

PlanET Gas flare

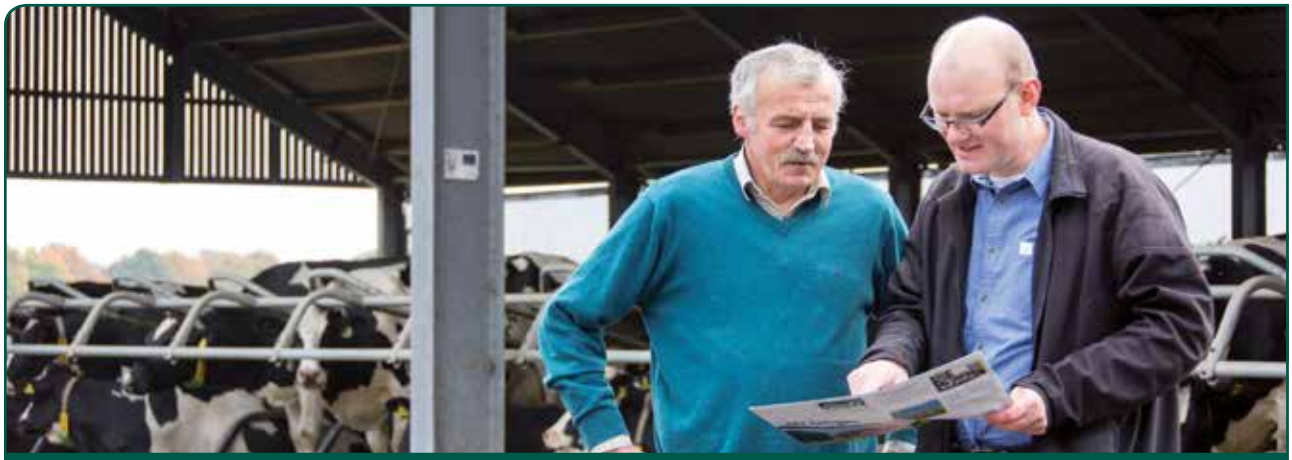
In addition to CHP or biomethane treatment, each plant must have an additional gas consumption facility.
PlanET Biogas offers you manual and automatic gas flares in various sizes.
The automatic industrial gas flares are operated with their own compressor to ensure constant and safe combustion, even under difficult weather conditions.
An optional enclosure of the gas-outlet section ensures that freezing does not occur, even in winter, and the flare is always ready for operation.
In the event of a power failure an emergency power unit can be connected via a CEE socket.
PlanET's more low-cost emergency flares are manual as standard, whereby the shut-off valve must be opened by hand.

In the manual version, the gas is ignited using a supporting flame, which is generated by the operator using a propane gas cylinder. This also allows operation of the flare in the event of power failure.
The automatic gas flare is activated by an external signal if the gas has reached dangerous filling levels or by a pressure switch in the gas system.

Advantages at a glance

- Manual or automatic selection and de-selection
- Flare operation possible even in the event of power failure (automatic flares require an emergency power unit)
- Vacuum safety gauge built into the safety system of the flare

PlanET Analysis of Potential

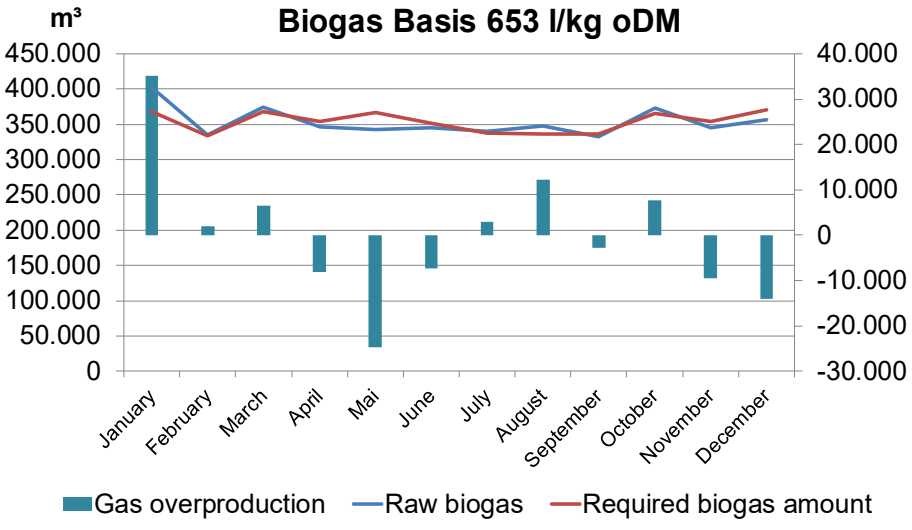


PlanET potential analysis

The bottom line is your profit. With this in mind, we advise our customers on new construction and re-powering. The PlanET feasibility analysis is our results-oriented service to propose measures for the long-term economic operation of an existing plant. In this context, it is our primary concern to ensure the optimal operation of your plant for the remainder of its lifetime. PlanET feasibility analysis also focuses on exploring opportunities for additional revenue. There are currently many repowering models on the market, this is why it is certainly worth examining in detail.

Apart from know-how and experience, successful repowering also requires sensitivity and instinct.

The complexity of the operating mechanisms, coupled with the additional consideration of modern operating requirements (i.e.: flexible power production), mean that a thorough plausibility check of the existing operating data is essential. In this first step, our customers benefit from our databases and empirical experience from over 400 new build and re-powering projects.



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