COMBINED HEAT AND POWER
FROM BIOGAS, LANDFILL GAS
AND SEWAGE GAS.
CLEANER ENERGY FOR A BETTER FUTURE.

MTU Onsite Energy is one of the core brands of Tognum AG, a world-leading provider of distributed energy systems, diesel engines, fuel injection systems and complete propulsion systems. Every day, Tognum products are put to work in ships, heavy-duty land and rail vehicles, military vehicles and the oil and gas industry.

MTU Onsite Energy offers comprehensive, intelligent and innovative diesel and gas technology—for all applications, for the most diverse needs. Our products provide power to manufacturing facilities, data centers, office buildings, hospitals, shopping centers and college campuses.

Sustainability is important to us. We’re focused on developing systems that produce energy from climate-neutral, regenerative fuels, such as combined heat and power (CHP) plants fueled by biogas, landfill gas or sewage gas. The result? Cleaner energy.

A greener alternative
Biomass has massive potential as an essential energy source for the future. MTU Onsite Energy biogas CHP plants utilize that potential. Our generator sets and cogeneration modules based on gas engines use biogas, sewage gas and landfill gas to produce electricity and heat—reliably and efficiently—in an environmentally friendly manner.

Whether for recycling organic waste in the agricultural industry or utilizing sewage and landfill gas, MTU Onsite Energy develops solutions customized to fit your unique needs.
MTU has more than 100 years of experience in manufacturing engines. MTU Onsite Energy also has considerable expertise, with more than 35 years in development, design, manufacturing and support of complete distributed energy systems. Every cogeneration system we build benefits from this powerful combination of two industry leaders.

MTU Onsite Energy CHP generators and modules based on gas engines can be fueled by biogas, landfill gas and sewage gas. Our cogeneration (CHP) and trigeneration (CHP/C) systems can create any combination of electricity, heat and cooling for a wide variety of applications from farms to municipal buildings and manufacturing facilities. In each case, we develop a solution specifically configured to meet the customer’s precise requirements.

Our technology offers many advantages:

// Sustainable
CHP systems use a combustion engine to drive a power generator. Heat accrued during the combustion process is transferred via heat exchangers to be used by consumers. Highly efficient CHP systems consume up to 40% less primary energy than conventional power plants.

// Reliable
Our gas power systems have proven their reliability, availability and longevity in many installations and over hundreds of thousands of operating hours. Our advanced control technology ensures a high availability rate. Thanks to our extensive service network, you will receive full support from our experienced service partners—anytime, anywhere. Our MTU ValueCare portfolio of products and services helps keep your equipment and facility going.

// Independent
In areas with missing or unreliable public infrastructure, MTU Onsite Energy systems ensure independent power and heat supply.

Depending on the conditions, these systems can boost revenue potential. Size and number of modules are defined by a profitability analysis for each specific application. This analysis also demonstrates the customer’s profit potential when using an MTU Onsite Energy CHP system.

To meet environmental standards, MTU Onsite Energy focuses on reducing greenhouse gas emissions. In comparison with conventional power generation, MTU Onsite Energy CHP modules reduce CO₂ up to 50%.

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Strong heritage, powerful advantages.
A CHP system based on biogas is simple and efficient. Biogas is generated during the fermentation of organic material and collected. It is then used in a cogeneration system to create heat and power. The electricity can be used by the operator, saving costs and resources.

The heat generated by the engine (as part of waste gas, coolant and oil) is used by heat exchangers to maintain the temperature of the fermenters to optimize the fermentation process. Additional heat supply can be used elsewhere, such as buildings in the same complex.

Biogas is created by the digestion or fermentation of organic materials. The basic material is often slurry or solid manure. Regenerative raw materials or waste from the food industry may also be used as co-fermenters. The gas produced is 50-70% composed of the high-quality fuel, methane, carbon dioxide CO₂, nitrogen and trace gases (such as hydrogen sulfide) and its other constituents.

Many different organic materials can be used in a biogas plant. Some systems run entirely on slurry and solid manure, while others exclusively use raw regenerative materials. Frequently, a mixture of materials is used.

An increasing number of commercial operations specialize not only in the recycling of slurry but also the disposal of organic waste. Food waste from hotels and catering industries, wholesale markets and farms may also be processed and disposed.

With many years of technological experience with proven biogas engines, MTU Onsite Energy has the expertise needed to integrate CHP technology into the overall process and make it profitable. Details on our systems and case studies about our numerous installations are available on request.
SEWAGE GAS: ECONOMICAL POWER FOR TREATMENT FACILITIES.

Installing CHP modules in sewage plants is one of the most economical ways to utilize waste energy. Sewage gas, much like landfill gas, is available for free. The numbers are impressive: from about 200 ft.³ of sewage, MTU Onsite Energy systems manage to generate on average 1 kW of electric power and 4,100 Btu/hr of thermal energy.

The electric power can be used to supply the sewage plant. During the combustion process, heat is generated inside the gas engine. This thermal energy can be utilized for heating up the sewage sludge in the digester or for heating the whole facility. In large-scale plants, excessive high-temperature heat may be available that can be used to pasteurize or dry the sewage sludge.
LANDFILL GAS: MAKING WASTE USEFUL.

Propriety monitored landfill sites are economical energy sources. Gas produced by the anaerobic decomposition of organic matter from the landfill must be captured and removed to protect the environment. It’s a virtually free source of energy that can be used to generate electricity with MTU Onsite Energy gas-engine systems.

In addition to cost savings, planned gas recycling offers many other important benefits:
- Emissions reduction
- The odor nuisance from landfill sites is reduced
- Fire and explosion hazards can be prevented
- Gas migration is avoided
- Landfill site can be cultivated more quickly

Diagram:
- Gas well during refuse deposition
- Active horizontal and vertical gas wells
- Compressor with gas analyser (CH₄, CO₂, O₂)
- Landfill gas generator set
- Transformer substation
- Landfill gas flare
CHP GENSETS AND MODULES: PROVEN, EFFICIENT AND RELIABLE.

CHP gensets and modules from MTU Onsite Energy are technologically advanced and extremely efficient. They have proven their reliability, availability and longevity in many different locations, with hundreds of thousands of operating hours.

- Our lean-burn engines prevent harmful emissions from being produced during the combustion process. Emission levels below the limits required by EPA clean air regulations are achieved without the use of a catalytic converter.
- The MTU Onsite Energy oxygen-content control system guarantees optimum combustion even with variable gas qualities, preventing engine damage.
- The arrangement of the cooling system enables straightforward integration into existing heating systems.
- The exhaust heat exchanger is integrated into the engine coolant circulation system, minimizing the risk of heat exchanger damage.
- Largely standardized and carefully selected subassemblies maximize operational safety and reliability. Availability figures of well over 90% are common with MTU Onsite Energy systems.
- Low fuel and lubricant consumption, combined with long-component life, reduce operating costs.
- A specialized development department constantly analyzes usage data and optimizes the technology on our test benches for many natural gas application requirements.

Our CHP modules and gensets for renewable gases cover the 200-350 kW range. Selecting the right CHP system depends on various factors, and you can count on MTU Onsite Energy to provide you with our full support, from start to finish.

- Support in planning your new CHP module
- Assistance in incorporating a CHP module into your application
- Explanations of the technology behind the engine, system and individual components
- Simple project proposals with budgeted pricing for the planning phase and fixed pricing for implementation
- Design and planning of peripheral systems
- Advice on service solutions as early as the project phase
- Help with questions on legal situations

We will gladly provide you with more information in person or by telephone.
MTU Onsite Energy has an advanced product program, with reliable gas engines at its heart. Over 2,700 CHP modules are in use worldwide. Many of our systems have already completed well over 100,000 hours of service and continue to supply heat and electricity day after day—a testament to the dependability of our engine technology.

We design most CHP plants as multi-module systems so various outputs can be achieved with optimum efficiency. Electrical or thermal load profiles can be adjusted by switching in or shutting down individual modules. Another advantage of multi-module systems is their high level of availability and redundancy.

Compact modules not only offer high levels of electrical and thermal efficiency with a fuel-efficiency level of up to 90%, but also many other benefits:
- Conserves space
- Easily connected
- Factory tested
- Available as open or enclosed units
- Easy to maintain

Distributed energy plants using CHP modules can also be used as a grid backup or emergency power generator. With a synchronous generator and starter battery, our modules are ideal for emergency power generation.

Series 400 Components

1 MTU Module Control (MMC)
   - Contains all functions necessary for controlling the CHP plant. Provides full access to auxiliary drive operation. Integrated power circuitry minimizes the need for cabling.

2 Generator
   - Precisely customized to the engine and built by renowned manufacturers, the generator ensures a high level of reliability and maximum efficiency.

3 Crank-case ventilation
   - Minimizes deposits in intake tract and combustion chamber and guarantees a continuously high level of performance.

4 Mixture cooler
   - The two-stage mixture cooler with large surface area improves engine performance and heat utilization.

5 Gas engine
   - Advanced and proven Series 400 gas engine, optimized for natural gas use. Combustion chambers ensure the highest level of efficiency in its performance category.

6 Ignition system
   - Ignition systems for individual cylinders maximize efficient operation for all cylinders, even with variable CH₄ content. The ignition voltage display also provides spark plug information.

7 Knock detection
   - Cylinder-specific knock detection and regulation protects the engine from abnormal operating conditions and guarantees safe operation even with natural gas, which contains high levels of methane.
MTU Onsite Energy offers a wide range of natural gas CHP plants, including energy modules and generator sets for larger outputs of up to 1,930 kW per unit. Unlike the small series modules, these systems are supplied as split-configuration installations rather than as compact modules. In this design, the engine/generator set and heat module are separate units. With size requirements needed for high outputs, our split configuration offers many benefits:

- Separation of the heat generation module
- Customizable to customer requirements
- Optimal adaptation to the space available at the installation site
- Optional warm-water generation with various temperature ranges as well as steam generation with separate waste heat utilization
- Easily transportable
- Simplified installation

Like the compact modules, the engine-and-generator sets are comprehensively factory tested before delivery to the client.

**Series 4000 components**

1. **Generator**
   - Precisely customized to the engine and built by renowned manufacturers, the generator ensures a high level of reliability with the best degree of efficiency.
2. **Mixture cooler**
   - The two-stage mixture cooler with large surface area improves engine performance and heat utilization.
3. **Ignition system**
   - Ignition systems for individual cylinders maximize efficient operation for all cylinders, even with variable CH4 content. The ignition voltage display also provides spark plug information.
4. **Gas engine**
   - Advanced and proven Series 4000 gas engine, optimized for biogas use. Combustion chambers ensure the highest level of efficiency in its performance category.
5. **Knock detection**
   - Cylinder-specific knock detection and regulation protects the engine from abnormal operating conditions and guarantees safe operation even with natural gas, which contains high levels of methane.
6. **Crank-case ventilation**
   - Minimizes deposits in intake tract and combustion chamber and guarantees a continuously high level of performance.
7. **MTU Module Control (MMC) – Not shown**
   - Contains all functions necessary for controlling the CHP plant. Provides full access to auxiliary drive operation. Integrated power circuitry minimizes the need for cabling. The MMC is housed separately in the control cabinet and hidden from sight.
MTU Onsite Energy is your complete systems partner. In addition to supplying modules and gensets, we offer you a full range of advanced system components.

Gas preparation
Depending on the quality of the biogas, extra measures may be required before it can be used. These ensure optimal combustion in the engine and also enable the use of an oxidation catalyst in order to reduce emissions levels even further.

Oxidation catalyst
Customized to the engine, the catalyst guarantees adherence to emissions requirements.

Auxiliary drive control and electrical connections
The integrated MMC (MTU Module Control) offers a range of connections and control options, such as hot water pumps, mixed cooling water pumps, extractor fan control, gas warning system, lubricant system, smoke detector and gas compressor.
MTU Onsite Energy provides a complete package for every installation. Control system technology, one of the most important elements in the engineering system, comes standard with purchase. If the generator set is the heart of the system, then the module controller is its brain. To ensure optimum operation, our industrial computer controlled electronics monitor the engine and the system.

CHP module controller features:
- Control via RPS
- Operation and visual display by industrial PC, with color touch-screen panel
- Visual display of all functional processes and controls
- Numerous additional controls and functions can be integrated (CH₄, gas tank, heat production mode, heat storage, mains power usage)
- Networking of multi-module plants via Ethernet
- Linkable to master control systems
- Wide choice of interface protocols (Ethernet, Profibus DP, 948R, Modbus RTU)
- Logging of all fault and status messages in a database (up to six months of data can be recorded)
- Optional remote diagnosis via ISDN or DSL
- Optional integration of SMS text/e-mail alerts (notification of faults, daily reporting of all meter readings)
Purchasing a gas power system from MTU Onsite Energy pays off in many ways. In addition to enhanced performance, efficiency and reliability, we offer peace of mind through superior service and maintenance.

Our customers have high demands for electricity and heat production. MTU Onsite Energy offers a full range of support through MTU ValueCare to help you get the most from your equipment. MTU ValueCare is a portfolio of value-enhancing products and services designed for peak performance and maximum uptime. Support is always nearby—anytime and anywhere. For your convenience, MTU ValueCare is available worldwide through our MTU Onsite Energy service network.

MTU ValueCare includes three product lines:

// **ValueService** – Global support and service products

// **ValueSpares** – Genuine spare parts and top-quality consumables

// **ValueExchange** – Remanufactured engines, engine parts and overhauls

**MTU VALUECARE:**
**WE’RE WITH YOU ALL THE WAY.**
COMPLETE MAINTENANCE AND SUPPORT.
VALUE SERVICE.

Reliable, expert assistance is essential to maintaining and improving high levels of performance throughout your engine or system’s lifecycle. Value Service is a full line of maintenance and repair solutions to help you protect your investment and get the most out of your equipment. From Remote Diagnostics to training, MTU Onsite Energy provides you with all the tools, with support customized to your needs.

Service Agreements make it easy to plan maintenance throughout your engine’s lifecycle. The details, terms and periods of each package are precisely tailored to match your individual needs, ensuring cost certainty and streamlining operations. Service Agreements offer a complete range of services. Professional maintenance is performed by MTU certified technicians, using only genuine MTU new or remanufactured spare parts.

Comprehensive training is a great way to get maximum efficiency from your equipment. From timely preventive maintenance to efficient diagnostics and repair, our training programs are designed to make your service personnel proficient with MTU Onsite Energy engines and systems. Whatever the product or application, we offer a wide range of standardized and customized training programs to maximize your return on investment.

Service Agreements make it easy to plan maintenance throughout your engine’s lifecycle. The details, terms and periods of each package are precisely tailored to match your individual needs, ensuring cost certainty and streamlining operations. Service Agreements offer a complete range of services. Professional maintenance is performed by MTU certified technicians, using only genuine MTU new or remanufactured spare parts.

Identifying faults as early as possible saves valuable service time and helps you make quick decisions regarding operational issues. Remote Diagnostics is a powerful solution, providing you with direct access to the activity of your generator set through a secure Internet connection. Through early fault identification, you can act quickly to prevent damage, save on service and repairs, identify spares needed and increase engine efficiency.

A full line of MTU Onsite Energy technical documentation provides complete, clear information on the operation and maintenance of all our engines and systems, helping you maximize the performance and value of MTU Onsite Energy products. MTU Onsite Energy technical documents are not one size fits all. They are tailored to the unique and specific needs of each engine or system.
FOR THE LONG RUN.
VALUE SPARES AND VALUE EXCHANGE.

ValueSpares
To ensure that your equipment is always up and running, you can choose from a full line of ValueSpares genuine parts and consumables. They’re designed, tested and approved specifically for MTU Onsite Energy systems. Therefore, only MTU Onsite Energy can guarantee that ValueSpares products are genuine quality and will work seamlessly with your product.

ValueSpares products help you get maximum performance and value from your generator sets. And putting our parts and consumables to work is easy. ValueSpares products are available worldwide through our MTU Onsite Energy service network.

ValueExchange
Whether replacing a single component or an entire engine or system, quality is essential. ValueExchange provides a full range of genuine remanufactured engine products, engineered to ensure robust, reliable performance. A rigorous reconditioning process ensures the same high standards of performance, service life and quality as new products—including design and model updates. As a result, genuine ValueExchange products feature the same technological advancements as new products. The ValueExchange process is designed to save you time and money, while benefiting the environment through the reuse of existing materials.