SEBIGAS Lean and Green





Company profile

About us

SEBIGAS is a major Italian company with many years' experience in the international market field, designing, constructing and managing anaerobic digestion plants for the production of biogas for energy purposes. The company's growth has been marked by both the execution of a large number of projects and by a constant focus on research and development, allowing us to acquire increasingly specific skills in relation to diverse and complex matrices.

SEBIGAS has an ongoing commitment to provide practical solutions that contribute to the process of energy transition and decarbonisation. We offer a virtuous and sustainable way of transforming waste into resources, contributing to today's needs to safeguard our planet, while also developing new solutions for tomorrow.

Our history

^ 2008

SEBIGAS was established as a business venture, aimed at meeting the growing interest in agricultural biogas in Italy.

2009

SEBIGAS became part of S.E.C.I. Energia, consolidating its presence in Italy.

1 2012

With the Italian biogas market continuing to grow strongly, SEBIGAS became a reference point in the industry, constructing 37 plants in a single year.

2013

SEBIGAS began its process of internationalisation by signing a joint venture with SEBIGAS UAC and constructing two plants in Thailand.

1 2014

This expansion into global markets continued with the establishment of SEBIGAS do Brasil, and the development of specific skills for the treatment of biomass for the sugar and bioethanol production industry. AGRIPOWER was created as a spin-off of SEBIGAS, to provide a prompt and efficient plant management and maintenance service within Italy.

2015

SEBIGAS became a division of EXERGY, a company in the S.E.C.I. Energia Group operating in the renewable energy sector. This provided extra value in terms of technical expertise, financial resources and long-term experience in global markets.

2018

SEBIGAS regained its independence within the S.E.C.I Energia Group, continuing its process of growth in the European market.

The joint venture company SEBIGAS COTICA was set up in Brazil, and plants were put into operation in Greece, Belgium and France, using agro-industrial matrices.

2019

SEBIGAS set up Maserati Energia, its first OFMSW biomethane production plant.

2020

SEBIGAS joined the TICA group, a well-established multinational based in China, offering new opportunities for growth in international markets.

2022

The Nanjing Sebigas RET Co., Ltd branch was set up, to promote development in Asian markets.

Presence on international markets





SEBIGAS operates worldwide with installations, branches and an active sales network, enabling it to develop solutions based on needs, requests and national regulations. SEBIGAS has proven expertise in European, American and Asian countries, demonstrating its ability to develop flexible solutions for every different setting, and for the many areas of application of anaerobic digestion.

A sustainable solution

SEBIGAS is committed to providing solutions that contribute to the energy transition process. SEBIGAS technology allows companies to play a part in the fight against climate change, by making their businesses more sustainable and embracing the circular economy.

At SEBIGAS, we firmly believe in the importance of capturing and transforming waste into an added value and opportunity. We are constantly renewing our commitment to ensure that our projects are seen as a genuine example of the circular economy with the production of renewable energy.

All of us are being called upon to adopt more mindful and sustainable behaviour: THE FUTURE DEPENDS ON OUR CHOICES.

Why the circular economy?

Because the feedstock for the plant consists of waste and scrap material, which is then transformed into valuable new resources.

The biogas plant also gives added value to the surrounding area, by returning high quality digestate to the land, and supplying citizens and users with energy from renewable sources.

Biogas and the environment

producing energy from immediately accessible renewable sources

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reducing the impact of CO₂ on energy and biofuels production



giving value to waste and scrap as an energy source



producing good quality fertilisers and soil improvers



restoring nutrients to the soil



creating value in locally-based circular systems



supporting the companies economic growth



creating jobs in the sustainable supply chain

The plant feeding

SEBIGAS uses a combination of expertise, research and flexibility to create a tailor-made mass balance for its customers, designed to meet the need to treat varied and complex biomasses in anaerobic digestion plants. The company has worked in the international arena for many years, developing and managing over 70 biomass plants, and proving to be an expert and reliable partner in this field.

SEBIGAS offers biological analysis and processing services, to help make best use of the incoming feedstock and ensure the customer achieves optimal results.

+70_{biomasses}



Technology

SEBIGAS offers CSTR (Continuous stirred-tank reactor) technology, based on a semi-continuous flow of fresh biomass, which is fed into temperature-controlled reactors and constantly stirred to ensure it is perfectly blended.

The process of wet anaerobic digestion takes place in a tank containing 10% or less dry matter, and under either thermophilic (50-55°C) or mesophilic (38-43°C) conditions. The period of retention in the digester can vary from 25 and 50 days.

dry matter content
10%

25-50 days

• retention time

BOILER heat electrical PRETANK and thermal BIOGAS COGENERATOR energy biometane UPGRADING CO CO₂ DIGESTER **IMPROVER** DIGESTATE FERTILISER FEEDER **PURIFIED WATER**

The solid and liquid biomass is loaded via a pre-tank or feeder into the digesters, circular tanks made of concrete or steel. The digesters are equipped with slow and fast mixers to enable the process of anaerobic digestion; this also ensures that the digestant in the tank is perfectly blended and prevents the formation of sediment or crusts.

A heavy cover or gasometric dome is fitted on top of the digester to ensure that a sufficient quantity of the biogas produced is safely stored.

After receiving suitable treatment, the biogas can be used to produce heat, electricity and thermal energy through cogeneration, or it can be separated to obtain biomethane and carbon dioxide for industrial and food use.

Technologies to obtain sustainable hydrogen from biomethane transformation are being studied.

At the end of the process, the digestate can be separated and then undergo further treatment to produce soil improver and fertiliser (both in solid and liquid form), or it can be purified to reduce the nitrogen content and remove any pollutants.

Results and output

Continuous production and consistent profit

SEBIGAS systems achieve an average of 98.2% total operating time over the course of a year.

The greatest strength of SEBIGAS technology is that it is very reliable, as long as simple maintenance procedures are always followed.

SEBIGAS systems have an excellent track record, with an average of 8,600 hours of operation per year at maximum power, enabling the best possible use of all forms of biomasses by exploiting their maximum energy potential.







SEBIAGRI

The SEBIAGRI line offers farms and food & beverage companies a technical solution for exploiting a variety of organic materials, including livestock waste, agricultural by-products, agro-industry by-products, second crops and energy crops.

SEBIGAS has used its considerable expertise to create reliable systems adapted to the individual needs of the customer, harnessing the potential of each individual material used as feedstock.

SEBIAGRI-FARM

SEBIAGRI-FARM provides a structured method for exploiting agricultural by-products, energy crops and animal manure. A technical solution for the use of substrates for the constant production of sustainable energy, to benefit both the business itself and society.

In this way, the SEBIAGRI-FARM line allows the company to integrate its activities by completing the production cycle in a virtuous way: the energy produced can not only be sold to the national grid, but also recovered for internal activities. Digestate, on the other hand, becomes an ecological and economical fertilizer replacing synthetic products.

AGRICULTURAL BY-PRODUCTS

fruit and vegetable waste, straw, leaves and cobs...



SECOND CROPS AND ENERGY CROPS

sorghum, triticale, corn, hay, napier grass...



from cows, pigs, sheep, poultry, horses...

SEBIAGRI-FOOD

SEBIAGRI-FOOD is a solution designed to provide an efficient and effective way to treat agro-industrial by-products, such as those derived from the production of coffee, sugar, ethanol, fruit juices, alcoholic beverages, dairy products, oil, rice and other cereals, tomato sauce, and also slaughterhouse waste.

The SEBIAGRI-FOOD line involves pre-treatment solutions such as sanitisation, pasteurisation and sand removal, for dealing with more complex materials. After leaving the plant, the solid and liquid digestate undergo special treatments to upgrade them into soil improvers, fertilisers and purified water.



resulting from the production of coffee, sugar, ethanol, fruit juices, alcoholic beverages, dairy products, oil, rice and other cereals, tomato sauce, and slaughterhouse waste

Case study **SEBIAGRI-FARM**

SALERA

LOCATION Castelvisconti (CR)

YEAR OF INSTALLATION 2011

 ★ FEEDSTOCK pig manure, rye silage, maize silage

INSTALLED POWER 625 kW

🗩 USE OF ELECTRICAL/THERMAL ENERGY

The electricity is sold to the grid with a special feed-in tariff. The thermal energy is used to heat a cultivation of organic spirulina algae

DIGESTATE

Used as a source of nitrogen for the soil



DEBO

- LOCATION
 Niella Tanaro (Cuneo)
- **YEAR OF INSTALLATION** 2015

INSTALLED POWER 300 kW

USE OF ELECTRICAL/THERMAL ENERGY

The electricity is sold to the grid with a special feed-in tariff. The heat is reused in the farm's production cycle and to heat the digesters

DIGESTATE

Used as a fertiliser and soil improver, replacing synthetic products



Case study **SEBIAGRI-FOOD**

FARMA-CHALASTRAS

Q LOCATION

Thessaloniki (Greece)

YEAR OF INSTALLATION 2018

난 FEEDSTOCK

cattle slurry, slaughterhouse waste, expired food, beer production waste, whey.

4 INSTALLED POWER

1 MW

W USE OF ELECTRICAL/THERMAL ENERGY

The electricity is fed into the grid, the heat is used for heating the buildings, the pasteurisation system and the digester

DIGESTATE

Used as an organic fertiliser for animal feed crops



BIOQUERCY

- **LOCATION** Gramat (France)
- **YEAR OF INSTALLATION** 2017

INSTALLED POWER 1.800 kW

▲ USE OF ELECTRICAL/THERMAL ENERGY

The electricity is fed into the grid under an incentive scheme, the thermal energy is used to heat the digesters and for the pasteurisation process

DIGESTATE

Used as an organic fertiliser for the crops around the plant



SEBIWASTE

Studies of the methods and processes of the anaerobic wet digestion system, and research into specific techniques for the pre-treatment and use of digestate, have led SEBIGAS to develop a practical solution for treating the Organic Fraction of municipal solid waste.

This OFMSW is collected from domestic users and/or selected sources such as the Ho.Re.Ca sector and large retail organisations, using a collection network that delivers the partially selected organic waste to the entrance of the plant. The SEBIGAS system separates the organic from the residual inorganic material (non-reusable fractions) and transforms it into biomethane, purified water and mixed composted soil improver.

Italian households each produce an average of 100 Kg of Organic Fraction per annum, so treatment in anaerobic digesters is a readily available and complete solution for recovering huge amounts of waste and transforming them into energy.

What are the benefits of using OFMSW in anaerobic digestion?

- ----- COMPLETE USE OF THE WASTE
- REDUCED DISPOSAL COSTS
- PRODUCTION OF ELECTRICAL, THERMAL ENERGY OR BIOMETHANE
- PRODUCTION OF QUALITY COMPOST AND PURIFIED WATER FOR USE IN AGRICULTURE

As the OFMSW is varied and contains many impurities, it is very important to use a pre-treatment process to remove the inert matter and prevent it entering the anaerobic digestion system. It is also essential to carry out post-treatment of the digestate, to ensure it complies with regulatory standards governing reuse and/or discharge into the environment.

OFMSW

From door to door collection

NON-DOMESTIC FOOD WASTE

From hotels, restaurants, catering companies, bars and cafés (Ho.Re.Ca)

EXPIRED AND NON-COMPLIANT FOOD

From large-scale retailers and distributors



Pre-treatment

After the feedstock is received at the plant, it enters the pre-treatment line to remove any unwanted content that could affect the performance of the anaerobic digestion process. This line consists of special equipments, which perform the following functions:

Anaerobic digestion

Wet anaerobic digestion requires a low content of dry matter, equivalent to 10% or less. To ensure the stability of the biological process, it is important to design a system with the following distinctive features:

- METHODS FOR ELIMINATING RESIDUAL SEDIMENTS
 - AN EFFECTIVE MIXING SYSTEM
 - SIMPLE, ACCESSIBLE WAYS TO CARRY OUT MAINTENANCE ON COMPONENTS

PASTEURISATION (OPTIONAL)

REMOVAL OF METALS

OPENING OF BAGS

HOMOGENISATION OF THE ORGANIC SUSPENSION

SIEVING AND SAND REMOVAL

Digestion of the liquid fraction

The substrate leaving the digester continues on to the dewatering stage (solid/liquid separation).

To ensure the plant is environmentally sustainable, the liquid fraction of the digestate has to undergo particular treatments.

These effluents can only be discharged into a body of surface water after they have been subjected to biological treatments, ultrafiltration, reverse osmosis and evaporation. These produce a form of a wastewater with characteristics consistent with the minimum requirements of legislation.

Composting the digestate

The separate solid fraction is mixed with ligno-cellulosic material (bulking agent) and then subjected to a process of bio-oxidation: an aerobic process during which the material is aerated, to obtain a stabilised and mineralised product.

Following the bio-oxidation process, the material is stored in heaps and left to mature, before its final use in agriculture or for packaging.



MASERATI ENERGIA

- **LOCATION** Sarmato (PC)
- **YEAR OF INSTALLATION** 2019

산 FEEDSTOCK

50.000 t/year OFMSW and 5,000 t/year green waste from public spaces

- PRODUCTION OF BIOMETHANE 5.100.000 Sm³/y
- **PRODUCTION OF COMPOST** 10.000 t/y
- LIQUID EFFLUENT INTO SURFACE WATER BODIES 36.000 m³/a





SEBISLUDGE

Public and private companies are increasingly keen to adopt sustainable solutions for the treatment of sludge, produced at both civil and industrial level. Sewage sludge can be efficiently managed and treated, turning it into a valuable resource for the circular economy. As well as a high water content, it also contains various organic and inorganic substances, nutrients and bacteria (including some pathogenic forms), and so requires an initial purification treatment.

What types of sludge are treated in anaerobic digestion?

PRIMARY SLUDGE:

derived from the process of primary sedimentation. With a biogas yield of about 300-400 $\rm Nm^3/t_{ODS}$, this type has good methane potential and is readily digestible.

SECONDARY SLUDGE:

this derives from the sedimentation produced through processes of biological oxidation. As digestion takes places through an aerobic process, this sludge is less efficient in terms of biogas production (200-300 Nm^3/t_{ODS})

What are the various stages of sludge treatment?

THICKENING:

increasing the amount of dry matter in the sludge, reducing its original volume.

BIOLOGICAL STABILISATION:

mineralising putrescible organic substances and eliminating bacteria.

DEWATERING:

removing most of the water and reducing the sludge to about 18-22% dry matter, by use of techniques such as centrifugation, belt presses, filter presses, etc.

- DRYING:

further removal of water from the sludge by the use of thermal energy.

Sustainable reuse of sludge

Through its treatment of sludge in anaerobic digesters, SEBIGAS is exploiting this resource in a sustainable way and creating a virtuous circle. The sludge is subsequently used in the production of electricity, thermal energy or biomethane, thus helping to reduce our carbon footprint, and can also be used for the plant's own consumption in the water treatment process.

SEBISLUDGE industrial sludge

Industrial wastewater needs to be treated through a process of anaerobic digestion to exploit its methane potential and use it as a form of energy. Making use of its own sources of renewable energy will allow industry to reduce greenhouse gas emissions from its production processes, and also reduce its dependence on fossil fuels.

Which businesses are the main producers of industrial wastewater?

- ----- SOFT DRINKS COMPANIES
- BREWERIES
- ---- CONFECTIONERY COMPANIES
- PAPER MILLS
- TEXTILE INDUSTRY



Meat, fish and dairy processing companies, soft drink companies, breweries, confectionery companies, paper mills, the textile industry...

Which are the advantages of anaerobic digestion treatment?

- Allows sludge to be reused for energy purposes, enabling a supply from renewable sources.
- Reduces and optimises treatment management costs
- Makes an efficient use of resources, by allowing the reuse of water in industrial processes
- Reduces the bacterial load in sludge
- Reduces the amount of sludge that has to be disposed of, and so cuts the costs of disposal.

SEBISLUDGE municipal sludge

Municipal sludge refers to the type sludge produced in urban wastewater treatment, which contains pollutants of various kinds. This is a fairly thick residue, composed mainly of water, organic matter, macro and micro-nutrients and inert substances.

	DRY SUBSTANCES (DS)	ORGANIC DRY SUBSTANCE (ODS)	BIOGAS YIELD
PRIMARY SLUDGE	4 - 15%	70 - 78%	300 - 400 Nm³/t _{ops}
SECONDARY SLUDGE	2 - 4%	76 - 80%	200 - 300 Nm³/t _{ops}
DEWATERED SLUDGE	18 - 22%	78 - 80%	200 - 300 Nm³/t _{ops}

Application

The digester and purification system are two complementary and integrated processes, which help to stabilise the sludge and reduce its odorous impact. The anaerobic digester unit can be inserted into the purification system at various stages, depending on the process or the requirements of the plant.

Who benefits from the results of anaerobic sludge digestion?

(\mathfrak{O})		
MUN	CIPAL	SLUDGE

Sludge from sewage treatment and urban wastewater treatment plants

Technical benefits of anaerobic digestion of sludge

- Reduces the amount of sludge to be disposed of, and the relative costs
- Reduces the energy costs of the existing treatment plant
- Reduces the bacterial load and odour, as a result of stabilising the sludge
- Enables the carbon to be fixed in the form of humus, with slow release of CO₂.

THE ENVIRONMENT

- TREATMENT PLANT OPERATORS
- PUBLIC ADMINISTRATIONS
- MULTI-SERVICE COMPANIES
- THE GENERAL PUBLIC

Our services

SEBIGAS offers a system of integrated services, ensuring the customer receives practical support at every stage of the design, construction and operation of an anaerobic digestion system. From the feasibility study to the design, from the preparation of a tailor-made mass balance to help with the authorisation process, from the preliminary engineering work to the overall construction, and from a support service to the management (O&M) of the plant.



With the support of the TICA group, SEBIGAS helps its customers in their search for financing, drawing up pre-feasibility studies to support the **business plan** for their initiatives, and providing a prompt analysis of the return on investment for every project.

SEBIGAS also uses the services of experts to carry out pre-feasibility studies, helping the customer to evaluate the investment not only from a technical standpoint, but also in economic and financial terms. A service directed at both private and public administrations, to allow a business idea to be planned and implemented in line with the customer's expectations.

SEBIGAS also provides support with the **process of authorization** for the plant, working alongside the customer and its consultants in relations with the competent authorities, to acquire the necessary authorizations.

To respond to the demands of an evolving sector, SEBI-GAS offers its services as a **technical partner** for developers and investors, helping to authorise and construct plants with high guaranteed profitability.

Engineering and construction



SEBIGAS offers integrated solutions, to develop engineering projects that suit the customer's needs and ensure the expected levels of performance.

It also acts as a **technology provider**, giving constant support in supplying the technology and engineering required for constructing the biogas plant.

SEBIGAS manages the entire construction process in a reliable and expert way, offering an **EPC** – Engineering Procurement Construction – service for turnkey delivery of the project.

SEBIGAS also offers a **revamping and repowering service** for existing biogas plants. After a careful, in-depth assessment of the system in operation, SEBI-GAS puts forward the best solution for maximising its performance and extending its useful life.

Research & Development

For SEBIGAS, the desire to develop better solutions is the driver behind its constant research and development work.

To guarantee high performance for its customers, and to give them a real opportunity to make their businesses circular, sustainable and profitable, SEBIGAS researches and **selects cutting-edge processes and technologies**, and constantly upgrades the standards it uses.

Biological service

SEBIGAS has its on-site laboratory and offers a specialist biological service to monitor the well-being of the anaerobic environment and the continuing production of biogas. It is very important to monitor the biological efficacy of the biomasses, in order to control the operating costs of the plant and to produce revenues in line with expected performances.

SEBIGAS will act as a consultant before, during and after the construction of the plant, offering a customised biological service based on the particular characteristics of the plant.

Our services include:

- BMP TEST & THEORETICAL BIOMETHANE YIELD
- ---- CONTINUOUS TESTING
- ----- PLANT REMOTE MONITORING
- CONSULTANCY SERVICE TO ASSESS AND IMPROVE THE PLANT
- ON-SITE VISITS AND SAMPLING FOR FOS-TAC, PH AND TEMPERATURE CONTROL ANALYSIS.
- LABORATORY TESTS OF THE DIGESTANT

Operation & Maintenance

SEBIGAS supports operators with training to **manage the plant**, and its staff are always on hand to offer service and **assistance**, both at the **plant** itself and online, using the **proprietary software** with which the plant is equipped.

The SCADA system, with its intuitive interface and efficient data trending features, plays a central role in ensuring robust, effective and timely process management.





creative-farm.<mark>it</mark>

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