



Photograph courtesy of agc - AENA.

Bilbao Airport

# COGENERATION

## High efficiency and energy quality



## WHAT IS COGENERATION?

Cogeneration defines those processes in which useful electric (or mechanical) energy and heat energy are produced simultaneously from fuel.

Cogeneration systems are efficient alternatives to traditional mains-energised systems and boilers.

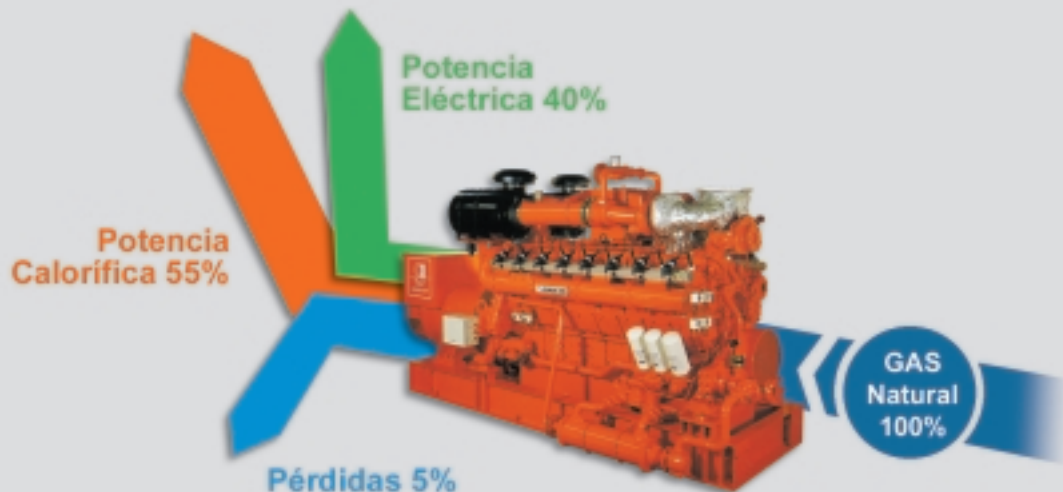
Cogeneration is a fully developed technology that is well introduced in the industrial sector. For a few years now, owing to its unquestionable advantages, it has also been successfully used in the service sector.

## COMMENTS ON THE EFFICIENCY OF COGENERATION AS COMPARED TO OTHER ELECTRICITY AND HEAT GENERATING SYSTEMS

Simultaneous generation of electricity and heat in cogeneration plants helps using the fuel energy to incomparable levels.

Compared with the generation of electricity in a thermal power station and the production of heat with a boiler, the simultaneous generation of electricity and heat in a cogeneration plant equipped with a GUASCOR gas engine permits savings of about one third of the primary energy.

The cogeneration systems developed by GUASCOR are efficient alternatives to traditional methods based on the use of the electric power system and of generating heat with boilers.



## ADVANTAGES

There are plenty of advantages offered by cogeneration both to its users and to the society as a whole.

### Advantages for the user:

Reduction of energy costs, through savings of primary energy and the lower operating cost of a cogeneration plant.

Independence from the mains and reliability of supply, since the energy necessary for the industrial processes is self-generated.

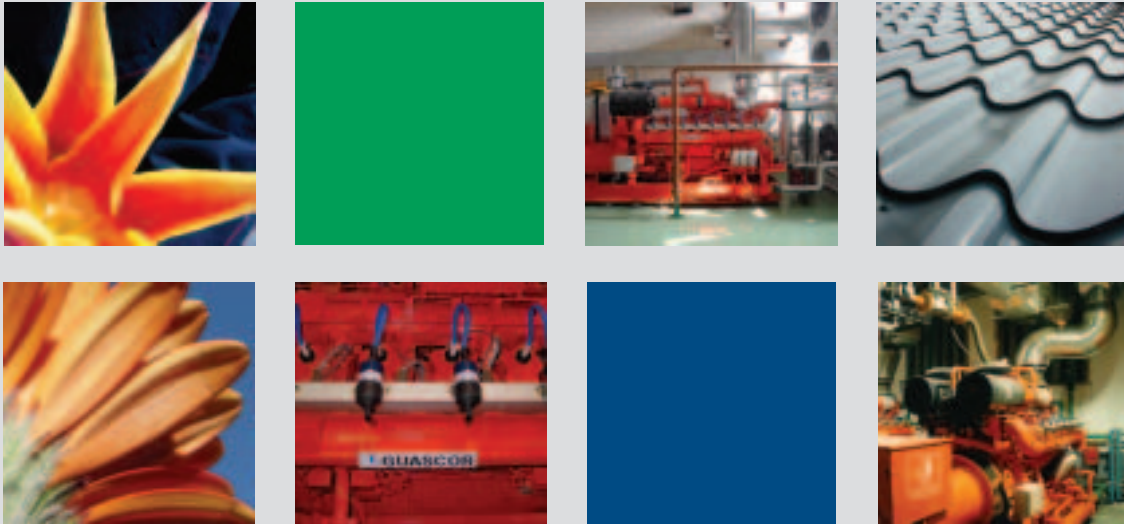
Size of the cogeneration plant according to the process' energy requirements.

### Advantages for the society:

Increased protection of the environment, as emissions are drastically reduced.

Improved efficiency of energy generation; electricity and heat generation, transport and distribution cost cut-down, since energy is produced at the place at which it is consumed.

Greater balance between the demand and supply of energy, which results in the reduction and stability of the energy prices.



## **Cogeneration represents a profitable investment again.**

GUASCOR offers you a specialist proposal for comprehensive implementation of this plan:

- We study and dimension the new cogeneration system that will best meet your requirements.
- We design, build and start the plant, reducing the completion times as much as possible.
- We upgrade and redeploy your existing cogeneration facility to restore it to optimum levels of profitability.
- We operate and service your plant, ensuring high usability rates.
- We manage your production of electricity and make it available to the market, maximising your incomes.
- We advise you and make use of our related consumables buying capacity to minimise costs.

**The result:** Improved competitive edge and global performance of your business.

### **784,444kWe installed power at 601 plants equipped with 1350 GUASCOR gas modules.**

There are GUASCOR cogeneration systems operating all over the world, in the following sectors or applications: Aeronautics, catering, cement, ceramics, chemical, cold storage, distribution chain (shopping centres), education (universities), environment, farming and cattle breeding, food, health (hospitals), industry, leisure (sports centres), mining, paper, textile, etc.



# COGENERATION

Environment-friendliness, profitability, performance, usability and maintenance service

## ENVIRONMENT-FRIENDLINESS

Based on the total useful energy generated, the NO<sub>3</sub> and CO<sub>2</sub> emissions produced by a system comprising a thermal power plant and a boiler almost double those released by a GUASCOR gas engine-operated cogeneration plant. GUASCOR gas engine-operated cogeneration plants comply with the strictest emission regulations in force.



## QUALITY AND ENVIRONMENT

GUASCOR S.A., in the framework of its commitment to quality, continual improvement and the environment, has been awarded the Registered Company Certificates to **ISO 9001** quality standard and to **ISO 14001** environmental management standard by Lloyd's Register Quality Assurance.

## PROFITABILITY

Cogeneration must be applied to those processes where heat and part of the electric energy produced by the cogeneration module can be used in an efficient manner.

The Governments of the most developed countries recognise that cogeneration is the most effective and less polluting system for making the most of a fuel in terms of energy. This is why there exist regulations intended to foment the use of this energy production system.

High-performing cogeneration plants successfully pass every profitability test.

Beside fuel and electric power costs, there are other very important factors which must be taken into account in order to secure outstanding economic results from the exploitation of a cogeneration plant. The performance of the cogeneration module, the availability and quality of the maintenance and repair service are constituents of the produced energy price.

## PERFORMANCE

GUASCOR equipment's performance ranks among the best. The GUASCOR engine features a combustion chamber which permits maximum use of the fuel energy. A last-generation electronic control of ignition and carburetion enables automatic adjustment of the working parameters and optimising efficiency according to the gas quality and charges. Due to the heavy-duty alternators selected for this application, the GUASCOR modules have an exemplary electric efficiency.

## USABILITY

This is as important as performance, or even more so. The decrease in a cogeneration plant generated energy, further to a two-days breakdown, amounts to a 0.6% power loss if the said plant operates 8000 hours a year. For plants with less hours of operation per year, the effect is greater.

Usability depends on the existence of a good technical assistance service and GUASCOR undoubtedly is the brand with the most developed service network.

Official technical service



**GUASCOR**



assistance service  
24 hour

## MAINTENANCE SERVICE

Cogeneration modules operate a great number of hours a year and require maintenance.

It is impossible to get good **performance** and a high **usability** ratio from the cogeneration plant, if servicing is not carried out in a professional manner, at a high standard of service quality. A good **maintenance service** is equally or more important than the two previous characteristics.

GUASCOR, supported by an extended and proven quality service network, also proposes maintenance contracts that guarantee the equipment's performance throughout their operating life.

GUASCOR's comprehensive maintenance contracts guarantee the correct operation of the cogeneration system and include the supply of all the consumables, except for fuel. They also cover corrective maintenance in case of a possible failure, which means users have a total warranty on the equipment. The quick responsiveness of GUASCOR's assistance service has been recognised and appreciated for years both by the industrial sector and by the demanding marine-fishing sector.

 **GUASCOR**

## COGENERATION

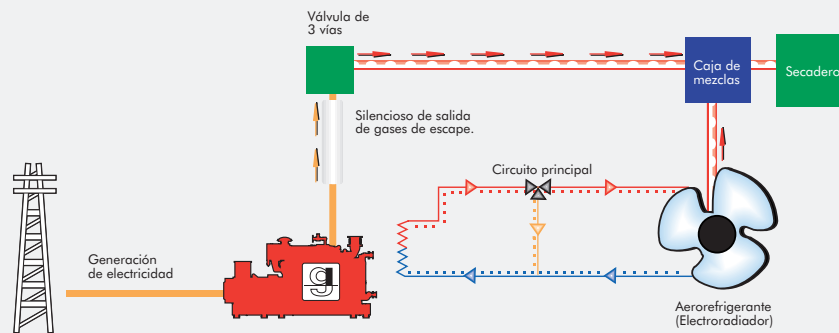
With hot air production and air conditioning

### COGENERATION WITH HOT AIR PRODUCTION

Cogeneration with hot air production for drying processes is the simpler system, since the elements necessary for heat recovery are basically the same as would be required to cool the engine.

This type of cogeneration is usable in processes where hot air is needed for drying purposes, namely in the ceramic industry, lucerne dehydration, manure or sludge dewatering, etc.

Heat from the engine liners, in the form of hot water, is converted into hot air in an aircooler. And this hot air is mixed with the exhaust gases in a chamber. On the controlled mixing process and the correct determination of the amount of air needed by the drying process depends the success of an application in which GUASCOR possesses a very extensive experience.



### COGENERATION FOR AIR CONDITIONING-ABSORPTION

Using cogeneration to produce hot water for heating systems is widespread in all of Europe. Since the demand for heating varies according to the seasons, a cogeneration system would not be profitable if heat generated by the cogeneration modules were not used in the summer.

In summer, what is really needed is cold water for air conditioning, and this is usually obtained by means of high power-consuming refrigerating compressors.

An effective alternative presently consists in using absorption chillers which are fed with hot water from the cogeneration modules and provide cold water without any draw on electric energy. This makes it possible to get a uniform curve of the cogeneration receiving facilities' heat energy demand and to reduce the electricity bill at the same time. The system is successfully used in air conditioning plants for the tertiary sector as well as in important industrial applications, such as the food, chemical and other industries.



Atocha Railway Station (MADRID).

**Cogeneration :**  
1.272 kW<sub>e</sub>



Iguatemi Square Business Center (SAO PAULO).

**Trigeneration:**  
3.000 kW<sub>e</sub>



University of Santiago de Compostela.

**Cogeneration loop:**  
3.500 kW<sub>e</sub>

## COGENERATION

with hot water production and cogeneration in greenhouses



Bidasoa Hospital (Hondarribia)

## COGENERATION WITH HOT WATER PRODUCTION

### ALL-WATER MODULES

**Health care sector:**  
18,813kWe installed power at 20 plants equipped with 38 GUASCOR cogeneration modules.

Cogeneration with hot water production probably is the type of cogeneration first put into practice.

The so produced hot water can be used as is either as Sanitary Hot Water or in washing, heating or any industrial processes.

Its scope of application is very wide, ranging from applications in the tertiary sector, such as hospitals, hotels, sports centres, swimming pools, hypermarkets, etc., to the most complex uses in an industrial environment.

Hot water is produced by recovering almost the total engine heat. Heat from oil and intercooler is used; heat is recovered from the wet liners circuit and the exhaust gases.



## COGENERATION IN GREENHOUSES

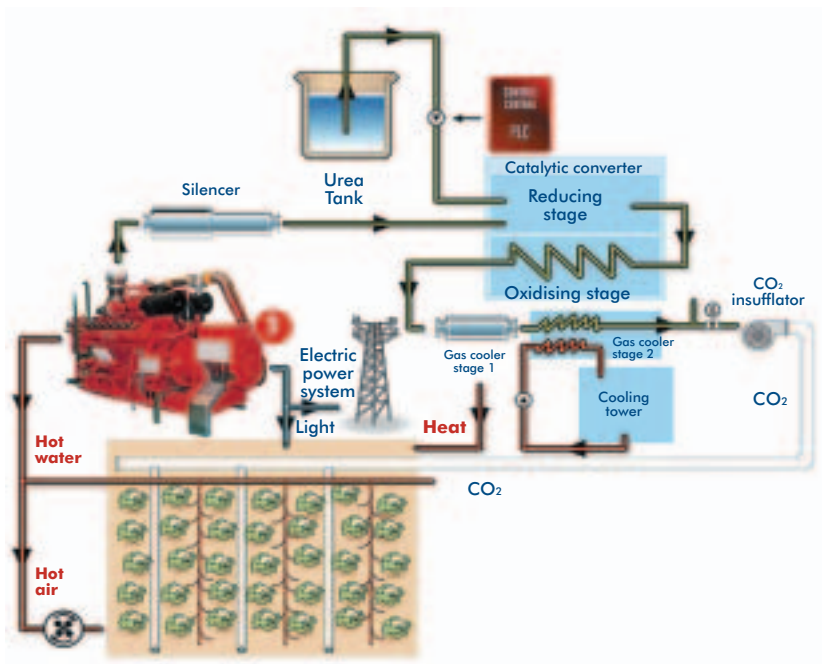
175,119kWe installed power at 159 greenhouses equipped with 309 GUASCOR cogeneration modules.

Due to its great energy utilisation rate and contribution to photosynthesis, cogeneration reaches its maximum level of effectiveness when applied to greenhouses. GUASCOR has installed over 300 systems in various greenhouses in Spain and other European countries like the Netherlands, Belgium, Italy, Germany, etc.

Natural gas-operated cogeneration modules represent a very profitable investment. Investments can be rapidly paid back thanks to the possibility of selling up to 90% of the generated electric energy to the electric power system at a good price, the exploitation of heat, and the use of exhaust gases to provide carbon dioxide to plants in the greenhouse. GUASCOR's wide range of modules enables cogeneration patterns to meet the specific requirements of every greenhouse.



ENDANEA Greenhouse (Hondarribia)





# COGENERATION

At landfills and sewage treatment plants

## COGENERATION AT LANDFILLS

### Landfill biogas:

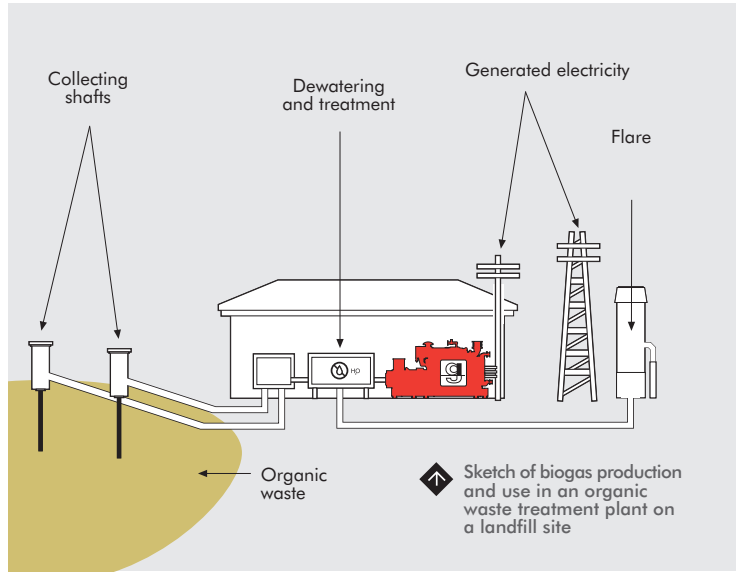
66,219kWe installed power at 66 landfill sites equipped with 115 GUASCOR cogeneration modules.

Years ago, biogas developing on landfill sites as a result of the organic matter's anaerobic fermentation was extracted by means of a suction system and burnt in flares.

Since then, the extraction process has been improved and biogas is now used, once treated, as fuel in GUASCOR cogeneration modules in order to produce electricity and heat.

GUASCOR has a great experience in this field and our machines are used in many countries.

Most of the electric energy is exported and heat can be used in nearby facilities. Installing biogas cogeneration modules on landfill sites is very simple and operating them generates economic resources that contribute to defraying the considerable operating costs of controlled landfills.



## COGENERATION AT SEWAGE TREATMENT PLANTS

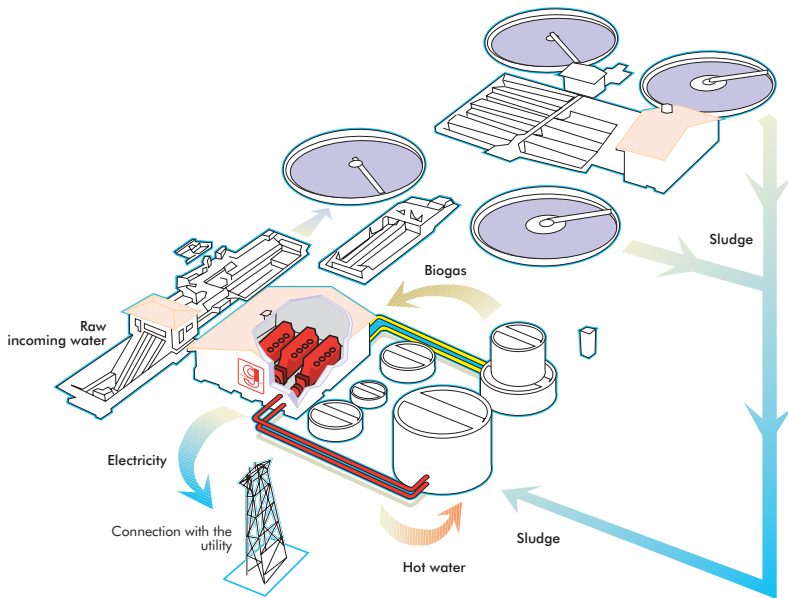
### Digester biogas:

41,862kWe installed power at 58 waste water treatment plants equipped with 95 GUASCOR cogeneration modules.

Using GUASCOR cogeneration equipment in waste water treatment works is very simple and profitable. Result of the anaerobic fermentation of sludge during the tertiary phase of the sewage treatment process is a methane-rich gas (biogas).

Once adequately treated, this biogas is used as fuel in special-purpose GUASCOR cogeneration modules. These produce electric energy for the works and hot water for the digesters. When the process demands for hot water is lower due to climatic conditions, the exhaust gases of the gensets can be used for sludge drying.

It is also frequent to use biogas-fuelled engines as direct drivers of agitators.





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