

DRESSER-RAND®

Empowering Sustainability





Since 1966

Since its creation in 1966, Guascor has been committed to the design, research and manufacture of energy production systems (from the engine to an entire generation plant). It was recently acquired by the Dresser Rand group and now ranks as the world's point of reference in the field of distributed generation, cogeneration, and renewable energy (bioenergy), working directly to ensure our customers can develop their own sustainable energy strategy.

The significant continued investments in its R&D center, opened in 1996, have enabled Guascor to design and manufacture high performance engines, developed to minimise environmental impact by complying with the most demanding environmental management standards such as UNE-EN ISO 14001:2004 standard.

The excellent quality and reliability of Guascor power and generation systems have been recognized over more than 49 years in marine and industrial use, as Guascor engines are used in over 40 countries and they come complete with a fast and efficient technical assistance and spare parts worldwide, as stated in the ISO 9001 quality certificate and OSHAS 18001.

- 1966** Foundation of **Guascor**
- 1984** Conversion of marine engine to natural gas engine.
- 1996** Creation of a worldwide reference R&D center in Vitoria.
- 1998** Launch of the new line of SF Diesel engines.
- 1999** Launch of SFGLD gas engine series.
- 2000** Launch of gas engine SFGLD 560 (985 KWe).
- 2000** IMO 1 emission certificate for marine Diesel engines.
- 2001** Syngas engines (Biomass).
- 2001** Development of compression engines.
- 2003** CCNR1 emission certificate for marine Diesel engines.
- 2004** Launch of Dry exhaust manifold for gas engines.
- 2006** Development of low compression ratio gas engines.
- 2007** Launch of dual fuel engine (Diesel - Natural Gas) series.
- 2007** Launch of BioDiesel BD100.
- 2007** CCNR2 emission certificate for marine Diesel engines.
- 2008** HGM 560 engine launch, new high-performance technology millercycle engine.
- 2008** Launch of new system for integrated control of management.
- 2009** Increase of power in marine and industrial Diesel range.
- 2009** Launch of engine model SFGM 560.
- 2010** Launch of engine model HGM 240.
- 2010** IMO 2 emission certificate for marine Diesel engines.
- 2010** Launch of engine model SFGLD 560-LCR.
- 2011** Acquisition by DRESSER RAND Group



FIELDS OF APPLICATION

1

“Nature never makes anything without a purpose, and it knows how
to make multiple uses of a single cause”

COPERNICUS, Polish-Prussian scientist

DRESSER-RAND®



That is the spirit of D-R GUASCOR.

D-R Guascor offers complete and tailored solutions to fit every need, solutions that are adjusted to the specific conditions of each project, covering all its stages.

Generator sets, entire cogeneration modules, distributed generation plants, complete marine propulsion systems that give the highest performance and reliability and designed with respect for the environment at their heart.

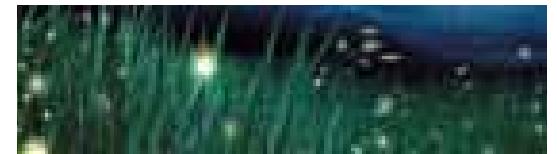
1 Energy Efficiency

D-R Guascor offers cogeneration or trigeneration energy recovery systems which save up to one third of the primary energy coming from natural gas, biogas or Diesel.



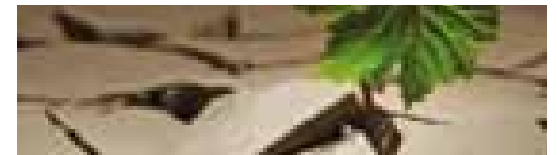
2 Power Generation

Distributed energy is an effective solution to bring energy where it is most needed and most difficult to obtain. Distributed energy centers located in isolated areas have autonomous systems and do not require the services of a traditional power plant. They can use Diesel, biogas or natural gas as the primary source of fuel.



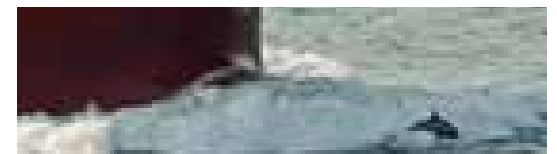
3 Bioenergy

Guascor creates solutions for energy recovery from gases generated in water treatment plants, landfills, food industry, forest and agricultural waste and animal waste on farms. Biogas from Biomethanisation or Anaerobic digestion, BioDiesel or Bioethanol from dedicated energy crops, Gassified fuel from Pyrolysis of energy crops, can all be used to turn a Sustainable energy solution into a Renewable energy solution.



4 Marine

Due to our Guascor origins, we develop propulsion systems, propulsors, engines, auxiliary engines and reduction gearboxes for different types of naval vessels ships, to the satisfaction of both captains skippers and owners, whilst maintaining strict emission levels and optimum reliability.



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1

Energy Efficiency

“Beware of the little expenses, a small leak can sink a great ship”

BENJAMIN FRANKLIN, U.S. statesman and scientist.







Reduces the costs of energy production

- Increased energy efficiency, reduced losses.
- Reduced no dependence on the electrical network.
- Scalability adapted to the energy needs of each case.
- Reduction of the cost of energy.

Why introduce a cogeneration system?

• PROFITABILITY

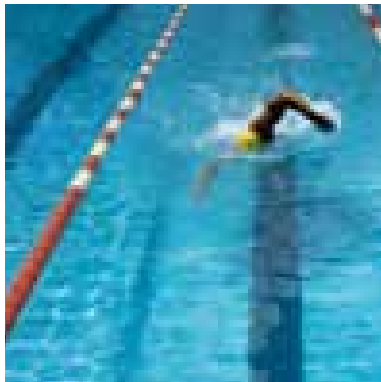
The use of low cost fuels and waste energy recovery are crucial factors which make high performance cogeneration plants obtain exceptional economic results. Based on an input scheme of 100% fuel (natural gas) and results in 40% of electrical power, up to 55% of thermal power and only 5% of losses. This is why the governments of most developed countries have taken cogeneration as the most efficient, cleanest and most economically viable system of energy recovery from fuel, promoting regulatory rules that seek to encourage this energy production system.

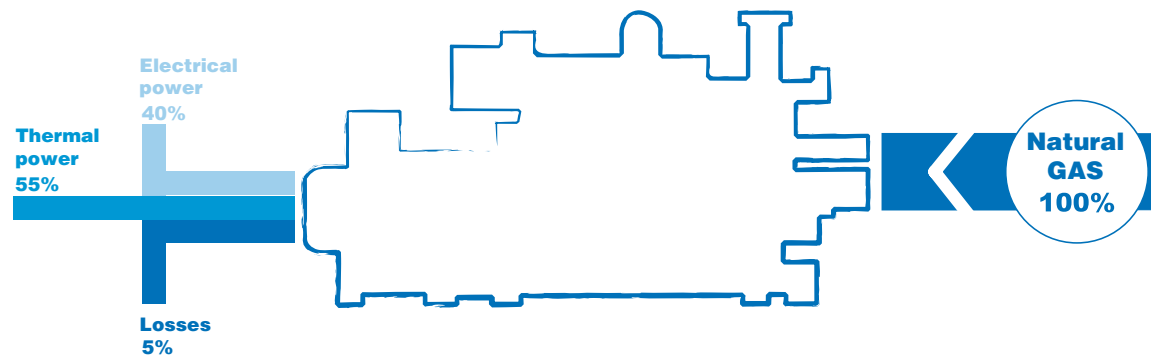
• AVAILABILITY

In manufacturing and commerce, stability and availability in power generation is almost as important as efficiency itself. In order to provide it, D-R Guascor offers a global support network through their dealers. We aim to keep your system running harder and stronger for longer, maximizing your savings and benefits.

• PROTECTION OF THE ENVIRONMENT

Earth is where we live and we want to take care of it. The NO_x and CO_2 emissions produced by a building using a conventional boiler and grid connection produce nearly double that of the emissions produced by an equivalent D-R Guascor cogeneration plant with a gas engine. D-R Guascor cogeneration systems are all designed to meet the strictest emission standards.





Applications

Good individual applications for Cogeneration tend to be buildings and processes with high occupancy levels. Buildings like hotels, shopping centers, universities, stations, hospitals, datacentres, etc. are all good examples of this and will invariably make for good CHP installations.

Individual factories and processes with high thermal loads often also qualify as Cogeneration applications: ceramic industry, laundry facilities, textile and food industries, maltings, etc. again are all good examples.



LOIU AIRPORT (Bilbao, Spain)

**TRIGENERATION.**

Implementation of a trigeneration system at the international airport of Bilbao, designed by the architect Santiago Calatrava.

Installation:

- 2 x FGLD 360 natural gas engines.
 - Power output: 1 MWe
 - Thermal Output: 1.3 MWth (Low Temperature Hot Water)
 - Thermal Output: 0.9mWth (Chilled Water)
- 1 Absorption Chiller, coupled with the 2 engines, Producing 900kW of Chill water for the Air Conditioning.

ARGILORE (Hondarribia, Spain)

**COGENERATION.**

Installation of a cogeneration plant for greenhouse and plant nursery.

Installation:

- 3 engines FGLD 360, powered by natural gas.
 - Power output: 1.6 MWe
 - Thermal Output 2.6MW (Heated air)
 - CO₂ Output ~600kg/h

HERA COVALPA (Italy)

**COGENERATION.**

Food company processing vegetables.

Installation:

- 2 engines HGM 560, natural gas.
 - Thermal Output: 2.4MWth (Low Pressure Steam)
 - Power output: 2.4 MWe

AFRICAN GLASS (Lagos, Nigeria)



COGENERATION.

Glass manufacturing & recycling industry.
Exhaust energy for Glass processing.
Hot water for heating.

Installation:

- 2 gensets SFLGD 560 powered by natural gas of 945 KWe, 50 Hz.
- 1 genset SFLGD 360 powered by natural gas of 945 KWe, 50 Hz.
-Power output: 2.5 MWe

INDUSAL (Spain)



COGENERATION.

Cogeneration Natural gas for laundry industry:

- 11 containerized Genset of HGM 240.
Production of Steam, Hot Water.
-Power output: 5.5 MWe
-Thermal output: 6.14 MWth.

Cumilla, Bangladesh



COGENERATION.

Textile industry.

Installation:

- 2 engines 560 SFGLD powered by natural gas.
-Power output: 2 MWe

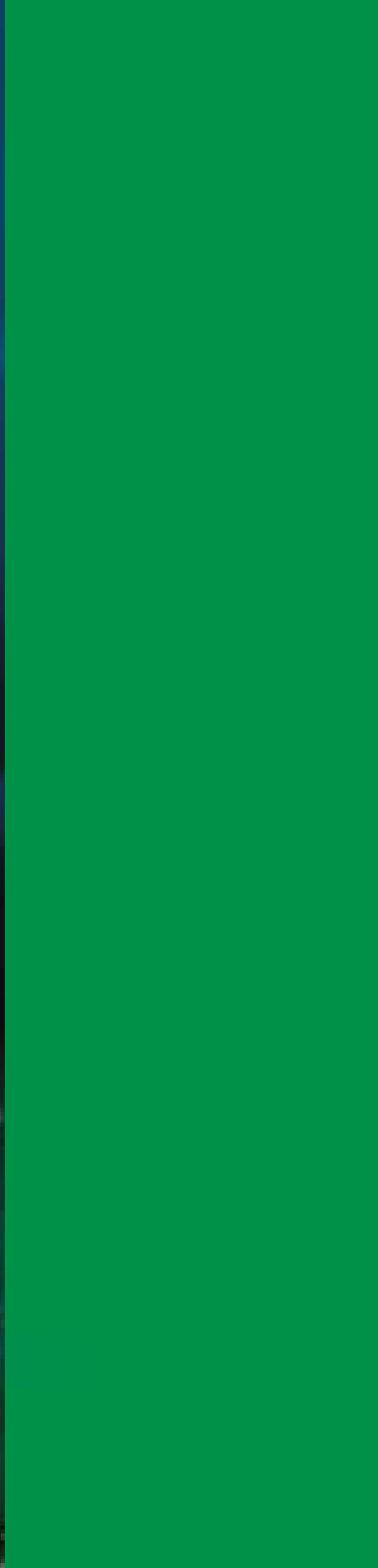
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Power Generation

“The only way to discover the limits of the possible is to go beyond them into the impossible.”

ARTHUR C. CLARKE, CBE English Science Fiction writer







An effective solution to produce energy locally where it is most needed.

Distributed energy is a system of local power generation and energy resource management in off-grid locations where users demand power with greater quality, reliability and efficiency.

Private companies developing isolated areas with remote industrial projects and construction plants need flexible electrical energy generation assets to power their processes and drive their projects.

Rather than stretch out to connect to a remote grid, Distributed generation takes the power to them.

Numerous generation assets are installed to form a mini-grid which is modular in nature, allowing operations in isolated areas to expand and contract to support the demands of the client as they work in isolation, independent of major grid networks while retaining maximum availability and efficiency.

These grids can be powered from numerous diverse power sources - solar panels, wind, reciprocating engines - all installed and interconnected.

Distributed energy centers in isolated areas are autonomous and do not require services of a traditional generating plant.

Distributed energy has many uses: public lighting, domestic supply, supply of energy to industrial plants, etc.



Why Distributed Energy?

- **It is easy to obtain**

It uses fuels that are easily accessible, such as natural gas, biogas, Diesel, etc.

- **Cheap energy**

It is acceptable for the economy of the community where it will be used, with the aim of creating incomes which benefit directly to the community.

- **Clean energy**

It is obtained through projects that include all kinds of guarantees designed to minimise environmental impact.

- **Easy installation**

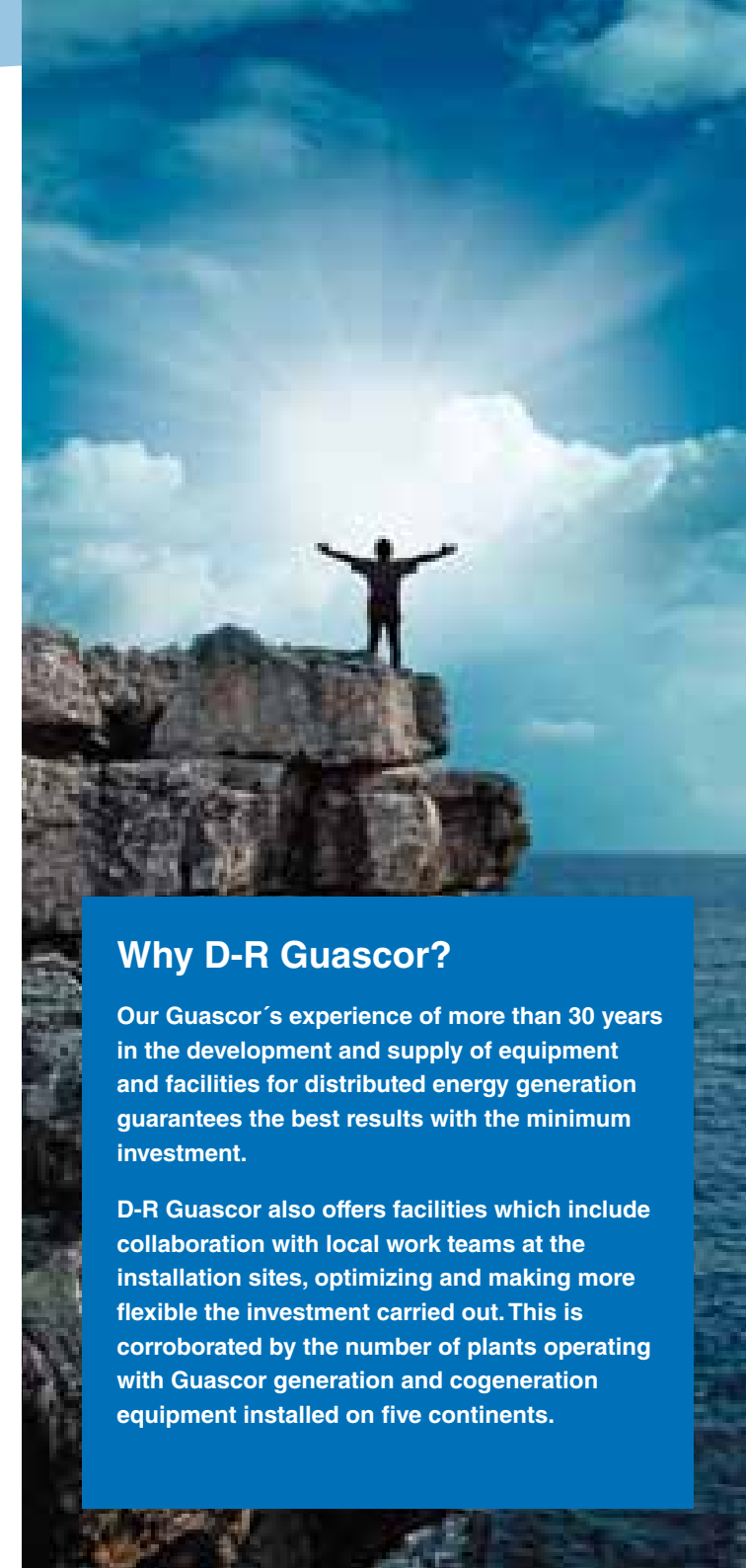
Simple projects, easy to install and maintain, with little civil work.

What are the benefits of distributed energy?

- Quick access to remote areas.
- Lower energy losses in transmission and distribution.
- Allows for cogeneration optimizing energy efficiency.
- Modular plants that reduce investment by changing size as demand grows.
- Reliable and lasting power supply.
- Adaptability to the type of fuel available at the installation site.
- Greater control and improved energy cost forecast.
- Improved stability of the voltage of the electrical network.
- Increase in contingency reserves.

D-R Guascor offers:

- In-site feasibility studies.
- Feasibility studies for civil works.
- Basic engineering on site and civil works.
- Turnkey projects of basic engineering.
- Operation and Maintenance.



Why D-R Guascor?

Our Guascor's experience of more than 30 years in the development and supply of equipment and facilities for distributed energy generation guarantees the best results with the minimum investment.

D-R Guascor also offers facilities which include collaboration with local work teams at the installation sites, optimizing and making more flexible the investment carried out. This is corroborated by the number of plants operating with Guascor generation and cogeneration equipment installed on five continents.

NOVA BURITIS (Brazil)



Design and installation of an power generation plant based on Diesel generation gensets aimed to supply electricity to an isolated area of the electricity mains in the Brazilian state of Rondonia.

-Power output: 12.4 MWe

BRAZIL



Installations:

- **STATE OF RONDONIA**
 - Number of containerized gensets: 32
 - Power output: 75 MWe
- **STATE OF PARÁ**
 - Number of containerized gensets: 23
 - Power output: 66 MWe
- **STATE OF ACRE**
 - Number of containerized gensets: 13
 - Power output: 46 MWe

TOTAL POWER OUTPUT: 187 MWe

VENEZUELA



Installations:

- 225 Diesel containerized gensets SF 360 TA.
- Power output: 180 MWe

BARE + MEREY + TEJERO (Venezuela)



Installations:

- 240 containerized gensets of SFGLD 560 engine for Venting Gas (APG).
-Power output: 230 MWe

XAI XAI (Mozambique)



Installations:

- 4 containerized gensets of SF 480 TA Diesel engine.
- Power output: 4 MWe

AMAZONAS (Brazil)

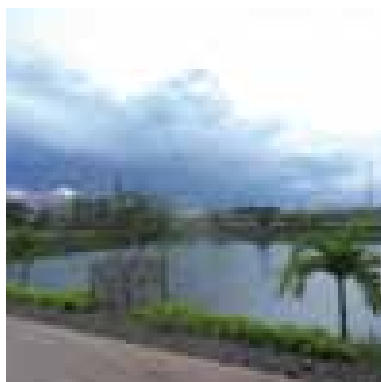


4 Power Plants in Amazonas Region.

Installations:

- Caapiranga (2.2 MW): 5 x SFGLD 360 Guascor Engine Series
- Anama (2.2 MW): 5 x SFGLD 360 Guascor Engine Series
- Anori (4.6 MW): 5 x SFGM 560 Guascor Engine Series
- Codajas (5.5 MW): 6 x SFGM 560 Guascor Engine Series

TOTAL POWER OUTPUT: 21 MW



Associated gas from crude oil gives a great amount of energy. Given that the quantities of oil that are extracted are large, associated gas from oil (GAP-APG) is commonly used as fuel for power generation. The continued growth of electricity prices and its production costs fully justify the use of associated gas from oil as supplementary or alternative fuel.

It is important to consider the following:

1/ Gas properties, chemical composition, volumes, calorific value, methane number and laminar flame speed.

2/ Usual chemical composition:

- Methane 40-90%
- Ethane 2-20%
- Propane 1-15%
- Butane 1-10%
- Carbon dioxide 1-40%
- Methane Number 30-65 (bottleneck that limits the whole process).
- LHV to 11-20 kWh/Nm³
- In case of high contents of H₂S, desulphurization is needed. The composition and flow of AG varies, and an in-depth control is required.

3/ The main requirements to consider:

- Fuel flexibility.
- Stability conditions in island operation.
- Low methane numbers needed in order to operate.
- The engines cannot operate in an ATEX area (explosive atmospheres) zones 0-2.
- Ventilation systems that ensure the dilution of methane are required.

4/ Low compression ratio Guascor engines (LCR-low compression ratio) are designed to operate:

- With gases with a low methane number.
- With the flexibility of fuel.
- With stability in island mode operation.

BARE, (Venezuela)

Venting Gas (APG)

Installations:

- 80 containerized gensets of SFGLD 560 engine.
- Power output: 60 MWe

Project:

- 320 containerized gensets SFGLD 560 engine.
- Power output: 245 MWe



PERTAMINA TAMBUN (Indonesia)

Venting Gas (APG)

Installation:

- 1 unit SFGM 560
- 3 unit SFGLD 560 LCR
- Power output: 4 MWe



PAE, PAN AMERICAN ENERGY (Amoco Brida, Argentina)

- Mechanical drive of pumps of different types.
- Injection pumps for water wells.
- Centrifugal pumps.
- Multistage pumps.
- Power output: 15 MWe



AGIBA PETROLEUM CO. (Egypt)

Well gas from Raml field. The gas well in Raml lies in the western part of the desert of Egypt (110 wells).

- 3 containerized gensets of SFGLD 480 LCR engine.
- Power output: 1.5 MWe



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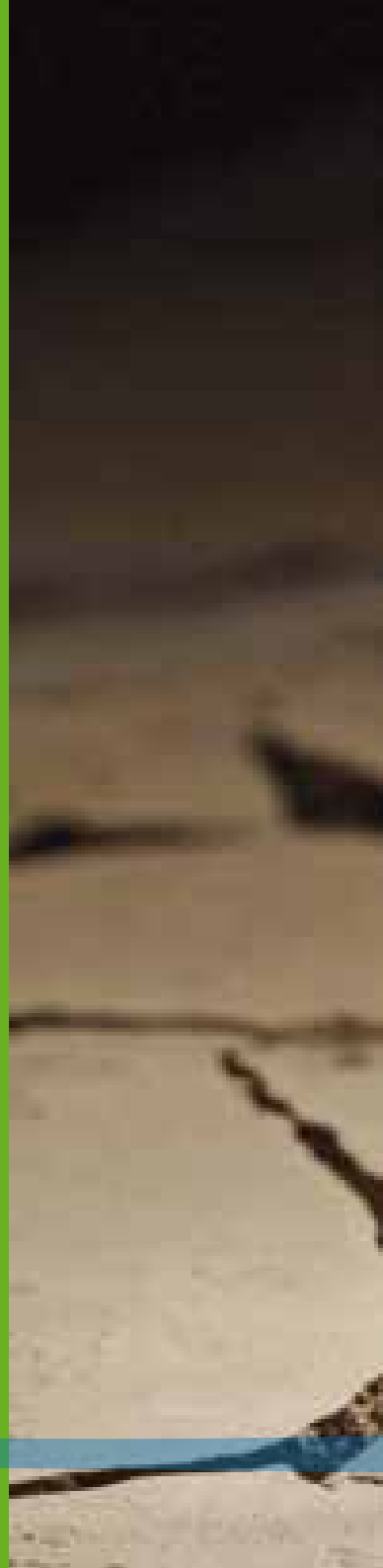
Bioenergy

“Nature never does anything without reason”

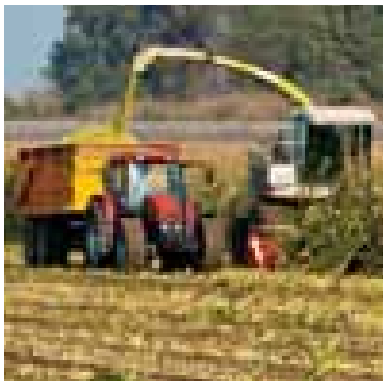
ARISTOTLE, ancient Greek philosopher and scientist

We admire the power of nature. We look to it as a source of inspiration in order to imitate it and perfect our solutions. We learned to make use of the waste and gases from different treatment processes of biomass and turn them into clean and useful energy.

We bring together the experience and accumulated knowledge in various activities related to bioenergy and this has led us to the development and design of engines for the application of biogas.







Biomethanization is a solution specially designed for the utilisation of different types of waste and their conversion into clean and usable energy:

- **Agriculture:** corn, tapioca, POME (Palm Oil Meal Effluent), Grape, Potato.
- **Forestry.**
- **Landfills.**
- **Wastewater treatment plants.**
- **Livestock:** swine, poultry, cattle,...

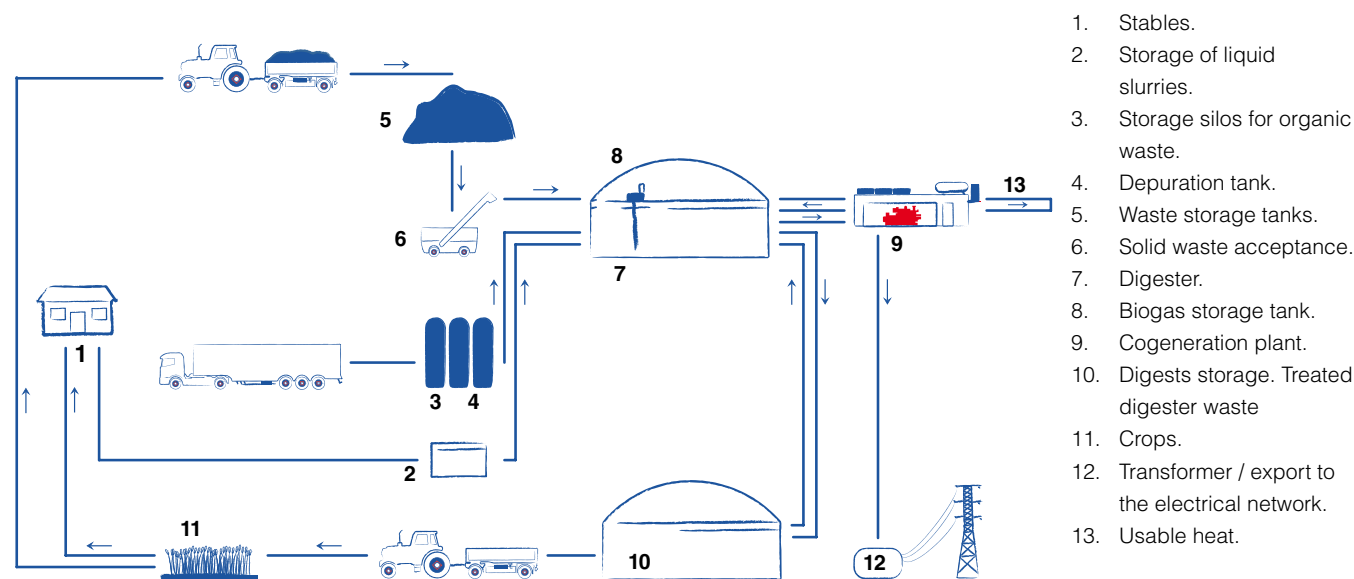
It is also applicable for the use of other types of biomass such as manure, agricultural surplus, etc.

Biomethanization, or controlled anaerobic digestion, is one of the most efficient processes for reducing greenhouse gas emissions available today: the capture and harnessing of the energy contained in organic waste and the use of the residual treated waste as an organic fertiliser is one of the most ecological and ethically responsible actions we can take as a species, it also happens to be one of the most economically advantageous.

Through anaerobic digestion of different types of waste and different effluents, Guascor provides the opportunity to achieve:

- **Significant odor reduction.**
- **Mineralization.**
- **Production of renewable energy, replacing fossil fuel by gas.**
- **Reduced environmental impact and reduced requirement for flaring.**
 - Dramatic reduction of methane (CH_4) emissions, which produces a greenhouse effect 21 times greater than CO_2 .
 - Reduced CO_2 emissions as a result of replacement of fossil fuels.

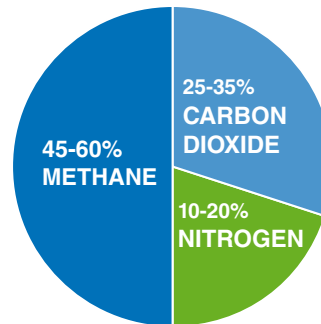
The promotion and implementation of collective biogas production systems on different farms also allows for the implementation of complete management systems for organic waste in different geographical areas, with obvious economic and environmental benefits for society.



ENERGY RECOVERY ON LANDFILLS

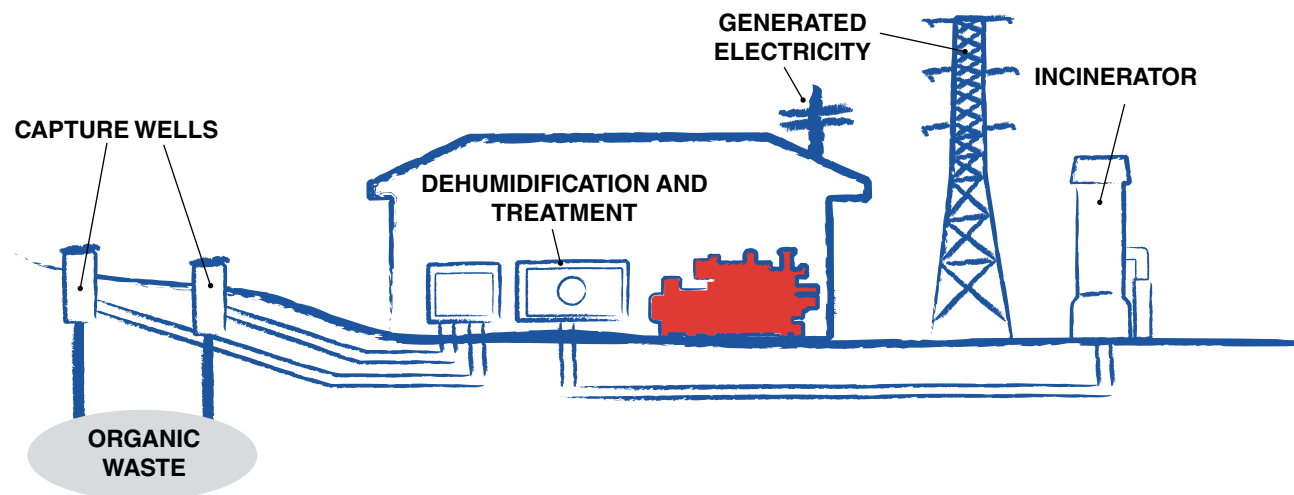
The organic matter from waste left on landfills decomposes which produces contaminating gases.

Composition of gases released during fermentation of organic matter on a landfill.



Gas capture is done through wells equipped with perforated tubes for gas collection, and a pipeline system which takes the gases to a measurement and control station where it is dehumidified and de-sulphurised.. It is then taken to a D-R Guascor engine-generator sets, which convert the energy contained in the methane into electricity.

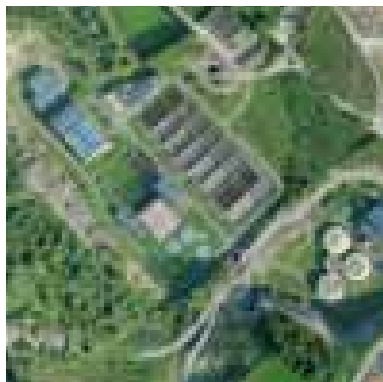
PRODUCTION AND OPERATION OF BIOGAS AT A LANDFILL ORGANIC WASTE TREATMENT PLANT



Guascor Solutions

- Desk and field studies to estimate biogas generation on landfills.
- Project implementation.
- Field work on landfills: explorations, equipping of wells, pipelines, condensate disposal systems, etc.
- Manufacture and installation of specific equipment for different types of biogas plants.
- Implementation of control systems and SCADA systems for plants for combustion of biogas.
- Development of Turnkey projects.
- Preventive and corrective maintenance.





Advantages of the use of Guascor systems for energy utilisation:

- Lower impact on the environment by reducing emissions of CH_4 and CO_2 .
- Energy self-sufficiency of the plant to the point of obtaining practically free energy.
- Use of thermal energy from the engines to maintain optimum fermentation temperature of the sludge and for its drying.
- Improved economic performance of the W.W.T.P. and possibility to export the surplus of electricity and obtain extra income. Often Government incentives for energy from waste make power produced from WWTP's exceptionally lucrative.

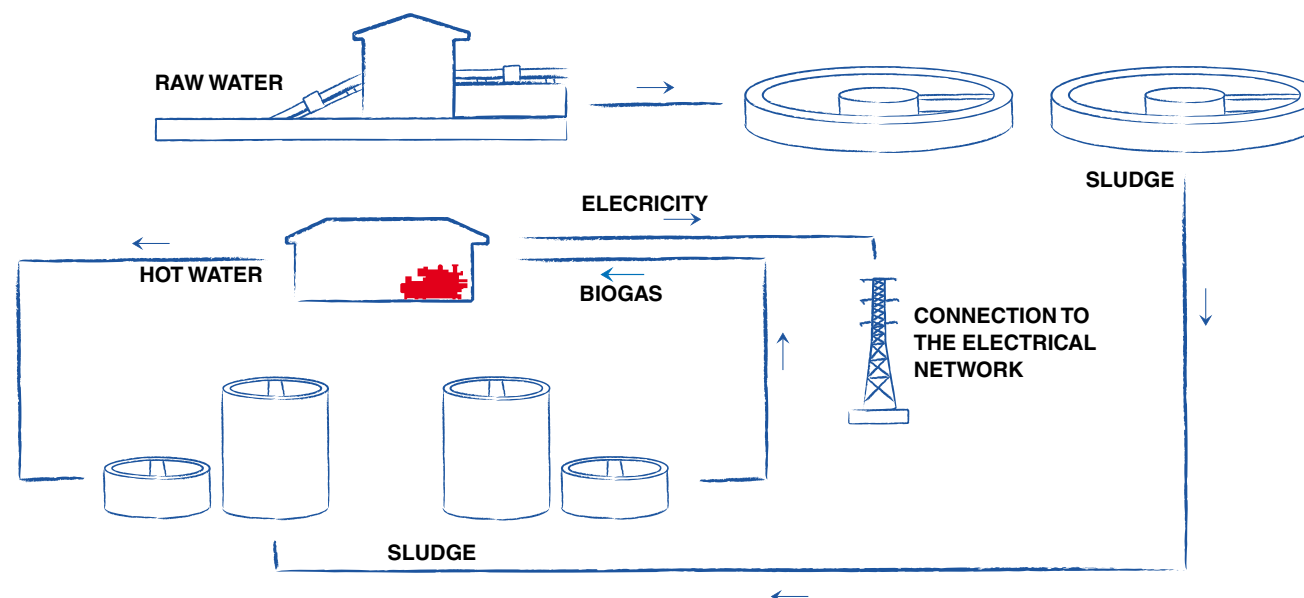
Energy recovery in Wastewater Treatment Plants (W.W.T.P.)

The classification and filtering of wastewater from urban areas involves a complex and selective process which allows discharge into rivers only once the water has been cleaned and freed of contaminants. Some of the components carried by water and brought to the treatment plant are organic products in the form of sludge, which are separated and stored through filtering and decanting.

Anaerobic digestion of sludge produces gas containing approximately 55%-65% of methane (CH_4), 30%-40% of carbon dioxide (CO_2) and other quantities of waste gases.

Historically the biogas was stored in a gasometer for its direct use as boiler fuel for heating the sludge. In modern plants however, gas is now only initially stored in a gasometer but after being treated for the removal of contaminants and corrosive components, it is now used as fuel in reciprocating engines specially designed for its consumption, the subsequent heat recovered from the engine is now used to heat the sludge instead - an altogether more efficient solution.

WASTE WATER TREATMENT PLANT PROCESS DESCRIPTION



BIOFUELS

BioDiesel

BioDiesel is a **synthetic liquid biofuel** obtained from natural **lipids** such as new or used vegetable **oils** or animal **fats**, through industrial processes of **esterification** and **transesterification**. It is used as total or partial replacement of **petroDiesel** or **Diesel** obtained from fossil (crude) oil.

To minimize the risks associated with the use of bioDiesel in our engines, it was considered appropriate to begin by making an engine that uses **10% bioDiesel and 90% Diesel**, and gradually increase the amount of bioDiesel until reaching the percentage of 100% of bioDiesel. These tests helped us identify problems linked with the use of biofuel in the engine without causing catastrophic failures, by optimizing guidelines and preventive maintenance costs and enabling the development of engine modifications to optimize the economical use of bioDiesel.

D-R Guascor has recently developed an engine which runs wholly on Bioethanol, an alternative to biodiesel, and the field results have been initially very positive. This product is due for launch in 2015

BIOMASS ENGINES

Designed for use with syngas

Made of different types of biomass: nut shells, fruit seeds, wood chips, bagasse, agricultural waste wood, forest waste, other.

All these biomass fuels can be made to release their stored energy by a process of pyrolysis, a gasification which allows the resultant gaseous fuel to be used in a gas engine identical to how biogas is used.

In direct competition with woodchip boilers, these biomass engines offer a viable renewable alternative to liquid biofuels and anerobic digestion systems.

The Biomass engine system results in a self-sustaining Cogeneration system fuelled by biomass.

Simple maintenance and operation.

In addition, by obtaining a syngas free of heavy hydrocarbons, Guascor solutions help reduce environmental impact.



DALFSEN (Netherlands)**Biomethanization**

Livestock and forestry waste digester.

The heat produced by the gensets is used to obtain heating. Installation also converts biogas into natural gas and it is introduced into the supply network.

Engines installed:

- 1 HGM 560 engine.
- 1 HGM 240 engine.

-Power output: 1.700 KWe

**WWTP ARROYO CULEBRO (Madrid, Spain)****Water treatment plant**

- 2 gensets of FGLD 480 engine.
- 3 gensets SFGLD 560 engine.

-Power output: 4,5 MWe

**CLOVER HILL FARM (USA)****Biomethanization**

CAMBELLSPORT WI/Holsum Dairies CHILTON WI (USA);

Dairy farms:

- 1 gensets of SFGLD 180 engine.
- 2 gensets of SFGLD 480 engine.

-Power output: 2 MWe

KR CLEAN STARCH FLOUR (Thailand)**Biomethanization**

Starch treatment plant.

- 3 gensets of SFGLD 560 engine.

-Power output: 3 MWe



UDOMDEJ FARM (Thailand)

Biomethanization

Biogas from a pig farm.

- 2 gensets of SFGLD 480 engine (subsequent lagooning).
- Power output: 1,6 MWe



RIBERAO (Brazil)

Biogas WWTP

- 2 containerized Gensets of SFGLD 560 engine (1200 rpm)
- Production of Hot Water, Heated Air.
- Power output: 1.5 MWe + 1.75 Mwth

EL TESORO MALDONADO (Uruguay)

Landfill

Landfill biogas.

- 2 containerized gensets of FGLD 360 engine.
- Power output: 1060 KWe



FYPASA (Mexico)

Biogas WWTP

Wastewater treatment plant biogas.

- 2 containerized Gensets of SFGLD 480 engine (1800 rpm)
- Power output: 1.75 MWe
- Thermal output: 2.4 MWth

GAS ENGINES COGENERATION

					ENGINES			GENSETS		
					1200 rpm	1500 rpm	1800 rpm	1200 rpm/60Hz	1500 rpm/50Hz	1800 rpm/60Hz
	Type	N°. CYL.	Displacement		kWb	kWb	kWb	KWe	KWe	KWe
Atmospheric engines	FG 180	6L	18		-	150	180	-	142	171
	FG 240	8L	24		-	200	238	-	191	226
Mechanical carburation	FGLD 180	6L	18		-	275	300	-	264	287
	FGLD 240	8L	24		-	360	400	-	347	385
	FGLD 360	12V	35,9		-	550	600	-	529	577
	FGLD 480	16V	47,9		-	725	800	-	702	774
Electronic carburation	SFGLD 180	6L	18		252	315	350	242	300	336
	SFGLD 240	8L	24		335	419	453	322	405	436
	SFGLD 360	12V	35,9		503	630	700	486	609	676
	SFGLD 480	16V	47,9		670	838	906	649	812	874
	SFGLD 560	16V	56,3		788	985	-	762	957	-
Miller cycle engines with electronic carburation	SFGM 560	16V	56,3		-	1055	1100	-	1025	1065
High performance Miller cycle engines	HGM 240	8L	24		-	520		-	502	-
	HGM 560	16V	56,3		1040	1240	1350	1007	1204	1308

DRESSER-RAND®



SYNGAS ENGINES AND GENSETS FOR LAND APPLICATION

ENGINES						GENSETS		
CONTINUOUS DUTY (kWb)						CONTINUOUS DUTY (KWe)		
Engine Type	N° CYL	Displacement Liters	1200 rpm	1500 rpm	1800 rpm	1200 60Hz	1500 50Hz	1600 60Hz
SFGLD 180	6L	12	209	263	283	199	253	271
SFGLD 240	8L	24	281	350	377	269	338	362
SFGLD 360	12V	36	418	526	565	401	508	544
SFGLD 480	16V	48	561	700	754	541	678	729
SFGLD 560	16V	56	590	735	-	569	711	

LHV:4.5/7 MJ/Nm³

Cos phi=1

DUAL FUEL ENGINES AND GENSETS FOR LAND APPLICATION

ENGINES					GENSETS	
CONTINUOUS DUTY (kWb)					CONTINUOUS DUTY (KWe)	
Engine Type	N° CYL	Displacement	1500 rpm	1800 rpm	50Hz KWe	60Hz KWe
SFD 180	6L	12	360	407	347	391
SFD 240	8L	24	480	543	464	523
SFD 360	12V	36	720	815	698	787
SFD 480	16V	48	960	1087	930	1048

Cos phi=1

DIESEL ENGINES AND GENSETS FOR LAND APPLICATION

ENGINES							GENSETS			
			CONTINUOUS DUTY (kWb)		PRIME DUTY (kWb)		CONTINUOUS DUTY		PRIME DUTY	
Engine Type	N° CYL	Displacement	1500 rpm	1800 rpm	1500 rpm	1800 rpm	50Hz KWe	60Hz KWe	50Hz KWe	60Hz KWe
SF 180 TA-LG	6L	12	395	410	425	445	381	394	409	427
SF 240 TA-LG	8L	24	525	545	565	590	507	525	542	565
SF 360 TA-LG	12V	36	785	820	850	890	760	791	820	857
SF 480 TA-LG	16V	48	1045	1095	1130	1180	1012	1056	1092	1135

Cos phi=1

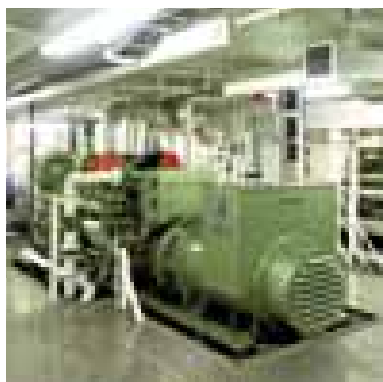
Marine

“Theory is eventually eliminated by experience”

ALBERT EINSTEIN, German physicist







D-R Guascor engines comply with the regulatory environmental requirements for emissions:

- IMO (International Maritime Organization), we fulfill the **IMO Tier 2** standard.
- CCNR 2 (Central Commission for the Navigation on the Rhine).

And classification societies:

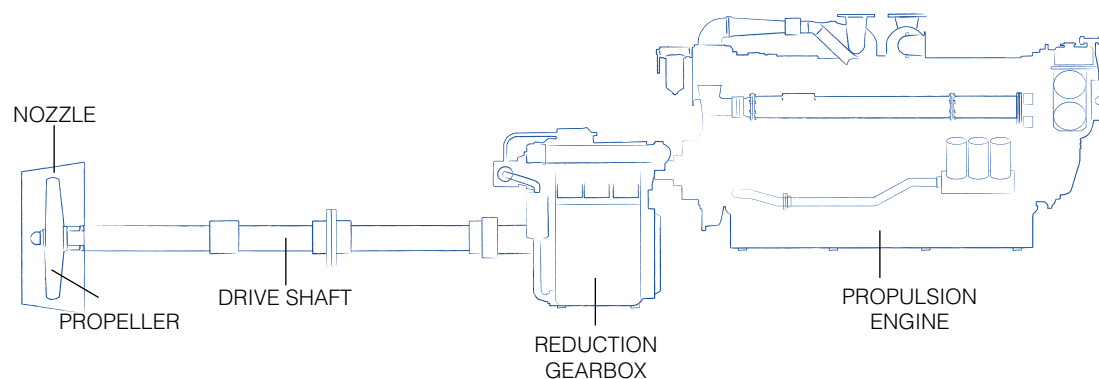
- Bureau Veritas.
- Rina.
- Lloyds register.
- Germanischer Lloyd.
- ABS.
-

Over 45 years of experience in this field has helped Guascor meet the demanding working conditions for marine engines. Therefore, Guascor marine engines have been designed and manufactured to work in harsh conditions with minimum fuel consumption.

D-R Guascor offers a complete range of propulsion, auxiliary engines and gear reducers designed and developed to meet every fleet's requirements, thanks to the worldwide technical assistance network that offers such a strong service.

PROPULSION ENGINES:

Type	N° CYL.	Displacement	Unrestricted Continuous			Variable Continuous			Intermittent Duty		
			kW	HP	rpm	kW	HP	rpm	kW	HP	rpm
F 180 TA	6L	17,96	331	450	1800	353	480	1800			
F 180 TAB	6L	17,96	368	500	1800	382	520	1800	404	550	1800
SF 180 TA	6L	17,96	412	560	1600						
SF 180 TA	6L	17,96	434	590	1800						
SF 180 TA	6L	17,96	441	600	1800	474	645	1800	504	685	1800
SF 180 TA	6L	18,96	452	615	1800						
F 240 TAB	8L	23,96	478	650	1800	493	670	1800			
SF 240 TA	8L	23,96	550	750	1600						
SF 240 TA	8L	23,96	577	785	1800						
SF 240 TA	8L	23,96	588	800	1800	635	864	1800	662	900	1800
SF 240 TA	8L	23,96	610	830	1800						
F 360 TA	12V	35,93	662	900	1800	706	960	1800			
SF 360 TA	12V	35,93	824	1120	1600						
SF 360 TA	12V	36,93	868	1180	1800						
SF 360 TA	12V	37,93	883	1200	1800	949	1290	1800	1000	1360	1800
F 480 TA	16V	47,9	934	1270	1800	993	1350	1800	1029	1400	1800
SF 480 TA	16V	47,9	1103	1500	1600						
SF 480 TA	16V	48,9	1177	1600	1800	1268	1725	1800	1324	1800	1800
SF 480 TA	16V	49,9	1221	1660	1800						



AUXILIARY ENGINES

Type	N° CYL.	Displacement	CONTINUOUS DUTY			CONTINUOUS DUTY		
			kW	HP	rpm	kW	HP	rpm
F 180 TA	6L	17,96	294	400	1500	346	470	1800
SF 180 TA	6L	17,96	383	521	1500	433	589	1800
F 240 TAB	8L	23,96	426	580	1500	478	650	1800
SF 240 TA	8L	23,96	510	694	1500	577	785	1800
F 360 TA	12V	35,93	588	800	1500	699	950	1800
SF 360 TA	12V	35,93	765	1041	1500	866	1178	1800
F 480 TA	16V	47,9	846	1150	1500	934	1270	1800
SF 480 TA	16V	47,9	1020	1388	1500	1155	1571	1800

GEARBOXESS

Type	Reduction Ratio	Max. rpm.	Maximum continuous power
R-100	1,5:1 - 2:1 - 3:1	2500	250
R-160 / R-160 T	1,5:1 - 2:1 - 3:1 - 4:1 - 5:1 - 6:1	2500	400
R-240	3:1 - 4:1 - 5:1	2500	700
RE-240	3,5:1 - 5:1 - 6:1	2500	600
R-360	2:1 - 3:1 - 4:1 - 5:1 - 6:1	2000	900
RV-360*	2:1 - 3:1 - 4:1 - 5:1 - 6:1	2000	900
RE-360	7:1 - 9:1	2000	900
REV-360*	7:1 - 9:1	2000	900
R-500 HT	2,5:1 - 3:1 - 4:1 - 5:1 - 6:1	1900	1670
RV-500 HT*	2,5:1 - 3:1 - 4:1 - 5:1 - 6:1	1900	1670



GREENOIL (Spain)**TANKER**

- 2 propulsion engines SF 480 TA-SP .
- 2 auxiliary gensets SF 180 TA-SG.
- 1 emergency generator gensets SH 74 TAB-SG/2.

MIGUEL OLIVER (Spain)**OCEAN RESEARCH VESSEL**

- 4 auxiliary gensets
F 480 TA-SG ICES 209.
- 1 gensets SF 240 TA-SG.
- 1 emergency gensets H 84 TA-SG/2.

ARKLOW FLAIR (Ireland)**BULK CARRIER**

- 3 auxiliary gensets SH 74 TAB-SG.
- 1 emergency gensets H 44 T-SG/22.

ONGI ETORRI (Spain)



FISHING VESSEL

- 1 propulsion engines SF 480 TA-SP + R 500 HT 5/1.
- 1 auxiliary gensets SF 180 TA-SG.
- 2 emergency gensets H 66 T-SG/2.

TXORI GORRI (Spain)



FISHING VESSEL

- 4 auxiliary gensets SF 480 TA-SG.
- 1 emergency gensets F 180TA -SG/2.

AIOLOS (Greece)**FERRY**

- 4 propulsion engines F 240 TA-SP.

PRIMADONNA (Germany)**PASSENGER VESSEL**

- 2 propulsion engines SF 360 TA-SP.

RED HUSKY (Ireland)**TUG BOAT**

- 1 emergency gensets H 44 T-SG/2.

CRISTOBAL COLON (Belgium)



DREDGE

- 1 emergency gensets F 180 TA-SG/2.

GALEON ANDALUCÍA (Spain)



Replica of the eighteenth century galleon "Andalucia".

It is the largest replica of a historic Spanish ship ever built. After three months of voyage away from Seville, it was docked in Shanghai, where it represented Spain and Andalusia on Expo 2010. It carries a Guascor engines.

- 2 propulsion engines F 180 T2-SP.
- Reduction gearbox / inverter R 160.
 - Power output 760 HP. 1800 rpm.

R & D

“Innovation distinguishes between a leader and a follower.”

STEVE JOBS, American businessman

DRESSER-RAND®





Research and continuous development

In Dresser-Rand Guascor we think that the only way to achieve and maintain leadership in products and applications is through innovation and continuous research.

Within its commitment to continuous improvement and implementation of new technologies, D-R Guascor has created its own Research and Development Center, Guascor R&D, devoted to research, innovation and continuous improvement of its products.

This center is unique in Spain and it is considered as one of the most advanced centers in the world. Located in the Alava Technological Pole and opened in 1996, D-R Guascor R&D center is the engineering headquarters and center for testing of new engines and cogeneration sets.

R&D center in Alava



R&D, Miñano, Alava, Spain

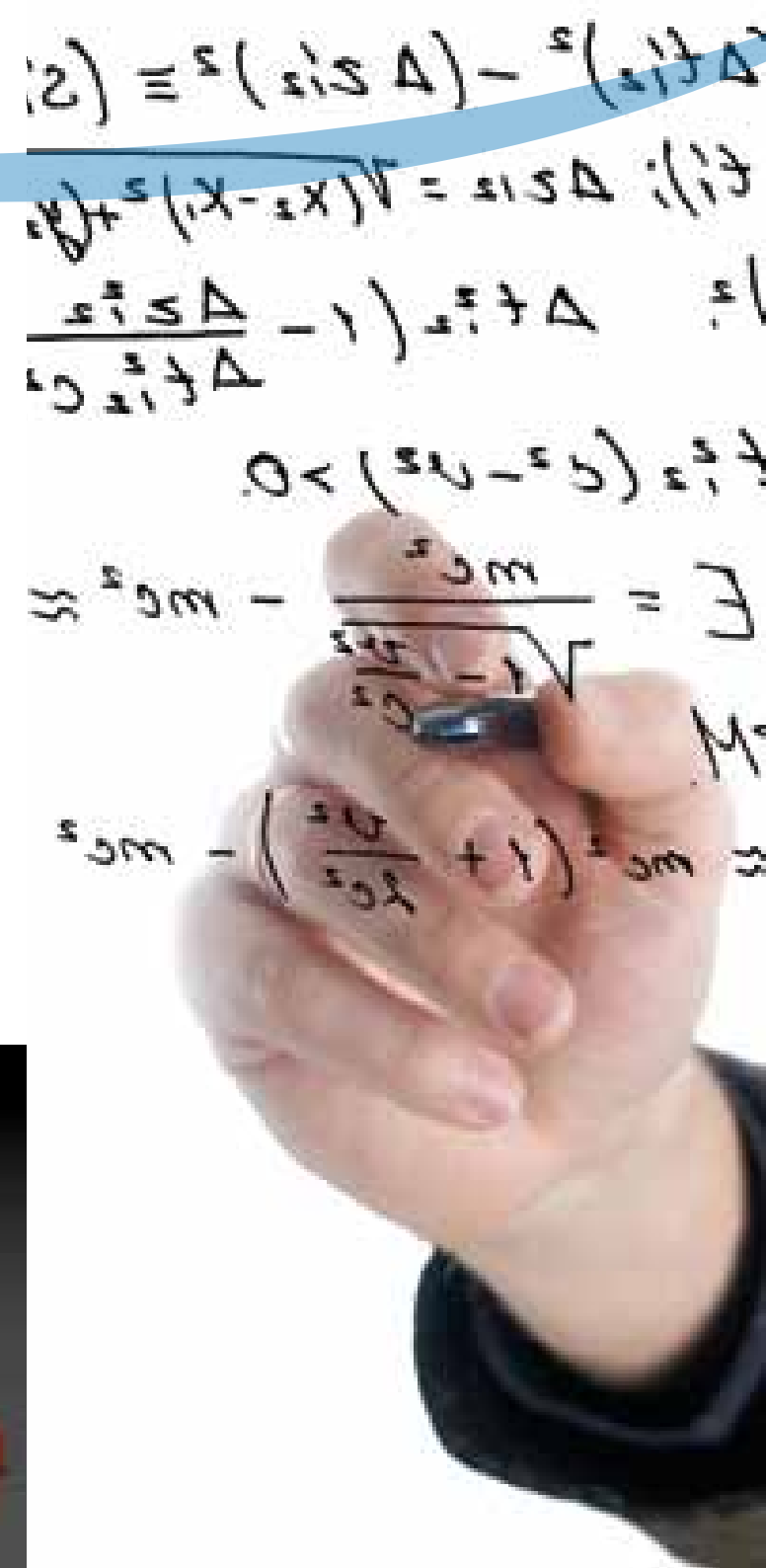
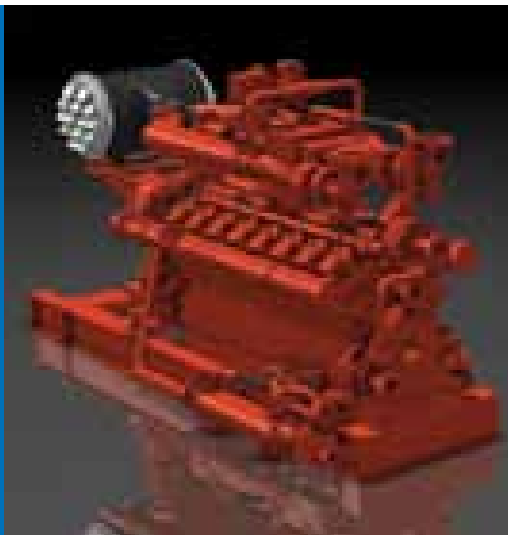
An R&D center for engines and their applications, located in Miñano.

It is an active center of excellence and international reference. It's large human and technical resources allow us to place ourselves inside the world's technological avant-garde.

R&D, Jundiz, Alava, Spain

An R&D center specifically for the research and development of bioenergy. It is a development center on an industrial scale with unique biomass gasification equipment and facilities. In it, we develop and endurance test technologies related to biomass and energy recovery, through the processes of gasification.

Innovation at your service.



Resources

- 1.000 m² of office space for computer aided design
- 2.200 m² of installation for assembly and testing.
- Total generation capacity of 15 MW.
- Heat recovered from the test engines is used to heat the R&D office space. Use of generated heat for air conditioning in buildings.

• Test capacity

- 7 cells for performance, development and durability tests equipped with high precision hydraulic brakes of 800 to 2000 kW, capable of load variation and equipped with 1250 kW alternators.
- 1 long duration engine test cell, operating 4000 h per year, 1500 and 1800 rpm with a reduction gearbox, designed for durability tests, component testing and standardization.



• Facilities

Gas fuel

- System comprising of a mixture of gases for fuel simulation (landfill biogas, water treatment plant biogas, biomethanization, syngas, pyrolysis gas, propane, Hydrogen.).
- Available gases: N_2 , CO_2 , CH_4 , C_2H_8 , C_3H_8 , C_4H_{10} , H_2 , CO , O_2

Liquid fuels

- Diesel, biodiesel, bioethanol.
- Other fuels.
- Oils.

Engine services

- Cooling circuits.
 - High temperature.
 - Low temperature.
- Start by compressed air.

• Equipment and control

Indicated measurements

- 2 teams of real-time analysis of the construction processes.

Emissions

- 2 teams in continuous analysis of exhaust gases.
- 1 particles measuring team for tests with Diesel.

Chromatograph

Stand-by equipment

- Coriolis gas flow meters.
- Fuel scales.
- Measurement nozzles for air consumption.
- Digital measurements of pressure and temperature.

SPARE PARTS, After-sales service

“With perseverance and tenacity, you get what you want; the word
impossible is not in my dictionary”

NAPOLEON BONAPARTE, French statesman and military commander

DRESSER-RAND®





Assistance



SPARE PARTS ANYWHERE IN THE WORLD

D-R Guascor guarantees the supply of original parts anywhere in the world through our wide distribution network in over 40 countries.



DRESSER-RAND

TECHNICAL ASSISTANCE

- Preventive maintenance system.
- Predictive and preventive long-term maintenance agreements with results warranty.
- Technical assistance agreement.
- Engine overhaul or refurbishment.
- Operation and multi-technical maintenance for large areas, industrial facilities, generation and cogeneration plants.

REMOTE MONITORING

- D-R Guascor has the capability to remotely monitor units to optimise their performance and to identify, diagnose and correct problems before they affect availability.

AN INTERNATIONAL SERVICE NETWORK

Through its own technology and staff, Guascor has created a network of after-sales workshops in all local and international delegations which guarantees quick technical support and spare parts anywhere in the world. Thus, maintenance agreements fully ensure the durability of machines since they cover all the needs for assistance in damage prevention and implementation of improvements.

ORIGINAL OIL

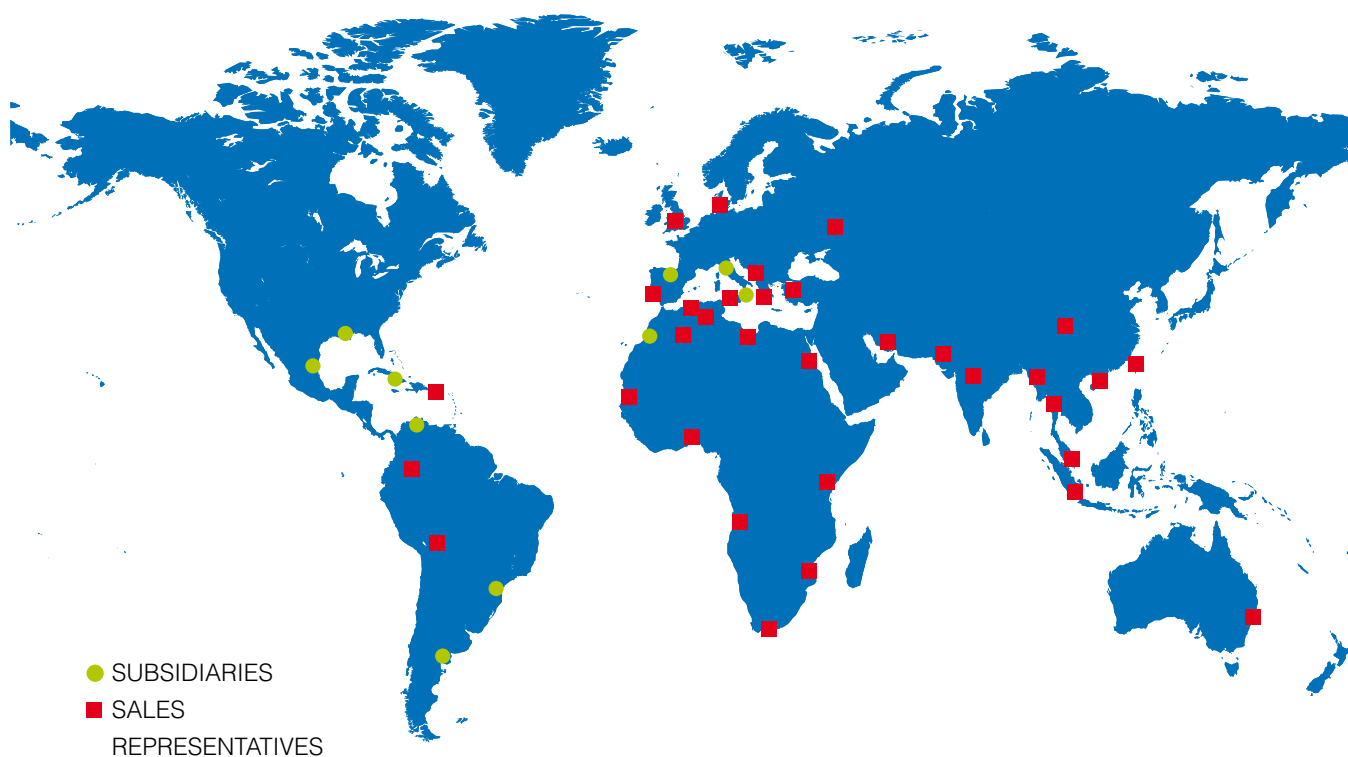
Original Guascor oil has been developed and adjusted specifically for use with Guascor engines.



D-R Guascor in the world

Guascor consider themselves as the owners of the following values: dynamic, competitive and profitable company focused on customer satisfaction and continuous improvement, sensitive to market demands, imaginative and creative, based on training, participation and teamwork of its own resources.

Guascor also owns an official network of workshops, working with dedication and honesty contributing to integrated development of the environment.



DRESSER-RAND®

 **Guascor®**

Subsidiaries

- **Spain - D-R Guascor (Headoffice & Factory)**
- **Argentina - D-R Guascor Argentina**
- **United Kingdom - Dresser-Rand UK**
- **Brazil - D-R Guascor DO BRASIL**
- **United States - D-R Guascor NORTH AMERICA**
- **Italy - D-R Guascor Italia**
- **Morocco - D-R Guascor MAROC**
- **Mexico - D-R Guascor MEXICO**
- **Venezuela - D-R Guascor Venezuela**

Sales Representatives

Industrial

- | | |
|-----------------|----------------|
| • Algeria | • Italy |
| • Australia | • Malaysia |
| • Bangladesh | • Mozambique |
| • Belgium | • Nigeria |
| • Chile | • Pakistan |
| • China | • Philippines |
| • Colombia | • Poland |
| • Egypt | • Portugal |
| • Germany | • Romania |
| • Great Britain | • Russia |
| • Holland | • South Africa |
| • Hungary | • Thailand |
| • India | • Tunisia |
| • Indonesia | • Turkey |

Marine

- Bangladesh
- Bulgary
- Denmark
- Egypt
- Germany
- Greece
- Holland
- Italy
- Morocco
- Portugal
- Russia
- Senegal
- Singapore
- Tunisia
- Turkey



DRESSER-RAND®



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