Environment, Health and Safety Report 2011

SARAS


SARAS

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Foreword

Welcome to the Saras Group Environmental, Health and Safety Report 2011.

2011 was a particularly complex year, marked by the fatal accident of 11 April, which claimed the life of a worker from a subcontractor; a tragedy that had a profound impact on the company and on local industry.

The event led the company to redouble its commitment and attention to safety, strengthening all the measures implemented over the years.

It is through everyone working together that we can improve our behaviour and that of all people working on our sites, implementing our "safety vision": "*We want to see ourselves, and be seen, as an industrial group made up of people who live and promote a culture of safety through our daily actions".*

Among the many initiatives aimed at promoting effective communication, I would like to highlight the particular emphasis now placed on "safety talks", which are designed to involve and motivate all staff working on the site on safety issues.

Despite the difficult situation caused by the global recession, which has had serious repercussions on refining margins, the resources that Saras has allocated to improvements, maintenance and investment (such as technical/structural/organisational changes) relating to safety and the environment have remained at the same levels in terms of financial commitment as in the last few years.

Saras considers safety to be a key production factor. Without safety, it cannot guarantee a positive industrial outlook.

Similarly, environmental aspects, as set out in the Integrated Environmental Authorization permit, are fundamental for the business and contribute to achieving results in production.

Francesco Marini
Operations Management Director


Milan
ARCOLA
Arcola
SARAS
Rome
Madrid
SARDEOLICA
Ulassai
Macchiareddu
Cartagena
Sarroch
saras
SARAS
SARLUX
SARTEC

The Saras Group

The Saras Group

The Sarroch site and Saras' subsidiaries

The Saras Group, established in 1962 by Angelo Moratti, operates in the energy sector, and is one of the leading oil refiners in Italy and Europe. It is active in the following areas:

- the sales and distribution of oil products on national and international markets, both directly and through its subsidiaries Saras Energia SA in Spain and Arcola Petrolifera SpA in Italy
- the generation and sale of electricity through Sarlux Srl and Parchi Eolici Ulassai Srl
- industrial-engineering services and scientific research for the oil, petrochemical, energy and environmental sectors through Sartec

Saras SpA - a subsidiary of Angelo Moratti Sapa - is the parent company, and was established in 1962 to refine. Today, it owns the Sarroch production site. It has shareholdings in a number of subsidiaries in Italy and abroad, which are briefly described below.

Arcola Petrolifera sells oil products on the domestic wholesale market, in Sardinia and in the rest of Italy.

Deposito di Arcola Srl provides leading operators with reception, storage and land or sea redelivery services for oil products for the fuel distribution network and maritime bunkering.

Sarlux - a wholly-owned subsidiary of Saras - owns the IGCC plant and manages the commercial activities relating to the energy generated by the IGCC, while Saras is wholly responsible for the plant's operational management.

Saras Energia SA distributes oil products in the Spanish retail and wholesale market and manages a biodiesel production plant, a hydrocarbon storage facility in Cartagena and 119 service stations.

Sardeolica manages the wind farm in the municipality of Ulassai (Province of Ogliastra). Following the acquisition by Saras SpA of the stake held by Babcock & Brown Wind Energy in the subsidiary Parchi Eolici Ulassai Srl (PEU), this company was fully consolidated from 30 June 2008.

Akhela: Saras has sold the company to the Solgenia Group, one of Italy's biggest companies in the ICT sector.

Sartec (Saras Ricerche e Tecnologie) provides industrial engineering and scientific research services nationally and internationally. It also designs, builds and rolls out modular plants for emission monitoring.

SARAS

Saras has **1,270 employees**. Its registered office is in Sarroch, its administrative office in Milan and it has a sales office in Rome.

Strategy and investment

In the refining sector, the Saras Group's strategy in 2011 was focused on implementing an asset management programme known as "Project Focus". This programme is intended to boost production efficiency and the effectiveness of industrial operations, and reduce costs. The Group has achieved very positive results up to now in terms of "cost rationalisation" (approximately EUR 23 million in 2011, also taking into account measures to offset inflationary pressures) and "operational efficiency", while progress in terms of "energy efficiency" continues to require significant efforts and still offers room for improvement.

Over the year, the scope of the programme was extended by identifying investments that provide immediate returns, in the areas of energy efficiency, the removal of operational limits for some units, the improvement in yields and the rationalisation of outsourcing. Furthermore, the organisational structure was subject to significant changes, with the appointment of new industry professionals to key management positions.

"Project Focus" was also extended to the areas of "Planning" and "Supply & Trading". The approach to refinery planning, previously dictated by industrial management, is now primarily guided by commercial decisions, in order to take better advantage of the opportunities that arise in a market environment subject to high volatility in oil prices.

Furthermore, in the first quarter of 2011, the Saras Board of Directors approved the partial resumption of the multi-year investment programme announced in 2008. Specifically, it approved the completion of the revamping project for the MildHydroCracking 2 (MHC2) plant, for a total amount of approximately EUR 60 million. This investment is expected to be completed by the end of the first half of 2013, and will generate benefits quantifiable at approximately 600,000 tons in greater diesel production at the expense of heating oil, and an increase in refinery processing of approximately 650,000 tons.

In the wind segment, the Ulassai wind farm reached an installed capacity of 96 MW during the second quarter of 2011. Currently, the Group is continuing to develop other projects in its pipeline concerning sites located in Sardinia and abroad (Romania).

Finally, in gas exploration and research, on 15 July 2011, the company Sargas Srl was created to undertake exploration and development, as well as the transport, storage, purchase and sale of gaseous hydrocarbons. The Group is currently going through the process to gain authorisation to begin drilling activities in an area of Oristanese ("Eleonora" permit), for which annual production is cautiously estimated at between EUR 70 and 170 million cubic metres of gas, with a production period of more than 20 years. The estimated time required to drill the exploratory well ranges from four to six months once the authorisation process is completed.

Investments made in 2011 and future developments

Investment in 2011 totalled EUR 105 million, which breaks down as shown in the table. This represents a further decrease compared with the programme implemented by the Group in the last few years, and is a result of the decision to carefully synchronise the timeline of the medium-term strategic plan with the macroeconomic situation. The uncertainty of the current climate prompted caution in 2011, with a view to preserving the Group's strong financial position.

EUR million	2011	2010
REFINING	64,6	92,5
ELECTRICITY GENERATION	31,2	10,3
MARKETING	4,8	5,1
WIND POWER	2,5	14,9
OTHER ACTIVITIES	1,9	6,2
Total	**105,0**	**129,0**

Specifically, in 2011, in the refining segment, the necessary preparatory work continued for the revamping of the Mild HydroCracking 2 (MHC2) plant, which will be carried out in the shutdowns of 2012 and 2013. The Group undertook civil works on the foundations and mounted the main items, including the gas treatment system and the compressors. Work proceeded fully in line with the programme, which aims to have the completely revamped plant in operation again towards the end of the first half of 2013.

In the electricity generation segment, the ten-year shutdown was conducted in 2011, with a total investment of approximately EUR 30 million. During the shutdown, the Group undertook activities aimed at restoring full efficiency to the main items, such as the revolving parts (turbines and generators), the gasifiers, the hydrogen production unit (a utility fundamental for refining), and the cooling tower.

Finally, in the wind power segment, at the Ulassai wind farm (Sardinia), the last civil works were completed, along with the installation of a MT/HT step-up transformer with power connections, which enabled the plant to reach full installed capacity of 96 MW.

The Sarroch site: refining and electricity generation

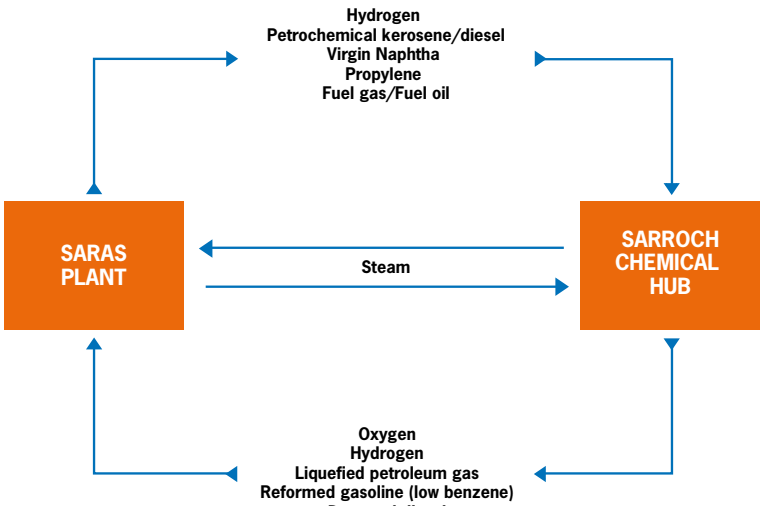
Saras conducts its refining activity at its site in Sarroch (Cagliari), on the southern coast of Sardinia. This is the largest refinery in the Mediterranean region in terms of production capacity and the most complex in western Europe. The refining cycle is integrated with the IGCC plant, which generates electricity.

Refining capacity totals approximately 15 million tons per year (Table 1), and represents around 15% of Italy's capacity, while the site's catalytic conversion capacity is 9.6 million tons per year and its thermal conversion capacity is 2.4 million tons. The IGCC electricity generation plant has installed capacity of 575 megawatts and annual production in excess of 4 billion KWh, sold entirely to national grid operator GSE (Gestore Servizi Elettrici).

Table 1 - Raw materials processed (kt/year)

2008	2009	2010	2011
15,517	13,305	14,340	14,006

Figure 1 - Synergies between the Saras plant and the neighbouring chemical companies



Its large processing capacity and structural complexity make the Sarroch site a focal point of production in the Mediterranean region, capable of handling both separation and conversion operations, and of adapting the different stages of the production cycle based on the characteristics of the crude oil to be processed, to obtain oil products of high commercial and environmental quality. The excellent geographical location of the Sarroch production site has proved strategic for trade with central and western Mediterranean countries, both in Europe and North Africa, while its proximity to the plants of Polimeri Europa (now Versalis), Air Liquide and Sasol Italy allows its refinery operations to be integrated with petrochemical production (Figure 1).

The Sarroch industrial hub

The production hub that built up around Sarroch in the 1960s has helped generate employment and wealth in the region. Over the years, numerous small and medium-sized companies have sprung up around the large industrial companies present in the region – such as Saras, Polimeri Europa (now Versalis), Sasol Italy, Air Liquide and Liquigas. These companies build and maintain the plants of the larger firms, and therefore represent a significant satellite industry. Saras maintains mutually beneficial industrial relations with all these production companies.

The site shared by Polimeri Europa and Sasol Italy was built in the early 1970s, under the name Saras Chimica (in which Saras also had a stake). The name then went through various changes over the years, until it took on the current names of Polimeri Europa and Sasol Italy.

The Polimeri Europa plants receive the raw materials from Saras and use them for production destined for the plastics industry, while those of Sasol Italy produce detergents and the bases for synthetic lubricants, again from raw materials received from Saras (mainly diesel and kerosene).

Air Liquide produces liquid oxygen, which is used in the Saras plants (IGCC plant). Finally, the Liquigas site stores and sells the LPG from Saras.

History of the refinery

Saras' connection with Sarroch dates back to 1962, when Angelo Moratti identified it as a strategic location for an oil refinery. Construction of the refinery facilities began in 1963, and refining activity began in 1965. Until the end of the 1980s, Saras mainly provided refining services for third parties (i.e. it refined crude oil owned by other oil companies that provided Saras with the raw materials to produce oil products). In the mid-1990s, following a significant downturn in demand for high-sulphur fuel oil, Saras launched a major industrial project to build a plant for the gasification of heavy distillates from the refining process and the subsequent combined-cycle cogeneration of electricity and thermal power (IGCC plant). With the IGCC plant on stream, the oil production cycle was closely integrated with the electricity generation cycle, thereby maximising the conversion of raw materials into finished oil products and energy. Meanwhile, the company continued to invest in updating the technology of its existing plants and improving the environmental impact of fuels, partly to comply with increasingly stringent quality standards defined by European law. These investments have led to a progressive reduction in the content of sulphur in the oil products and to an improvement in the quality of middle distillates and gasoline.

Plant description

The activities conducted at the Sarroch site can be broken down into the following functions:

- receipt of raw materials and shipping of products through the marine terminal
- production of oil products
- electricity generation in the IGCC
- storage of raw materials, liquid products and liquefied gas
- shipping of products by land
- auxiliary services (power generation in the thermoelectric plant, incoming water treatment, wastewater treatment)
- offices, workshops and warehouses
- activities of subcontractors

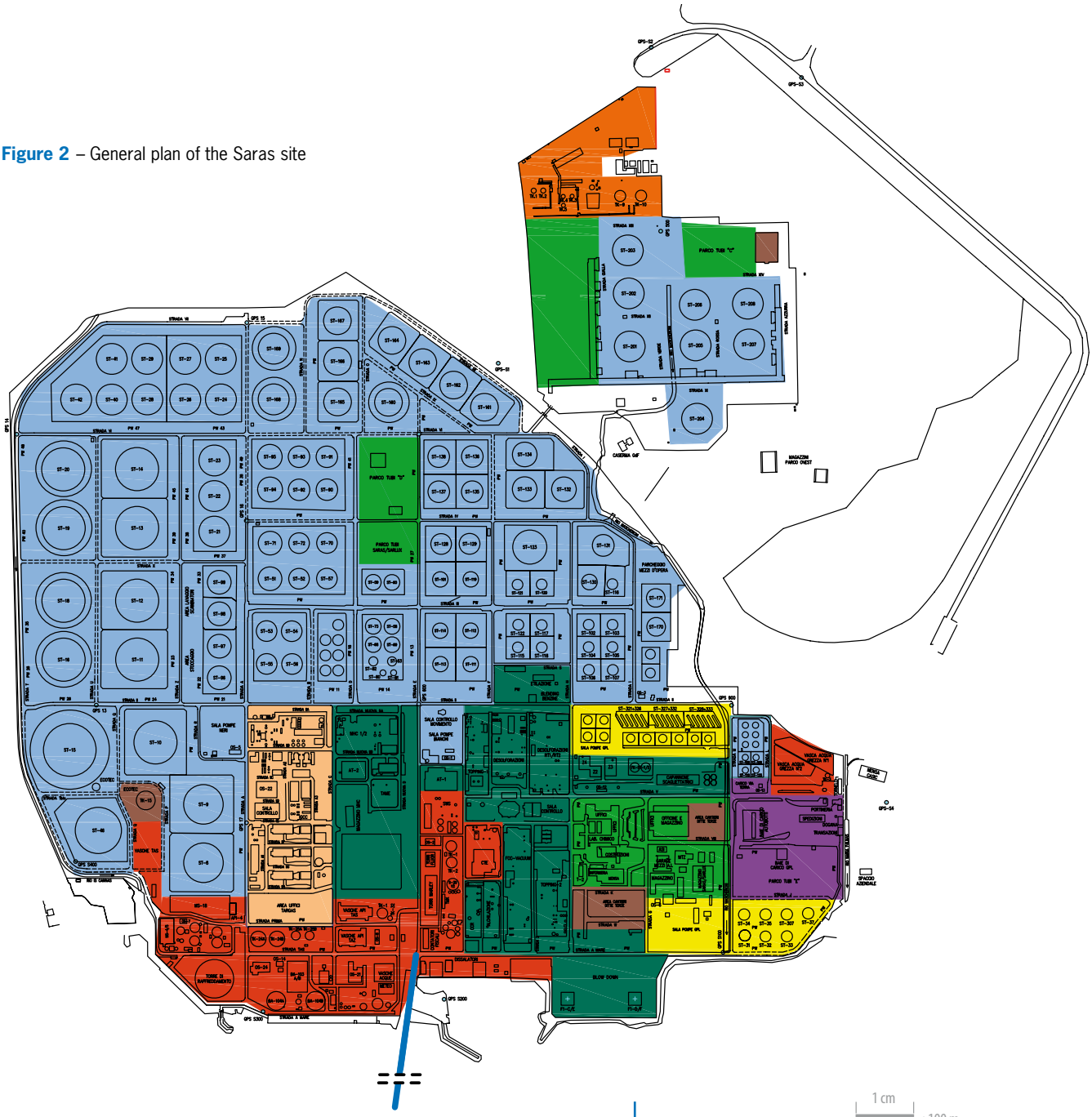
Figure 2 on page 15 shows the areas used for the different types of activity performed within the facility, summarised below.

Receipt of raw materials and shipping of products through the marine terminal

The marine terminal linked to the refinery has a 1,600-long wharf and fixed platforms connected to it by a 1,200m piling.

All raw materials are delivered here, and the bulk of the oil products are shipped from here. In 2009-2011, 80% of oil products were shipped by sea.

Figure 2 – General plan of the Saras site



The terminal has 11 independent docking berths, nine of which are for shipping finished oil products and the receipt of semi-finished products, docking oil tankers of up to 65,000 tons, while the remaining two are for the receipt of raw materials, docking oil tankers of up to 300,000 tons. Advanced monitoring systems ensure that all receipt and shipping operations take place under conditions of the utmost safety: the phases relating to the docking and mooring of ships and the connection between the ship and the loading arms transferring raw materials to the shore and finished products to the ship are carried out under continuous surveillance. In order to be admitted to the Saras marine terminal, all incoming ships must comply with rigorous safety standards that conform to internationally recognised criteria as well as additional requirements laid down by Saras. A dedicated control room, which has been completely renovated and updated with the latest monitoring technology, is manned and operational 24 hours a day, and is in continuous radio contact with the ships operating in the terminal, ensuring that all operations fully comply with all safety and environmental protection requirements.

Production of oil products

The production process is illustrated in the simplified diagram shown in Figure 3, and involves the following units:

- atmospheric distillation plants (topping) and vacuum distillation plants for raw materials, which produce the primary fractions
- conversion plants (Visbreaking, Mild Hydrocracking 1 and 2, Fluid Catalytic Cracking – FCC), where heavy hydrocarbons and distillates are converted into medium-light fractions; heavy hydrocarbons are sent from the visbreaking plant to the IGCC plant
- catalytic reforming (CCR) plant, where light distillates (naphtha) are converted into high-octane components; hydrogen, which is used in the desulphurisation treatment, is produced at the same time
- plants that improve the quality (alkalisation) and performance (TAME, Tertiary-Amyl-Methyl-Ether plant) of gasoline
- desulphurisation plants, where middle distillates (kerosene and diesel) are subjected to catalytic hydrogenation processes to remove sulphur and improve product quality
- plants to recover and convert sulphur compounds into a solid sulphur for subsequent sale
- non-condensable fuel gas treatment plant for the removal of sulphur compounds and subsequent internal re-use of gas
- the tail gas treatment unit (TGTU) downstream of the sulphur recovery plant, which increases the sulphur recovery yield, thereby reducing SO_2 emissions
- the U800 unit at the catalytic cracking plant, which produces low-sulphur gasoline
- the U600 unit, which produces hydrogen used in the desulphurisation of motor diesel, with a very low sulphur content.

Figure 3 – Production cycle of the Saras plant: oil production and electricity generation

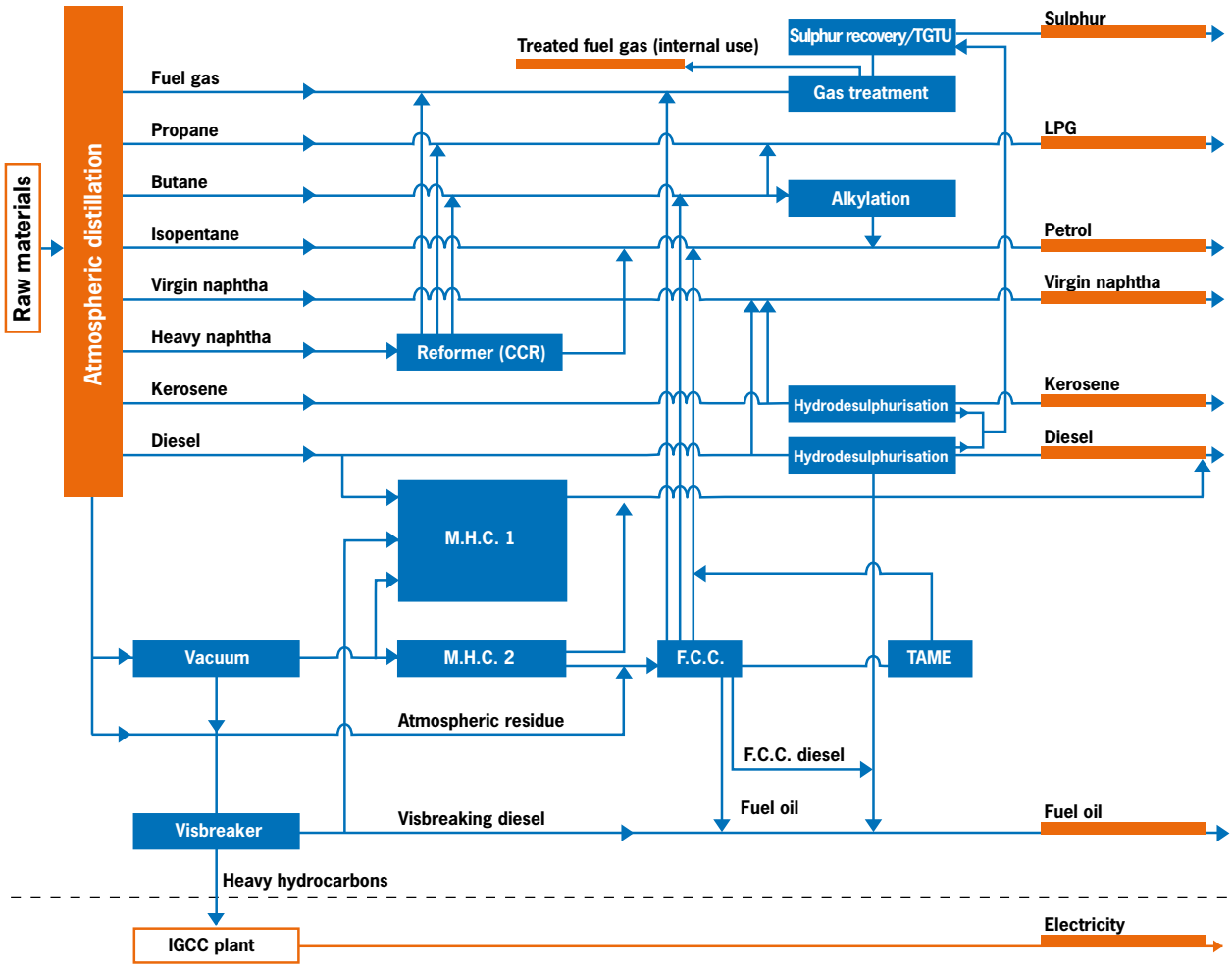


Chart 1 - Refinery products and consumption

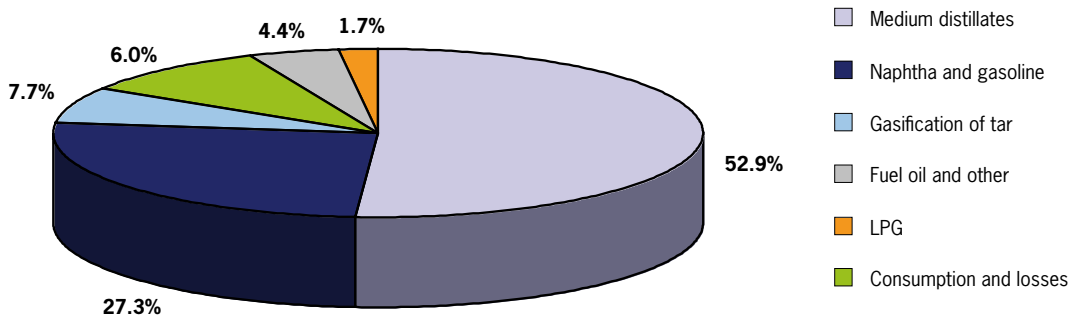


Table 2 – Oil products (tons/year)

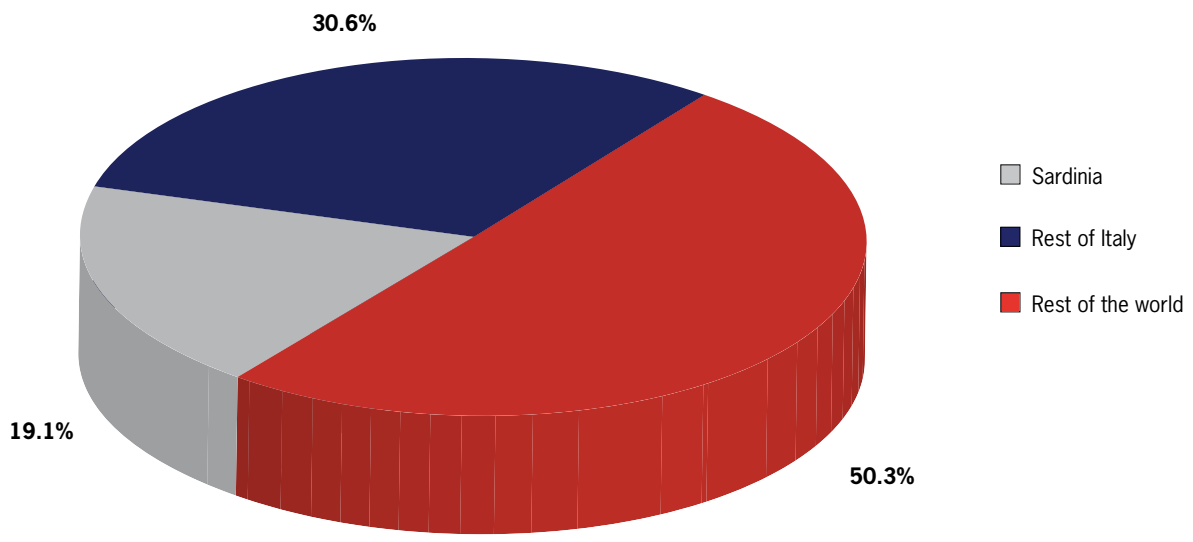
	2008	2009	2010	2011
LPG	337,000	221,000	323,000	238,000
Gasoline and virgin naphtha	4,056,000	3,343,000	4,024,000	3,824,000
Middle distillates (gasoil, kerosene)	8,275,000	6,769,000	7,517,000	7,415,000
Fuel oil and other	825,000	1,119,000	463,000	623,000
Sulphur*	110,000	110,000	130,000	113,000
TAR	1,121,000	1,077,000	1,166,000	1,075,000

* Includes sulphur recovered both from refining and the IGCC

Table 3 – Raw materials processed by the Sarroch refinery: origin of crude oils (%)

	2008	2009	2010	2011
North West Africa	47	43	38	15 16
Middle East	10	12	7	20
Russia and Caspian Sea	25	29	30	42
North Sea	16	16	11	3
Other	2	0	14	4
Total	100	100	100	100

Chart 2 - Total shipping, 2011



The Sarroch site has a high output of medium oil products (diesel) and light oil products (LPG, naphtha and gasoline), which in 2011 accounted for around 82% of total production, as summarised in Chart 1 and shown in detail in Table 2, which sets out production data relating to the four-year period 2008–2011.

Raw materials mainly come from the Mediterranean area (North Africa and the Middle East), the former Soviet Union, western Africa and northern Europe (Table 3). The primary, but not sole, destination of refinery products is the central and western Mediterranean region.

Specifically, in 2011, approximately 20% of total production of oil products was absorbed by the local Sardinian market (Chart 2).

Electricity generation

The IGCC (Integrated Gasification Combined Cycle) plant generates electricity, hydrogen and steam from the heavy hydrocarbons resulting from the refining process. Taken as a whole, it is recognised as one of the best techniques available for the refining sector.

As shown in Figure 4, the plant is divided into two main sections:

- gasification
- combined cycle

In the gasification section, oxygen supplied by the Air Liquide plant is used to convert heavy hydrocarbons from the visbreaking plant into a synthesis gas (shortened to "syngas"), which, once purified of the sulphur and metals it contains, is burned in the combined cycle section.

SARLUX

Sarlux, which owns the plant, has its registered office in Sarroch and its administrative office in Milan.

Figure 4 – Flow chart of the IGCC plant

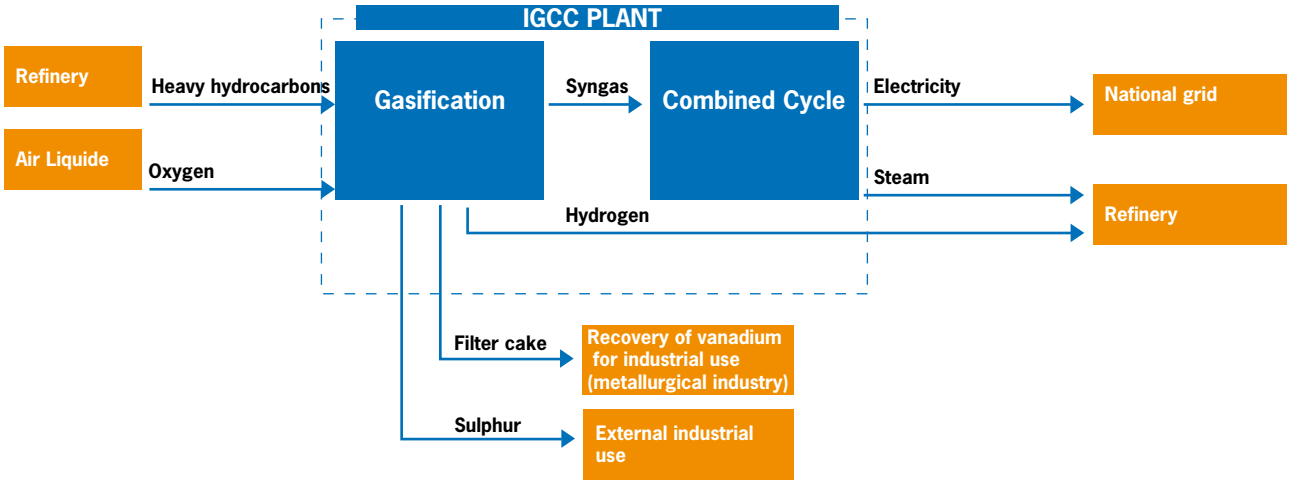


Table 4 – IGCC products

	2008	2009	2010	2011
"Gross" electricity (MWh)	4,251,353	4,086,439	4,339,335	4,034,163
Low-pressure steam (tons/year)	539,680	437,003	586,626	555,647
Medium-pressure steam (tons/year)	667,763	570,754	737,033	699,486
Hydrogen (t/year)	34,042	37,939	39,731	35,809
Sulphur* (tons/year)	49,752	48,405	52,666	37,872
Vanadium concentrate (tons/year)	1,199	1,633*	1,122**	1,494***

*Including 877 tons/year that do not meet the specification, which are therefore sent for disposal rather than recovery.
**Including 181 tons/year that do not meet the specification, which are therefore sent for disposal rather than recovery.
***Including 44 tons/year that do not meet the specification, which are therefore sent for disposal rather than recovery.

Electricity – produced in three identical production lines, each comprising a gas turbine, a steam recovery boiler and a steam turbine – is sold to the national grid operator, GSE. Part of the steam produced and not used to generate electricity is sent to the refinery for use in refining processes, along with the hydrogen produced by the gasification section.

As with the sulphur recovered from the refining cycle, the sulphur recovered through the removal of hydrogen sulphide from the syngas is also sold (see figures in Table 4).

The metals removed from the syngas are used to form a metallic panel called "vanadium concentrate" or "filter cake", sent to external plants to recover the metals. The IGCC plant therefore enables the Saras site to maximise the conversion of raw materials into value-added products. The three-line configuration of the IGCC plant ensures continuity in electricity generation and the production of hydrogen and steam for internal use on the site. The figures recorded to date confirm the effectiveness of the plant processes and technology. The plant is extremely reliable (an average of over 90%). The IGCC plant offers particularly significant environmental and technological advantages, relating to the adoption of the best available technologies, which have delivered one of the highest efficiency ratings among the various production processes available (over 50%, see Table 5) and result in extremely low emissions, with a performance superior to ENEL's national average benchmark figure.

Table 5 – Comparison of power plant efficiency

Plant	Overall efficiency (gross)
Natural gas combined cycle	56÷57%
Natural gas conventional cycle (turbogas)	30÷35%
Fuel oil conventional cycle	35÷38%
IGCC Sarlux	51%

A reduction in emissions from the Sarroch site as a whole (refinery + IGCC) was achieved following the start-up of operations at the gasification plant.

This result is also due to a series of improvements made to the refinery equipment, especially with regards to sulphur oxide emissions; furthermore, reduced fuel oil production has led to a fall in the number of ships crossing Sarroch Bay.

Filter cake

This is the solid formed from the gasification of heavy refinery products. It contains high percentages of metals such as iron, carbon, vanadium and nickel.
It is stored in the refinery's temporary storage area, or in an area specifically authorised for this purpose before it is shipped externally to plants located in Germany, which recover the metals contained therein. In order to ship this solid, the company applies for a permit for the cross-border shipment of waste each year, in accordance with EC Regulation 1013/2006.

From a technological viewpoint, the main advantage of IGCC plants is the integration of the oil cycle with the electricity cycle: the overall processing cycle constitutes a complete cycle during which all incoming material is converted into a finished product or energy.
Note that the Sarlux plants water requirements – which are particularly high for large power plants – are met entirely from sea water, which is desalinated and then demineralised in specific processing plants; it therefore does not affect Sardinia's water reserves. This water is then returned to the sea, in full compliance with all environmental quality criteria established by law.

Storage of raw materials and products

The storage facilities break down is as follows:

- storage of raw materials and products in the tank farm
- storage of products for which excise duties have been paid in the unbonded storage facility, located outside the bonded area, further along the S.S. 195
- storage of liquefied gases in special pressurised facilities ("spheres" and "bullets")

In total, there are 161 tanks with an overall capacity of around 3.5 million cubic metres. All tanks are fitted with permanent fire-prevention systems and containment basins (reinforced concrete) and cement paving (43 tanks), or earthworks (118 tanks).
The fire-prevention system in the LPG storage areas is controlled by devices that, depending on various factors (including wind direction) activates systems to prevent fires and contain any product leak. In addition, to prevent accidents, the LPG tanks are equipped with instruments that monitor and protect against potential pressure surges.
Raw materials and products are moved within the site between plants and storage and shipping areas using the following systems and equipment:

- pumping lines and systems, including pipelines connecting to the unbonded storage facility and the marine terminal
- systems for the measurement and additivation of products prior to shipping
- land-loading systems (loading bays)
- sea-loading systems (marine terminal equipment)

Shipping of products by land

Products are shipped by land using special loading gantries for tanker trucks:

- a gantry with three loading points for LPG and 12 loading bays for liquid products (kerosene, diesel and fuel oil), located near the facility's manned entrance
- ten loading bays for gasoline and diesel, located in the national unbounded storage facility. The Saras site is connected via oil and gas pipelines to the national storage facility and the Liquigas storage facility, and via an oil pipeline to the neighbouring petrochemical plant, for the commercial exchange of semi-finished products and services (Figure 1, page 13).

Auxiliary services

The site is equipped with the following units, which provide utilities for the production cycle:

- thermoelectric power plant for the refining cycle, which produces part of the electricity and steam necessary for the processes
- air compression system, comprising four compressors and two distribution networks, one for instruments and one for services
- treatment unit for water coming into the site, taken from the industrial water supply
- treatment plant for wastewater generated by site activities (process-water purification plant)

Internal infrastructure enables the distribution of services, such as water, steam, electricity, fuel and nitrogen, and the collection of wastewater to be sent to the treatment plant before it is discharged into the sea.

Offices, workshops, warehouses and other services

The office buildings are located next to the production area; opposite these are the mechanical workshop, the electrical workshop and part of the warehouse space, where auxiliary substances and consumables are stored before being sent to the areas in which they will be used.
Other areas designated for materials storage (pipe yard) are located in the centre of the tank farm and at the national storage facility. Other general services, such as the canteen and the medical centre, are also located in the offices area.

Activities conducted by subcontractors

Subcontractors operating continuously within the Saras site (maintenance, construction, mechanical and instrument checks, etc.) have logistics bases in dedicated areas on the site, which enables them to perform their work to the highest possible standard and reduces the need to leave the site. Specifically, two external companies work permanently on the site in waste management: one to manage the waste inertisation plant and one to manage an area in which mainly ferrous and electrical materials are sorted and recovered.

The site and the local area

The area most affected by refinery operations from a socio-economic standpoint covers four municipalities: Sarroch, Villa San Pietro, Pula and Capoterra, which form a fairly homogenous area south-west of Cagliari.

The region has two main types of economic activity: activities connected to the energy and petro-chemical hub around Sarroch and the Macchiareddu industrial area; and activities connected to natural resources in the region, such as agriculture, livestock farming and tourism, particularly in Pula.

Saras' predominant position in terms of size and production capacity means that the refinery's location in the area has a significant impact on employment: since beginning its operations, the company has increased its workforce from 100 to 1,270, divided between the Sarroch site, which employs more than 87% of the total, and its two offices in Rome and Milan. It also supports a satellite industry that employs around 7,000 people, and not simply through its refining activity. The refinery's production units are a major development driver not only for a group of companies and a particular class of industrial business, but also for the advanced service sector, which is able to play its part in sophisticated production and technological processes. It should not be forgotten that the company fulfils an important role as a supplier of fuel to almost all regional industries, and that it actively co-operates with the neighbouring chemical companies in the commercial exchange of many of the raw materials required for production.

EMAS and communication with the local community

As part of the Group's drive for transparency, integration and co-operation with the region in which it operates, 2011 saw a continuation of activities aimed at strengthening relations with external parties, and in particular the local community living around the production facility. These initiatives are also in line with commitments required for EMAS (Eco Management Audit Schemes) registration, which the company obtained in 2008. EMAS is a tool designed to certify that companies are committed to continuous improvement in environmental matters and sustainable development, including through involvement of and dialogue with employees, both direct and indirect, as well as all main stakeholders. In 2011, the Group continued to implement a structured communications and external relations plan targeting in particular institutions, organisations, associations, the world of education, the media and specialised publications. This led to the creation and implementation of partnerships and joint events.

In this regard, various meetings were held with local authorities, which presented opportunities for discussion, the exchange of information and communication on issues of common interest, such as safety, environmental protection and regional development.

These meetings were also an opportunity to present both the results achieved, and Saras' environmental programmes and objectives for further improvement, as reported in the two documents – "Environmental Declaration" and "Environment, Health and Safety Report" – distributed on these occasions. The Saras School Project, now in its thirteenth year, is a tradition that forms part of the company's wider policy of fostering relations with the community in which it operates, with a view to ensuring the highest level of co-operation and transparency.

The initiative was launched in 1998 in partnership with the Municipalities of Sarroch, Villa San Pietro, Pula and Capoterra, and is supported by the Italian National Olympic Committee (CONI) and UNICEF. Its aim is to promote energy awareness among children in their final year of primary school.

The project has evolved over the years into a valuable opportunity to meet and liaise with local institutions as well as schools.
In 2011, the project, entitled "The Energy Route", was part of the activities of around 200 elementary school pupils throughout the school year. Its aim was to explain to them the refinery industry and in what way oil-based products are used in everyday life, and to raise their awareness of the responsible use of energy sources. During this phase, Saras personnel, in concert with the teachers, provided information about the energy industry, renewable and non-renewable energy sources, how oil is formed and transformed, and in particular how it is distilled.
The classroom sessions were an occasion for face-to-face dialogue with the students, and an opportunity for the children to get answers to their questions about the production cycle of a refinery and about energy in general.
Part of the project consisted in visiting the Sarroch refinery, which was another important opportunity for openness and dialogue with the local community. Saras is always ready to invest in issues such as the environment and safety, and in 2011, in concert with the Municipalities of Sarroch and Villa San Pietro, the local health authority, the Italian Ministry of Education, Universities and Research (MIUR) and UNICEF, it supported the Safe School Project, devised by the National Fire Service which will also continue in 2012. The project comprises a safety campaign that has been tailor-made for elementary and secondary school children. The initiative has aroused particular interest in Sarroch's school district, and the schools in Sarroch and Villa San Pietro will be the first to experience the project. The campaign's objective is to make the children aware of the risks around them, at home or at school, and communicate experiences about the positive action that can be taken to prevent domestic accidents.
Fire, electricity, falls and toxic substances are the four dangers that cause the largest number of accidents at home and at school. To teach the children how to prevent domestic accidents, five colouring books will be handed out, each one telling a story describing one of the domestic dangers. Animated cartoons will also be shown, teaching the children how to avoid danger.

Group companies

Sartec: environmental research and innovation

SARTEC is the environmental and industrial technology and research company of the Saras Group. Its environmental consultancy and monitoring, design, and production-process and industrial-automation optimisation services are aimed at supporting innovation and sustainable industrial development. As well as delivering these services through the technical expertise of its specialists, the services are strengthened by a special focus on SARTEC's key values, which add value for its customers: environmental sustainability, innovation and quality.

In order to offer the best technological solutions, SARTEC not only applies the most advanced technologies available on the market and the results of studies from the world of research or conducted at its own behest, but also draws on its own research and development unit equipped with a cutting-edge chemical laboratory.
SARTEC offers the following services:
Environmental protection services: air monitoring systems, water and emissions quality control, environmental consultancy and engineering, and water, air and emissions analysis services through its leading analysis laboratory.
Specifically in relation to environmental monitoring, SARTEC is able to offer both individual analysis instruments and entire turn-key measurement network systems, managing the whole process from design to after-sales technical assistance; in consultancy services, the company provides support for risk analysis, contaminated site characterisation, the planning of measures for the safety and reclamation of contaminated sites, and the monitoring of fugitive emissions, as well as for environmental impact studies (EIS) prior to environmental impact assessments (EIA), and the preparation of applications for the integrated environmental authorisation (AIA) permit. Industrial efficiency and energy saving services: these services range from the building of package plants for industry (including blowdown gas recovery systems, filtration systems and chemical additivation systems) to advanced process controls and process analysis systems (from their design and start-up to the periodic overhaul and revamping of the instrumentation). This type of service also includes engineering services (for example, feasibility studies and cost/benefits analysis, basic process, piping and layout, civil, mechanical, electrical and instrumentation and automation engineering), consultancy in the field of oil refining, tests on catalysts and alarm rationalisation, development of training systems for operators of the OTS (Operator Training Simulator) plant and integrated services for the implementation and subsequent management of measures to improve energy efficiency.
In 2009, SARTEC gained accreditation from the Italian Regulatory Authority for Electricity and Gas (AEEG) as an ESCO (Energy Service Company) in order to offer energy consultancy services aimed at obtaining energy efficiency credits (TEE), which can be traded privately with obliged parties and/or on the exchange organised by Italy's energy market operator (GME). SARTEC applies innovation as its guiding principle in every project; this has enabled the company to develop original solutions that have effectively resolved customers' problems. The company conducts applied research and develops new products and technologies, for itself and third parties, in the environmental sector and for the optimisation of industrial processes. It has worked on numerous research projects, some funded by the European Union, the Ministry for Education, Universities and Research and the Region of Sardinia, in partnership with the university, the Italian National Research Council and other research centres and innovative companies.

SARTEC
SARAS RICERCHE E TECNOLOGIE

With **140 employees**, Sartec has two locations in Italy: Cagliari, in the industrial zone of Macchiareddu (registered office, facilities and laboratories) and Milan (sales office).

Sardeolica: wind energy generation

Sardeolica's activities are fully in line with the corporate strategy of the Saras Group, which has designated environmental protection as one of its top priorities. As proof of this, in 2009 Sardeolica renewed its ISO 14001:2004 environmental certification, which it first obtained in 2006. The Ulassai facility, the first wind farm built by Sardeolica, is one of the largest in Sardinia. The final six authorised turbines were installed in 2010, bringing the total number at the wind farm to 48. In 2011, a third processing bay was installed and software changes were made to the aerogenerators, which enabled the plant's total capacity to be increased from 72 to 96 MW. At full capacity, the Ulassai wind farm produces around 175 GWh/year, corresponding to the annual consumption of about 60,000 households and accounting for around 12% of Sardinia's installed wind power capacity.

The power generated is fed directly onto the national grid, and sold to the GSE at the conditions laid down in the framework agreement drawn up by energy regulator, the AEEG. The plant will receive green certificates for 15 years after its initial start-up.

The Ulassai wind farm is set in one of the windiest locations in the region. These conditions enable power to be generated throughout much of the year at a higher rate than the national average.

2011 saw much lower wind strength than average, although approximately 141,000 MWh of power was generated, taking overall production since it became operational to approximately 995,000 MWh. The Ulassai wind farm makes a significant contribution to the production of wind energy in Sardinia, accounting for around 15% of the total in the region in 2011.

Arcola and Saras Energia (Spain)

Arcola Petrolifera

Arcola Petrolifera is the Group company that sells oil products on the Italian wholesale market. Its activities cover a wide range of products that are made available in different geographical regions via distribution through Saras' own storage facilities and third-party logistics centres. These are mainly located in Sardinia and central-northern Italy (see Figure 5). Formed in 1987, in 2010 Arcola transported approximately 2,300,000 tons of products for the retail and wholesale market.

With 16 employees, Arcola has its registered office in Sarroch and has agreed transit contracts at third-party bases (Civitavecchia, Livorno, Ravenna, Arcola, Naples, Venice and Visco as well as various logistical bases in the Po Valley), in order to cover the distribution area corresponding to the whole of central and north-western Italy.

The spin-off of Deposito di Arcola Srl from Arcola Petrolifera was completed in September 2011.

The background to the creation of Sardeolica: the Kyoto Protocol

The reduction of climate-changing gases is a global priority. To this end, the European Union committed to an 8% reduction in greenhouse gas emissions from the levels registered in 1990, with the Kyoto Protocol of 1997. As a result, a series of measures were adopted, including the 1997 White Paper and Directive 2001/77/EC, which support and incentivise the generation of electricity from renewable sources.

It was in this context that Sardeolica was formed in 2001 to build and manage plants generating power from renewable sources. Following the acquisition by Saras SpA of the stake held by Babcock & Brown Wind Energy in the subsidiary Parchi Eolici Ulassai Srl (PEU), this company was fully consolidated from 30 June 2008.

Environmental benefits

Wind is a clean and inexhaustible source of renewable energy. The environmental impact of wind power generation systems is extremely low, both during construction and when on stream. The environmental advantages of this type of plant include:

- extremely low environmental impact: when operational, wind farms do not produce atmospheric emissions or contamination of the soil, nor do they consume water, require the use of chemical products, or cause any damage to flora and fauna. At the end of their life cycle, they can be completely removed without causing any environmental damage, and no restoration or reclamation work is necessary, as there are no possible pollution risks.
- low noise levels: the level of acoustic emissions from the aerogenerators installed cannot be detected from sensitive points in the area.
- limited visual impact: if located carefully, following painstaking studies to ensure maximum environmental compatibility, wind farms and individual generators can be blended well into the landscape – usually far from inhabited areas (the closest inhabited area is in fact more than 4 km away) – without changing the designated use of the surrounding land. The Ulassai wind farm, for example, covers an area of 2,900 hectares, buts its installations occupy less than 1% of this area. Furthermore, optimal technological solutions have been adopted, such as the burying of electric cables, in order to minimise the visual impact and prevent electromagnetic interference with telecommunications.

SARDEOLICA

Sardeolica has **25 employees**, and its registered office is in Uta, in the industrial zone of Macchiareddu (Cagliari). The Ulassai wind farm is situated near Corte Porcus and Fenarbu, in the province of Ogliastra.

Owing to the above-mentioned spin-off, effective from 1 October 2011, Deposito di Arcola Srl took over the ownership of the industrial assets, previously held by Arcola Petrolifera, relating to Arcola's fuel storage facility and the related logistical equipment.

Deposito di Arcola

Deposito di Arcola Srl provides leading operators with reception, storage and land or sea redelivery services for oil products for the fuel distribution network and maritime bunkering. It has a storage capacity of approximately 200,000 m^3, which the company uses to store more than 500,000 m^3 of fuel on behalf of third parties; the facility is able to receive on average 30 tankers a year, and load approximately 100 barges and more than 15,000 tanker trucks.

Saras Energia

Saras Energia was established in 2001, from the merger of Saroil and Continental, two Spanish oil companies created by the Saras Group in the early 1990s. In 2011, the company maintained a strong position on the Spanish market for retail and wholesale oil products. The company operates across Spain through its own sales structure endowed with a high degree of expertise, professionalism and market knowledge. Products are distributed nationwide using a logistics network comprising the terminal owned by Cartagena, supplemented by the CLH system and independent storage facilities. Saras Energia acquired most of ERG's network of service stations in 2009. Work was carried out in 2010 and 2011 to change the image of some of these former ERG service stations and modernise them, in order to integrate them with the Saras Energia network. A process to develop coordinated management was also launched in the form of the DERES (Desarrollo de la Red de Estaciones Saras) project. The aim of the project is to guide and smooth the growth of the Saras Energia network based on "customer focus", health, safety and the environment (HSE), the commercial management model and the integration and harmonisation of the different ways of working resulting from the integration of people from different companies through a continually evolving cycle of training.

Saras Energia's network currently consists of 119 service stations, including 82 directly managed COCO (Company Owned Company Operated) stations, 7 CODO (Company Owned Dealer Operated) stations and 30 DODO (Dealer Owned Dealer Operated) stations. In 2011, Saras Energia sought to optimise its service station network by changing the management model, selling or leasing the less profitable stations. In 2009, Saras Energia also strengthened its logistical structure at the Cartagena industrial centre, starting up a new biodiesel production plant with a potential capacity of 200,000 t/year. The biodiesel plant is linked by a pipeline to the fuels storage facility, with which it shares sea loading and unloading equipment. In 2011, production totalled approximately 87,000 tons of biodiesel for the Spanish and Italian markets, to be mixed with motor diesel pursuant to European legislation on the release of biofuels for sale to consumers.

Figure 5 – Storage facilities - loading bases

Own storage facilities: Arcola and Cagliari

ARCOLA

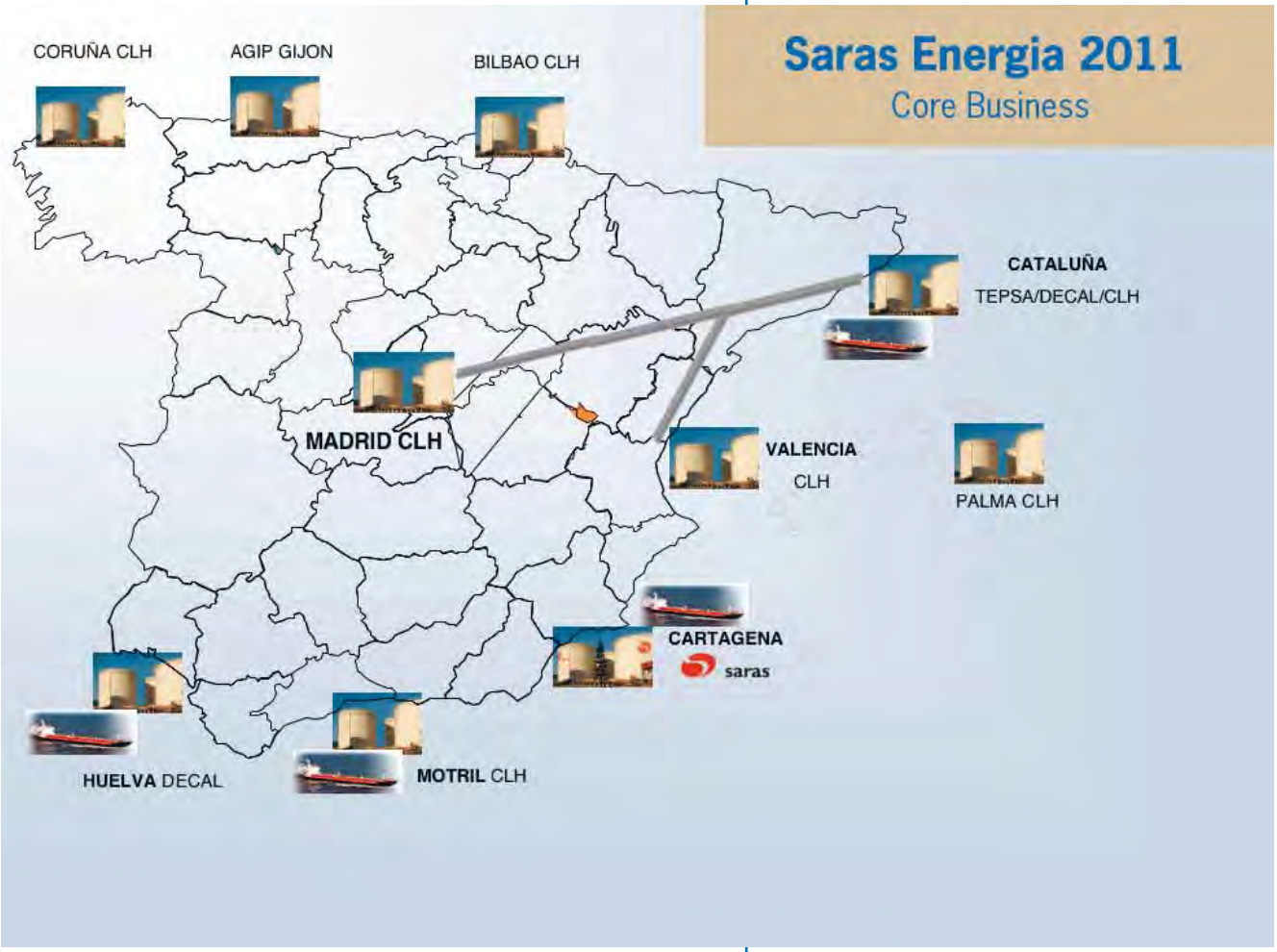
With **16 employees**, Arcola has its registered office in Sarroch, and has agreed transit contracts at third-party bases (Sarroch, Arcola, Civitavecchia, Livorno, Ravenna, as well as various logistical bases in the Po Valley), in order to cover the distribution area corresponding to the whole of central and north-western Italy.

With **24 employees**, Deposito di Arcola has its registered and operational office in Arcola; it provides reception, storage and land or sea redelivery services for oil products.

This production level, much lower than its real capacity, is due to the closure of the facility for several months owing to the difficult situation on the market, which made it cheaper to buy than to produce biodiesel.
In this economic environment, we expect in 2012 to continue to pursue a flexible production strategy that adapts to the market situation.
The company's marketing strategy is based on consolidating and further developing its strong and stable position, particularly in the areas lying along the Mediterranean coast, and on increasing its margins. It has therefore focused on sales channels offering greater added value, at the expense of less profitable sectors. As well as strengthening the network channel by adding to the number of service stations it owns, as mentioned above, Saras Energia has further expanded its presence in the area of large retailers, third-party service stations and direct sales to small and medium-sized resellers. Sales support has been strengthened in order to achieve excellence in customer service. There has been a particular focus on the stringent application of environmental and safety standards, and, naturally, on optimising costs. Saras Energia has a very flexible commercial and administrative organisation with a strong customer focus, which works in synergy with the logistics and production segments.
Sales support services and the Madrid call centre aim to achieve customer satisfaction, to comprehensively respond to their commercial, administrative or technical enquiries and to create a trustful relationship.
Products are organised and shipped promptly through delivery operations planned at every level, including the direct involvement of drivers employed by the companies transporting the products for us. At Saras Energia, we aim to optimise and improve working processes and achieve the operational standards set out in the company's mission statement ("Misión y Visión").
In the current economic scenario, in which market conditions are constantly changing, Saras Energia is working daily to adapt to the needs of its customers without lowering its quality standards, and is using this time as an opportunity to increase efficiency. In this regard, within the 2012 Strategic Project, continuous improvement and the definition of process and time efficiency involve the implementation of the SAP operating system, which will give the company a significant competitive advantage and boost the value of its human resources. It will enable the company to fully reap the benefits of significant coordination, communication, development and training for all areas.

With **431 employees**, Saras Energia has its registered office in Madrid and a biodiesel plant and storage facility in Cartagena

Figure 6 - Saras Energia's logistics network



The Policies

The Policies

Environmental management policy

Saras

Saras has always paid attention to the various aspects of the site's activities that have an impact on the environment, and in 2001, as part of its long-held commitment to environmental protection, it implemented measures to obtain Environmental Management System (EMS) certification for the refinery in accordance with the ISO 14001 international standard.

- The achievement of EMAS certification on 20 October 2008 was part of the continuous improvement process for environmental management that Saras had had in place for a number of years:
- in May 2002, *the company's Environmental Policy*, containing Saras' guiding principles and environmental management commitments, was issued to all employees
- the subsequent production of the Environmental Management System (EMS) manual and the associated implementation procedures established a code of conduct for all of the company's employees
- objectives for improvement have been set and approved by the Management Committee; these are checked and updated annually
- internal audit activities have been put in place to periodically check that the EMS is being applied correctly
- in June 2004, Saras achieved EMS certification pursuant to ISO 14001:1996, and in May 2006, this was updated to **ISO 14001:2004** (Figure 6)
- in June 2007, the first three-year EMS audit for the renewal of the environmental certification was carried out, followed by the second three-year audit in June 2010, resulting in the renewal and retention of Saras' ISO 14001:2004 certification; the certifying body, Lloyd's Register Quality Assurance (LRQA), also conducts six-monthly inspections as part of its planned assessment activities;
- in May 2008, the Environmental Policy was revised and issued to all the company's direct employees and to employees of subcontractors working on the site, thus concluding the process of developing the Environmental Management System and enabling the Saras site to register in accordance with the **EMAS Regulation**, the European eco-management and audit standard (EC Regulation 761/2001), which led to the publication of the 2008 Environmental Declaration (Figure 7). This document, aimed at the company's internal and external community, is intended to establish a transparent relationship with the local population, local authorities and employees, and illustrates Saras' activities, the direct and indirect environmental aspects associated with these activities and the environmental improvement targets that the company has set itself.
- 2010 saw the full implementation of the new organisational structure for the business units involved in HSE (Health, Safety and the Environment) issues, which established a central department dedicated

CERTIFICATO DI APPROVAZIONE

Si certifica che il Sistema di Gestione Ambientale di

Saras S.p.A.
Galleria de Cristoforis, 1 - 20122 Milano - Italia
S.S. Sulcitana n. 195 - Km. 19 - 09018 Sarroch (Cagliari) – Italia

è stato approvato da Lloyd's Register Quality Assurance per conformità alla seguente norma di Sistemi di Gestione Ambientale:

ISO 14001:2004

Il Sistema di Gestione Ambientale si applica a:

Produzione di prodotti della raffinazione del petrolio, programmazione, preparazione e spedizione di prodotti finiti, produzione di energia elettrica. Gestione della progettazione, ingegnerizzazione e costruzione di impianti interni.

Certificato di Registrazione

Registration Certificate

EMAS

SARAS S.p.A.

S.S. Sulcitana n.195 – Km 19
09018 – Sarroch (CA)

N. Registrazione: IT – 000995

Data di registrazione: 20 ottobre 2008

FABBRICAZIONE DI PRODOTTI DERIVANTI DALLA RAFFINAZIONE DEL PETROLIO — NACE: 19.20

PRODUZIONE DI ENERGIA ELETTRICA — NACE: 35.11

Roma, 20 ottobre 2008

Certificato valido fino al: 25 luglio 2011

Comitato Ecolabel - Ecoaudit

Il presidente

Elio Lannutti

to obtaining and maintaining environmental and safety certification, as well as four new HSEQ (Health, Safety, Environment and Quality) positions, one for each production area, with a specific focus on environmental, health, safety and quality issues.

- In June 2010, Saras obtained the second renewal of its EMS certification, pursuant to ISO 14001:2004. Subsequently, the Environmental Declaration 2010, drawn up pursuant to the new EC Regulation 1211/2009, was validated, again by LRQA, and published, while Saras' EMAS registration was confirmed at the same time.
- Certifying body Lloyd's Register Quality Assurance (LRQA) continued its half-yearly inspections of the Environmental Management System during 2011, with positive results. Furthermore, in July 2011, the certifying body conducted its three-year audit of the EMAS registration, validating the 2011 Environmental Declaration and recommending the three-year renewal of Saras' registration with the ECOLABEL Control Body, whose approval procedure was still in progress at 31 December 2011.

Group companies

Sardeolica

Sardeolica generates electricity from wind power at its production unit in the municipality of Ulassai (OG). Although this type of energy generation is in itself already an activity with a low environmental impact, Sardeolica believes it is important to adopt an Environmental Management System in order to ensure continuous improvement in various environmental aspects: consumption of energy, water and auxiliary materials, production of waste and the prevention and reduction of all forms of pollution. In 2006, Sardeolica obtained ISO 14001:2004 environmental certification for its Environmental Management System (EMS), which was successfully renewed in July 2009. The certifying body, Lloyd's Register Quality Assurance, conducts annual inspections as part of its planned assessment activities. In March 2006, Sardeolica's Environmental Policy, containing the guiding principles and the company's environmental management commitments, was issued to all employees; the subsequent drafting of the implementation procedures established a code of conduct for all of the company's staff.


CERTIFICATO DI APPROVAZIONE

Si certifica che il Sistema di Gestione Ambientale di

Sardeolica S.r.l.
SP 13 Km 11 + 500
08040 Ulassai (Ogliastra) - Italia

è stato approvato dal Lloyd's Register Quality Assurance
per conformità alla seguente norma di Sistema di Gestione Ambientale

ISO 14001:2004

Il Sistema di Gestione Ambientale si applica a:

Installazione, esercizio e manutenzione dei parchi eolici in Ulassai (Ogliastra) nelle località di Corte Porcus, Fenarbu, Larenzu e Perda Fitta.

Sartec

In order to prevent pollution and implement reasonable solutions to reduce the environmental impact, promote the rational use of natural resources, energy and materials, where possible reducing consumption thereof, providing proper maintenance of its plants, machinery and equipment and for any measures deemed necessary to ensure its workers' health and safety, improved energy efficiency and environmental protection, maintain the offer of its products and services relating to environmental protection, industrial efficiency and energy saving, identifying its customers' requirements and proposing comprehensive solutions, in

April 2011 SARTEC adopted an environmental management system, certified in accordance with EN ISO 14001:2004, supplemented with Safety and Quality management systems. On 8 April 2011, senior management issued a new integrated company policy, containing the company's guiding principles and commitments on environmental protection, worker health and safety, and product and service quality when performing its activities.

Health and safety policy

Saras

The Safety Policy Declaration

On the basis of increasingly stringent legislative guidelines for safety management in industrial activities and for the protection of workers and the local area, Saras has also launched a process of continuous improvement to standards and results, recognising that safety is of strategic value to its corporate activities. The company introduced a specific safety policy in 1996, and since then has achieved good results in accident prevention and in continuously protecting both its workers and the region.

As part of the continuous improvement process, between 2009 and 2011, Saras implemented the "Saras Safety" project in support of safety management, designed in co-operation with Du Pont - a global leader in issues relating to safety at work.

The Safety Management System

The implementation of a Health and Safety Management System (HSMS) introduced performance measurements and defined improvement targets. Following a similar process to that undertaken for the EMS, in December 2007 Saras obtained OHSAS 18001:2007 certification for its Occupational Health and Safety Management System (OHSMS) from Lloyd's Register Quality Assurance Italy.

In November 2011, Saras' OHSMS was subject to another audit, through an intense inspection procedure conducted by certification body TÜV Austria, which confirmed it met the BS OHSAS 18001:2007 standard and renewed its certification for a further three years.

Saras considers health protection and the prevention of any form of accident or injury (either to its own employees or workers of subcontractors) as core values, as stated in the Occupational Health and Safety Policy updated on 19 July 2007.

To make synergic use of the common parts of the two management systems, Saras' HSMS is integrated with the Management System for the Prevention of Major Accidents, implemented in accordance with the Ministerial Decree of 9 August 2000. Furthermore, the company drafted a specific Major Accident Prevention Policy for the Sarroch site on 31 March 2008.


CERTIFICATO

TÜV AUSTRIA

per il sistema di gestione secondo
EN ISO 14001:2004, OHSAS 18001:2007

Saras Ricerche e Tecnologie SpA
Sede legale e operativa:
Traversa 2ª Strada Est Z. I. Macchiareddu
IT-09032 Assemini (CA)

Servizi di ingegneria nel campo industriale e ambientale.
Progettazione, montaggi, commissioning e manutenzione
di impianti package in campo industriale e ambientale.
Commercializzazione e assistenza di strumentazione analitica.


CERTIFICATO

TÜV AUSTRIA

per il sistema di gestione secondo
OHSAS 18001:2007

SARAS Sp.A.
Sede Direzionale:
Galleria De Cristoforis 1, IT-20122 Milano
Sede Legale e Operativa:
Strada Statale 195 Sulcitana km 19,000, IT-09018 Sarroch (CA)

Produzione di prodotti della raffinazione del petrolio,
programmazione, preparazione e spedizione di prodotti finiti,
produzione di energia elettrica. Gestione della progettazione,
ingegnerizzazione e costruzione di impianti interni.

The main objectives of Saras' commitment to safety management have always been accident prevention and the identification of the most effective methods of reducing the likelihood of accidents. This approach is the same as that which underlies Legislative Decree 334/99 (Seveso II), which stipulated the adoption of a Safety Management System for the Prevention of Major Accidents, also covering electricity generation at the IGCC plant.
Saras aims to integrate the Health and Safety Management System with the Environmental Management System in the future.

The subsidiaries and the Occupational Health and Safety Management System

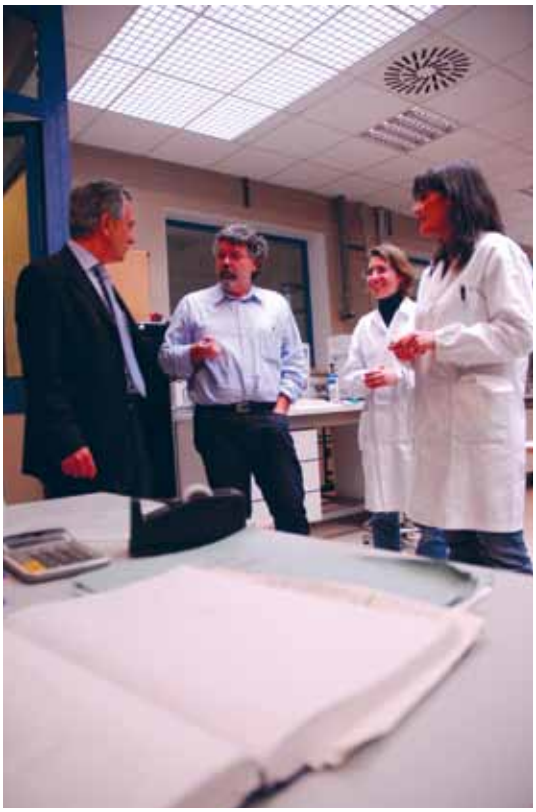
Other Group companies also consider it important to adopt an Occupational Health and Safety Management System to ensure the maximum safety of all their employees and those of subcontractors.

Sardeolica

Sardeolica has adopted an Occupational Health and Safety Management System in line with OHSAS 18001:2007. As part of this process, the company's Occupational Health and Safety Policy, containing the guiding principles and Sardeolica's commitments, was issued to all employees in June 2008. The subsequent drafting of the Manual for the Integrated Environmental and Safety Management System and the associated implementation procedures established a code of conduct for all of the company's staff.

Sartec

SARTEC aims to control occupational health and safety risks for its employees at the workplace and to improve its performance in order to eliminate or minimise risks for employees and other interested parties who might be exposed to risks associated with the company's activities and work performed by company employees or those supervised by the company. In line with the requirements of the current legislative framework, which are increasingly specific and stringent, and on the basis of the company's awareness of the strategic importance of the health and safety of its employees, in 2011 SARTEC gained certification, pursuant to BS OHSAS 18001:2007, for its Safety Management System, in place since 2008, and integrated it with its certified Quality and Environmental Management Systems.



POLITICA PER LA SALUTE, SICUREZZA, AMBIENTE E QUALITÀ

By adopting an Integrated Management System (IMS), SARTEC aims to:

- reduce the probability of the occurrence of any event resulting in injury to people or damage to the environment or property, and pursue continuous improvement in the working conditions and quality of work within the site
- progressively reduce the overall costs of occupational health and safety, including those resulting from work-related accidents, injuries and illnesses by minimising the risks to which employees or third parties (e.g. customers, suppliers and visitors) may be exposed
- increase the company's efficiency and performance
- improve the company's internal and external image.

The IMS defines methods for identifying, within the corporate organisational structure, responsibilities, procedures, processes and resources to implement the company's accident prevention policy, in accordance with the health and safety legislation in force.

Arcola Petrolifera / Deposito di Arcola Srl

The drafting and dissemination at all levels of the Occupational Health and Safety Policy, containing the guiding principles and Arcola's commitments, and the revision of the Risk Assessment Document to bring it into line with the criteria set out in Legislative Decree 106/2009, supplement the statutory obligations regarding the risk of major accidents and are codified in the Health and Safety Management System (HSMS) and the related Manual. The HSMS is therefore integrated with the Management System for the Prevention of Major Accidents, pursuant to the Ministerial Decree of 9 August 2000. This originates from the Major Accident Prevention Policy and is codified in the Policy Document for the prevention of major accidents and the protection of workers' health and safety (Article 7 of Legislative Decree 334/99). The education, communication and training activities supplemented by relevant internal and external audits, together with the revising and updating of the Safety Management System Manual, represent the cornerstones on which the concept of “continuous improvement” is based. In order to make the training and communication process more effective and efficient, in March 2009 Arcola Petrolifera / Deposito di Arcola Srl obtained a multimedia e-learning platform to support operator training and communication activities; the first sessions planned and organised were naturally dedicated to specific issues relating to major accident prevention and the protection of health and safety in the workplace (SICURPOINT).

Specific training courses dedicated to the following topics have been run on this platform: Safety Management System, Consolidated Law on Safety (Legislative Decree 81/08, as subsequently amended) - (Legislative Decree 106), Chemical Risk, ATEX Regulations, and the Internal Emergency Plan (IEP). All storage facility staff successfully completed the entire training programme. In 2010, further training programmes were added to the multimedia e-learning platform:

- Personal Protection Measures (PPMs)
- Emergency plan at the marine terminal.


CERTIFICATO

TÜV AUSTRIA

per il sistema di gestione secondo
OHSAS 18001:2007

Saras Ricerche e Tecnologie SpA

Sede legale e operativa:
Traversa 2° Strada Est Z. I. Macchiareddu
IT-09032 Assemini (CA)

Sede operativa:
5° Strada Ovest Traversa C. Z.I. Macchiareddu
IT-09032 Assemini (CA)

Servizi di ingegneria nel campo industriale e ambientale. Progettazione, montaggi, commissioning e manutenzione di impianti package in campo industriale e ambientale. Servizi di campionamento e chimica analitica in ambito merceologico ed ambientale. Commercializzazione e assistenza di strumentazione analitica.

In 2011, the following training programmes were added to the multimedia e-learning platform:

- CLP (legislation regarding the classification of dangerous substances)
- MAH (Major-accident hazard)

As well as these internal training activities, training sessions were held for all staff of subcontractors operating at the storage facility using an appropriate course developed on the SICURPOINT platform. Authorisation to access certain areas of the site depends on staff passing this course.
For the Arcola site, Arcola Petrolifera has produced a map of company areas where there is a crime risk, part of which is very important in relation to occupational health and safety.
This activity is one of those covered by the "Organisation, Management and Control Model" document pursuant to Legislative Decree 231/01, adopted by the company, which describes the basic elements and management procedures that Arcola has implemented for the current internal control system, lists the actions carried out to date in relation to organisational and procedural compliance, and indicates the general measures put in place to prevent potential crimes from being committed.

Saras Energia

In line with the principles of its health, safety and environment policy, Saras Energia has revised its risk assessment documents for all its sites and successfully implemented a training programme that offered all staff the necessary training to identify and avoid risks connected to activities at the various facilities. Amongst other things, the programme provided training in specific safety procedures for unloading fuel, the mechanical systems of the service stations, environmental protection measures and fire prevention systems. To implement the principles established in its health, safety and environmental policy and to monitor the health of its workers, the company has carried out a programme of medical checks to individually assess employee exposure to hazardous chemicals and to noise. To meet the need for a tool to disseminate information on health, safety and the environment simply and efficiently, a dedicated area has been set up on the group's intranet site specifically to address these questions. To adequately develop the idea of continuous improvement, a safety audit programme has been established for all company areas. The results of the audit have been used to design subsequent training activities.
Saras Energia owns two sites subject to Directive 96/82/EC of the European Council, issued on 9 December 1996, which governs the control of major-accident hazards (Seveso II): the hydrocarbon storage facility and the biodiesel production plant.
The Safety Management System for each site has therefore been revised, with necessary changes made and action taken to make the improvements indicated by the audit process.
For the biodiesel plant, the company also launched a review of the emergency plan to ensure, in the event of plant stoppage, the presence of personnel necessary to ensure plant safety.

saras | COMUNICADO CONSEJERO DELEGADO Nº 7 | 04/11/2009

ACTUALIZACIÓN DE LAS POLÍTICAS DE SEGURIDAD, SALUD Y MEDIO AMBIENTE (HSE) Y PREVENCIÓN DE ACCIDENTES GRAVES (PPAG)

Con el objeto de dar cumplimiento a la normativa legal y del Grupo Saras en materia de Prevención de Accidentes, les remito las Políticas de:

- Política de Seguridad, Salud y Medio Ambiente (HSE),
- Política de Prevención de Accidente Graves (PPAG),

que han sido actualizadas y aprobadas recientemente.

Aprovecho la oportunidad para resaltarles que el cumplimiento de dichas políticas debe estar presente en nuestras labores diarias ya que nos ayudarán a la consecución de nuestro principal objetivo:

"CERO ACCIDENTES"

Para cualquier duda, aclaración, sugerencia o comentario que quieran realizar sobre estas políticas o sobre cualquier asunto relacionado con esta materia, pueden hacerlas a la dirección de e-mail que se ha creado para dicho fin:

coordinacion@saras-energia.com

Próximamente recibirán en cada uno de los centros de trabajo la documentación que adjuntamos, que deberá ser colocada en sitios visibles tanto para el personal de Saras Energía como para el resto de personas que se relacionan con nosotros. De momento, imprima los documentos que se adjuntan en la presente comunicación y colóquelos provisionalmente hasta recibir los documentos originales que los sustituirán.

Para cualquier duda relacionada con la adecuada ubicación de los carteles pueden solicitar información al personal que se detalla en el siguiente cuadro:

Centro de Trabajo	Contacto
Madrid	Rafael Hurtado
EESS	Desarrollo Verdes
Planta BIO	Rodrigo Romero
Terminal Almacenamiento	Miguel Ángel Grau

Muchas gracias a todos por su colaboración.

Consejero Delegado

saras

POLÍTICA DE SEGURIDAD, SALUD Y MEDIO AMBIENTE (POLÍTICA H.S.E.)

Nuestro trabajo nunca es tan urgente o tan importante como para prescindir de la seguridad y el respeto al medio ambiente

La política de SARAS ENERGIA, S.A., ser conscientes de la importancia que tiene desarrollar nuestras actividades promoviendo la salud, el bienestar y la seguridad de nuestro personal contratistas, clientes y vecinos, así como respetando y cuidando el medio ambiente.

Para conseguirlo SARAS ENERGIA, S.A. se compromete a aplicar los siguientes principios básicos:

1. Cumplir la legislación aplicable.
2. Adoptar las recomendaciones de Organismos Oficiales y otras organizaciones de reconocido prestigio, relacionadas con nuestra actividad.
3. Identificar, evaluar y controlar todos los riesgos relevantes, especialmente aquellos que tengan relación con los accidentes graves.
4. Integrar la prevención de riesgos relativos a la seguridad y la salud de las personas y el respeto y cuidado a nuestro entorno, en todos los niveles de la organización y en todas las fases de nuestras tareas.
5. Asegurarse de que todos los que forman parte de Saras Energía, S.A. tienen la información y formación necesaria relacionada con H.S.E.
6. Establecer objetivos específicos en esta materia, proporcionando las herramientas necesarias para alcanzarlos y evaluando continuamente su fiel cumplimiento.
7. Exigir a nuestros contratistas que desarrollen y mantengan estándares adecuados relacionados con H.S.E.
8. Cooperar con las Autoridades y Organismos Públicos para mantener una capacidad de respuesta adecuada ante situaciones de emergencia.
9. Buscar la mejora continua en nuestra actuación y resultados, mediante la evaluación y revisión sistemática del sistema de prevención de riesgos relativos a la Seguridad, la Salud y el Medio Ambiente.

Consejero Delegado

To ensure proper implementation of the Internal Emergency Plan for the two sites, a programme of emergency drills was drawn up and successfully put into practice over the year, guaranteeing that staff designated to deal with emergency situations are adequately prepared and that the equipment provided for use in emergencies is suitable. In accordance with the Spanish legislation transposing Directive 96/82/EC (Seveso II), both sites have been inspected by the Department of Industry, Energy and Mining, through an accredited auditing body. The result of these inspections was positive and confirmed that both sites have adopted suitable measures for major accident prevention and for mitigation of the consequences both inside and outside the site.

Quality certification

Saras

Before obtaining environmental certification, the company took steps to adopt a Quality Management System (QMS), which established procedures for managing a range of internal areas and processes in the refinery. The company's activities in the following areas are currently certified according to the ISO 9001:2008 quality standard (Figure 10):

- **product movement**, the preparation of products according to customers' contractual specifications
- **shipping**, the distribution by land and sea of products requested by customers
- **operational and medium-term scheduling**, the supervision of the arrival of raw materials (crude oil), their processing, and the preparation and shipping of finished products requested by customers
- **engineering**, involving the design of new plants and improvements to existing plants
- **construction**, the management of the building of new plants and modifications to existing facilities.

Furthermore, the following processes, although not certified, are carried out within the QMS framework in accordance with the ISO 9001:2000 reference standard and QMS procedures, to protect customers and the market in which Saras operates:

- **reception**, the supervision of the unloading of raw materials (crude oil) from tankers at the marine terminal
- **analytical control of production**, by means of the chemical laboratory, which is responsible for verifying and monitoring the hydrocarbons produced; furthermore, in June 2008, the chemical laboratory obtained SINAL accreditation, in accordance with UNI CEI EN ISO/IEC 17025.
- **purchasing and tenders**, the issuing and scheduling of orders for materials and tenders, and the selection and evaluation of suppliers
- **human resources and organisation**, ensuring that employees meet company requirements, through careful staff selection and training aimed at acquiring, developing and transfering professional expertise

CERTIFICATO DI ACCREDITAMENTO

Numero di Accreditamento

0813

Si attesta che

Il Laboratorio SARAS SpA

Strada Sulcitana Km 19 - 09018 Sarroch - CA

è accreditato dal SINAL per l'esecuzione delle prove elencate nelle schede che accompagnano questo certificato. Le schede possono subire variazioni nel tempo.
L'accreditamento attesta la competenza tecnica del Laboratorio relativamente alle prove accreditate, in conformità alle prescrizioni della norma UNI CEI EN ISO/IEC 17025:2005 "Requisiti generali per la competenza dei laboratori di prova e taratura".
I requisiti gestionali della UNI CEI EN ISO/IEC 17025:2005 sono allineati a quelli della ISO 9001:2000.
L'accreditamento resta in vigore fino al **maggio 2012**.
I laboratori sono soggetti a verifiche annuali di sorveglianza e, ogni quattro anni, di rinnovo dell'accreditamento.
La conferma della validità dell'accreditamento può essere verificata sul sito WEB [illegible] o richiesta direttamente al SINAL.
Il SINAL è firmatario dell'accordo multilaterale di mutuo riconoscimento della European Cooperation for Accreditation (EA-MLA) e dell'accordo dell'International Laboratory Accreditation Cooperation (ILAC-MRA).

Il Direttore
(Dr. P. Bianco)

Il Presidente
(Prof. A. Paoletti)

LRQA

CERTIFICATO DI APPROVAZIONE

Si certifica che il Sistema di Gestione per la Qualità di

SARAS S.p.A.
S.S. Sulcitana km.19.5
09018 Sarroch (Cagliari) – Italia

è stato approvato dal Lloyd's Register Quality Assurance per conformità alle seguenti norme di sistema di gestione

ISO 9001:2008

Il Sistema di Gestione per la Qualità si applica a

Servizi di programmazione, preparazione e spedizione di prodotti petroliferi. Progettazione, ingegnerizzazione e costruzione impianti interni.

Le visite di sorveglianza periodica e ricertificazione devono avvenire entro le scadenze indicate sul certificato.

Certificato n. [illegible] Approvazione Originale: 8 Luglio 1999
Approvazione N. [illegible] Certificato emesso: 8 Luglio 2011
Scadenza Certificato: 7 Luglio 2014

Emesso da: Lloyd's Register Quality Assurance Limited

- **supply and trading**, the drafting of contracts for the supply of raw materials (through both purchasing and processing contracts) and the sale of products.
- **maintenance**, the supervision of activities necessary to keep the infrastructure and equipment used to make the products ordered by customers functioning and running efficiently.
- **warehousing and materials**, the transport of materials to/from the refinery and related expediting, the reception and distribution of these materials (both physically and in accounting terms), and their storage in defined locations.
- **ICT management**, management of a range of interconnected software applications, in order to gather, process and distribute information to support the company's decision-making, management and business control activities.

Group companies

Sartec

The Quality Management System applies to the following activities and processes:

- multi-disciplinary design of industrial plants in the oil, petrochemicals, chemicals and energy
- design, installation, testing and start-up assistance for package plants for the oil and petrochemicals
- design, configuration, testing and supply of automation, control, process optimisation and decision-making support systems, training activities and installation assistance for industrial applications in the oil and energy
- design, installation, testing, start-up, after-sales assistance and maintenance of systems' for measuring air and water pollutants, atmospheric emissions and the characteristics of fluids in chemical processes
- maintenance and inspection of oil product measuring systems
- applied research and consultancy services in the area of the environment and oil, specifically:
  - characterisation of contaminated sites, planning of measures to make safe and reclaim contaminated sites
  - environmental impact studies (EIS) and strategic environmental assessment (SEA); assistance and consultancy during the environmental authorisation process
  - research and development in the oil and biofuel refining
  - studies of catalysts and catalytic processes through pilot plant and modelling
  - studies of processes in the oil refining sector through modelling
  - development of on-line control of processing/preparation of oil products
  - analytical and modelling studies of non-typical crude oil behaviour


CERTIFICATO

TÜV AUSTRIA

- chemical analysis services in the area of commodities and the environment
- resale of measuring instruments and spare parts for environmental monitoring

The Quality Management System also applies to all business processes (support processes) that help the company ensure it can provide products that meet customer requirements and/or other applicable requirements.

No ISO 9001:2008 requirements are excluded.


12
10

Production

Production

The Sarroch site

The energy balance

Energy input into the site is in the form of raw materials (crude and semi-finished products), electricity and water, as shown in Figure 7. Crude oil is used in refining, from which fuels for internal use and feedstock for the IGCC plant are also obtained, while the imported electricity is needed to meet the energy requirements for processing. Taken together, the refinery and IGCC plant produce energy in the form of oil products, which are in daily use throughout the region and beyond, and electricity from the internal thermoelectric plant (CTE) and IGCC plant (Table 7). The thermoelectric energy produced is used internally for refining, while all power from the IGCC plant is fed into the national grid. In 2011, the Saras site recorded an energy requirement of 989,215 TOE.

Figure 7 – Saras' Sarroch site: flow diagram

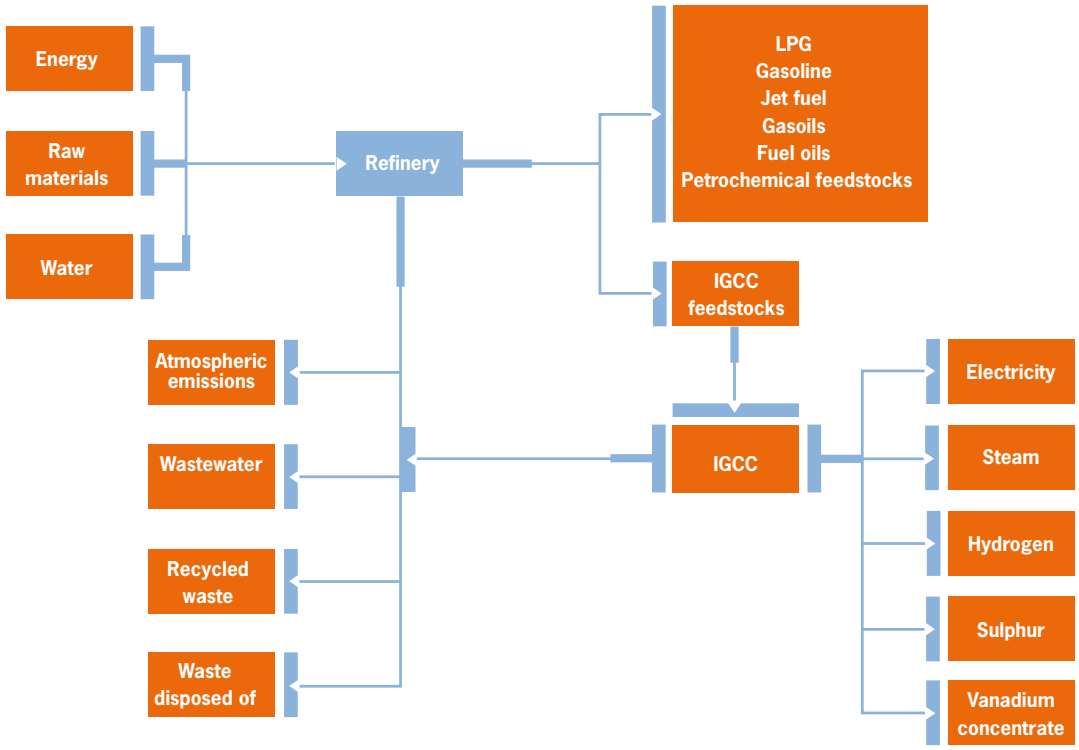


Table 6 – Energy in (TOE)

	2011
Crude and fuel oil	14,006,000
Power from external sources*	251,335
Total	**14,257,335**

*Converted into TOE using figures from the Italian Regulatory Authority for Electricity and Gas (AEEG)

Table 7 – Energy out (TOE)

	2011
Finished products	12,342,000
Electricity fed into the grid	741,076
Fuel gas	53,926
Total	13,137,002

Refining

In 2011, the Sarroch refinery processed approximately 14.0 million tons (Mton) of raw materials (crude oil and fuel oils), which is an average figure for recent years. Between 2008 and 2011, a total of 57.2 Mton of raw materials were processed, with an average of 14.3 Mton/year (Chart 3). In the last few years, more light products have been produced, with fuel oil being kept to a minimum and heavy distillates from refining (TAR) being used to generate electricity.

Chart 3 - Crude oil refining (thousands of tons/year)

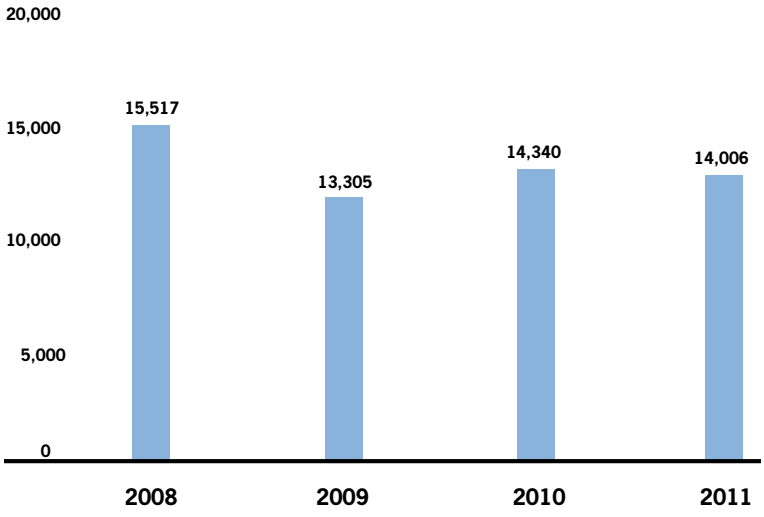


Table 8 – Products of the Saras plants (tons/year)

	2008	2009	2010	2011
LPG	337,000	221,000	323,000	238,000
Gasoline and virgin naphtha	4,056,000	3,343,000	4,024,000	3,824,000
Middle distillates (gasoil, kerosene)	8,275,000	6,769,000	7,517,000	7,415,000
Fuel oil and other	825,000	1,119,000	463,000	623,000
Vanadium concentrate	1199	1633*	1,122**	1,494***
Electricity (TOE)	780,974	750,679	797,136	759,386
Sulphur	110,000	110,000	110,000	113,000
Heavy hydrocarbons to IGCC	1,121,000	1,077,000	1,166,000	1,121,000

* Including 877 tons/year that do not meet the specification, which are therefore sent for disposal rather than recovery.
** Including 181 tons/year that do not meet the specification, which are therefore sent for disposal rather than recovery.
*** Including 44 tons/year that do not meet the specification, which are therefore sent for disposal rather than recovery

Environmental quality of products

Sulphur content is a key factor in assessing the environmental quality of refinery products, and in recent years regulations have been introduced to set limits. Low sulphur content means that fuels perform better during combustion and have less of an impact on the atmosphere. The facility's sulphur balance (Figure 8 and Table 9) provides useful information on how much sulphur enters the refining cycle and the breakdown of the sulphur output. The data show that the amount of sulphur coming in with raw materials is flat. Throughout the entire process, from selecting raw materials to fitting efficient desulphurisation systems (U800 for gasoline and DEA4 for better removal of H_2S from the fuel gas used on-site) and treating Claus tail gases (TGTU), the choices made and projects implemented at the site have produced impressive results. In 2011 there was a further improvement from the figures registered in the previous two years, particularly for sulphur emissions, validating the technical decisions taken over the years. The amount of sulphur in products entering the market increased substantially, due to increased production of fuel oil compared with previous years. This confirms the site's desulphurisation capacity, together with a marked reduction in the quantity of sulphur released into the atmosphere.

Chart 4 - Sulphur output

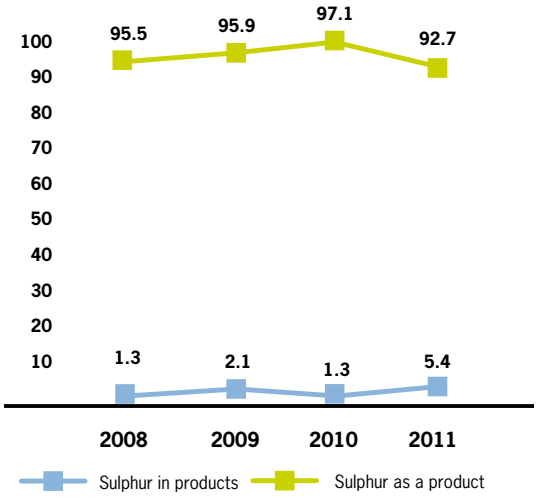


Figure 8 – Sulphur balance of plants - 2011

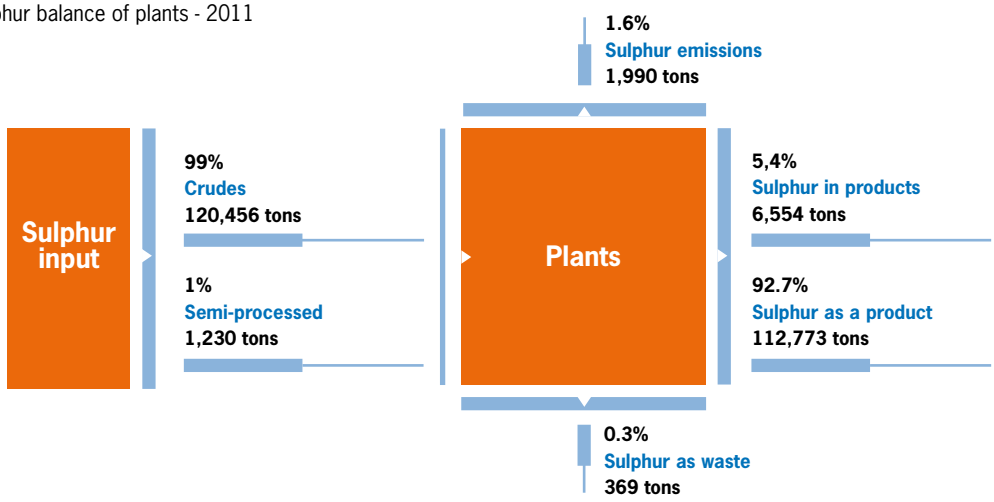


Table 9 – Sulphur balance of plants - 2011

	2008		2009		2010		2011	
	tons	% of total	tons	% of total	tons	% of total	tons	% of total
Sulphur input								
Raw materials	115,141	100	**114,714**	**100**	**133,634**	**100**	**121,686**	**100**
Sulphur output								
Atmospheric emissions	3,568	3.1	**2,200**	**1.92**	**2,086**	**1.55**	**1,990**	**1.64**
In products	1,441	1.3	**2,430**	**2.12**	**1,767**	**1.3**	**6,554**	**5.39**
As pure sulphur	110,000	95.5	**110,017**	**95.9**	**129,718**	**97.1**	**112,773**	**92.68**
As waste	132	0.11	**68**	**0.06**	**63**	**0.05**	**369**	**0.3**

Electricity generation

The production performance of the IGCC plant and its exchanges with the refinery are reported below.

Data for 2011 is shown in comparison with the previous three years.

Table 10 – IGCC consumption (tons/year)

	2008	2009	2010	2011
Heavy hydrocarbons for gasification	1,179,604	1,128,568	1,222,328	1,121,249
Syngas (obtained from gasification)	3,770,558	3,757,686	4,021,014	3,676,704
Diesel	4,370	18,904	3,440	13,994
Electricity from external sources (MWh)	380,508	378,700	379,495	349,658

Table 11 – IGCC products

	2008	2009	2010	2011
Electricity to external grid (MWh)	4,318,134	4,066,306	4,336,730	4,012,325
Medium-pressure steam (tons/year)	667,762	572,368	741,905	699,486
Low-pressure steam (tons/year)	539,680	437,003	613,911	555,647
Hydrogen (t/year)	34,042	37,939	39,731	35,809
Sulphur (tons/year)	49,753	48,405	52,666	37,872
Vanadium concentrate (tons/year)	1,199	1,633*	1,122**	1,494***

* Including 877 tons/year that do not meet the specification, which are therefore sent for disposal rather than recovery.
** Including 181 tons/year that do not meet the specification, which are therefore sent for disposal rather than recovery.
*** Including 44 tons/year that do not meet the specification, which are therefore sent for disposal rather than recovery.

Group companies

Sardeolica

Table 12 shows the net electricity produced by the Ulassai wind farm and distributed on the national grid (GSE).

The same table shows avoided emissions of CO_2, SO_2 and NO_x. The avoided emissions figure is particularly significant, because it highlights tons of pollutants not released due to the fact that the electricity was generated using wind rather than conventional fuels.

The number of households that could be supplied with electricity using this type of generation, and the corresponding TOE saved, have been estimated.

Table 12 – Electricity generated at the Ulassai wind farm

	2008	2009	2010	2011
Production (GW/h)				
Net electricity	154	156	176	141
Indicators				
CO_2 emissions avoided (1)	127,292	129,143	145,674	116,697
SO_2 emissions avoided (2)	584	593	669	536
NO_x emissions avoided (3)	292	296	334	268
Equivalent households (4)	51,245	51,990	58,645	46,979
TOE saved (5)	13,140	13,331	15,037	12,046
Barrels of oil saved	95,920	97,315	109,771	87,936

(1) Emissions avoided were calculated using a specific emission coefficient of 828 gCO_2/kWh, as indicated in the Official Bulletin of the Autonomous Region of Sardinia, no. 26, Parts I and II, page 31 (30 August 2003).

(2) Emissions avoided were calculated using a specific emission coefficient of 3.8 gSO_2/kWh, as indicated in the Official Bulletin of the Autonomous Region of Sardinia, no. 26, Parts I and II, page 31 (30 August 2003).

(3) Emissions avoided were calculated using a specific emission coefficient of 1.9 gNO_x/kWh, as indicated in the Official Bulletin of the Autonomous Region of Sardinia, no. 26, Parts I and II, page 31 (30 August 2003).

(4) Estimated consumption of an average Italian household: 3,000 kWh/year (source www.scienzagiovane.unibo.it)

(5) 1 TOE = 7.3 barrels = 11,700 kWh
N.B.: one barrel of oil is equal to 42 US gallons or 158.98 litres.

Sartec

SARTEC has undertaken some major new environmental projects in recent years. These include a project to monitor fugitive emissions of volatile organic compounds due to leaks of industrial plant process components. The company applies a new approach called "Smart LDAR", which detects leaks of volatile organic compounds through a visual survey of production plant process components with a camera and the evaluation of leaks using a PID or an FID. Another innovative project was designed to monitor odour emissions using an integrated approach based on speciation of odour emissions through chemical analysis, to identify and quantify the compounds making up the odour mix, quantification of the odour impact using olfactometric analysis and assessment of the impact using dispersion models.

Other projects are geared towards identifying contamination sources and their possible evolution over time, based on a forensic chemical approach using a wide range of high-tech analytical tools. These methods, in combination with modelling and risk analysis, enable the development of environmental due diligence services geared towards the assessment, including economic assessment, of environmental damage and the determination of possible remediation measures. The key projects implemented by SARTEC in the area of contaminated site remediation are the design of hydraulic barriers to render contaminated groundwater safe, bioremediation projects, soil washing projects and support for the design and construction of physical barriers.

The ten-yearly provision and management of air quality measurement systems has also continued, notably management of monitoring networks in Valle d'Aosta, the province of Terni and the supplementary network for the city of Cagliari, and the provision of a wide range of goods and services for monitoring networks for third-party industrial sites.

In the field of energy efficiency, SARTEC designs and builds plants fuelled by renewable energies.

As an Energy Service Company (ESCO), SARTEC formulates proposals and calculates energy efficiency credits for energy saving projects.

To date, seven proposals have been filed with the AEEG for the Saras refinery, three of which have been approved and four of which are being assessed. Approximately 30,000 energy efficiency credits have been calculated, with an average market value in 2012 of about 100.00/unit.

Saras Energia

The service station network to which Saras Energia belongs closed 2011 with total turnover of more than 222 million litres.

Table 13 shows the trend in the fuel sales of our motorway network.

Table 13 – Fuel sales on the Saras Energia network in litres

	2009	2010	2011
Fuel sold (litres/year)	178,684,814	233,326,098	222,663,614

Similarly, incoming and outgoing traffic at the fuel storage facility was more than 672,000 tons. Table 14 shows changes in storage facility traffic in the three-year period 2009-2011.

Table 14 – Movement of products at the Cartagena storage facility.

Incoming + outgoing (metric tons)

	2009	2010	2011
DIESEL	765,567	958,402	534,725
GASOLINE	101,146	99,334	96,212
BIOFUEL	15,519	27,398	25,410
METHANE	24,532	21,018	15,923
Total	906,764	1,106,147	672,270

Environment

Environment

The Sarroch site

Commitment to continuous improvement

For many years, we have prepared an Environmental and Safety Report that provides detailed and up-to-date information on all aspects that directly or indirectly affect the Sarroch site's internal and external environments.

Some of these, such as atmospheric emissions or wastewater, are more immediately obvious because they relate to the environment in which people live and work every day; others, such as energy and water consumption and carbon dioxide (CO_2) emissions, relate to problems of more general concern, and have a more global impact without significant direct effects on the local environment.

The trend in emissions over a four-year period shows a picture of general improvement, with the exception of some small fluctuations that may occur from year to year relating to plant changes and turnaround maintenance. The improvement in environmental data is due to a series of technical, organisational and management measures, which have gradually provided the refinery with more efficient technology and resources to operate in a more environmentally friendly manner.

In particular, sulphur dioxide (SO_2) emissions, which are of notable interest to the local community, have decreased sharply compared with previous levels, dropping substantially in the past three years due to the start-up of the tail gas treatment unit at the sulphur recovery plant. Compared with the average figure for previous periods, SO_2 emissions have fallen by about 50% in the past three years.

EMAS registration

Certifying body Lloyd's Register Quality Assurance continued its half-yearly inspections of the Environmental Management System during 2011, with positive results: ISO 14001:2004 certification was confirmed. In July 2011, the certifying body also jointly validated Saras' 2011 Environmental Declaration, which was prepared pursuant to new EC Regulation 1221/2009, recommending the three-year renewal of its registration to the ECOLABEL Community Control Body, whose approval procedure was still in progress at 31 December 2011.

This document, aimed at the company's internal and external community, intended to establish a transparent relationship with the local population, local authorities and employees, and to illustrate Saras' activities, the associated direct and indirect environmental impacts and the environmental improvement targets that the company has set itself, was then published and disseminated.

The AIA permit

2011 was the second year of full implementation of the AIA permit; it was issued for refinery and IGCC complex on 24 March 2009.

The AIA permit was issued pursuant to Legislative Decree 59/05, now included within the Consolidated Law on the Environment, transposing into

Environmental training

In order to achieve ongoing environmental improvements, it is essential to provide training to personnel, both to bring them up to date and to raise awareness of the importance of their individual roles.

As well as continuous dedicated training on environmental conservation and protection, which takes place every year, in the second half of 2011 a training course on Saras' AIA permit was launched, with a particular focus on the opportunities that the permit offers in managing and optimising resources, and the contribution that everyone can make to reducing environmental impact.

A special two-hour module on the Environmental Management System was also provided to new recruits as part of general orientation training.

In total, 2,969 hours of environmental training were delivered, an increase of 74% compared with 2010.

EMAS (Eco-Management and Audit Scheme)

EMAS (EcoManagement and Audit Scheme): established by EEC Regulation 1836/93, updated by EC regulation 761/2001 (EMAS II) and by EC Regulation 1221/2009 (EMAS III), this is a voluntary scheme intended to promote continuous improvement in the environmental efficiency of industrial activities. Under the regulations, participating companies must adopt environmental management systems at their production sites based on policies, programmes, procedures and objectives aimed at improving the environment, and must publish an environmental declaration. Before a site can be added to the register set up by the European Commission, this Environmental Declaration must be approved by an inspector accredited by an authorised national body. In Italy this body is the Ecolabel and Ecoaudit Committee, which has been operational since 1997 and works with the technical support of ISPRA (Istituto Superiore per la Protezione e la Ricerca Ambientale - Institute for Environmental Protection and Research).

AIA permit

The AIA (integrated environmental authorisation) permit is a provision authorising operation of a plant, while imposing measures to prevent or reduce emissions into the air, water or soil in order to achieve a high level of overall environmental protection. The AIA permit replaces all other environmental permits, authorisations, approvals or opinions specified by law and in the implementation legislation. Measures relating to the control of major accident-hazards involving dangerous substances are governed by specific legislation (Seveso).

Italian law Directive 91/61/EC, better known as the IPPC Directive, governing integrated pollution prevention and control. IPPC (Integrated Pollution Prevention and Control) is a new strategy in place throughout the European Union, aimed at enhancing the "environmental performance" of authorised industrial complexes. The key aim of the Directive is to make a comparative assessment of the various environmental segments and to unify authorisation procedures, so that separate approaches to the control of air, water and soil emissions do not encourage the transfer of pollution from one environmental category to another, and to protect the environment as a whole. This also introduces a need to assess the various solutions to prevent an improvement in one environmental area from creating an unacceptable deterioration in another. The AIA permit replaced all existing authorisations and fundamentally changed the way in which environmental issues are managed. Fine-tuning of the monitoring and control plan continued in 2011: specific meetings took place with ISPRA and ARPAS (Cagliari) technicians, while, in the oil industry, AIA permits are close to being issued for the Italian refineries. Regarding the requirements of the preliminary assessment, in the year under review in this report, implementation and research activities continued in relation to measuring flare temperature, recovering wharf steam and measuring dust on the CO-boiler stack.

Data

Energy consumption

The company is strongly committed to rationalising and optimising its energy consumption, which is closely related to the plant's environmental performance, both now and in the future. In the late 1970s and early 1980s, Saras invested heavily in heat and energy conservation, largely as a response to the energy crisis of the mid-1970s. Today, energy saving and energy efficiency are still strategic goals relating to overall environmental improvement at the refinery. As part of this commitment, important initiatives in thermal recovery implemented in 2009 reduced consumption by about 30,000 TOE in 2011. For these significant investments, applications were filed with the AEEG for certification of energy savings and for energy efficiency credits (also known as white certificates), which are an incentive towards making and maintaining investments to improve energy efficiency. One key step was the integration of the FCC with the desalinator, meaning that water can be desalinated with a significant reduction in the use of steam. Table 15 and Chart 5 - which show liquid and gas fuel consumption (the latter produced by the refinery itself) and the quantity of electricity supplied from external sources - show a largely flat trend in energy consumption during the period under review, with a slight reduction in 2010 due to the raw material processed. Table 16 shows the site's power requirement. The quantity of electricity produced by the refinery's thermoelectric plant (CTE) is shown under "internal production", while external supply is provided by the national grid operator.

BREFs (Bat REFerence documents)

The measures implemented for integrated pollution prevention and control, set out in the AIA permit, must specifically involve the use of best available techniques (BATs).

BATs include procedures, methods, technologies, operating standards, and efficiency and consumption standards with industrial applications. The competent authority establishes conditions and limits according to what is achievable using BATs. They are therefore intended as a benchmark on which to base an assessment of a plant's efficiency.

Directive 91/61/EC established that the European Commission would effect "**an exchange of information between Member States and the industries concerned on the best available techniques, associated emissions monitoring, and developments in this regard"**, and would publish the results of this information exchange.
The exchange of information applies to all industrial activities within the scope of the Directive. **The results of the information exchange have been made public in the form of reference documents for the BATs, entitled BREFs (Bat REFerence documents).**

Table 15 – Total energy consumption (refinery + IGCC; TOE)

	2008	2009	2010	2011
Electricity	194,118	160,969	168,159	167,918
Fuel oil	205,367	185,270	183,450	174,786
Fuel gas	439,011	403,358	446,345	459,213
Flue gas	174,345	125,143	183,564	187,298
Total	**1,012,841**	**874,740**	**981,518**	**989,215**

Chart 5 – Total energy consumption (refinery + IGCC)

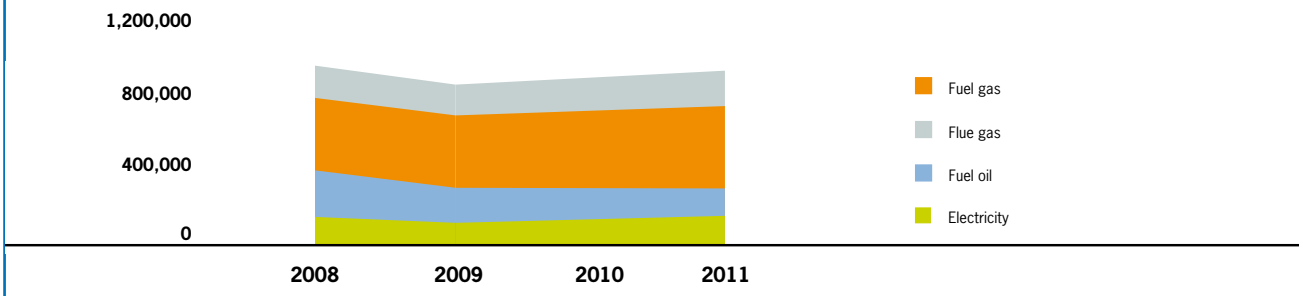
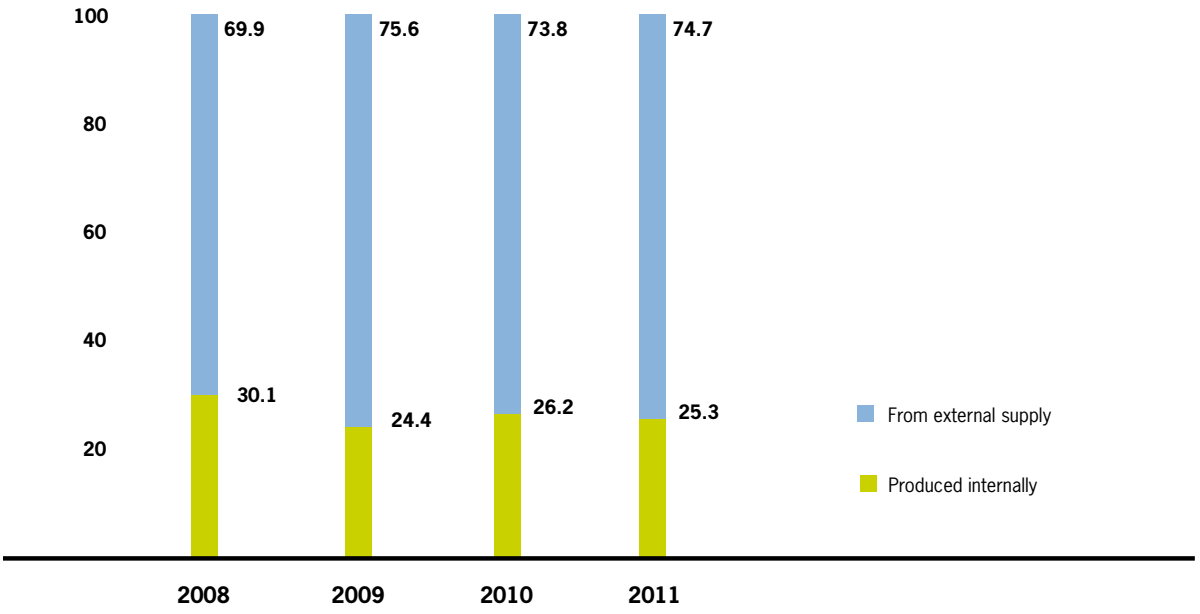


Table 16 – Electricity requirement and supply (refinery + IGCC; MWh)

	2008	2009	2010	2011
Total demand	1,170,189	1,137,842	1,218,295	1,202,358
- from internal production*	351,800	277,044	319,049	304,402
- external	818,389	860,798	899,246	897,956

* Production by the refinery's thermoelectric plant; all IGCC plant output goes to the national grid.

Chart 6 – Electricity requirement and supply (refinery + IGCC; %)



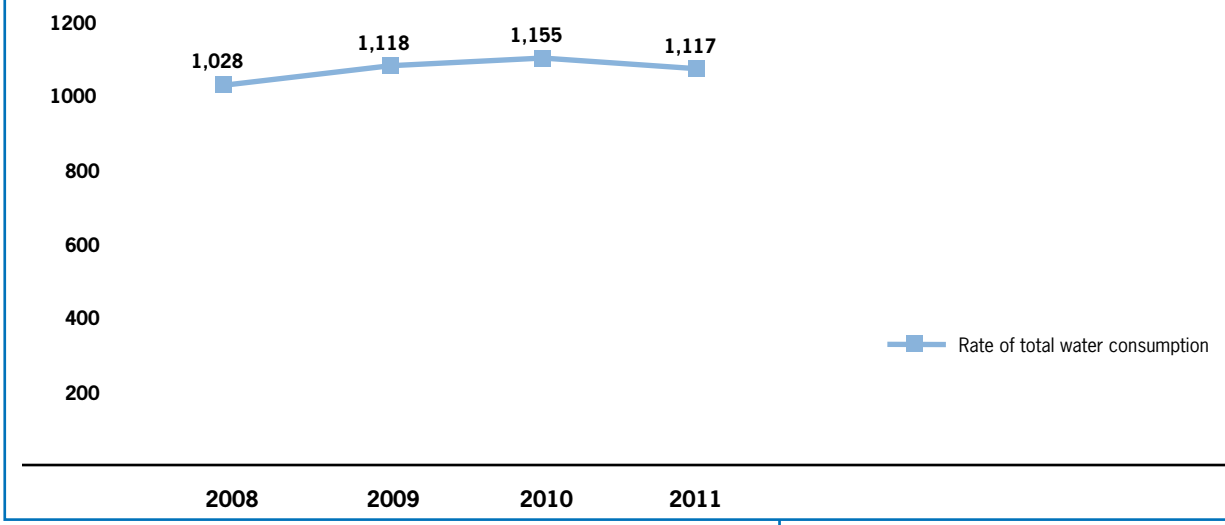
Water consumption

Water is a precious resource for the Sarroch facility, and its use is constantly monitored to optimise consumption and to promote recovery and desalination, instead of using fresh water supplied by CASIC (Cagliari Industrial Development Area Consortium), which manages the water supply to the Sarroch industrial district. The water used for industrial purposes mainly supplies the boilers that produce steam for technological use (steam stripping, heat exchangers and power generation), to supply the fire prevention system, to replace cooling cycle losses and for civil use. The water consumption data provided also include the quantities required for the IGCC plant which, for its own production, mainly makes use of water from dedicated desalinators and seawater, which is used in the cooling tower. The proportion of water used for refining is largely unchanged. In terms of supply sources, the trend in 2011 was in line with previous years, as shown in Table 17 and Chart 7. In the period under review, internal recovery covered an average of approximately 24% of the total annual requirement, while desalination as a source of supply accounted for 26% of the total. Taken together, desalination and recovered water met approximately 50% of the requirement in 2011. This is a significant result for the site, confirming that rationalising consumption and internal recycling is the right strategy.

Table 17 – Total water consumption by source of supply (refinery + IGCC; m^3/h)

	2008	2009	2010	2011
Desalination	612	546	540	464
CASIC	742	771	905	885
Internal recovery	457	447	446	438
Total	**1,821**	**1,674**	**1,891**	**1,787**

Chart 7 - Site water requirement - specific values (m^3/thousands of tons processed)



Air emissions

Saras has pursued its commitment to reducing air emissions by implementing a series of measures designed, over time, to improve its facilities and put in place procedures and management systems that can ensure its activities are environmentally compatible, as demonstrated by a reduction in pollutant emissions. As part of these activities, the gasification plant has made a substantial contribution to reducing air emissions, as described on page 17. Since 2009, one of the most significant projects in terms of reducing air emissions has been the start-up of the Tail Gas Treatment Unit (TGTU), which has increased the plant's sulphur recovery and reduced SO_2 emissions. The process of desulphurising gasoline and diesel for the European market has been consolidated and updated. Production of gasoline and diesel with a sulphur concentration of 10 ppm (parts per million) helps to reduce indirect SO_2 emissions. Initiatives to improve furnace combustion and to reduce emissions from various sources, by installing double seals on gasoline pumps, have also been implemented. In terms of legislation, meanwhile, the AIA permit came into force on 9 April 2009, imposing new, stricter limits in the area of atmospheric emissions. These have been fully complied with, as shown in the following charts.

Water conservation

Aware of the problem of scarce water resources, Saras has adopted specific measures to reduce the use of primary water sources supplied by the region, including:

- procuring water from different sources
- installing a first desalinator in 1994 with a capacity of 300 m^3/hr, followed by the installation of six desalination modules for the IGCC in 1999, with a total capacity of approximately 600 m^3/hour;
- implementing measures to maximise the recycling of purified water from the refining process, following improvements to the treatment process and increased filtering capacity.

The desalination plant allowed for a significant reduction in the use of fresh water from the CASIC water system (Cagliari Industrial Development Area Consortium, responsible for managing the water system in the Sarroch industrial area) without disrupting the marine ecosystem by the refinery.

In terms of water treatment systems, the refinery is equipped with a process-water purification (PWP) plant and a ballast water treatment (BWT) plant for oil tankers transporting crude oil and products to and from the refinery.

They were both built with the best technology available, and equipped with pollutant-monitoring systems; both process water and ballast water are subject to an oil extraction process that separates hydrocarbon particles from the water, which is then treated.

Furthermore, part of the water treated with the PWP system (approximately 400 m^3/hr) is reused for industrial purposes in the refinery, thereby reducing the amount of water taken from primary sources such as the industrial water supplies and the seawater desalination system.

Table 18 – Total air emissions (thousand tons/year)

	2008		2009		2010		2011	
	Refinery	IGCC	Refinery	IGCC	Refinery	IGCC	Refinery	IGCC
SO_2	6,73	0,41	3,89	0,51	3,71	0,46	3,57	0,39
NO_x	3,13	0,86	2,43	0,58	2,85	0,60	2,13	0,56
DUST	0,45	0,004	0,28	0,03	0,35	0,03	0,32	0,03
CO	1,16	0,13	0,54	0,12	0.36	0,16	0.26	0,17
CO_2*	2,485	3,728	2,130	3,540	2,369	3,783	2,354	3,519

* come da dichiarazione Emission Trading (vedi box a pag. 63)

Sulphur dioxide (SO_2)

The site recorded its best ever year for total SO_2 emissions in 2011, confirming the downward trend of the last few years. This result is due to both steady improvement in the quality of the fuels used and the stability of the TGTU. In particular, the emissions rate per ton of raw materials processed (Chart 10) confirms the improvement in process performance seen in recent years. The 2011 figures, confirmed by the monitoring of the refinery smokestacks and the IGCC, show that all the values recorded were well below the legal limits set for the refinery (Chart 11) and those for the IGCC (Chart 12).

Chart 8 - SO_2 emissions (thousand tons/year)

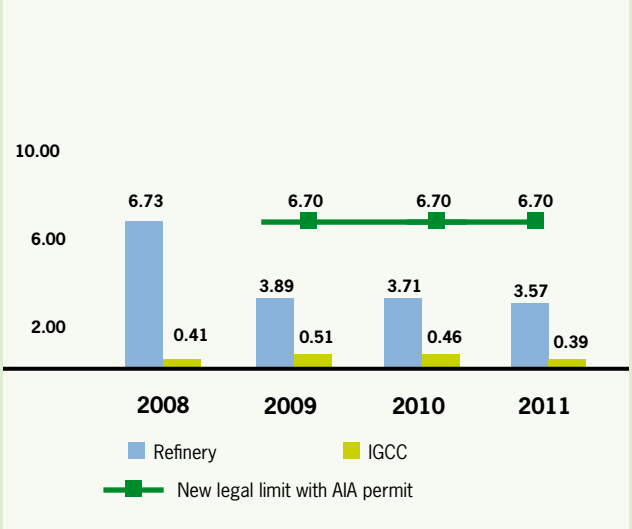


Chart 9 - Sulphur content (% in weight)

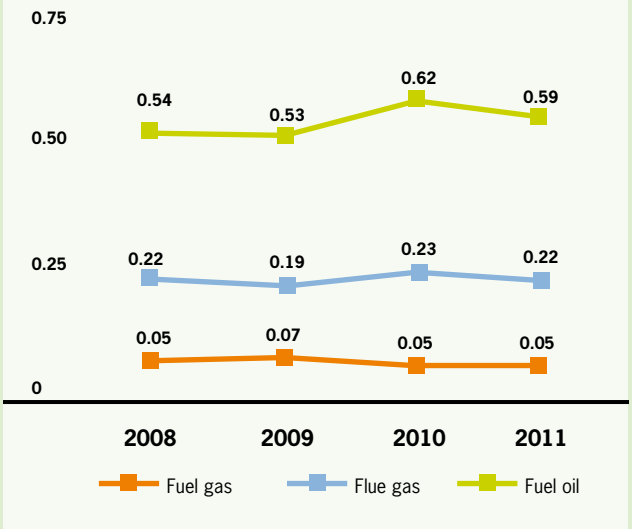


Chart 10 - Rate of SO_2 emissions (tons of SO_2/thousands of tons processed)

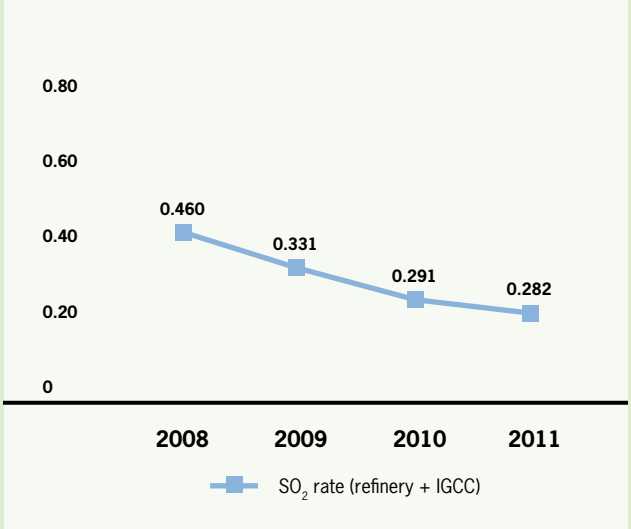


Chart 11 - SO_2 concentrations in refinery smokestacks (mg/Nm^3)

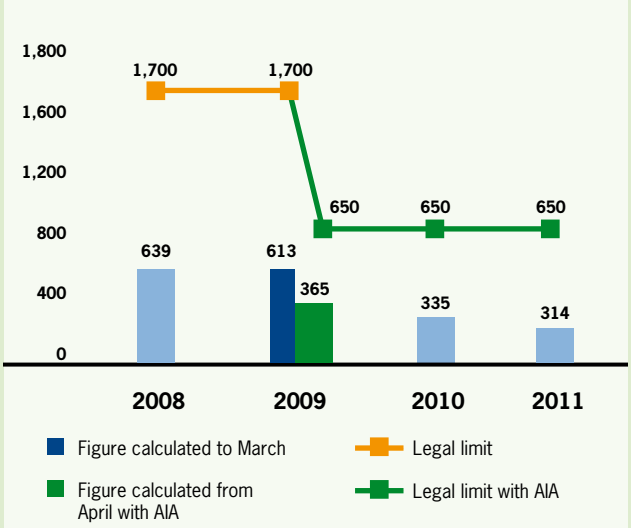
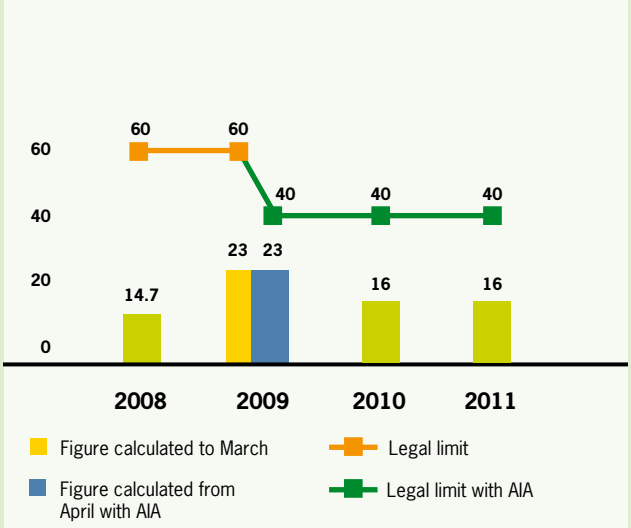


Chart 12 - SO_2 concentrations in IGCC smokestack (mg/Nm^3)



Nitrogen oxide (NO_x)

Overall, the Saras site has continued to curb its nitrogen oxide emissions. These are only marginally affected by fuel quality, and largely depend on combustion techniques, which in turn are related to structural factors such as burner type.
With the IGCC plant coming fully on stream, NO_x emissions have remained broadly unchanged over the years (Chart 13). The emissions rate is also in line with previous years (Chart 14). The trend in emissions concentrations in 2011 confirmed that of previous years.
A comparison of concentrations with the regulatory limits confirms that the results are positive and under the limit (Charts 15 and 16).

Chart 13 - NO_x emissions (thousand tons/year)

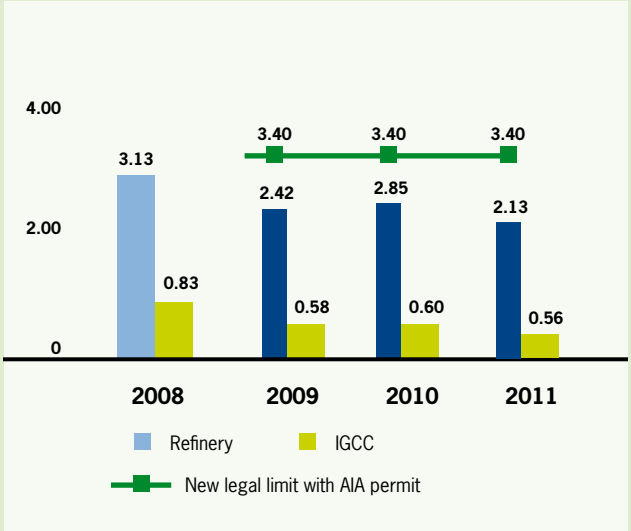


Chart 14 - Rate of NO_x emissions (tons of NO_x/thousands of tons processed)

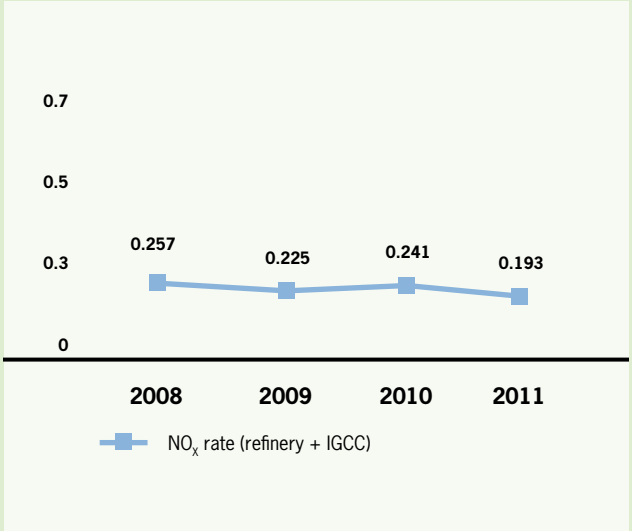


Chart 15 - NO_x concentrations in refinery smokestacks (mg/Nm^3)

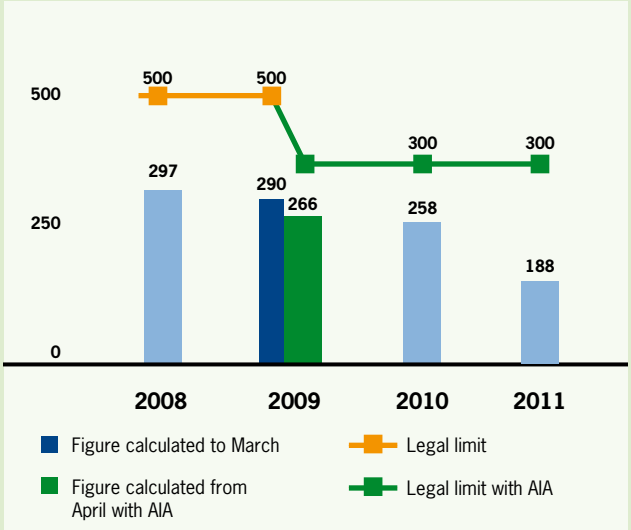
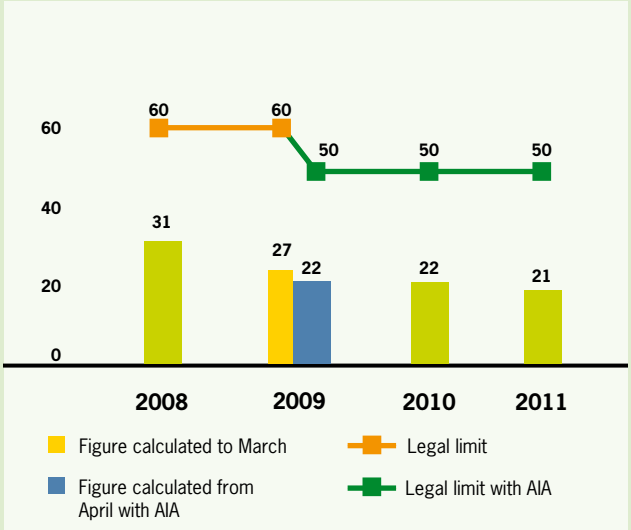


Chart 16 - NO_x concentrations in IGCC smokestack (mg/Nm^3)



Dust

The refinery's exclusive use of fuel oil with a low sulphur content (BTZ) since 2000 has kept dust emissions at low levels, and consistently below legal limits (Charts 19 and 20).
The trend can also be seen in the positive performance of the IGCC plant, which has negligible dust emissions, as seen in Chart 17 showing total emissions. Overall, levels at the site have remained largely unchanged (Chart 18).

Chart 17 - Dust emissions (thousand tons/year)

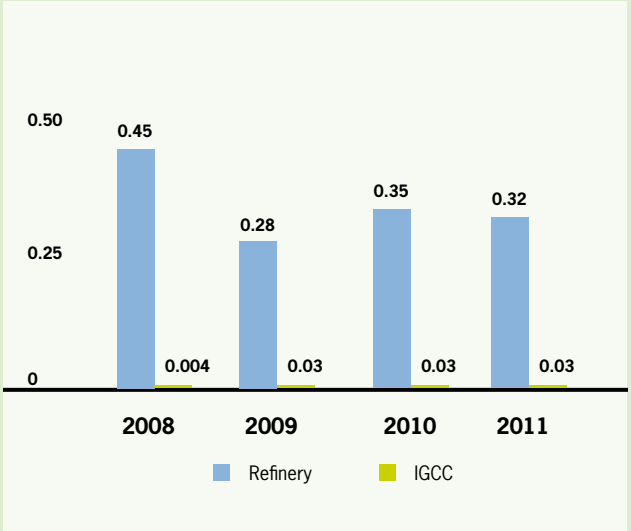


Chart 18 – Rate of dust emissions (tons of dust/thousand tons processed)

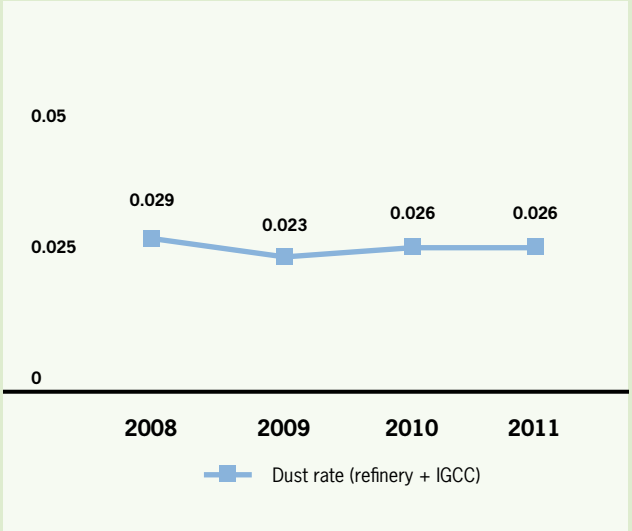


Chart 19 – Dust concentrations in refinery smokestacks (mg/Nm^3)

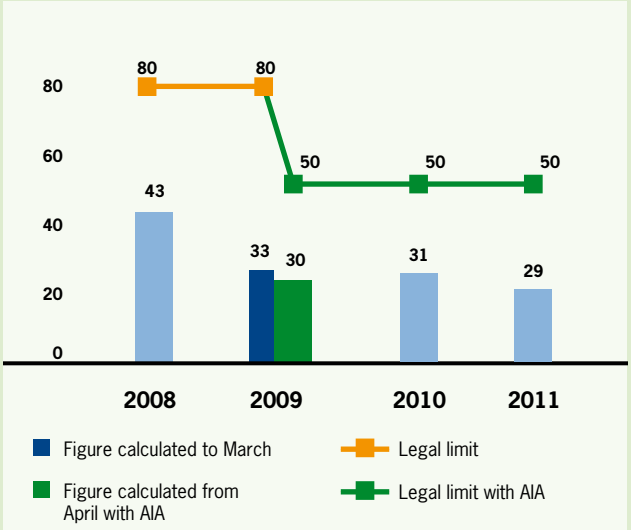
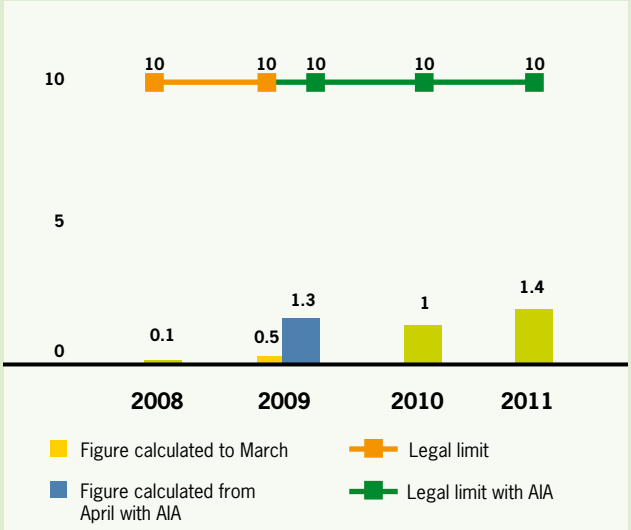


Chart 20 – Dust concentrations in IGCC smokestack (mg/Nm^3)



PM10

Previous legislation did not set limits for this parameter. The performance reported for 2008 is therefore an indicative estimate and is not comparable with the data for recent years, which were calculated using the US-EPA 1998 method. The authorised PM10 limits apply only to the refinery and were introduced on 9 April 2009 by the AIA permit.
The emissions performance is unchanged since 2009.

Chart 21 – PM10 emissions (thousand tons/year)

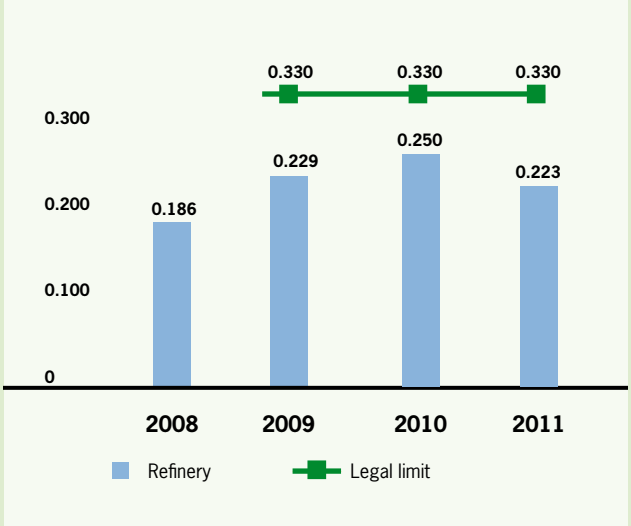


Chart 22 – Rate of PM10 emissions (tons of PM10/thousand tons processed)

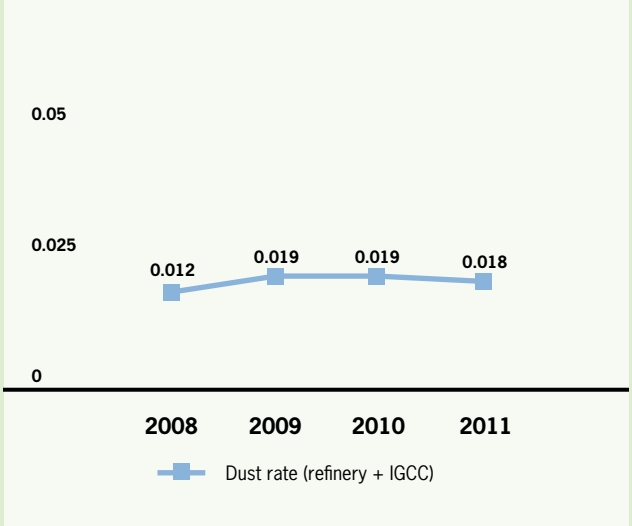
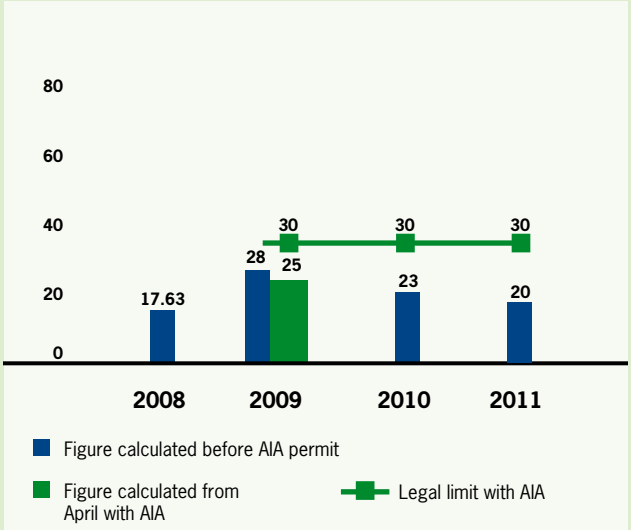


Chart 23 – PM10 concentrations in refinery smokestacks (mg/Nm^3)



Carbon monoxide (CO)

An ongoing positive trend can also be seen in carbon monoxide emissions: the IGCC figure has been close to flat, while the figure for the refining plants has fallen, due to the optimisation of the combustion process in certain furnaces, and especially to the new contribution of the TGTU unit since 2009 (Chart 24). The emission rate is also heading in the right direction; in 2011 it was the lowest for the period under review.
All the values recorded are also well below legal limits.

Chart 24 – CO emissions (thousand tons/year)

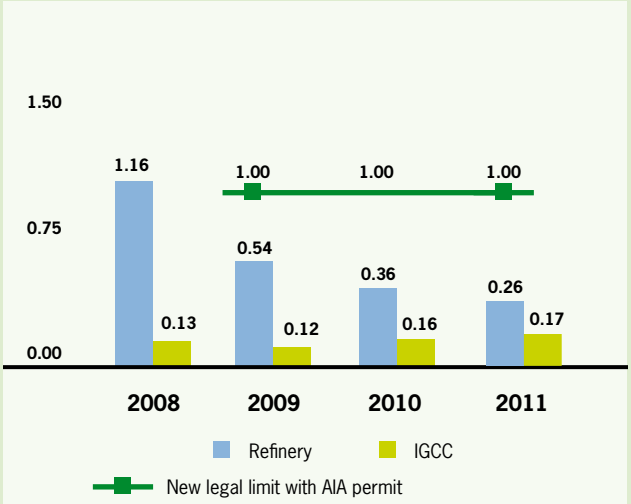


Chart 25 – Emission rate of CO emissions (tons of CO/thousand tons processed)

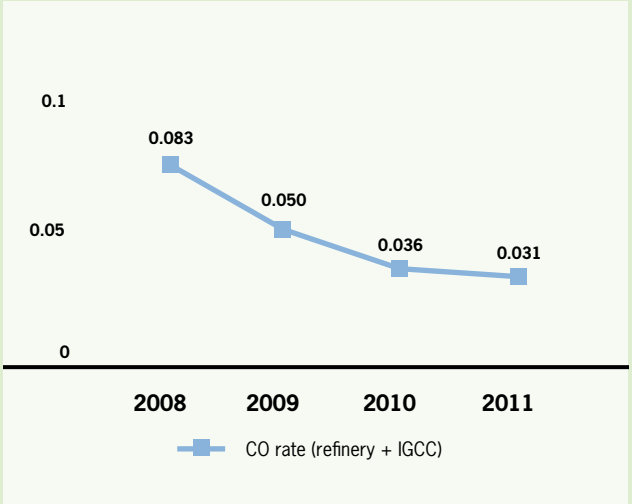


Chart 26 – CO concentrations in refinery smokestacks (mg/Nm^3)

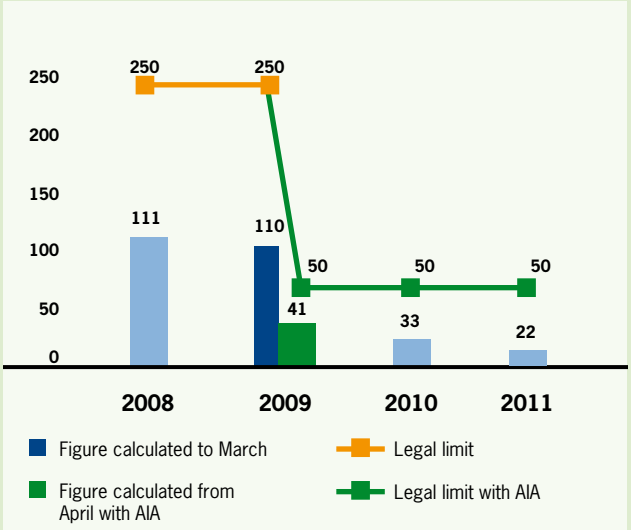
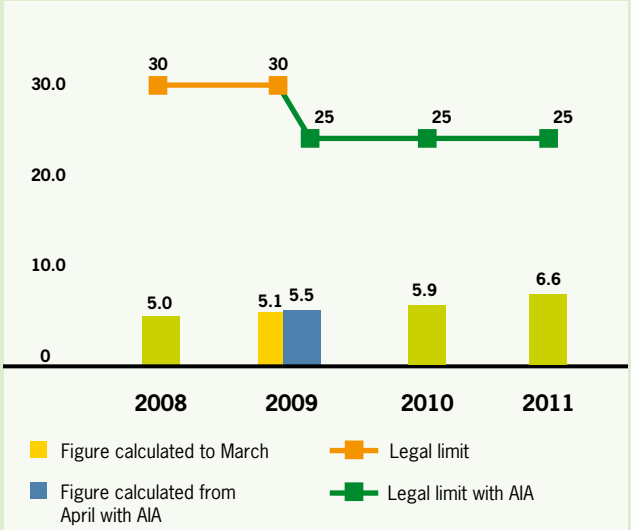


Chart 27 – CO concentrations in IGCC smokestack (mg/Nm^3)



Greenhouse gas emissions

The two activities carried out by the Saras Group at the Sarroch site – the refinery (refining sector) and the IGCC plant (thermoelectric sector) – fall within the scope of the European Emissions Trading Directive. The directive was introduced across Europe to control and reduce carbon dioxide emissions as part of the fight against climate change.

Carbon dioxide emissions do not have a direct impact at local level, particularly in terms of air quality around the site, but are connected to the global greenhouse effect.

The Emissions Trading scheme was introduced in 2005 to help Member States comply with the requirements of the Kyoto Protocol.

It works by assigning an emissions allowance to each individual plant falling within the scope of the directive, set by the Member State through a national allocation plan.

Surplus allowances may be traded and/or stockpiled, and any deficit must be covered by purchasing emissions allowances on the market.

The allocation authorised by the competent authority for the five-year period 2008-2012 involved a reduction of around 15% for all companies in the oil industry.

Overall data for 2011 were affected by the general shutdown for maintenance of the IGCC plant for 49 days in the second quarter. The data for the refinery alone show largely flat CO_2 emissions compared with the previous year, confirming the reduction due to investments in energy saving.

Saras' approach of rational energy use and efficient production systems is the main method of controlling and reducing CO_2 emissions. The National Emissions Trading Register, which is available for consultation, records both the CO_2 allowances assigned and emissions in Italy year on year.

Saras has been assigned a single position based on the total emissions from all its operations at the Sarroch site.

Direttiva Emission Trading

On 13 October 2003, the European Commission published the European directive on emissions trading (Directive 2003/87/EC), better known as the emissions trading system.

The key points established by the directive are as follows:

- as of 1 January 2005, no plant within the scope of the directive may emit CO_2 (i.e. continue to operate) without appropriate authorisation
- each year the operators of these plants must surrender CO_2 allowances equal to the CO_2 released into the atmosphere to the competent national authority
- maximum CO_2 allowances have been set for every plant regulated by the directive
- CO_2 emissions actually released into the atmosphere are monitored in accordance with the requirements of the competent national authority and certified by an accredited inspector

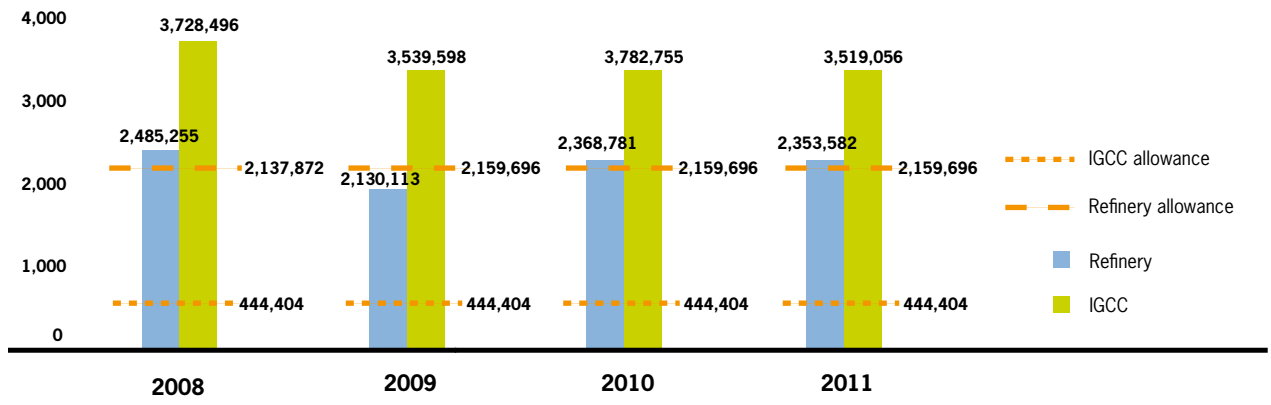
Table 19 – CO_2 emitted by the site (refinery + IGCC; ton/year)

	2008	2009	2010	2011
Refinery	2,485,255	2,130,113	2,368,781	2,353,582
IGCC	3,728,496	3,539,598	3,782,755	3,519,056
Total	**6,213,751**	**5,669,711**	6,151,536	5,872,638
Total allowance (refinery + IGCC)	**2,582,276***	**2,604,100****	**2,604,100****	**2,604,100****

This figure includes 489 tons/year allocated for 2008 for the start-up of the U800 plant.

*This figure includes 22,313 tons/year allocated for the period 2009-2012 for the start-up of the U800 plant.

Chart 28 – CO_2 emissions: absolute values and allowances (tons/year)



Air quality monitoring

The constant monitoring of air quality is a key element in a strong environmental protection policy. Saras has therefore, over time, acquired the tools and adopted the management procedures to achieve this target. Air quality is currently monitored using bio-indicators and biodiversity studies as well as monitoring networks (detection stations).

- **Monitoring using bio-indicators and biodiversity studies**

  Air quality can be monitored using bio-indicators as well as chemical indicators.

  Epiphytic mosses (mosses that grow on tree trunks) are the bio-indicators most frequently used for monitoring air quality.. The monitoring methodology is based on a measurement of biodiversity, i.e. the abundance of different moss species. The presence of air pollutants (mainly sulphur and nitrogen oxides) can reduce biodiversity values.

  For some years, the Botanical Sciences Department of the Mathematical, Physical and Natural Sciences Faculty at Cagliari University has been monitoring the condition of the vegetation over a very wide area covering the inland region of Sarroch, as illustrated in Figure 9. It also uses the epiphytic mosses methodology as a bio-monitor of air quality.

  Table 20 shows the key criteria for interpreting the categories of air quality and atmospheric purity, with reference to the Index of Atmospheric Purity (I.A.P.)[1]. The categories that include the indicator values measured in the stations being monitored are shown in Table 20.Sempre nella tabella 20 sono state evidenziate le classi in cui rientrano i valori dell'indice rilevato nelle stazioni oggetto di monitoraggio.

  In 2011, air quality in the area studied again fell into category "IAP3, with an assessment of "average" for air quality and atmospheric purity in eight out of the 11 monitoring stations, while the remaining three units fell into category IAP4 with an assessment of "mediocre" for air quality, "low" for atmospheric purity and "low" for pollution. The station closest to the industrial complex is one of these three.

Figure 9 - Location of air quality biomonitoring units.

1 - The I.A.P. index was created by: P.L. Nimis, "Linee guida per la bioindicazione degli effetti dell'inquinamento tramite la biodiversità dei muschi epifiti" ('Guidelines for the bio-indication of the effects of pollution through the biodiversity of epiphytic mosses'), Department of Biology, University of Trieste, 1999, and has been used in various air quality studies, as well as by the ARPAs (Regional Environmental Protection Agencies).

As might be expected, quality was generally higher for the stations further inside and lower in the one closest to the Sarroch industrial complex. The picture that emerges from an analysis using bio-indicators nevertheless shows that the air quality falls in the mid-range of the IAP index. In the area under review, a survey was also carried out to monitor the condition of the vegetation.

The survey is conducted through visual checks of the condition of different species of vegetation and by monitoring the bioaccumulation of pollutants. As in previous years, the field work results show no critical situations in 2011.

Table 20 - Index of Atmospheric Purity (I.A.P.): categories of air quality and atmospheric purity

Categories I.A.P.	Values I.A.P.	Air quality assessment	Purity pollution
7	I.A.P. = 0	Very poor	Very high pollution
6	1 < I.A.P. < 10	Poor	High pollution
5	11 < I.A.P. < 20	Low	Average pollution
4	21 < I.A.P. < 30	Mediocre	Low purity/low pollution
3	31 < I.A.P. < 40	Average	Average purity
2	41 < I.A.P. < 50	Fair	High purity
1	I.A.P. > 50	Good	Very high purity

- **Monitoring networks**

  Air quality outside the Sarroch refinery (emissions) is checked by three monitoring networks. Saras manages its own air quality measurement sensors (four), while Polimeri Europa is currently restructuring its own monitoring network and ARPA Sardegna (ARPAS) operates the three sensors owned by the Sardinian regional authorities; the CENSA9 station, Sarroch Villa d'Orri, was dismantled in May 2011 to be used in another location.

  The Saras network – managed alongside those of the local authorities and other companies in the region – provides data on changes in parameters relevant to air quality in real time, to ensure that pollution is kept below the minimum levels set out by the laws in force and that immediate steps can be taken when necessary

  Each of the four Saras monitoring stations (Villa d'Orri, Sarroch, Porto Foxi and the depot storage facility) is equipped with measurement devices that continuously gauge levels of the following pollutants in the air: SO_2, NO_2, CO, H_2S, PM10, ozone and hydrocarbons (PM10 in 2011 was only available for the Porto Foxi station, due to an update in the management software); the station located in the area of the national storage facility also has a weather station. In the second half of 2010, two stations, Sarroch and the national storage facility, were also fitted with PM2.5 continuous analysis equipment. The ARPAS network records average hourly concentrations of the following pollutants: SO_2, NO_2, dust, H_2S and PM10 at all stations; ozone and benzene at two stations; and CO at two stations. A dedicated monitoring system constant-

ly checks emissions from the IGCC plant for: SO_2 NO_X, PTS, CO and flue gas flow rate, guaranteeing a high degree of reliability, as shown by the data availability index (the ratio between the device's operating hours and normal plant operating hours), which in 2011 was around 99%.
A similar system monitors emissions from the refinery's central smokestack, which collects approximately 30-35% of total emissions (Topping 1 and thermoelectric plant), monitoring the same parameters as described above. In 2009, similar monitoring systems were also installed for emissions from the smokestacks of the Z3 and Z4 sulphur recovery plants, and since September 2010, monitoring systems for the smokestacks of the Topping 2, Reformer/Alkalisation (CCR/Alky) and CO Boiler plants have also been on stream. The remaining emissions are monitored periodically through half-yearly sampling.
The tables opposite show data on the concentrations of the main parameters measured by the Saras monitoring stations, compared with the limits set under current legislation.
The data show that the quality standard is met for all the pollutants monitored; the values measured by the monitoring stations are all below the emission limits (page 69, Table 21). 69). This result is significant as it is closely connected with the health and environmental quality of the region, and these are the objectives behind initiatives to ensure that the management of production processes is constantly monitored from an environmental performance perspective. The reduction in emissions due to the start-up of the TGTU plant in 2009 has also led to a marked improvement in air quality, notably for SO_2, a trend that was confirmed in 2011.

Figure 10 - Map showing the location of the air quality monitoring stations of the public network

Table 21 – Data from the monitoring network and comparison with legal limits pursuant to Ministerial Decree 60/02 (µg/m^3)

SO_2	Number of times that limits have been exceeded									
	in excess of hourly limit[1]			in excess of 24-hour limit[2]			in excess of limit for ecosystems[3]			
	2009	2010	2011	2009	2010	2011	Value limit	2009	2010	2011
Villa d'Orri	0	0	0	0	0	0	**20**	2	3	4
Porto Foxi	0	0	0	0	0	0	**20**	7	7	7
Sarroch	0	0	0	0	0	0	**20**	8	6	3
National storage facility	0	0	0	0	0	0	**20**	3	4	1

1 - Hourly limit must not be exceeded more than 24 times per calendar year (350 µg/m^3 since 2005)
2 - Daily limit must not be exceeded more than three times per calendar year (125 pg/m^3).
3 - Limit for the protection of ecosystems (20 pg/m^3).

NO_2	Number of times the hourly limit was exceeded[1]			2009		2010		2011	
	2009	2010	2011	Value recorded[3]	Value limit[2]	Value recorded[3]	Value limit[2]	Value recorded[3]	Value limit[2]
Villa d'Orri	0	0	0	6	**42**	5	**40**	4	**40**
Porto Foxi	0	0	0	5	**42**	4	**40**	3	**40**
Sarroch	0	0	0	6	**42**	6	**40**	5	**40**
National storage facility	0	0	0	6	**42**	6	**40**	5	**40**

1 - Hourly limit must not be exceeded more than 18 times per calendar year (250 µg/m^3 in 2005; 240 µg/m^3 in 2006; 230 µg/m^3 in 2007; 220 µg/m^3 in 2008; 210 µg/m^3 in 2009; 200 µg/m^3 in 2010)
.2 - Annual limit.
3 - Annual average on an hourly basis.

PM10	Number of times the daily limit was exceeded[1]			2009		2010		2011	
	2009	2010	2011	Value recorded[2]	Value limit	Value recorded[2]	Value limit	Value recorded[2]	Value limit
Villa d'Orri	-	-	-	-	**40**	-	**40**	-	**40**
Porto Foxi	5	N.D.	4	24	**40**	17	**40**	19	**40**
Sarroch	2	N.D.	N.D.	23	**40**	14	**40**	N.D.	**40**
National storage facility	-	-	-	-	**40**	-	**40**	-	**40**

1 - Daily limit must not be exceeded more than 35 times per calendar year (50 pg/m^3 since 2005).
2 - Arithmetic mean of average daily concentrations in a one-year period.
N.A.: figure not available, data acquisition system being replaced

CO	Number of times average daily peak exceeded[1]		
	2009	2010	2011
Villa d'Orri	0	0	0
Porto Foxi	0	0	0
Sarroch	0	0	0
National storage facility	0	0	0

1 - Average daily peak in 8 hours (10 µg/m^3 since 2005)

Wastewater

The site performed normally in the period 2008-2011, with slight variations due to maintenance work on the processing plants (Chart 30). To measure the environmental quality of wastewater, COD (a general index of water quality) and hydrocarbon (mineral oils) indicators were adopted as processing benchmarks (Table 22). In line with the provisions of the AIA permit, monthly samples are taken from discharges of wastewater into the sea and sent for analysis by an accredited external laboratory, while daily samples are analysed by the Saras in-house laboratory. Charts 35 and 36 are based on these figures and on information obtained from continuous hydrocarbon analysis. They show that all the concentration values measured during the period under review were consistently below the limits set by existing legislation.

Chart 29 – Total wastewater (m^3/h)

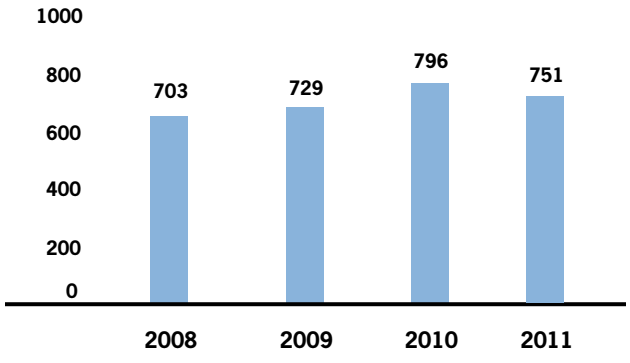


Chart 30 – Total wastewater rate (m^3/thousand tons processed)

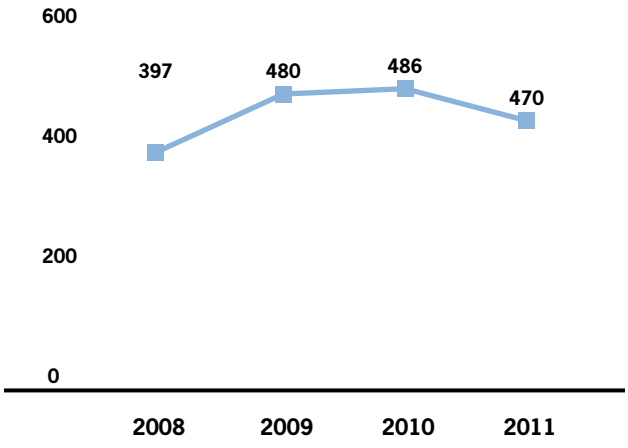


Table 22 – Main substances detected (tons/year)

	2008	2009	2010	2011
COD	368.6	561	673	571
Mineral oils	10.4	12.2	13.8	14.6

The difference in the figures registered for COD from 2009 onwards is due to a new calculation criterion stipulated by the AIA permit, rather than to a real change in the emission content.

Chart 31 – COD emissions (tons/year)

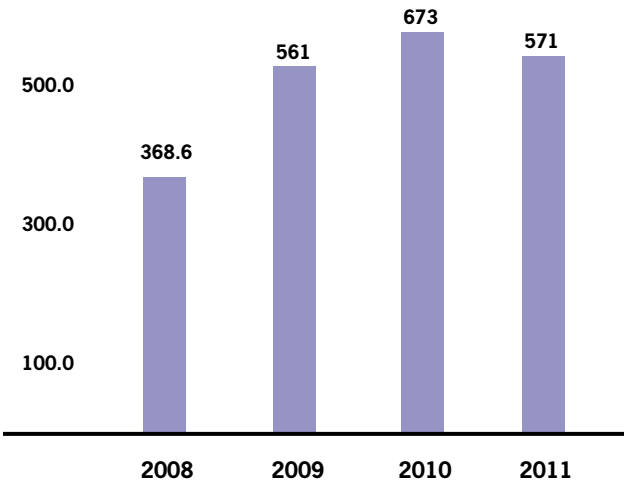


Chart 32 – Mineral oil emissions (tons/year)

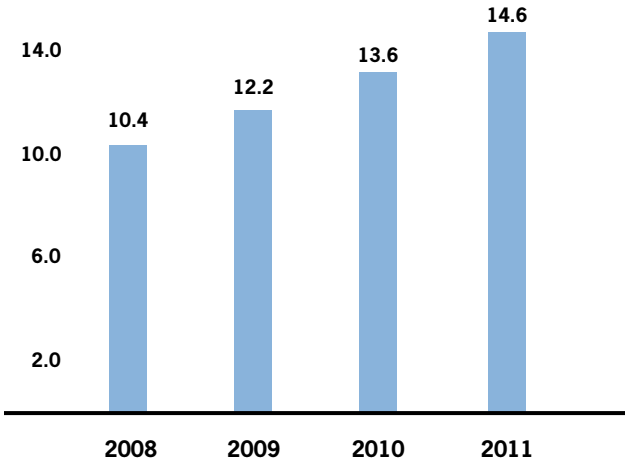


Chart 33 – Rate of COD emissions (tons/million tons processed)

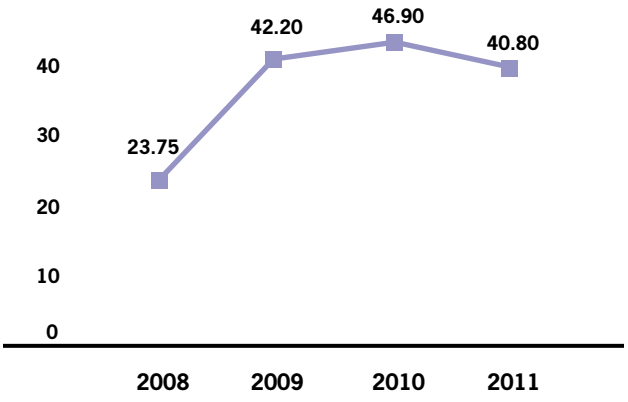


Chart 34 – Rate of mineral oil emissions (tons/million tons processed)

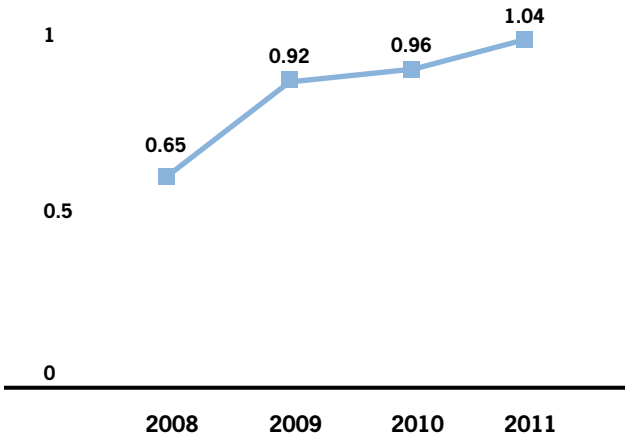


Chart 35 – COD concentration (mg/l)

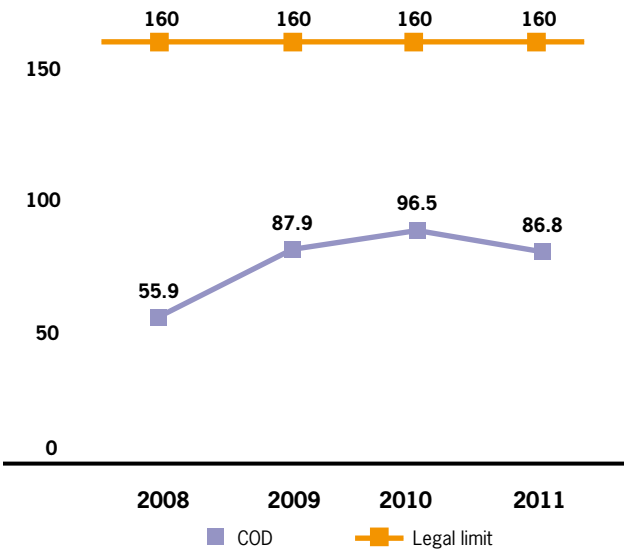
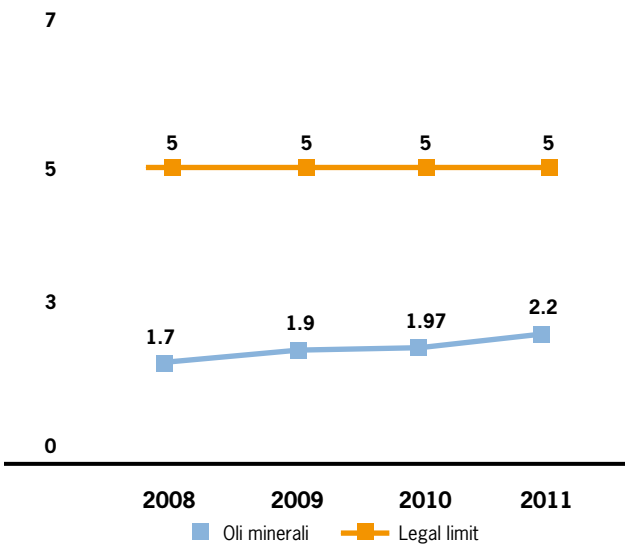


Chart 36 – Mineral oil concentration (mg/l)



The monitoring of the marine environment

For Saras, safeguarding the marine environment is a vital ongoing commitment, which is put into practice mainly by constantly checking the quality of wastewater and by monitoring the environmental parameters of the marine environment on a six-monthly basis. The area covered by the surveys is shown in Figure 11, and includes monitoring points from which surface and bottom water samples are taken.

These monitoring points, positioned along five lines perpendicular to the coastline, remain constant, to ensure that the results of the various surveys conducted over time are fully comparable.

Figure 11 - Seawater quality survey area

The continual monitoring of the parameters makes it possible to trace the trophic state of the sea close to the Sarroch plant. This is the main tool used to evaluate the seawater quality, shown by data on the following areas:

- hydrology (transparency, temperature, salinity, dissolved oxygen, pH balance)
- nutrients (nitrogen compounds, phosphorous)
- state of vegetation (chlorophyll, phytoplankton, posidonia oceanica, macroalgae)
- monitoring of sediment particles (deposited during the study period) and surface sediment
- monitoring of heavy metals in sediment

Table 23 on page 73 summarises the results for the trophic state of the seawater based on surveys of the quality of the water off the coast near the refinery carried out over the past four years. Assessment of the trophic state is given for both surface and bottom water.

Table 23 – Trophic index (TRIX): seawater quality categories and results (2008-2011 survey)

	Surface water	Bottom water
January 2008	high	high
July 2008	high	high
January 2009	good	good
July 2009	good	good
January 2010	**good**	**good**
July 2010	**good**	**high**
January 2011	**high**	**high**
July 2011	**high**	**high**

Several years ago a new parameter, the CAM (classification of seawater) index, was introduced to assess the trophic state of water. This index is based on specific algorithms for the sea around Sardinia. Generally speaking, the CAM index has produced an average rating for the quality of seawater in the entire survey area. The sole exception was in 2009, when the quality of seawater was poor due to a particularly rainy period that started in the last quarter of 2008, causing a number of water courses to overflow into the Gulf of Cagliari, with a resulting movement of sediment-forming nutrient substances. These immissions created a broad area of persistent turbidity with a significant effect on the quality of the water in the bay (Table 24). In any case, these indices are significant over long periods rather than in a single period. The parameter in question improved in 2011 compared with previous years.

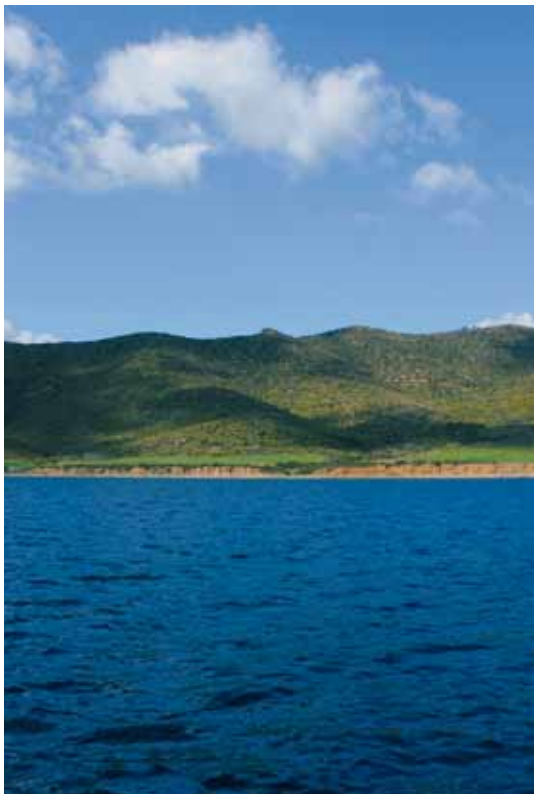
Table 24 - Trophic state of seawater (2008-2011 survey)
CAM Index (specific to the seas surrounding Sardinia)

	Surface water	Bottom water
January 2008	average	average
July 2008	average	average
January 2009	low	low
July 2009	low	low
January 2010	average	average
July 2010	low	low
January 2011	**average**	**average**
July 2011	**high**	**high**

Measures to protect the sea and coastline

Since the early 1990s, Saras has launched various initiatives to protect the sea and coastline. The most significant are:

- adoption of the "Saras Minimum Safety Criteria" for ship screening and selection: this is a list of minimum safety requirements that ships must satisfy for inspection and authorisation to operate at the Saras marine terminal
- the implementation of the Safety Service, which involves the presence of qualified personnel on board ships at all times during operations, to verify technical and operational compliance in terms of safety and environmental protection. This measure is intended to mitigate and



minimise the greater risk to the environment posed by ships transporting particularly heavy and pollutant products (such as crude oil, fuel oil and some types of diesel)
- the implementation of the automatic ESD (Emergency Shut Down) system, to prevent the spillage of products by automatically stopping the loading pumps and closing the block valves for oil products in the event of a pressure surge
- a ban on the discharge of segregated ballast (seawater that does not come into contact with oil products) into the sea at night applied to ships carrying particularly pollutant products

In the event of a spill, vessels and equipment are available to quickly deal with the incident, according to procedures laid down in the Internal Emergency Plan, which includes the Marine Pollution Prevention Plan (page 88).
For several years, Saras has also been stepping up its use of double-hulled ships to transport crude oil and oil products, with the result that the goal achieved in 2009 of using only double-hulled ships for transportation of gasoline, kerosene and diesel (Table 25).
To further guarantee protection of the sea and coastline, all leasing contracts agreed by Saras for the supply of raw materials and shipment of finished products contain clauses prohibiting any ship from passing through the Strait of Bonifacio.

Waste

With Ministerial Decree of 17 December 2009, as subsequently amended, the Ministry for the Environment set out a series of new requirements for businesses, largely consisting of registration with SISTRI (waste traceability control system) and the use of new IT procedures in waste management. These IT procedures will replace the current paper-based system (registers, forms and MUDs (unified environmental declarations)).
Saras registered with SISTRI in February 2010 and now uses the new IT system alongside the paper-based documentation still in use.

Refinery equipment to protect the sea and coastline

The Sarroch refinery has four vessels that operate 24 hours a day:
- the Neptune, an anti-pollution motorboat equipped with systems to recover and store heavy hydrocarbons
- the pilot boat Pegasus, used to transport people and equipment and assist in the positioning of floating booms
- the working boat Proteo, used for rapid identification, positioning of floating booms and operations in shallow water
- the motorboat Tripesce, used to position floating booms and carry out operations in shallow water

A wide range of equipment guarantees that the site is able to respond immediately and fully to contain and remove any product spills:
- skimmers to collect spillage floating on the surface of the water with a recovery capacity of up to 27 m^3/hour
- floating tanks, each with a 5 m^3 capacity, to collect any product recovered from the sea;
- motor pumps to recover products, with a capacity of up to 48 m^3/hour;
- 1,950 m of floating booms to contain floating product, equipped with inflation systems (three compressors and two blowers)
- radio buoys connected to the GPS system
- absorption systems.

Table 25 – Commitments and results relating to the protection of the marine environment from shipping traffic - 2011

	Commitment for 2011	Result for 2011	Commitment for 2012
Double hull for light crude oil	100%	100%	100%
Gasoline/kerosene/diesel	100%	100%	100%

Chart 37 - Types of vessel (%)

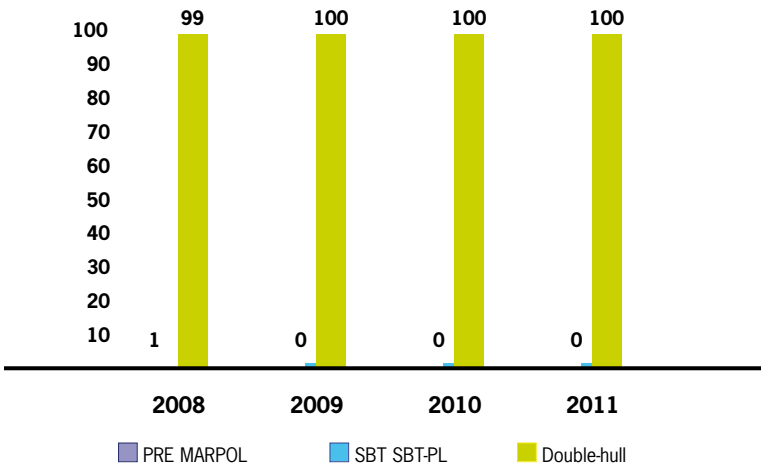
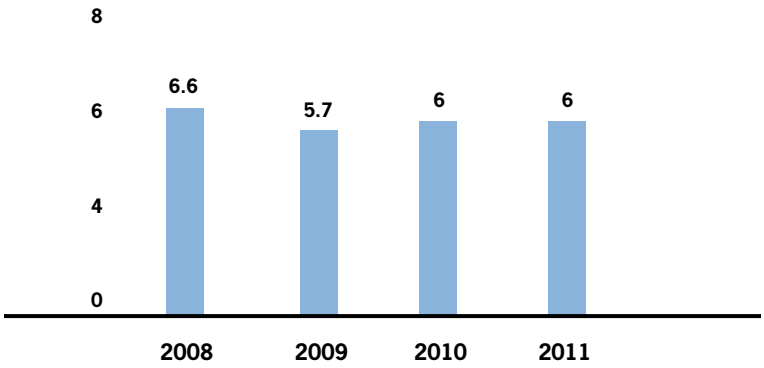


Chart 38 - Average age of tankers (years)



It has also taken part in SISTRI test days organised by the Ministry for the Environment. SISTRI is scheduled to enter into force on 30 June 2012. The facility manages waste according to its objectives of minimising the quantity produced and increasing the quantity recovered. In 2011, there was a reduction in the total amount of waste from refining, in line with previous years, due to lower production of excavated soil. Around 106,890 tons of waste were recovered or recycled over the year, in line with recent years. This was mainly due to site remediation activity and to the delivery of used catalysts to companies specialising in the recovery of metals (Co, Mo, Ni).

New measures to protect our coastlines: elimination of single-hulled oil tankers

In order to dramatically reduce the risk of environmental disasters, the law (no. 51 of 7 March 2001: "Measures for the prevention of pollution deriving from the maritime transportation of hydrocarbons and for the control of maritime traffic") requires oil tanker fleets to be modernised, promoting the use of tankers with low environmental impact and encouraging the elimination of single-hulled units, which do not conform to the latest navigational safety standards. These standards are instead met by double-hulled ships equipped with a double external structure in metal incorporating cavities, which, in the event of an accident, can absorb the impact and thus reduce the probability of cargo leaking into the sea. The oldest and most vulnerable single-hulled tankers, built before 1982, were withdrawn from circulation before 2005. Other categories of large, single-hulled tankers had to be withdrawn by 2010.

The three main categories of single-hulled tanker are those specified in EC Regulation 417/2002, namely:

- **Category 1**: the "**pre-MARPOL**" single-hulled tanker, which does not have segregated ballast tanks in protective locations (**SBT/PL**). These are the oldest and most vulnerable tankers, mostly built before 1982.
- **Category 2**: the "**MARPOL**" single-hulled tanker, which is the same size as the Category 1 tanker, but is equipped with segregated ballast tanks in protective locations (SBT/PL). These were mostly built between 1982 and 1996.
- **Category 3**: a single-hulled tanker, smaller than Category 1 and 2 tankers, but with over 5,000 tons of deadweight capacity. These smaller tankers are often used for regional transportation.

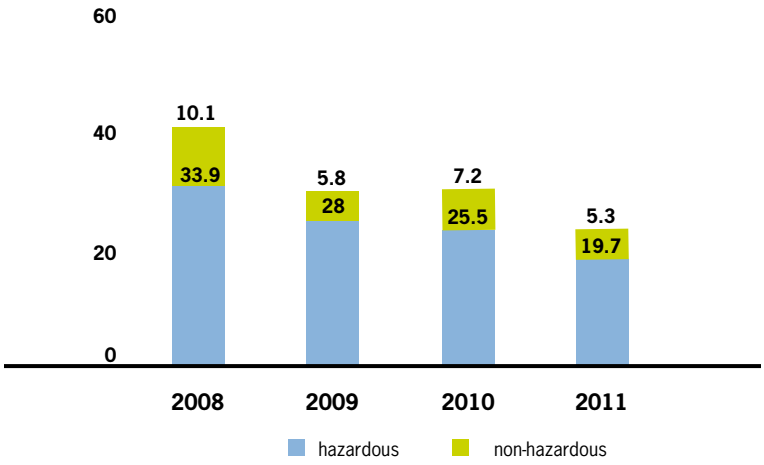
In the past few years, **Category 6** vessels, which have **a double hull**, have increasingly been used, with the aim of preventing accidents at sea or limiting their consequences. Saras has chosen to increase its use of this type of ship for the transportation of crude oil and oil products (Chart 34).

Table 26 – Waste produced by the site (thousand tons/year)

	2008	2009	2010	2011
Hazardous waste*	33.9	29.2	25.5	19.7
Non-hazardous waste	10.2	5.7	7.2	5.3
Total	**44.1**	**34.9**	**32.7**	**25.0**

*Excludes waste deriving from the 2008 Site Characterisation Plan.

Chart 39 – Waste produced by the site (thousand tons/year)



Waste for chemical/physical treatment is processed on Saras' behalf by a specialist company working within the site. This activity is continually monitored in accordance with the internal evaluation procedures used for all subcontractors used by Saras. Treated waste is transformed into non-hazardous waste that can then be sent to landfill (Table 29).

Table 27 - Remediation activity (thousand tons/year)

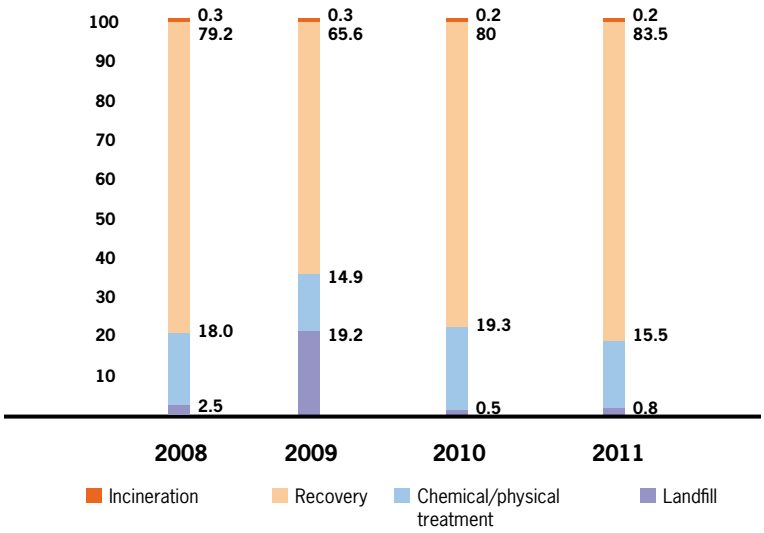
	2009	2010	2011
WATER	91.7	105	103
EARTH	35.8	2.8	0

Table 28 – Destinazione finale dei rifiuti (Migliaia ton/anno)

	2008	2009	2010	2011
Landfill	3.38	31.25*	0.75	1.0
Recovery	107.34	106.54	112.35	106.53
Incineration	0.45	0.50	0.37	0.31
Internal chemical/physical treatment External chemical/physical treatment	22.95 1.46	24.06	27.09	19.79
Total	**135.57**	**162.35**	**140.56**	**127.63**

*The figure includes remediation activities totalling 25.9 tons/year.

Chart 40 – Destinazione finale dei rifiuti (%)



In 2011, the waste inertisation plant sent about 9,303 tons of waste that had been rendered inert to landfill on behalf of Saras.
Separated waste from offices and the canteen continued to be collected in 2011 by agreement with the Municipality of Sarroch. The quantities of material sent for recycling are shown in Table 30.

Table 29 – Chemical/physical treatment of waste (thousand tons/year)

	2008	2009	2010	2011
Chemical/physical treatment, of which:	22.95	22.96	27.09	19.79
Rendered inert and sent to landfill	10.09	10.61	13.1	9.3
Internal recycling	12.86	12.35	13.9	10.49

Table 30 - Separated waste sent for recycling (tons)

	2008	2009	2010	2011
Paper	95.8	74.6	81.7	82.4
Plastic	14.9	24.7	20.8	17.5
Glass and aluminium	8.1	10.9	14.4	12.1
Wet waste (since 2008)	7.4	7.8	12.6	22
RSU	448.6	498.5	373	307.1

Soil, subsoil and underground water

In accordance with the provisions of Ministerial Decree 471 of 25 October 1999, as subsequently amended (regulations containing criteria, procedures and methods for the safety, remediation and environmental restoration of polluted sites), Saras, pursuant to Article 9 of the Decree, presented the authorities with its Site Characterisation Plan on the condition of the soil and the water tables beneath the refinery.
Subsequently, in 2004, in conjunction with the Italian Ministry for the Environment, the Region of Sardinia, the Province of Cagliari, Local Health Authority no. 8 and the Municipality of Sarroch, the company defined the procedures for implementing the Site Characterisation Plan, which set out a series of surveys to be carried out and proposed the measures needed to protect the environment and safeguard public health.
In July 2004, characterisation activities were initiated at the site using the following techniques:

- **soil surveys** with extraction of core samples from 5 to 10 metres deep to establish the subsoil stratigraphy, ascertain whether any contaminants are present and measure their concentrations;
- **piezometry**, or special surveys of soil with extraction of core samples from 10 to 20 metres deep that can monitor the water table. This type of survey not only takes a stratigraphy of the subsoil and its quality (as in the surveys above), but also makes it possible to verify the condition of the water in the subsoil.
  Piezometry is carried out using a windowed tube inserted in the area where the water flows which periodically takes samples of water to check its quality

- **gas surveys**, a technique to verify the presence of hydrocarbon gas in the soil interstices;
- **surface soil surveys**, for which samples of the first 10-15 cm of soil were taken from 10% of the survey points to determine their asbestos, PCB and dioxin content.

The site investigation plan was completed in June 2009, with 739 surveys, 140 piezometric tests, 89 surface soil surveys and 542 gas surveys carried out.

In October 2010, sampling and analysis of groundwater was carried out jointly with ARPAS to verify the results of the analysis: a total of 130 piezometric readings were taken, including 15 in partnership with ARPAS technicians.

All the soil and water samples taken were analysed in early 2011. Analysis of the surveys provided the following information:

- the soil analyses showed only restricted areas in which hydrocarbon concentration limits were exceeded. Other parameters also marginally exceeded the limits (Cd, Co, Cr, Cu, Ni, Pb, V, Zn and IPA), in limited and non-adjoining areas, confirming that they were isolated cases rather than a widespread problem.
- analysis of the groundwater indicated the present of hydrocarbons above the concentration limit in some cases. Hydrocarbons were also detected in the light non-aqueous (supernatant) phase liquid (LNAPL); and certain other parameters (Cd, Ni, Pb, IPA, BTEX, MTBE, sulphates) marginally breached the limits.
- No abnormal readings were found in gas survey analyses.
- No abnormal readings were found in the surface soil surveys.

Preparation of the final documentation for the Site Characterisation Plan, which will be officially submitted in 2012, began in 2011.

Based on the results of the characterisation activities, a plan was drawn up to make the groundwater safe in emergency and operational situations, which was approved at the Services Conference held at the Italian Ministry for the Environment in April 2007.

The project phase involving construction of a hydraulic barrier with LNAPL recovery systems has already been completed. The projected 46 wells have been created: of these, 26 are already operating on the mid-line, extracting contaminated water and recovering the supernatant, while 13 are being used for groundwater replenishment on the sea side, including one outside the plant to the south, to prevent salt inflows. The remaining seven wells are hydrogeologically upstream, controlling groundwater levels, and became operational in early 2011.

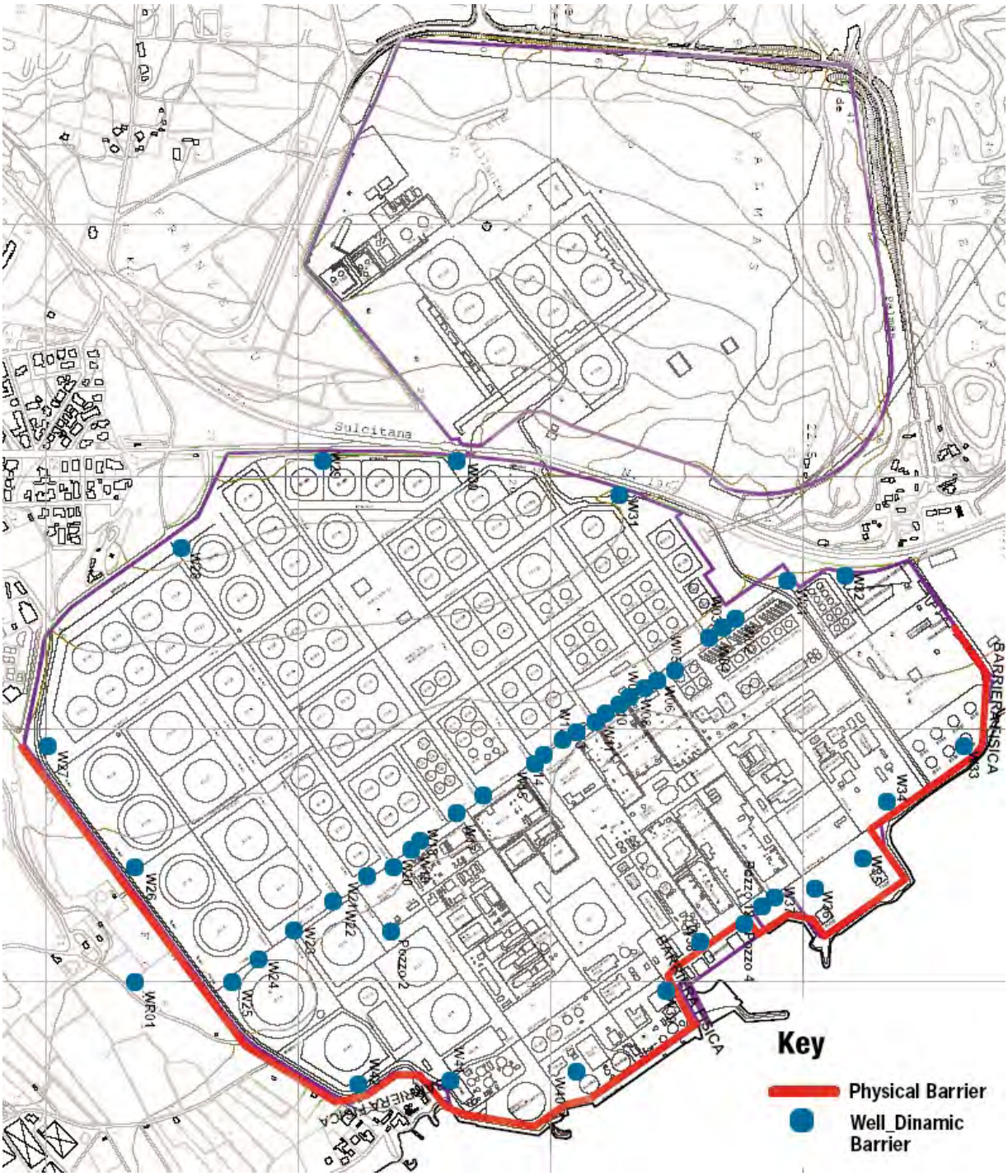
In September 2011, replenishment tests were carried out on the 13 wells on the sea side; these will be completed by mid-2012. The aim is to activate the entire replenishment side by the end of 2012.

The physical barrier will extend over 3,050m and will be constructed using jet grouting and waterproofing injections.

Field tests were carried out in 2009 to test operating and construction conditions in preparation for the executive project. Preliminary surveys were carried out in 2010 to assess the best techniques for installing barriers on the southern side of the refinery. The specifications to tender for the entire project, subdivided into operational lots, were defined in 2011.

During 2008, Saras drew up the projects for the remediation of C>12 hydrocarbon hot spots in soil in the West Tank Farm area and for decontaminating soil in the area of the disused ST1 tank.

Figure 12 – Location of the wells comprising the dynamic barrier, and planned location of the physical barrier



Since 2009, in line with the project schedules, the process of earth excavation, soil washing for removal of hydrocarbons and the subsequent restoration of washed soil to the original site has been ongoing at the West Tank Farm area, while contaminated soil in the ST1 area has been removed and delivered to authorised landfill. Both projects are near to completion. In 2010, sampling and analysis was carried out jointly with ARPAS to approve the replacement of washed soil and uncontaminated soil in the West Tank Farm area.

All contaminated soil from the former ST1 area has been sent to landfill, and in December 2011 the plan to make the site permanently safe was presented. After the plan has been implemented, restitution of the site will be requested.

Noise monitoring

Since 1999, Saras has planned and implemented regular checks of noise levels in the local area, using phonometric surveys to establish the acoustic characteristics of the surrounding environment.

Monitoring units to measure noise levels were set up along roads close to the refinery, on roads leading to Sarroch city centre and in the city centre itself. These areas are shown on the aerial photographic map below (Figure 13 on page 79). The phonometric testing showed that the refinery emits steady and continuous noise. In the city centre, the noise level fluctuates more markedly, as it is affected by noise from vehicle traffic and other noises unrelated to the refinery. The L90 noise level attributable to the refinery (which allows traffic noise to be excluded), measured at night, is considerably lower in the recordings taken in Sarroch city centre. The latest measuring campaign relating to 2011 confirmed the above trend, as shown in Charts 41 and 42 on page 79. Saras not only assesses noise levels outside the refinery, but has also pursued an ongoing programme of phonometric testing to create a complete acoustic map of the site itself, which was launched in 2006. This is one of the initiatives for the protection of employees from physical agents set out in Section VIII of Legislative Decree 81/2008. In 2010, the MHC1, MHC2, TAME and U800 plant areas were mapped, while the TMK plants (incoming water treatment) and SWS (sour water stripper) were mapped in 2011.

Measurement of electromagnetic pollution

In 2001, in order to determine the possible existence of risk situations, Saras launched a study to analyse and assess this phenomenon within and outside the refinery area.

The first phase of the study was completed in October 2001 with the aid of a rigorous measurement system. The results were completely satisfactory, confirming that the magnetic fields generated inside the plant are well within the legal limits established to protect the population. In addition, it was found that no such fields existed outside the company perimeter. This research was followed by a further study, completed in 2004, which assessed the exposure of workers to electromagnetic fields during working hours. In this case the levels detected were also well below regulatory limits.

In July 2007, a follow-up study was carried out to verify the results obtained in 2001. Magnetic fields were again monitored, using the same criteria adopted in the 2001 study. The levels detected were in line with those seen previously, confirming that the electromagnetic fields generated within the site are well below the legal restrictions imposed to protect the population.

The study on worker exposure to electromagnetic fields was repeated in 2008. The legislative framework was even clearer than for the previous study, due to the introduction of Legislative Decree 81/2008.

The data confirmed the results of the 2004 study, with no detection of electromagnetic field levels higher than the specified thresholds.

Figure 13 – Location of noise monitoring units

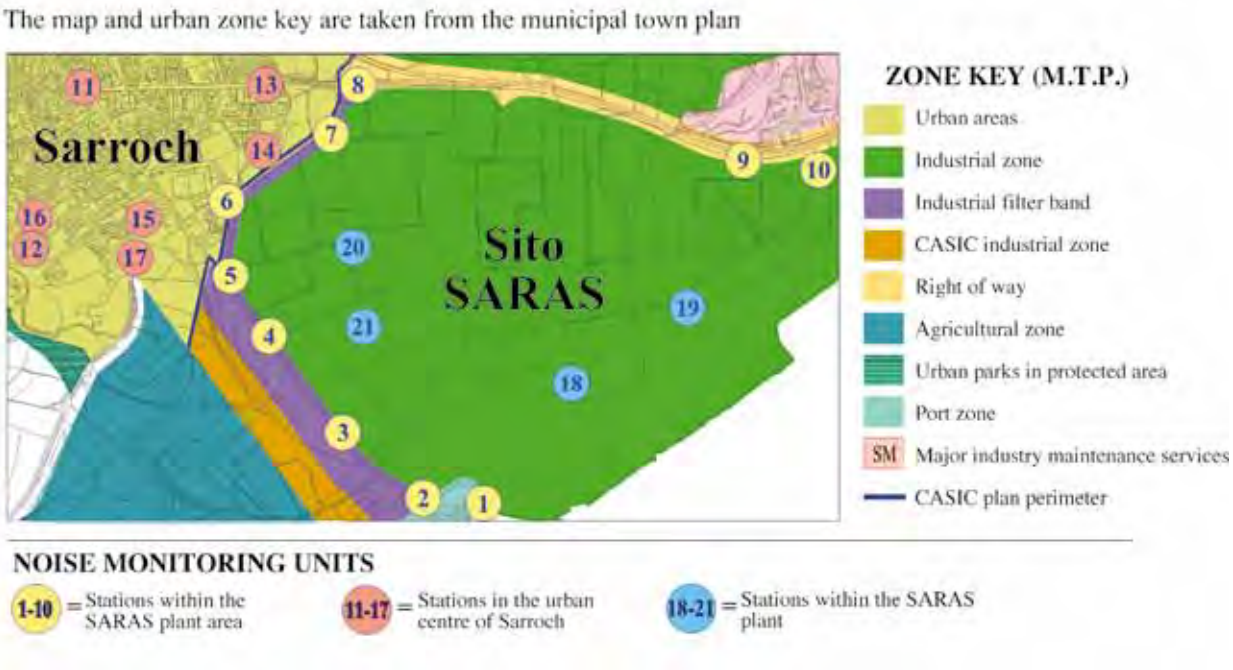


Chart 41 - External environmental immissions dB (A) - L90 levels - Day time (Sarroch city centre)

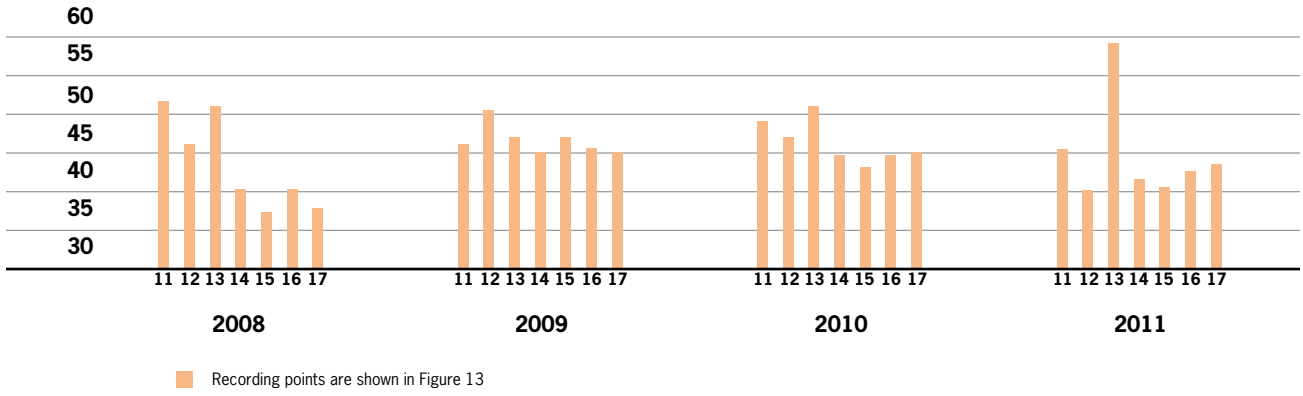
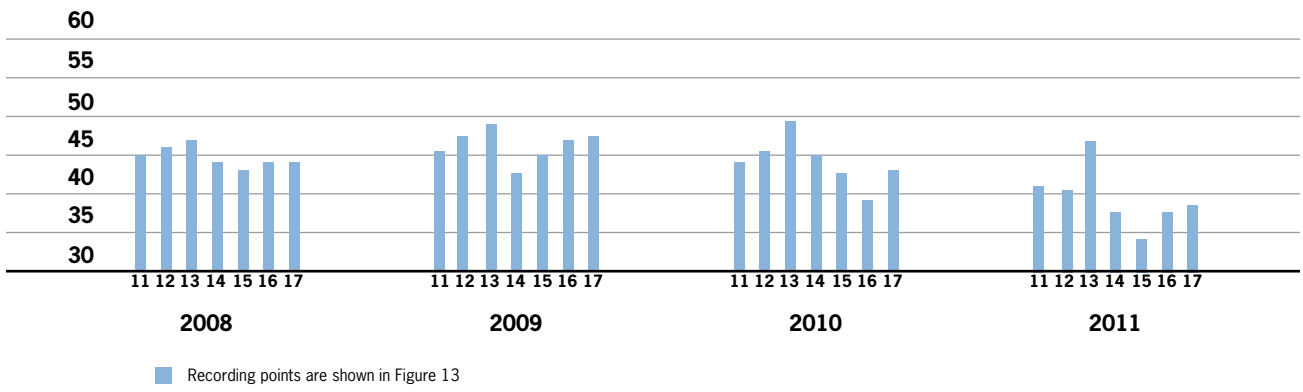


Chart 42 - External environmental immissions dB (A) - L90 levels - Night time (Sarroch city centre)



The aims of this mapping activity are:

- to precisely define the noise levels to which staff are exposed
- to identify higher-risk areas and outline appropriate preventative and protective measures
- to select appropriate ear protectors and identify measures to reduce loud noises at source

An analysis of the phonometric data enabled the company to quantify the potential acoustic effects of the noise in the working environment under normal operational conditions.

Parameters	Period	Stat. 11 (H24)	Stat. 12 (H24)	Stat. 13 (SPOT)	Stat. 14 (SPOT)	Stat. 15 (SPOT)	Stat. 16 (SPOT)	Stat. 17 (SPOT)
L90	Day time Chart 41	46.0	40.5	60.0	42.0	41.0	43.0	44.0
	Night time Chart 42	41.5	41.0	47.5	38.0	34.5	38.0	39.0

Improving the internal and external visual impact

Since 2000, the company has been increasingly committed to improving the visual impact of the site, both to offer a more pleasant working environment and to improve the way the refinery relates to its surroundings. The focus has been on improving perceptions of the refinery areas and structures, both internally and externally. To achieve the first of these targets, the internal area has been renovated through the reorganisation of spaces and buildings, repainting, improvements to green areas, and the installation of images to raise awareness about environmental protection and safety and new signage. Several sculptures, created following suggestions from employees and contractors and made of scrap metal and other materials used in plant operations, have also been placed. Structures and spaces in direct contact with the outside were also improved, with green areas established to provide continuity between the site and its surroundings. In particular, the junction on the S.S.195 was rebuilt and the green spaces in the car park were improved. Work has been completed in recent years to prevent a steam plume from rising from the boilers in the combined-cycle section of the IGCC unit. The new installation eliminated the visual impact of the steam plume, and also enabled heat to be recovered for use in process activities.

Investment in the environment

Saras' commitment to continually improving environmental performance can also be measured and evaluated in terms of the financial investment devoted to this purpose. The data in Table 31 show the company's strong commitment on this front, with total investment of more than EUR 39 million in the past four years.

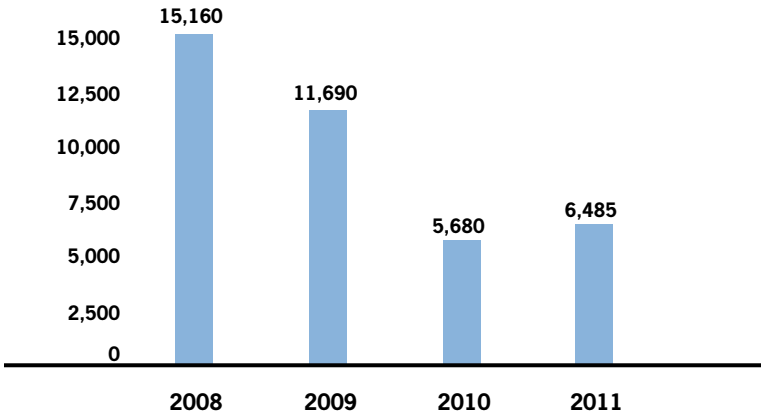
In 2011, the main investments were as follows:
completion of the dynamic groundwater control barrier

- continuation of activities for continuous measurement of the flare temperature
- ongoing installation of double seals on gasoline pumps
- ongoing tank and pipeway paving
- ongoing installation of double bottoms in tanks
- launch of a study to create a prototype to monitor dust from the FCC-COBoiler smokestack.

Table 31 – Investment in the environment (EUR thousands/year)

	2008	2009	2010	2011
Investments	15,160	11,690	5,680	6,485

Chart 43 – Investment in the environment (EUR thousands/year)



Group companies

Sardeolica

Environmental and occupational health & safety monitoring

When the wind farm was built, Sardeolica set up an environmental monitoring system to quantify the possible environmental impact of the site. The monitoring of:

- flora
- fauna (and birds in particular)

Table 32

	2009	2010	2011	TOTALE
Power [kW]	18.9	18.9	18.9	18.9
Production [MWh]	21,186.4	21,137.3	26,884.0	75,207.7
Months in financial year	8	12	12	20
Equivalent households	7,062	9,046	8,961	25,069

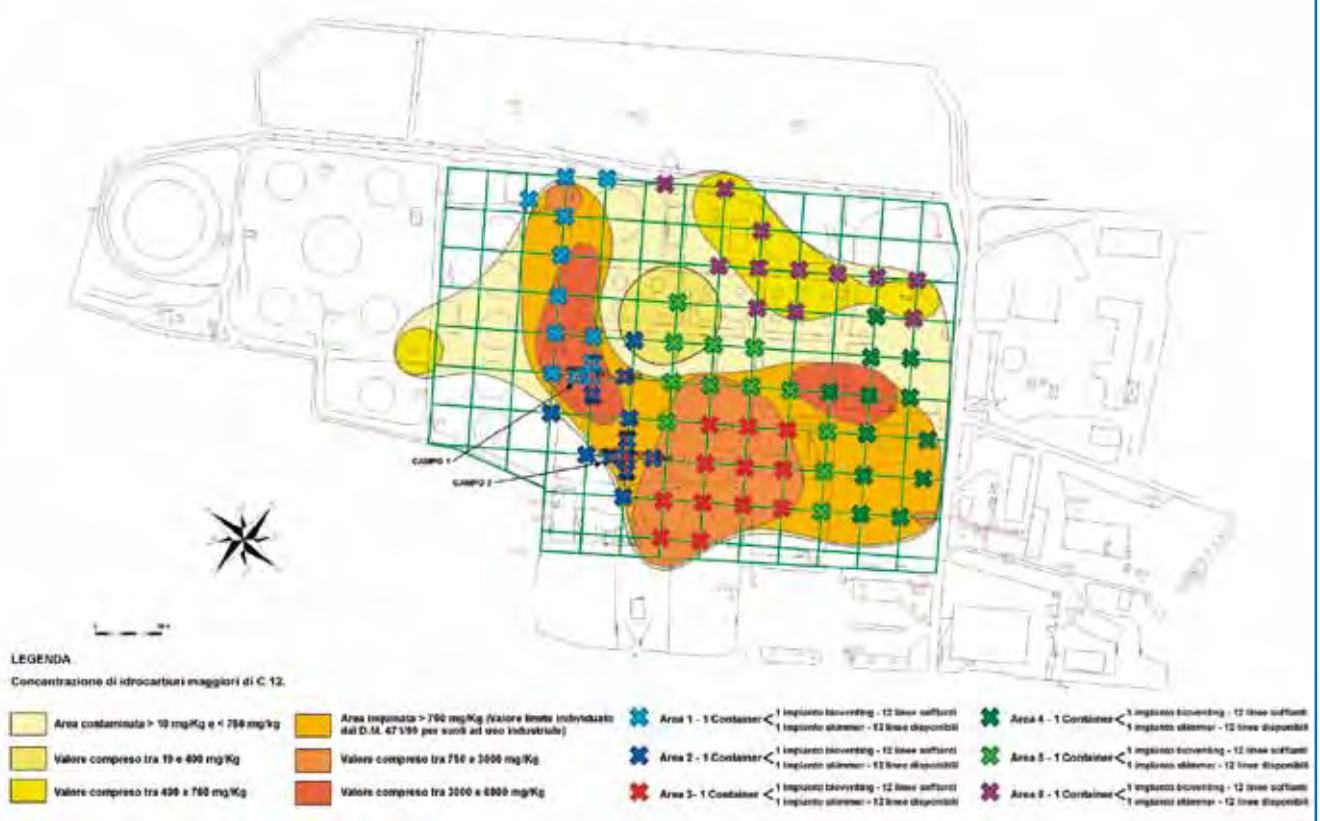
- noise
- electromagnetic fields

showed not only that the wind farm is compatible with the local environment, but that it is fully integrated with the traditional activities carried out in the area and with the pre-existing natural habitats.
Table 32 below shows production data for the photovoltaic plant (power: 18.9 kW) installed on the roof of the Ulassai Multifunctional Building.

Arcola Petrolifera / Deposito di Arcola

The project to reclaim subsoil at the Arcola storage facility, currently at an advanced stage of implementation, completes a process that began in 2002 with the approval of the preliminary project and later of the operational plan drawn up by Arcola Petrolifera, in preparation for the programme of remediation and safety improvements at the Arcola storage facility. The project was designed to identify the best subsoil decontamination techniques to use at the Arcola site, taking into account the fact that the groundwater is used to obtain potable water. The test phase then began, aimed at planning and drawing up a remediation project using the best available technologies appropriate for the site. The test project was developed with the assistance and scientific advice of the University of Cagliari. A variety of biodegradation techniques were selected and tested in areas that were specifically identified and set up on the basis of the preliminary project and the subsequent operational plan. A hydraulic barrier was kept in operation throughout the test phase, in order to protect the site. This comprised five extraction wells distributed at various points within the facility that were constantly monitored to check that they were working properly using groundwater quality checks. The test phase involved a substantial amount of work to identify and define optimum operational parameters based on the site's specific features and vulnerabilities. Many series of tests were carried out, incorporating coherent and co-ordinated variations in plant-related and operational components. The results were analysed on an individual basis as they emerged, with continuous monitoring supported by analytical field tests. The field testing was integrated with research activities developed by the University of Cagliari aimed at identifying the microbiological features of the indigenous bacterial communities at the site, and determining their evolutionary process. Amongst other things, the research identified a particular biosurfactant micro-organism (already known in scientific literature as the Gordonia bacterium), which specialises in biodegrading hydrocarbons, demonstrating that the indigenous microbiological communities are selectively evolving in favour of micro-organisms specific to the type of organic substratum that can be found at the site. On completion of this full series of tests, field monitoring and laboratory research, the base technology – bioslurping – was developed further and refined to maximise its effectiveness in light of the specific features and vulnerabilities of the site. The testing of remediation technology was completed in December 2004. The definitive reclamation plan was the result of nearly three years' work, during which it was possible to perfect the most suitable techniques, ensuring that the required result

Figure 14 – Remediation project for the Arcola site



could be achieved while taking into account all the environmental factors, particularly potable water resources.

The definitive remediation project provides for the simultaneous and synergistic application of bioventing and skimming techniques (which were optimised during testing) in 60 newly equipped and installed piezometers. Arcola Petrolifera drew up and presented the definitive remediation project to the Services Conference, organised by the Municipality of Arcola, in 2005. The Conference approved the project at the end of the same year. In the early months of 2006, work began on installing and preparing equipment in the field; this was completed in April. Developments in the project are constantly tracked via monitoring of specific indicators of efficiency and effectiveness and careful recording of surrounding environmental conditions. This is made possible by the use of special monitoring equipment, both fixed and portable, which registers changes in the process and measures its effectiveness. For example, the instruments installed allow for evaluation of the activity of indigenous aerobic plant life by measuring oxygen and carbon dioxide in the subsoil. This information is supplemented with periodic analysis of subsoil samples, taken using microprobing. The results of monitoring activity are collected, interpreted and commented on in the form of regular technical reports, which are passed on to the relevant authorities. The fifth technical report was prepared and submitted in December 2008, covering remediation activity between June and November of that year. The key data confirm the effectiveness of the techniques adopted, which have enabled a sizeable part of the unsaturated area of the area for remediation to be decontaminated. As expected, the focus is

still on the capillary fringe, which remains a contaminated layer due to groundwater dynamics. In 2009, a new phase of testing was launched, using additional techniques designed to maximise the degradative capacity of the capillary fringe by adding oxygenated water.
In 2010, air sparging was added to the bioventing and skimming techniques. Air sparging involves directing large quantities of air below groundwater level (4 metres) to eliminate volatile fractions (VOC) through stripping and to increase oxygen levels in the saturated layer. Construction of a large-diameter open well was also planned to test techniques for reclaiming and collecting residual product in the free phase. Samples of contaminated subsoil were also taken to carry out further laboratory tests. The process of building and launching the plants continued until spring 2011, with a three-month break due to adverse weather conditions. This process was completed in March, when a system was installed to reclaim and recover residual contaminants in the large-diameter well. During the year, chemical oxidation tests were conducted using all available oxidising resources, and aerobic and anaerobic oxidation tests were also carried out, in the laboratory and in the field (on a reduced scale). All the information obtained was collected and commented on in a technical paper delivered to the Environmental Office of the Municipality of Arcola, which will call a Services Conference to jointly analyse the results and establish the action still required to complete remediation.

Saras Energia

Biodiesel production plant

On 5 June 2008, Saras Energia obtained an AIA permit from the Directorate-General of Environmental Planning, Assessment and Control for the biodiesel production plant in Cartagena, complying with all integrated contamination prevention and control requirements set out in Law 16/2002 of 1 July, which transposed Directive 91/61/EEC into Spanish law. In order to maintain this authorisation, the company has developed an environmental monitoring programme implementing timely and systematic verification of environmental effects arising from activity at the site and defining necessary control measures to ensure adequate environmental protection. The environmental monitoring programme was successfully completed in 2011. The Directorate-General of Environmental Planning, Assessment and Con-

Table 33 – Control parameters

Parameter	2009		2010		2011	
	Value recorded[3]	Value limit[2]	Value recorded[3]	Value limit[2]	Value recorded[3]	Value limit[2]
CO (ppm)	54.6	500	49.1	500	17.7	500
NO_x (ppm)	69.9	300	71.3	300	97	300
VOC (mg/m^3N)	<0.05	–*	<0.05	–*	<0.05	–*
HCL (mg/m^3N)	<0.5	–*	<0.5	–*	11.76	–*
Noise dB(A)	64.0	65.0	60.1	65.0	-	65.0

*No legal limits have been established.

trol verified the adoption and proper implementation of the programme by means of inspections by a partner organisation, which confirmed this positive result and certified that the site meets all the environmental requirements set out in the legislation in force

Pursuant to Royal Decree 9/2005 of 14 January, which defines the reporting of potential soil-contaminating activities and criteria and standards for the declaration of soil contamination, in 2011 the site drafted and submitted a preliminary disclosure statement on the soil situation to the Directorate-General of Environmental Planning, Assessment and Control. On the basis of the planned and completed analyses, the statement declared that no initial contamination had been detected and that there was no evidence of soil contamination.

Fuel storage facility

The fuel storage facility was built by Saras Energia in Cartagena in accordance with the provisions of Royal Decree 833/1988 of 20 July, which approved the implementation of regulation for Law 20/1986 of 14 May governing toxic and hazardous waste. The storage facility is registered with the Spanish Ministry of the Environment as a facility producing hazardous waste; it therefore has to submit an Annual Environmental Declaration, an Annual Declaration as a Producer of Hazardous Waste and an Annual Declaration as a Producer of Contaminated Packaging. In 2011, the above declarations were duly drawn up and submitted within the relevant deadlines, with no observations from the public administration. The storage facility is authorised to discharge industrial wastewater into the El Fangal water course by the Confederación Hidrográfica, the Spanish body that regulates industrial discharges into public water.

The legislation in force requires the company to submit an annual record of discharges made over the course of the year. This record was drawn up and submitted within the relevant deadlines with no observations from the competent authority. Pursuant to Royal Decree 9/2005 of 14 January regarding potentially contaminating activities, which sets out rules for the identification and declaration of contaminated soil, a report on the state of the soil below the facility was sent to the Spanish Ministry of the Environment. The report shows that the current level of soil contamination is exactly the same as it was before Saras Energia began its activities.

SARTEC

In accordance with the Integrated Management System, SARTEC keeps all of its significant environmental aspects under constant control, including through specific monitoring with instruments.

Specifically, the following aspects were controlled:

- noise pollution in respect of the foundations and the sites overlooking SARTEC's operational headquarters
- wastewater
- waste
- energy and resources consumption
- water consumption
- soil/subsoil contamination
- air emissions.

Training

During 2010, specific courses on safety and respect for the environment were held at service stations in the Saras Energia network, in line with the Training Plan (DERES Project).

An initial, three-day course on safety during unloading was held for staff responsible for sales development and managers at the stations.

The course included: a brief discussion of the products and their chemical and physical properties, protective measures and safety procedures for unloading trucks.

Technical training days were also run by experts in maintenance and environmental issues, which explored the topics mentioned in detail.

Operational exercises were also held at selected service stations. The exercises involved the service station staff, the head office transport co-ordinator and the network sales managers in their various roles.

Teaching was co-ordinated by the head of HSE with the support of safety advisers from the transport companies and RED.

In the 2011 Annual Plan, safety and a focus on the environment continue to feature prominently in relation to the Saras Energia service stations.

Health and safety

Health and safety

The Sarroch site

One of the company's key priorities is to constantly foster a culture of safety, as this helps to create working conditions appropriate to the needs of employees and to achieve a progressive reduction in the number of emergencies and accidents.

As is the case with other measurable objectives, such as product quality and competitiveness, promoting and maintaining a high level of safety are shown in this part of the report using precise and accurate data and information. The decisions made by the company on safety issues cannot be properly evaluated except through a detailed analysis of data on suitable indicators. The indicators examined confirm that, while substantial progress has been made through ongoing improvements to employee safety, there is still room for further improvement, which the company sees as reasonable and achievable.

The Saras Safety Project

The "Safety is our Energy" programme was implemented by Saras in March 2009 as part of its efforts to achieve continuous improvement.

The project, which was undertaken over three years, focused on developing a culture of safety and safe conduct by everyone working on the site. The programme was based on the seven modules described below.

1. Project vision and strategic management

- The starting point for the project was the definition of a vision for safety that expresses our company's values and aspirations on safety issues
- This vision for safety was approved on 7 April 2009 by the committee overseeing the project, which also ensured its maximum dissemination and visibility

2. Standards and procedures

As part of the "Safety is our Energy" project, new tools to disseminate and implement the principles of safe conduct were developed, including:

- Basic Safety Measures leaflets explaining the fundamentals of safe conduct
- Safety Tours consisting of field inspections as per a specific yearly schedule, to ensure constant monitoring and oversight of safety in all areas of the plant, checking conditions and conduct, and highlighting both positive and negative points.

3. Communication

To support all the programme's initiatives, internal communication activities were also developed, aimed at both Saras staff and the employees of subcontractors.

Safety training

The safety of a highly reliable system can only be guaranteed if the people who apply it are trained and competent to act in their various capacities. All staff must be trained to the highest possible level, in terms of both technical skills and responsible behaviour.

Saras focused on both these aspects in 2011, increasing the total number of training hours delivered by 24%.

In total, 49,623 training hours were delivered, including 33,181 hours of safety training.

In early 2011, the project for the certification of the maintenance competencies, launched in 2010, was completed.

In addition, following approval of the new procedure governing the issue and management of work permits, but before its entry into force, a training programme for over 730 internal employees - i.e. all those involved in the process in whatever capacity - was launched and completed. Over 4,400 hours were spent on this training. 120 staff from subcontracting firms involved in carrying out this work were also trained.

Many of the training initiatives had a direct impact on the acquisition of expertise and technology, some of which became necessary after tools and processes were updated. Over 10,800 hours were spent on this training.

4. Management/HSE structure

Major organisational changes were made to decentralise management responsibility for safety from the Prevention and Protection department (PPD) to the production areas/staff services, while maintaining co-ordination with the PPD. One important step was the appointment in each production area and other corporate processes of a new HSEQ (Health, Safety, the Environment and Quality) specialist with the specific task of helping to promote safe conduct, identifying anomalies and overseeing corrective action.

5. Accident management

In this area, improvements have been made to the tools (revision of procedure) and methods for assessing accidents (first- and second-level analysis) that have greatly enhanced the company's capability and speed when conducting analysis, preparing corrective measures and monitoring implementation of these measures.

6. Auditing and safety dialogues

Important changes have also been made to the audit system in the field, with a major overhaul of the field inspection tool:

- reducing the number of inspectors involved (to make inspections “leaner”)
- more targeted selection of inspectors (choosing from individuals with extensive plant experience)
- changes to the subjects and aims of the inspection, with a focus on subcontractors

One real innovation, however, is the concept of Safety Talks. A Safety Talks is a meeting between an operator and two suitably trained "dialoguers", with the aim of:

- disseminating a culture of safety leading employees to adopt safe behaviour, and perceive and assess risks
- identifying and collecting ideas for improvements to safety at work
- involving and motivating staff

7. Contractor Management

Major innovations have also been introduced in the management of contractors. Synergic work between the Prevention and Protection and the Procurement departments led to the following changes:

- Creation of a minimum HSE (Health, Safety and the Environment) standard for contractors
- Implementation of formalised auditing through checklists for the various aspects (including HSE aspects)
- Creation of an additional HSE standard to verify compliance with legal obligations
- Certification of contractors in relation to the HSE standards as a prerequisite for inclusion in the vendor list (authorised subcontractors)
- Updating of the audit system for HSE-certified external companies
- Determination of weekly checks of compliance with HSE standards.

REACH and CLP

Implementation of the REACH regulation

The main aim of REACH is to improve the protection of human health and the environment through better and earlier identification of the intrinsic properties of chemical substances. It is also intended to enhance the competitiveness of the European chemicals industry.

Unless they are registered, substances cannot be produced or released on the European market, according to the "NO DATA NO MARKET" principle. The substances produced by the refinery fall within the scope of REACH, which enforces the registration of chemical substances via the sending of a file to a central, shared database for member states, which is managed by ECHA, the European Chemicals Agency.

With regard to the oil industry, the substances involved (about 660) have been grouped into 20 categories by CONCAWE, the European Oil Company Association, based on affinity between refining processes as well as similarities in chemical and physical properties and end use.

The substances produced by the Saras refinery fall into the following categories: gases, low boiling point naphthas/gasolines, kerosenes, straight run gas oils, vacuum gas oils, hydrocracked gas oils and distillate fuels, cracked gas oils, heavy fuel oils and sulphur.

Registration of substances takes place in two phases:

- pre-registration
- final registration

In line with the regulation, Saras pre-registered 43 phase-in substances by 1 December 2008, submitting summary information on the substances to ECHA.

Pre-registration allowed producers and/or importers to:

- continue manufacturing and releasing the substances onto the market after 1 December 2008
- benefit from staggered registration according to the hazards and tonnage band of the substance (2010, 2013 or 2018). These substances are subject to the “transitional regime”
- have access to facilities for data sharing between declarers (the Substance Information Exchange Forum)

Registration was completed pursuant to the regulation by 30 November 2010 and required the preparation and delivery to the ECHA of a file comprising:

- a technical dossier containing information on the intrinsic properties of the substances (chemical, physical, toxicological and ecotoxicological), their uses and hazards to human health
- a chemical security report for quantities exceeding 10 tons a year, identifying chemical and physical hazards to health and the environment and PBT and vPvB substances and providing, if necessary, an assessment of risk characterisation and exposure.

The regulation stipulates that there should be a lead declarer for each substance, mandated by the other declarers, which submits the registration file to ECHA, to which each declarer then refers. Saras was lead declarer for seven of the 43 substances registered. Each file submitted to ECHA was

REACH and CLP

REACH Regulation

EC Regulation 1907/2006 of the European Parliament and the Council came into force on 1 June 2007 to rationalise and improve the previous legislative framework for chemical substances in the European Union (EU).

The REACH (Registration, Evaluation, Authorisation and restriction of Chemicals) Regulation aims to provide greater protection for human and environmental health and to improve the competitiveness and capacity for innovation of the European chemicals industry, via an integrated system of registration, evaluation, authorisation and restriction of chemical substances.

“Phase-in” substances

Substances subject to the transitional regime that meet at least one of the following conditions:

- it is listed in EINECS, (European Inventory of Existing Commercial Chemical Substances)
- it was manufactured in the EU, but not placed on the market by the manufacturer or importer, at least once in the 15 years prior to the entry into force of the current regulation, provided that there is documentary evidence of this
- it was placed on the EU market before the entry into force of REACH by the manufacturer or importer, and was considered as having been notified in accordance with Directive 67/548/EEC, but does not meet the definition of polymers as set out by REACH, provided that there is documentary evidence of this.

SIEF

SIEF (Substances Information Exchange Forum) is a forum of businesses that have pre-registered substances with the same CAS/EINECS number, which enables them to share and send data, share registration costs and avoid the duplication of tests, particularly tests on vertebrates.

Lead Registrant

The Lead Registrant is the registrant within a SIEF that acts on behalf of other registrants of the same substance (member registrants) and presents the “joint submission dossier”.

checked for compliance and completeness. A registration number is only assigned after the files have passed these checks. During 2011, work was undertaken to maintain the registration, focusing particularly on documentary checks of the substances coming into or leaving the site. Saras registered 41 oil-based substances, of which 30 were to be sold and hence required a safety data sheet to be issued in accordance with the new standards.

Occupational health monitoring

A number of monitoring campaigns have taken place at the refinery over the years, both in open and closed working environments, to check for the presence of physical, chemical or microclimate hazards. The regular monitoring programme includes VDUs, hazardous substances, biological agents, electromagnetic fields, etc. For ease of reference, please see the table relating to the occupational health monitoring carried out between 2004 and 2011. This takes place every three years, but the frequency may vary according to requirements that arise within the site or in a single area. The AIDDI (the Italian Occupational Hygiene Association) sets out three Threshold Limit Value (TLV) categories (AIDII, 1997; ACGIH, 2002), shown in Table 35.

General considerations

Hazardous substances and carcinogenic substances

Monitoring of hazardous substances is based on the raw materials used, the production cycles involved and, naturally, intrinsic harmfulness of the substances (e.g. hydrocarbons, sulphur dioxide, hydrogen sulphide and hydrofluoric acid).

GHS-CLP

The UN has developed a global system to define harmonised criteria for the classification and labelling of chemical products (GHS – Globally Harmonised System on the Classification and Labelling of Chemicals), which provides a high-level international standard to safeguard the health of anyone using chemical substances (professionally or otherwise) and to protect the environment.

Regulation 1272/2008, also known as the CLP Regulation, which came into force in 2010, led to the application of new classification, labelling and packaging criteria (including for the purposes of REACH), which was to become mandatory from 1 December 2010 for substances and from 1 June 2015 for mixtures.

The aim of the regulation, which applies international criteria taken from the Globally Harmonised System in the EU, is to harmonise classification criteria and standards on the labelling and packaging of substances and hazardous mixtures to ensure their free circulation, while at the same time guaranteeing a high level of protection for human health and the environment.

The CLP Regulation introduces changes for the industry relating to the classification of substances and mixtures and the reformulation of the Safety Data Sheets and hazard labelling, with changes being made to the current hazard symbols and the risk (R) and safety (S) phrases. Saras is part of a national working group involved in the creation of new Safety Data Sheets on oil products, co-ordinated by Unione Petrolifera, an association of the main companies operating in oil processing and oil product distribution in Italy.

The Safety Data Sheets represent the most important technical documents for information on chemical substances and mixtures, since they contain the information on the physical, chemical and toxicological properties of the substances and their environmental hazards necessary for the proper and safe handling of the substances and mixtures.

The SDSs allow:

- employers to determine whether hazardous chemical substances are being handled in the workplace and to assess any risk to the health and safety of workers resulting from their use
- users to adopt the necessary measures to safeguard health and the environment and promote safety in the workplace.

These documents are published on a dedicated page of the company website and are available to all staff at the site. They are also sent to all our customers, before or at the time of the first product delivery.

Table 34 – Monitoring Programme

Hazard	2005	2006	2007	2008	2009	2010	2011	2012
Lighting			■					■
Group 1 hazardous substances	■			■			■	
Group 2 hazardous substances		■			■			■
Noise			■				■	
Electromagnetic fields			■					
Microclimate		■		■	■			■
Biological agents		■			■	■		
Asbestos			■			■		

Table 35 – Threshold Limit Values

TLV-TWA Time-weighted average threshold limit value	Time-weighted average over one typical eight-hour working day and over a 40-hour working week, to which nearly all employees may be repeatedly exposed on a daily basis without any negative effects.
TLV-STEL Threshold Limit Value Short Term Exposure Limit	Concentration to which workers may be exposed continually for short periods, as long as the daily TLV-TWA is not exceeded, without any of the following effects arising: 1) irritation; 2) chronic or irreversible damage to tissue; and 3) a reduction in vigilance sufficient to increase the likelihood of accidents or influence a person's ability to reach safety or materially reduce working efficiency (always provided that the TLV-TWA is not exceeded). The TLV-STEL does not constitute an independent, separate exposure threshold, but rather supplements the TLV-TWA of a substance, whose toxic action is mainly chronic, when recognised acute effects exist. STELs are recommended when human or animal exposure to a high concentration for a short period has identified toxic effects. A STEL is defined as the average weighted exposure for a period of 15 minutes, which must never be exceeded during the working day, even if the weighted average over eight hours is less than the relevant TLV. STEL exposure must never exceed 15 minutes and must not be repeated more than four times a day. There must be at least 60 minutes between successive STEL exposures. A different averaging period may be advisable if this is justified by the observed biological effects.
TLV-C Threshold Limit Value (Ceiling)	The concentration that must never be exceeded during working activity, even for a very brief period

The sampling parameters for the hazard classes are as follows:

- Group 1 hazardous substances (all hydrocarbons, n-hexane, benzene, toluene, xylene, ethyl benzene, tetrachloroethylene, butadiene, methane, TAME (ether) and metal oxides).
- Group 2 hazardous substances (respirable dusts, thiols, phenol, lead, hydrochloric acid, hydrofluoric acid, hydrogen sulphide, carbon monoxide and ammonia).

Under the Health and Safety Protocol adopted by Saras, shift workers carrying out normal production activities, technical service staff and staff responsible for inspection and control are involved in the assessment process. This essentially means all those who, based on the Risk Assessment Document, are potentially exposed to the above-mentioned substances.

The aims of the assessments are as follows:

- to measure the exposure of operators using personal dosimeters
  - during operational activities in the course of the normal three shifts of eight hours each, for all jobs at the plant
  - during daily activities in the course of eight hours over three consecutive days, for all technical/inspection and control staff; the results are compared with the weighted-average concentration thresholds (TLV-TWA) prescribed by national or international standards
- to measure the exposure of operators while performing particular tasks; the results are compared with the short-term exposure limits (TLV-STEL), where available, applied over limited periods (at specific, fixed points)
- to measure the exposure of every person with access to a given area, by monitoring transit routes (fixed points), in the course of the eight-hour working day

For statistical analysis of the results, the concentration values measured are divided into four classes within the maximum concentration:

CLASS 1: Safe zone - values up to 10% of the maximum tolerable concentration.
CLASS 2: First zone of caution - values in the range of 10% to 50% of the maximum tolerable concentration.
CLASS 3: Second zone of caution - values in the range of 50% to 100% of the maximum tolerable concentration - need for further checks and possible technical improvements.
CLASS 4: Risk zone - values higher than the maximum tolerable concentration.

Summary of the last three years

Monitoring in 2008

The results of the dosimeters relating to hazardous substances in the first group showed that the stated objectives had been met; all values detected fell within Class 1, i.e. in the safe zone (concentration values of less than 10% of the maximum tolerable concentration), with the exception of five jobs, which fell in Class 2, but with values that were very close to the transition threshold between Classes 1 and 2.
The results of the dosimeters relating to carcinogenic or potentially carcinogenic substances showed that the values fell within Class 1, i.e. in the safety zone (concentration values of less than 10% of the maximum tolerable value) and all but one also fell within Class 0.

Monitoring in 2008 and 2009 during plant shutdown and maintenance

In 2008 and 2009, monitoring of hazardous and potentially carcinogenic substances was also carried out when the FCC, RT1 and V2 plants were closed for maintenance during steam-out operations and equipment start-up. Measurements were taken during works activity (plant dismantling and remediation); it should be noted that all the employees involved in the activity wore masks fitted with ABEK filters specifically for organic compounds during the time they were working and therefore exposed, eliminating any risk associated with exposure. The aim of the survey was to obtain the information needed to assess the risk of exposure to the substances mentioned below during periods when the plant was being prepared for maintenance compared with periods of normal operation. In the case of benzenes, the dosimeter results were good in all three plants, with four instances above Class 1, while most of the results were in Class 1 and Class 0. Readings for other substances gave similar results.

Monitoring in 2009/2010

In late 2009 and early 2010, hazardous substances were monitored to measure the level of exposure of staff operating in the refinery to certain organic compounds and non-organic substances

All the substances monitored in this latest campaign, and specifically: thiols, phenol, hydrofluoric acid, hydrochloric acid, ammonia and carbon monoxide always fell within Class 1. In the case of hydrogen sulphide, thiols and phenol, no significant concentrations were detected at any time, i.e. the levels were too low to be detected by the instruments. The respirable dust results were in line with previous data. To conclude, we can state that the substances monitored did not exceed threshold levels at any time during any activity or at any of the points monitored.

Monitoring hazardous substances in the first group in 2011

In the monitoring campaign, which covered all the shift and daily working activities considered to expose workers to this risk, the study was carried out using both personal dosimeters and fixed monitoring points located in the most representative positions on the site. Around 300 samples were taken for each substance monitored except for: nickel and methanol (139 and 116 samples respectively) in the specific areas where the substances are present. The first results show that no significant quantities (only amounts of under 1 mg/m^3) of substances such as n-hexane, toluene, ethyl benzene, xylene, tetrachloroethylene, methanol, molybdenum, aluminium and diphosphorus pentoxide were detected. The only significant value of toluene (approx. 1 mg/m^3) recorded was in the CCR-ALKY plant, but even this value is well below the TLV-TWA limit (192 mg/m^3). It can be seen from the results that all concentrations measured are below 10% of the TLV-TWA limit and TLV-STEL, which means that all personal dosimeters, fixed locations and specific operations fall within Class 1. However, as regards the substances 1.3-butadiene, benzene, total hydrocarbons and nickel (insoluble inorganic compounds), either the surveys are still under way or the results of the monitoring, which continued into 2012, are still being analysed.

Asbestos

Historically, fiber-glass and rock wool were used as insulation materials at the refinery. In some facilities and for small-diameter tubing, asbestos cord was occasionally used. Eternit (a cement and asbestos compound)panels were also used in coverings at the refinery and asbestos gaskets was used on flanged couplings. There are no longer any asbestos-containing materials at the refinery. Asbestos-containing materials were banned in 1990, and progressive elimination measures began, particularly during plant maintenance operations. In 1995, two processing furnaces were dismantled. A work plan for the removal and dismantling of small quantities of asbestos cord was submitted to, and approved by, the competent health authority. In 1996, further dismantling of tubing was carried out, again involving the removal of asbestos cord and again following approval of a work plan submitted to the competent health authority.

An environmental survey was conducted in 1998, to check for the presence of asbestos in the working environment. The results of the survey showed a very low risk of staff exposure. Another environmental survey was performed in 2002, and this also showed a very low risk of staff exposure. Various plans were subsequently drawn up for the removal of the Eternit panels, in order to progressively eliminate this material. The plans were submitted on each occasion to the competent health authority and were all approved, in few cases subject to the fulfilment of further requirements. All Eternit materials were completely removed under these plans. In September and October 2004 the periodic environmental survey was carried out, and was repeated at the same points in April 2007, pursuant to amendments set out by Legislative Decree 257/2006 and subsequently included in Section IX, Chapter III of Legislative Decree 81/08. The results of these surveys indicated the presence of fibrous airborne particles, irrespective of their mineralogical nature, at levels close to zero. The exposure limit for asbestos set out in Article 254 of Legislative Decree 81/08, is 100 ff/L. Since 98% of the samples taken (100 out of total of 102) recorded a level of 0 ff/L, and the remaining samples recorded levels of less than 1 ff/L, we can conclude that the survey indicates a very low level of exposure to asbestos fibre at the site.

Noise

A phonometric survey of noise exposure was carried out between July and September 2007 to update previous surveys and in implementation of Legislative Decree 195/2006, which amended previous noise legislation. The measuring process involved all employees in the various production divisions, including at the planning, operational, presentation and results verification stages.

Article 189 of Legislative Decree 81/08 sets out the following exposure limits and levels requiring action for daily noise exposure and peak acoustic pressure:

- Exposure limit LEX, 8H=87 dB(A) and Ppeak=140 dB(C)
- Upper exposure limit LEX, 8H=85 dB(A) and Ppeak=137 dB(C)
- Lower exposure limit LEX, 8H=80 dB(A) and Ppeak=135 dB(C)

As the regulations stipulate, the assessment will be updated every four years. The most recent monitoring campaign for worker noise exposure, completed in February 2007, identified the current situation in relation to employee exposure as regards aspects governed by the regulations in force on controlling exposure to noise in the workplace. The exposure of operational staff to noise at the site was therefore assessed by means of analysis and estimates based on phonometric data taken from personal dosimeters.

To date, a range of specific environmental improvement measures have been implemented and soundproofing systems for machines and plants have been installed as a result of targeted workplace health and safety initiatives, as we continue to strengthen, and seek certification for, noise prevention activities for the workplace.
As previous testing and noise measuring campaigns have shown, some operational jobs fall into the acoustic risk category. Based on personal phonometric readings, noise exposure for operational staff is as follows:

ACOUSTIC RISK CATEGORY	LEVEL OF PERSONAL EXPOSURE	EXPOSURE TO NOISE BY OPERATIONAL STAFF %
0	LEX,8h < 80 dB(A)	29
I	80 dB(A) < LEX,8h < 85 dB(A)	35
II	85 dB(A) < LEX,8h < 87 dB(A)	15
III	LEX,8h > 87 dB(A)	21

However, it should be noted that:

- no instantaneous sound pressure levels higher than 140 dB(C) were detected
- the auditory Personal Protective Equipment (PPE's) currently used are sufficient to ensure compliance with exposure limits, and provide suitable protection for employees (in terms of noise mitigation)
- acoustic mapping is also taking place at plants within the "refinery + IGCC" complex; one of the main goals of the mapping is to characterise noise frequency, so that the octave band method can be applied and suitable PPE's identified for each individual plant.

This type of monitoring – both subjective mapping using personal dosimeters and objective mapping (acoustic mapping of plants) – is carried out by the Prevention and Protection department.
To date, acoustic mapping has been completed for the following plants: T1, T2/V2, CTE, Alkalisation, CCR, FCC, API/PWP/BWT, Targas Chemical Laboratory and Unit 800 TAME MHC1/2. In 2011, mapping was carried out for the SWS and TMK plants and will also follow for all the other plants.

Acoustic mapping 2011 (Stripper and thermo-chemical plants)

As part of the continuous improvement of its activities to protect the health and safety of its employees (an objective of all corporate policies), although there is no specific legislative requirement, Saras decided to supplement the assessment of noise exposure risk for workers by determining the acoustic levels in the various areas of the TMK and SWS plants, drafting the related "acoustic mapping" and identifying the areas at greatest risk.
The main aims of the study are to set out the current situation as regards noise levels in the various plant areas and to identify the places with the greatest risk, which will enable us to create an objective noise map. This is a tool that can be easily understood by both the employer and the plant operators for the purposes of preventing the risk of exposure. This mapping will enable us to easily identify:

- the plant areas that are similar in terms of equivalent noise levels, as per the risk bands set out in Section VIII, Chapter II (Protection of employees from risks of exposure to noise during working hours) of Legislative Decree 81/2008, and the related percentages of plant surface areas
- peak levels (ppeak) measured on the "C" scale
- the correct individual protection equipment, which with their capacity to minimise noise, help to ensure that exposure limits are not exceeded
- the employer's obligations arising from the application of Section VIII, Chapter I (General Provisions) and Chapter II (Protection of employees from risks of exposure to noise during working hours) of Legislative Decree. 81/2008.

The acoustic zoning distribution of noise levels in the working environment was then extrapolated from the sound levels obtained in the plant's accessible operational area.

Table 36 - Acoustic risk category (article 189 of Legislative Decree 81/2008)

ACOUSTIC RISK CATEGORY	LEVEL OF PERSONAL EXPOSURE		RISK
0	LEX,8h < 80 dB(A)	p_{peak} < 135 db (C)	Absent
I	80 dB(A) < LEX,8h < 85 dB(A)	135db (C) <p_{peak} < 137 db (C)	Low
II	85 dB(A) < LEX,8h < 87 dB(A)	135db (C) <p_{peak} < 140 db (C)	Average
III	LEX,8h > 87 dB(A)	p_{peak} < 140 db (C)	High

The equivalent levels of A-weighted acoustic pressure (LAeq, T) represent the log-weighted average of the instantaneous sound pressure values recorded in the respective measurement period.

The zoning highlighted various areas at different acoustic risk in regard to the areas of interest stipulated by art. 192 (Prevention and protection measures), para 3, of Legislative Decree 81/2008.

A series of tables containing the acoustic mapping of the plants (SWS and TMK) monitored was then prepared, showing the zones according to the different acoustic classes, and broken down by category of acoustic risk:

- homogenous area with stable noise levels of less than or equal to 80 dB (A)
- homogenous area with stable noise levels of between 80 and 85 dB (A)
- homogenous area with stable noise levels of between 85 and 87 dB (A)
- homogenous area with stable noise levels of over 87 dB (A)

The results provided a comprehensive picture of the noise levels produced and their spread in the relevant operational area of the TMK and SWS plants. An analysis of the phonometric data enabled the company to quantify the potential acoustic effects of the noise in the working environment under normal operational conditions. The results showed that noise in the various areas of the TMK and SWS plants (which recorded different levels) does not spread very far and is only concentrated in small areas, mainly in the monitored area and near certain noisy machinery. The situation will, however, be closely monitored with regard to the provisions imposed by Legislative Decree 81/2008.

The plant's operational areas have been divided into acoustically homogeneous zones, according to the classification set out in Section VIII, Chapter II, art. 189 of Legislative Decree 81/2008. The total area in which the sound levels reached and exceeded the exposure limit (87 dBA) is around 11.2 % of the TMK area and 47.16% of the SWS plants. In each case, the C-weighted peak (ppeak) value of 135 dB(C), used as a substitute for the LEX equivalent value, 8h = 80 dB(A) and corresponding to the "lower action level" established by the regulation, has never been exceeded.

Electromagnetic fields

In 2008, a new study was carried out as an update to previous studies, pursuant to Section VIII, Chapter IV of Legislative Decree 81/08. Workers' exposure to electromagnetic fields was measured to improve knowledge about these exposure levels through the monitoring of working activity (monitoring of the three shifts using personal dosimeters) and certain work points (about 42 fixed points with low and high frequency readings), selected to give a comprehensive picture of the site. The jobs monitored were selected according to the greatest likelihood of exposure, but staff working in the offices were also monitored. Analysis of the magnetic induction readings from personal dosimeters at industrial frequency (about 50 Hz) showed that the maximum legal limit of 500 µT was not reached at any time for any of the jobs in question. The average exposure level during the work shift was 1.23 µT, i.e. well below legal limits. The study did not detect any maximum exposure levels exceeding the threshold limits; generally, average exposure levels for the 22 jobs monitored were measured in terms of microteslas, which is extremely low. Analysis of the high-frequency electromagnetic field readings also showed compliance with threshold limits. Electric field readings also came in at zero for all the points monitored. The electric field readings took place under normal working conditions.

Ionising radiation

In accordance with the requirements of Legislative Decree 230 of 17 March 1995 and Legislative Decree 81/08, Saras has appointed a qualified expert to carry out periodic checks for potential staff exposure to ionising radiation and to produce the related accompanying documentation. There are some instruments at the refinery that use X-ray sources (analysers in the Chemical Laboratory) and radioactive isotope sources (level measuring instruments at the CCR plant and FFC Stage IV). Use of these instruments has been duly authorised by the Prefecture of Cagliari.

No controlled or supervised zones have been identified based on the features of the equipment, the measurements carried out, operational conditions and dose assessment, and therefore all areas surrounding the equipment using radioactive sources are categorised as “unclassified”. In view of the low irradiation levels in question, there is no possibility of operators or visitors to the area absorbing doses differing significantly from those absorbed in natural environments, and they are therefore included in the general population, with a legal dose limit of 1,000 µSv a year.

Biological agents

Monitoring in 2011

Microbiological monitoring campaigns aim to monitor the biological sources identified and check seasonal trends in concentrations. An objective comparison of results achieved in different operational conditions (summer and autumn) not only enables a thorough risk classification but, most importantly, provides an assessment of the effectiveness of the preventative systems identified and adopted for airborne biological pollutants (bioaerosols), especially of the air and wastewater near the refinery's purification unit at the WASTEWATER TREATMENT FACILITY. The study was carried out pursuant to Legislative Decree 81 of 9 April 2008 (implementing art.268, Section X – Exposure to biological agents) and of EC Directive 2000/54.

Some of the work activities envisaged by the law-makers that could involve potential exposure to micro-organisms include those carried out at urban and industrial wastewater purification units, where advanced technology is used to support the natural, aerobic and anaerobic process of bacterial degradation.

The following parameters are monitored:

- Total bacterial count
- total coliforms
- escherichia coli
- salmonella spp and legionella pneumophila in the aerosol
- escherichia coli and salmonella spp in wastewater

The method used to assess biological risk at the wastewater treatment plant complies with operating protocols stipulated by existing legislation and is carried out in a sequence of phases:

PHASE 1 - DATA COLLECTION: STRUCTURE

- Site assessment with map and designation of use of the working area
- Assessment of the potential pollution sources (activity, machinery, microclimate)
- Assessment of management protocols (maintenance procedures)

PHASE 2 - AUDIT

- Inspection of the environments and assessment of plant, equipment and production layouts

- Definition of parameters (bacterial classification) to be researched based on the activities carried out
- Definition of the most representative sampling points for each operational area
- Definition of a timetable of action (4 samples in different environmental and operational conditions)

PHASE 3 - MONITORING
- Survey using an impactor air-sampling device (Surface Air System).
- Surveys of the internal and external microclimate (temperature, relative humidity and air direction)
- Definition of risk category

The survey may be considered complete if the results of the checks of the first three phases are negative or acceptable. The protocol states that the survey should only continue to phases 4 and 5 if the results are abnormal (high-risk category). The results of the monitoring show that the objectively estimated value relating to the size of the risk at the WATER TREATMENT PLANT is low, as the species identified are correlated with the nature and type of the matrices (waste), the treatment methods and environmental conditions. Workers' levels of exposure to biological agents, estimated by area of the PWP-BWT – Cooling plant, examined during the monitoring, show overall risk values of average-low (risk = 2 4). Levels of exposure are moderate (2nd-4th degree) and mainly limited to one concentration of Total Bacterial Count and moulds. The isolated pathogenic species recorded a low concentration, and consequently, have a limited impact thanks to suitable prevention systems (the use of Personal Protection Measures (PPMs) and the correct behaviour by operators). Only three of the points identified recorded average risk values. An analysis of the results between September and the second half of 2011 confirm the risk classification at average-low levels of exposure. Although the individual species identified belong to level 2-3 classes of pathogens (moulds), they recorded concentrations that are considerably lower than the limit values.

Lighting

Lighting at the refinery has changed radically in recent years, and adequately meets the requirements for working and moving around within the site. However, a specific series of lighting checks was performed in 2007 by a specialist company, which carried out a systematic study of the lighting situation in both the plant areas and the offices. The study indicated areas of the site where improvements could be made.

After the study was completed, the site drew up a multi-year plan to improve lighting at the various plants.

Microclimate

This type of monitoring is conducted according to a three-year programme, and is carried out at representative points, i.e. at the centre of the environment in the case of a homogenous area, and at specific points if there are particular locations requiring assessment.

The microclimate survey carried out in 2006 was repeated in 2008/2009. The main purpose of the surveys was to check wellbeing indicators in moderate environments, and heat stress indicators in warm environments. The assessments are based on basic environmental parameters (air temperature, mean radiant temperature, relative humidity and air velocity) and personal parameters (metabolic energy expenditure and heat resistance of clothing).

The results of microclimate assessment in moderate environments are expressed in percentages according to satisfaction or dissatisfaction due to heat or cold.

Analysis of environments in refinery areas defined as "moderate environments" (61 environments in total) shows that dissatisfaction levels of less than 10% (the UNI EN ISO 7730 standard target) were recorded for 48 points, representing 78.7% of the points assessed. None of the environments recorded a dissatisfaction level equal to or more than 30%. The following indices were included in the criteria for assessing hot environments in the survey:

- the WBGT (Web Bulb Globe Temperature) index, pursuant to UNI EN 27243
- the HSI (Heat Stress Index)
- the Required Sweat Rate index (SWreq), pursuant to UNI EN ISO 7933

The analysis of warm environments included calculation of the continuous exposure limit, which was compared with effective exposure duration. None of the three indices showed rates higher than the alarm threshold for a given point since the SWreq limit was not exceeded for any of the points. Generally the environmental analyses show a reduced incidence of heat stress in critical zones.

Health monitoring – 2010 Health Report

The health monitoring plan, drawn up by the competent doctor, provides for the following clinical and instrumental tests for all employees at the site:

- preventative medical consultations
- spirometry
- audiometry
- biohumoral tests
- urinary metabolites (hippuric acid, methylhippuric acid, total phenols, trans-muconic acid)
- eye tests
- drug tests

Pursuant to legislation in force, employees subject to health monitoring are invited every six months for the tests set out in the plan. At the first check, all the instrumental tests are carried out as well as the biohumoral and urinary metabolite tests. The second check involves biological exposure monitoring tests (complete blood count and urinary metabolites). Drug tests for emergency response teams and drivers are conducted at a later stage. Testing for psychotropic substances: in accordance with the provisions set out by the conference of the state and regions on 30 October 2007, pursuant to article 8, paragraph 6 of Law 131 of 5 June 2003, the site has created a specific protocol for testing for, and monitoring, psychotropic substances as part of general drugs testing.

The site's Safety Report

For the purposes of drawing up the Safety Report for the site, every five years the company carries out, for all its plants, a precise and in-depth analysis of its activities and the associated risks in relation to the refining process, the materials used and all the procedures involved in running a complex operation like an oil refinery. For this purpose, the company's existing plant and management system are examined, and risk scenarios and hypothetical accidents are reviewed, together with the possible consequences for staff inside the plant and the surrounding area. The Safety Report is therefore an invaluable tool for preventing risk situations from arising, through the examination of all possible prevention measures, and for identifying and adopting the technological solutions, equipment and safety systems that will ensure a suitable response to any accident and minimise its consequences. The Saras refinery issued its first Safety Report in 1989, and since then the document has been continually updated to reflect all changes made to the plant over the years, which had to be integrated into the existing system. An analysis of potential accident scenarios has ruled out any significant consequences outside the site for the time being; if an accident did occur, its impact would be felt in the direction of the S.S. 195 road, an uninhabited area.

The Safety Report was last revised in October 2010 (the previous revision was carried out in 2006, in turn a revision of the 2005 report in accordance with the provisions of Legislative Decree 238/2005), and was sent to the competent authorities the same month.

In July 2007, the Sardinian Regional Technical Committee for Fire Prevention completed its examination of the Safety Report and issued its final technical assessment. The Safety Report and the above-mentioned process refer to the Sarroch site as a whole. The conclusions, reported by the Committee in its detailed minutes, record the positive outcome of the assessment and endorse the continuous improvement activities undertaken by the site operator.

The Internal Emergency Plan (IEP)

After defining the risk scenario for the internal plant area, the company drafted its Internal Emergency Plan (IEP), which includes the procedures to be adopted and action to be taken in the event of an accident, with the aim of managing any such occurrence with maximum efficiency and minimum impact via co-ordinated intervention. The objective of the IEP is to ensure the company reacts as effectively as possible to accidents by:

- preventing and minimising injury and providing assistance to any casualties
- bringing accidents under control and limiting their effects
- preventing and minimising environmental damage
- preventing and minimising damage to company property.

As mentioned earlier, the IEP, which is regularly revised to take account of changes in operating and plant conditions, also includes the Marine Pollution Prevention Plan, drawn up to deal with emergencies resulting from spills into the sea from the refinery or other critical events that could occur at the site's marine facilities. Based on the content of the refinery's Safety Report, the IEP defines the criteria for classifying reportable accidents, and distinguishes between three types (i.e. levels) of emergency:

- localised emergency
- general emergency
- near-accident.

A localised emergency refers to an accident affecting a distinct area of the plant that can be quickly handled using locally available resources. This generally means that a fire is not involved. A general emergency is an accident that, due to its nature or because of particular environmental conditions, risks spreading to other parts of the plant or areas outside the refinery. Lastly, near-accidents are situations that could potentially have led to an accident. Analysis and assessment of such events is essential to the continuous improvement of site safety. To ensure that accidents are dealt with quickly and efficiently, it is crucial to have reliable procedures for raising the alarm and alerting all personnel concerned, according to the type of event. Another important requirement of the IEP is to have clear and direct lines of communication to alert those involved in executing the plan, all personnel within the plant, the emergency services and the general public.

Communication and alarm devices (fire alarm buttons, telephones, fixed and mobile intercom units at various plant locations or in the possession of key personnel) are widely available throughout the refinery, so that personnel and equipment can be mobilised immediately. Following a list of priorities, the refinery's Emergency Co-ordination Centre (Figure 15, page 89) distributes information and provides updates on the management of accidents to certain organisations, depending on the type of incident involved, namely:

- the fire service
- the prefecture
- nearby industrial sites

Other relevant organisations include the Sarroch municipal authorities, the Sarroch carabinieri, the police and the port authority. These organisations are continually updated until the emergency is fully resolved, so that the local community can be kept informed

In relation to continuous improvement, the Committee recommended a number of areas for further examination and possible implementation. Ahead of the assessment for the 2010 Safety Report, Saras is currently involved in implementing the requirements of the Regional Technical Committee following the review of the 2006 Safety Report. In June 2011, the Prefecture of Cagliari approved the 2011 External Emergency Plan for the Sarroch urban area, which takes account of updates to the Safety Reports of the various sites at risk of a major incident in Sarroch's industrial area. The plan is available in the Civil Protection - Provincial Civil Protection Plans section of the Prefecture's website (www.prefettura.it/cagliari). Following the entry into force of EC Regulation 1272/2008 (better known as the CLP Regulation), fuel oil has been reclassified and, therefore, pursuant to article 6 of Legislative Decree 334/99, the 2010 Safety Report sent to the competent authorities in November 2011 needed to be updated. The update also included the revised classification of crude oil contained in the CONCAWE Report 11/10. In 2011, an inspection visit, arranged by the Environment Ministry, was carried out at the site, pursuant to Ministerial Decree of 5 November 1997. The purpose of the inspection, which took place over eight and a half days, was to ascertain progress in implementing a security management system. The inspection was carried out by a committee appointed for the purpose by the ministry. It concluded as follows: "The safety management system, as currently in existence, is largely adequate, and its essential elements comply, in terms of both structure and content, with the provisions of legislation and the Policy Document."

Safety systems at the refinery

The Sarroch site has a complex safety system designed to detect potentially dangerous situations immediately. The fire prevention water distribution system comprises an extensive network that covers the whole plant. All the storage tanks are protected by cooling systems; the most important of these are activated automatically if a tank overheats. Similar systems are installed on all the pressure tanks, LPG storage and loading equipment and any other piece of equipment for which a rise in temperature could compromise safety. The refinery also has eight fast and easily manoeuvrable fire trucks carrying powder and foam extinguishers, which can be operated quickly in emergencies and act as a backup to the installed systems. Safety equipment and systems are regularly checked, and carefully and routinely maintained.

Data

Incidents

Saras personnel. The policy of continuous improvement that Saras has adopted in a number of areas, such as the environment, technology and training, can also be applied to safety.

The External Emergency Plan (EEP)

The Internal Emergency Plan and External Emergency Plan (EEP) are closely related. The EEP is drawn up in conjunction with the Prefecture of Cagliari following a consultation phase involving numerous local bodies, law enforcement agencies and emergency services, including the regional and provincial authorities, the municipality of Sarroch, the fire service and the local health authority.

The plan concerns the Sarroch industrial complex as a whole, and considers hypothetical accidents concerning sites belonging to the various companies located there (Saras, Polimeri Europa, Sasol Italy, ENI, Liquigas, Air Liquide Italia) that could result in harmful consequences for the area outside the facilities.

In addition, the safety reports for the various production facilities and analyses of hypothetical accident scenarios (study of the local area, especially populated districts and infrastructure) are used to plan the best way of managing accidents given the potential effects on people living nearby.

Procedures have been defined for executing and managing the EEP, from raising the alarm to the intervention of all company and external personnel responsible for carrying out particular actions in accordance with the various roles assigned to them, including direct management of accidents at the site, accident control in the surrounding area, dissemination of information and assistance for local residents (road management, health services, media, etc.).

The organisations concerned (prefecture, police headquarters, fire service, traffic police, carabinieri, financial police, forestry authority, port authority, health authority, ARPAS, regional and provincial authorities, Sarroch municipal authorities) will be involved in various ways to ensure that accidents with potential consequences outside a production facility are managed quickly and effectively.

The effectiveness of the EEP and its implementation is monitored via accident response exercises involving the companies and organisations responsible.

Figure 15 – Location of the refinery's Emergency Co-ordination Centre

Table 37 – Saras employees – Incident indices

	2008	2009	2010	2011
Total frequency index	11.6	13.2	10.7	6.8
Accident frequency index *	6.4	7.5	6.3	3.7
Severity index	0.172	0.376	0.330*	0.155
Average duration	26.7	49.9	43.8*	41.8
Near accidents notified	10	60	82	129

* The calculation of this index includes all accidents that involved absence from work of at least one day (excluding the day on which the accident occurred)

Chart 44 – Saras employees – Total frequency rate

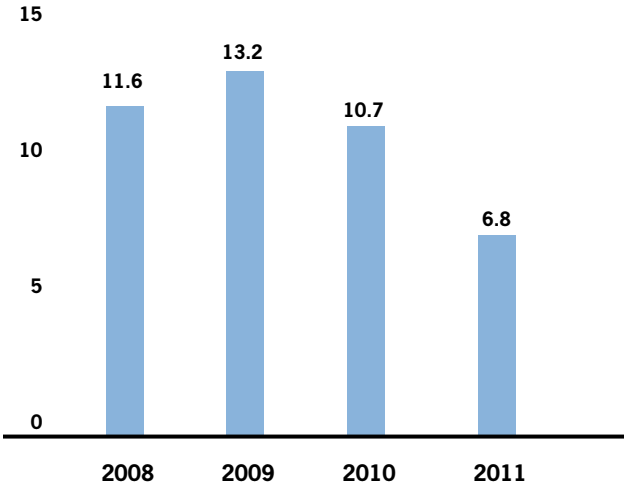


Chart 45 – Saras employees – Total incident frequency rate

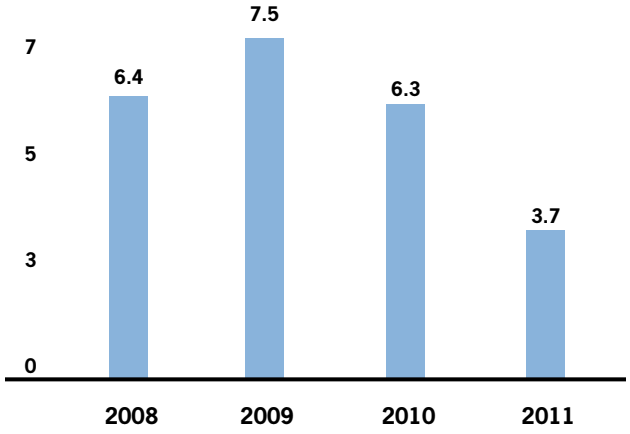


Chart 46 – Saras employees – Incident severity rate

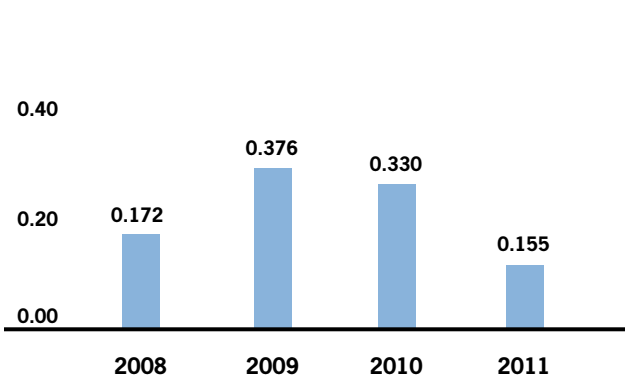
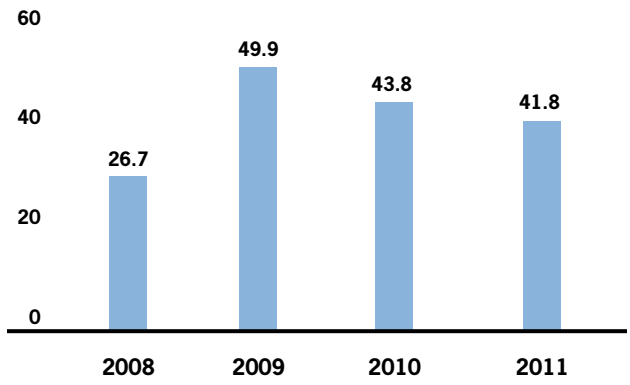


Chart 47 – Saras employees – Average incident duration (days)



The "Safety is our Energy" programme, launched in 2009, was completed in 2011. Significant efforts were spent on activities aimed at influencing - through training and information programmes - conduct, the main cause of accidents at work. The INAIL total frequency and incident frequency rate recorded in 2010 show significant improvement: the 2011 result was one of the best ever. In 2011, there was a further increase (+57%) in the number of near accidents reported. These were analysed and corrective action taken to prevent such incidents.

Contractors. Saras also records and analyses data on incidents at work involving staff employed by contractors. In 2011, a particularly serious incident occurred on the site, which caused the death of an employee of a contractor during refinery maintenance work.

Table 38 – External staff – Incident indices

	2008	2009	2010	2011
Total frequency rate	5.77	8.50	5.97	6.18
Accident frequency rate ***	2.26	4.90	2.83	3.27
Severity rate	0.061	4.939	0.203	2.752
Average duration	26.7	30.5*	58.8**	10**
Near accidents notified	15	127	153	60

*This figure does not include fatal accidents
** The figure is affected by two accidents that occurred in 2009, which extended into 2010. Stripping out these two accidents, the figure would be 31.6
*** The calculation of this index includes all accidents that involved absence from work of at least one day (excluding the day on which the accident occurred)

Chart 48 – External staff – Total frequency rate

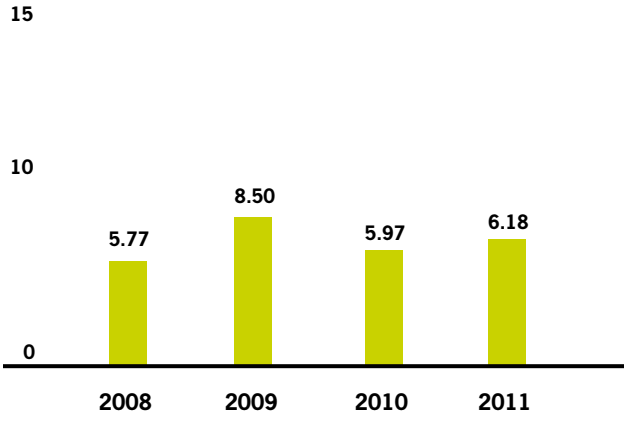


Chart 49 – External staff – Total incident frequency rate

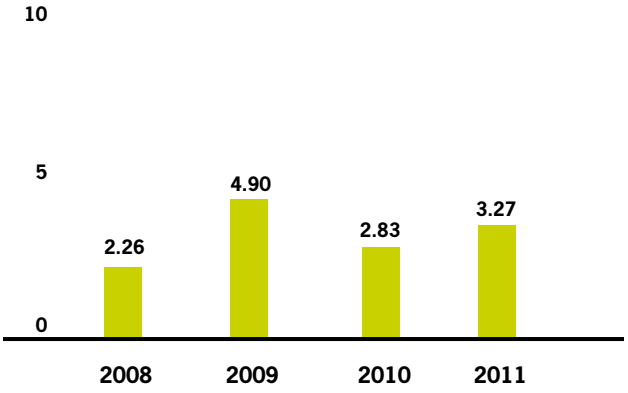


Chart 50 – External staff – Incident severity rate

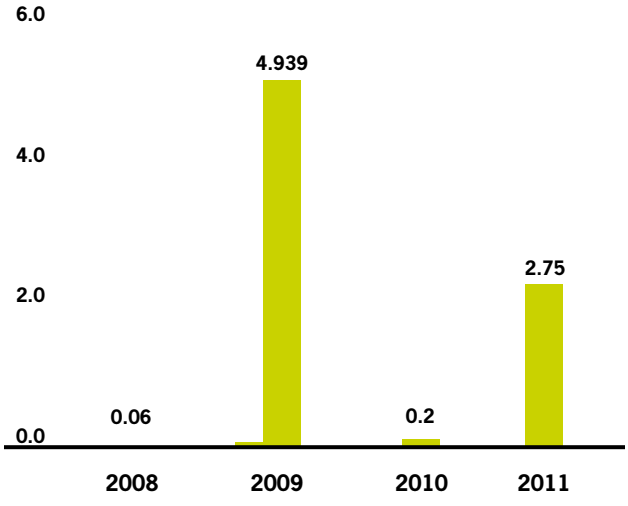
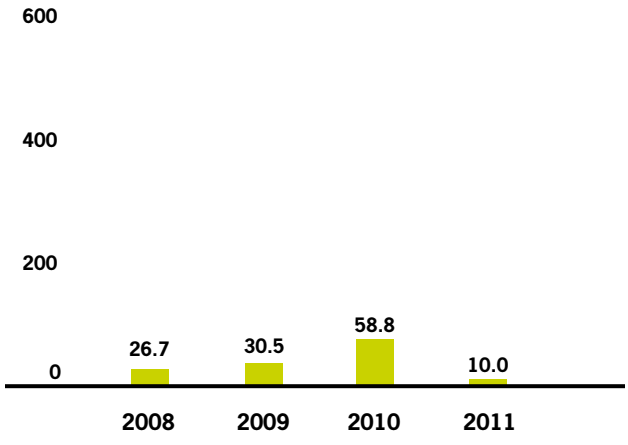


Chart 51 – External staff – Average incident duration



Incident analysis has shown that conduct is also the most critical factor for contractors. In 2011, Saras again increased its focus on contractors operating within the site, stepping up checks on the ground and classroom training activities by Saras staff. These efforts had a positive effect on the incident rates, which despite the events described above, recorded values in line with previous years.

Emergencies

In 2011, one general emergency and four localised emergencies were recorded. Neither emergency caused injury to people or plant shutdowns (Tables 39 and 40).

Table 39 – Emergencies – Number of events

	2008	2009	2010	2011
Localised emergencies	18	32	15	4
General emergencies	7	3	5	1
Near-accidents	11	20	4	17

Chart 52 – Localised emergencies

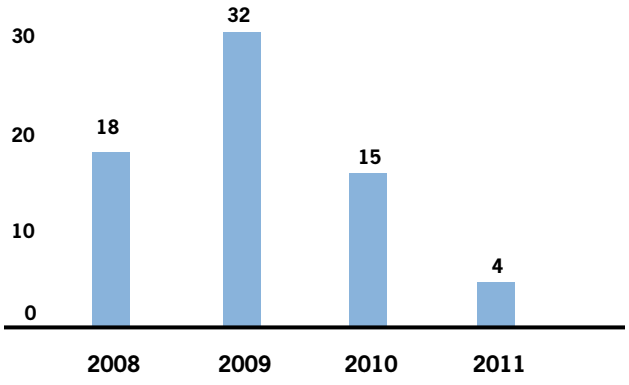


Chart 53 – General emergencies

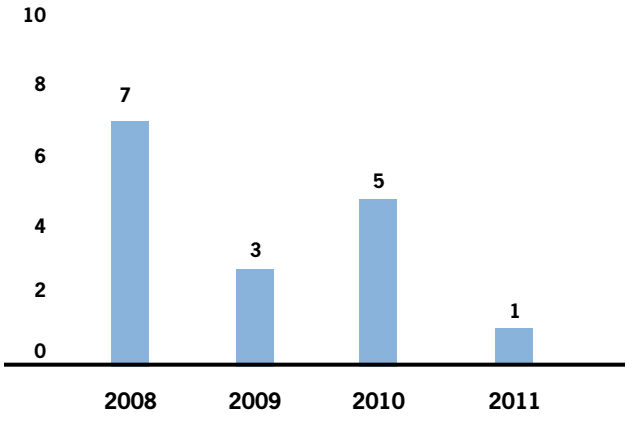


Chart 54 – Near-accidents

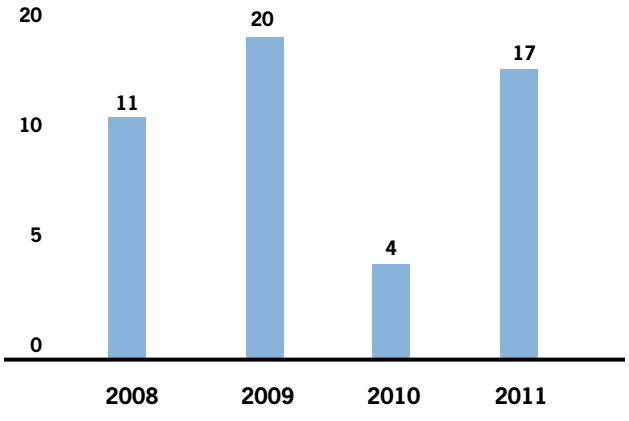


Table 40 – Shutdowns following an emergency

	2008	2009	2010	2011
Number of shutdowns	1	3	4	0
Number of days of shutdown	3	7	11	0

Chart 55 – Shutdowns

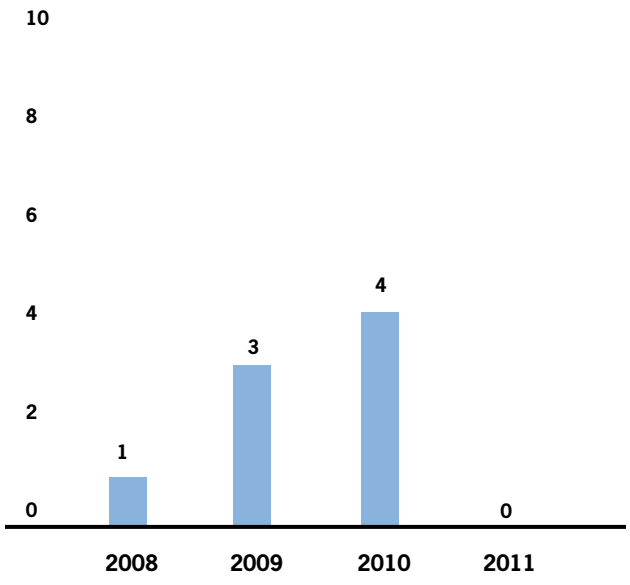
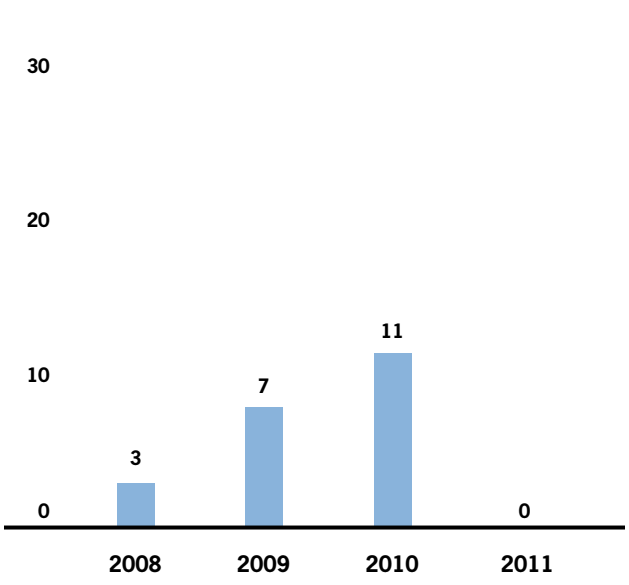


Chart 56 – Shutdown days



Reports of near-accidents (see Table 51) increased markedly in 2011. The chart shows the number of reports and analysis of near-accidents in 2008 and 2009. On the opposite page, Tables 55 and 56 also show the number of plant shutdowns following an emergency and the related number of shutdown days.

Investment in safety

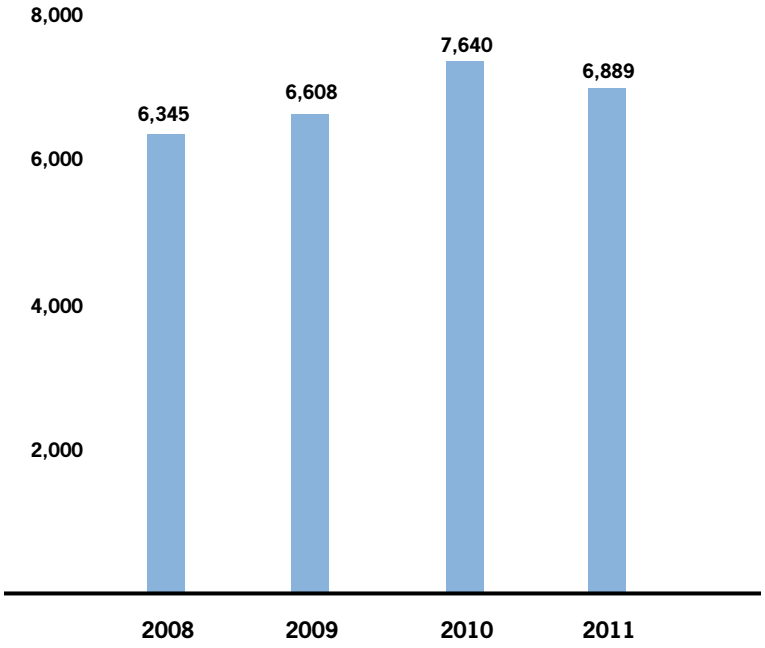
Between 2008 and 2011 Saras invested over EUR 27 million in projects and policies to continually upgrade safety levels at its site, spending on average around EUR 6,750 million a year. The main measures funded in 2011 involved both the improvement of existing safety equipment and modifications to plant and product movement systems, specifically:

- fitting of further block valves to the plants
- the replacement of glass sight gauges with magnetic ones at the processing plants
- the continued upgrading of the fire prevention system and new equipment
- the continued upgrading of the fire and hydrocarbon detection systems (CCR plant)
- the completion of the upgrade to the structural fire proofing
- safety improvements within the tank containment basins

Table 41 – Investment in safety (EUR thousands/year)

	2008	2009	2010	2011
Investment	6,345	6,608	7,640	6,889

Chart 57 – Investment in safety (EUR thousands/year)



Group companies

Data

The charts opposite show the results of the main frequency rates for Group companies. Data for the Sarroch site have already been illustrated. Neither the Saras head office in Milan, nor Arcola, Sarlux or Sardeolica, have reported any accidents entailing a loss of working days, either in the case of their employees or the staff of external companies.

Sartec reported one incident among its own staff and the rate of 3.96, when scaled to working hours, was in line with the Group average. In 2010, data for Saras Energia, which operates in the Spanish oil products distribution market, was included for the first time. Total frequency, incidents and severity rates were calculated according to the aggregate methods used for the other Group companies, all operating in Italy. The rates recorded by Saras Energia in 2011 were also, on average, higher than the Group average, corresponding to the results recorded by the service stations, where most accidents took place. In the following charts, the "Total" column shows the figure for the sum of events among direct and indirect employees compared with the sum of hours worked by those employees. Staff at the Sarroch site and the staff of Saras Energia particularly affect the Group figure, since the hours worked by direct staff account for 51% and 29% of the total respectively, while for the staff of contractors, the Sarroch site has the biggest effect on the data, with a percentage of 95.1%.

Chart 58 – Total frequency index

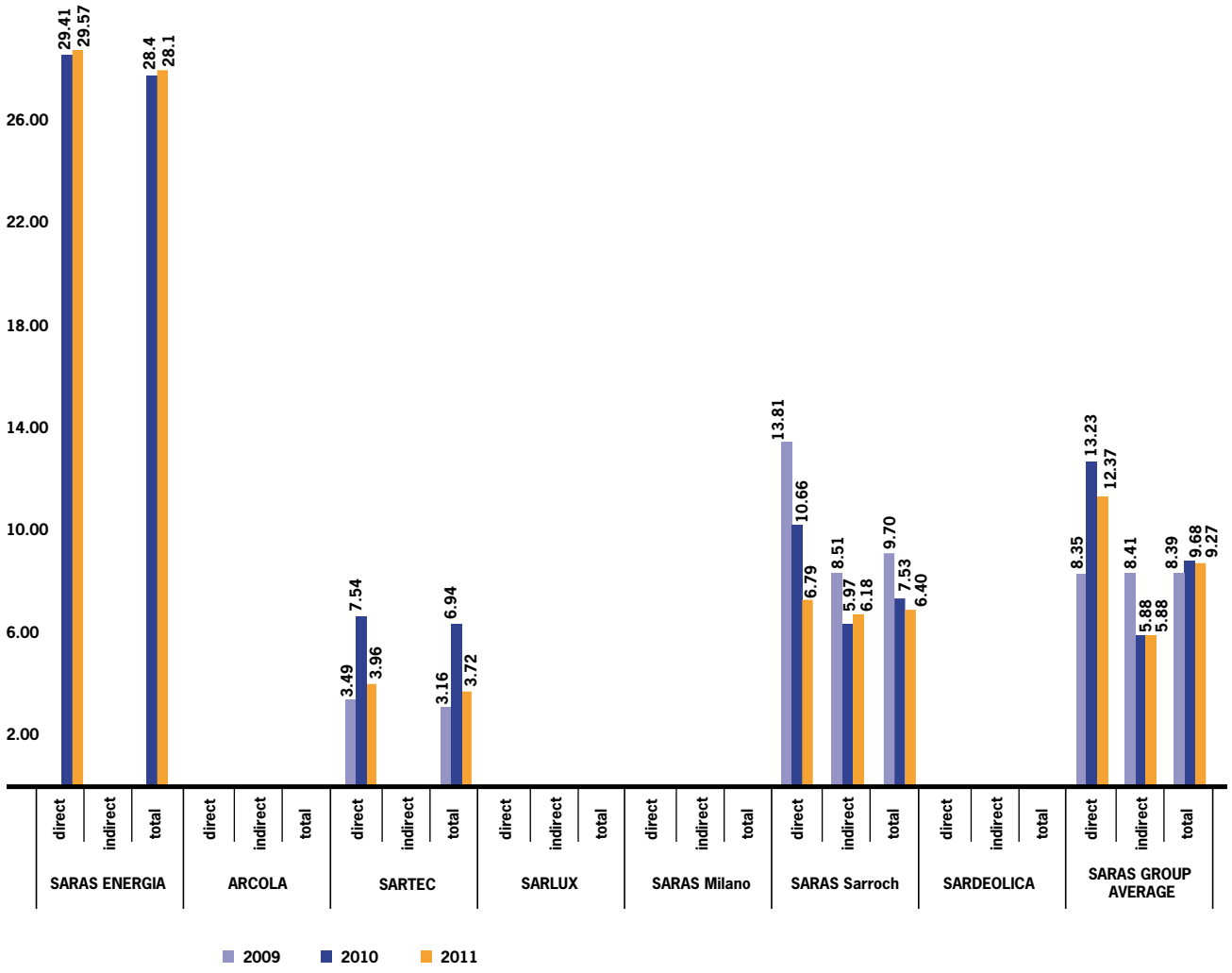


Chart 59 – Total accident frequency index

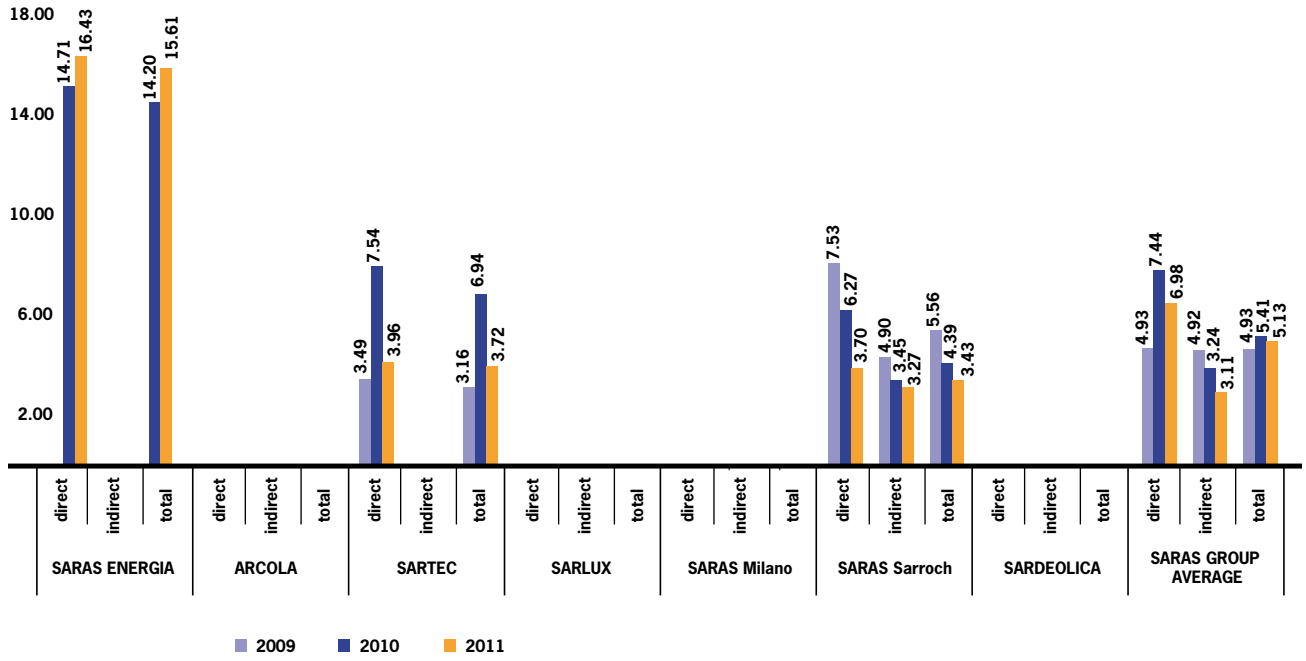
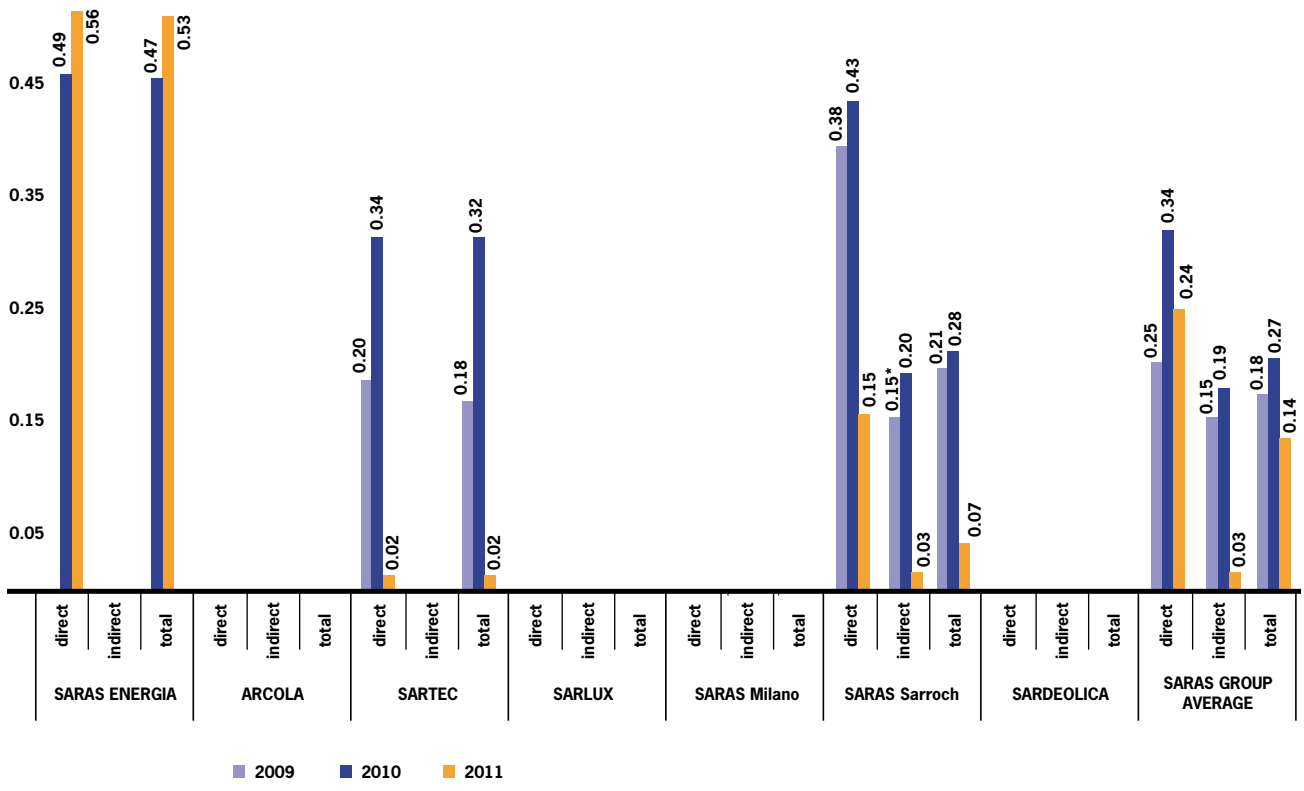


Chart 60 – Accident severity index



* The fatal accident (Saras Sarroch indirect) is excluded from the severity index

Occupational health monitoring

Sartec

Last year, monitoring and/or measurements taken to check employees' levels of exposure to the following risks to health and safety were carried out:

- noise
- vibrations
- hazardous substances relating to the exposure of operating staff in the chemical-oil laboratory
- microclimate
- ionising radiation.

The results of the surveys all gave encouraging results; the monitoring showed that no threshold limits set by legislation or technical regulations were exceeded.

Health monitoring - Excerpt from 2011 Health Report

In accordance with the guidelines set out by the Health Monitoring Plan created by the MC in accordance with the interdepartmental decree and the provisions of Legislative Decree 81/2008, the programme of controls based on the Risk Assessment was completed in 2011.

The health monitoring plan provides for the following clinical and instrumental tests for all employees at the site:

- preventative medical consultations
- spirometry

Chart 61 – Hours worked by direct employees

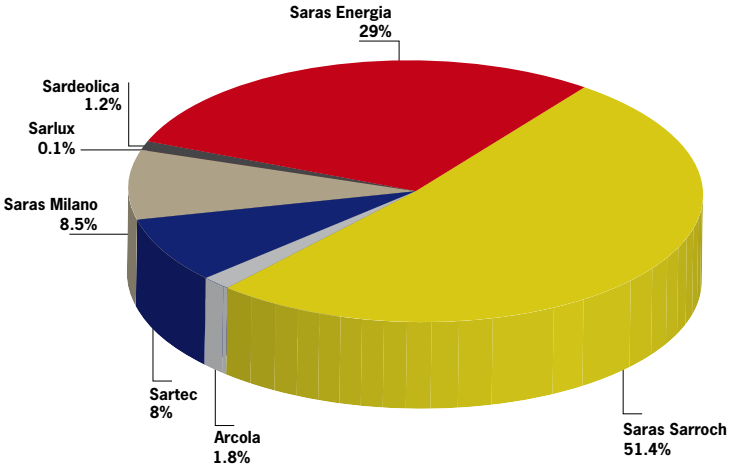


Chart 62 – Hours worked by contractors

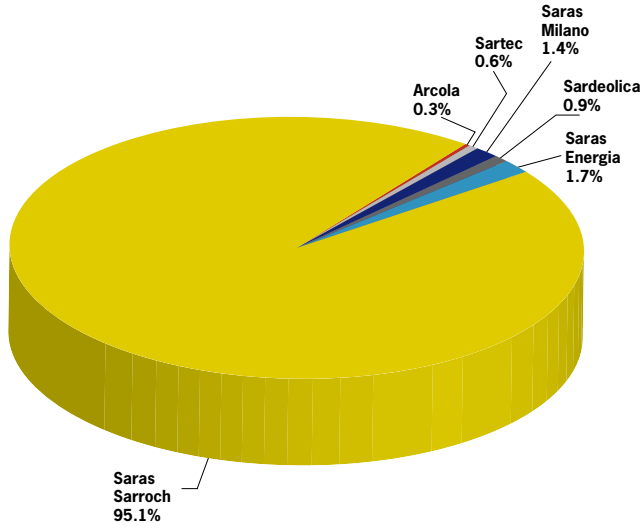
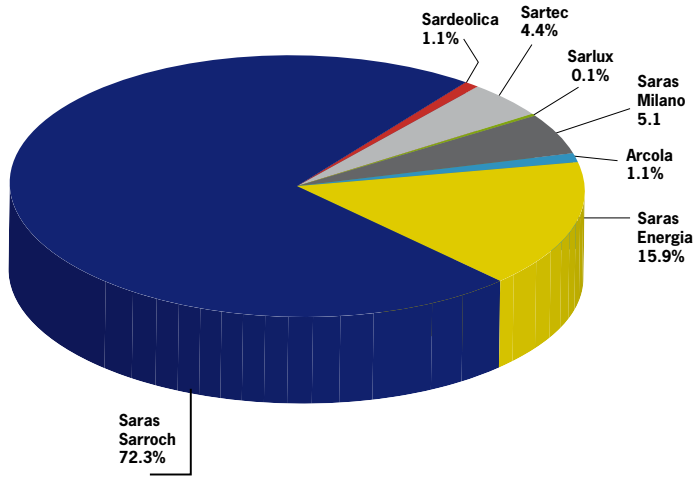


Chart 63 – Total hours worked



- audiometry
- eye tests
- biohumoral tests
- urinary metabolites.

In accordance with existing legislation, the individuals covered by health monitoring were invited to undergo the tests included in the monitoring plan on a regular basis commensurate with the type of activity carried out. The company's annual average headcount was 149.5 employees in 2011. During the year, 104 workers were monitored (102 periodic checks and two when they were hired), of which 46 also involved six-monthly checks to biologically monitor exposure to hazardous/carcinogenic substances (complete blood counts and urinary metabolites).

Specifically, the following tests were administered to workers:

- 86 spirometric examinations
- 44 audiometric examinations
- 86 biohumoral tests
- 46 urinary metabolites.

Analysis of the clinical and instrumental test results paints an encouraging picture in regard to the absence of occupational illness and the general state of employees' health.

Sardeolica

Since the time of its construction, Sardeolica has carried out monitoring activities **designed to measure** the potential effects on the staff working at the wind farm site. The outcome of the monitoring of noise and electromagnetic fields combined with the results of the health report have confirmed that there are no risks relating to these factors for the staff working at the site.

Arcola Petrolifera / Deposito di Arcola

Health monitoring - 2011 Health Report

The health monitoring plan, drawn up by the competent doctor, provides for the following clinical and instrumental tests for all employees at the site to carry out a risk assessment:

- preventative medical consultations
- spirometry
- audiometry
- biohumoral tests
- urinary metabolites.

Glossary

Glossary

BALLAST WATER Water deriving from the ballasting of empty ships with sea water.

RELIABILITY The reliability of a piece of equipment is defined as the probability that it will function correctly, for a specific period of time, under certain conditions.

AIA (Integrated Environmental Authorisation Permit) The AIA (integrated environmental authorisation) permit is a provision authorising operation of a plant, while imposing measures for the avoidance or reduction of emissions into the air, water or soil in order to achieve a high level of overall environmental protection. The AIA permit replaces all other environmental permits, authorisations, approvals or opinions specified by law and in the implementation legislation.

ARPAS (Regional environmental protection agencies) These are regional agencies tasked with environmental monitoring and protection at local level. They were established under Law 61 of 1994, together with ANPA (Agenzia Nazionale per la Protezione dell'Ambiente - the Italian Agency for Environmental Protection and Technical Services), now ISPRA and formerly also known as APAT, which directs and co-ordinates the regional agencies and those based in Italy's autonomous provinces. In the years that followed, all of Italy's regions and autonomous provinces set up their own agencies. ARPA Sardinia (ARPAS) was created under Regional Law 6 of 18 May 2006.

AUDIT A term used in various contexts to mean verification by inspection or assessment. It indicates a systematic, independent and documented process to obtain evidence (registrations, declarations of fact or other information) and to assess it objectively, with the aim of determining the extent to which the criteria of the verification by inspection (policies, procedures or requirements) have been met.

GASOLINE A mixture of hydrocarbons made up of fractions from various refining processes. In ambient temperature and pressure conditions it takes a liquid form.

REMEDIATION Any action, whether physical, chemical or biological, to sanitise situations of contamination or to remove disused plants in order to eliminate or limit risks to human health and/or to the environment.

CO (carbon monoxide) A gas produced by the incomplete combustion of vehicle fuels and fossil fuels. The main source is gasoline engines that do not have catalytic converters.

CO_2 (carbon dioxide) An odourless, colourless, flavourless gas produced from combustion, respiration and decomposition of organic material. Its characteristics include the ability to absorb infrared radiation emitted by the Earth's surface, thereby contributing to the greenhouse effect.

COD (chemical oxygen demand) The quantity of oxygen needed to oxidise the organic content of waste, including non-biodegradable matter.

COGENERATION The process by which two different energy products, such as electricity and heat, can be generated together by a single, purpose-built plant, resulting in high environmental efficiency.

DESULPHURISATION

The process for treating oil fractions in order to reduce the sulphur content in refined products.

DISTILLATION

The process of progressive separation of crude oil components in the distillation column – into the base of which the crude oil is injected – via the counterflow of liquid and gas, which respectively absorb the heavier and lighter components.

GREENHOUSE EFFECT

A gradual increase in average atmospheric temperature due to the increased concentration of gases in the atmosphere. Substances that contribute significantly to the greenhouse effect (greenhouse gases) include chlorofluorocarbons (CFCs), carbon dioxide (CO_2), methane (CH_4), nitrogen oxides (NO_x) and sulphur hexafluoride (SF_6).

EMAS (Eco-Management and Audit Scheme)

Established by EEC Regulation 1836/93, updated by EC Regulation 761/2001 (EMAS II), this is a voluntary scheme intended to promote continuous improvement in the environmental efficiency of industrial activities. Under the regulations, participating companies must adopt environmental management systems at their production sites based on policies, programmes, procedures and objectives aimed at improving the environment, and must publish an environmental declaration. Before a site can be added to the register set up by the European Commission, this declaration must be approved by an inspector accredited by an authorised national body. In Italy, this body is the Ecolabel and Ecoaudit committee, which has been operational since 1997 and works with the technical support of ISPRA.

EMISSIONS TRADING

On 13 October 2003, the European Commission published the European directive on emissions trading (Directive 2003/87/EC), better known as the emissions trading system. The key points established by the directive are as follows: from 1 January 2005 no plants falling within the scope of the directive may emit CO_2 (i.e. continue to operate) without appropriate authorisation; each year the operators of these plants must surrender CO_2 allowances equal to those released into the atmosphere to the competent national authority; maximum CO_2 allowances have been set for every plant regulated by the directive; CO_2 emissions effectively released into the atmosphere are monitored in accordance with the requirements of the competent national authority and certified by an accredited inspector.

EMISSION

The discharge of any solid, liquid or gaseous substance into the ecosystem from a plant or any other source, which can have a direct or indirect effect on the environment.

EPER (European Pollutant Emission Register)

The European Pollutant Emission Register was set up by the European Commission with its decision of 17 July 2000 (2000/479/EC) in accordance with Article 15 of European Council Directive 96/61/EC on integrated pollution prevention and control. It is the EU's first and most wide-ranging record of emissions into the air and water from industrial plants.

ESCO (Energy Service Company)

Companies that implement measures aimed at improving energy efficiency. The companies assume the risk relating to the initiative and release the end customer from any liability organisational and investment The financial savings obtained are shared between the ESCO and the end customer through various types of commercial agreement.

WHOLESALE

The wholesale market in oil products sold to customers such as industries, consortia and public bodies.

FILTER CAKE

The solid formed from the gasification of heavy refinery products. It contains high percentages of metals such as iron, vanadium, carbon and nickel.

DIESEL

A mix of hydrocarbons principally obtained from the primary distillation of crude oil.

IGCC (Integrated Gasification Combined Cycle)

A plant that allows for production of synthesis gas (syngas) from heavy hydrocarbons and subsequent combined-cycle production of electricity and heat.

IMMISSION

The release of a pollutant into the atmosphere or water, which then spreads into the environment. The concentration of the pollutant is measured at a distance from the point at which it was emitted.

ENVIRONMENTAL IMPACT

Any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organisation's activities, products or services.

CAM (classification of seawater) INDEX

This index is used to monitor the coastal marine environment, interpreting the values measured and placing them in one of three categories of seawater quality, assessed according to the degree of eutrophication of coastal systems and potential health risks. High quality - uncontaminated water.
Average quality - water with varying degrees of eutrophication, but ecologically intact.
Low quality - eutrophic water with evidence of environmental changes that are partly due to human activity.

INAIL FREQUENCY INDEX

Calculated using the number of accidents reported by the company to the work accident compensation authority (INAIL) and the number of hours worked (calculated using the formula: number of accidents reported to INAIL x 106/hours worked).

TOTAL FREQUENCY INDEX

Calculated using the total number of verified events (accidents reported to INAIL and cases of medical treatment) and the number of hours worked (calculated using the formula: number of events x 106/hours worked).

SEVERITY INDEX

Expresses, with reference to a given period of time, the ratio of the number of days' sick leave due to accidents to the number of hours worked (calculated using the formula: number of working days lost x 103/hours worked).

INES (Inventario Nazionale delle Emissioni e loro Sorgenti - National Inventory of Emissions and their Sources)

The inventory set up pursuant to Legislative Decree 372 of 4 August 1999 (implementing Directive 96/61/EC) and to decrees issued by the Ministry for the Environment on 23 November 2001 and 26 April 2002. The register contains information on the emissions of Italian industrial sites that are subject to IPPC legislation. The legislation states that such companies must submit qualitative and quantitative data to ISPRA (formerly APAT) each year in relation to a set list of pollutants present in gaseous and aqueous waste from their plants. Communications are therefore forwarded to the Environment Ministry for sending to the European Commission, and will be used to create the EPER register.

IPPC (Integrated Pollution Prevention and Control)

A European directive of 1996 relating to the reduction of pollution from the various places where it is emitted throughout the European Union, implemented in Italy by Legislative Decree 59/2005.

ISO (International Organisation for Standardisation)

An international non-governmental organisation based in Geneva, to which the standard-setting bodies of around 140 countries belong. It is responsible for examining, drafting and distributing to the international community standards relating mainly to environmental management (ISO 14000) and quality assurance (ISO 9000) for companies in all sectors.

ISPRA (Istituto Superiore per la Protezione e la Ricerca Ambientale - Institute for Environmental Protection and Research)

An Italian research body, created in 2008 through the merger of three entities controlled by the Ministry for the Environment – APAT (Agenzia per la Protezione dell'Ambiente e per i Servizi Tecnici - Agency for Environmental Protection and Technical Services), ICRAM (Istituto Centrale per la Ricerca Scientifica e Tecnologica Applicata al Mare - Central Institute for Scientific and Technological Research Applied to the Sea) and INFS (Istituto Nazionale per la Fauna Selvatica - National Institute for Wildlife) – in order to streamline the work done by these three bodies and ensure greater efficiency in environmental protection while helping to contain public spending.

KWH (kilowatt hour)

A unit of measurement of electricity generated or consumed, equal to the power generated by 1 kW in one hour.

MW (megawatt)

A multiple of kW (kilowatt), the unit of measurement of a power station's power, i.e. its energy-generating capacity. It also measures the power consumed by an item of electrical equipment. 1 MW = 1,000 kW.

MWH (Megawatt hour)

Unit of measurement of electricity generated or consumed, equal to the power produced by 1 MW in one hour and equivalent to 1,000 kWh.

NO_X (nitrogen oxides)

Gaseous compounds consisting of nitrogen and oxygen (NO, NO_2, etc.), normally released during the combustion of fossil fuels when free nitrogen (N_2) is oxidised. In the atmosphere they are the main agents responsible for photochemical smog and, after SO2, the biggest cause of acid rain.

OHSAS (Occupational Health and Safety Assessment Series)

Regulations developed to replace the previous British Standard 8800 in order to meet the growing demand for a recognised standard on the organisation needed to manage health and safety. OHSAS 18001 certification was developed to be compatible with ISO 14001 and ISO 9001 and allow for the adoption of an integrated management system.

FUEL OIL

A heavy fraction obtained in oil refining and used as a fuel, increasingly in a form with low sulphur content, in order to limit negative effects on the environment in terms of atmospheric emissions (chiefly SO_2 and particles).

PIEZOMETER

A small-diameter tube or well inserted into a body of water and used to measure, by means of the water level reached in the tube, the piezometric level (the line where points with a level equal to that of the body of water are located) at a set point.

PM10

Particulates with a diameter of less than 10 mm (1 µm = 1 micrometer) which can pass through the airways and reach the lungs and are a potential health hazard, depending on the substances which they contain.

PPM (parts per million)

A unit of measurement of the concentration of a substance present in small quantities in a liquid or gas.

KYOTO PROTOCOL

An agreement approved by the Conference of the Parties in Kyoto, 1-10 December 1997, containing the initial decisions on the implementation of some commitments of the United Nations Framework Convention on Climate Change (UN-FCCC), which was approved in 1992 and ratified by Italy in 1994. The agreement came into force on 16 February 2005, following ratification by Russia. For the protocol to become mandatory at international level, it had to be ratified by at least 55 countries. The protocol's key points include a commitment by the industrialised countries (including Italy) to cut emissions of greenhouse gases (carbon dioxide, methane, nitrogen oxide, hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride) by at least 5% compared to 1990 levels during the commitment period 2008-2012. The same countries must also draw up projects for the protection of woodland, forests and agricultural land that absorb carbon dioxide and each create a national system for assessment of gas emissions. They may gain carbon credits by assisting developing countries to avoid pollutant emissions. The signatory countries will be subject to sanction if they fail to meet the targets set. The rules for developing countries are more flexible.

TSPs (total suspended particulates)

These are tiny solid particulates suspended in the air. They mostly comprise uncombusted carbonaceous material able to absorb various types of compound onto its surface.

REFINING

Processes for the transformation of crude oil into derivatives with various qualities (principally LPG, light gasoline, naphtha, kerosene, diesel and residues).

YIELD

The yield of a machine is defined as the ratio between the power distributed (or energy generated) and the power absorbed (or energy consumed) at a given time. The greater the yield, the more efficient the machine; the lower the yield, the more energy wasted.

REVAMPING

Measures taken at industrial plants to improve or increase processing capacity.

MAJOR ACCIDENT HAZARD

The probability that an event linked to an uncontrolled development in an industrial activity could give rise to serious danger, either immediately or in the future, for people and the environment.

MANAGEMENT SYSTEM

The organisational structure, planning activities, responsibilities, procedures, practices, processes and resources to formulate, implement, achieve, review and maintain control, where possible, over all the internal and external variables of an organisation.

SO2 (sulphur dioxide)

A colourless gas with a pungent odour released when fossil fuels containing sulphur are burnt. In the atmosphere high concentrations of SO_2 are the main cause of acid rain.

TEE (Titoli Di Efficienza Energetica, Energy Efficiency Credits)

Energy efficiency credits (which are also known as white certificates) serve as an incentive and certify that energy savings have been achieved through the implementation of specific measures. White certificates, which were created in Italy with the electricity and gas ministerial decrees of 20 July 2004 and came into force in January 2005, consist of credits that can be obtained and subsequently resold. Their value was originally fixed at 100 €/TOE. The energy value of one TOE is comparable to an average family's annual consumption of electricity.

TOE (ton of oil equivalent)

A unit of measurement conventionally used to determine the energy contained in various sources taking into account their calorific value.

SULPHUR

A chemical element present in crude oil in the form of sulphur compounds. Following recovery via desulphurisation processes, sulphur is sold for use by the chemicals industry.

Note

Note

Note

Prepared by

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HSE management system and legislation

Prevention and Protection

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