Saras Group
Environment, Health and Safety Report 2010


SARAS

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Foreword

Welcome to the Saras Group Environmental and Safety Report 2010.
In this year's report we have added the word "health" to the title because we have provided a more detailed description in the document of the range of activities related to health and occupational hygiene that have for years been controlled and monitored within our Group.
Health and safety in the workplace are both fundamental to enjoying a good quality of life, and current legislation treats these issues as two sides of the same coin.

Usually, it is safety that is more heavily emphasised and in which we have an explicit involvement, but our company has also always been committed to health and has strengthened and integrated all the activities it has launched over the years.

In 2010 we continued our collaboration with Du Pont, the world leader in safety, to consolidate the multi-year project entitled **"Safety is our Energy"**, intended to disseminate a "culture of safety" and promote safe behaviour at work and elsewhere in all of our lives. As our vision states: "We want 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".
In 2010 we took further steps to develop ways of spreading these messages through "safety talks" to involve and motivate all our staff on these issues. Our performance for the last half-year shows a marked reduction in accident frequency rates, and we believe that this is due to efforts to involve and motivate all employees accessing the industrial site.
The communication initiatives included a day of events entirely dedicated to safety issues, in which Saras' Board of Directors also took part.

Another important goal achieved in 2010 was the registration of produced/imported substances as required by REACH (Registration, Evaluation, Authorisation and Restriction of Chemical Substances), the regulation issued by the European Parliament. The main aim of REACH is to improve the protection of human health and the environment through the better and earlier identification of the intrinsic properties of chemical substances used in Europe.

On the environmental front, we have built on the emissions reduction results obtained in 2009 and confirmed improvements to air quality outside the industrial site, which is a fundamental factor in sustainable development.

The **Focus** programme, which concentrates our efforts to manage our business processes to maximise availability, reliability, efficiency and productivity over the long term, was stepped up significantly in 2010 with the completion of a number of projects, the definition of more efficient organisational processes and structures, and functional models of conduct, in order to guarantee Saras' competitiveness and future sustainability.

The market, which was showing signs of recovery in the early months of 2011, is now signalling general uncertainty for the "western" economies due to the crisis in North Africa. We are convinced that the action taken will ensure our continued competitiveness, allowing us to look to the future with confidence.

Dario Scaffardi
General Manager Saras S.p.A.


ARCOLA
Milano
Arcola
SARAS
Roma
Madrid
SARDEOLICA
Ulassai
Macchiareddu
Sarroch
Cartagena
saras
SARAS
akhela
SARLUX
SARTEC

The Saras Group

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 sale and distribution of oil products on the national and international market, 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
- the provision of IT services through Akhela and 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, established in 1962 to carry out refining activities. 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 sells oil products on the domestic wholesale market, in Sardinia, North and Central Italy.

Sarlux, a wholly-owned subsidiary of Saras, owns the IGCC plant and manages 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 121 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 is an IT company. Its offers two main types of services: information technology and embedded systems. Within its range of IT solutions, the issues of logical security, IT optimisation and business continuity are particularly important, while its embedded systems are chiefly applied in the automotive and multimedia fields.

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

SARAS

Saras has **1,287 employees**. Its registered office is in Sarroch, and it has an administrative office in Milan and a sales office in Rome.

Strategy and investment

The Saras Group's strategy is traditionally geared towards the continued technological development of the plant at the Sarroch industrial facility. Investments dedicated to this organic growth process have enabled the Saras Group to become one of the main operators in the Mediterranean over time, due to its highly flexible, complex and efficient plant. Given the highly capital-intensive nature of the refining industry, all investments and strategic plans have always been developed and assessed along broad timelines so that the effects of fundamental factors determining future trends in demand for oil products can be properly taken into consideration.

The Saras Group strongly believes that the profitability of its refinery will always be tied to operational efficiency, plant productivity, the capacity to convert heavy products into middle and light distillates and an ever-increasing drive for energy efficiency, which assumes ever greater importance in a context of continually rising crude prices. In late 2009 and early 2010 we therefore launched a dedicated asset management programme, with the support of a world-class consultancy group, aimed at increasing asset integrity (maintenance strategies, both routine and for shutdowns), asset efficiency (optimising consumption and losses) and asset effectiveness (plant productivity). The programme, entitled Project Focus, achieved significant results in 2010, increasing production efficiency and the availability of the various refining units and reducing certain costs in line with initial expectations. The project is expected to achieve further significant results in 2011. Estimates put improvements in efficiency and productivity at around EUR 20-30 million, and cost savings at a further EUR 10-15 million. In marketing, the Saras Group recently signed a storage and transit contract with an oil storage facility operator in southern Italy. The Group is also pursuing its strategy of growth in the Spanish retail market, evaluating opportunities offering interesting synergies. In the wind segment, the Group completed installation work for six new wind turbines at the Ulassai wind farm during the second and third quarters of 2010. With the completion of the final minor works currently in progress, the wind farm will reach its full installed capacity of 96 MW as early as the second quarter of 2011. There is also work in the pipeline to further develop some other sites, both in Italy and abroad. Finally, with regards to gas exploration activities, following the encouraging results from the seismic tests and geophysical surveys conducted in 2010, the Saras Group has determined the optimal location of the first exploration wells, and is currently taking the necessary steps to begin drilling activities.

The Sarroch site: refining and electricity generation

Saras conducts its refining activity at its plant 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

Investments made in 2010 and future developments

In 2010, investments totalled EUR 129 million, as shown in the table below. Investments were scaled down by comparison with 2009, after a decision to synchronise the timeline of the medium-term strategic plan with the macroeconomic situation. The uncertainty of the current climate urged caution in 2010 in order to preserve the Group's strong financial position.

Millions of Euros	2010	2009
REFINING	92,5	244,4
ELECTRICITY GENERATION	10,3	12,4
MARKETING	5,1	56,6
WIND POWER	14,9	0,3
OTHER ACTIVITIES	6,2	3,3
Total	**129,0**	**317,0**

The following projects were carried out in Refining:

Revamping of the MildHydroCracking-2 (MHC2) plant
Installation of the "third reactor", the key part of the work to enhance the MHC2, was completed in March 2010, enabling conversion capacity to be increased. Engineering activities for detailed design were also completed. Finally, installation of other equipment and key structures will take place in 2011.

Revamping of the Visbreaking (VSB) plant
Engineering activities have been completed, and factory construction of the new plant compressors has also been finished. Once in operation, the compressors will be fundamental to improving reliability and will increase the performance of the gas recovery section.

Energy recovery initiatives
Thermal integration work for energy recovery at the FCC plant has been completed. To date this has generated fuel oil savings of about 40,000 tons a year.

Logistics adjustments for biodiesel transportation
Adjustments required to receive tankers used for biodiesel transportation were carried out in 2010 to exploit synergies with the Cartagena plant. Tanks and lines suitable for biodiesel transportation and storage were also identified.

New steam reforming plant
Engineering activities continued for detailed design.

Electricity generation
Investments of about EUR 10 million were made in 2010, mainly for completion of changes to the sea water filtering system, technological improvements to the cooling tower and the modernisation of the DCS automation system at the IGCC plant.

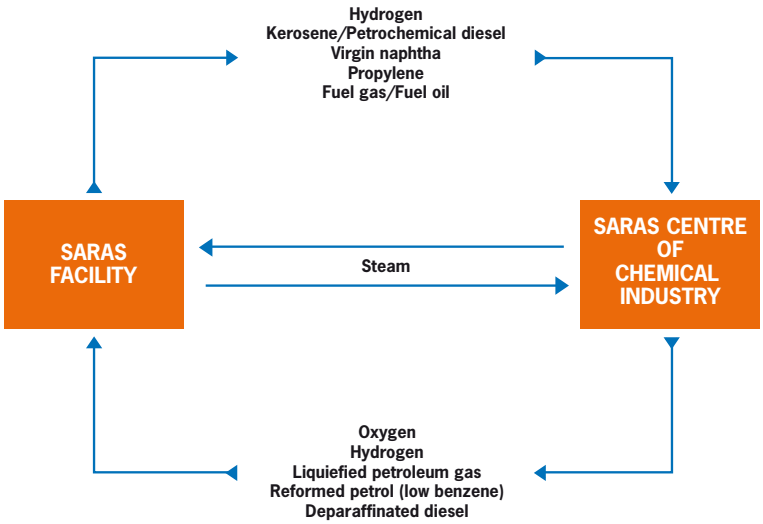
Wind segment
In the second and third quarters of 2010, the Saras Group invested about EUR 15 million in repowering the Ulassai wind farm, installing six new Vestas V80 wind turbines, in line with the original design for the wind farm. These investments are a milestone in achieving new installed capacity of 96 MW, which will be available in the second quarter 2011 when final minor works have been completed.
The projects described above are a fundamental part of the Saras Group's growth strategy and are vital for the achievement of our medium- to long-term corporate goals.

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 (thousand tons/year)

2007	2008	2009	2010
14,593	15,517	13,305	14,340

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, Air Liquide and Sasol Italy allows its refinery operations to be integrated with petrochemical production (Figure 1).

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

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, Sasol Italy, Air Liquide, Liquigas and Eni RM. 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.

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 percentage of sulphur in the oil products and to an improvement in the quality of middle distillates and gasoline.

Site layout

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.

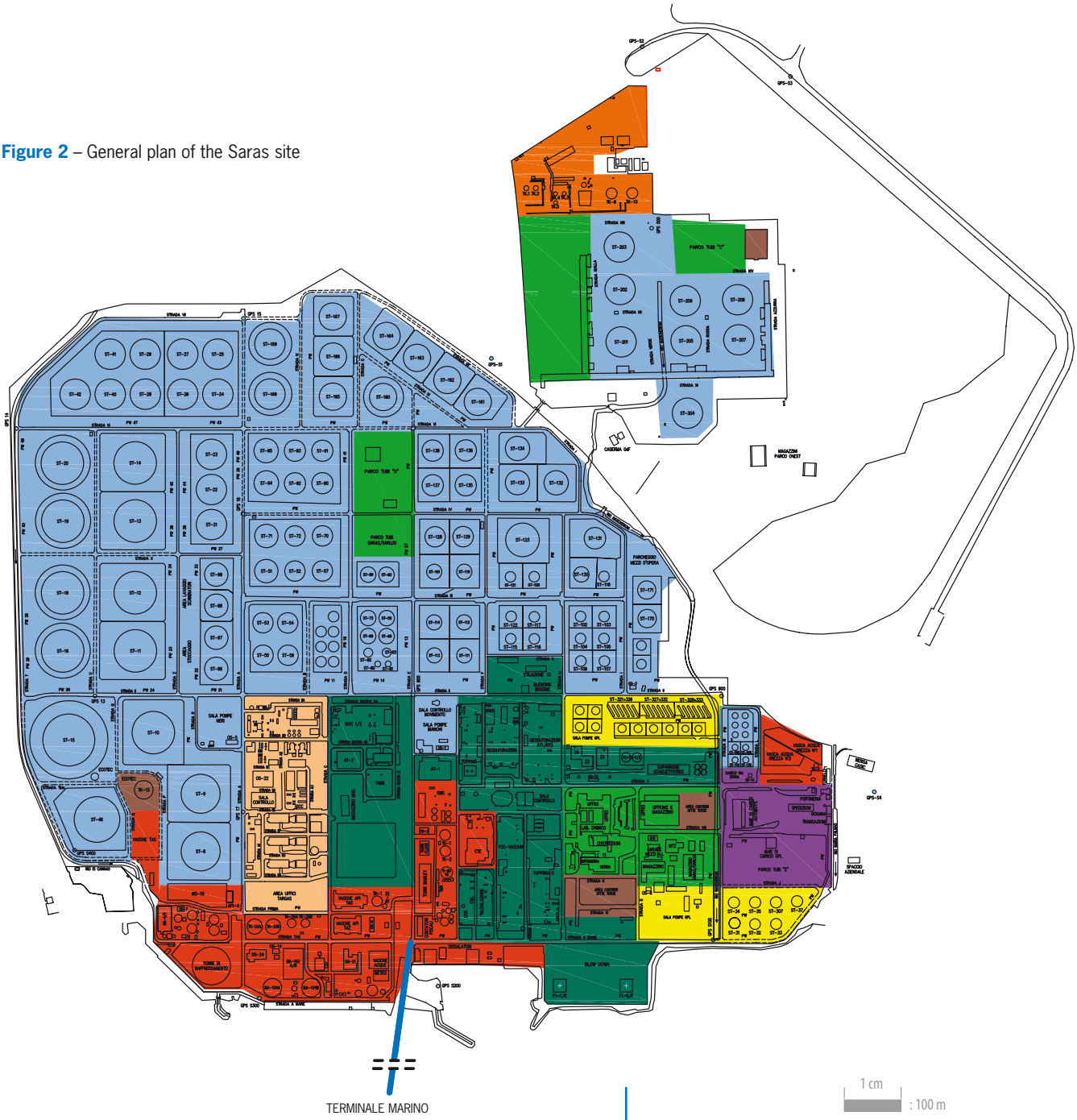
Receipt of raw materials and shipping of products through the marine terminal

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 2008-2010, 80% of oil products were shipped by sea.

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

Figure 2 – General plan of the Saras site



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 into a solid 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

The Sarroch plant has a high output of medium oil products (diesel) and light oil products (LPG, naphtha and gasoline), which in 2010 accounted for around 83% 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 2007–2010.

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

Specifically, in 2010, over 20% of total production of oil products was absorbed by the local Sardinian market (Chart 2).

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

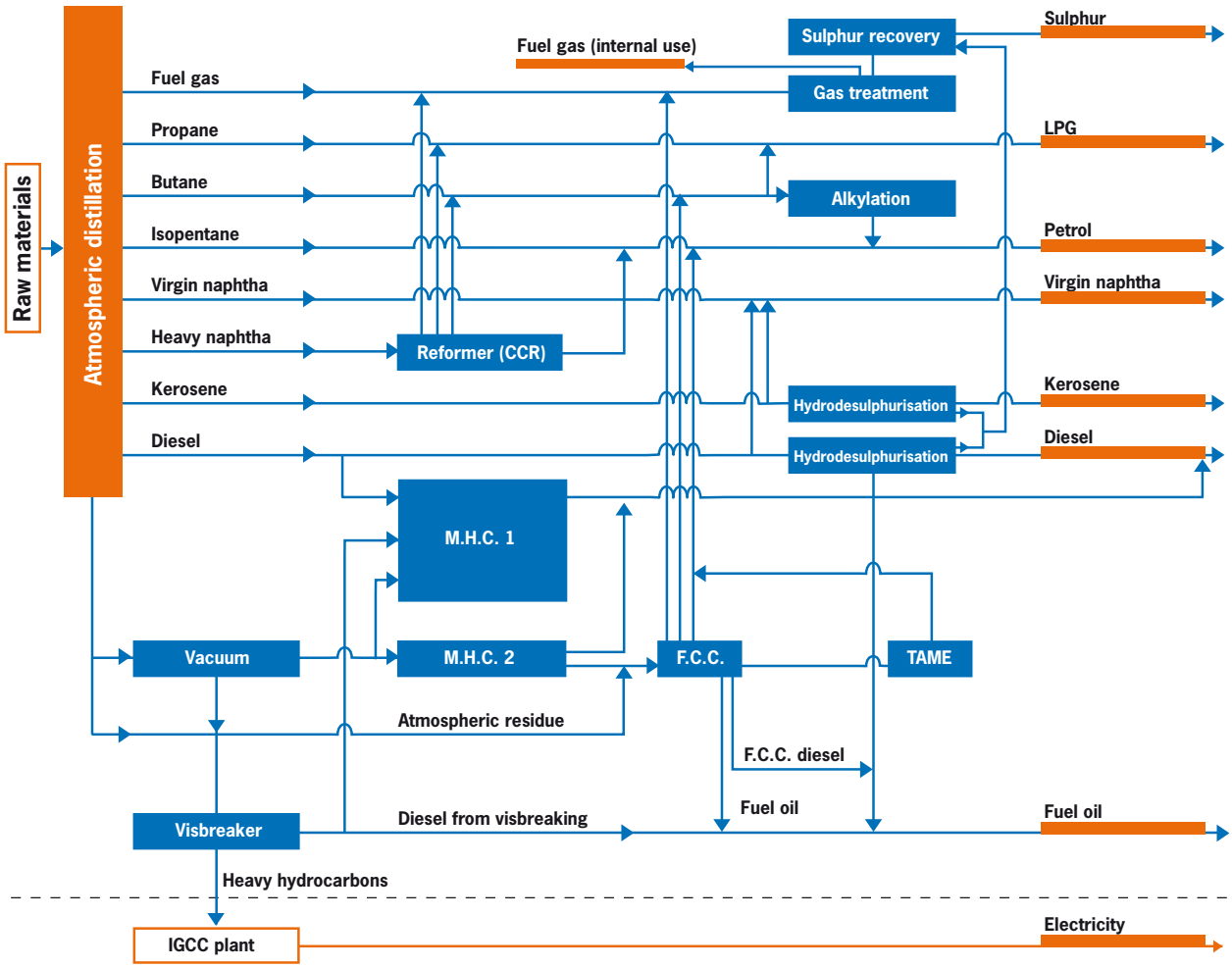


Chart 1 – Refinery products and consumption

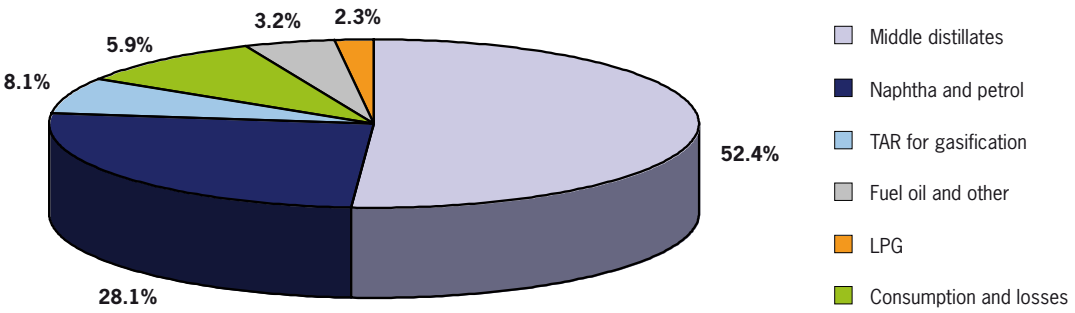


Table 2 – Oil products (tons/year)

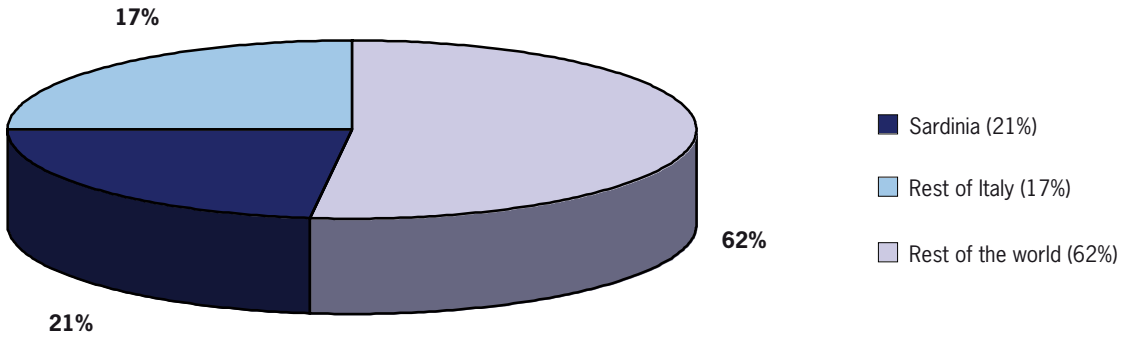
	2007	2008	2009	2010
LPG	306,000	337,000	221,000	323,000
Gasoline and virgin naphtha	4,039,000	4,056,000	3,343,000	4.024,000
Middle distillates (diesel, kerosene)	7,541,000	8,275,000	6,769,000	7.517,000
Fuel oil and other	707,000	825,000	1,119,000	463,000
Sulphur*	112,000	110,000	110,000	130,000
Heavy distillates (TAR)	1,120,000	1,121,000	1,077,000	1,166,000

* Includes sulphur recovered both from refining and the IGCC

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

	2007	2008	2009	2010
North Africa	55	47	43	38
Middle East	11	10	12	7
Russia and the Caspian	15	25	29	30
North Sea	18	16	16	11
Other	1	2	0	14
Total	100	100	100	100

Chart 2 – Total shipping, 2010



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.

Electricity – produced in three identical 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 envi-

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

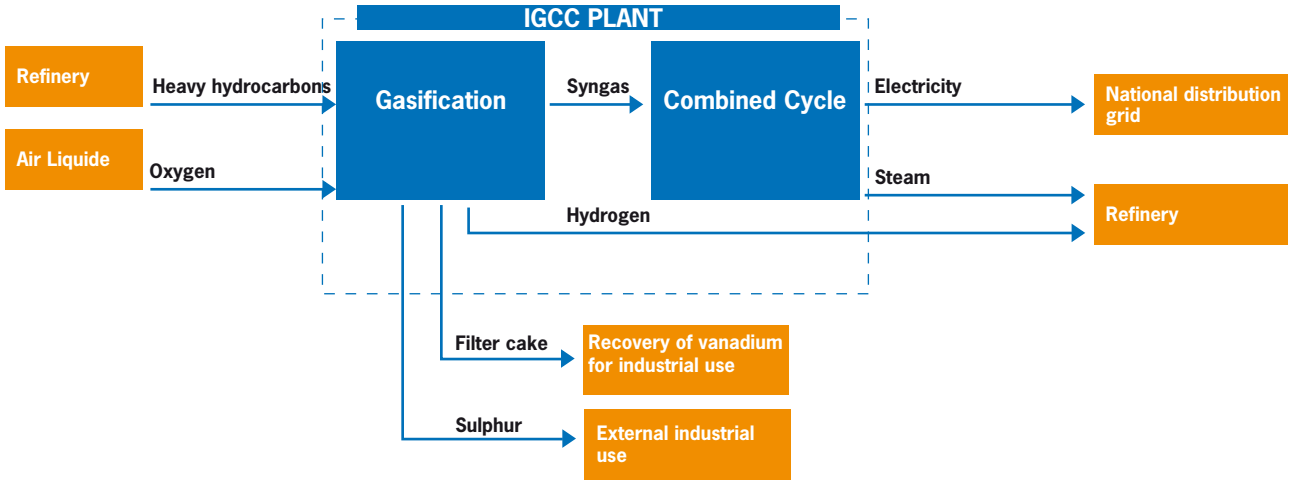


Table 4 – IGCC products

	2007	2008	2009	2010
"Gross" electricity (MWh)	4,432,136	4,251,353	4,086,439	4,339,335
Low-pressure steam (tons/year)	556,828	539,680	437,003	586,626
Medium-pressure steam (tons/year)	568,650	667,763	570,754	737,033
Hydrogen (tons/year)	31,451	34,042	37,939	39,731
Sulphur* (tons/year)	42,588	49,752	48,405	52,666
Vanadium concentrate (tons/year)	1,700	1.199	1,633*	1,122**

* 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.

ronmental 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.

A reduction in emissions produced by 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's equipment, especially as regards sulphur oxide emissions; furthermore, reduced fuel oil production has led to a fall in the number of ships crossing the Bay of Sarroch.

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 plant's 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 supplies. This water is then returned to the sea, in full compliance with all environmental quality criteria established by law.

Table 5 – Comparison of power production technology yields

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

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.

Storage of raw materials and products

The storage facilities on the site break down as follows:

- storage of raw materials and products in the tank farm
- storage of products for which excise duties have been paid in the national storage facility, located outside the bonded area, further along the S.S. 195
- storage of liquefied gases in special pressurised containers ("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 of reinforced concrete with cement floors (42 tanks), or earthworks (119 tanks). The fire-prevention system in the LPG storage areas is controlled by a device that, depending on various factors (including wind direction) activates systems to prevent fires and contain any product leaks. In addition, to prevent accidents, the LPG tanks are equipped with instruments that monitor and protect against unexpected 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 national storage facility and the marine terminal
- systems for the measurement and additivation of products before 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 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 services necessary 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 1,287, 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, activities aimed at strengthening relations with external parties, and in particular the local community living around the production facility, continued in 2010. 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 and sustainable development, including through involvement of and dialogue with employees, both direct and indirect, as well as all main stakeholders. In 2010, 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, which led to the creation 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.

The meetings were also an opportunity to reveal both the results achieved, and Saras' environmental programmes and objectives for further improvement, as reported in the two documents "Environmental Declaration" and "Environment and Safety Report" distributed on these occasions.

The main action taken in 2010 concerning the local community included:

- a meeting with the Municipality of Sarroch's Environmental Commission
- a meeting with the region's environmental, social, cultural and sports associations
- the publication in local daily newspapers of information regarding current and future environmental improvement programmes
- the "Saras for School" project, which unfolds during the school year and involves five elementary classes

In 2010, Saras celebrated the twelfth year of the School Project, a tradition that forms part of a framework of external relations activities aimed at the local community in a spirit of transparency and reciprocal collaboration. The initiative aims to promote and disseminate the culture of energy in schools through information and awareness-raising activities. The "Saras for School" project, which was devised and created by Saras and is supported by the Italian National Olympic Committee (CONI), the Italian Ministry of Education, Universities and Research (MUIR) and Unicef, provides a cycle of classroom lessons to learn about energy, safety and environmental protection. The programme takes place over the school year and involves about 300 Year 5 children in the elementary schools in the municipalities neighbouring the production site (Sarroch, Villa San Pietro, Pula and Capoterra Circle I and II). The project includes a visit to the Sarroch refinery and the Ulassai wind farm, an important opportunity to see production at first hand. The cycle of lessons ends with a project, devised and created by the children, showing what they have learned in the lessons. The best of these projects are awarded prizes at a final event attended by all the

classes taking part, the head teachers, municipal officials and representatives from CONI, Unicef and MUIR. At the event, the children, with the help of entertainers, take part in team games and creative activities inspired by the world of refining.
Like the programme that takes place over the year, the final event aims to increase the children's awareness of the importance of energy. The final event in 2010 also marked the opening of a technical-scientific laboratory within the Sarroch secondary school, a partnership between Saras and the Municipality of Sarroch, where students conducted experiments in collaboration with experts from the Saras refinery chemical laboratory.
Activities for schools have their own dedicated website at www.sarasperlascuola.it, an information and communication tool aimed at pupils and all those wishing to learn more about one of Sardinia's most important international industrial groups.

Group companies

Akhela and IT services

Akhela was created in 2004 from the merger of the IT and electronics companies of the Saras Group, from which it inherited vast experience in its field of activity. One of the keystones in Akhela's history is the remote management of the IT infrastructure of the Saras refinery. This enabled it to build a store of methods, skills, experience, procedures and systems for the supervision of mission-critical environments and services. Akhela's track record in managing the systems and infrastructure of Saras and of other high-profile companies demonstrates its ability to respond successfully to the challenging requirements of critical situations, highly complex systems and tight deadlines. Akhela's services break down into two areas: the development and management of IT services, and embedded systems. In the IT market, Akhela focuses on services and solutions designed to consolidate and optimise performance and to reduce the costs of operating IT systems. Its customers are medium- and large-scale organisations, for which safety and business continuity are absolute priorities. Akhela controls Artemide Tecnologie Informatiche. This acquisition has enabled Akhela to broaden its range of business intelligence and application management services. In the planning and development of embedded systems, Akhela has built up substantial expertise in real-time operating systems, signals processing and software development, winning major contracts in the automotive and avionics sectors and in multimedia systems for consumer and telecoms applications. Akhela currently has five bases: to its original offices in Cagliari (registered office and operational site) and Milan (sales), it added Rome in 2005, Turin in 2008, and Maranello in 2010, which are active in regional customer management. Akhela's procedures and infrastructure are designed to ensure maximum continuity of service and the utmost confidentiality regarding information and activities conducted on its customers' behalf. The company operates in accordance with benchmark standards on quality, is ISO 9001 certified and has attained Level 2 of the CMMI® for Development. Akhela has a total of about 258 employees. Because it

akhela

With **258 employees**, Akhela has five bases in Italy: Cagliari (registered office and operational site), Milan (marketing head office), Rome, Turin and Maranello.

1 - *sistema embedded*: sistema incapsulato, dedicato.

recognises the strategic importance of its human capital, Akhela invests systematically in professional and technological training. Finally, Akhela's search for innovation is highlighted by its partnership with universities, through participation in research projects and the creation of apprenticeships and internships, and the search for selected international partners, whose emerging technologies complete and add further value to Akhela's product range.

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:* systems monitoring air, water and emissions quality, 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

SARTEC
SARAS RICERCHE E TECNOLOGIE

With **154 employees**, Sartec has two locations in Italy: Cagliari, in the industrial zone of Macchiareddu (registered office, facilities and laboratories) and Milan (sales office).

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.

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. Sardinia's regional authorities also recently issued Sardeolica with a standardised permit to increase the facility's power from 72 MW to 96 MW. The new configuration, which will include the installation of a third processing bay and software changes to the wind turbines, is scheduled for completion in the first half of 2011. At full capacity, the Ulassai wind farm will produce about 190 GWh/year, representing the annual consumption of about 65,000 households and accounting for about 12% of Sardinia's installed wind power capacity and about 2% of Italy's installed wind power capacity (in December 2010, total Italian capacity was 5,797 MW). The wind farm is connected to the national electricity grid through an electricity substation. Power is sold to the grid operator, GSE, and the plant will also receive green certificates for 15 years after its initial start-up. The wind farm has obtained IAFR (plant fed by renewables) certification. In terms of its impact on the region, Sardeolica has 25 employees, mainly young graduates and diploma-holders from Ulassai and the surrounding area, chiefly employed in technical and operational management, plant operation and maintenance, environmental monitoring, activities related to the company management system and in administrative, purchasing and contracting activities. Design engineers have also been trained to research, conduct feasibility analyses for, develop and build new wind farms, including in support of other companies in the Saras Group. This is particularly significant since the initiative has cre-

The background to the creation of Sardeolica: the Kyoto Protocol

The reduction of climate-changing gases is a global priority. To this end, and on the basis of the 1997 Kyoto Protocol, the European Union committed to reducing greenhouse gas emissions by 8% compared to 1990 levels. 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.

ated a working group with advanced technical expertise geared towards industry in a predominately agro-pastoral region, affected by high unemployment and migration. It has also had a positive economic effect in terms of the increase in activities related to maintenance, catering and tourism. Sardeolica's commitment to respecting and protecting the environment and health and safety in the workplace, and appropriately integrating its activities into the local area, is also fundamental.

Arcola and Saras Energia (Spain): the distribution network

Arcola

Arcola 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 1,720,000 tons of products for the retail and wholesale market. In addition to its sales activities, which constitute its core business, the company also provides leading operators with reception, storage and land or sea redelivery services for oil products for the fuel distribution network and maritime bunkering at its storage facility in Arcola, Liguria. Its storage facility has a capacity of approximately 200,000 m^3, which the company uses to store more than 500,000 tons of fuels on its own and its customers' behalf, and where it receives on average 30 tanker ships and loads around 80 barges and more than 15,000 tanker trucks. Since 2009, the Arcola storage facility has been the point of entry for subsidiary Saras Energia SA to introduce biodiesel to Italy, part of the quota that receives tax relief, which is subsequently mixed with engine diesel and released for sale to consumers.

Saras Energia

Saras Energia was established in 2001 from the merger of Saroil and Continental, two oil companies created in Spain by the Saras Group in the early 1990s.

In 2010, Saras Energia occupied a leading position in 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 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 co-ordinated 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,

Figure 5 – Storage facilities – loading bases

Own depots: Arcola and Cagliari

ARCOLA

With **36 employees**, Arcola has its registered office in Sarroch and operational sites in Arcola, in Liguria, and Sarroch; furthermore, the company has agreed transit contracts at third-party bases (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.

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.

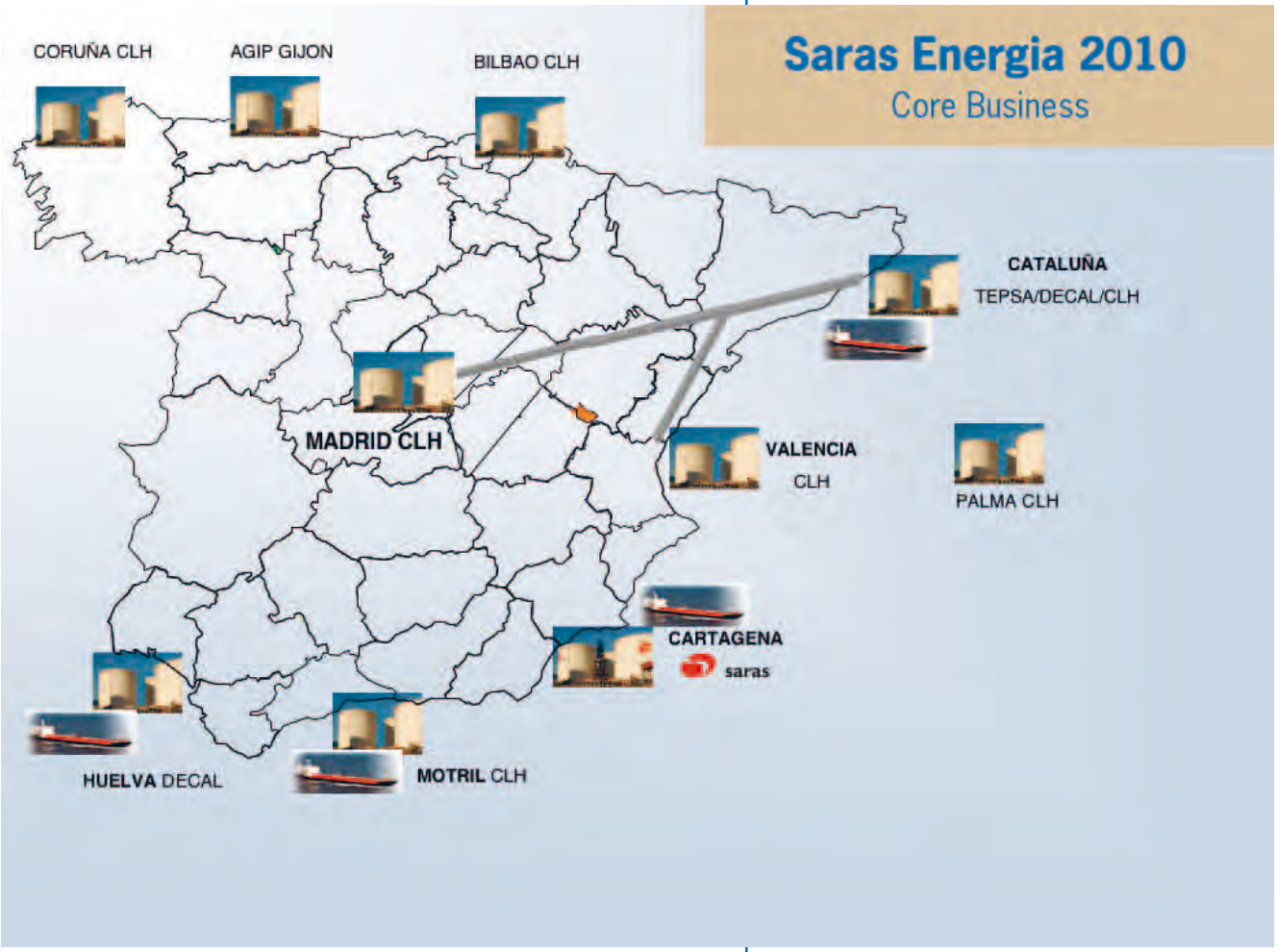
Saras Energia's network currently consists of 121 service stations, including 82 directly managed COCO (Company Owned Company Operated) stations, 8 CODO (Company Owned Dealer Operated) stations and 31 DODO (Dealer Owned Dealer Operated) stations. In 2009, Saras Energia also strengthened its logistical 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. The plant, which was brought up to full capacity in the second half of 2009, produced about 105,000 tons of biodiesel in 2010 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.

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 respond comprehensively to their commercial, administrative or technical enquiries and to create a relationship of reciprocal trust. Products are organised and shipped promptly through delivery operations planned at every level, including with 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").

With **470 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 certification (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
- the revised version of the Environmental Policy was issued in May 2008 and distributed to the company's direct employees and to subcontractors working on site

In 2008, the process of developing the EMS was completed, 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. It also illustrates Saras' activities, the direct and indirect environmental aspects associated with these activities and the environmental improvement targets that the company has set itself.

In 2009, the certifying body, Lloyd's Register Quality Assurance, continued its inspection activities, and the six-monthly inspections of the Environmental Management System were completed successfully. In July 2009, the certifying body approved the 2009 Environmental Declaration, which was then published, presenting figures updated to 31 December 2008, and

CERTIFICATO DI APPROVAZIONE

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

ISO 14001:2004

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.

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

Saras' EMAS registration was confirmed. 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 to obtaining and maintaining environmental and safety certification, as well as four new HSEQ (Health, Safety, Environment and Quality) positions, one for each area of production, with a specific focus on environmental, health, safety and quality issues. As mentioned earlier, following an in-depth audit by LRQA covering all the company's processes at the Sarroch site and the Milan office, in June 2010 Saras obtained the second renewal of its EMS certification, pursuant to ISO 14001:2004. In July 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.


CERTIFICATO DI APPROVAZIONE

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

ISO 14001:2004

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

Group companies

Sardeolica

Sardeolica generates electricity from wind power at its production unit in the municipality of Ulassai. 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 (LRQA), conducts six-monthly 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.

Akhela

In September 2008, Akhela issued its Environmental Protection Policy, containing its guiding principles and commitments on environmental protection when performing its activities, to all employees.

Sartec

Senior management issued a new integrated company policy on 15 January 2010, containing the company's guiding principles and commitments on environmental protection 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, on 10 March 2009 Saras launched the implementation phase of the Saras Safety Project in support of safety management, designed in co-operation with Du Pont – a global leader in issues relating to occupational safety – with a presentation of the work plan and project milestones.

The Safety Management System

The implementation of a Health and Safety Management System (HSMS) introduced performance measures 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 from Lloyd's Register Quality Assurance Italy. In 2010, with the expiry of the three-year period of validity of the certification, Saras successfully completed the schedule of half-year inspections by LRQA, special inspections and a three-year certification renewal audit at the Sarroch and Milan offices, obtaining renewed certification of its HSMS pursuant to OHSAS 18001:2007 for another three years. Saras considers the protection of health and the prevention of any form of accident or injury (either to its own employees or those of subcontractors) to be 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 Managerial Decree of 9 August 2000. The company also drafted a specific Major Accident Prevention Policy for the Sarroch site on 31 March 2008. 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.

LRQA

CERTIFICATO DI APPROVAZIONE

Saras S.p.A.
Direzione: Galleria De Cristoforis, 1 - 20122 Milano – Italia
Impianti: Strada Statale 195 Sulcitana, KM. 19,000
09018 Sarroch (Cagliari) – Italia

OHSAS 18001:2007

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 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.

Akhela

In September 2008, Akhela's Occupational Health and Safety Policy, containing the guiding principles and the company's commitments, was issued to all employees; the subsequent drafting of the Health and Safety Management System Manual 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 to its employees in 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 internal 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 2010 Sartec integrated its Occupational Health and Safety Management System with its Quality Management System. By adopting an Integrated Management System (IMS), the company aims to:

reduce the possibility 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. Sartec aims to complete OHSAS 18001 certification of the IMS in 2011.

Arcola

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 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

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 risk of crimes being committed, 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


saras

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

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 and environmental protection measures. 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 Energy 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.

The Risk Assessment Document for Major Accidents and the Internal Emergency Plan for the fuel storage facility were also revised, to take account of the conversion of one of the tanks to methane and the construction of a new tank for biodiesel.

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.


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)

CERO ACCIDENTES

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 9001:2000 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


CERTIFICATO DI APPROVAZIONE

Saras S.p.A.
S. S. Sulcitana, km 19.5 - 09018 Sarroch (Cagliari) - Italia
Galleria De Cristoforis, 8 - 20122 Milano - Italia

ISO 9001:2008

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

- 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:** 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 the acquisition, development and transfer of professional expertise
- **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, elaborate and distribute information to support the company's decision-making, management and business control activities

CERTIFICATO DI ACCREDITAMENTO

Numero di Accreditamento

0813

Si attesta che

Group companies

Akhela

Akhela's mission is to provide the market with solutions for IT system security and consolidation, professional services for the design and development of complex software applications and for application life cycle management, and the design, provision and monitoring of IT services and infrastructure, all at extremely high quality standards and in the utmost security.

To fulfil this mission, Akhela adopted a Quality Management System (QMS) for its Macchiareddu site, and in April 2004 achieved ISO 9001:2000 quality certification.

Akhela's QMS is intended to guarantee product and service quality. Its first objective is therefore to implement the Quality Policy set out by the management, with the involvement of all company departments. Akhela's QMS applies to processes for the design, development and provision of IT services, as well as to software development and maintenance processes, including those for embedded software. Specifically, the certification applies to:

The design, development and provision of IT services on market standard and open source[1] infrastructure and platforms.

The design, development and maintenance of:

- application software
- embedded software

The Quality Management System should also be considered as an appropriate tool to help the company acquire an integrated and high-level corporate culture.

Specifically, Akhela's QMS is organised according to processes, which are interrelated and interact with each other:

- Management processes
- Quality system management processes
- Resource management processes
- Product manufacture, provision and monitoring (delivery) processes
- Measurement and control processes
- Operations support processes.

In the last few years, in order to constantly improve the quality of its services, Akhela has undertaken a programme to bring the company into line with international standards in software development and service provision. A fundamental step in this process is the recent achievement in December 2008 of Maturity Level 2 of CMMI® DEV (Capability Maturity Model Integration for Development) ver. 1.2. The CMMI, established by the Software Engineering Institute (SEI) of Carnegie Mellon University, has become one of the most authoritative standards at international level in relation to business process requirements for software development.

ITIL stands for Information Technology Infrastructure Library, and is a set of guidelines inspired by best practice in the management of IT services. The ITIL guidelines were developed in the 1980s by the Central Computer and Telecommunications Agency (CCTA) of the UK government in response to the growing reliance on information technology. Unlike CMMI, compliance with ITIL standards may not be certified for a company or one of its departments; instead, individuals working in service management must pass examinations, divided into several levels. Ten service managers at Akhela hold the Foundation certificate in IT Service Management.

[1] - *open source:* software whose authors allow it to be freely studied and amendments to be made by other independent programmers.

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 sectors
- design, installation, testing and start-up assistance for package plants for the oil and petrochemicals sector
- 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 sector
- design, installation, testing, start-up, after-sales assistance and maintenance of analysis 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 sector
- 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 atypical crude oil behaviour
- 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 to guarantee the company's ability to provide products that meet customer requirements and/or other applicable requirements.

No ISO 9001:2008 requirements are excluded.


CERTIFICATO

TÜV AUSTRIA


12
10

Production

Production

The Sarroch site

The energy balance

Energy is brought into the site in the form of raw materials (crude and semi-finished products), electricity and water, as shown in the diagram 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 2010, the Saras site recorded an energy requirement of 981,518 TOE.

Figure 7 – The Saras site at Sarroch: flow chart

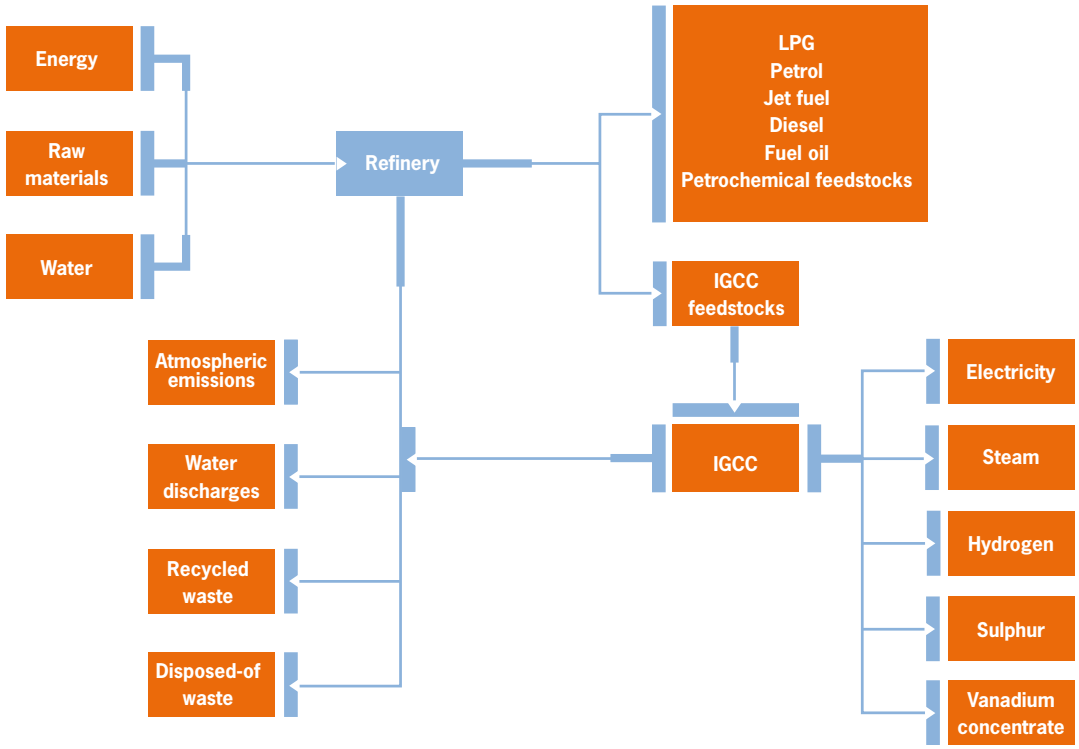


Table 6 – Energy in (TOE)

	2010
Crude and fuel oil	14,308,294
Crude and fuel oil	268,335
Total	14,576,629

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

Table 7 – Energy out (TOE)

	2010
Finished products	12,926,569
Electricity fed into the grid	797,136
Fuel gas	70,478
Total	13,794,183

Refining

In 2010, the Sarroch refinery processed approximately 14.3 million tons of raw materials (crude oil and fuel oils), which is an average figure for recent years. Between 2007 and 2010, a total of 57.7 million tons of raw materials were processed, an average of 14.4 million tons per 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 produce electricity.

Chart 3 – Crude oil refining (thousand tons/year)

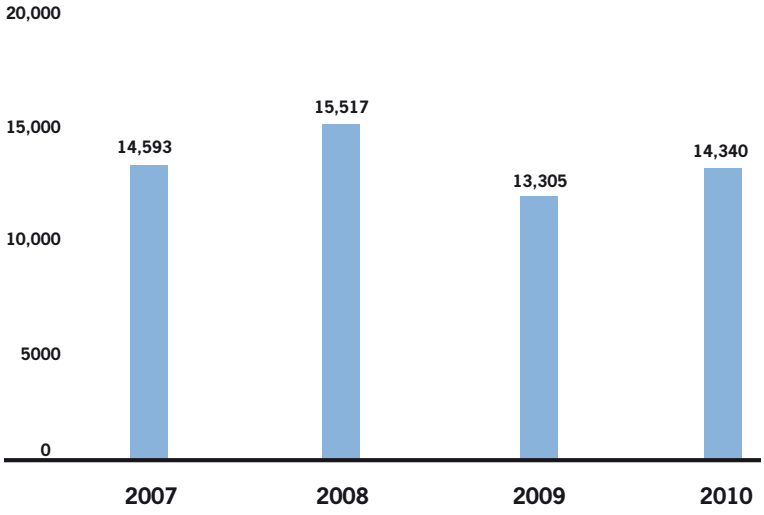


Table 8 – Products of the Saras plants (tons/year)

	2007	2008	2009	2010
LPG	306,000	337,000	221,000	323,000
Gasoline and virgin naphtha	4,039,000	4,056,000	3,343,000	4,024,000
Middle distillates (diesel, kerosene)	7,541,000	8,275,000	6,769,000	7,517,000
Fuel oil and other	707,000	825,000	1,119,000	463,000
Vanadium concentrate (tons/year)	1,700	1,199	1,633*	1,122**
Electricity (TOE)	823,870	780,974	750,679	797,136
Sulphur*	112,000	110,000	110,000	110,000
Heavy hydrocarbons to IGCC	1,120,000	1,121,000	1,077,000	1,166,000

* 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.

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.

As they did in 2009, sulphur emissions fell steeply in 2010 compared with previous years, due to the operation of the new TGTU. The amount of sulphur in products entering the market decreased slightly, due to reduced production of fuel oil compared with 2009 (Chart 4). The percentage of sulphur sold as a product was higher than the 2009 figure (Table 9).

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 produced

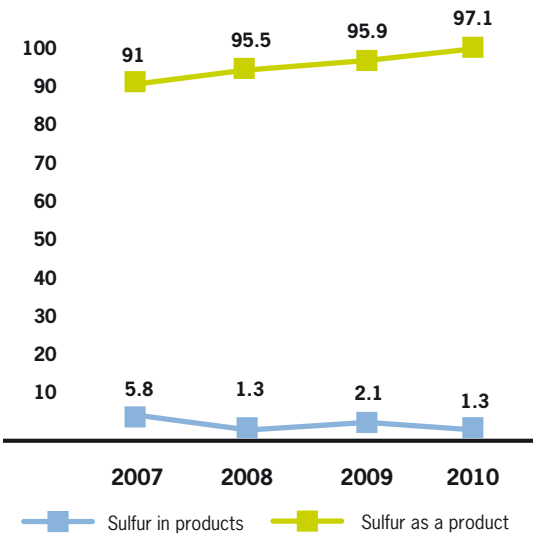


Figure 8 – Sulphur balance of plants - 2010

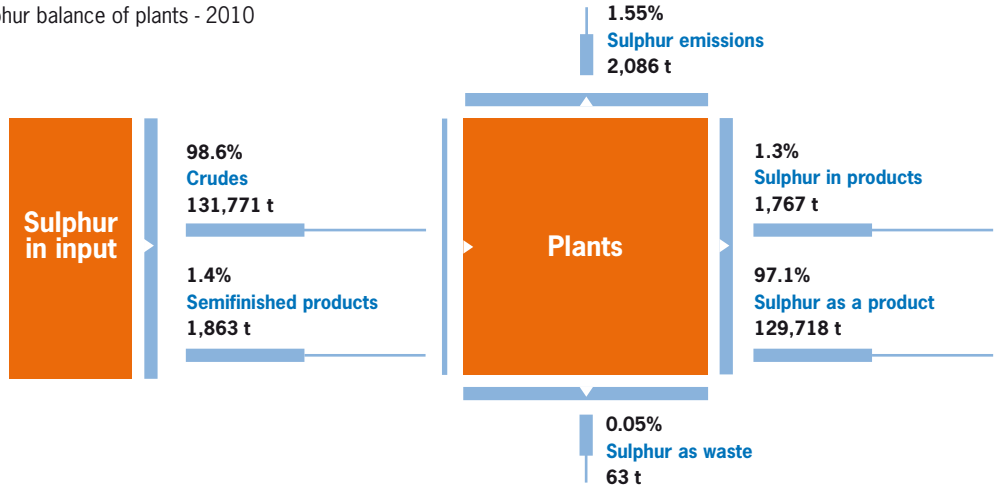


Table 9 – Sulphur balance of plants - 2010

	2007		2008		2009		2010	
	tons	% of total	tons	% of total	tons	% of total	tons	% of total
Sulphur input								
Materie prime	122,920	100	115,141	100	**114,714**	**100**	**133,634**	**100**
Raw materials								
Atmospheric emissions	3,697	3.2	3,568	3.1	**2,200**	**1,92**	**2,086**	**1.55**
In products	7,148	5.8	1,441	1.3	**2,430**	**2,12**	**1,767**	**1.3**
As pure sulphur	111,815	91	110,000	95.5	**110,017**	**95,9**	**129,718**	**97.1**
As waste	260	0.2	132	0.11	**68**	**0,06**	**63**	**0.05**

Electricity generation

The production performance of the IGCC plant and its exchanges with the refinery are reported below.
Data for 2010 and comparison with the previous three years.

Table 10 – IGCC consumption (tons/year)

	2007	2008	2009	2010
Heavy hydrocarbons for gasification	1,190,195	1,179,604	1,128,568	1,222,328
Syngas (obtained from gasification)	3,942,542	3,770,558	3,757,686	4,021,014
Diesel	7,068	4,370	18,904	3,440
Electricity from external sources (MWh)	369,491	380,508	378,700	379,495

Table 11 – IGCC products

	2007	2008	2009	2010
Electricity to external grid (MWh)	4,417,843	4,318,134	4,066,306	4,336,730
Medium-pressure steam (tons/year)	568,651	667,762	572,368	741,905
Low-pressure steam (tons/year)	556,828	539,680	437,003	613,911
Hydrogen (tons/year)	31,451	34,042	37,939	39,731
Sulphur* (tons/year)	42,589	49,753	48,405	52,666
Vanadium concentrate (tons/year)	1,700	1,199	1,633*	1,122**

* 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.

Group companies

Sardeolica

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

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

Similarly, the number of households that could be supplied with electricity using this type of power generation and the corresponding amounts of oil saved have also been estimated.

Table 12 – Electricity generated at the Ulassai wind farm

	2007	2008	2009	2010
Production (MW/h)				
Net electricity	168,185	153,735	155,970	175,934
Indicators				
CO_2 emissions avoided (1)	139,257	127,292	129,143	145,674
SO_2 emissions avoided (2)	639	584	593	669
NO_x emissions avoided (3)	319	292	296	334
Equivalent households (4)	56,062	51,245	51,990	58,645
TOE saved (5)	14,375	13,140	13,331	15,037
Barrels of oil saved	104,936	95,920	97,315	109,771

(1) Emissions avoided were calculated using a specific emission coefficient of 828 gCO2/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 gSO2/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 gNOX/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 of 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.

Akhela

Akhela provides two main types of services: information technology and embedded systems. One of the historically important aspects of the company's IT services is security solutions, which the company divides into two main areas: logical security (infrastructure and applications) and physical security (video surveillance, perimeter security, industrial security). One of Akhela's strengths is that it can combine and integrate these disciplines. Furthermore, while the security services generally found on the market often focus on individual actions designed to remedy contingent situations, Akhela applies a methodological approach, according to which security is seen as a continuous process to be updated according to changes in vulnerability, and continually maintained. Staying with IT, Akhela has also developed competencies in the design, creation and optimised management

1 - *sistema embedded*: sistema incapsulato, dedicato.

of complex, cutting-edge IT infrastructures. Through its partnership with leading US company Vmware, Akhela offers virtualisation solutions, the new frontier for the optimisation of IT infrastructures. It allows multiple virtual machines with different operating systems to be managed separately on a single, physical machine. Its various advantages include server consolidation, entailing the consolidation of applications and service infrastructure into a smaller number of servers, thereby simplifying systems management, cutting costs and reducing substantially the typical energy consumption of the data centres. In embedded systems, Akhela designs software for the engine control systems used in the automotive sector by many car and motorcycle manufacturers. These also include a number of engine control systems for engines powered on LPG/methane or electricity. Akhela is also implementing innovative combustion control systems that reduce the quantity of emissions released into the atmosphere.
Akhela's Embedded Systems division is also taking part in another eco-sustainability project, a sophisticated car sharing scheme currently used in Ulm, Hamburg and Austin (Texas), which was extended in 2010. Car sharing, which aims to reduce traffic and car numbers, is seen as one of the most intelligent solutions for personal mobility in urban areas.

Sartec

Sartec has developed 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 a 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 very 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 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.

Saras Energía

In 2010, the service station network belonging to Saras Energia sold 54 million litres more than in 2009, an increase of more than 30%.
2010 closed with more than 230 million litres sold in total; the strategic decision to acquire the service stations of ERG, which took place in 2009, was crucial to achieving this result.
Table 13 shows the trend in the fuel sales of our motorway network.

Table 13 – Fuel sold by the Saras Energia network in litres

	2008	2009	2010
Fuel sold (litres/year)	136,222,437	178,684,814	233,326,098

In a similar pattern, incoming and outgoing traffic at the fuel storage facility increased by about 200,000 tons compared with 2009, with a total of more than a million tons of product received and shipped. Table 14 shows changes in storage facility traffic in 2009 and 2010.

Table 14 – Movement of products at the Cartagena storage facility.
Incoming + outgoing (metric tons)

	2009	2010
DIESEL	765,567	958,402
GASOLINE	101,146	99,334
BIOFUEL	15,519	27,398
METHANE	24,532	21,018
Total	906,764	1,106,147

Since starting up in 2009, the biodiesel production plant has supplied, for the purposes of the additivation of motor diesel, the Cartagena storage facility, the Sarroch refinery and the Arcola storage facility, as well as external Italian and Spanish customers. Tables 15 and 16 show the traffic in raw materials and products from the Cartagena plant.

Table 15 – Raw materials processed (tons/year)

	2009	2010
Citric acid	297	236
Hydrochloric acid	935	844
Phosphoric acid	242	141
Sulphuric acid	29	39
Oil	115,537	98,945
Methane	11,841	10,495
Sodium methylate	1,668	1,447
Caustic soda	569	282

Table 16 – Products from plants (tons/year)

	2009	2010
Fatty acids	4,909	5,888
Esterified fatty acids	3,435	5,475
Biodiesel	118,894	104,830
Glycerine	13,173	13,671
Rubbers	2,657	1,395

The environment

The 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 extraordinary maintenance. The improvement in environmental data is due to a series of technical, organisational and management measures, which have gradually equipped the refinery with more efficient technology and resources to operate in a more environmentally friendly manner.

In particular, the trend in sulphur dioxide (SO_2), which is of special interest to the local community, has decreased sharply compared with previous levels, dropping substantially in the past two years due to the start-up of the tail gas treatment unit at the sulphur recovery plant. Compared with the average figure for the previous two-year period, SO_2 emissions fell by about 48% in the past two years.

EMAS registration

As already mentioned, in 2010 Saras obtained a three-year renewal of ISO 14001:2004 certification for its EMS, successfully undergoing control and audit activities carried out by Lloyd's Register Quality Assurance, the certifying body.

In July 2010, the certifying body also validated the Environmental Declaration 2010, which was drawn up pursuant to the new EC Regulation 1221/2009 and confirmed EMAS registration for Saras. The Environmental Declaration 2010, which is a document aimed at the company's external and internal community, designed to establish a transparent relationship with the local population, local authorities and employees and to explain the activities carried out by Saras, the direct and indirect environmental aspects of these activities and targets for environmental improvement set by the company, was then published and disseminated.

The AIA permit

On 24 March 2009, an integrated environmental authorisation (Autorizzazione Integrata Ambientale - AIA) permit was issued for the refinery and IGCC, pursuant to Legislative Decree 59/05, which implements Directive 91/61/EC, more commonly known as the IPPC Directive on integrated pollution prevention and control.

Environmental training

In order to achieve continual improvements in environmental protection, it is essential to provide ongoing training to personnel, both to update their skills and to raise awareness of the importance of their individual roles.

This is particularly true in complex systems with over 1,000 employees, which is why in 2010 Saras continued training its staff on environmental protection issues in relation to the activities carried out at the Sarroch site.

In 2010, specific training in HSE (health, safety and the environment) was provided to more than 200 employees.

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

Other special courses included: SISTRI updates, regulatory updates, courses on accident scenarios and on the environmental, safety and major accident prevention policies, in which the entire workforce took part. More than 1,700 hours of environmental training were delivered in total.

EMAS (Eco-Management and Audit Scheme)

EMAS (Eco-Management 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 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 integrated environmental authorisation **(Autorizzazione Integrata Ambientale – AIA)** 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. Measures relating to the control of major accident-hazards involving dangerous substances are governed by specific legislation (Seveso).

The AIA permit replaced all existing authorisations and fundamentally changed the way in which environmental issues are managed.
Throughout 2010, activities responding to the requirements of the preliminary assessment for the permit continued, including:

- an increase in continuously monitored emission points (CCR-Alky, T2 and CO boiler)
- installation of systems to measure pH, temperature and discharge flow rate
- Implementation of the monitoring and control plan, which assigns methods for managing, checking and presenting environmental variables, continued in 2010 via specific meetings in partnership with technicians from ISPRA and ARPAS in Cagliari.

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 for overall environmental improvement at the refinery. As part of this commitment, important initiatives in thermal recovery were implemented in 2009 that reduced consumption by about 12,500 TOE in 2010. 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 17 and Chart 5, which show consumption of liquid and gas fuels (gas fuels are produced by the refinery itself) and the amount of electricity from external sources, indicate a broadly flat trend in energy consumption during the period under review, with a slight reduction, due to the raw material processed, in 2010.
Table 18 opposite shows the site's power requirement. The quantity of electricity generated by the refinery's thermoelectric plant (CTE) is shown under internal production, while electricity from external sources comes from the national grid.

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 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 17 – Total energy consumption (refinery + IGCC; TOE)

	2007	2008	2009	2010
Electricity	193,917	194,118	160,969	168,159
Fuel oil	192,254	205,367	185,270	183,450
Fuel gas	452,451	439,011	403,358	446,345
Flue gas	166,124	174,345	125,143	183,564
Total	**1,004,746**	**1,012,841**	**874,740**	**981,518**

Chart 5 – Total energy consumption (refinery + IGCC)

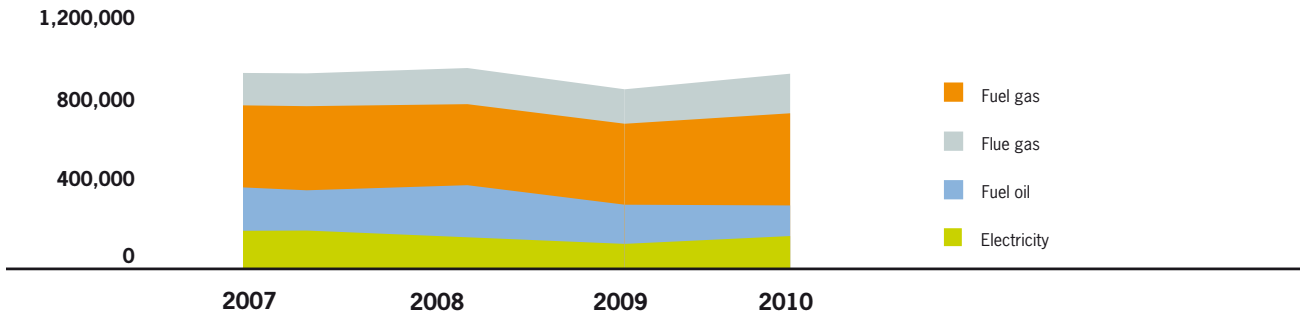
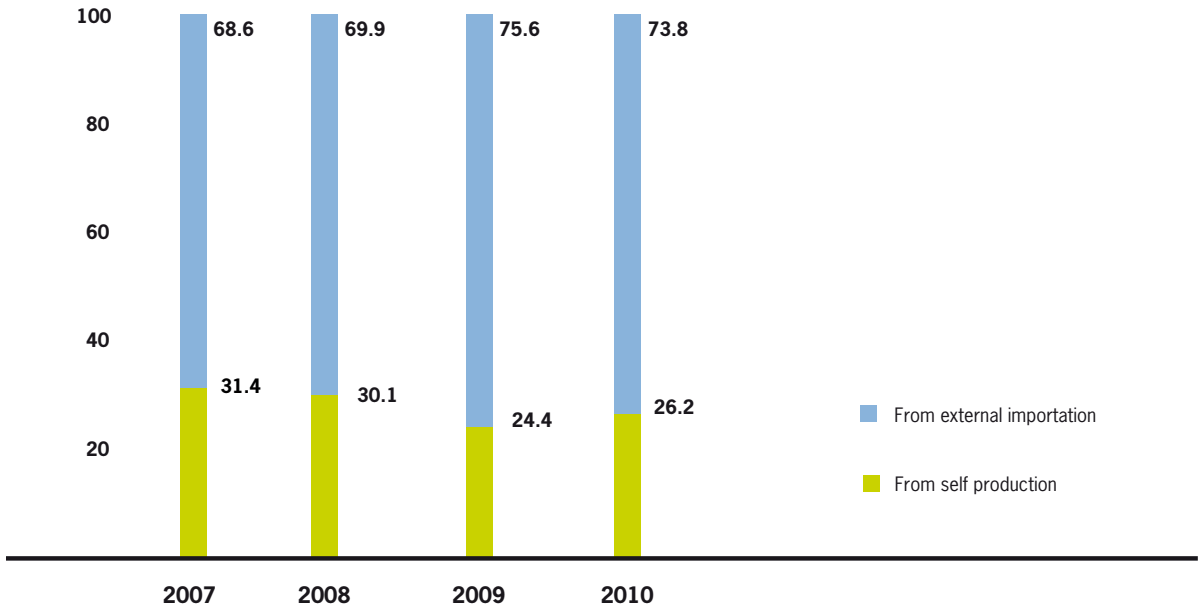


Table 18 – Electricity requirement and supply (refinery + IGCC; MWh)

	2007	2008	2009	2010
Total requirement	1,166,208	1,170,189	1,137,842	1,218,295
- from internal production*	366,242	351,800	277,044	319,049
- external	799,966	818,389	860,798	899,246

*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

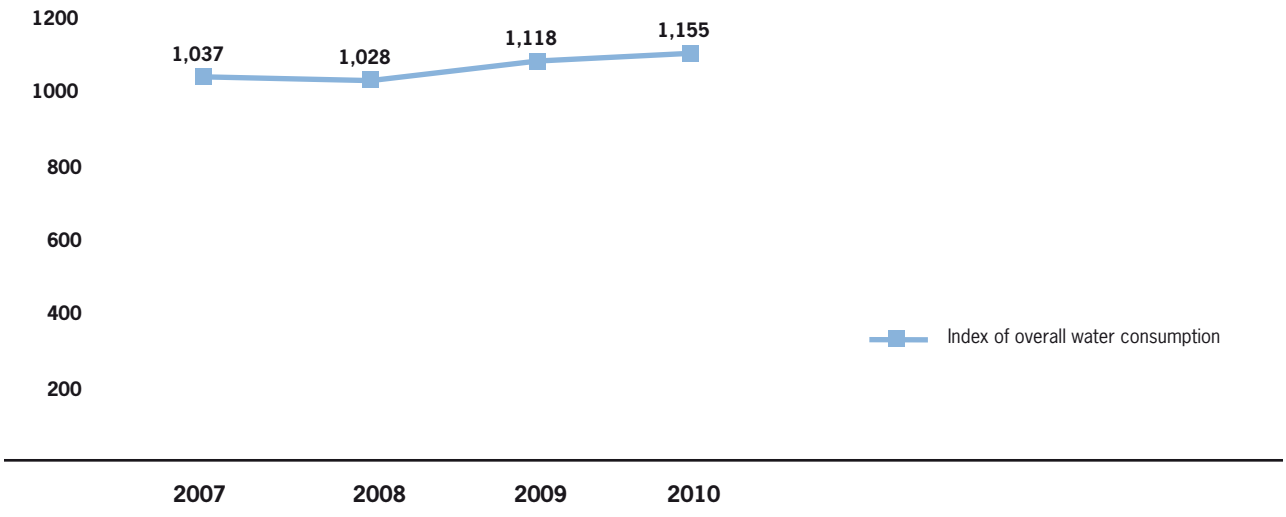
Water is a precious resource for the Sarroch facility, and its use is constantly monitored to optimise consumption and to promote recovery and desalination, instead of using fresh water supplied by CASIC (Cagliari Industrial Development Area Consortium), which manages the water supply to the Sarroch 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. Supply sources in 2010 continued the trend seen in previous years, as shown in Table 19 and Chart 7.

In the period under review, internal recovery on average met approximately 24% of the total annual requirement, and desalination was also a source of supply, accounting for 28% of the total. Taken together, desalination and recovered water met approximately 52% of the requirement in 2010. This is a significant result for the site, confirming the strategy of rationalising consumption and internal recycling.

Table 19 – Total water consumption by source of supply (refinery + IGCC; m^3/h)

	2007	2008	2009	2010
Desalination	600	612	546	540
CASIC	711	742	771	905
Internal recovery	416	457	447	446
Total	**1,727**	**1,821**	**1,674**	**1,891**

Chart 7 – Water requirement of site - specific values (m^3/thousands of tons processed)



Atmospheric emissions

Saras has pursued its commitment to reducing atmospheric emissions by implementing a series of measures designed, over time, to improve its facilities and put in place procedures and management systems to ensure that its activities are environmentally compatible, as demonstrated by a reduction in pollutant emissions (see Table 20). As part of these activities, the gasification plant has made a substantial contribution to reducing atmospheric emissions, as described on page 17. Since 2009, one of the most significant projects in terms of reducing atmospheric emissions has been the start-up of the Tail Gas Treatment Unit (TGTU), which processes tail gases, thereby increasing the plant's sulphur recovery and reducing 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 diffuse emissions (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 respected, as shown in the following charts.

Water conservation

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

- 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/hr
- implementing measures to maximise the recycling of purified water from the purification process, following improvements to the treatment process and increased filtering capacity

The desalination plant has significantly reduced the use of fresh water from CASIC (Cagliari Industrial Development Area Consortium, which is responsible for managing the water system in the Sarroch industrial area) water system, without disrupting the marine ecosystem near 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.

Both plants were built using the best technology available, and are 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 in 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 20 – Total atmospheric emissions (thousand tons/year)

	2007		2008		2009		2010	
	Raffineria	IGCC	Raffineria	IGCC	Raffineria	IGCC	Raffineria	IGCC
SO_2	6.97	0.42	6.73	0.41	3.89	0.51	3.71	0.46
NO_x	3.16	0.997	3.13	0.86	2.43	0.58	2.85	0.60
DUST	0.52	0.005	0.45	0.004	0.28	0.03	0.35	0.03
CO	1.19	0.14	1.16	0.13	0.54	0.12	0.36	0.16
CO_2*	2,508	3,751	2,485	3,728	2,130	3,540	2,369	3,783

* as per emissions trading declaration (see box on page 63)

Sulphur dioxide (SO_2)

The site recorded its best ever year for total SO_2 emissions in 2010, confirming the downward trend seen for the past 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 that the improvement in performance seen in 2009 continued in 2010.
The 2010 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)

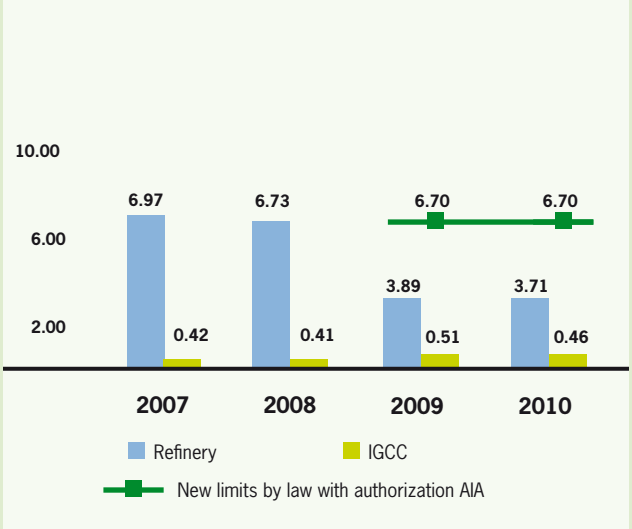


Chart 9 – Sulphur content (% in weight)

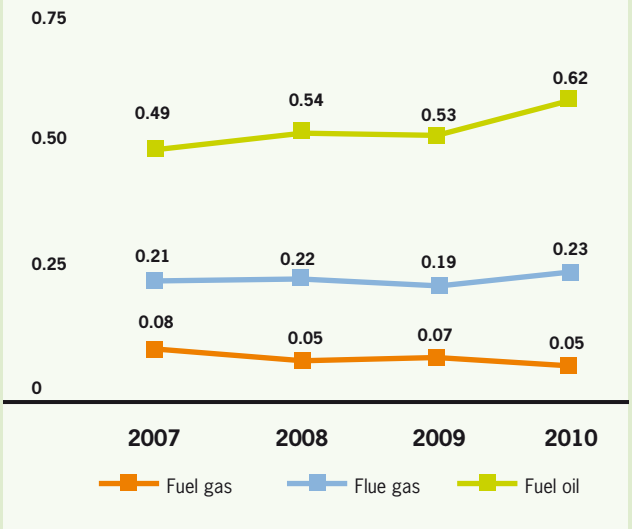


Chart 10 – Rate of SO_2 emissions (SO_2 tons/thousand tons processed)

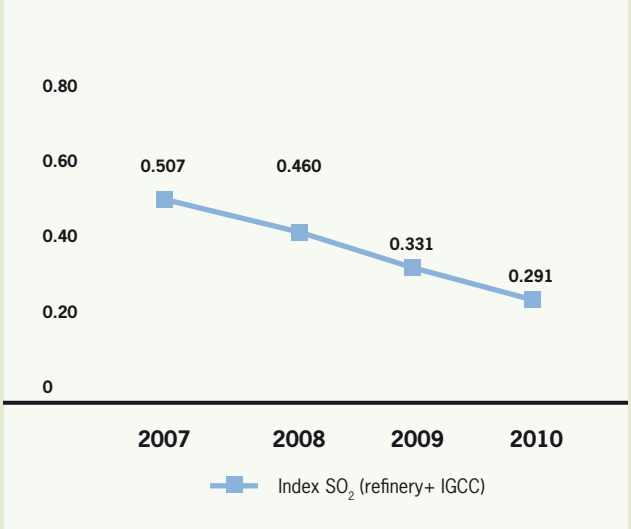


Chart 11 – SO_2 concentrations in refinery smokestacks (mg/Nm^3)

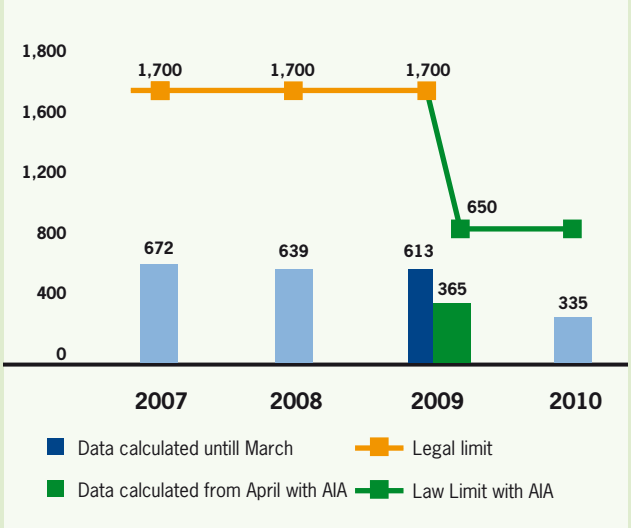
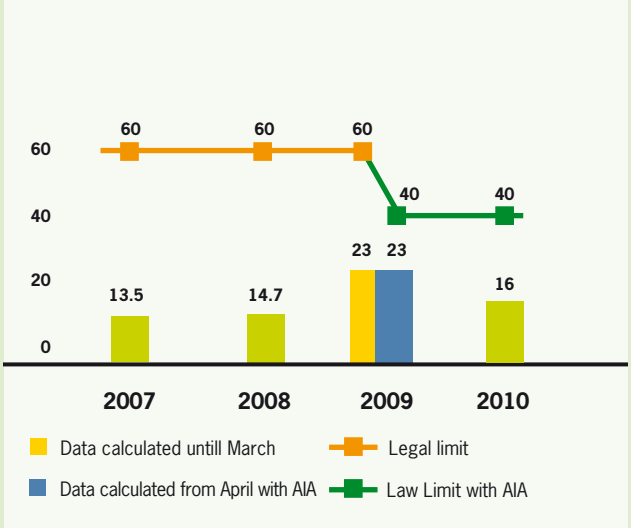


Chart 12 – SO_2 concentrations in IGCC smokestack (mg/Nm^3)



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, the trend in NO_x emissions over the years continues (Chart 13). The emissions rate is also in line with previous years (Chart 14). The trend in emissions concentration confirms that the performance achieved in 2009 continued to improve in 2010.
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)

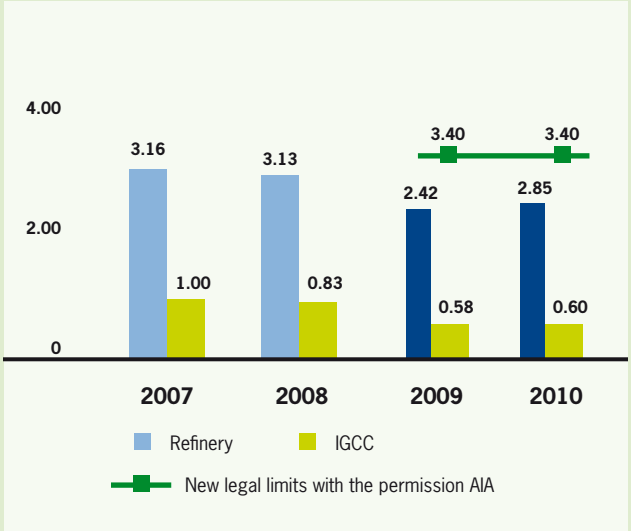


Chart 14 – Rate of NO_x emissions (NO_x tons/thousand tons processed)

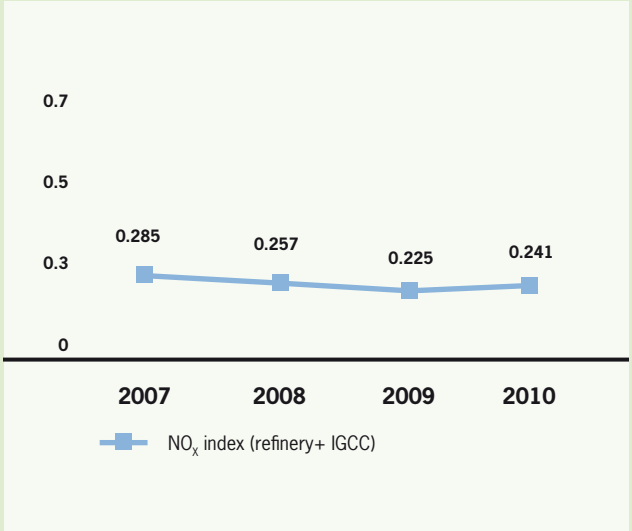


Chart 15 – NO_x concentrations in refinery smokestacks (mg/Nm^3)

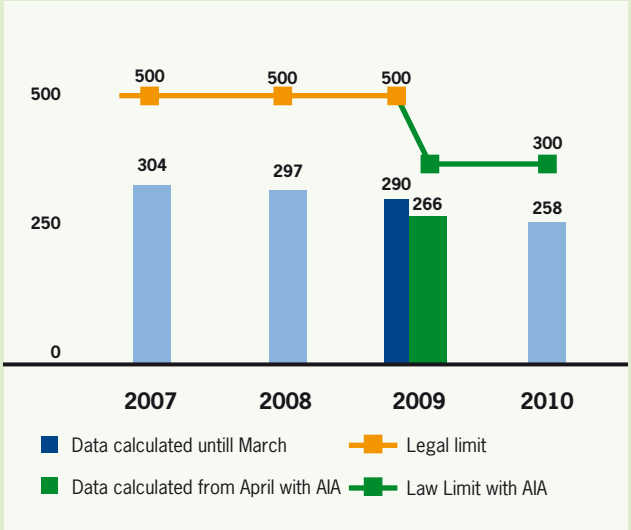
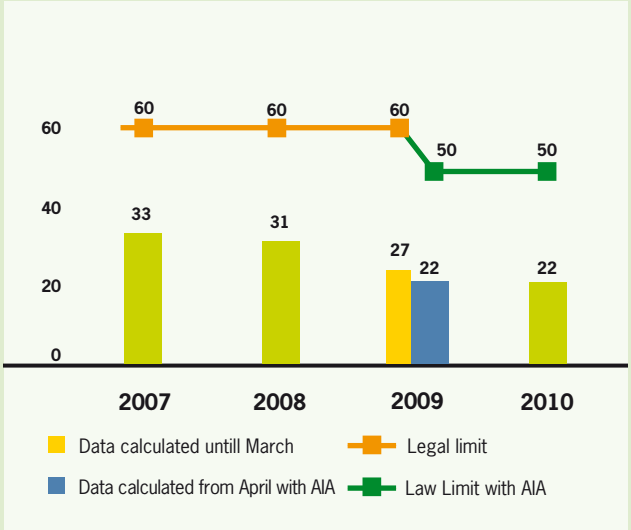


Chart 16 – NO_x concentrations in IGCC smokestack (mg/Nm^3)



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 been largely unchanged (Chart 18).

Chart 17 – Dust emissions (thousand tons/year)

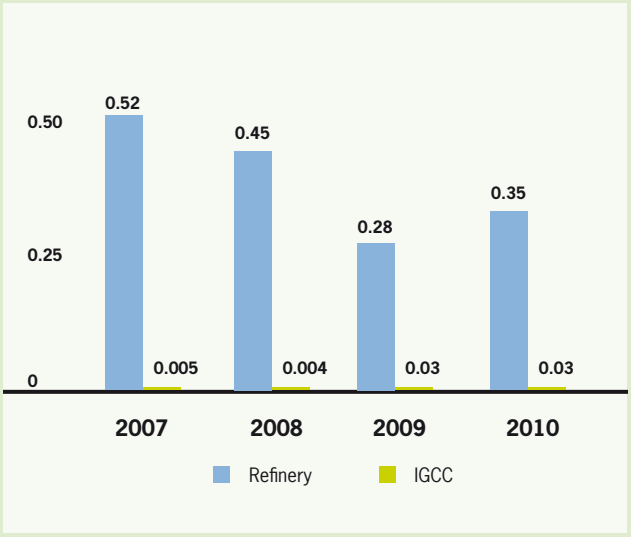


Chart 18 – Rate of dust emissions (dust tons/thousand tons processed)

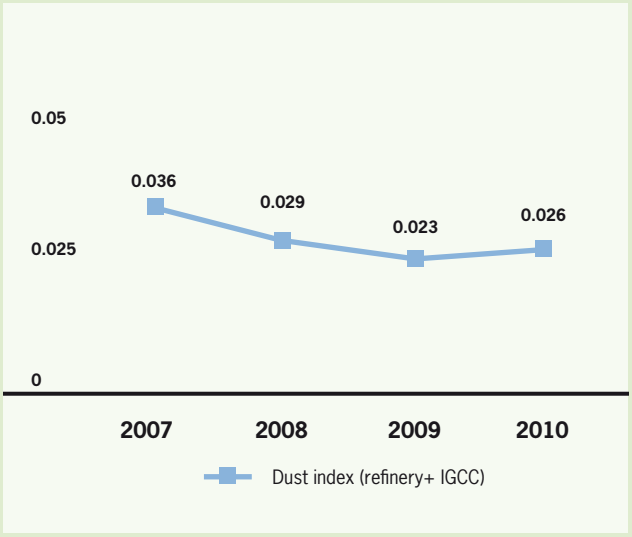


Chart 19 – Dust concentrations in refinery smokestacks (mg/Nm^3)

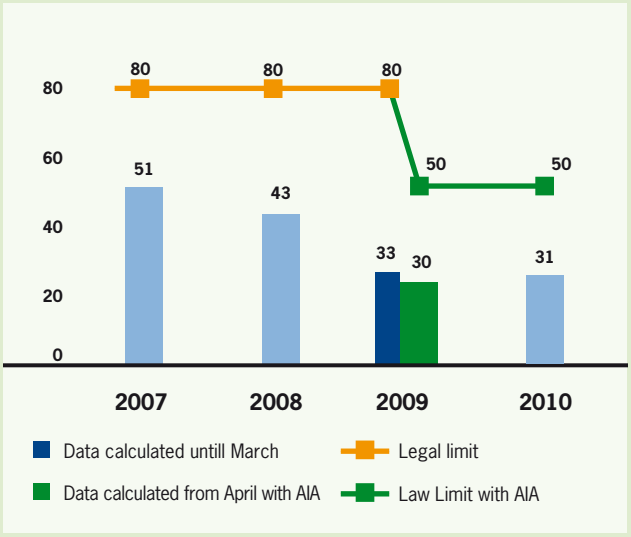
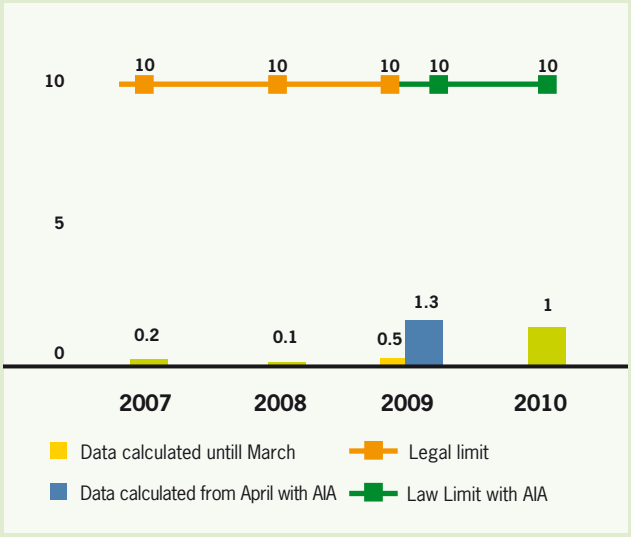


Chart 20 – Dust concentrations in IGCC smokestack (mg/Nm^3)



PM10

Previous legislation did not set limits for this parameter. The performance reported for 2007 and 2008 is therefore an indicative estimate and is not comparable with the data for the last two years, which were calculated using the US-EPA 1998 method. The authorised PM1 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)

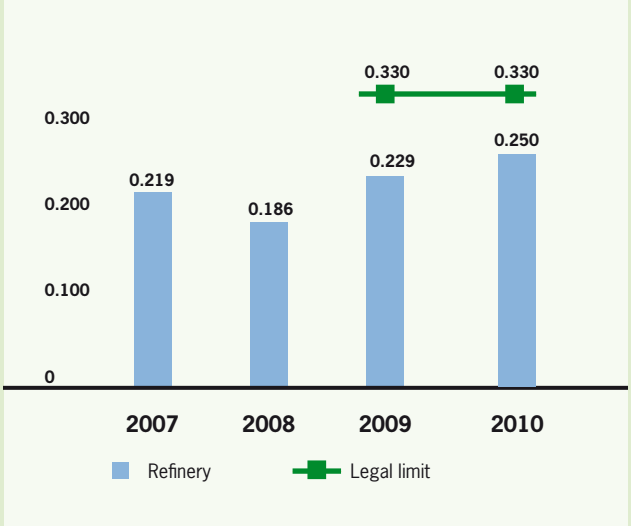


Chart 22 – Rate of PM10 emissions (PM10 tons/thousand tons processed)

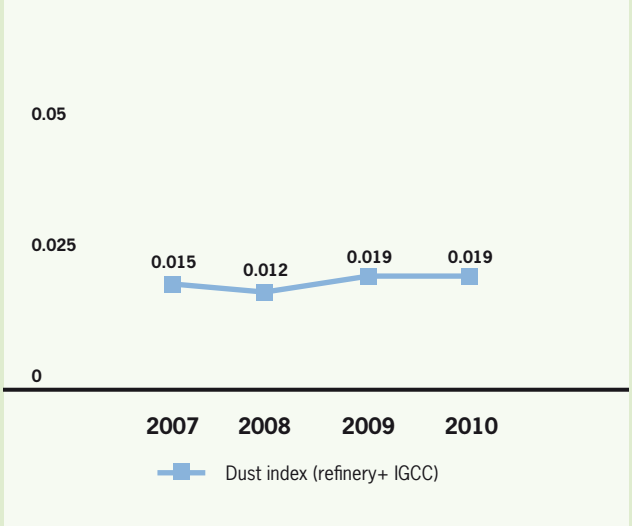
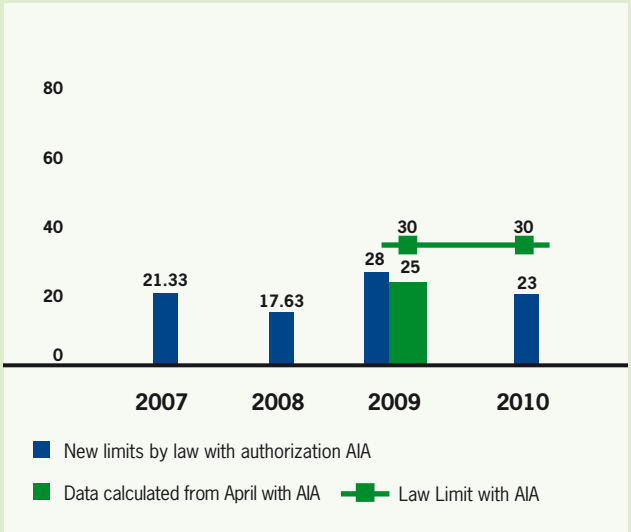


Chart 23 – PM10 concentrations in refinery smokestacks (mg/Nm^3)



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 in 2009 (Chart 24). The rate of emission is also heading in the right direction; in 2010 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)

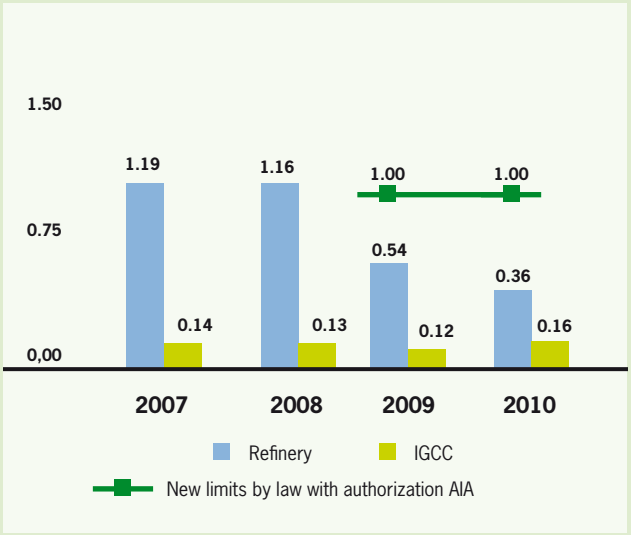


Chart 25 – Rate of CO emissions (CO tons/thousand tons processed)

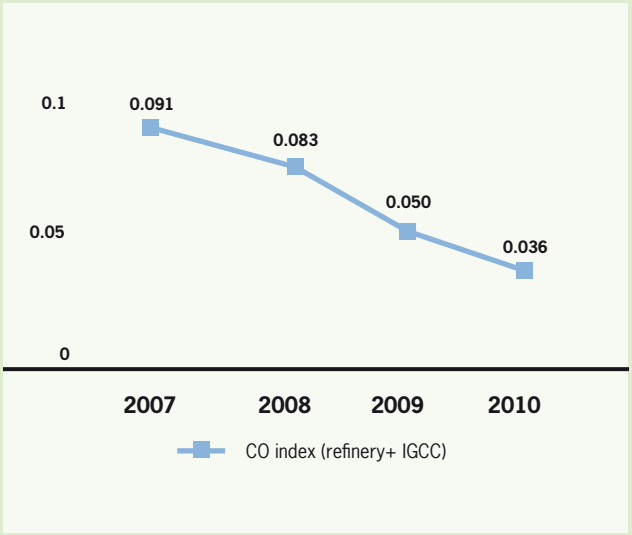


Chart 26 - CO concentrations in refinery smokestacks (mg/Nm^3)

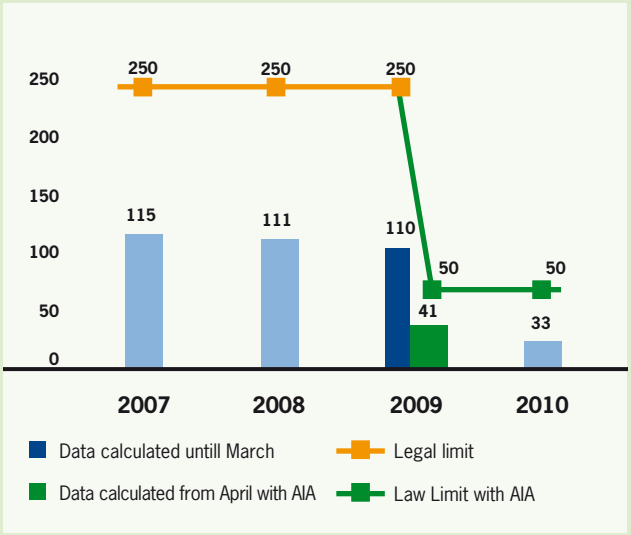
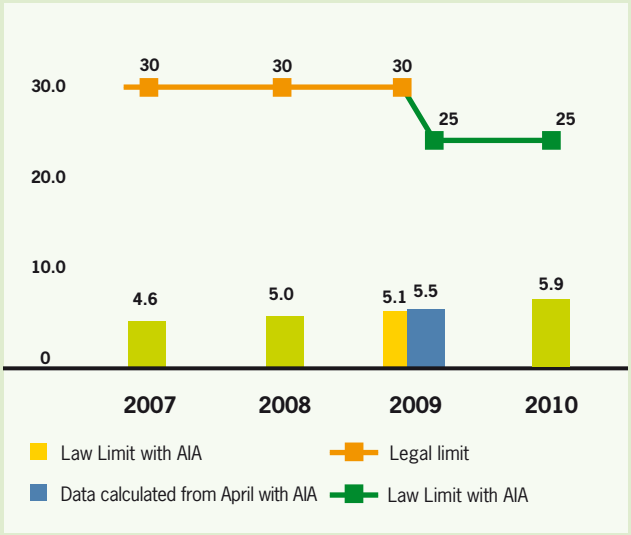


Chart 27 - CO concentrations in IGCC smokestack (mg/Nm^3)



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 acquiring 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 sector.

Compared with the average for the three-year period 2006-2008 (2009 data was influenced by major plant shutdowns), the 2010 data show a reduction in emissions from the refinery, mainly due to investments made in energy recovery. Emissions from the IGCC plant have returned to typical levels for recent years.

The figures for 2010 demonstrate that the route taken by Saras, involving rational energy use and adoption of efficient production systems, is the key approach for controlling and reducing CO_2 emissions.

The National Emissions Trading Register, which is available for consultation, records both the allowances assigned and the annual CO_2 emissions in Italy. Saras has been assigned a single position grouping the total emissions from its operations at the Sarroch site.

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 aim. Air quality is currently monitored using bio-indicators and biodiversity studies as well as monitoring networks (detection stations).

Emissions Trading Directive

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:

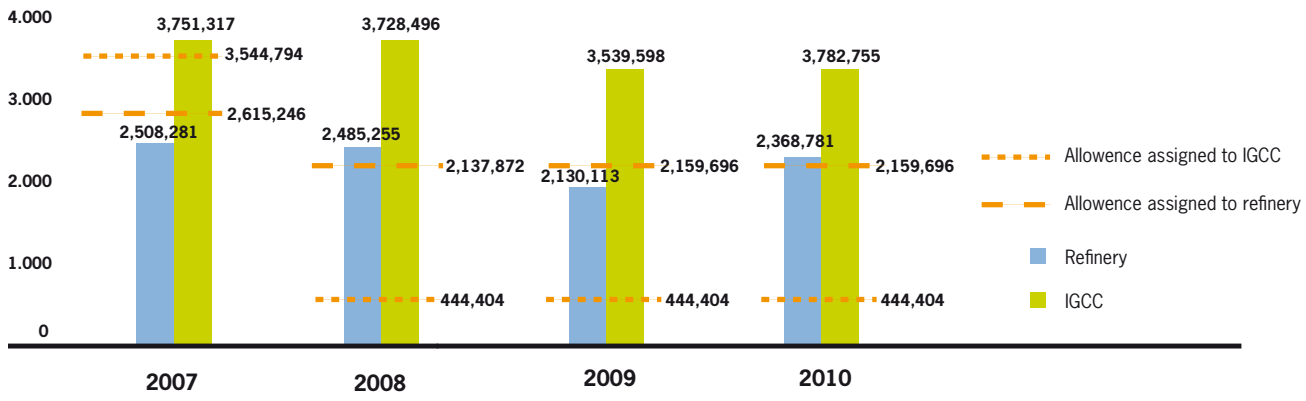
- as of 1 January 2005, no plant within the scope of the directive may emit CO_2 (i.e. continue to operate) without appropriate authorisation
- each year, the operators of these plants must surrender CO_2 allowances equal to the CO_2 released into the atmosphere to the competent national authority
- 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 21 – CO_2 emitted by the site (refinery + IGCC; tons/year)

	2007	2008	2009	2010
Refinery	2,508,281	2,485,255	2,130,113	2,368,781
IGCC	3,751,317	3,728,496	3,539,598	3,782,755
Total	**6,259,598**	**6,213,751**	**5,669,711**	**6,151,536**
Total allowance (refinery + IGCC)	**6,160,040**	**2,582,276***	**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)



- **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 atmospheric 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 22 shows the key criteria for interpreting the categories of air quality and atmospheric purity, with reference to the Index of Atmospheric Purity (IAP)[1]. The categories that include the indicator values measured in the stations being monitored. In 2010, 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 area is one of these three.

  As could reasonably be expected, air quality is generally higher in the stations further inland and lower in the one nearest to the Sarroch industrial area. The picture that emerges from an analysis using bio-indicators shows, therefore, that the air quality falls in the mid-range of the IAP index. In the area under review, a survey is 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 2010.

Figure 9 - Location of the air quality bio-monitoring stations.

1 - The IAP index was created by P.L. Nimis, "Linee guida per la bioindicazione degli effetti dell'inquinamento tramite la biodiversita 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).

- **Monitoring networks**

  Air quality outside the Sarroch refinery (immission level) is checked by three monitoring systems, comprising a total of 14 monitoring stations, of which four belong to Saras and six to Polimeri Europa, while the other four are managed by ARPAS. 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.

Table 22 - Index of Atmospheric Purity (IAP): categories of air quality and atmospheric purity

IAP categories	IAP values	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

Each of the four Saras monitoring stations (Villa d'Orri, Sarroch, Porto Foxi and the national 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. The station located in the area of the national storage facility also has a weather station. In the second half 2010, two stations (at Sarroch and at the national storage facility) were 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 monitoring stations; ozone and benzene at three stations; and CO at one station. A dedicated monitoring system constantly 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 2010 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) and also monitors the parameters 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 Topping2, 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 (Table 23 on page 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 2010.

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

Table 23 – 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									
	Hourly limit[1]			Daily limit[2]			Ecosystems limit[3]			
	2008	2009	2010	2008	2009	2010	Limit	2008	2009	2010
Villa d'Orri	1	0	0	0	0	0	**20**	4	2	3
Porto Foxi	2	0	0	0	0	0	**20**	10	7	7
Sarroch	2	0	0	0	0	0	**20**	11	8	6
National storage facility	0	0	0	0	0	0	**20**	6	3	4

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 3 times per calendar year (125 µg/m^3).
3 - Limit for the protection of ecosystems (20 µg/m^3).

NO_2	Number of times hourly limit was exceeded[1]			2008		2009		2010	
	2008	2009	2010	Registered value[3]	Limit[2]	Registered value[3]	Limit[2]	Registered value[3]	Limit[2]
Villa d'Orri	0	0	0	5	**44**	6	**42**	5	**40**
Porto Foxi	0	0	0	5	**44**	5	**42**	4	**40**
Sarroch	0	0	0	6	**44**	6	**42**	6	**40**
National storage facil.	0	0	0	7	**44**	6	**42**	6	**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 24-hour limit was exceeded			2008		2009		2010	
	2008	2009	2010	Registered value[2]	Limit	Registered value[2]	Limit	Registered valueo[2]	Limit
Villa d'Orri	-	-	-	-	**40**	-	**40**	-	**40**
Porto Foxi	13	5	N.D.	24	**40**	24	**40**	17	**40**
Sarroch	12	2	N.D.	25	**40**	23	**40**	14	**40**
National storage facil.	-	-	-	-	**40**	-	**40**	-	**40**

1 - Daily limit must not be exceeded more than 35 times per calendar year (50 µg/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 the average daily peak was exceeded[1]		
	2008	2009	2010
Villa d'Orri	0	0	0
Porto Foxi	0	0	0
Sarroch	0	0	0
National storage facil.	0	0	0

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

Wastewater

The site performed normally in the period 2007-2010, 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 24). 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)

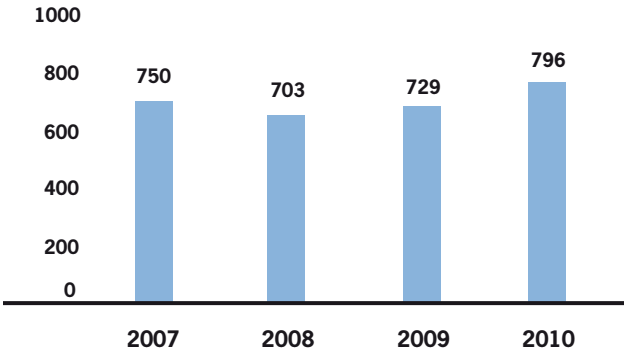


Chart 30 – Total wastewater rate (m^3/thousand tons processed)

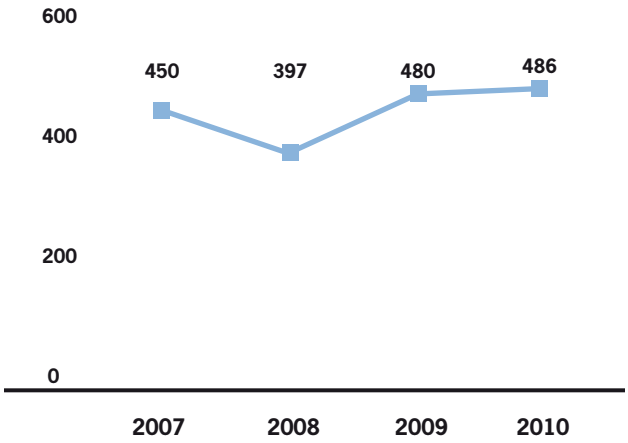


Table 24 – Main substances detected (tons/year)

	2007	2008	2009	2010
COD	472.0	368.6	561	673
Mineral oils	14.3	10.4	12.2	13,8

The difference in the figures recorded for COD, from 2009 onwards, is attributable to the new calculation criteria adopted as required by the AIA permit, rather than to a genuine change in the emissions content.

Chart 31 – COD emissions (tons/year)

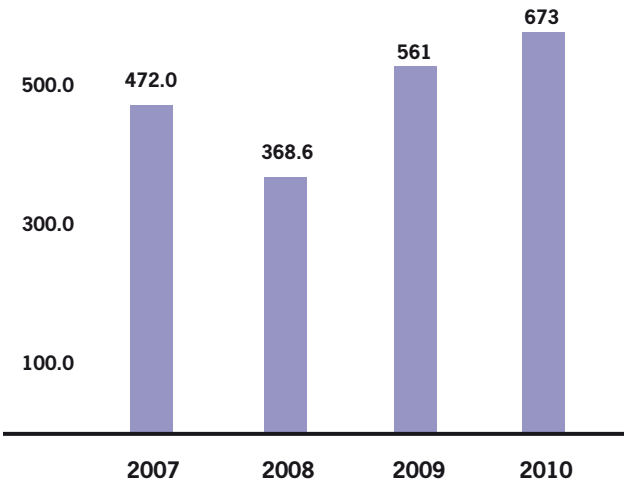


Chart 32 – Mineral oil emissions (tons/year)

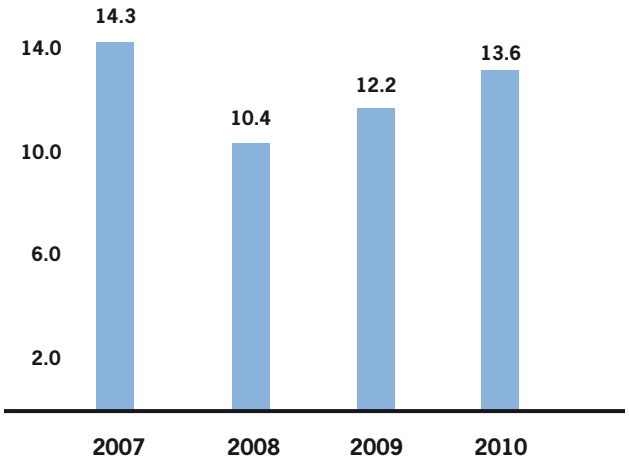


Chart 33 – Rate of COD emissions (tons/million tons processed)

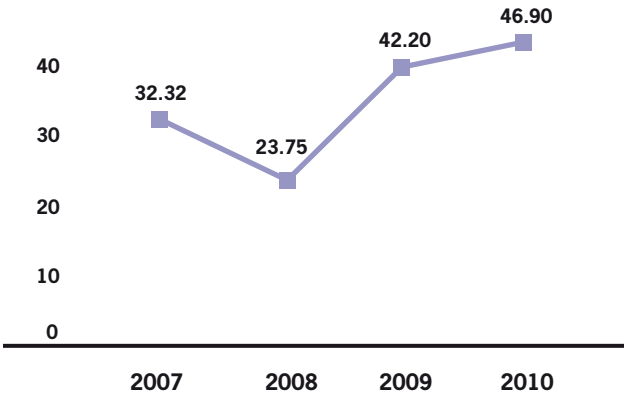


Chart 34 – Rate of mineral oil emissions (tons/million tons processed)

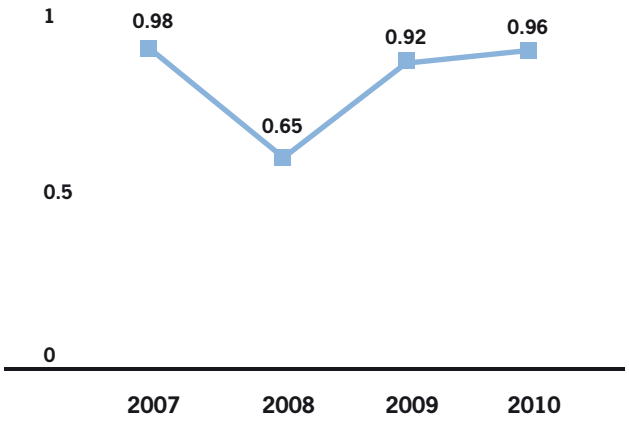


Chart 35 – COD concentration (mg/l)

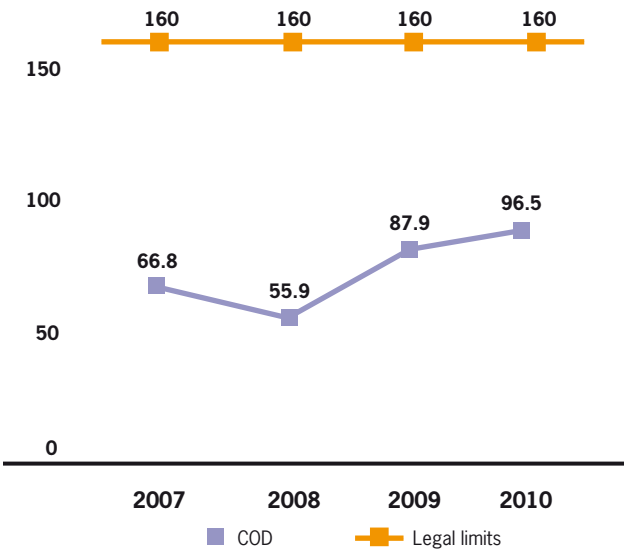
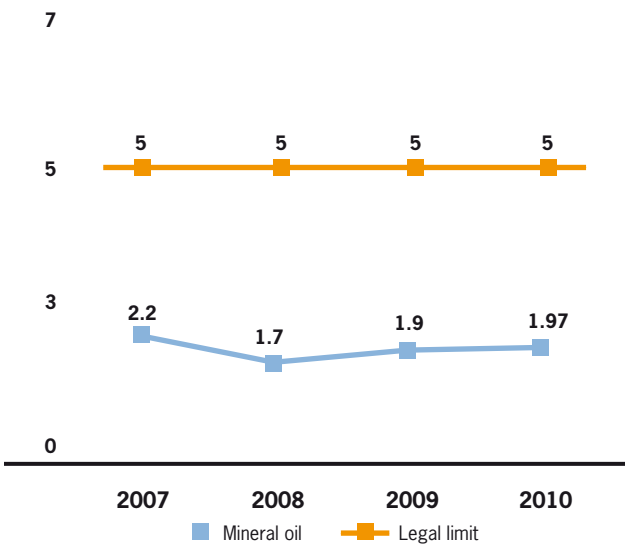


Chart 36 – Mineral oil concentration (mg/l)

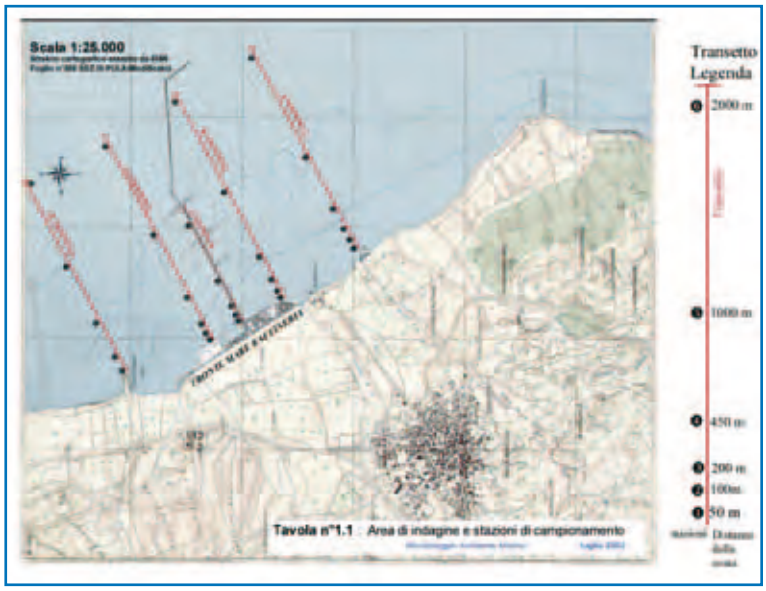


Monitoring the marine environment

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 25 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 25 – Trophic index (TRIX): seawater quality categories and results (2007-2010 survey)

	Surface water	Bottom water
January 2007	high	high
July 2007	high	high
January 2008	high	high
July 2008	high	high
January 2009	good	buono
July 2009	good	buono
January 2010	**good**	**good**
July 2010	**good**	**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 produced an "average" rating for the quality of seawater in the entire survey area. The sole exception was 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 the resulting transportation 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 26). In any case, these indices are significant over long periods rather than in a single period. In 2010, the parameter showed a continuation of the trend seen in previous years.

Table 26 - Trophic state of seawater (2007-2010 survey)
CAM index (specific to the sea around Sardinia)

	Surface water	Bottom water
January 2007	average	average
July 2007	average	average
January 2008	average	average
July 2008	average	average
January 2009	low	low
July 2009	low	low
January 2010	**average**	**average**
July 2010	**low**	**low**

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 interception 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
- an agreement with a specialist company for the constant attendance of anti-pollution staff and equipment

In the event of a spill, vehicles and equipment are available to deal quickly with the incident, according to procedures laid down in the Internal Emergency Plan, which includes the Marine Pollution Prevention Plan (page 106).
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 of using only double-hulled ships for transportation of gasoline, kerosene and diesel (Table 27) was achieved in 2009.
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 sets 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, as permitted by the regulations. The facility manages waste according to its objectives of minimising the quantity produced and increasing the quantity recovered. In 2010 there was a reduction in the total amount of waste from refining, in line with previous years, due to lower production of excavated earth.

Refinery equipment for the protection of 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 27 – Commitments and results relating to the protection of the marine environment from shipping traffic - 2009

	Commitment for 2009	Result for 2009	Commitment for 2010
Double hull for light crude oil	100%	100%	100%
Gasoline/kerosene/diesel	100%	100%	100%

Chart 37 – Types of vessel (%)

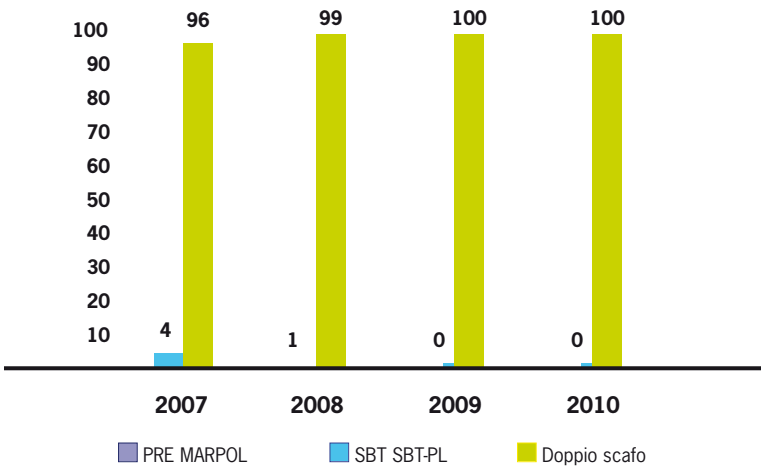
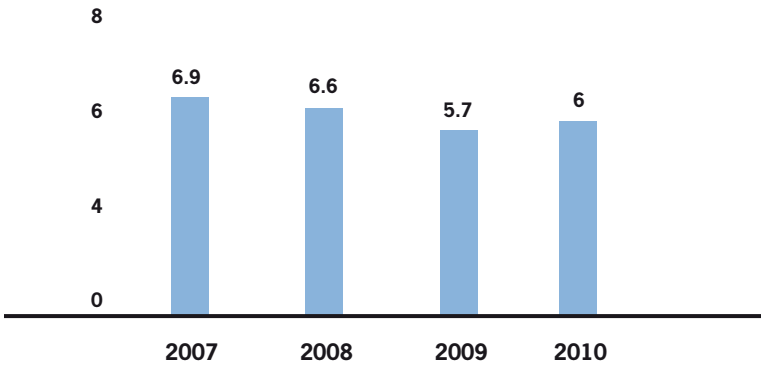


Chart 38 – Average age of tankers (years)



In 2010, around 112,350 tons of waste were recovered or recycled, an increase consistent with that of previous years. The rise was mainly due to site remediation activity and to the delivery of used catalysts from the desulphurisation process to companies specialising in metals recovery (Co, Mo, Ni). 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. Treated waste is transformed into non-hazardous waste that can then be sent to landfill (Table 31).

Excavated earth from new operations and maintenance and remediation activities was sent off-site to a recovery plant, thus eliminating hydrocarbons and allowing it to be reused.

New measures to protect our coastline: 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 must 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.

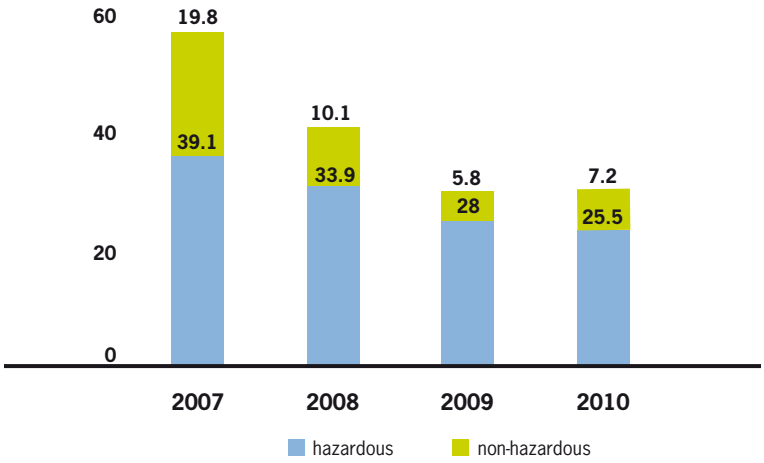
In the past few years, **Category 6** vessels, which have **a double hull**, have increasingly been used, with the aim of preventing accidents at sea or limiting their consequences. Saras has chosen to increase its use of this type of ship for the transportation of crude oil and oil products (Chart 34).

Table 28 – Waste produced by the site (thousand tons/year)

	2007	2008	2009	2010
Hazardous waste*	39.1	33.9	29.2	25.5
Non-hazardous waste	19.8	10.2	5.7	7.2
Total	**58.9**	**44.1**	**34.9**	**32.7**

*excludes waste deriving from the 2008 characterisation plan

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



In 2010, the waste inertisation plant sent about 13,100 tons of waste that had been rendered inert to controlled landfill on behalf of Saras.
Separated waste from offices and the canteen continued to be collected in 2010 by agreement with the Municipality of Sarroch. Table 32 shows the quantities of material sent for recovery; 81.7 tons of paper, 19.9 tons of plastic and 14.4 tons of glass and aluminium went for recycling. Wet waste collection was also introduced in 2008. In 2010, a total of 14.3 tons was collected.

Table 29 - Remediation activity (thousand tons/year)

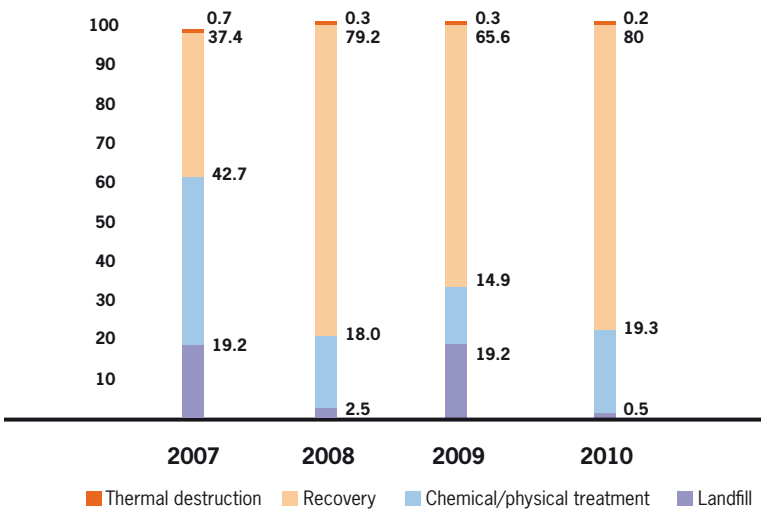
	2008	2009	2010
WATER	77.7	91.7	105
EARTH	13.8	35.8	2.8

Table 30 – Final destination of waste (thousand tons/year)

	2007	2008	2009	2010
Landfill	11.32	3.38	31.25*	0.75
Recovery	22.06	107.34	106.54	112.35
Incineration	0.42	0.45	0.50	0.37
Internal chemical/physical treatment External chemical/physical treatment	25.16	22.95 1.46	24.06	27.09
Total	**58.96**	**135.57**	**162.35**	**140.56**

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

Chart 40 – Final destination of waste (%)



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 competent authorities with its Site Characterisation Plan on the condition of the terrain and the layers of water beneath the refinery.

Table 31 – Chemical/physical treatment of waste (thousand tons/year)

	2007	2008	2009	2010
Chemical/physical treatment, of which:	25.16	22.95	22.96	27.09
Rendered inert and sent to landfill	13.67	10,09	10.61	13.1
Internal recycling	11.49	12.86	12.35	13.9

Table 32 - Separated waste sent for recycling (tons)

	2007	2008	2009	2010
Paper	84.5	95.8	74.6	81.7
Plastic	11.5	14.9	24.7	20.8
Glass and aluminium	4.3	8.1	10.9	14.4
Wet waste (since 2008)	-	7.4	7.8	12.6
USW	423	448.6	498.5	373

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:

- surveys of the terrain with extraction of core samples from 5 to 10 metres deep to establish the subsoil stratigraphy, ascertain whether any contaminants were present and measure their concentrations
- piezometry, or special surveys of the terrain 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

The Site Characterisation Plan is currently nearing completion. By December 2009, 739 surveys, 140 piezometric readings and 539 gas survey control points had been carried out.

Analysis of the surveys provided the following information:

- soil analysis showed only small areas in which the limits for hydrocarbon concentration had been exceeded (182 samples out of 3,164 analysed), mostly in the area of the West Tank Farm and the disused ST1 tank. Other parameters also marginally exceeded the limits (Cd, Co, Cr, Cu, Ni, Pb, V, Zn and IPA), for a total of 97 samples out of 3,164, 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). Other parameters (Cd, Ni, Pb, IPA, BTEX, MTBE, sulphates) were also found to have marginally exceeded limits
- No abnormal readings were found in gas survey analysis of topsoil

In 2010, sampling and analysis of groundwater was carried out jointly with ARPAS to verify analytical results.

Preparation of the final documentation for the Characterisation Plan, which will be officially submitted in 2011, is currently under way.

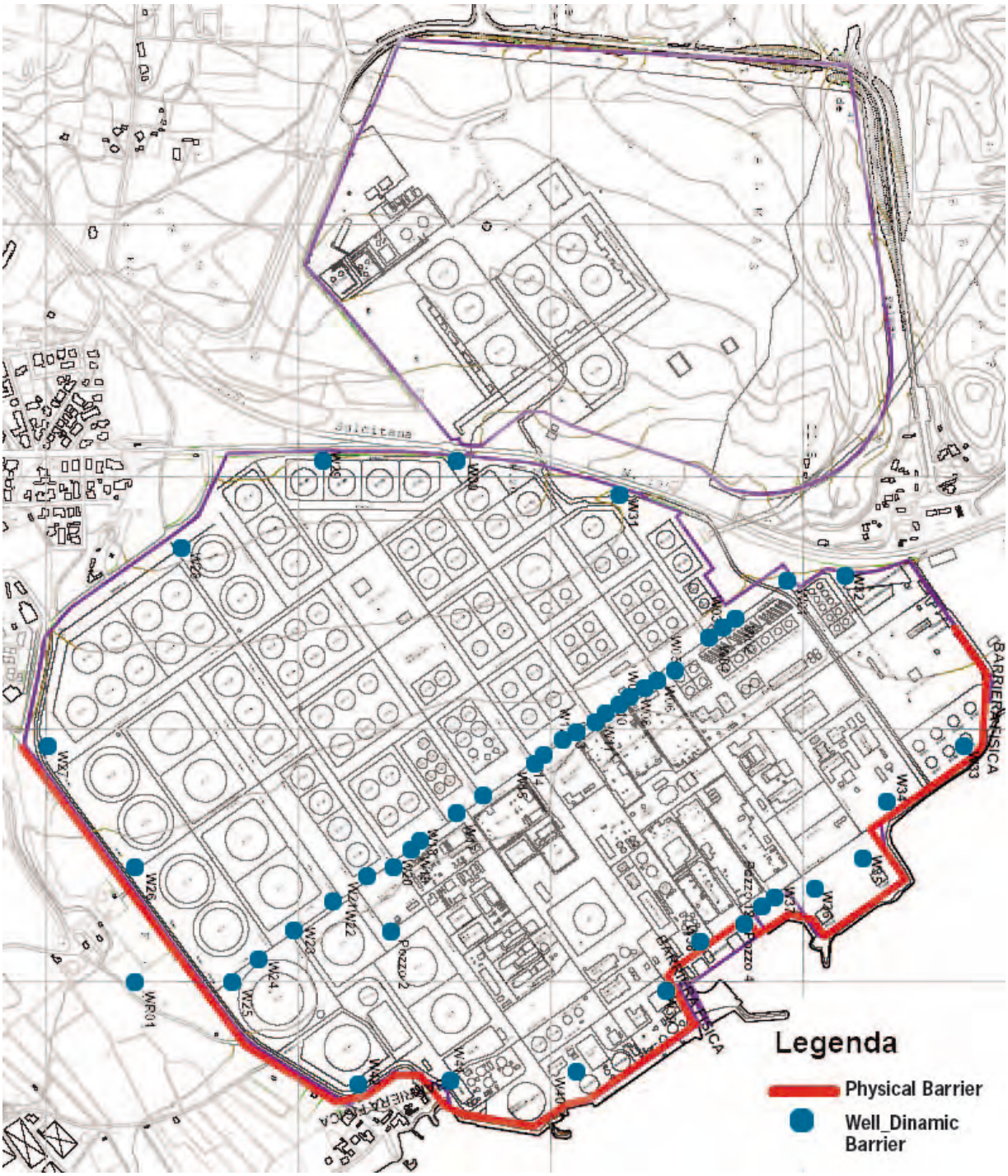
Based on the results of the characterisation activities, a plan was drawn up to make the groundwater safe in emergency and operational situations, which was approved at the Services Conference held at the Italian Ministry for the Environment in April 2007.

The project involves building a hydraulic barrier with supernatant recovery systems to protect the groundwater in emergency situations, and an integrated system containing both a hydraulic and a physical barrier to protect it in operational situations.

All 46 wells required for the hydraulic barrier have been dug. Of these, 26 are already operating on the mid-line, extracting contaminated water and recovering supernatants, 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 are hydrogeologically upstream, controlling groundwater levels. The upstream and replenishment wells are currently being brought into service. The physical barrier will extend over 3,050 m and will be made using jet grouting and waterproofing injections; plastic sheeting will also be used on the southern part. 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 tender specifications for the entire project, subdivided into operational lots, are also being defined. During 2008, Saras drew up projects for 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. 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 nearing 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 restitution of the site has been requested, except for the area through which the sewer rod passes and where action can only be taken after construction of a new sewer.

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



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 opposite (Figure 13 on page 81). 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 in 2010 confirmed the above trend, as shown in Charts 41 and 42 on page 81. 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 areas of the MHC1, MHC2, TAME and U800 plants were mapped.

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.

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 inside 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 site 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 of 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, thanks 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

Map base and urban zone legend taken from the municipal town plan

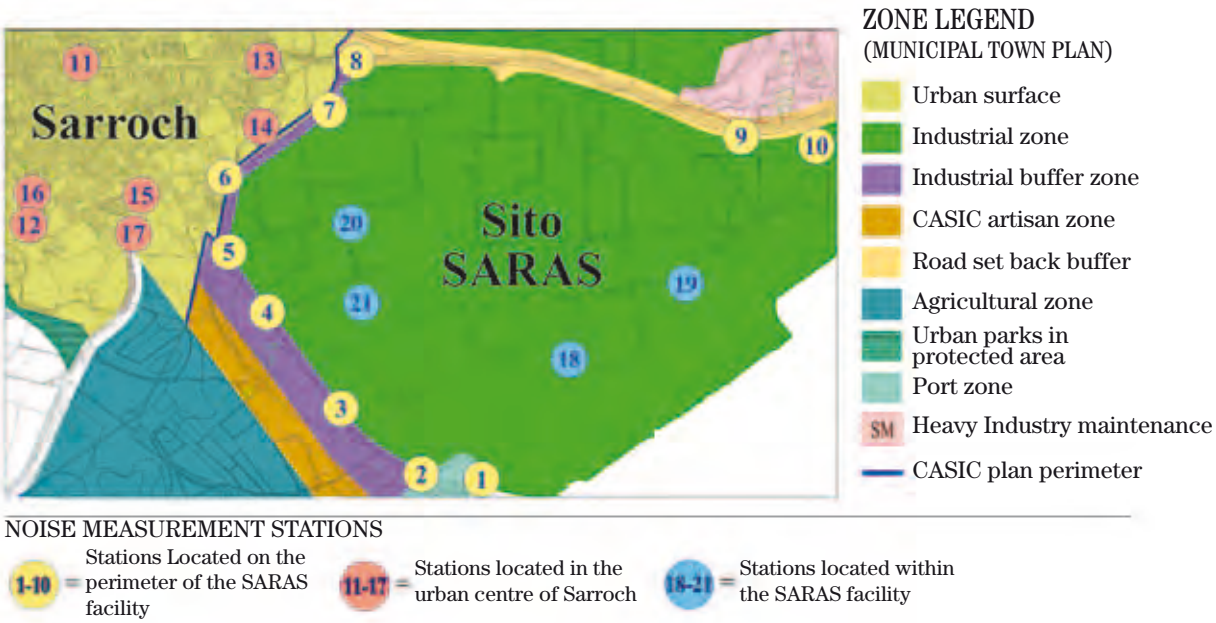


Chart 41 - External environmental immissions (dBA) - L90 levels - Daytime (Sarroch city centre)

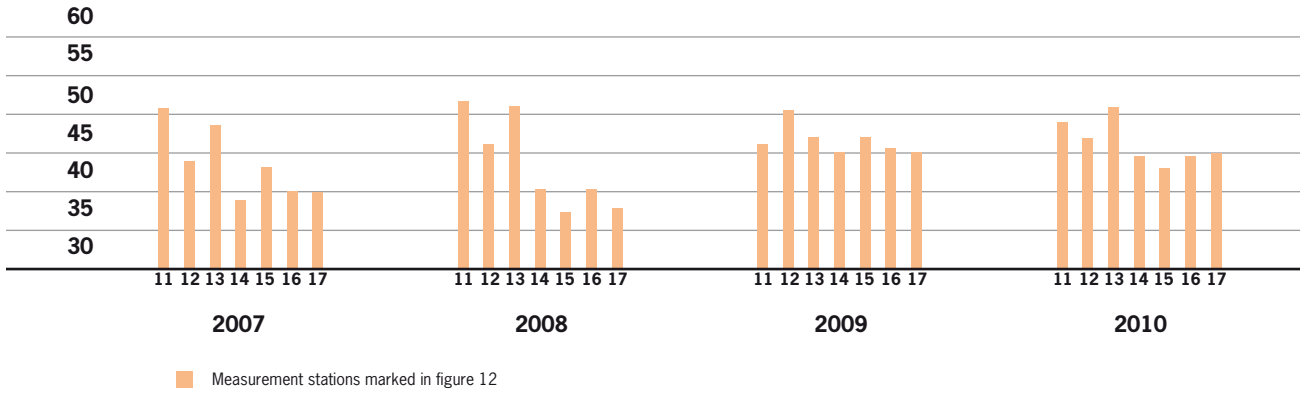
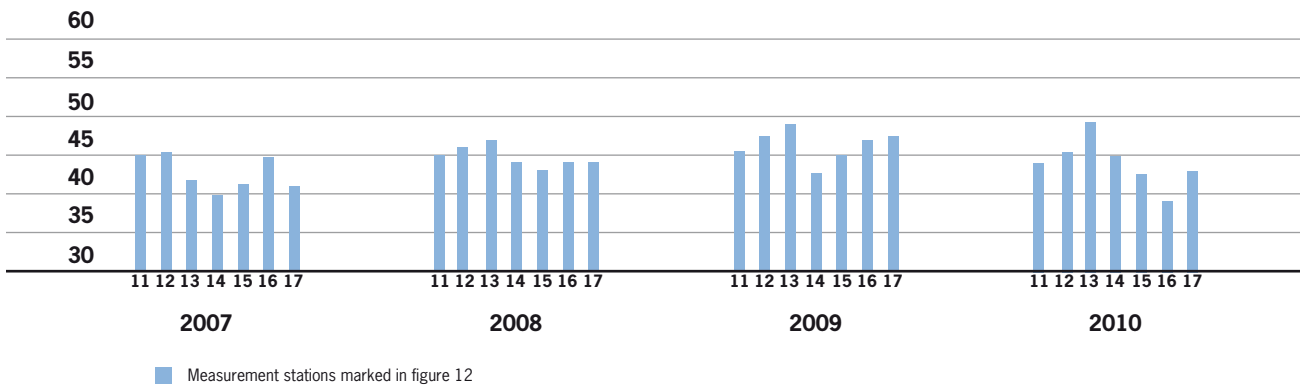


Chart 42 - External environmental immissions (dBA) - L90 levels - Night time (Sarroch city centre)



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 aims, 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 external companies and made of scrap metal and other materials used in plant operations, have also been installed. 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 33 show the company's strong commitment on this front, with total investment of more than EUR 40 million in the past four years.

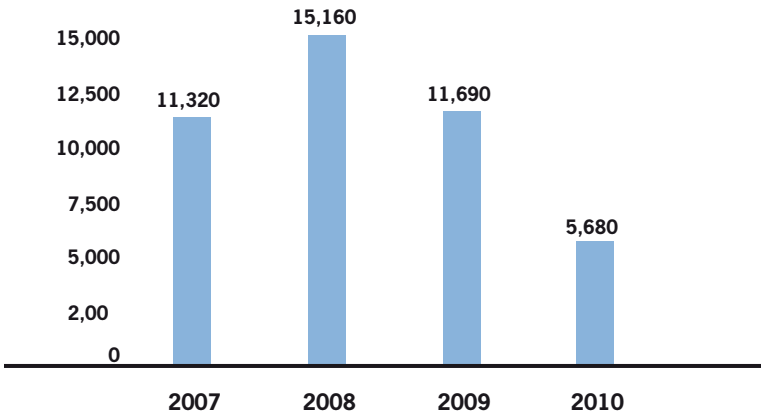
In 2010, the main investments were as follows:

- ongoing work on the dynamic groundwater control barrier
- launch 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
- completion of monitoring system for the CCR/alkalisation smokestack
- completion of monitoring system for the T2 smokestack
- completion of monitoring system for the FCC/CO boiler smokestack, excluding dust monitoring.

Table 33 – Investment in the environment (EUR thousands/year)

	2007	2008	2009	2010
Investments	11,320	15,160	11,690	5,680

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



Group companies

Sardeolica

Environmental monitoring

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

- flora
- fauna (and birds in particular)
- noise
- and 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 34 below shows production data for the photovoltaic plant (power: 18.9 kW) installed on the roof of the Ulassai Multifunctional Building.

Table 34

	2009	2010	TOTAL
Power [kW]	18.9	18.9	18.9
Output [MWh]	21,186.4	21,137.3	48,323.7
Months of operation	8	12	20
Equivalent households	7,062	9,046	16,108

Akhela

Since August 2008, plastic and paper waste has been collected separately at Akhela's premises in Cagliari. In 2010, solar panels were also installed at the main offices for hot water production

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 specific features and vulnerabilities of the site. 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 raft 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. Remediation technology testing was completed in December 2004. The definitive remediation plan was the result of nearly three years of work, during which it was possible to perfect the most suitable techniques, ensuring that the required result 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 applica-

Figure 14 – Remediation project for the Arcola site

tion 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 drawn up 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 on additional techniques designed to maximise the degradative capacity of the capillary fringe. This involved ascertaining whether the addition of oxygenated water would supplement the biodegradative processes. The relevant testing area had been set up by the end of June, when testing with oxygenated water began. The tests continued until mid-October. The data collected are currently being analysed, prior to preparation of the report to be submitted to the Services Conference.

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 2010. The Directorate-General of Environmental Planning, Assessment and Control 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. Table 35 shows the data for the main parameters that are systematically monitored compared with the limits set by the legislation in force.

Table 35 – Monitoring parameters

Parameter	2009		2010	
	Recorded value[3]	Limit value[2]	Recorded value[3]	Limit value[2]
CO (ppm)	54.6	500	49.1	500
NOx (ppm)	69.9	300	71.3	300
VOCs (mg/m^{3}N)	<0,05	–*	<0,05	–*
HCL (mg/m^{3}N)	<0,5	–*	<0,5	–*
Noise db(A)	64.0	65.0	60.1	65.0

* No legal limit has been set

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 2010 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 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 2010 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 publicly owned 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.

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.

The 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, the promotion and maintenance of high safety standards are shown in this part of the 2010 report using precise and detailed data. The decisions made by the company in terms of safety cannot be properly evaluated except by 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

Saras implemented the "Safety is our Energy" programme in March 2009, as part of its efforts to achieve continuous improvement. The three-year project focuses on spreading the culture of safety and on the safe conduct of everyone working on site. The programme is 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 in terms of safety. 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 spread 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 to 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

A highly reliable system can only ensure safety if the people who apply it have the training and skills to act in their various capacities. All staff must be trained to the highest possible level, in terms of both technical skill and responsible conduct.
Saras focused on both these aspects in 2010.
A project for certification for maintenance competencies was launched, which will be completed in the early months of 2011.
Appropriate training in aspects of conduct was continued in 2010, as part of the "Safety is our Energy" project, to develop an approach to safe conduct.
Shift managers, assistants, operators and managers from the subcontractors all took part in this activity in order to standardise conduct throughout the system into a proactive approach to safety. In-house teaching was key to the success of these initiatives, bringing active and participatory dialogue to the classroom.
As part of the "Safety is our Energy" project, a total of 412 Saras staff received 3,800 hours of training, while 230 staff from subcontractors received 920 hours of training.
The in-house teachers played a major role in this initiative.

In total, 39,886 training hours were delivered, including 24,672 hours of safety training.

Meanwhile, a course on confined spaces was held for subcontractors, with a total of 1,369 participants receiving 5,476 hours of training. This course in particular was planned with the aim of combining, as in other areas, technical and behavioural aspects based on the latest research into human behaviour, which shows that knowledge should be actively gained by those taking part in the training process, rather than passively transmitted.

4. Managerial/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 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 analyses) that have greatly enhanced the company's capability and speed when conducting analyses, 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 true innovation is the Safety Dialogues. A Safety Dialogue is a meeting between an operator and two suitably trained "dialoguers", with the aim of:
- disseminating the culture of safety through the adoption of safe conduct and the identification and assessment of risks
- identifying and collecting ideas for improvements to company safety
- involving and motivating staff

7. Management of external firms

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

- Creation of a minimum HSE (Health, Safety and the Environment) standard for subcontractors and 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 third-party companies in relation to the HSE standards as a pre-requisite for inclusion in the vendor list (authorised subcontractors).
- Updating of the audit system for HSE-certified third-party companies.
- Establishment 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 the better and earlier identification of the intrinsic properties of chemical substances. It also aims 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 with the scope of REACH, which enforces the registration of chemical substances via transmission 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 sector, the substances concerned (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, delivering 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 Fora).

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 file was compiled as follows:

- for each category represented by a Super SIEF (the combination of the various SIEFs of single substances in the same category), the joint parts of the registration dossier and generic chemical safety reports were provided to each oil company covered by CONCAWE for liquid substances and LOA for gaseous substances
- for each substance, Saras adjusted the joint parts of the dossier for its own industrial situation, adding in specific data

REACH and CLP

REACH Regulation

EC Regulation 1907/2006 of the European Parliament and the Council was brought 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

These are substances subject to the transitional regime, fulfilling at least one of the following conditions:

- they are listed in EINECS, (European Inventory of Existing Commercial Chemical Substances)
- they have been 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
- they were placed on the EU market before the entry into force of REACH by the manufacturer or importer, and were considered as having been notified in accordance with Directive 67/548/EEC, but do not meet the definition of polymers as set out by REACH, provided that there is documentary evidence of this

SIEF

A 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".

The regulation stipulates that there should be a lead declarer for each substance, mandated by the other declarers to submit 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 checked for compliance and completeness. A registration number is only assigned after the files have passed these checks.

Occupational hygiene 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 monitoring programme is periodic and includes VDUs, hazardous substances, biological agents, electromagnetic fields, etc.
For the sake of simplicity, Table 36 shows the occupational hygiene monitoring carried out between 2002 and 2010, which takes place every three years. This schedule may vary according to the requirements that arise within the site or in a single area.

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, came into force in 2010. The regulation determines the application of new classification, labelling and packaging criteria (including for the purposes of REACH), which will be 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 substance.
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 36 – Monitoring programme

Hazards	2002	2003	2004	2005	2006	2007	2008	2009	2010
Lighting						■			
Group 1 hazardous substances	■			■			■		
Group 2 hazardous substances		■			■			■	
Noise			■			■			
Electromagnetic fields						■			
Microclimate		■			■		■	■	
Biological agents		■			■			■	■
Asbestos	■		■			■			■

The AIDDI (the Italian Occupational Hygiene Association) sets out three Threshold Limit Value (TLV) categories (AIDII, 1997; ACGIH, 2002), shown in Table 37.

Table 37 – Threshold Limit Values

TLV-TWA Threshold Limit Value Time-Weighted Average	Refers to the time-weighted average concentration for a normal 8-hour working day and 40-hour working week, to which nearly all workers may be repeatedly exposed, day after day, without adverse effect.
TLV-STEL Threshold Limit Value Short Term Exposure Limit	Refers to the concentration to which workers may be exposed continually for short periods, as long as the daily TLV-TWA is not exceeded, without 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 to influence the ability to reach safety or to materially reduce working efficiency (always provided that the TLV-TWA is not exceeded). TLV-STEL is not a separate and independent exposure limit, but instead supplements the TLV-TWA of substances whose toxic action is mainly chronic, when recognised acute effects exist. STEL are recommended when human or animal exposure to high concentrations for brief periods has demonstrated toxic effects. A STEL is defined as average weighted exposure for a period of 15 minutes, which must never be exceeded during the working day, even if the weighted average over 8 hours is less than the TLVs. 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 STEL exposure periods. A different averaging period may be advisable if this is justified by observed biological effects.
TLV-C Threshold Limit Value – Ceiling	Refers to a concentration that must never be exceeded during working activity, even for a very brief period.

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).

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 and TAME (ether))
- 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 all involved in the assessment process.

The aims of the assessments are as follows:

- measuring 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
- measuring 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)
- measuring 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.

Details of monitoring campaigns

Monitoring in 2008

The dosimeter results for hazardous substances were all in Class 1, i.e. the safety zone (values up to 10% of the maximum tolerable concentration).

The results for respirable dusts were all in Class 1, except for four jobs which came under Class 2, with values very close to the threshold between Classes 1 and 2. The fixed monitoring points all gave Class 1 results, except for one respirable dust reading in Class 2.

Finally, measurements of short-term exposure (15 minutes) during particular tasks were all in Class 1. The dosimeter measurements for carcinogenic or potentially carcinogenic substances all gave Class 1 results, i.e. within the safety zone (values up to 10% of the maximum tolerable concentration). In the case of benzene, Class 1 was divided into two and a Class 0 was created, to distinguish between TLV-TWA concentrations of up to 5% and those within the range of 5% to 10%; the results were all within Class 0, except for one result in Class 1.

Monitoring in 2008 and 2009 during plant remediation 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 remediation 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 remediation 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.

FCC plant

The dosimeter results were good: in the case of benzene, compared with exposure during normal plant operation, there were four cases above Class 1, and most of the results were in Class 1 and Class 0. Readings for other substances gave similar results.

RT1 plant

The dosimeter results were very good: all the benzene results were in Class 0, and readings for other substances gave similar results.

V2 plant

The dosimeter results were very good: all the benzene results were in Class 0, and readings for other substances gave similar results.

Monitoring in 2009/2010

In late 2009 and the early months of 2010, monitoring of hazardous substances was carried out to measure the level of exposure of staff operating within the refinery to certain organic compounds and non-organic substances. All the substances monitored fell within Class 1, including thiols, phenol, hydrofluoric acid, hydrochloric acid, ammonia and carbon monoxide.

In the case of hydrogen sulphide, thiol 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.

Asbestos

Historically, glass wool 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 panels were also used in coverings at the refinery and asbestos fibre edging 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 demolished. 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 performed 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, sometimes 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 in December 2010, pursuant to 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 approaching zero.

The exposure limit for asbestos set out in Article 254 of Legislative Decree 81/08, is 100 ff/L.

Since 97% of the samples taken showed a level of 0 ff/L, and the remaining samples showed 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 in 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:

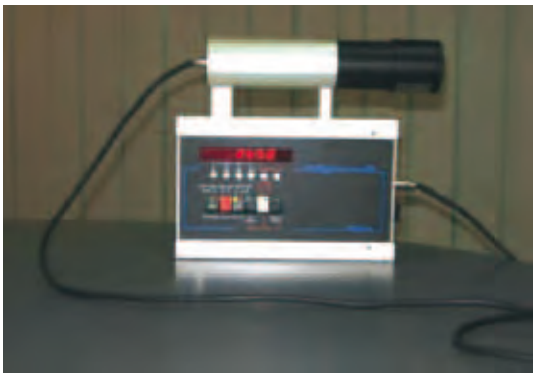
Exposure limit LEX, 8H=87 dB(A) and Ppeak=140 dB(C)
Upper action level LEX, 8H=85 dB(A) and Ppeak=137 dB(C)
Lower action level LEX, 8H=80 dB(A) and Ppeak=135 dB(C)
As the regulations stipulate, the assessment will be updated every four years. The most recent monitoring campaign for worker noise exposure, competed 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 to noise of operational staff 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 improvements measures have been implemented and soundproofing systems for machines and plants have been installed as the result of targeted workplace hygiene and safety initiatives, and we continue to develop and seek certification for workplace prevention activities.
As previous testing and noise measuring campaigns have shown, some operational jobs fall into the acoustic risk category. Based on personal phonometric readings, the noise exposure situation for operational staff is as follows:

ACOUSTIC RISK CATEGORY	EMPLOYEE EXPOSURE LEVEL	NOISE EXPOSURE OF OPERATIONAL STAFF
0	LEX, 8h < 80 dB(A)	40
I	80 dB(A) < LEX, 8h < 85 dB(A)	32
II	85 dB(A) < LEX, 8h < 87 dB(A)	9
III	LEX, 8h > 87 dB(A)	19

However, it should be noted that:

- no instantaneous sound pressure levels higher than 140 dB(C) were detected
- the auditory Personal Protection Measures (PPMs) 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 PPMs 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. Mapping will also be carried out on all the other plants.



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. Measurement of worker exposure to electromagnetic fields in order to increase knowledge about these exposure levels was carried out through 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 person 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 possible staff exposure to ionising radiation and to produce the relative 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 Cagliari prefectural authorities.

No controlled or supervised zones have been identified based on the equipment characteristics, 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

Microbiological monitoring of the air and wastewater near the refinery’s purification unit has been ongoing for a number of years.

The following parameters are monitored:

- total bacterial count, total coliforms, Escherichia coli, Salmonella spp and Legionella pneumophilia in the aerosol
- Escherichia coli and Salmonella spp in wastewater

In 2006, aerosol sampling took place at certain points in the plant, such as equalisation tanks, biological tanks and the final splitter, which are seen as more likely to form and spread aerosols and sprays due to the effects of factors such as movement and air insufflation. The water samples were taken in areas with a high concentration of micro-organisms in the sludge (equalisation and biological tanks).

The results of the checks showed that:

- the concentration of airborne micro-organisms was "low" at all measurement points
- no significant levels of coliforms or E. coli were detected in any of the aerosol samples
- no Salmonella spp or L. pneumophilia (measured in the cooling tower only) was found in any of the aerosol samples

In the wastewater samples, E. coli was detected within legal limits, and the Salmonella spp result was negative.

The periodic biological monitoring campaign of 2009 was repeated in order to gather data on microbiological contamination at the PWP and BWT plants and in the cooling tower.

The following parameters were measured:

- total bacterial count
- moulds (Cladosporium, Aspergillus)
- Enterobacteriaceae (total coliforms, Enterobacter, E. coli, Serratia, Salmonella and Pseudomonas).

Moulds were widely detected in all areas. However, the presence of species from the Cladosporium and Aspergillus families (Class 2 biological agents) is not attributable to production but to the seaside location of the plant.

Applying the European Collaborative Action classification system (which correlates total bacterial loads to fungal species) to the results of the monitoring, exposure to the risk of biological agents at the plant is classed as "medium-low".

The coliform study also produced a risk classification of medium-low: although they have Level 2 pathogen status, the species identified are present in concentrations far lower than the Threshold 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 systemic 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 performed 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 these are 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 caloric stress indicators in hot 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 registered for 48 points, representing 78.7% of the points assessed.

None of the environments registered 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 hot 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:

- medical check-ups
- 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 by the plan. At the first check, all the instrumental testing is carried out as well as the biohumoral and urinary metabolite tests. At the second check, biological exposure monitoring tests are carried out (complete blood count and urinary metabolites).

Drug tests are carried out at a later stage for emergency response teams and drivers.

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 psychotropic substances as part of general drugs testing.

The site's Safety Report

The Saras refinery drew up 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, an uninhabited area. In drawing up the Safety Report for the site, the company conducted a precise and in-depth analysis of its activities and the risks associated with them in relation to the refining process, the materials used and all the procedures involved in running a complex operation such as an oil refinery. The five-year review of the Safety Report was completed in October 2010 (the previous review took place in 2005) pursuant to the regulatory requirements, and was delivered to the competent authorities in the same month. The revised version included an in-depth analysis of the situation at the plant and its current management; risk scenarios and hypothetical accidents were reviewed, together with the possible consequences for staff, the area inside the site and the surrounding area. The document was also modified to include all the important changes to plants, procedures and the organisation implemented at the site between 2005 and 2010. The analysis was performed with the active support of operational staff and employees in staff services (e.g. production areas, processes, specialist maintenance, major maintenance, engineering, reliability and availability), who contributed their professional experience to help achieve the accident prevention goals. The Safety Report is therefore an invaluable tool for preventing risk situations from arising, examining all possible prevention measures, and identifying and adopting technological solutions, equipment and safety systems that would enable any accident to be dealt with effectively, thereby minimising the impact on people, the environment and the facility. In 2006, pursuant to Legislative Decree 238/2005, the Safety Report and the documents required for the External Emergency Plan (the "Notice" and the "Information Sheet" for the public) were updated. Subsequently, 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. In relation to continuous improvement, the Committee suggested a number of areas for further examination and possible implementation.

The analysis method used is based on indices, pursuant to the regulatory requirements. Each plant has therefore been divided into logical units. The logical units were chosen according to pre-established criteria to enable the plant equipment in question to be grouped in a logical way (e.g. equipment operating under similar temperature and pressure conditions and processing the same fluids).

Each logical unit was then analysed, with prior assessment of penalising factors due to:

- risks related to the substances processed
- general process risks
- specific process risks
- risks related to the quantities of substances processed
- layout (design) risks
- health risks in the event of an accident

and the subsequent assessment of compensatory factors that could reduce the number and potential scale of accidents, including:

measures helping to reduce the number of accidents (e.g. control and safety instruments, operating and maintenance procedures and staff training)

measures helping to reduce the potential scale of accidents (e.g. fire prevention systems and fixed fire fighting systems)

The overall analysis of these parameters enables a specific risk category to be assigned to each logical unit. The forward-looking choices made have enabled the elimination of all the logical units that had been classified in the "high I" risk category in the previous review of the document (in 2005), and increased the proportion of units in the average minor/low category, as shown below:

2005 Safety Report

258 logical units analysed

Risk category distribution:

88% minor/low

11 % moderate

1 high I

2010 Safety Report

276 logical units analysed

Risk category distribution:

89% minor/low (61% minor, 28% low)

11% moderate

0% high I

We can see that, although a higher number of logical units was analysed in 2010 (about 7%) than in the previous review, as a result of the continuous improvement policy all the logical units that had been classified as high-risk in 2005 were moved down to the minor/low category.

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:

- limited 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. Continual updates are provided to these organisations until the emergency is fully resolved, so that the local community can be kept informed.

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 seven 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.

The External Emergency Plan (EEP)

The External Emergency Plan (EEP) is closely related to the Internal Emergency Plan. 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 and Air Liquide Italia) that could result in harmful consequences for the area outside the facilities.

Here, too, the safety reports for the various production facilities and analyses of hypothetical accident scenarios (study of the local area, urban 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, monitoring of the surrounding area and provision 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 regular drills involving the companies and all other responsible organisations.

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

Data

Accidents

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 "Safety is our Energy" programme, implemented with the support of Du Pont, the world leader in occupational safety, was stepped up in 2010 with the launch of new training and information activities mostly targeting aspects of behaviour, which is the main cause of company accidents.

The INAIL total frequency and accident frequency indices registered in 2010 for Saras began to show signs of improvement, which is expected to continue in 2011. There was a sharp rise (+36%) in near-injuries reported in 2010; these were analysed and corrective action taken to prevent injury.

Table 38 – Saras employees – Accident indices

	2007	2008	2009	2010
Total frequency indexe	12.2	11.6	13.2	10.7
INAIL frequency index	7.5	6.4	7.5	6.3
Severity index	0.123	0.172	0.376	0.330*
Average duration	16.5	26.7	49.9	43.8*
Near accidents reported	2	10	60	82

* the figure does not include non-work-related accidents

Chart 44 – Saras employees – Total frequency index

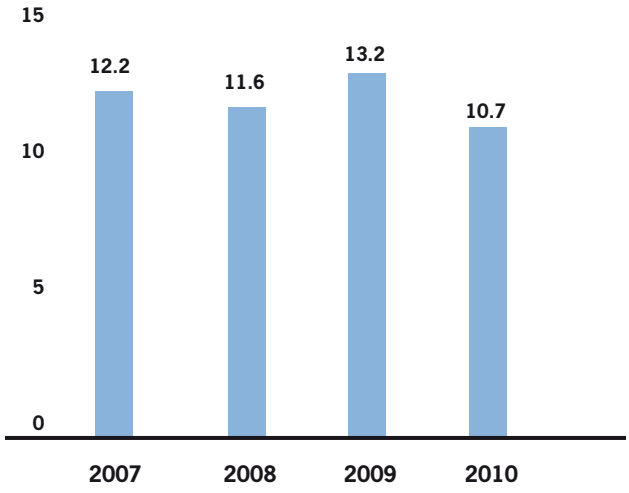


Chart 45 – Saras employees – INAIL frequency index

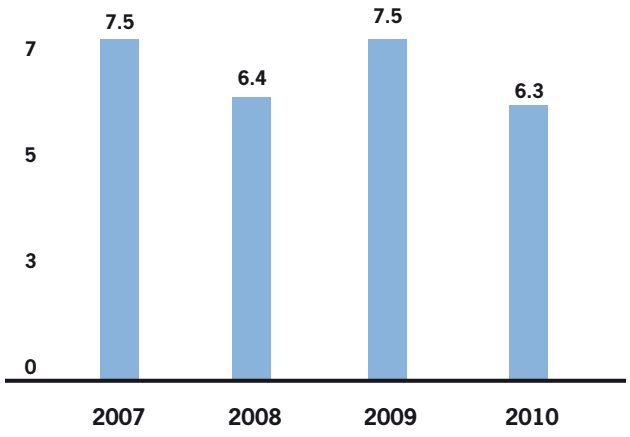


Chart 46 – Saras employees – Accident severity index

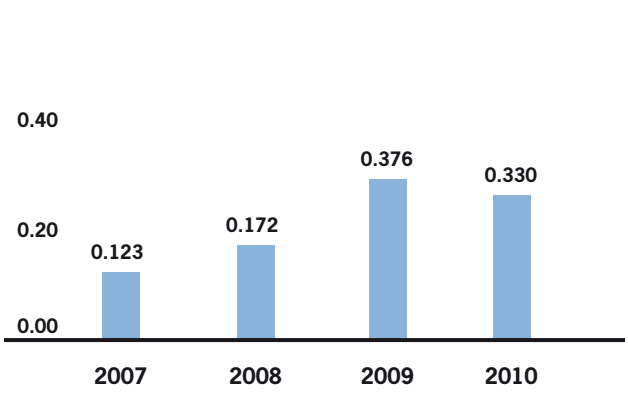
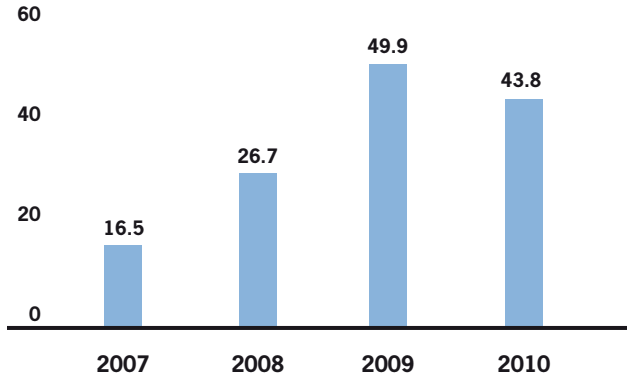


Chart 47 – Saras employees – Average accident duration (days)



Subcontractors. Saras also records and analyses data on accidents at work involving staff employed by subcontractors. Accident analysis has shown that conduct is also the most critical factor for subcontractors. In 2010, Saras increased its focus on subcontractors operating within the site, stepping up checks on the ground and classroom training activities by Saras staff (17 sessions with 230 participants for a total of 920 hours). These initiatives have had a positive effect on accident rates, which improved markedly on the previous year. Subcontractors also made an important contribution to the reporting of near-injuries, with an increase of 20% compared with the previous year.

Table 39 – External staff – Accident indices

	2007	2008	2009	2010
Total frequency index	10.93	5.77	8.50	5.97
INAIL frequency index	5.75	2.26	4.90	2.83
Severity index	4.58	0.061	4.939	0.203
Average duration	39.8*	26.7	30.5*	58.8**
Near accidents reported	45	15	127	153

* This figure does not include fatal accidents

** This figure is affected by two accidents that occurred in 2009 but lasted into 2010. Stripping out this effect, the figure is 31.6

Chart 48 – External staff – Total frequency index

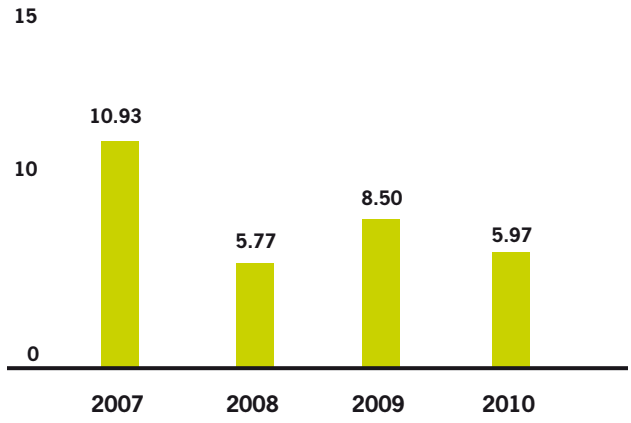


Chart 49 – External staff – INAIL frequency index

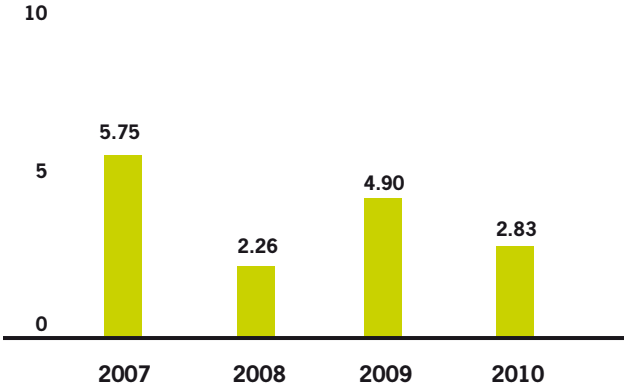


Chart 50 – External staff – Accident severity index

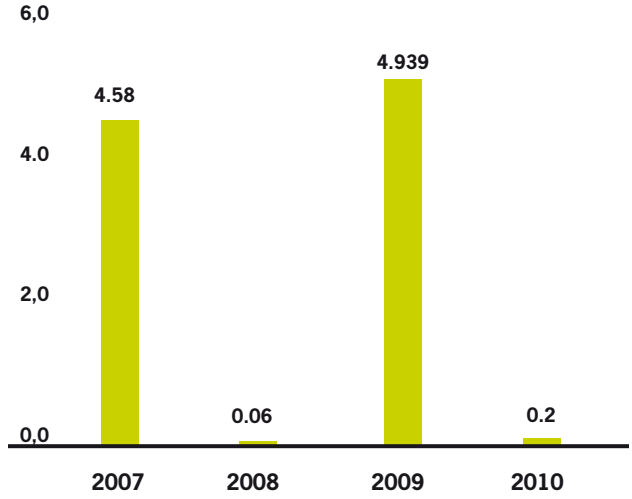
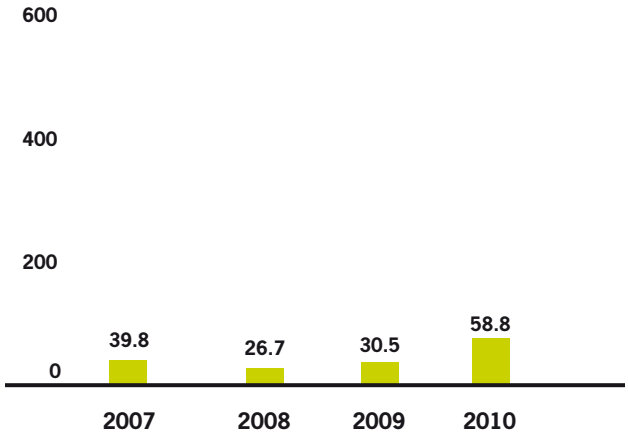


Chart 51 – External staff – Average accident duration



Emergencies

In 2010, five general emergencies were reported, all of less than 30 minutes' duration. None of these emergencies caused any physical injury, and a total of 11 days of plant shutdown due to emergency were recorded (see Tables 40 and 41). Reports of near-accidents (see Graph 51) decreased markedly in 2010; although this can be attributed to the increased focus on the reporting and analysis of near-injuries, it merits attention and the setting of a goal for improvement.

The charts opposite show the number of plant shutdowns due to emergencies and the number of days plants were shut down due to these incidents (Charts 55 and 56).

Table 40 – Emergencies – Number of events

	2007	2008	2009	2010
Limited emergencies	21	18	32	15
General emergencies	6	7	3	5
Near accidents	10	11	20	4

Chart 49 – Limited emergencies

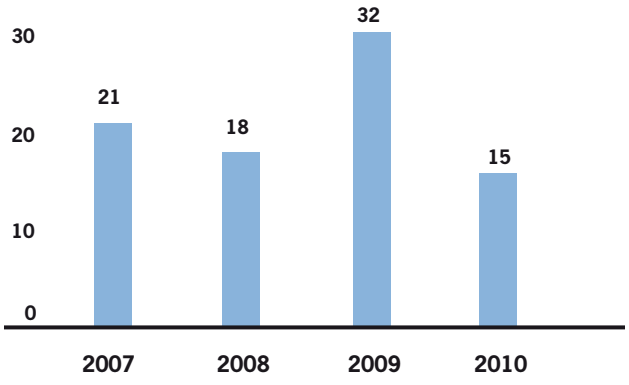


Chart 50 – General emergencies

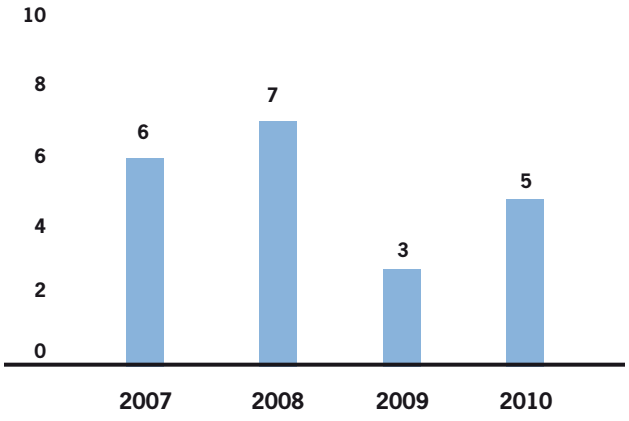


Chart 51 – Near accidents

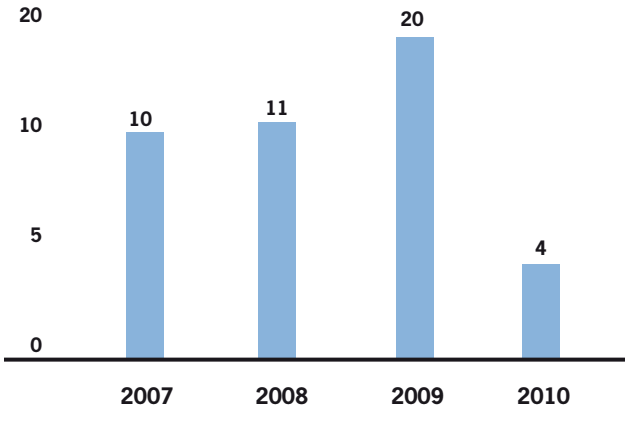


Table 41 – Shutdowns following an emergency

	2007	2008	2009	2010
Number of shutdowns	2	1	3	4
Number of days of shutdown	1	3	7	11

Chart 55 – Shutdowns

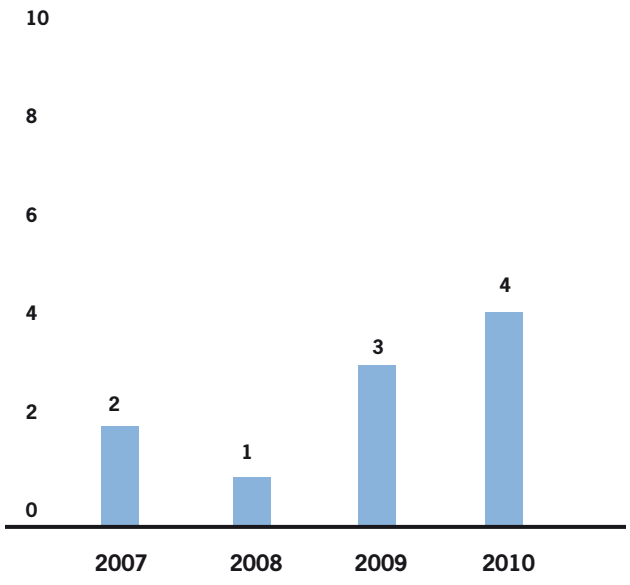
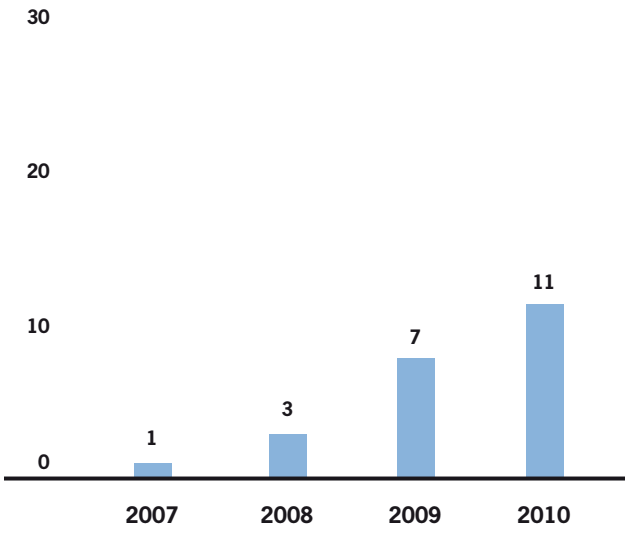


Chart 56 – Days of shutdown



Investment in safety

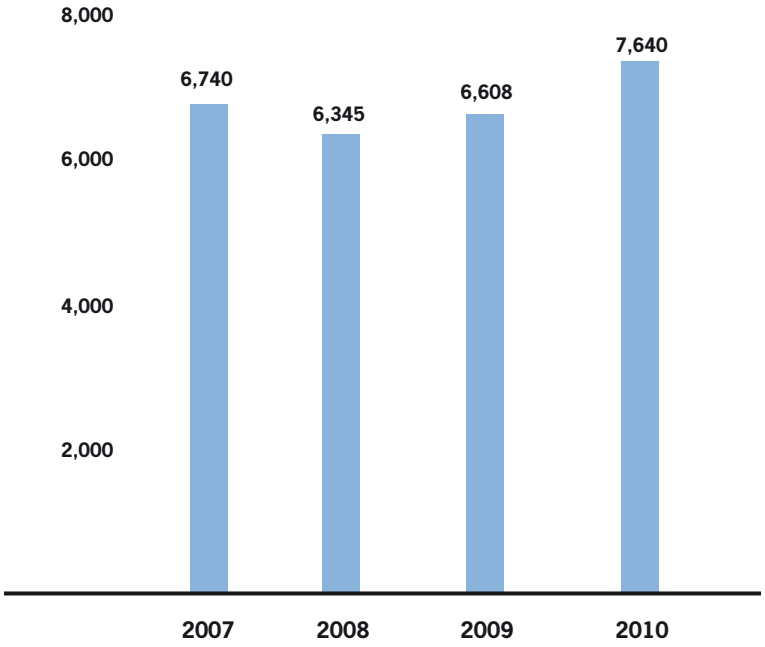
Between 2007 and 2010 Saras invested over EUR 27 million in projects and policies to continually upgrade safety levels at its site, spending on average around EUR 6.750 million a year. The main measures funded in 2010 involved both the improvement of existing safety equipment and modifications to plant and product movement systems, as follows:

- the fitting of further product volume interception valves at the V2/T2 plant
- the replacement of glass "klingers" 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 (FCC plant)
- the completion of the upgrade to the structural fire prevention systems
- safety improvements within the tank containment basins

Table 42 – Investment in safety (EUR thousands/year)

	2007	2008	2009	2010
Investments	6,740	6,345	6,608	7,640

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



Group companies

Data

The charts opposite show the results of the main accident indices for Group companies.

Data for the Sarroch site have already been provided.

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.

Akhela reported one accident among its own staff and one case of medical treatment among the staff of the external subcontractors. Sartec reported two accidents among its own staff and the index value of 7.54, 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. Its total accident frequency, INAIL and severity rates were calculated according to the aggregate methods used for the other Group companies, all operating in Italy. The rates registered by Saras Energia were on average slightly higher than the Group average, corresponding to the results registered by the service stations, where most accidents were concentrated. In the following charts, the "Total" column shows the figure for the sum of accidents 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 have a particular influence on the Group figure, since the hours worked by direct

staff account for 44% and 26% of the total respectively, while for the staff of subcontractors, the Sarroch site has the biggest influence on the data, with a percentage of 93.7%.

Chart 58 – Total frequency index

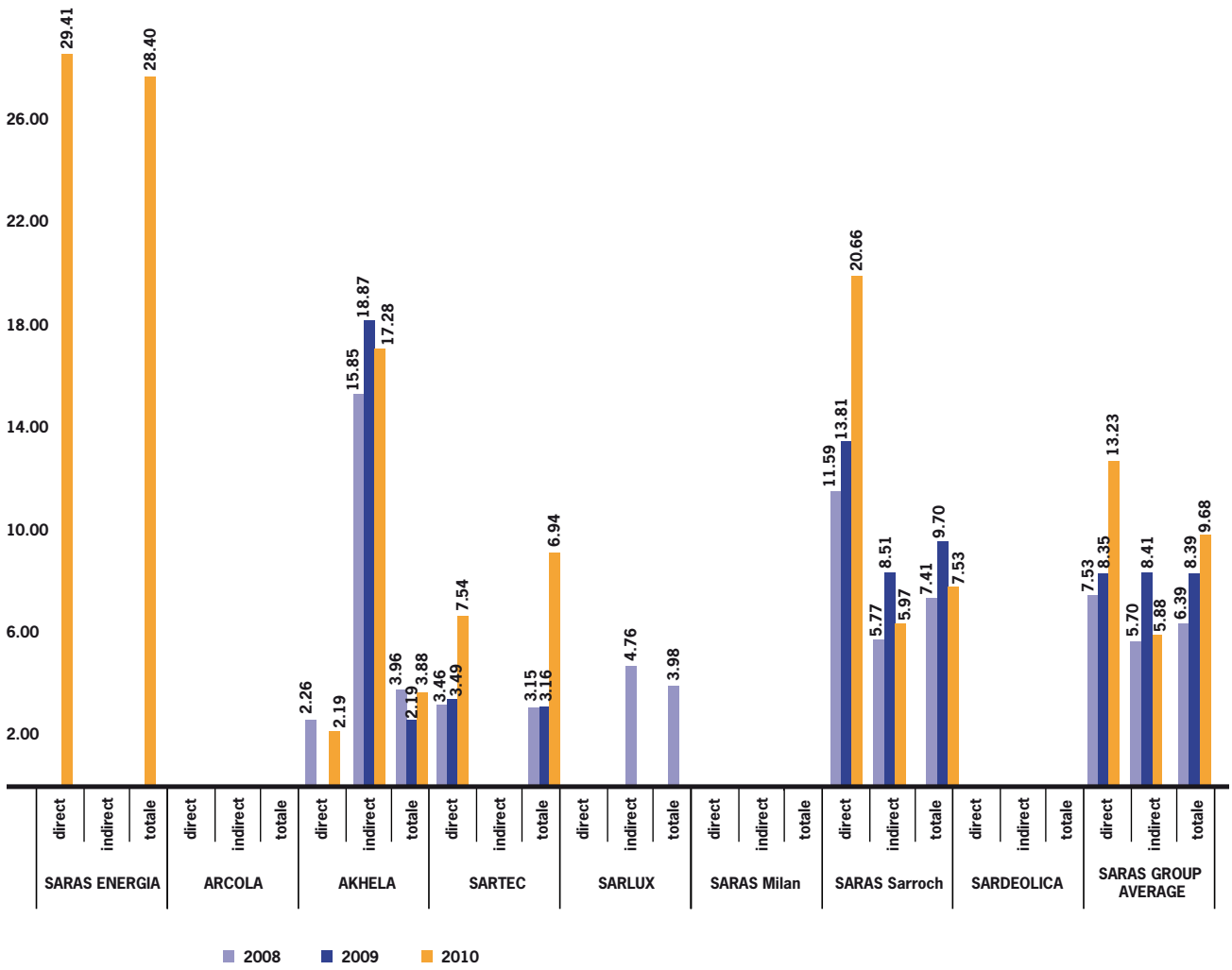


Chart 59 – INAIL frequency index

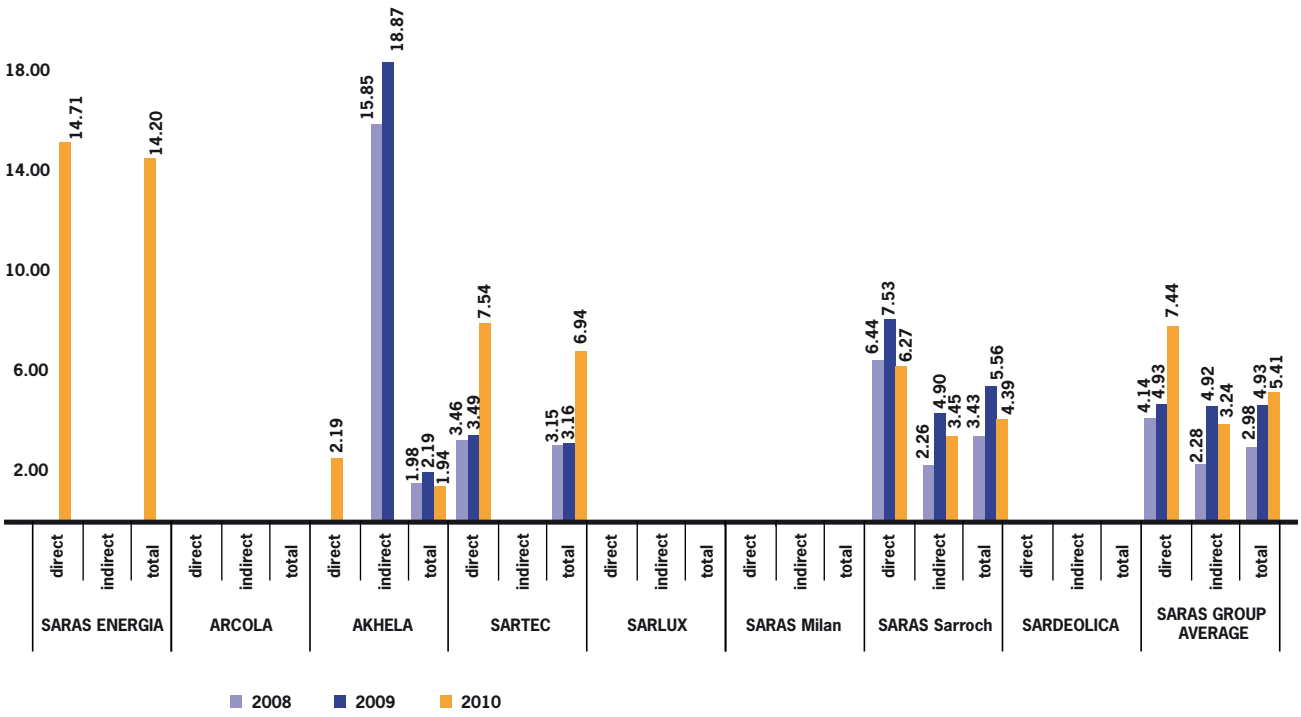
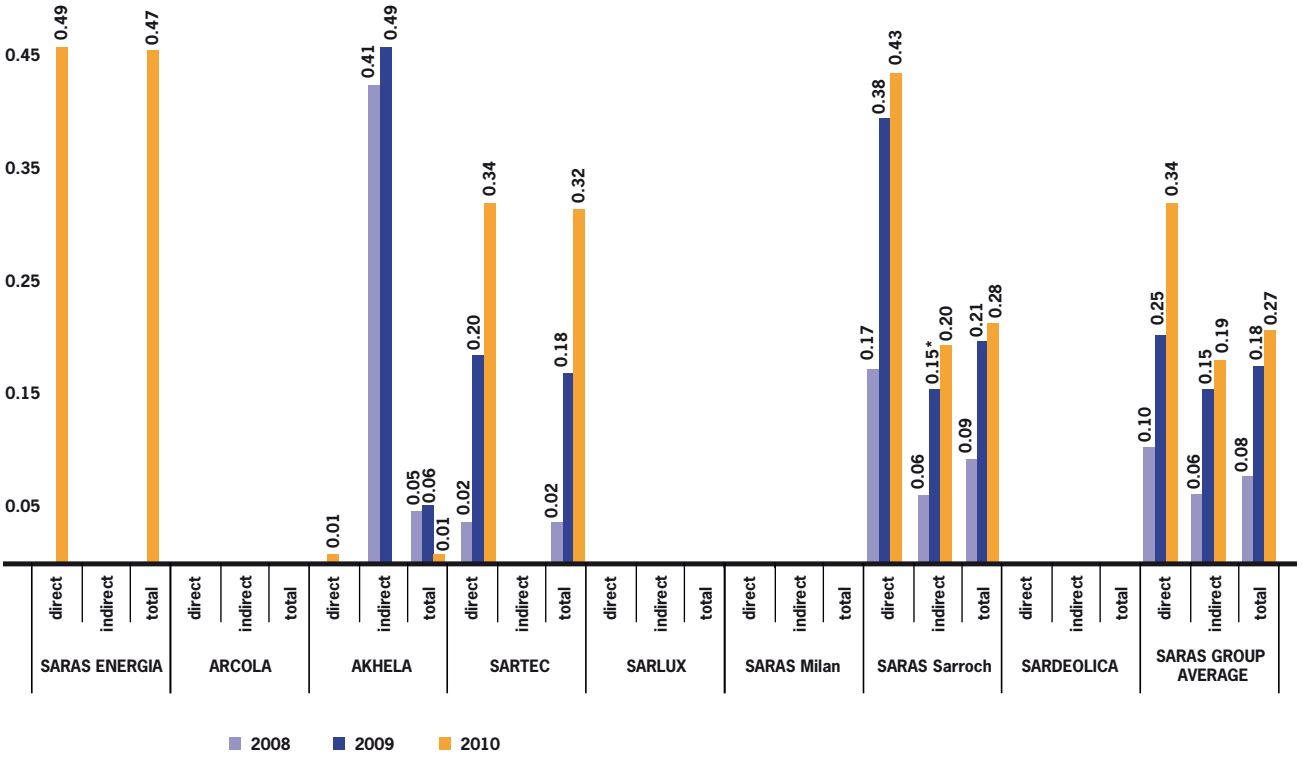


Chart 60 – Accident severity index



* Nell'indice di gravità è escluso l'incidente mortale "indiretti Saras Sarroch"

Chart 61 – Hours worked by direct employees

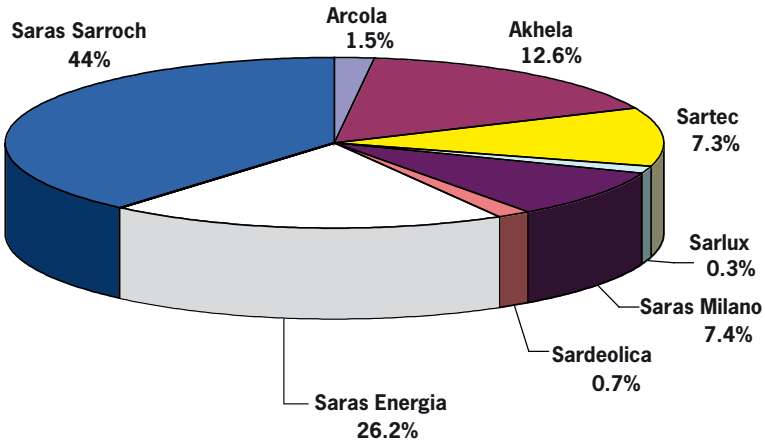


Chart 62 – Hours worked by staff of external companies

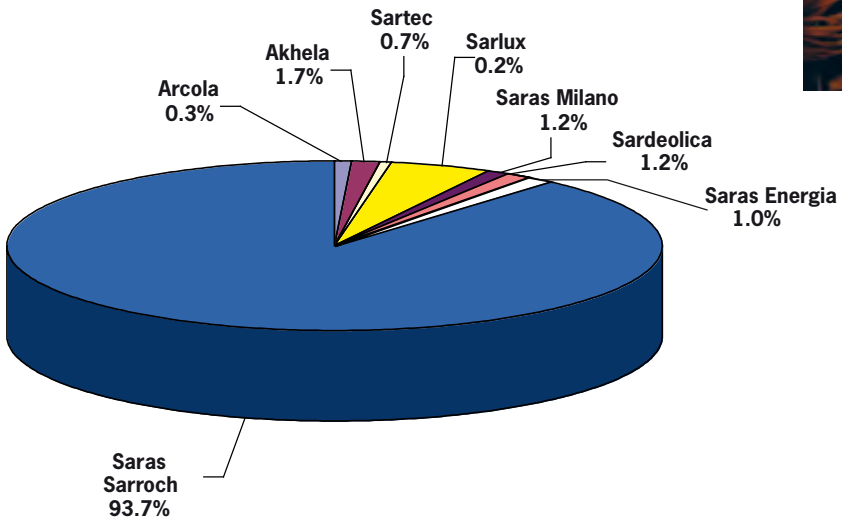
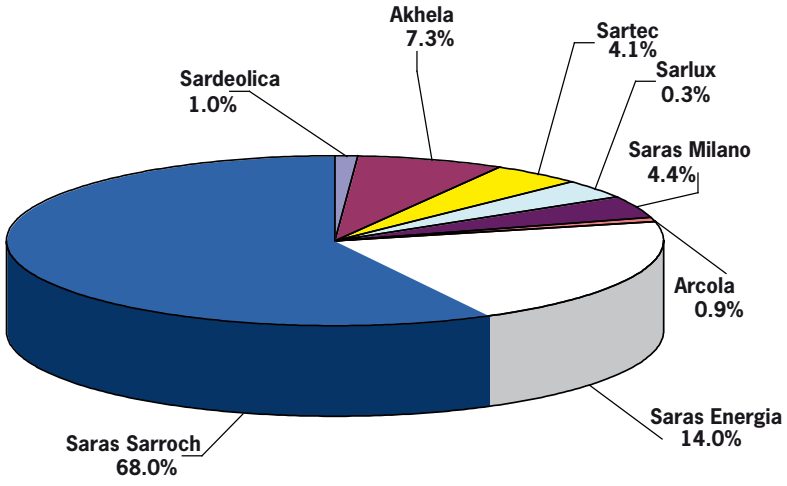


Chart 63 – Total hours worked



Occupational hygiene monitoring

Sardeolica

Since the time of its construction, Sardeolica has carried out monitoring activities designed to measure possible effects on the staff working at the wind farm site. Monitoring of:

- noise
- electromagnetic fields

and 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

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 to carry out a risk assessment:

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

Glossary

Glossary

BALLAST WATER

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

AIA 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 control 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.

CAM INDEX (classification of seawater)

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 and hygiene 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.

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

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.

DIESEL

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

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.

EMAS (EcoManagement 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.

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.

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.

ENVIRONMENTAL IMPACT

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

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.

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.

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).

GASOLINE

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

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 (SF6).

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.

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).

INAIL 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).

INAIL 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).

INES (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. This information is then submitted to the Ministry for the Environment for forwarding to the European Commission and inclusion in 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 Organization for Standardization)

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 (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.

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.

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.

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 SO_2, 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.

PIEZOMETER

A small-diameter tube or well inserted into a body of water and used to measure, by means of the water level reached inside 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 μm (1 μm = 1 micrometre), 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.

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

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.

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.

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

SO_2 (sulphur dioxide) A colourless gas with a pungent odour released when fossil fuels containing sulphur are burnt. In the atmosphere high concentrations of SO2 are the main cause of acid rain.

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.

TOE (tons of oil equivalent) A unit of measurement conventionally used to determine the energy contained in various sources taking into account their calorific value.

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

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

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.

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