Saras S.p.A.
Environmental Declaration 2011

Saras SpA
Environmental Declaration
2011

Version of 12 June 2011
(performance data updated to 31 December 2010)

Prepared according to the requirements of EC Regulation 1221/2009

SARAS SpA
Registered office and production plant: Sarroch (CA)
S.S. 195 Sulcitana, Km 19

Head office: Milan
Galleria de Cristoforis, 1

Activity codes: NACE 19.20 (refinery) and 35.11 (IGCC)
IPPC activity categories: 1.2 (refinery) and 1.1 (IGCC)

Revised version of 12 June 2011 (updated performance data as at 31 December 2010) of the Saras SpA Environmental Declaration
EMAS registration no.: IT – 000995 on 20 October 2008

The accredited environmental inspector that validated the Saras Environmental Declaration pursuant to EC Regulation 1221/2009 is Lloyd's Register Quality Assurance Italy Srl.

EMAS accreditation no.: IT-V-0010 on 19 September 2008

This document describes for the public and all stakeholders:
- the activities carried out by Saras
- the direct and indirect environmental aspects associated with these activities
- the objectives that the company has set itself in order to improve its environmental performance

The document is aimed at the company's internal and external community, and is intended to establish a transparent relationship with all its stakeholders, particularly the local population, local authorities and employees, which represents a key component in the proper management of the company's activities.

The Environmental Declaration will be updated on an annual basis and a complete version will be re-issued in 2014.

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Foreword

During 2010, we continued our activities to build on the environmental results previously achieved by implementing measures at a technical, organisational and management level.

Emissions of sulphur dioxide (SO_2) fell a further 4% in 2010 compared with the figure for the previous year, confirming the positive trend that since 2007 has brought about a total reduction in emissions of around 46%. In particular, this is due to the structural improvements achieved with the entry into operation of the tail gas treatment unit of the sulphur recovery plant.
We should also highlight the data from the air quality monitoring stations, which did not report a single reading in excess of the hourly average value for SO_2 emissions for the whole of 2010.

In the case of greenhouse gases too, compared with the average for the three-year period 2006-2008 (2009 data was affected by major plant shutdowns), the 2010 data show a reduction in emissions from the refinery, mainly due to investments made in energy recovery. The direction taken by Saras to monitor and reduce CO_2 emissions mainly revolves around the rational use of energy and the adoption of efficient production systems.

As far as flare emissions are concerned, a programme was launched in July 2010 to optimise the refinery networks in order to reduce the emission of hydrocarbons from the flares.
The results have been very clear to see, with flare emissions down by 26% compared with 2009 and a noticeable reduction in visual impact.

A further significant achievement came in the area of waste management at the Industrial site, which in 2010 led to a 13% decrease in the volume of waste generated compared with the previous year, as well as an increase in the recovery of waste leaving the site, which rose from 26% in 2009 to 34% in 2010.

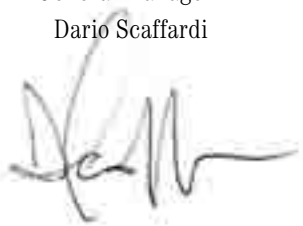
Another goal achieved in 2010 was the registration of 43 produced/imported substances as required by REACH (Registration, Evaluation, Authorisation and Restriction of Chemical Substances), the regulation issued by the European Parliament. The main aim of REACH is to improve the protection of human health and the environment through better and earlier identification of the intrinsic properties of chemical substances used in Europe.

2010 also saw the start of the audit inspections conducted by Lloyd's Register Quality Assurance (LRQA), which cover all company processes at both the Sarroch site and the Milan office.
In addition, Saras successfully completed the second renewal of the certification for its environmental management system (EMS) according to ISO 14001:2004 and, at the end of the three-year period of validity, obtained the renewal of the certification of its safety management system (SMS) according to OSHAS 18001:2007 for a further three years.

In the context of a market that is still showing signs of weakness, Saras will pursue its commitment to regaining efficiency (the Focus project) while building on all the environmental measures put in place, in order to combine commercial competitiveness with sustainable development.

Sarroch, 29 june 2011

General Manager
Dario Scaffardi



Contents

Note to the reader

This document, which provides a detailed description of Saras' activities and the company's interaction with the environment and the region in which it operates, has been structured in such a way as to make it easy to read and quick to understand.
The features that have been adopted are described below.

At the start of each section, a brief summary is provided of the main information contained in the pages that follow, in order to identify in a few sentences the concepts that will be explained in more detail in that section..

In each section, the headings in blue in the margin of the text provide an extract of the most important information discussed in more detail on that page.

Similarly, in Section 4, which provides information on the main environmental aspects, the reference legislation governing authorisation mentioned in the text is specified in the margin of the text.

Where relevant, reference is also made to the table "Environmental objectives and programmes" (Section 5, page 121), which summarises the objectives and improvement measures that will be the company's particular focus over the next few years, as well as the improvement measures implemented in 2010.

The charts in the document that have an orange border show the measurement of a parameter in comparison to an applicable legal or permit limit.

Finally, the text boxes with a blue background contain information that, while it does not relate directly to Saras or its activities, will help the reader to gain a better and fuller understanding of the company and the context within which it operates.


SARAS

1.
The company– –
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Saras' heart is in Sardinia.

Since it was founded in 1962, Saras has grown into a Group that operates in the energy sector within Italy and abroad in a number of different areas, including the production, distribution and sale of oil products, energy generation from renewable sources or other eligible sources, IT services, research and environmental services.
The Sarroch refinery in Sardinia, in the heart of the Mediterranean, has been the company's primary operation for over 45 years.

Today, the site's production complexity, capacity and quality make it one of the most important in Italy and Europe. This is an industrial organisation where respect for the environment, health and safety inform all of the company's decisions, as part of an ongoing dialogue with the surrounding area, and it is against this backdrop that Saras achieved EMAS registration in October 2008.

1. The company

1.1 – The Saras Group

The Saras Group operates in the energy sector and is among the leading independent oil refiners in Europe.

[2,000 employees, 7,000 employed in related industries]

At the end of 2010, the Group had around 2,000 employees, of which 1,284 were employed by the parent company Saras SpA, which has EMAS registration.

With its registered offices and production site in Sarroch (1,118 employees) and its administrative and financial head office in Milan (164 employees), Saras represents the most important employment hub in Sardinia, with more than 7,000 people employed in related industries.

In recent years, the company has broadened its operations beyond oil refining to encompass other activities in the energy sector, particularly the generation of electricity:

- by building an IGCC (Integrated Gasification Combined Cycle[1]) plant that is highly integrated with the refining cycle and produces 4.4 billion kWh of electricity each year, representing over 30% of the region's requirements
- by building a 72 MW capacity wind farm in Ulassai, again in Sardinia. During the second and third quarters of 2010, the Group completed installation work for six new wind turbines at the Ulassai wind farm. As soon as the last minor operations currently under way are complete, the wind farm will reach its full capacity of 96 MW as early as the second quarter of 2011.

[Group investments]

Saras SpA has been listed on the Borsa Italiana stock market since May 2006. With revenues at the end of 2010 of EUR 8.6 billion (+62% compared with 2009, as a result of shutdowns) and a comparable gross operating margin[2] of EUR 149.2 million (+6% compared with 2009), the Saras Group operates in the energy sector and is one of the leading independent oil refiners in Europe. In 2010, Group investments totalled EUR 129 million (-59% compared with EUR 317 million in 2009). 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. Investment was mainly split between refining activities (EUR 92.5 million) and wind energy (EUR 14.9 million).

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[1] **Gasification Combined Cycle:** the IGCC plant enables heavy hydrocarbons produced as a processing by-product from the refinery to be converted into electrical energy.

[2] **Comparable gross operating margin:** gross operating margin calculated by valuing inventories using LIFO and adjusted for non-recurring items.

[3] **Adjusted net profit:** net profit adjusted for the difference between inventories valued using LIFO (Last In, First Out – oil stocks at historical values) and inventories valued using FIFO (First In, First Out – oil stocks at current values) after taxes, non-recurring items after taxes, and changes in the fair value of derivatives after taxes.

FIGURE 1. Location of the Saras site

The Sarroch production site

The Saras production site in Sarroch, around 20 km south-west of the Sardinian capital Cagliari, is the location for one of the largest refineries in the Mediterranean region by production capacity and its complexity makes it one of six "super sites" in western Europe (source: Wood Mackenzie, February 2007).

With production capacity of 15 million tons per year (or 300,000 barrels per day), the Saras refinery accounts for about 15% of Italy's total refining capacity. The refining cycle is integrated with the IGCC plant, which generates electricity.

The excellent geographical position of the Sarroch plant has proved strategic for trade with central-western Mediterranean countries, both in Europe and North Africa, while its proximity to the plants of Polimeri Europa and Sasol Italy enable it to add petrochemical production to its refinery operations (see box on page 13).

1.1.1 – Group companies

[oil products, electricity, services]

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.
Saras operates in the energy sector, and is one of the leading operators in oil refining in Italy and Europe.
Arcola Petrolifera sells oil products on the domestic wholesale market, in Sardinia, North and Central Italy. 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.
Sarlux, a wholly-owned Saras subsidiary, owns the IGCC plant. The company manages all commercial activities relating to the energy generated by the IGCC plant, while Saras is wholly responsible for the plant's operational management (see section 3.1.3, page 34).
Saras Energia SA distributes oil products on the Spanish retail and wholesale market, via a sales structure endowed with a high degree of expertise, professionalism and market knowledge.
Sardeolica manages the wind farm located in the municipality of Ulassai (Province of Ogliastra), and is one of the largest wind farms in Sardinia, with authorisation for 48 wind turbines, of which 42 are already in place, offering an output capacity of 72 MW. This will rise to 96 MW from the first quarter of 2011 with the entry into service of the six new wind turbines currently being completed.
Akhela is an IT company with long-standing experience gained from managing the IT systems of the Sarroch refinery; the company develops high-tech tools and applications for the automotive, audio processing and avionics sectors.
Sartec (Saras Ricerche e Tecnologie) provides engineering and research technology for industry and the environment. Sartec's services of consultancy and environmental monitoring, design, and production-process and industrial-automation optimisation are aimed at supporting innovation and sustainable industrial development both within Italy and internationally. Sartec also designs, builds and rolls out modular plants to monitor emissions.

1.2 – Saras in Sarroch

[in Sardegna since 1962]

Saras' connection with Sarroch dates back to 1962, when Angelo Moratti identified it as a strategic location for an oil refinery. Construction of the refinery facilities began in 1963, and refining activity began in 1965.
Until the end of the 1980s, Saras mainly provided refining services for third parties (i.e. it refined crude oil owned by other oil companies that provided Saras with the raw materials to produce oil products).
In the mid-1990s, following a significant downturn in demand for high-sulphur fuel oil, Saras launched a major industrial project to build a plant to gasify heavy distillates from the refining process and subsequent combined-cycle cogeneration of electricity and thermal power (IGCC plant).

[the IGCC project]

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,

[continuous technological development]

FIGURE 2. The Saras production site and the surrounding region

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 gasoil 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 (Figure 10, page 36).

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.

[new facilities]

Since 1 January 2009, thanks to the start-up of the gasoline desulphurisation plant (unit 800) built in 2008, Saras is able to meet new European requirements that gasoline should have a sulphur content of 10 ppm, allowing the company to produce gasoline in accordance with the new restrictions and helping to reduce the indirect environmental impact linked to the sulphur content of motor fuels. In addition to the desulphurisation unit, a new hydrogen plant (unit 600) was completed and put into service within the IGCC plant, increasing the nominal hydrogen production capacity of the IGCC, which the refinery now uses on a permanent basis for the desulphurisation processes for middle and light products.

[competent authorities informed of the start-up of the Auto Oil and MTD plants on 23 December 2008[1]]

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. The percentage of sulphur sold as a product was higher than the 2009 figure.
This confirms the site's desulphurisation capacity, together with a marked reduction in the quantity of sulphur released into the atmosphere.

1.3 – Company organization

The organisation chart in Figure 3 shows the internal structure of Saras SpA. The two roles that head up the organisation, the General Manager and Chief Financial Officer, report directly to the company's Board of Directors. The diagram includes all the functions that could have an impact on the management of the Sarroch site. Most of these report to the General Manager. The General Manager's direct reports include the Health, Safety and Environment (HSE) Service, the Operations Management and Asset Management units and the Purchasing and Tenders department, all of which are based in Sarroch. The operating activities at the Sarroch site are managed by Operations Management, which, through the Operations function, co-ordinates the production areas listed below, which have a direct influence on the management of environmental aspects (see definition on page 46):

[operating activities]

- the Movement, Shipping and Wharf production area, which is responsible for the receipt of raw materials, and the internal movement and shipping of products
- the Distillation and Desulphurisation production area, which is responsible for the refining systems
- the Conversion production area, which is responsible for the conversion systems
- the Targas and Utilities production area, which is responsible for the IGCC plant and auxiliary services

[other services on-site]

Within each production area, the Reliability and Area Maintenance unit is responsible for ordinary unscheduled maintenance operations. Remaining within Operations, a particularly important role in the management of environmental aspects is played by the Service Engineer (in relation to atmospheric emissions and waste water) and the Blow-down and Networks Engineer (in relation to flare emissions). The above functions are assisted and supported in managing the site and environmental aspects by the following organisational units:

- Specialist Maintenance, responsible for scheduled maintenance activities not involving shutdowns

[1] **Relevant legislation:** Directive 98/70/EC, amended by Directive 2003/17/EC and within Italy, the following provisions: Prime Ministerial Decree no. 434 of 23 November 2000, Prime Ministerial Decree 29/2002, Law no. 306 of 31 October 2003.
[2] **TGTU:** Tail Gas Treatment Unit.

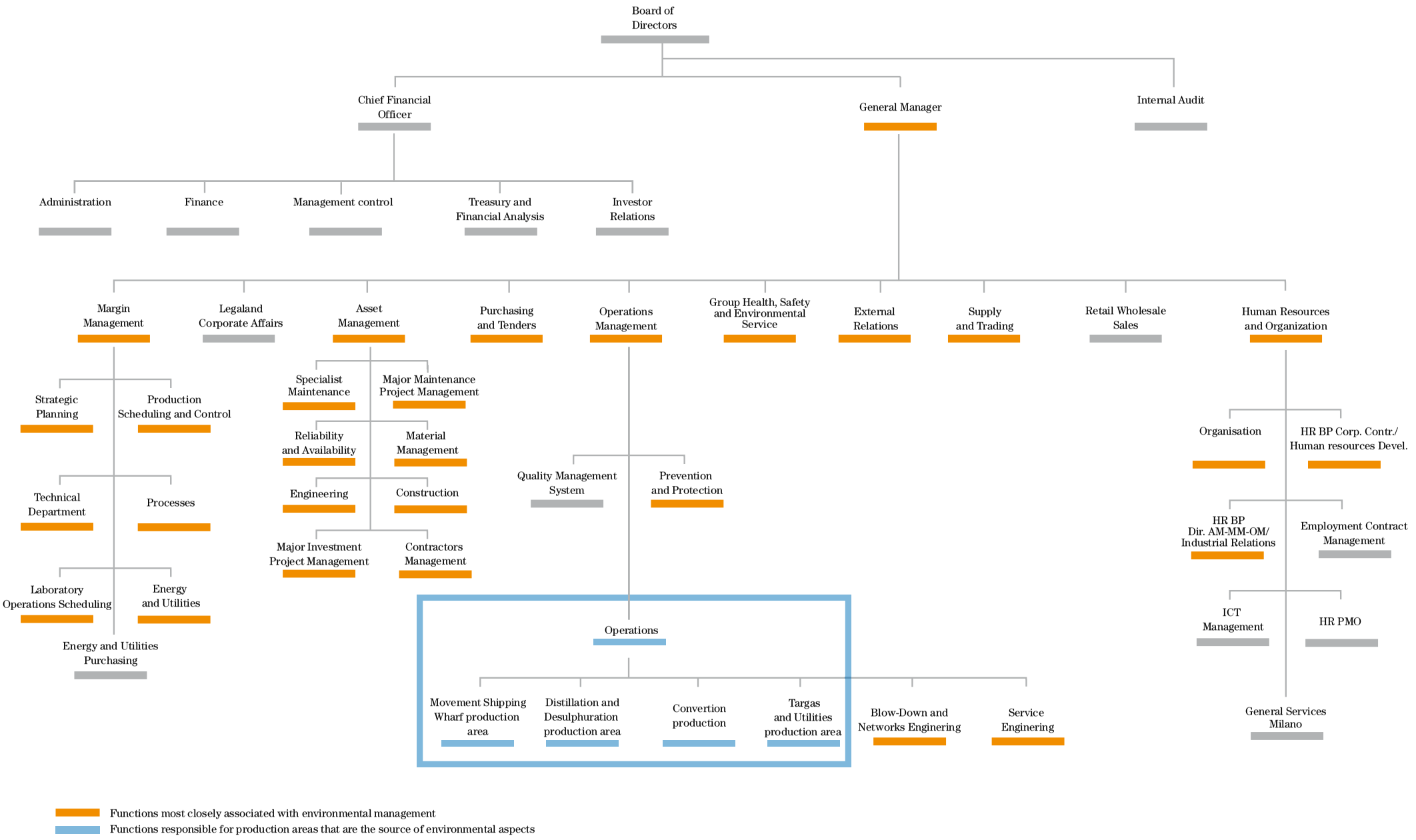


FIGURE 3. Saras' organization chart

- Major Maintenance Project Management, responsible for maintenance activities involving shutdowns
- Material Management, responsible for the temporary storage of materials and auxiliary substances
- Reliability and Availability, responsible for promoting and ensuring the continuous improvement of the reliability and safety of plants and equipment
- Prevention and Protection

Site Prevention and Protection, as well as carrying out the tasks required of the Prevention and Protection Service (PPS) under health and safety legislation (Legislative Decree 81/2008, Art. 33), also assists the management and other functions at the site to comply with environmental legislation and to implement the safety and environmental management systems that have been introduced at the site. The site's Prevention and Protection unit is also in charge of the organisation for handling emergencies, which consists of both dedicated staff and officially designated and appropriately trained employees within the operational organisation of the various areas.

[the Prevention and Protection Service]

Internal and external communication is divided into separate functions. Internal communication is handled by the Organisation unit, which reports to the Human Resources and Organisation department, whereas external communication is managed directly by the External Relations. Although there is no direct organisational link between these two communication functions, they work in close contact and collaborate well.

[communication]

1.4 – Subject of EMAS registration

On 20 October 2008, the Ecolabel and Ecoaudit committee, which is the body responsible for EMAS in Italy, approved the registration of Saras SpA under no. IT-000995. The EMAS registration[1] relates to Saras SpA in its entirety, including both the Sarroch site and the Milan office. Following the EMAS registration that was completed on 20 October 2008, the Environmental Management System (EMS) was brought into line with EC Regulation 761/2001. The validation was updated to EC Regulation 1221/2009 during the course of third-party verification on 12-15 July 2010. In June 2010, Saras successfully renewed the ISO 14001[2] certification of its EMS, issued by Lloyd's Register Quality Assurance Italy, for the second time.

[EMAS registration for the Sarroch site and the Milan office]

Saras has its registered offices at the Sarroch site and it is here that it conducts all its production activities (the area of the site is indicated by the white boundary in Figure 2 on page 13).

The activities covered by the certification relate to both the Sarroch site and the Milan office, specifically:

a) at the Sarroch site, the processes for "producing products from oil refining, scheduling, preparing and shipping finished products, and the generation of electricity, and managing the design, engineering and construction of internal plants"
b) at the Milan office, the activities for "managing the design and engineering of internal plants"

All the processes and activities that have a direct or indirect influence on the company's environmental management are monitored as part of the certified Environmental Management System.

[1] **EMAS registration certificate** issued on 20 October 2008 by Ecolabel-Ecoaudit, in line with EC Regulation 761/2001, which expires on 25 July 2011.

[2] **Certificate** issued on 1 June 2004 in accordance with the ISO 14001:1996 standard, later updated to ISO 14001:2004 with certificate LRC no. 180526/14 on 30 July 2007, which expires on 1 June 2010.

It is worth noting that Saras' activities with a direct link to significant environmental aspects all take place at the Sarroch site, whereas the environmental aspects linked to the Milan office are not significant, as shown by the environmental analysis set out in section 4.1 on page 44.
The main areas involved in the environmental aspects of Saras' activities are therefore located in Sarroch and in the Province of Cagliari.

2.
Commitment to protect the environment, health and safety

Saras' commitment to environmental sustainability and safety is growing every day.

The process was set in motion many years ago, combining compliance with the law with the search for technological and management solutions that would go beyond statutory requirements in order to translate the company's respect for the region in which it is based into action.

Crucial steps in this journey have included the adoption of an environmental management system, certified in line with ISO 14001 in 2004, and of a safety management system, certified in line with OHSAS 18001 in 2007, and the strengthening of initiatives to promote openness and collaboration with local communities, which enabled Saras to obtain EMAS registration in October 2008.

2. Commitment to protect the environment, health and safety

2.1 – Environmental management

Il Sistema di Gestione Ambientale

[the commitment to continuous improvement]

Preparing the Environmental Declaration and distributing it to the public forms part of the continuous improvement process for environmental management that Saras has 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

[ISO 14001 certification]

- in June 2004, Saras' EMS achieved IS0 14001:1996 certification, and in May 2006, ISO 14001:2004 certification
- in June 2007 and June 2010, the three-yearly checks on the EMS were carried out for the renewal of the environmental certification; the certifying body, Lloyd's Register Quality Assurance, also conducts six-monthly inspections as part of its planned assessment activities
- the revised version of the Environmental Policy (Figure 4) was issued in May 2008 and distributed to the company's direct employees and to subcontractors working on site

[EMAS registration]

In October 2008, the process of developing the EMS was completed, enabling the Saras site to register in accordance with the Eco-Management and Audit Scheme (EMAS) Regulation (EC Regulation 761/2001). Registration then led to the public dissemination of the first Environmental Declaration in 2008.

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.

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,

SARAS' ENVIRONMENTAL POLICY

Saras considers respect for and protection of the environment to be of primary importance in achieving its development objectives and for an appropriate integration of its activities in the area where it operates.

The criteria underlying the management of Saras' activities include the preventive assessment of the possible environmental consequences of new activities and products, the adoption of the reference principles, standards and solutions indicated in the "BREF for refining" (Best Available Techniques Reference documents, a document drawn up in application of Directive 61/96/EC, the Integrated Pollution Prevention and Control (IPPC) Directive), the utmost transparency and co-operation with the general public and with the authorities, and the involvement and accountability of its personnel and of all those who access the site as far as environmental protection is concerned.

Through the introduction and maintenance of the Environmental Management System applied to the refining and electricity generation activities at the Sarroch Refinery, Saras aims to ensure the efficient and proper management of the systems and activities conducted on site and to achieve, over and above the due observance of current legislation and the other regulations subscribed to by the company, the twin objectives of continuously improving environmental performance and preventing pollution.

Specifically, Saras commits to:

- Pursue the reduction of atmospheric emissions, to ensure minimum impact on air quality
- Pursue the prevention of sea pollution, by acting on seagoing transport vessels and on the wastewater treatment system
- Minimise the use of fresh water from external sources
- Improve the waste management cycle, by encouraging recovery
- Develop its own monitoring system for emissions and for environmental quality
- Improve the accessibility and usability of the data found and of the studies conducted
- Mitigate the impact of company activities that can be perceived by the surrounding communities

It is Saras' firm belief that achieving the above goals is only possible with the active contribution of all its employees, and to address these issues the company has developed a system of information and ongoing training.

Everyone at Saras is directly responsible for putting the environmental policy into practice when carrying out their activities, and conduct consistent with these issues is one of the objectives at both an individual and group level.

The management is at the front line of responsibility for putting this policy into practice.

Saras is committed to promoting its environmental policy and to requiring its application by contracting firms, suppliers and any other person who works on behalf of the organisation, and to this end the company provides training and information. The responsibility, conduct and attitudes in relation to environmental aspects of the above-mentioned parties are significant elements in judging the quality of performance, and the parties must also set up adequate training and information on these issues.

Saras undertakes to ensure provision of the human and technical resources necessary to fully implement and maintain the environmental policy at the Sarroch site.

Saras SpA
The General Manager

Sarroch, 23 May 2008

FIGURE 4. Saras Environmental Policy

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.
EMAS is currently the most advanced voluntary tool available to demonstrate a company's commitment to environmental sustainability. For Saras, the decision to join this scheme, which was taken several years ago, has meant following a course of continuous improvement that takes a structured approach to the company's relationship with the environment and the local area.

2.2 – Health and safety management

The Safety Management System

The company introduced its first Safety Policy in 1996, and since then has achieved positive results in continuously protecting its workers: "Saras will treat safety as being equally as important as production, quality and costs." Since 2008, the company has had a specific Major Accident Prevention Policy (Figure 5, page 23), created for the Sarroch site following the enactment of the ministerial decree of 9 August 2000, which set out the legislative framework for implementing a management system for the prevention of major accidents.
The subsequent introduction of specific legislation on the protection of workers' health and safety (formerly Legislative Decree 626/94, now Legislative Decree 81/2008, the Consolidated Law on Occupational Health and Safety) suggested the need to do something above and beyond simply complying with the law. Saras considers the protection of health and the prevention of any form of accident or injury (for all people working at its site) as core values, as stated in the Occupational Health and Safety Policy (Figure 6, page 24), as defined by the General Manager in July 2007. The implementation of an Occupational Health and Safety Management System introduced performance measures and defined improvement targets.
The Safety Management System (SMS) has now become an integrated system (Major Accidents, Occupational Health and Safety) that shares components to generate synergies.

[health and safety are key priorities]

Following a similar process to that undertaken for the EMS, in December 2007 Saras obtained certification for its Safety Management System in accordance with the OHSAS 18001:2007 standard, issued by Lloyd's Register Quality Assurance Italy[1]. 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.

[OHSAS 18001 certification]

[1] Certificate no. LRC 8180526 of 9 January 2008, which expires on 9 January 2011

Saras SpA

MAJOR ACCIDENT PREVENTION POLICY

In the broader context of its policy on safety, health and the environment, the Operator of the Saras SpA site in Sarroch commits to:

- Pursue the utmost levels of safety for its employees and for every person present on the site
- Implement every action and initiative that will help to prevent major accidents and reduce to a minimum the possible consequences for people, the environment and property
- Observe Italian legislation governing control of the risk of major accidents
- Ensure observance of its internal safety regulations, standards and procedures, which are periodically checked, updated and amended whenever deemed necessary to improve the prevention of major accidents
- Promote continuous improvement through the use of new and more stringent safety standards
- Ensure that all its employees and those of subcontractors, with respect to their skills and responsibilities, have received sufficient training and information to be fully aware of the potential risks associated with their activities, both under ordinary and abnormal operating conditions and in the event of an emergency
- Distribute the policy to suppliers, subcontractors and any other third party who accesses the site for work reasons
- Distribute the policy to all employees and actively involve the entire site organisation (executives, managers, employees and their safety representatives, within the scope of their skills and responsibilities) in Safety Management
- Periodically assess the major-accident risks associated with the company's activity, identifying safety objectives and defining appropriate programmes for continuous improvement
- Ensure that any emergencies can be controlled by implementing specific internal plans in close co-ordination with the respective authorities, including as regards the need to keep the general public informed and the activation of the External Emergency Plan
- Implement the Safety Management System and periodically assess its effectiveness and efficiency, and make any necessary changes and updates
- Maintain a relationship of full co-operation and transparency with the general public and public institutions

The above goals can only be achieved with the active involvement of all Saras employees, and the implementation of the policy is one of the objectives at both an individual and group level.

The Operator

Sarroch, 31 March 2008

Figure 5 Policy for prevention of major-accident hazards

OCCUPATIONAL HEALTH AND SAFETY POLICY

Saras considers health and safety at work to be of primary importance, and ensures the protection of its staff in the execution of its production activities.

In addition to complying with legal obligations, Saras has set itself the objective of continuous improvement, and for this reason, is committed to adopting best practice principles, standards and solutions in the sector.

Saras commits to manage its operations with the aim of preventing occupational accidents, injuries and illness, and in particular to:

- Ensure that the design, implementation and maintenance of plant, machinery and equipment for its site protect the health and safety of workers
- Implement increasingly effective working methods and organisational structures to protect the health and safety of workers, third parties who access the site and members of the local community
- Inform staff and employee representatives about industrial hygiene monitoring programmes and the results obtained
- Provide all staff with information and training on the specific risks associated with their roles and ensure that this is updated if they change position
- Provide third parties who access the site with information and training on the specific risks associated with the activities carried out on the premises
- Involve and empower employees and personnel from subcontractors so that they participate in the pursuit of health and safety objectives
- Develop a relationship of constructive co-operation, based on the utmost transparency and trust, both within the company and with the general public, regarding health and safety issues

Further preventive measures to safeguard the health and safety of employees will be put in place, even though these may not be directly connected with site activities.

The company puts in place and actively promotes measures to make employees aware of the importance of their actions with regard to the policies and requirements of the Health and Safety Management System, emphasising the consequences that each employee's activities can have on health and safety.

The management is at the front line of responsibility for putting this policy into practice.

Saras commits to distribute this policy to employees, suppliers, subcontractors and anyone who accesses the site, and to provide all the necessary resources (human, instrumental and financial) to put the policy into practice.
Implementation of the aforementioned principles, through the Health and Safety Management System, and conduct that complies with it, is the goal and the responsibility of all employees within the organisation, each according to his or her role and responsibilities.

Sarroch, 19 July 2007

The General Manager

Figure 6 Saras' Occupational Health and Safety Policy

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.

Accidents

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 1 Accidents

Parameter	2007	2008	2009	2010
INAIL frequency index* (no. accidents x 1,000,000/total no. hours worked)	7.4	6.4	7.5	6.3
Severity index** (no. days lost x 1,000/total no. hours worked)	0.120	0.172	0.376	0.330*
Average duration (days)***	16.5	26.7	49.9	43.8*

* Accidents lasting more than 1 day
** Calculated using the number of days lost to accidents
*** Calculated as the ratio (accident days per year + accident days continuing from the previous year) / no. of accidents in the calendar year

2.3 – Environmental communication

Saras dedicates particular care and attention to communication, whether it be to internal employees and subcontractors or its external partners.

2.3.1 – Internal communication

The aim of internal communication activities is to increase the involvement in and contribution to improving environmental management at the site by the employees of Saras and subcontractors operating on site. To encourage this, the suggestion box system is still in place, allowing employees of Saras and subcontractors to submit questions and comments, either via email or on paper, to which the company responds publicly on notice boards and in the EMAS section of the company Intranet. There are also regular campaigns to raise awareness and meetings to look in greater depth at health and safety and environmental issues for both Saras employees and the workers of subcontractors, with the objective of encouraging and fuelling dialogue and internal discussion.

[involving employees]

2.3.2 – External communication

Residents and the local community, authorities, schools, universities, customers and suppliers: with each of these groups of stakeholders, Saras has for some time been engaged in a series of activities to provide more information about the measures implemented as part of its environmental commitment. Foremost among these initiatives is the preparation of the site's Environmental and Safety Report, which since 2003 has

[the Environmental and Safety Report]

been distributed externally to institutional stakeholders. Anyone wishing to view the Report can find it at www.saras.it, in the "Our Responsibilities" section. Two further means of communicating with external stakeholders are the company's Annual Report and the Environmental Declaration, which are also available on the company website.

2.3.2.1 – Communication with the region

Even more so than in the past, environment, health and safety for Saras mean engaging more with the local community, represented by an approach to communication and dialogue designed to ensure maximum transparency. The confirmation of EMAS registration represents an important tool for the sustainable development of the region, in the spirit of sharing and participation. 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.

[meetings with the local community and local authorities]

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 School project, which unfolds during the school year and involves five elementary classes

Finally, to encourage and facilitate communication between Saras and the wider region, it is possible for anyone, including individual residents, to contact the company with questions or to request information by writing to the postal addresses or the email address on the front page of this Environmental Declaration. Further contact details for specific areas of interest can be found on the "Contact Us" page of the Saras website (www.saras.it).

2.3.2.2 – The School Project

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 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.

[collaboration with schools and events for children and families]

[around 300 pupils involved]

3.
Information about the Sarroch production site

Oil products and electricity from clean technology.

These are the activities that Saras carries out at its site in Sarroch, which produces products for daily domestic use (vehicle fuels, other fuels and electricity) and for industrial applications.

It is a facility where more than 1,000 employees operate plants and equipment for the receipt of raw materials, crude oil processing, electricity generation, internal transport and the storage of raw materials and products, before finally shipping the finished products and co-ordinating the supporting activities performed by external subcontractors.

It is a complex system, safely managed using an intricate network of systems and equipment, where constant attention is paid to compliance with all authorisations and statutory provisions governing activities at the site.

3. Information about the Sarroch production site

3.1 – Activities performed at the site

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 7 shows the areas used for the different types of activity performed within the facility, with a brief description provided in the paragraphs below.

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

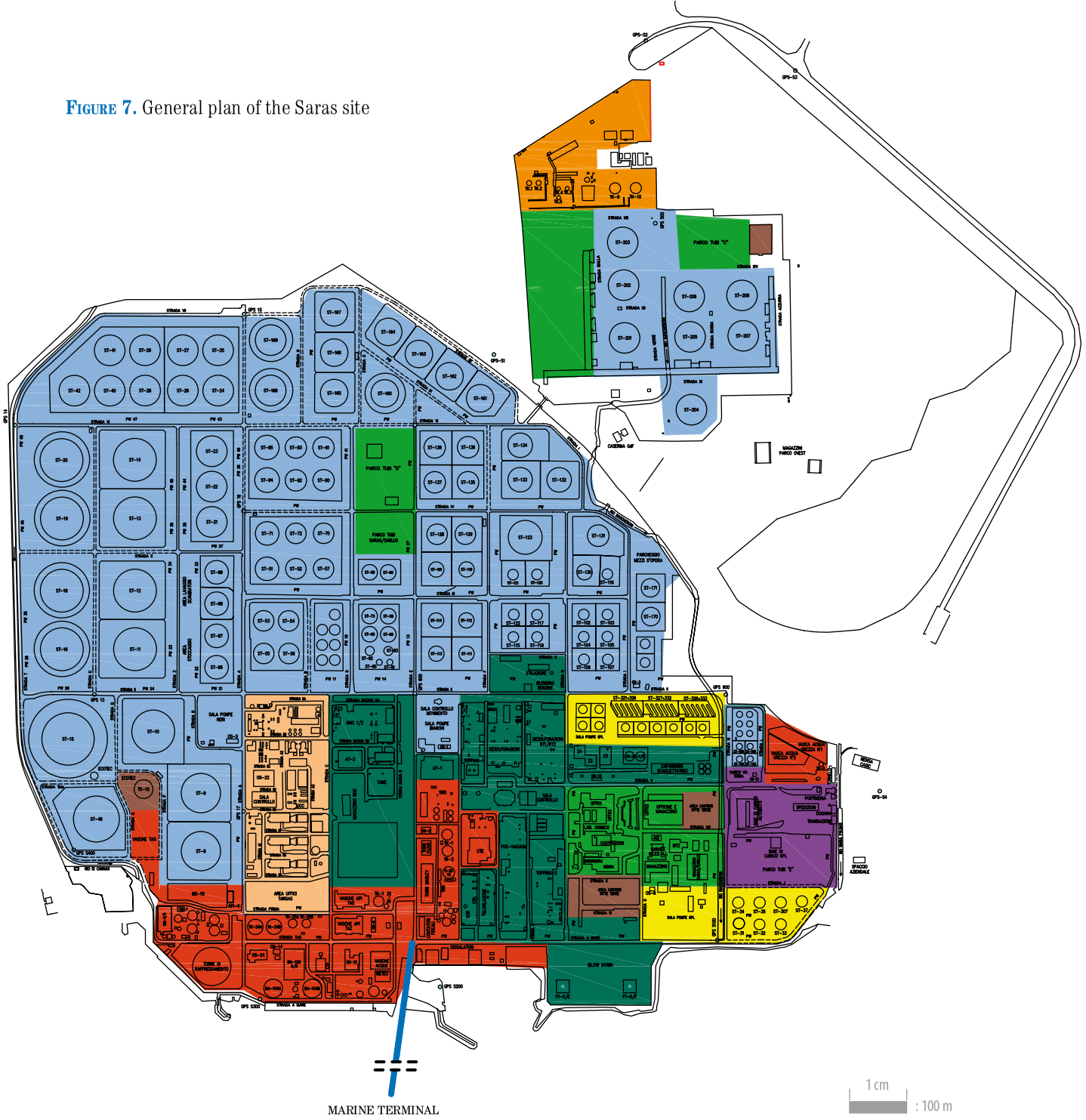
[delivery and shipping by sea]

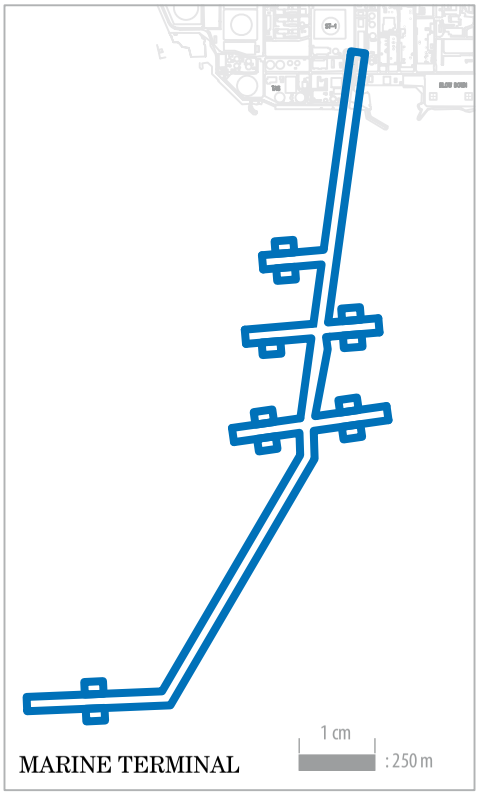
The marine terminal linked to the refinery has a 1,600-long wharf and fixed platforms connected to it by a 1,200m piling. All raw materials are delivered here, and the bulk of the oil products are shipped from here. In 2008-2010, 80% of oil products were shipped by sea. The terminal has 11 independent docking berths, nine of which are for shipping finished oil products and the delivery of semi-finished products, docking oil tankers of up to 65,000 tons of deadweight capacity. In addition to these docking berths, there are also two platforms which enable ships of up to 300,000 tons of deadweight capacity to dock for the delivery of crude oils.

[continuous monitoring of operations and ships]

The various docking berths can operate simultaneously, thus reducing waiting times for anchored ships. Advanced monitoring systems ensure that all receipt and shipping operations take place under conditions of the utmost safety: the phases relating to the docking and mooring of ships and the connection between the ship and the loading arms transferring raw materials to the shore and finished products to the ship are carried out under continuous surveillance. In order to be admitted to the Saras marine terminal, all incoming ships must comply with rigorous safety standards that conform to internationally recognised criteria as well as additional requirements laid down by Saras (section 4.3.2, page 113). 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.

FIGURE 7. General plan of the Saras site





- Reception of raw materials and shipment of products by sea
- Production of oil products
- Electricity production (IGCC)
- Storage of raw materials and products (tank farm)
- Storage of liquefied gases (LPG spheres & cigars)
- Storage of liquid products (National Deposit)
- Shipping of products over land
- Auxiliary Services
- Offices, workshops and warehouses
- Area for contracted firm

3.1.2 – Production of oil products

The production process is illustrated in the simplified diagram shown in Figure 8, 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

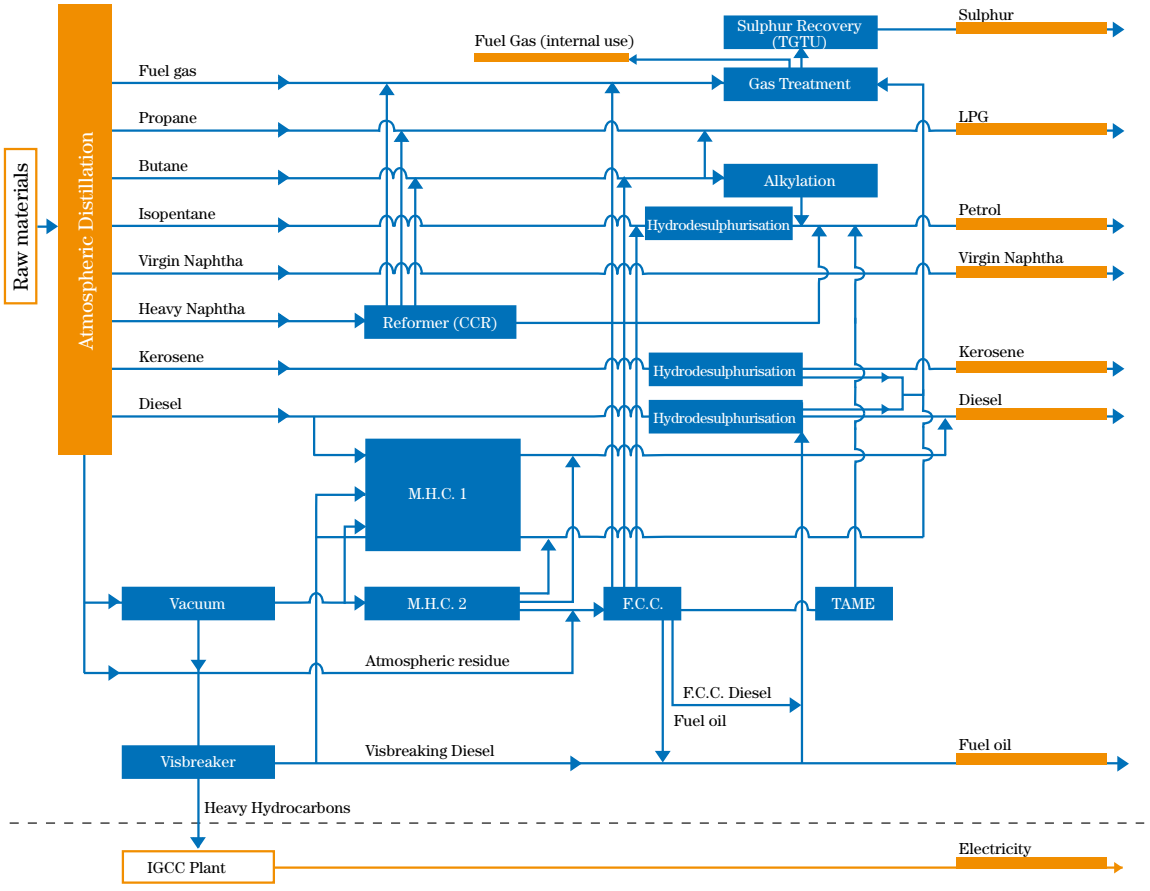


Figure 8 Production cycle of the Saras plant: oil production and electricity generation

- 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 shown in Table 2, which contains production data relating to the period 2007–2010.

[oil products]

The drop in the production of fuel oil seen in 2010 is largely due to negative price developments on the external market, leading to a cut in processing and a focus on production for purely internal use instead.

TABLE 2 Oil products (tons/year)

	2007	2008	2009	2010
LPG	323,000	359,000	242,000	351,000
Gsoline	3.110,000	3,184,000	2,532,000	2,999,000
Virgin Naphta	916,000	862,000	799,000	1,000,000
Kerosene	467,000	544,000	358,000	302,000
Diesel	6,813,000	7,498,000	6,205,000	7,184,000
Fuel oil	788,000	896,000	1,155,000	463,000
Sulphur*	112,000	110,000	110,000	129,000
Heavy hidrocarbons to IGCC	1,190,195	1,179,604	1,076,783	1,166,000

* Includes sulphur recovered both from refining and the IGCC.

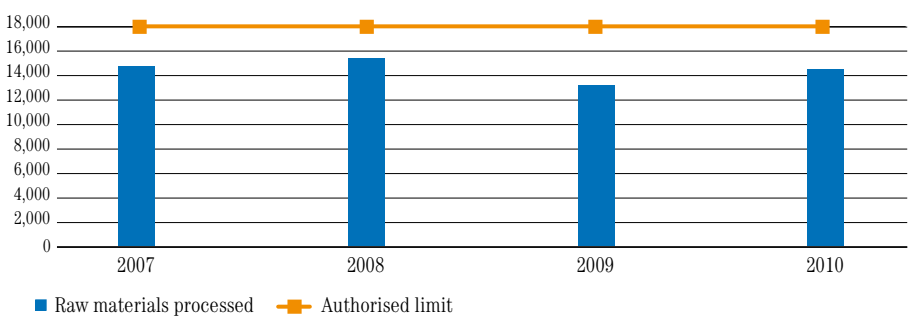
[Saras at the heart of the Mediterranean]

Raw materials mainly come from the Mediterranean area (North Africa and the Middle East), the former Soviet Union and North Europe. The primary destination of refinery products is the central and western Mediterranean region, with more than 20% of total production absorbed by the Sardinian market. 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. Table 3 shows the change in the level of raw materials processed in comparison with the maximum authorised quantity (18 million tons/year) specified by the refinery's Concession to Process Mineral Oils (Decree of the Italian Ministry for Productive Activities no. 17086 of 7 July 2003).

TABLE 3 Raw materials processed (kt/year)

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

CHART T3 (kt/year)



3.1.3 – Power generation

[electricity, hydrogen, steam]

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 9, 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 (abbreviated to "syngas"), which, once purified of the sulphur and metals it contains, is burned in the combined cycle section.

[electricity to the external distribution grid]

Electricity is produced in three identical lines, each comprising a gas turbine, a steam recovery boiler and a steam turbine, with an overall net rated power of 551 MW, and is sold to GSE (Gestore Servizi Elettrici, the operator of the Italian national grid). 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, further increased by the recently built U600 unit.

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).

[recovery of metals]

The metals removed from the syngas are used to form a solid panel called "vanadium concentrate" or "filter cake", which is sent to external plants to recover the metals.

The IGCC plant therefore enables the Saras production site to maximise the conversion of raw materials into value-added products and to minimise the generation of waste.

Table 4 shows the production figures for the IGCC for the past four years.

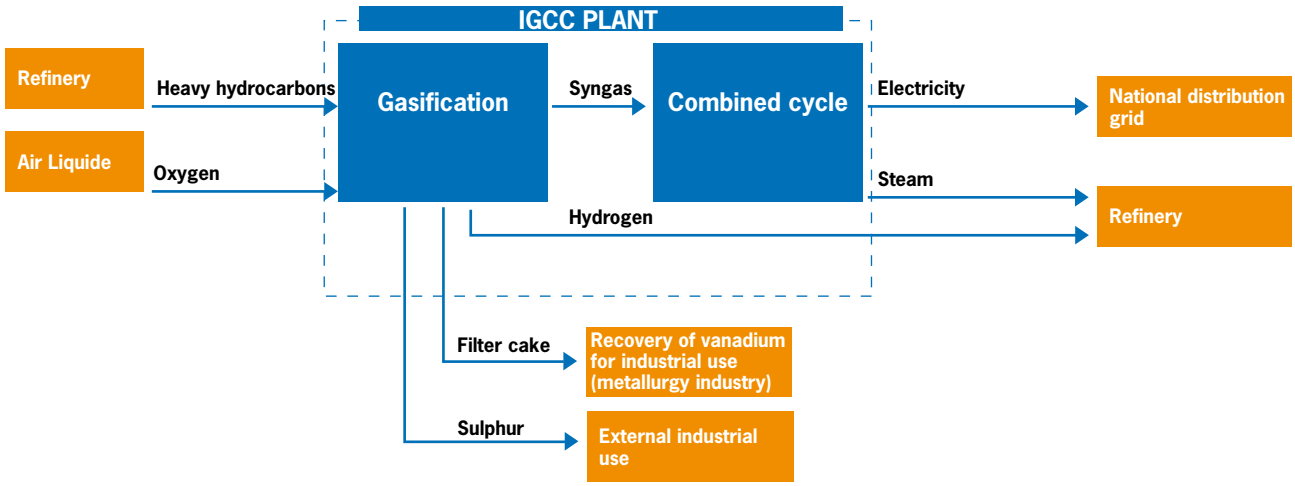


Figure 9 Flow chart of the IGCC plant

TABLE 4 IGCC products

	2007	2008	2009	2010
Electricity (kWh)	4,432,135,634	4,251,352,752	4,086,438,699	4,339,335,000
Low pressure steam (t/anno)	556,828	539,680	437,003	586,626
Medium pressure steam (t/anno)	568,650	667,763	570,754	737,033
Hydrogen (kNm^3)	307,083	322,226	359,108	376,074
Sulphur* (t/anno)	42,589	49,752	48,405	52,666

* The quantity shown here is already included in the figure in Table 2 on page 33, "Oil 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, as shown in Table 5 and Chart T5.

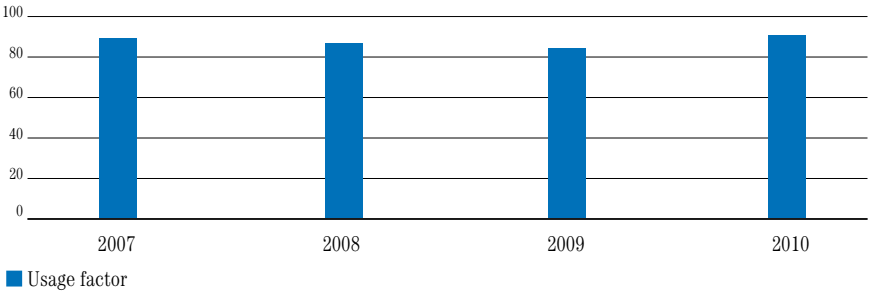
[IGCC efficiency and reliability]

TABLE 5 The IGCC plant usage factor

Indicator	2007	2008	2009	2010
Energy produced / Potential energy* (%)	91.5	87.8	84.7	89.9

* Potential energy is calculated by multiplying the available power by the maximum number of hours in one year.

CHART T5 (%)



3.1.4 – 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", "bullets" and "horton spheres").

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 (42 tanks), or earthworks (119 tanks).

[extensive and widespread safety systems]

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)

3.1.5 – 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 diesel and fuel oil, located in the national storage facility

[synergies between companies in the Sarroch petrochemical industrial hub]

The Saras site is linked via the Agipgas and Liquigas gas pipelines and two oil pipelines to the neighbouring petrochemical plant (for the commercial exchange of semi-finished products and services), as well as to the national storage facility (Figure 10).

3.1.6 – 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 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.

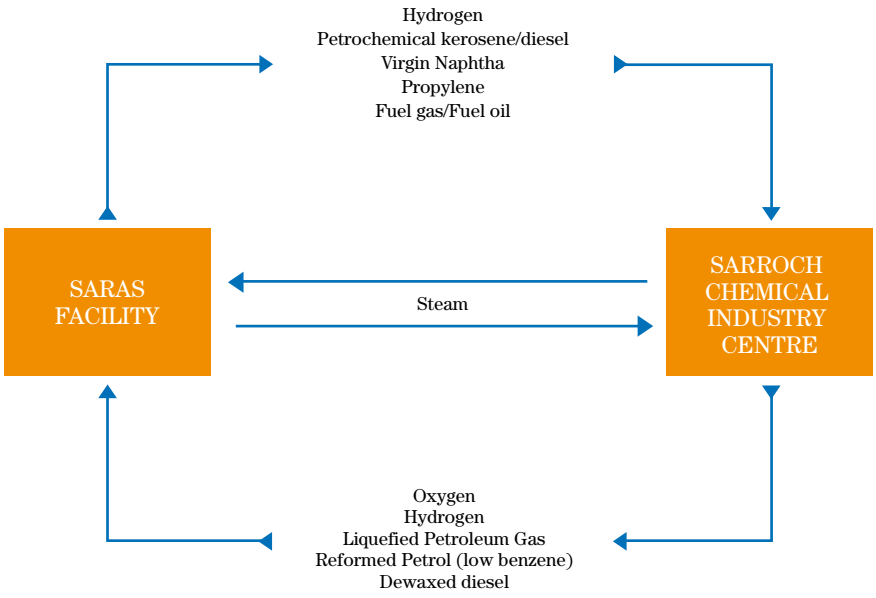


Figure 10 Synergies between the Saras plant and neighbouring chemical companies

3.1.7 – 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 used 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.

3.1.8 – 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 (section 4.2.6).

3.2 – Authorisation status of the Sarroch site

3.2.1 – Integrated environmental authorisation (AIA)

On 24 March 2009, the integrated environmental authorisation (AIA) permit for the combined operations of the refinery and the IGCC was issued, 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.

[AIA permit DSA-DEC-2009-0000230]

The AIA permit replaced all existing authorisations and fundamentally changed the way in which environmental issues are managed.

The main features introduced by the permit are:

1. New limits on atmospheric emissions for the refinery
2. New limits on atmospheric emissions for the IGCC plant
3. Limits for the refinery flares
4. New control parameters and limits on wastewater
5. New waste management criteria

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.

3.2.2 – Existing authorisations

The refining activities at the site are performed in accordance with the “Concession to Process Mineral Oils”, which was last updated by the Decree of the Italian Ministry for Productive Activities issued on 7 July 2003. Until 9 April 2009, the date when the AIA permit came into force, the existing environmental authorisation permits were as follows:

[new emissions limits]

- Authorisation permit 445 of 22 November 2004, issued to Saras by the Province of Cagliari. The permit relates to the discharge of water from the facility into the sea and the Rio Mascheroni channel.

[monitoring and control plan]

- Assessment of environmental compatibility for the IGCC project, no. DEC/VIA/2025 of 28 December 1994 issued by the Italian Ministry for the Environment, supplemented by letter ref. 854/05/SIAR from the Ministry for the Environment. The documents contain the authorisation for the construction of the IGCC and specify requirements for, in particular, atmospheric emissions from the IGCC and the facility as a whole.
- Decision 2510/IV of 4 November 2004 and decision 964/IV of 31 May 2005 (supplementing the previous decision), issued to Saras by the Region of Sardinia.

The documents authorise the treatment of water contaminated with hydrocarbons, to be performed in the ballast water treatment plant (BWT).
The BWT can treat the bilge water that has collected in the ships' hulls, the ballast water, the water used to wash oil tankers and the water drained from the wells of the hydraulic barrier for securing Saras' site.
As of 9 April 2009, all of the environmental authorisation permits listed above were combined and replaced by AIA permit DSA-DEC-2009-0000230 of 24 March 2009.

3.3 – Plans and procedures for handling emergencies

The site's Safety Report

The activities performed at the site involve the presence of substances with hazardous properties or that are hazardous when used at certain levels.
In 1989, following the entry into force of the Italian law implementing the first European Directive on establishments where there are major-accident hazards, Saras prepared the first Safety Report on its activities at the Sarroch site. 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 on the basis of the processes and substances used.

[1989: the first Safety Report]

Since then, the document has been continually updated in accordance with the applicable legislation (currently Legislative Decree 334/99, as subsequently amended, which requires the report to be updated every five years) and in order to include all the changes that have been made to the plants over the years. The Safety Report looks at all the different types of hazardous substance, characterised by varying degrees of flammability (e.g. crude oil, gasoline, LPG), toxicity (e.g. hydrogen sulphide) and risk to the environment (e.g. diesel, kerosene).

[an in-depth risk analysis]

On the basis of the quantity and type of substance present on site and the processes in which they are used, possible events and accident scenarios have been identified, such as fires, explosions, toxic gas clouds and the discharge of hazardous substances into the soil or sea. The potential consequences of the accident scenarios identified have been studied in order to determine their impact on the safety of individuals on and off the site and on the environment. The analysis of potential accident scenarios has ruled out any significant consequences outside the site for the time being. The only external area that could potentially be affected is an uninhabited area in the direction of SS 195. As far as the marine terminal is concerned, any potential cases of discharge into the sea involve limited quantities of hydrocarbons. Internal rapid response vehicles and equipment are available to efficiently counteract the effects of any discharge into the sea. A brief overview of these is provided on page 41. In October 2005, Saras SpA presented the five-year update of the Safety Report, in compliance with the provisions of Art. 8 of Legislative Decree 334/99, and sent the Municipality the information sheet intended for the general public. The 2005 Safety Report contained the risk analysis for the new plants (TGTU and U800) that became operational at the end of 2008, for which declarations that there would be no increase in risk were submitted on 5 September 2005.

[Legislative Decree 334/99]

[the information sheet on major hazards for the general public and employees]

In fulfilment of the provision of Art. 23 of Legislative Decree 238/05, which amended and supplemented Legislative Decree 334/99, in December 2006 Saras submitted the update to its Safety Report, including the progress made on the recommendations of the Sardinia Regional Technical Committee for Fire Prevention (CTR) during the assessment stage for the site's Safety Report (October 2000 edition), and sent the Municipality of Sarroch the updated information sheet for the general public. Upon completion of the assessment stage, the Sardinia CTR issued its Final Technical Evaluations on the above-mentioned Safety Report (October 2005 edition, as amended), as per the report ref. 4921/P12 of the session on 18 July 2007. The conclusions state:

[the assessment of the Regional Technical Committee]

[omissis]
In acknowledging the measures executed, those currently being executed and those planned, we consider that the company has taken positive steps to follow up on the recommendations made by the CTR upon conclusion of the assessment of the Safety Report (2000 edition) and has, on its own initiative, put in place plant and procedural solutions that, taken as a whole, have contributed or will contribute to enhancing the level of safety. However, as on previous occasions, a number of issues need to be addressed further and some of the measures executed or planned could be further improved. This being so, it is in the company's interest to verify the information detailed above based on the priority assigned according to the urgency of the individual measures, and to provide prompt notification of said verification, in whole or in part.
[omissis]

In June 2008, the CTR was notified of the measures implemented between October 2006 and May 2008, in relation to the recommendations received, and the measures planned for the period May 2008 to October 2010. Upon completion of the planned activities, in accordance with the Ministerial Decree of 19 March 2001 regarding fire prevention procedures for activities involving major-accident hazards, on 26 November 2008 Saras submitted an application to the Sardinia regional fire service for a Fire Prevention Certificate.

[June 2008 – October 2010: a plan of action]

Regular inspections of the site's production areas by the fire service restarted in May 2011 for the purpose of issuing the Fire Prevention Certificate and checking progress on the observations made during previous inspections (for the same purpose) and communicated to Saras in document no. 0006220 of 20 April 2009.
At the end of 2009, inspection work was begun by the Italian Ministry for the Environment and the Conservation of Land and Sea in order to assess the programmes and measures in place to prevent major accidents, with specific reference to the suitability of management procedures and plant solutions adopted.
The inspection was completed, with a successful outcome for the company, in early April 2010.
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.

[October 2010: most recent update to the Safety Report]

In relation to continuous improvement, the Sardinian Regional Technical Committee

for Fire Prevention 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) and
measures helping to reduce the potential scale of accidents (e.g. fire prevention systems and fixed fire fighting systems).
An overall analysis of these parameters enables a specific risk category to be assigned to each logical unit. The choices made in the past 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.

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 the co-ordinated intervention of personnel and vehicles. At the same time as updating the Safety

Report, the company is also updating its Internal Emergency Plan.

[personnel and equipment for effective 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

[prevention and control]

The IEP also includes the Marine Pollution Prevention Plan, which was drawn up to deal with emergencies resulting from spills into the sea from the refinery or 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 reportable accidents, and distinguishes between two types (i.e. levels) of emergency:

- limited emergency: an accident limited to a well-defined area
- general emergency: an accident with the potential to spread to other areas inside or outside the site
- near accident

[classification of emergencies]

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 distributes information and updates on the management of accidents to certain organisations, as appropriate to the nature of the accident:

- the fire service
- the prefecture
- nearby industrial sites

[extensive internal communication system]

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.

Table 6 shows the data on emergencies for the four years between 2007 and 2010.

Table 6 Emergencies

Parameter	2007	2008	2009	2010
No. of general emergencies	6	7	3	3
No. of limited emergencies	21	18	32	17
No. of near-accidents	10	11	20	4

In 2010, three 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. Reports of near-accidents (see Table 6) 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.

External Emergency Plan (EEP)

[a plan for the entire Sarroch area]

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 RM, Liquigas, Air Liquide) that could result in harmful consequences for the area outside the facilities. In addition, the safety reports for the various production facilities and analyses of hypothetical accident scenarios (study of the local area, 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, dissemination of information to the relevant external bodies and the provision of assistance to local residents (road management, health services, information 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. The EEP currently in place was last reviewed in September 2005.

[a programme of regular drills]

Safety systems at the site

The Sarroch site has a complex safety system designed to detect potentially dangerous situations immediately.

[fire prevention system]

The fire prevention water distribution system comprises an extensive network that covers the whole plant.

[cooling systems on tanks]

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 site also has nine 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. In the event of a spill at sea, vessels and equipment are available to respond quickly to the problem, following procedures laid down in the Internal Emergency Plan which, as mentioned above, includes the Marine Pollution Prevention Plan. The site has four seagoing vessels that operate 24 hours a day and a wide range of equipment (skimmers, floating booms, etc.) all of which ensure that the site is fully capable of responding quickly to contain and collect any product spills.

[nine fire trucks]

[rapid-response seagoing vessels]

4.
Environmental aspects

Complete, accurate and transparent information forms the solid basis of any dialogue.

In this section Saras sets out all the information necessary for understanding how its production plant interacts with the environment and the surrounding area. The facts and figures show how the plant has improved over time and its commitments to expected new environmental objectives in the next few years: the result of technological and managerial decisions always made with an eye to improving the environment as well as health and safety, and production quality.

Saras is committed to the clarity and completeness of information, which will allow it to engage in clear, concrete and ongoing dialogue with stakeholders, in order to give the surrounding area the answers that it expects.

4.
Gli aspetti ambientali

4.1 – General information

[environmental analysis]

In accordance with the requirements of the European Parliament and Council Regulation (EC) 1221/2009 (EMAS), Saras submitted its activities under normal, abnormal and emergency conditions to a thorough environmental assessment. The results of this environmental assessment are set out in a specific document held at the Prevention and Protection department, where it may be consulted. It is updated periodically and when changes are made.

Definitions contained in EC Regulation 1221/2009

Environmental aspect: an aspect of an organisation's activities, products or services that has or can have an impact on the environment; a significant environmental aspect is an environmental aspect that has or can have a significant environmental impact.

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

[environmental aspects]

The direct and indirect environmental aspects of Saras' activities have been identified with reference to Annex 1 of the EMAS Regulation. The aspects deemed to be "significant" have also been determined. The direct environmental aspects are those over which the organisation has direct management control. Examples of direct aspects are atmospheric emissions and wastewater discharges.
Indirect environmental aspects are those over which the organisation can exert an influence but does not have direct control. Examples of indirect aspects are the transport of raw materials and products.

The significance of each direct environmental aspect under normal operating conditions is assessed using the following criteria:

- the extent of the impact on the environment
- the existence of legislation, authorisation and other regulations to be followed
- the sensitivity of the issue to the local community

Abnormal events or emergencies that may give rise to major accidents such as fires, explosions and discharges into the sea were analysed and assessed as part of the Safety Report (described in section 3.3, page 38).
Other types of abnormal or emergency events not likely to generate major accidents were identified as part of the environmental analysis and assessed using estimates of their probability of occurrence and their potential consequences.

As regards the company's past record, no accidents have been sustained or environmental responsibilities incurred such as to determine significant impacts at the present time, with the exception of accidental spills into the soil and subsoil, as described in section 4.2.7, page 101.

In summary, the direct environmental aspects identified as significant are as follows:

Significant direct environmental aspects
Consumption of raw materials
Energy consumption (fuels, electricity)
Water consumption
Atmospheric emissions
Waste
Discharges into water
Discharges into the soil and subsoil (past activities, prevention activities)
Noise
Odours
Visual impact
Legislative obligations and limits prescribed by the relevant permits

The legislative obligations and limits prescribed the relevant permits are included in the descriptions and tables relating to the specific aspects listed above. For indirect environmental aspects, the degree of influence that Saras can indirectly exert over their control was assessed. The assessment led to the identification of the following indirect environmental aspects as significant:

Significant indirect environmental aspects
Product design
Road transport (of products, materials and substances by employees and external companies)
Sea transport (of raw materials and products)
Environmental conduct of external companies

The significant indirect environmental aspects all relate to the Sarroch production facility. The significance of the environmental aspects relating to the offices in Milan was assessed and deemed to be negligible in the context of Saras' activities and the surrounding area (city of Milan).

The correlation between the various significant environmental aspects (both direct and indirect) identified for the Sarroch site and the resulting environmental impacts is shown in the table on the next page.

Significant direct environmental aspects	Environmental impacts
Raw materials	
Consumption	Consumption of a non-renewable resource
Storage and use	Risk of accidents (fires, explosions, discharges into the soil and sea)
Consumption of energy in the form of	
Fuels produced by the refinery	Atmospheric emissions from the site and resulting impacts
Electricity purchased	Indirect impacts on external electricity production sites
Water consumption	
Sea water desalinated internally	Energy consumption and resulting impacts
Water from industrial water supply	Consumption of natural resource in the local area
Atmospheric emissions	Effect on air quality at local level
	Contribution to large-scale effects (greenhouse effect, acid rain)
Waste	
Storage and treatment within the site	Indirect impacts on external disposal and recovery sites
Off-site treatment	Risk of discharges into the soil
Discharges into water	Effect on seawater quality
Discharges into the soil and subsoil	
Past activity	Contamination of soil, subsoil and underground water on the site
Prevention activities	Reduction of the risk of contamination of the soil, subsoil and underground water
Noise	Effect on the acoustic environment outside the site (Sarroch area)
Odours	Nuisance caused outside the site (Sarroch area)
Visual impact	Visibility of the site in the area

Significant indirect environmental aspects	Environmental impacts
Product design	Indirect impact on air quality (fuel combustion)
Transport of products, auxiliary materials and employees over land	Atmospheric emissions
	Road traffic, risk of traffic accidents
Transport of raw materials by sea	Emissioni in atmosfera
	Risk of accidents and contamination of seawater
Environmental conduct of external companies	
Internal waste management	Risk of accidents and contamination of soil and subsoil
Road transport of employees, materials and equipment	Road traffic, risk of traffic accidents

A qualitative and quantitative description of the significant direct and indirect environmental aspects is set out in the tables on the following pages. Specific numerical performance indicators are given for each environmental aspect.
The indicator values, calculated on an annual basis, are generally provided for the last four years (2007-2010). Where relevant, the indicator values are compared with legal thresholds.
The indicators are divided into:

- operating performance indicators
- environmental sector indicators
- management performance indicators

Direct performance aspects

Operating performance indicators

Relevant environmental aspect	Applicability	Definition of indicator[1]	Unit of measurement
Consumption of raw materials	Refinery	Quantity of raw materials processed	kt/year
	Refinery	Low-sulphur crude oil used/total raw materials processed	%
	Refinery	Refinery hydrocarbons burned in the flare system	kt/year
	Refinery	Refinery hydrocarbons burned in the flare system	% weight relating to processing
Energy consumption	Site*	Energy input to the site	TOE/year GJ/year
	Site	Energy output from the site	TOE/year GJ/year
	Site	Efficiency of integrated cycle: output/input energy	%
	Refinery	Efficiency of refinery cycle: output/input energy	%
	IGCC	Efficiency of IGCC cycle: output/input energy	%
	Refinery	Specific energy consumption: energy consumed/raw materials input	TOE/t raw materials refinery - GJ/t raw materials used in refining
	IGCC	Specific energy consumption: energy consumed/semi-processed goods input	TOE/t IGCC load GJ/t IGCC load
Water consumption	Site	Site water requirement[2]	m^3/hour - m^3/year
		Site water requirement – specific values	m^3/kt raw materials
		Use of recovered water/site water requirement	%
		Use of freshwater/site water requirement	%
		Use of water from refinery desalinator/site water requirement	%
		Use of water from IGCC desalinators/site water requirement	%
Atmospheric emissions	Refinery, IGCC, Site	SO_2 emissions in mass flow	t/year
	Site	Specific SO_2 emissions	t SO_2/kt raw materials
	Refinery	Sulphur content in fuels	% (in weight)
	Refinery	SO_2 concentration bubble	mg/Nm^3
	IGCC	SO_2 concentration	mg/Nm^3
	Refinery, IGCC, Site	NO_x emissions in mass flow	t/year
	Site	Specific NO_x emissions	t NO_x/kt raw materials
	Refinery	NO_x concentration bubble	mg/Nm^3
	IGCC	NO_x concentration	mg/Nm^3
	Refinery, IGCC, Site	CO emissions in mass flow	t/year
	Site	Specific CO emissions	t CO/kt raw materials
	Refinery	CO concentration bubble	mg/Nm^3
	IGCC	CO concentration	mg/Nm^3
	Refinery, IGCC, Site	Dust emissions in mass flow	t/year
	Site	Specific dust emissions	t dust/kt raw materials
	Refinery	Dust concentration bubble	mg/Nm^3
	IGCC	Dust concentration	mg/Nm^3
	Refinery	PM10 emissions in mass inflow	t/year
	Refinery	Specific PM10 emissions	t PM10/kt raw materials
	Refinery	PM10 concentration bubble	mg/Nm^3
	Site	Diffuse emissions – fugitive emissions	t/year
	Refinery, IGCC, Site	CO_2 emissions in mass flow	t/year
	Site	Specific CO_2 emissions	t CO_2/kt raw materials
Discharges into water	Site	Total capacity of discharged water[2]	m^3/hour
		Specific capacity of discharged water	m^3/kt raw materials
		Total hydrocarbons in mass flow	t/year
		Specific COD emission	t/Mt raw materials
		Annual average COD concentration	mg/litre
		Specific hydrocarbon emission	t/year
		Emissione specifica di Idrocarburi	t/Mt raw materials
		Annual average concentration of hydrocarbons	mg/litre
		Emission of nitrogen (ammoniacal, nitrous or nitric) in mass flow	t/year
		Specific emission of nitrogen (ammoniacal, nitrous or nitric)	t/Mt raw materials
		Annual average concentration of nitrogen (ammoniacal, nitrous or nitric)	mg/litre
		Total capacity of primary treatment units for incoming water, desalinators, IGCC towers[2]	m^3/hour
		Specific emissions of primary treatment units for incoming water, desalinators, IGCC towers[2]	m^3/kt raw materials

Relevant environmental aspect	Applicability	Definition of indicator[1]	Unit of measurement
Discharges into water	Site*	Emissions of suspended solids in discharges from primary treatment units for incoming water, desalinators and IGCC towers in mass flow	t/year
		Specific emission of suspended solids in discharges from primary treatment units for incoming water, desalinators and IGCC towers	t/Mt raw materials
		Annual average concentration of suspended solids in discharges from primary treatment units for incoming water, desalinators and IGCC towers	mg/litre
		Difference in the temperature of the seawater 1 km from the point of discharge from the IGCC tower	Temperature in °C
Waste	Site	Total waste production (split into hazardous and non-hazardous)	t/year
	Site	Waste disposed of externally	t/year
		Waste sent to landfill	%
		Waste sent for incineration	%
		Waste sent for recovery	%
		Waste sent for preliminary storage	%
	Refinery	Specific production of typical refining waste	kg/t raw materials
	Site	Vanadium concentrate (filter cake) produced by the site	t/year
Accidental spills into the soil and subsoil – past activity	Site	Quantity of product recovered/quantity of water drained from the wells of the hydraulic barrier	%
Accidental spills into the soil and subsoil – contamination prevention activities	Site	Protection of the soil in storage areas: paved surface area of basins/total surface area	%
		Protection of the soil in storage areas: number of double bottom tanks	no.
		Protection of the soil along pipeways	m^2
		Inspection and maintenance: non-destructive testing expenses	EUR thousands/year
Noise	Site	Equivalent sound pressure level at site limits	dB(A)

*"Site" is understood to mean refinery + IGCC

Quality indicators for specific environmental sectors

Relevant environmental sector	Applicability	Definition of indicator	Unit of measurement
Atmosphere	Sarroch area (surveys by the public air quality monitoring network)	SO_2 – Compliance with the three-hourly, hourly and daily concentration limits	no. of times threshold exceeded/year
		SO_2 – Annual average concentration	Micrograms/m^3
		PM10 – Compliance with hourly concentration limits	no. of times threshold exceeded/year
		PM10 – Annual average concentration	Micrograms/m^3
		NO_2, NO_x – Annual average concentration	Micrograms/m^3
		NO_2 – Compliance with hourly and daily concentration limits	no. of times threshold exceeded/year
	Sarroch hinterland (surveys using bio-indicators)	Index of Atmospheric Purity (IAP)	a number plus a quality assessment
Seawater	Stretch of sea surrounding the site (chemical surveys)	Trophic index (TRIX)	a number plus a quality assessment
		CAM Index	a number plus a quality assessment
Noise	Sarroch area	L90 statistical indicator of sound pressure at points located in the town of Sarroch	dB(A)

*"Site" is understood to mean refinery + IGCC

(1) With reference to EC Regulation 1221/2009, Annex IV, it should be noted that for Saras it is not total annual production that is significant, but rather total annual processing of crude oil.

(2) With reference to EC Regulation 1221/2009, Annex IV, it should be noted that Saras, believing the hourly figure to be more intuitive, also expresses its water consumption in (m^3/hour) and not just in (m^3/year) to make the figure more immediately comprehensible.

Management performance indicators

Relevant environmental sector	Applicability	Definition of indicator	Unit of measurement
Training	Employees	Environmental protection training/total training hours	%
		Management emergency training/total training hours	%
Audit	Combined audit of environment, safety and quality	Hours spent on audits/total hours worked by auditors and employees audited	%
	"Arrow" field inspections	Hours spent on inspections/total hours worked by auditors and employees audited	%
Product design	Design and development	Product design hours/thousands of hours worked	hours/thousands of hours worked
Design and engineering of internal plant & equipment	Engineering	Plant & equipment engineering hours/thousands of hours worked	hours/thousands of hours worked
Investments	Environmental protection and safety	Total investment	EUR thousands/year

Indirect environmental aspects

Operating performance indicators

Relevant environmental sector	Applicability	Definition of indicator	Unit of measurement
Product characteristics	Oil products	Production of fuel oil/total oil products	%
		Quantity of sulphur in products/quantity of sulphur entering the site with raw materials	%
	Sulphur produced	Quantity of sulphur produced/quantity of sulphur entering the site with raw materials	%
Transport	Maritime traffic	Use of double-hulled ships/total ships	%
		Use of ships with segregated ballast tanks/total ships	%
	Road traffic	Total number of heavy transport vehicles/quantity of raw materials processed	no. of vehicles/kt raw materials

Management performance indicators

Relevant environmental sector	Applicability	Definition of indicator	Unit of measurement
Transport	Maritime traffic	Ship safety checks: no. of ships checked/total ships	%
	Road traffic	No. of in-house company vehicles checked/no. of authorised vehicles	%
External companies	Environmental behaviour	Companies that have ISO 9001 certification/total companies	%
		Companies that have ISO 14001 certification/total companies	%
		Companies that have OHSAS 18001 certification/total companies	%
		Training provided to employees of external companies/total hours worked	%

4.2 – Direct environmental aspects

4.2.1 – Consumption, storage and use of raw materials

Consumption

The raw materials entering the production cycle mainly comprise crude oil and small quantities of fuel oils and other semi-processed hydrocarbons.

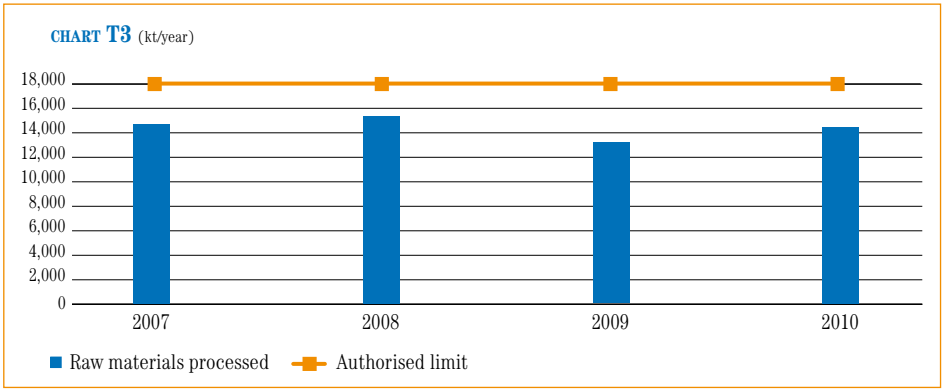
The refining of mineral oils (oil) is subject to specific authorisation. In Saras' case, an upper limit of 18 million tons a year has been set.

[Italian Ministry for Productive Activities no. 17086 issued on 7 July 2003]

The consumption of raw materials is a significant environmental aspect of the activities carried out at the Sarroch site, since oil is a natural, non-renewable resource and the quantities processed are considerable, as shown in Table 3 above. For ease of reference, the table is reproduced below.

TABLE 3 Raw materials processed (kt/year)

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



In 2010, the Sarroch refinery processed approximately 14,300 kilotons (kt) of raw materials (crude oil and fuel oils), which is in line with the average for recent years. Between 2007 and 2010, a total of 57,700 kt of raw materials were processed, an average of 14,400 kt per year. 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.

In addition to the quantity of materials processed, the sulphur content in crude oil is another important parameter for managing the refining processes and controlling product characteristics.

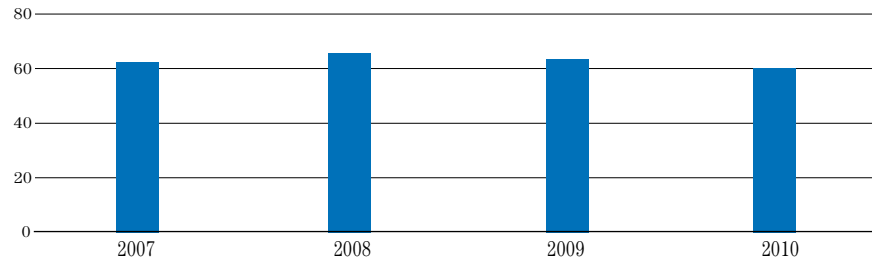
Table 7 and Chart T7 below show the values of the key indicator, which is calculated as the quantity of low-sulphur crude oil used as a proportion of the total quantity of crude oil processed.

TABLE 7 Consumption of low-sulphur crude oils *

Parameter	2007	2008	2009	2010
Low-sulphur crude oil used/total raw materials processed (%)	62.4	65.7	62.0	60

*Using the same criterion as that set out in Legislative Decree 152/06, Part V, Appendix X, for low-sulphur fuel oils, low-sulphur crude oils are defined as those with a sulphur content of less than 1%.

CHARTS **T7** (%)



An examination of the above-mentioned figures shows that the use of low-sulphur crude oil was broadly stable over the four-year period 2007-2010. In addition to oil, auxiliary chemical substances are also used in refining and the IGCC. These auxiliary substances can be classified under the following main categories:

- catalysts of chemical reactions
- treatment and process additives
- additives for correct product formulation
- oxygen, nitrogen, hydrogen

[auxiliary chemical substances]

The consumption of auxiliary substances is less significant than that of raw materials as they are generally renewable resources and the total quantities used are much lower.

However, the supply of raw materials and auxiliary substances involves the need for sea and road transport, which is an indirect environmental aspect. This aspect is examined in section 4.3.2 on page 113.

Storage and use

Under normal operating conditions, the use and storage of raw materials may involve, as an induced environmental aspect, diffuse and fugitive emissions of volatile organic substances into the atmosphere. This aspect is discussed in section 4.2.4.3 on page 72.

As regards abnormal or emergency conditions, any events that may involve hazardous substances on the premises, such as raw materials, auxiliary substances or products, are analysed in the plant's Safety Report (section 3.3, page 38).

Flare emissions management

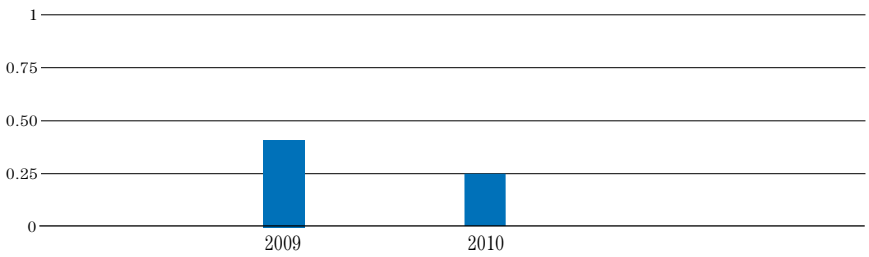
In 2010, the group launched a project aimed at minimising flare emissions from the refinery, to be achieved by optimising management of the fuel gas and hydrogen networks. The work also included a critical analysis of the start-up and shut-down procedures to identify corrective measures that would help reduce the impact on flare emissions. The results were extremely successful as flare emissions were significantly down on 2009 (-26% in absolute terms, -35% for specific processing). The visual impact was also considerably reduced.

Table 8 and Chart T8 below show the values of the key indicator (expressed in kt/year) for hydrocarbons burned in the blow-down system.

TABLE 7 BIS Refinery hydrocarbons burned in the flare system

Parameter	2009	2010
Refinery hydrocarbons burned in the flare system (kt/year)	49.0	36.0
Refinery hydrocarbons burned in the flare system (% weight in relation to processing)	0.39	0.25

CHARTS T7BIS (%) Refinery hydrocarbons burned in the flare system



4.2.2. – ENERGY CONSUMPTION

The consumption of energy resources in the form of electricity and fuels represents a significant environmental aspect for the Saras site, and has a considerable economic impact on the business. Figure 11 shows a diagram of the site's energy balance and a table with the 2010 figures for external energy coming into the site, broken down into electricity, thermal energy and crude oil.

ENERGY INPUT TO THE SITE 2010	(GJ)	(TOE)
Energy	7,041,418	168,182
Thermal energy (steam, H2)	3,996,932	95,465
Crudes	600,385,686	14,340,000
Total energy input to the site	611,424,036	14,603,647

ENERGY OUTPUT TO THE SITE 2010	(GJ)	(TOE)
Oil products	540,730,261	12,915,151
Electricity	33,374,405	797,136
Fuel gas	2,950,778	70,478
Totale energy output from the site	577,055,445	13,782,765

For oil product figures see: Table 2, page 33

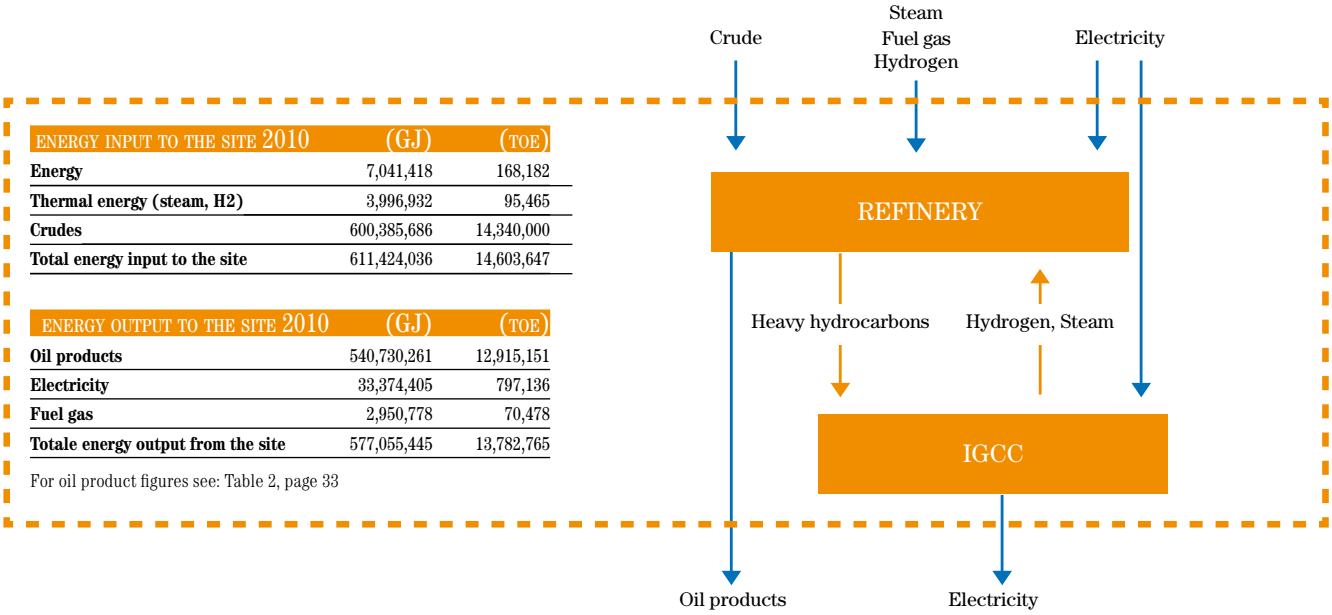


FIGURE 11 Energy balance chart

[Law 10 of 9 January 1991]

Saras' commitment to improving energy efficiency dates back to the end of the 1970s/early 1980s, when it began to invest heavily in energy and heat conservation.

In accordance with legislation, an Energy Manager is appointed each year to monitor and promote energy conservation activities and efficient energy use on the Sarroch site.

As mentioned earlier, the combined operations of the refinery and the IGCC plant effectively represent a large integrated cycle that transforms hydrocarbon inputs into refined oil products and energy.

The tables and charts below show the indicators relating to energy resource consump-

[energy efficiency of the integrated cycle]

tion. To enable comparisons to be made between the figures relating to the various types of energy, the group has adopted the unit of measure "tons of oil equivalent" (TOE): all quantities of raw materials coming into the site and products leaving the site (fuels) and electrical energy inflows and outflows have been converted to TOE. In accordance with EC regulation 1221/2009, the same figures have also been expressed in gigajoules (GJ).

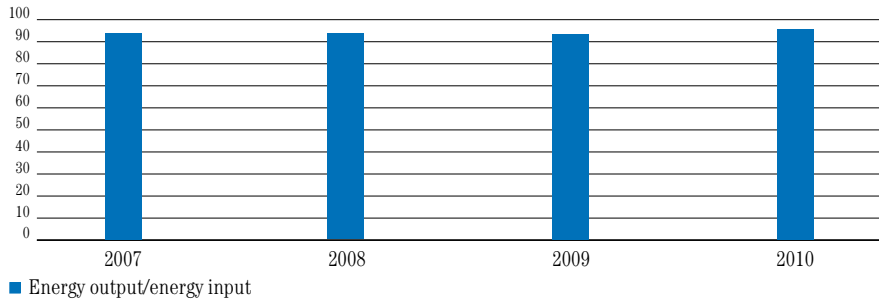
The energy efficiency of the integrated cycle (refinery and IGCC), shown in Table 8 and Chart T8, is calculated as the ratio of:

- the energy output from the integrated cycle (the sum of the energy content of oil products sold and of energy sold); to
- the energy input to the integrated cycle (the sum of the energy content of the raw materials used in the refining process and energy purchased externally).

TABELLA 8 Energy efficiency of the integrated cycle (refinery and IGCC)

Parameter	2007	2008	2009	2010
Energy input (GJ)	621,538,403	661,349,608	567,062,841	611,424,036
Energia output (GJ)	589,449,315	617,267,780	523,381,381	577,055,445
Energy input / Energy output (%)	94.5	93.3	92.3	94.4

GRAFICO T8 (% output/input)



It can be seen from the figures that the integrated cycle (refinery and IGCC) is extremely efficient, with a total value of over 92% in the last four years. The difference between energy input and energy output is mainly due to the internal consumption of energy necessary for the operation of the manufacturing processes and to an amount lost during operations.

[energy efficiency of the IGCC plant]

The IGCC, as a producer of electricity for sale and of steam and hydrogen to be used in the refining process, converts the energy in the heavy hydrocarbons (that cannot be used in its present state) into valuable energy. This helps to meet the site's energy requirement through the recovery of steam and hydrogen. The energy efficiency indicator for the IGCC, shown in Table 9 and Chart T9, is calculated as the ratio of:

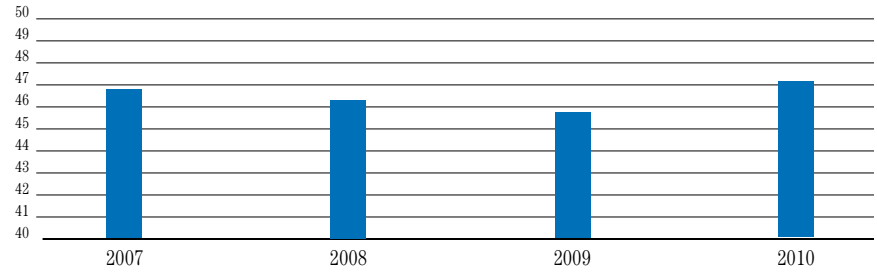
- energy output from the IGCC, in the form of electricity, steam, hydrogen or sulphur; to
- energy input to the IGCC, in the form of hydrocarbon feedstocks and electricity consumed

The efficiency values obtained by the IGCC are much higher than those of traditional thermoelectric plants.

TABLE 9 Energy efficiency of the IGCC

Parameter	2007	2008	2009	2010
Energy output/energy input (% TOE output/TOE input)	46.9	46.2	45.8	47.1

CHART T9 (% TOE OUTPUT/TOE INPUT)



[energy efficiency of the refining cycle]

The indicator for the refining process is given as the ratio of:

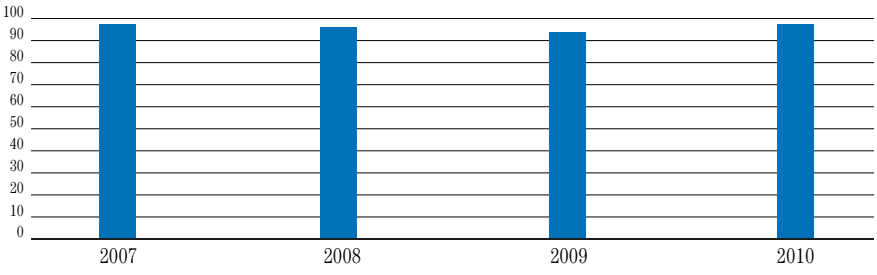
- energy output from the refining process (the sum of the energy content in the oil products sold); to
- energy input to the refining process (the sum of the energy content in the raw materials used in the refining process and the energy purchased externally, mainly electricity).

Here too, Table 10 and Chart T10 show high energy efficiency values.

TABLE 10 Energy efficiency of the refining process

Parameter	2007	2008	2009	2010
Energy output/energy input (% TOE output/TOE input)	96.5	95.2	94.6	96.7

CHART T10 (% TOE output/TOE input)



[energy consumption]

Internal energy consumption comprises the combustion of oil products and electricity used. Small quantities of thermal energy, in the form of steam, can be exchanged with the neighbouring petrochemical plant, especially during plant shutdowns or on other specific occasions.

Fuels used in the refining process comprise:

- fuel gas generated automatically from the refining process, which is not saleable as it is non-condensable
- low-sulphur fuel oil
- coke consumed directly in the fluid catalytic cracking (FCC) process

Fuels used in the IGCC cycle comprise:

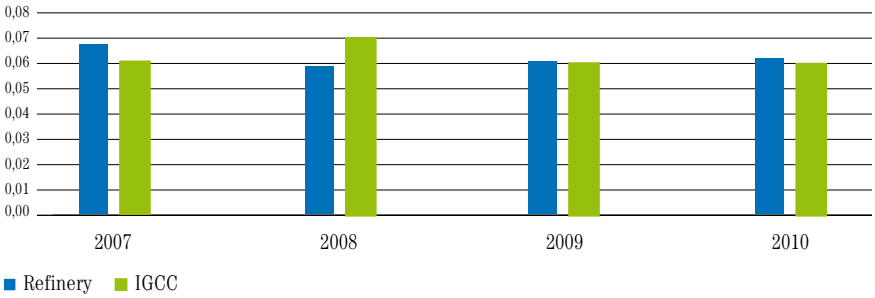
- syngas generated automatically from the gasification section and used in the combined cycle section
- diesel, used only as an emergency fuel

Table 11 and Chart T11 show the values of the specific energy consumption indicators relating to the raw materials processed in refining and used as feedstock for the IGCC.

TABLE 11 Specific energy consumption

Parameter	2007	2008	2009	2010
Specific energy consumption: refinery (TOE/t raw materials used in refining)	0.067	0.059	0.061	0.062
Specific energy consumption: IGCC (TOE/t IGCC feedstock)	0.064	0.070	0.060	0.060
Specific energy consumption: refinery (GJ/t raw materials used in refining)	2.805	2.470	2.554	2.650
Specific energy consumption: IGCC (GJ/t IGCC feedstock)	2.680	2.931	2.512	2.512

CHART T11 (TOE/T raw materials)



The indicator values have remained broadly stable in the last few years. In order to save energy, the company is committed to achieving energy efficiency improvement and energy conservation objectives, resulting in a reduction in the consumption of fuel oil.

[table of objectives and measures: objective 2, page 125]

4.2.3 – Use of water resources

At the Sarroch site, water is mainly used to generate 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. Figure 12 shows a diagram of the site's water cycle. Aware of the problem of scarce water resources in the region, Saras has adopted a policy, over the years, to reduce its dependence on primary water sources from the surrounding region, by:

- 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

Currently, the main types of water resources used are:

- seawater that has been treated using dedicated desalination units
- untreated water supplied by the CASIC industrial water system, which is fed by reservoirs in the area
- water recovered by the wastewater purification system (after filtering)

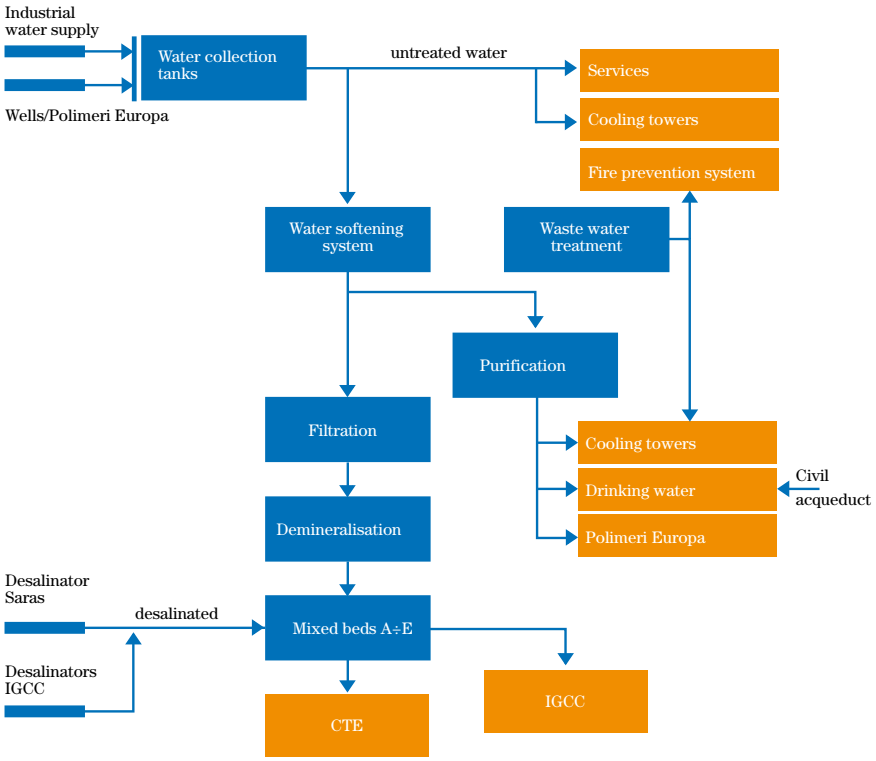


FIGURE 12 Water usage chart

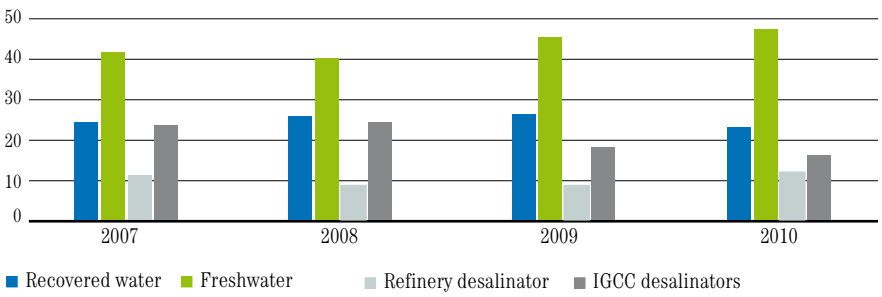
[concession degree pursuant to Presidential Decree 250/491, Constitutional Law 3/48 of 5 June 1998 and renewal application of 12 June 2007 to the Civil Engineering Department of the Province of Cagliari]

A limited quantity of demineralised water can be obtained through an exchange with the Polimeri Europa (formerly Enichem) industrial site, which was used in 2010.
The figures on the site's water consumption are shown in Table 12 and Chart T12. These also include quantities relating to the IGCC, which mainly uses water from the dedicated desalinators for its production activities. A closed-circuit seawater system with a cooling tower has been installed for cooling the IGCC equipment.
Supply sources in 2010 continued the trend seen in previous years, as shown in Table 12 and Chart T12.

TABLE 12 Water sources for the site

Parameter	2007	2008	2009	2010
Recovered water/water requirement (%)	24.1	25.1	26.5	23.4
Freshwater/water requirement (%)	41.2	40.7	45.7	47.9
Water from refinery desalinator/water requirement (%)	10.9	8.8	8.7	11.4
Water from IGCC desalinators/water requirement (%)	23.8	24.5	18.4	17.1
Demineralised water from Polimeri Europa (%)		0.8	0.8	0.2

CHART T12 (%)

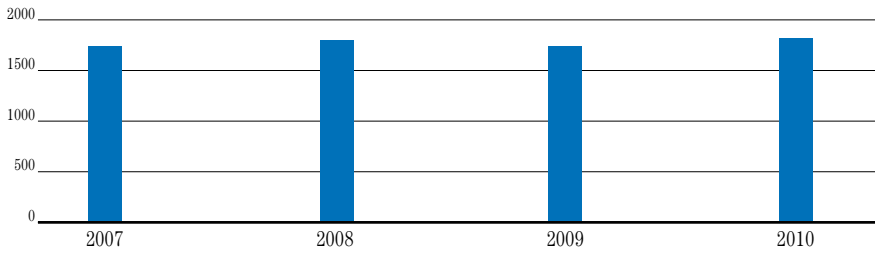


In the four years under review, around 24% of the total annual requirement came from internal recovery while desalination accounted for 28% of the total.
Desalinated water and water recovered internally together accounted for around 52% of the total requirement in 2010.
The output of the IGCC desalinators was broadly in line with the two previous years, while the output of the refinery desalinator increased. The site's water consumption (in absolute terms) is shown in Table 13 and Chart T13.

TABLE 13 The site's water requirement – absolute values

Parameter	2007	2008	2009	2010
The site's water requirement - average flow rate (m^3/hour)	1,727	1,821	1,687	1,891
The site's water requirement (m^3/year)	15,128,520	15,951,960	14,778,120	16,565,160

GRAFICO T13 (m^3/hour)

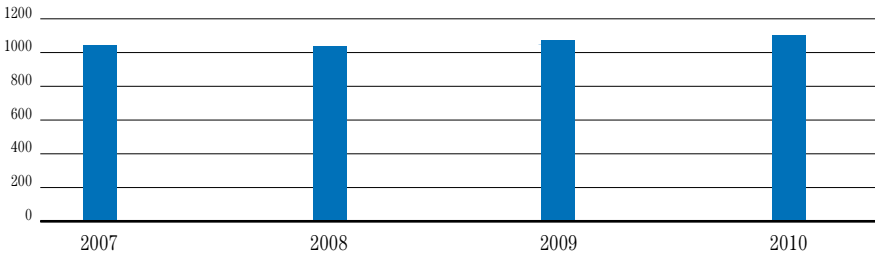


In 2010, the site's water requirement began to rise again in absolute terms compared with the previous year, in relation to the increase in annual processing.
The ratio of specific water consumption to raw materials processed is shown by the indicator in Table 14 and the related chart.

TABLE 14 The site's water requirement – specific values

Parameter	2007	2008	2009	2010
Site's water requirement/raw materials processed (m^3/kt raw materials)	1,037	1,031	1,116	1,157

CHART T14 (m^3/kt raw materials)



4.2.4 – Atmospheric emissions

4.2.4.1 – General

Atmospheric emissions represent a significant environmental impact of the activities carried out at the Saras site under normal, abnormal and emergency conditions. In 2010 the reference legislation governing atmospheric emissions by the Saras plant consisted of the AIA permit DSA-DEC-2009-0000230 of 24 March 2009, which entered into force on 9 April 2009). The AIA permit contains the regulations on the limits for atmospheric emissions from the refinery and the IGCC. As regards the refining process, the limits on emission concentrations relate to the concentration "bubble", i.e. the ratio of the total quantity of the mass of each pollutant to the total volume of the gaseous effluents of the refinery as a whole.

In accordance with legislation, atmospheric emissions can be divided into:

- emissions ducted to smokestacks
- non-ducted emissions

Ducted emissions

[table of objectives and measures: objectives 1, 2, 3, 4, 5, 7, page 125-126]

Emissions ducted to smokestacks are mainly due to:

- combustion processes carried out in furnaces to guarantee the thermal energy necessary for refining
- combustion processes necessary for producing electricity and steam (thermoelectric plant and IGCC)

The main pollutants in these emissions are SO_2, NO_x, CO, dust and CO_2. Figure 13 shows the location of the emission points ducted from the refinery and the IGCC. Numerous objectives and improvement measures have been defined for ducted atmospheric emissions.

Non-ducted emissions

[table of objectives and measures: objective 6, page 126]

Non-ducted emissions are mainly due to:

- the storage and transportation of raw materials and products, and the treatment of wastewater (diffuse emissions)
- minor systemic emissions from sealing components, such as valves and flanges (diffuse emissions, also known as fugitive emissions)

Diffuse and fugitive emissions are technically not ductable. These may be contained by installing appropriate sealing systems and through monitoring and maintenance.

The substances present in diffuse and fugitive emissions are volatile organic compounds (VOCs), which contain light hydrocarbons and can evaporate in ambient and in processing conditions.

As can be seen from the plan of the facility in figure 7 (page 31), the areas in which diffuse emissions can arise relate to storage, shipment, the production processes and wastewater treatment.

Objectives and improvement measures have also been defined for diffuse and fugitive atmospheric emissions.

Calculation of emissions values

Ducted emissions may be calculated in various ways. Specifically:

- emissions of SO_2, NO_X, PTS, CO and the flue gas flow rate from Saras' centralised smokestack (which collects approximately 33% of the emissions from the refining process) and from the IGCC smokestack (which collects 100% of the emissions from the plant) are determined using continuous instrument analysis; instruments

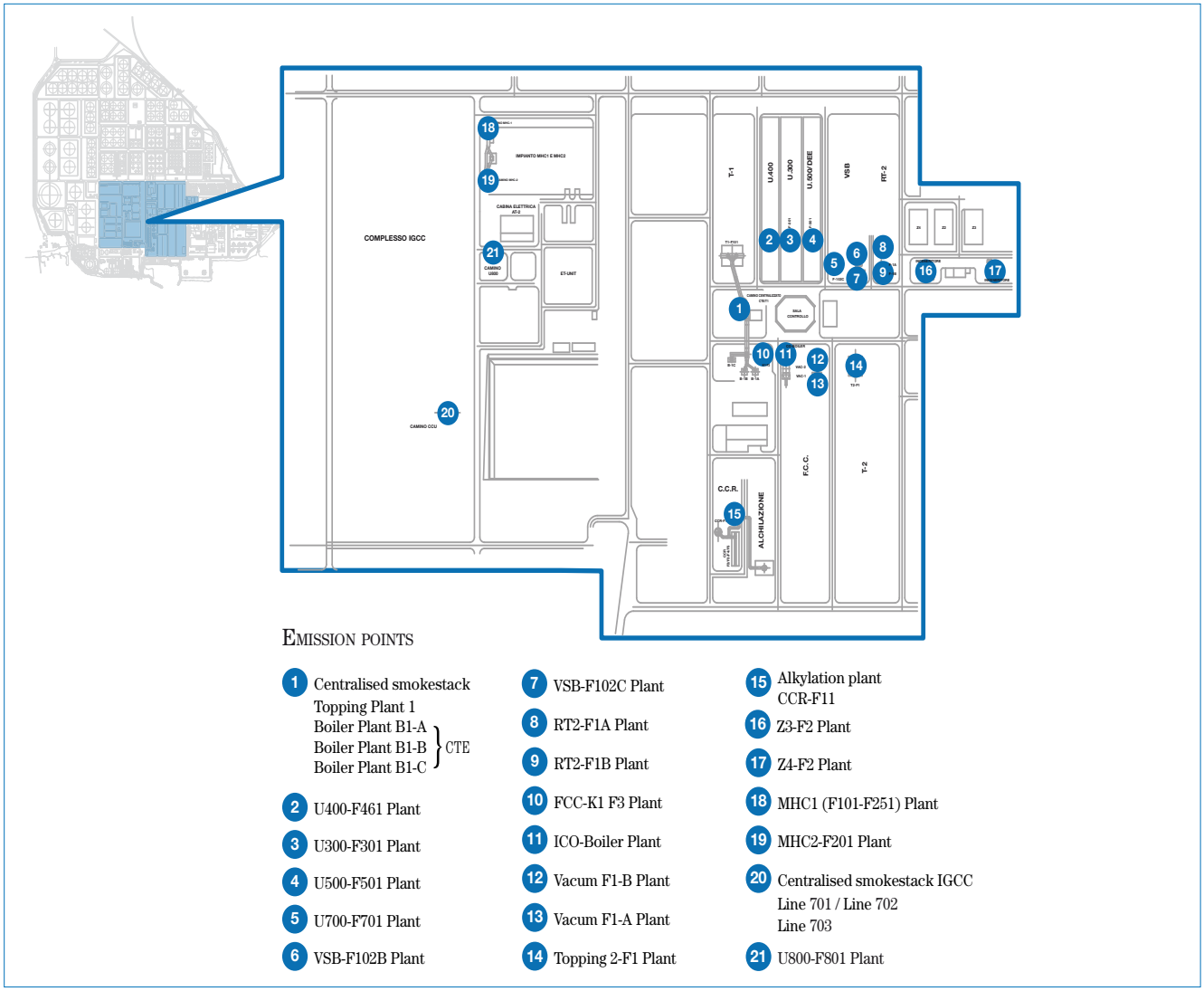


Figura 13 Map showing the locations of the plant's emission points

for carrying out the continuous measurement of emissions from sulphur plants (Z3-F2 and Z4-F2) were also installed in 2009 but did not become operational until June 2010; instruments to continuously measure emissions from the CCR/ Alkalisation, CO-Boiler and Topping 2 plants were installed in September 2010, becoming operational in December 2010

- emissions from the other smokestacks are calculated based on the measurement of fuels consumed, laboratory analysis of their quality and the characteristics of the burners

The methods of calculation used for 2010, in line with the procedures implemented in 2009, also take account of the parameters H_2S, VOCs, NH_3 and chlorine-based compounds and follow the instructions contained in new European and international guidelines[1].

[1] CONCAWE – Air pollutant emission estimation methods for E-PRTR reporting by refineries – 2009 edition
RTI International - Emission Estimation Protocol for Petroleum Refineries – December 2009
European Environment Agency - Air pollutant emission inventory guidebook - 2009

From 2009, alternative checks were made on all smokestacks in the site every six months. This will involve taking a sample and sending it for analysis by an external laboratory. Non-ducted emissions are determined based on estimates and calculations using formulae and widely accepted models[1].

[table obiettivi e interventi obiettivo n° 6, pagina 126]

Diffuse and fugitive emissions for 2007–2010 were determined using estimates based on formulae and accepted calculation methods (source: United States Environmental Protection Agency (USEPA) for emissions from the transportation and storage of raw materials and products; American Petroleum Institute (API) for emissions from wastewater treatment; and Unione Petrolifera for fugitive emissions).

A monitoring campaign is currently under way for fugitive emissions using LDAR[2] monitoring methodology, which is considered one of the best techniques available in the sector[3]. The results obtained with this technique show that the calculation methods adopted previously were very conservative.

The next few sections set out the figures for 2007-2010, calculated according to the above-mentioned methodologies and broken down into the following categories:

- ducted emissions of SO_2, NO_X, dust, PM10 and CO (section 4.2.4.2 below)
- non-ducted emissions of volatile organic compounds (section 4.2.4.3, page 70)

Since atmospheric emissions from the facility may affect the air quality in the locality, the data collected by the public monitoring network on the air quality in the Sarroch area and processed by the Cagliari provincial authority are also presented after the figures on emissions (paragraph 4.2.4.4. page 71).

Lastly, the data on CO_2 emissions from the facility are also provided (section 4.2.4.5, page 79). Although these emissions fall into the category of ducted emissions, it was considered appropriate to show them separately as their impact is global rather than local, given that they contribute to the “greenhouse effect”.

4.2.4.2 – Data on ducted emissions of SO_2, NO_X, dust, PM10 and CO

Data on ducted emissions of SO_2, NO_X, dust, PM10 and CO are provided using the following indicators:

- absolute mass flow values for the refinery, the IGCC and the whole site (refinery + IGCC)
- specific mass flow values, given as ratios to the raw materials input to the integrated production cycle, relating to the whole site
- total concentration values for the refinery (“bubble” values)
- concentration values for the IGCC

Of the indicators given above, the following are subject to limits:

- absolute mass flow values for the refinery
- concentration values for the IGCC
- concentration “bubble” values for the refinery

All indicators are determined annually.

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[1] For diffuse emissions from the storage tanks, the “TANKS” model is used, source: US Environmental Protection Agency (EPA); for diffuse emissions from product despatch and wastewater treatment tanks specific EPA and American Petroleum Institute (API) formulae are used respectively.
For fugitive emissions, an algorithm from Unione Petrolifera and CONCAWE was adopted and, from 2008, was supplemented by new monitoring technology (varifocal infrared video camera) and a new approach to monitoring (Smart LDAR programme). The calculation algorithms specifically take account of the quantity of raw materials processed for emissions from storage and fugitive emissions; the quantity of products despatched for emissions from despatch; and the quantity of incoming wastewater to be treated, for emissions from the wastewater treatment plant.
For storage emissions, the technical characteristics of the tanks are also relevant.

[2] LDAR: Leak Detection and Repair

[3] Guidelines on the Best Available Techniques in the Refining Sector, Ministerial Decree of 29 January 2007.

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 (chart 17) and the stability of the TGTU.

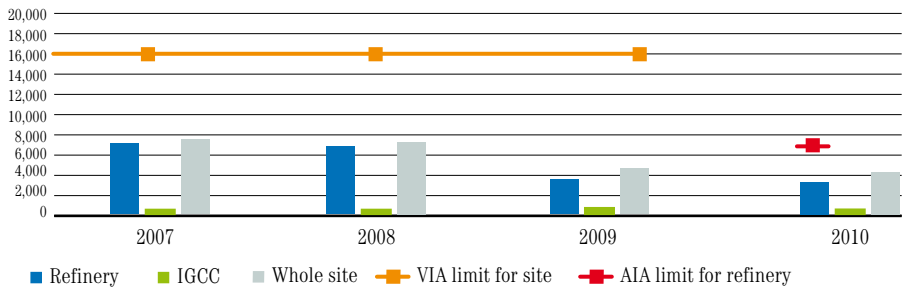
This can be clearly seen from the absolute values relating to the refinery and to the whole site, as shown in Table 15 and Chart T15.

TABELLA 15 SO_2 emissions: absolute mass flow values

	2007	2008	2009	2010
Refinery (t/year)**	6,970	6,733	3,896	3,709
IGCC (t/year)	423	406	514	463
Whole site (t/year)*	7,393	7,139	4,410	4,172

* Compared to the limit of 16,000 t/year, established by DEC/VIA/2025 of 28 December 1994, in force until 8 April 2009.
** Compared to the limit of 6,700 t/year applicable (for the refinery only) from 9 April 2009, in accordance with AIA permit DSA-DEC-2009-0000230 of 24 March 2009.

CHART T15 (t/year)

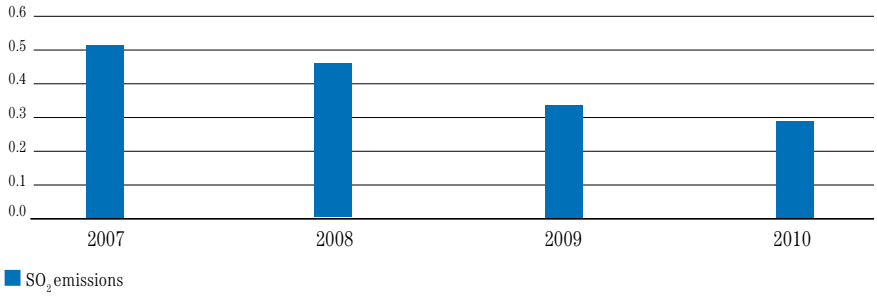


The values of all the mass flow indicators show a general reduction over time and, in any case, the indicators are always well within the limits. Specific emissions from the site are also gradually decreasing, as shown in Table 16 and Chart T16.

TABELLA 16 SO_2 emissions: specific mass flow values

Parameter	2007	2008	2009	2010
Emissions (t SO_2/kt raw materials)	0.51	0.46	0.33	0.29

CHART T16 (t SO_2/kt raw materials)



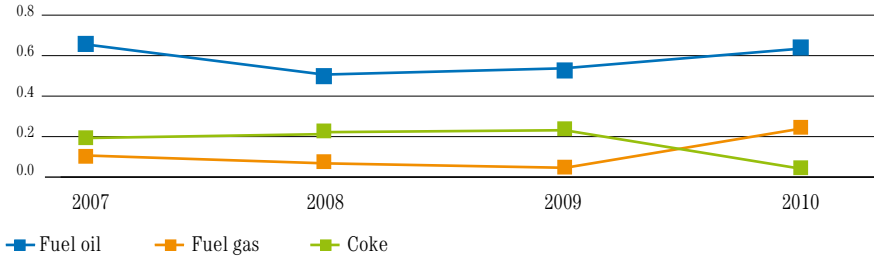
As mentioned earlier, the reduction in SO_2 emissions reflects the balance between the gradual improvement in the quality of fuels and the changes in the quantities used: specifically, in 2010, there was an increase in the use of fuel gas, in which the percentage of sulphur present was gradually being reduced, as shown in Table 17 and Chart T17.

TABLE 17 Sulphur content of fuels used in the refinery

Parameter	2007	2008	2009	2010
Sulphur content of fuel oil (%)	0.49	0.54	0.53	0.62
Sulphur content of fuel gas (%)	0.08	0.05	0.07	0.05
Sulphur content of coke * (%)	0.21	0.22	0.19	0.23

*Fuel generated automatically and consumed in the Fluid Catalytic Cracking (FCC) plant

CHART T17 (%)



The general reduction of SO_2 emissions over time is also borne out by the concentration values reported in the following tables, which are, moreover, much lower than the applicable limits, even though these have been reduced.

TABLE 18 SO_2 emissions: concentration "bubble" values for the refinery

Parameter	2007	2008	2009	2010
SO_2 concentrations - refinery (mg/Nm^3)	672	639	395	335
Limit for the refinery * (mg/Nm^3)	1,700	1,700	650	650

* Limit of 1,700 mg/Nm^3 stipulated by Legislative Decree 152/06 Part V, Appendix I, Part IV in force until 8 April 2009; from 9 April 2009 limit of 650 mg/Nm^3 in accordance with AIA permit DSA-DEC-2009-0000230 of 24 March 2009.

CHART T18 (mg/Nm^3)

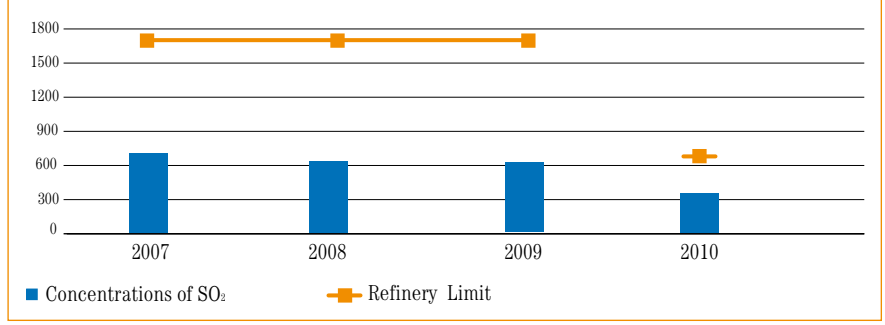
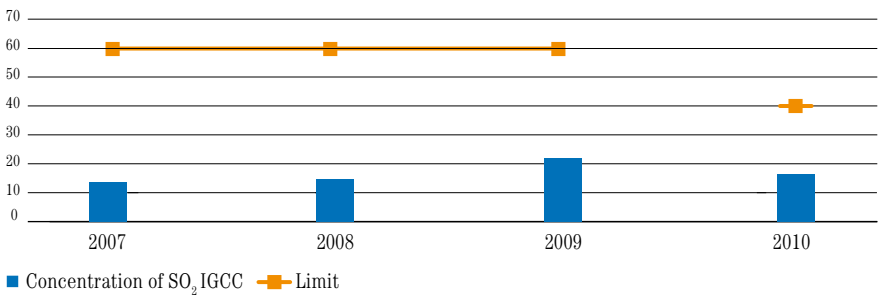


TABLE 19 SO_2 emissions: concentration values for the IGCC

Parameter	2007	2008	2009	2010
Concentration of SO_2 – IGCC (mg/Nm^3)	14	15	23	16
Limit for the IGCC * (mg/Nm^3)	60	60	60	40

* Limit of 60 mg/Nm^3 established at the conclusion of the environmental impact assessment procedure for the IGCC project (DEC/VIA/2025 of 28 December 1994) in force until 8 April 2009; from 9 April 2009, limit of 40 mg/Nm^3 in accordance with AIA permit DSA-DEC-2009-0000230 of 24 March 2009.

CHART T19 (mg/Nm^3)



Nitrogen oxides (NO_x)

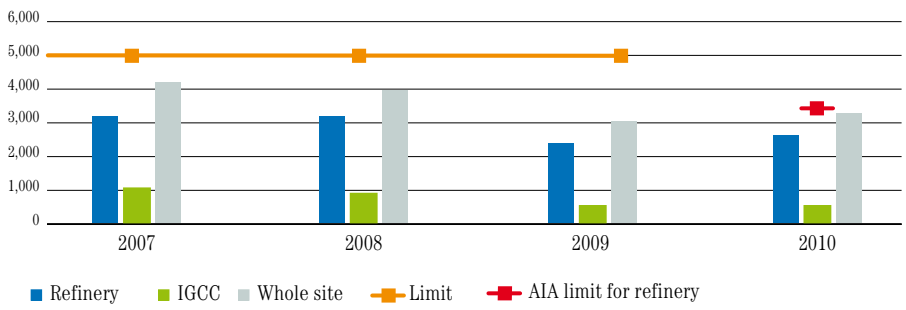
NO_x emissions are only marginally affected by fuel quality, and largely depend on combustion techniques, which in turn are related to technological factors such as burner type. The installation in 2007 of burners that produce low levels of NO_x for the furnaces of the Topping RT2 and Visbreaking plants led to a significant reduction in emissions from the refinery. This performance, shown below, was repeated in subsequent years. The trend in emissions concentration confirms that the performance achieved in 2009 continued in 2010; the rise in the mass flow figures relating to the refinery in 2010, compared to the figures for 2009, is mainly due to the plant shutdowns for planned maintenance in 2009. The figures relating to the absolute mass flow indicators are shown in Table 20 and Chart T20.

TABLE 20 NO_x emissions: absolute mass flow values

	2007	2008	2009	2010
Refinery (t/year)**	3,167	3,130	2,426	2,854
IGCC (t/year)	997	857	578	600
Whole site (t/year)*	4,164	3,987	3,004	3,454

* Compared to the limit of 5,000 t/year, established by DEC/VIA/2025 of 28 December 1994, in force until 8 April 2009.
** Compared to the limit of 3,400 t/year applicable (for the refinery only) from 9 April 2009, in accordance with AIA permit DSA-DEC-2009-0000230 of 24 March 2009.

CHART T20 (t/year)

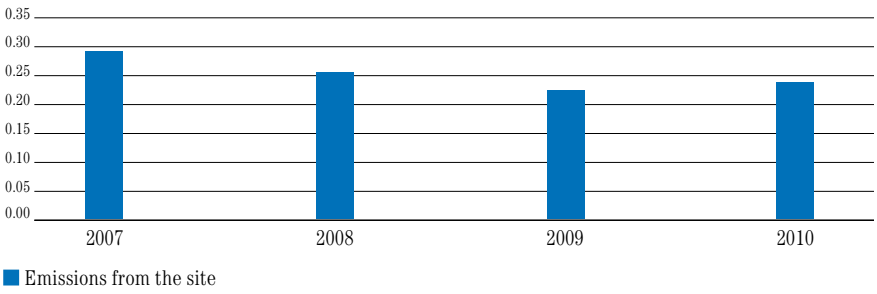


The indicators relating to the site and the refinery have always been lower than the authorised limits, and have decreased over time, assisted by the reduction in the indicator values relating to the refinery and by the start-up of the IGCC. The specific mass flow indicator (figures in Table 21) has also come down over the years, in keeping with the absolute mass flow indicator for the site.

TABLE 21 Specific NO_x emissions: specific mass flow values

Parameter	2007	2008	2009	2010
Emissions (t NO_x/kt raw materials)	0.29	0.26	0.23	0.24

CHART T21 (t NO_x / kt raw materials)



The concentration indicators are also lower than the applicable limits and are improving all the time, as shown in the tables and charts below.

TABELLA 22 NO_2 emissions: concentration "bubble" values for the refinery

Parameter	2007	2008	2009	2010
NO_x concentrations - refinery (mg/Nm³)	381	297	273	258
Limit for the refinery * (mg/Nm³)	500	500	500	300

* Limit of 500 mg/Nm³ stipulated by Legislative Decree 152/06 Part V, Appendix I, Part IV in force until 8 April 2009; from 9 April 2009 limit of 300 mg/Nm³ in accordance with AIA permit DSA-DEC-2009-0000230 of 24 March 2009.

CHART T22 (mg/Nm³)

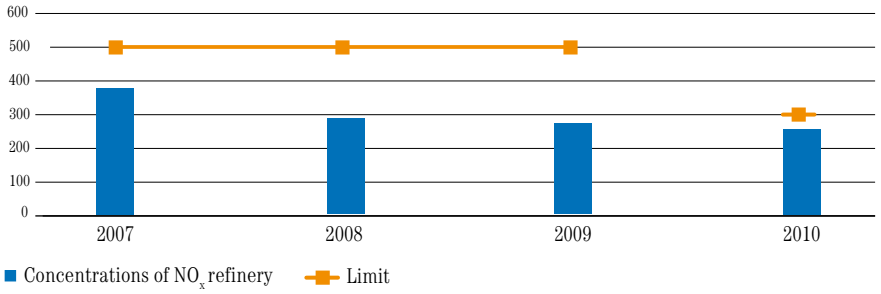
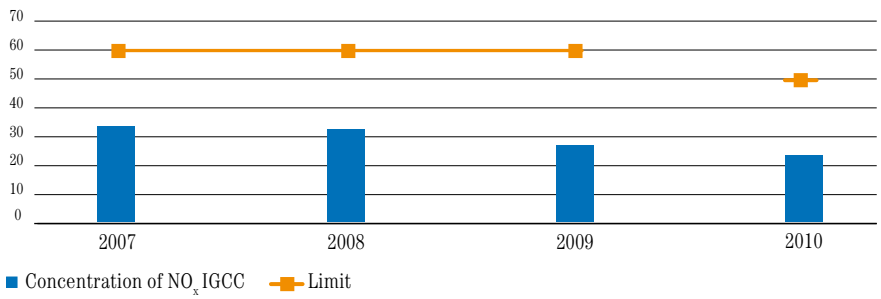


TABELLA 23 NO_x: concentration values for the IGCC

Parameter	2007	2008	2009	2010
NO_x concentrations - IGCC (mg/Nm³)	33	31	27	22
Limit for the IGCC * (mg/Nm³)	60	60	60	50

* Limit of 60 mg/Nm³ established at the conclusion of the environmental impact assessment procedure for the IGCC project (DEC/VIA/2025 of 28 December 1994) in force until 8 April 2009; from 9 April 2009 limit of 50 mg/Nm³ in accordance with AIA permit DSA-DEC-2009-0000230 of 24 March 2009.

CHART T23 (mg/Nm³)



Dust

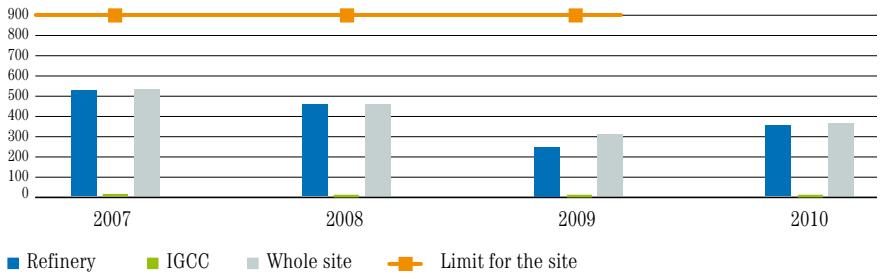
The figures relating to the absolute mass flow indicators for dust are shown in Table 24.

TABLE 24 Dust emissions: absolute mass flow values

	2007	2008	2009	2010
Refinery (t/year)	524	452	277	348
IGCC (t/year)	5	4	26	28
Whole site* (t/year)	529	456	303	376

* Compared to the limit of 900 t/year stipulated by the DEC/VIA/2025 of 28 December 1994, in force until 8 April 2009. The AIA permit DSA-DEC-2009-0000230 of 24 March 2009, in force from 9 April 2009, stipulates mass flow limits only for PM10, which are reported in Table 24 bis. The dust emissions figure for 2010 is also provided for comparison purposes.

CHART T24 (t/year)



The refinery's exclusive use of fuel oil with a low sulphur content (BTZ) in the past few years has kept dust emissions at low levels. The emissions indicator for the site has always been much lower than the authorised limit. Specific values have remained broadly stable (Table 25). The concentration indicators, shown in the tables and charts below, are in line with previous years.

TABLE 25 Dust emissions: specific mass flow values

Parameter	2007	2008	2009	2010
Emissions from the site: t dust/kt raw materials	0.04	0.03	0.02	0.03

CHART T25 (ton dust/ kt raw materials)

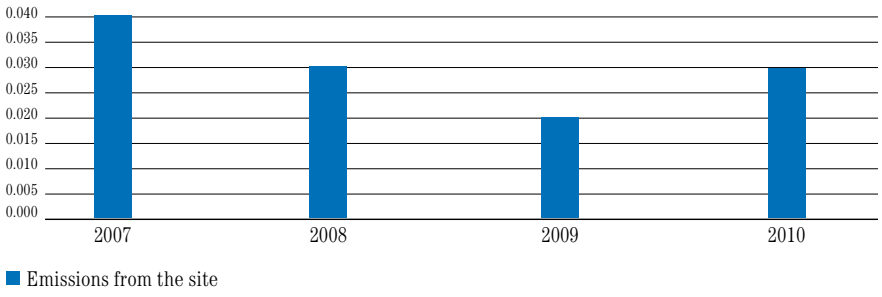


TABLE 26 Dust: concentration "bubble" values for the refinery

Parameter	2007	2008	2009	2010
Concentration of dust – refinery (mg/Nm^3)	45	43	31	31
Limit for the refinery* (mg/Nm^3)	80	80	80	50

* Limit of 80 mg/Nm^3 stipulated by Legislative Decree 152/06 Part V, Appendix I, Part IV in force until 8 April 2009; from 9 April 2009 limit of 50 mg/Nm^3 in accordance with AIA permit DSA-DEC-2009-0000230 of 24 March 2009.

CHART T26 (mg/Nm³)

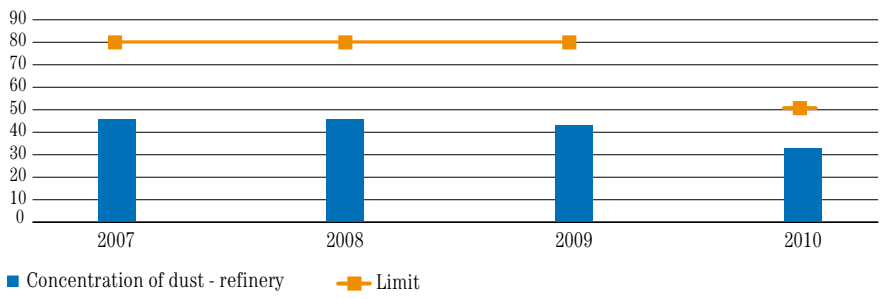
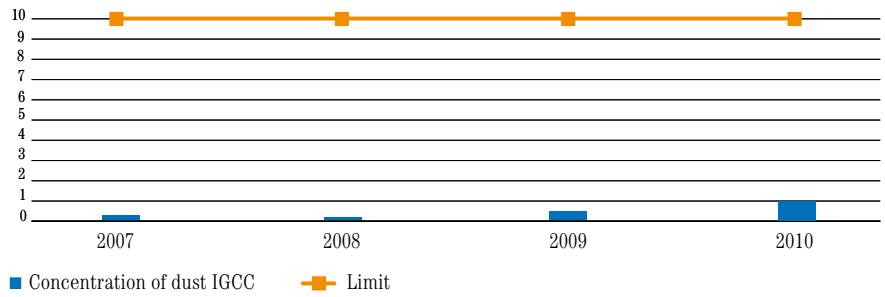


TABLE 27 Dust: concentration values for the IGCC

Parameter	2007	2008	2009	2010
Concentration of dust - IGCC (mg/Nm³)	0.2	0.1	1.1	1.0
Limit for the IGCC (mg/Nm³)	10	10	10	10

CHART T27 (mg/Nm³)



All the values shown are much lower than the applicable limits. Objectives and measures to reduce these emissions and improve monitoring are planned.

[table of objectives and measures: objectives 2, 3, 4 and 5, page 125]

PM10

Table 24 bis shows the figures relating to the absolute mass flow indicator for PM10. The authorised limits, which were introduced on 9 April 2009 by the AIA permit, relate only to the refinery.

[PM10]

TABLE 24 BIS PM10 emissions: absolute mass flow values

	2007	2008	2009	2010
Refinery (t/year)*	219	186	229	250
Limit for the refinery (t/year)	-	-	-	330

* Compared to the limit for the refinery only of 330 t/year in accordance with AIA permit DSA-DEC-2009-0000230 of 24 March 2009 in force from 9 April 2009. Previous legislation did not stipulate limits for this parameter.

Previous legislation did not stipulate limits for this parameter, therefore the figures shown in the three tables below for 2007-2008 are purely indicative estimates and are not comparable with the 2009 and 2010 figures, which were calculated using the US-EPA 1998 method. In 2010, the absolute mass flow value of PM10 was below the limit. Table 25 bis below shows the specific values. The concentration indicator values given in the next table (Table 26 bis) show that the new legal limits have been complied with.

TABLE 25 BIS PM10 emissions: specific mass flow values

	2007	2008	2009	2010
Emissions from the site: t PM10/kt raw materials	0.015	0.012	0,017	0.017

TABLE 26 BIS PM10: concentration "bubble" values for the refinery

	2007	2008	2009	2010
PM10 concentrations - refinery (mg/Nm^3)	21	18	25	23
Limit for the refinery * (mg/Nm^3)	-	-	-	30

* Limit of 30 mg/Nm^3 in accordance with the AIA permit in force from 9 April 2009. Previous legislation did not stipulate limits for this parameter.

All the values shown are lower than the applicable limits. Objectives and measures to reduce these emissions and improve monitoring are planned.

Carbon monoxide (CO)

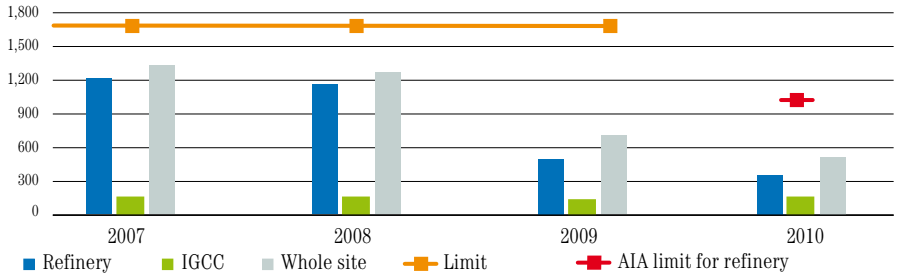
The figures for the absolute mass flow indicators are shown in Table 28 and Chart T28.

TABLE 28 CO emissions: absolute mass flow values

	2007	2008	2009	2010
Refinery (t/year)**	1.195	1.168	542	360
IGCC (t/year)	138	133	123	159
Whole site* (t/year)	1.333	1.301	665	519

* Compared to the limit of 1,700 t/year, established by DEC/VIA/2025 of 28 December 1994, in force until 8 April 2009.
** Compared to the limit of 1,000 t/year applicable (for the refinery only) from 9 April 2009, in accordance with AIA permit DSA-DEC-2009-0000230 of 24 March 2009.

CHART T28 (t/year)

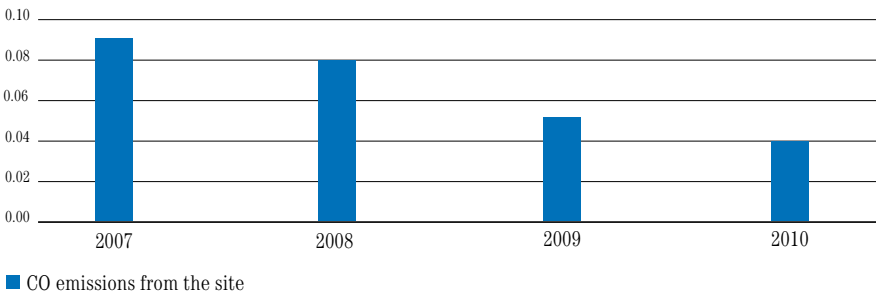


The indicator for site emissions has always been lower than the limit and confirms a largely positive performance in this regard over time: the IGCC figure has been broadly stable, while the figure for the refining plants has fallen, due to the optimisation of the combustion process in certain furnaces, and in particular to the contribution made by the TGTU unit from 2009 onwards. The figure relating to the specific mass flow indicator for the site shown in Table 29 and Chart T29 is also positive and in 2010 recorded its lowest value for the period in question.

TABLE 29 CO emissions from the site: specific mass flow values

Parameter	2007	2008	2009	2010
Emissions from the site: t CO/kt raw materials	0.09	0.08	0.05	0.04

CHART T29 (t CO / kt raw materials)



The values of the concentration indicators shown in the tables below are much lower than the applicable limits.

TABLE 30 CO emissions: concentration "bubble" values for the refinery

Parameter	2007	2008	2009	2010
CO concentrations - refinery (mg/Nm³)	115	111	41	33
Limit for the refinery * (mg/Nm³)	250	250	250	50

* Limit of 250 mg/Nm³ stipulated by Legislative Decree 152/06 Part V, Appendix I, Part IV in force until 8 April 2009; from 9 April 2009 limit of 50 mg/Nm³ in accordance with AIA permit DSA-DEC-2009-0000230 of 24 March 2009.

CHART T30 (mg/Nm³)

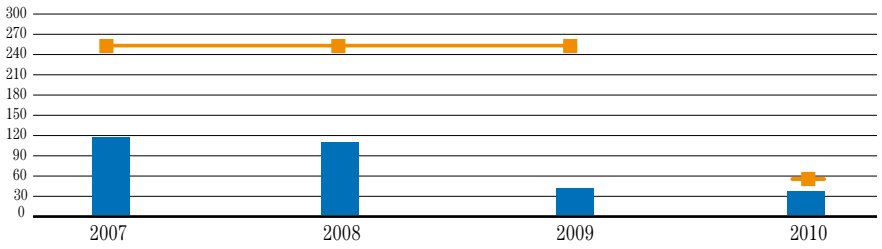
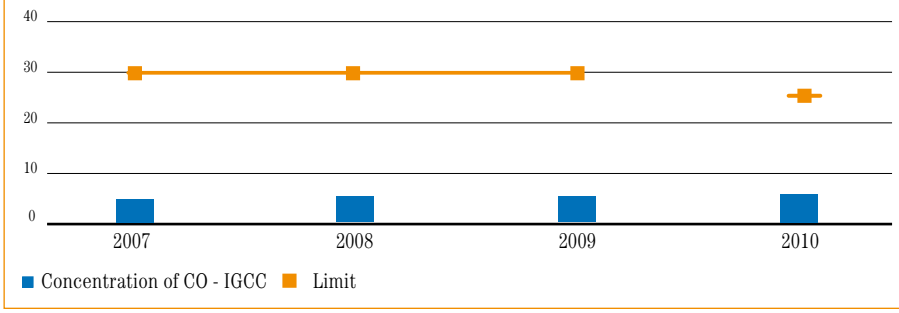


TABLE 31 CO emissions: concentration values for the IGCC

Parameter	2007	2008	2009	2010
CO concentrations - IGCC (mg/Nm³)	4.6	5.0	5.4	5.9
Limit for the IGCC * (mg/Nm³)	30	30	30	25

* Limit of 30 mg/Nm³ established at the conclusion of the environmental impact assessment procedure for the IGCC project (DEC/VIA/2025 of 28 December 1994) in force until 8 April 2009; from 9 April 2009 limit of 25 mg/Nm³ in accordance with AIA permit DSA-DEC-2009-0000230 of 24 March 2009.

CHART T31 (mg/Nm³)



Objectives and measures to improve the monitoring of CO emissions are planned. Lastly, the AIA permit stipulates new limits for the refinery in terms of concentrations for VOCs (volatile organic compounds), H_2S and NH_3, and chlorine-based compounds. These limits were also fully complied with in 2010.

[table of objectives and measures: objectives 3 and 4, page 125]

Abnormal or emergency situations

An analysis of abnormal or emergency situations that can affect the plant's atmospheric emissions led the company to identify the following event as significant:

- increase in SO_2 emissions and the emission of dense smoke from the incinerator smokestack for the refinery's sulphur recovery plants

The installation of the treatment unit for tail gases coming from the refinery's sulphur recovery plants has reduced the probability of this type of event and its consequences. In effect, the tail gas treatment unit helps reduce the sulphur compound content in

[table of objectives and measures: objective 1, page 125]

tail gases before they are sent to the incinerator. SO_2 emissions have also been reduced under normal operating conditions, generating a total reduction of over 30% in such emissions from the site per year. To prevent other types of emergency relating to emissions from the centralised smokestacks of the refinery and the IGCC, warning thresholds for emission concentrations have been defined for internal use: as soon as the thresholds are reached, the appropriate corrective measures are rapidly activated in the plants responsible for the emissions in order to prevent the spread of the ground-level effects of the pollutants.

4.2.4.3 – Data on non-ducted emissions

The data on non-ducted emissions, comprising diffuse and fugitive emissions, are summarised in Table 32.

TABLE 32 Non-ducted (diffuse and fugitive) emissions of volatile organic compounds from the site

Total non-ducted VOC emissions	2007	2008	2009	2010
Diffuse (t/year)	449	442	434	443
Fugitive (t/year)	1,459	776	457	320
Total (t/year)	1,908	1,218	891	763

Fugitive emissions tend to increase as raw material inputs increase (Table 3 on page 33). In 2008, based on the new monitoring technology (varifocal infrared video camera) and new monitoring approach (Smart LDAR programme)* used, it was found that these emissions had been overestimated by at least 50% in the past few years and by a total of 35% in 2009 and 24% in 2010.

4.2.4.4 – Air quality in the Sarroch area

4.2.4.4.1 Air quality monitoring using fixed measurement sensors

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 location of the measurement sensors of the public network is shown in Figure 14.

The data measured by the sensors includes emissions from all sources in the area, including industrial, urban and non-urban emissions, such as those from vehicle traffic. The reference legislation for air quality monitoring methodology and limits are as follows:

- Ministerial Decree 60/2002 and Legislative Decree 155/2010 for SO_2, nitrogen oxides (NO_2 and NO_x), small dust particles (PM10), CO and benzene
- Legislative Decree 183/2004 and Legislative Decree 155/2010 for ozone
- Presidential Decree 322/1971 for hydrogen sulphide

The Saras network – managed alongside those of the local authorities and other companies in the region – provides data on changes in parameters relevant to air quality in real time, to ensure that pollution is kept below the minimum levels set out by the laws in force and that immediate steps can be taken when necessary. Each of the four Saras monitoring stations (Villa d'Orri, Sarroch, Porto Foxi and the 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 (hydrogen sulphide); PM10; ozone; hydrocarbons

*Vedi nota 2 pagina 60

In 2010 the continuous measurement of PM10 was recorded and archived for the Porto Foxi station only. This was due to a software update in progress, which temporarily limited part of the data transmission and storage functionality. The station located in the area of the national storage facility is also supplemented by 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.

Figura 14 Map showing the location of the air quality monitoring stations of the public network.

The ARPAS network records hourly average concentrations in all the stations of the following pollutants:
SO_2; NO_2; dust; H_2S; PM10
In three stations:
Ozone; benzene
In one station:
CO
A dedicated monitoring system constantly checks emissions from the IGCC plant for:
SO_2; NO_X; PTS; CO; 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), monitoring the same parameters as described above. In 2009, similar monitoring systems were also installed for emissions from the smokestacks of the Z3 and Z4 sulphur recovery plants, and since September 2010, monitoring systems for the smokestacks of the Topping 2, Reformer/Alkalisation (CCR/Alky) and CO Boiler plants have also been on stream. The remaining emissions are monitored periodically through half-yearly sampling. The results obtained by the public network for the pollutants monitored in 2007-2010 are shown below. The figures and comments are taken from reports prepared annually by ARPAS in Cagliari.

Measurements of SO_2 recorded by the provincial network

As regards SO_2, the report issued by ARPAS in Cagliari shows that the improvement on previous years recorded since 2007 continued in 2010, and that no legal limits were breached. These results are shown in the tables and charts below. More specifically,

it should be noted that before 2007, the three-hourly warning threshold was exceeded several times in one of the sensors (CENSA2), and the hourly and daily limits for the protection of human health were also exceeded more times than allowed by Ministerial Decree 60/2002. From 2007 onwards, the situation recorded by CENSA2 has complied with legal provisions. The warning threshold has not been exceeded and the number of times that the hourly and daily limits have been exceeded was lower than that stipulated by law for the protection of human health. In 2009, a further clear improvement in the effects of SO_2 emissions was recorded. This coincides with the start-up of the TGTU, and was again confirmed in 2010, when the limit was not exceeded. This trend is shown in Tables 33, 34, 35, 36 and associated charts. Note that Saras does not have access to the hourly data measured by the public network in sufficient time to allow it to implement immediate corrective action when the hourly/daily thresholds are exceeded. Following receipt of a report by the monitoring authorities that one of the above-mentioned limits or thresholds has been exceeded, Saras always promptly instituted the necessary checks of the plants' systems and the sulphur content in the fuels used. If anomalies were found, details were provided to the authority that notified the company of the breach, with a written summary of the event and its causes. Even if no anomalies were found, a written reply was always provided. Lastly, Table 37 shows the number of reports submitted to Saras of warning thresholds reached in respect of the pollutant SO_2, measured by the sensors of the public air quality monitoring network. The table shows that although the number of times the hourly and daily limits were exceeded was lower in 2008 than in previous years, there were more reports from the region, showing how awareness of environmental issues has increased. No reports were submitted in 2009, as a result of the clear improvement recorded in the impact of SO_2 emissions. The same is true of 2010.

[table of objectives and measures: objective 7, page 126]

TABLE **33** SO_2: measurements recorded by the provincial network - no. of days the warning threshold was exceeded

Sensor	2007	2008	2009	2010
CENSA0**	0	0	0	-
CENSA1	0	0	0	0
CENSA2	0	0	0	0
CENSA9	0	0	0	0
CENSA3**	-	-	0	0
Limit*	500 µg/m^3 not to be exceeded for 3 consecutive hours			

*Limit stipulated by Ministerial Decree 60/2002
**The sensor CENSA0 (Sarroch – Su Nuraxeddu) was removed on 13 July 2009. From 16 July 2009, the sensor CENSA3 was installed (Via Rossini in the urban area of Sarroch), with identical equipment to that of CENSA0. Data from the new sensor are available from 16 July 2009.

CHART **T33** (No. of times limit exceeded)

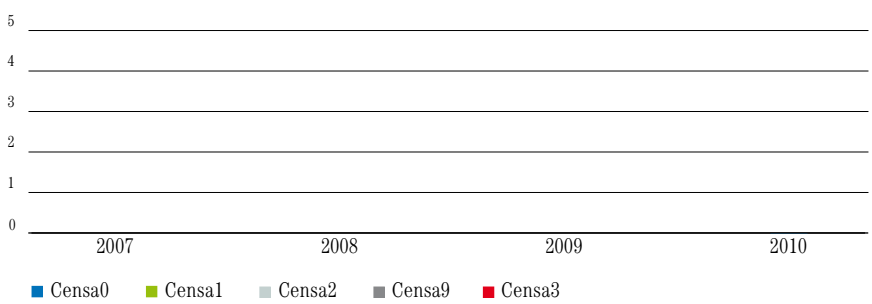


TABELLA 34 SO_2: measurements recorded by the provincial network - no of days the hourly limit for the protection of human health was exceeded

Sensor	2007	2008	2009	2010
CENSA0**	6	1	0	-
CENSA1	0	2	0	0
CENSA2	21	13	1	0
CENSA9	0	0	0	0
CENSA3**	-	-	0	0
Limit *	**350 µg/m³** not to be exceeded more than 24 times in a calendar year			

* Limit stipulated by Ministerial Decree 60/2002 from 2005. In 2004 the threshold not to be exceeded was 380 µg/m³
**The sensor CENSA0 (Sarroch – Su Nuraxeddu) was removed on 13 July 2009. On 16 July the sensor CENSA3 was installed (Via Rossini in the urban area of Sarroch), with identical equipment to that of CENSA0. Data from the new sensor are available from 16 July 2009.

CHART T34 (No. of times limit exceeded)

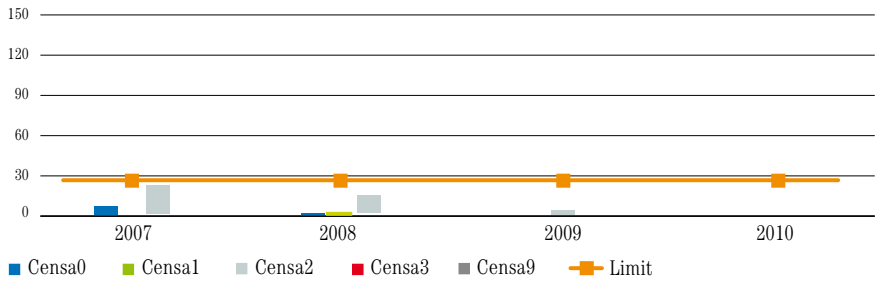


TABLE 35 SO_2: concentration values measured by the provincial network - no. of times daily limit for the protection of human health was exceeded

Sensor	2007	2008	2009	2010
CENSA0**	1	0	0	-
CENSA1	0	0	0	0
CENSA2	2	0	0	0
CENSA9	0	0	0	0
CENSA3**	-	-	0	0
Valore limite *	**125 µg/m³** not to be exceeded more than 3 times in a calendar year			

*Limit stipulated by Ministerial Decree 60/2002
**The sensor CENSA0 (Sarroch – Su Nuraxeddu) was removed on 13 July 2009. On 16 July the sensor CENSA3 was installed (Via Rossini in the urban area of Sarroch), with identical equipment to that of CENSA0. Data from the new sensor are available from 16 July 2009.

CHART T35 (No. of times limit exceeded)

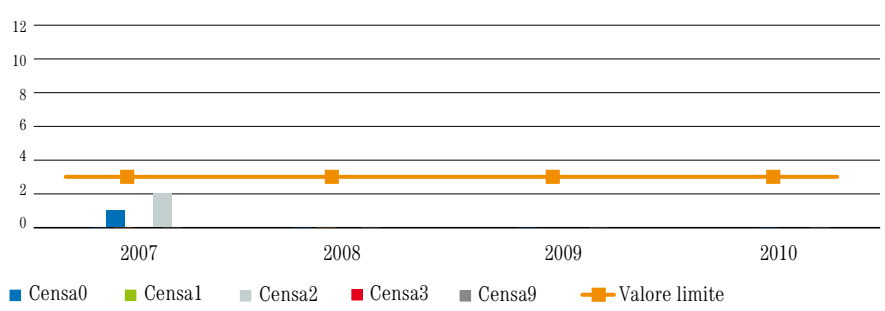


TABLE 36 SO_2: concentration values measured by the provincial network - annual average concentration

Sensor	2007	2008	2009	2010
CENSA0 (µg/m³)**	7	n.a.	n.a.	n.a.
CENSA1 (µg/m³)	4	n.a.	n.a.	n.a.
CENSA2 (µg/m³)	12	n.a.	n.a.	n.a.
CENSA9 (µg/m³)	4	n.a.	n.a.	n.a.
CENSA3 (µg/m³)**	-	-	n.a.	n.a.
Valore limite*	20 µg/m³ limit for the protection of eco-systems			

*Limit stipulated by Ministerial Decree 60/2002 n.a. figure not available as not supplied by ARPAS
**The sensor CENSA0 (Sarroch – Su Nuraxeddu) was removed on 13 July 2009. On 16 July the sensor CENSA3 was installed (Via Rossini in the urban area of Sarroch), with identical equipment to that of CENSA0. Data from the new sensor are available from 16 July 2009.

GRAFICO T36 (µg/m³)

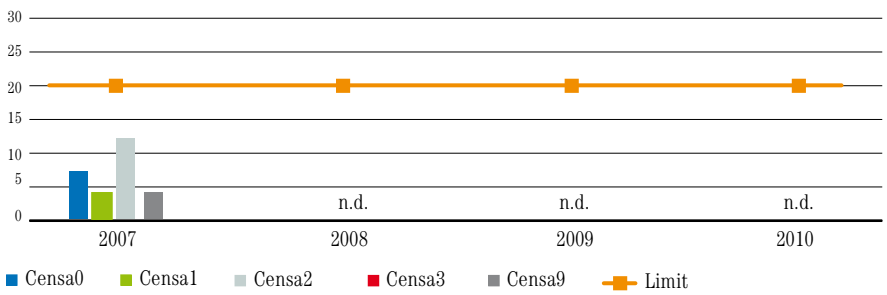


TABLE 37 Reports received by Saras on breaches of warning thresholds, for SO_2 stipulated in Ministerial Decree 60/2002

Parameter	2007	2008	2009	2010
No. of reports/year	6	13	0	0

*Limit stipulated by Ministerial Decree 60/2002, --- figures not available
**The sensor CENSA0 (Sarroch – Su Nuraxeddu) was removed on 13 July 2009. On 16 July the sensor CENSA3 was installed (Via Rossini in the urban area of Sarroch), with identical equipment to that of CENSA0. Data from the new sensor are available from 16 July 2009.

PM10: measurements recorded by the provincial network

There were no breaches of legal limits for PM10 in 2007–2010 with the sole exception of the sensor CENSA3 in 2010. An official assessment of this breach is available on the SardegnaArpa website, which explains that in the winter period the sources of small dust particles include a significant contribution from the combustion of heating plants, especially wood-fired plants. The number of times that the hourly limit for the protection of human health was exceeded and the annual average concentration values for PM10 are shown in Tables 38 and 39.

TABLE 38 PM10: concentration values measured by the provincial network - no. of times the hourly limit for the protection of human health was exceeded

Sensor	2007	2008	2009	2010
CENSA0**	12	14	2	-
CENSA1	8	11	5	2
CENSA2	21	15	10	15
CENSA9	0	11	10	1
CENSA3**	-	-	22	59
Limit*	50 µg/m³ not to be exceeded more than 35 times per calendar year			

*Limit stipulated by Ministerial Decree 60/2002; --- : figures not available
**The sensor CENSA0 (Sarroch – Su Nuraxeddu) was removed on 13 July 2009. From 16 July 2009, the sensor CENSA3 was installed (Via Rossini in the urban area of Sarroch), with identical equipment to that of CENSA0. Data from the new sensor are available from 16 July 2009..

CHART T38 (No. of times limit exceeded)

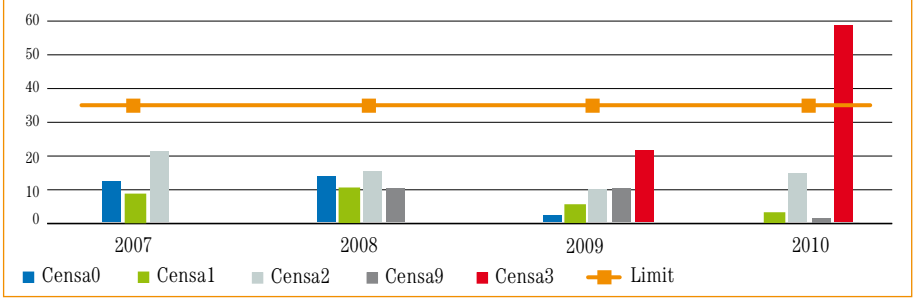
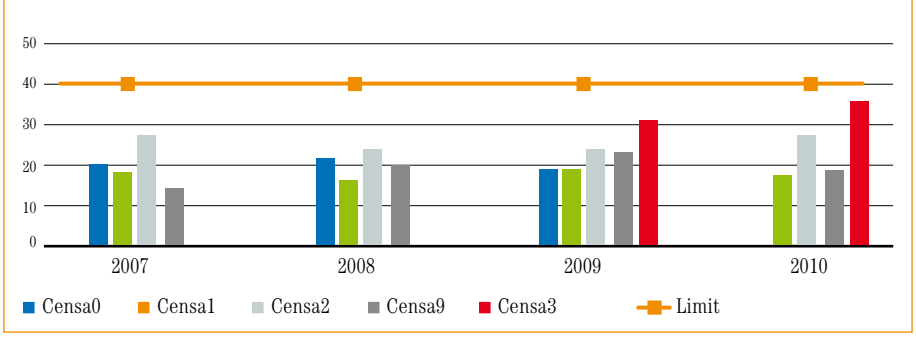


TABLE 39 PM10: concentration values measured by the provincial network - annual average concentration

Sensor	2007	2008	2009	2010
CENSA0 (µg/m³)**	20	22	19	-
CENSA1 (µg/m³)	18	17	19	18
CENSA2 (µg/m³)	27	25	25	28
CENSA9 (µg/m³)	14	20	23	19
CENSA3 (µg/m³)**	-	-	32	36
Limit*	40 µg/m³ limit for the protection of eco-systems			

*Limit stipulated by Ministerial Decree 60/2002; --- : figures not available
**The sensor CENSA0 (Sarroch – Su Nuraxeddu) was removed on 13 July 2009. From 16 July 2009, the sensor CENSA3 was installed (Via Rossini in the urban area of Sarroch), with identical equipment to that of CENSA0. Data from the new sensor are available from 16 July 2009.

CHART T39 (µg/m³)



NO_2 and NO_x: measurements recorded by the provincial network

The indicators at all stations show that the values for NO_2 are well below the legal limits. No breaches of the warning threshold or the hourly limit for the protection of human health were recorded in the period 2007-2010 apart from in 2008 when the CENSA0 station measured one breach of the hourly limit for the protection of human health. The annual value did not, however, exceed the limit. The average concentration values of NO_2 and NO_x are shown in Tables 40 and 41.

TABLE 40 NO_2: measurements recorded by the provincial network – annual average concentration of NO_2

Sensor	2007	2008	2009	2010
CENSA0 (µg/m³)**	7	9	6	-
CENSA1 (µg/m³)	13	10	10	8
CENSA2 (µg/m³)	12	11	10	9
CENSA9 (µg/m³)	12	12	11	8
CENSA3 (µg/m³)**	-	-	14	11
Limit for the protection of human health (µg/m³) *	46	44	42	40

*Limit stipulated by Ministerial Decree 60/2002; it will become 40 µg/m³ in 2010 - n.a. figure not available as not supplied by ARPAS
**The sensor CENSA0 (Sarroch – Su Nuraxeddu) was removed on 13 July 2009. From 16 July 2009, the sensor CENSA3 was installed (Via Rossini in the urban area of Sarroch), with identical equipment to that of CENSA0. Data from the new sensor are available from 16 July 2009.

CHART T40 (µg/m³)

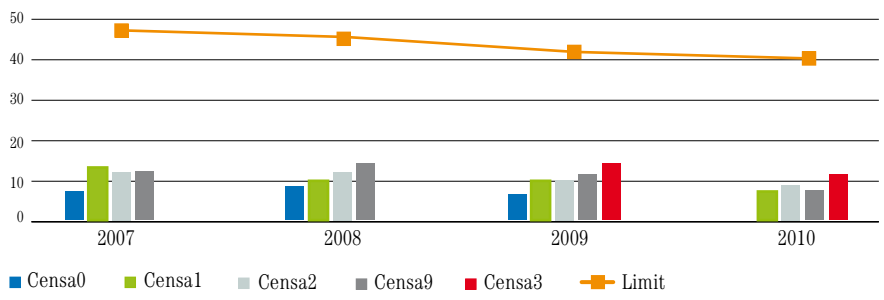
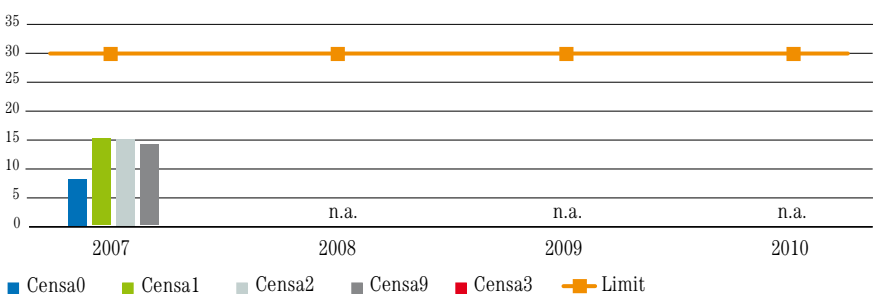


TABLE 41 NO_x: measurements recorded by the provincial network – annual average concentration of NO_2

Sensor	2007	2008	2009	2010
CENSA0 (µg/m³)**	8	n.a.	n.a.	n.a.
CENSA1 (µg/m³)	15	n.a.	n.a.	n.a.
CENSA2 (µg/m³)	15	n.a.	n.a.	n.a.
CENSA9 (µg/m³)	14	n.a.	n.a.	n.a.
CENSA3 (µg/m³)**	-	-	n.a.	n.a.
Limit*	30 µg/m³ limit for the protection of vegetation			

*Limit stipulated by Ministerial Decree 60/2002
n.a. figure not available as not supplied by ARPAS
**The sensor CENSA0 (Sarroch – Su Nuraxeddu) was removed on 13 July 2009. From 16 July 2009, the sensor CENSA3 was installed (Via Rossini in the urban area of Sarroch), with identical equipment to that of CENSA0. Data from the new sensor are available from 16 July 2009.

CHART T41 (µg/m³)



Measurements recorded by the provincial network for other pollutants (H_2S, benzene, ozone, CO)

As regards the other pollutants monitored, the report from the provincial authority shows that:

[Ministerial Decree 60/2002]

- the values for **CO** were much lower than the legal limits and in line with those of the years prior to 2008; in 2009 and 2010, the only data received related to the sensor CENSA2 and confirmed that there were no breaches of the legal limit;
- the values for **benzene** recorded in the period 2007-2010 were lower than the legal limits with the exception of the sensor CENSA0 (which has now been eliminated as it was considered by ARPAS* not to be representative), which recorded an annual average of 10.3 µg/m³ in 2009 compared with the legal limit of 6 µg/m³. None of the other sensors recorded breaches. In 2010 the annual average of the stations managed by the province did not breach the limit of 1.5 µg/m³ (CENSA2 and CENSA3).

[Legislative Decree 183/2004]

- for **ozone**, four breaches of the information thresholds were recorded (CENSA1) in 2009, while no warning thresholds were exceeded and no data relating to the thresholds for the protection of human health were received. The report emphasises that the problem of ozone emissions can only be tackled on a large scale given the long-distance transportation of this pollutant; in 2010, two breaches of the target value for the protection of human health were recorded (by CENSA1 and CENSA9), but there were no breaches of the warning thresholds.

[Presidential Decree issued on 15 April 1971]

- the concentration values of **hydrogen sulphide** for 2007-2009 were lower than the legal limit of 40 µg/m³ for daily average concentrations and 100 µg/m³ for hourly average concentrations, with the exception of 2008, when two breaches of the daily average and 15 breaches of the hourly average occurred, and 2009, when six breaches of the hourly average were recorded.

  The incidents in 2008 occurred on 13 and 14 February when certain plants were shut down due to an electrical fault, in accordance with operating procedures. No faults were found in the plants.

  Saras sent an analysis of the event to the local and national authorities.

  No ARPAS data have been received for 2010.

* An official assessment is available on the Arpas website www.sardegnaambiente.it

Figura 15 Location of the air quality bio-monitoring stations

4.2.4.4.2 Monitoring of air quality 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 15. It also uses the epiphytic mosses methodology as a bio-monitor of air quality.

Table 42 shows the key criteria for interpreting the categories of air quality and atmospheric purity, with reference to the Index of Atmospheric Purity (IAP)[1].

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

TABLE 42 Index of Atmospheric Purity (IAP): categories of air quality and atmospheric purity

I.A.P. categories	I.A.P. 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

The categories that include the indicator values measured in the stations being monitored are highlighted in Table 42.
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.
These monitoring stations also include the one nearest the industrial area.
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.
According to the results of these field measurements, In 2010 there is again no particularly critical threat to the condition of the vegetation in the area studied.
Saras' Sarroch site (including the refinery, IGCC, national storage facility and the tank farm) covers an area of 2,724,142 m^2, which has not changed in the period 2007-2010.
For some years a programme to recover "green" areas in the site has been under way.

4.2.4.5 – Greenhouse gas emissions

Greenhouse gas (carbon dioxide, CO_2)

[implemented by Legislative Decree 216/06 as subsequently amended]

The activities carried out on the Sarroch site, i.e. refining and electricity generation, fall within the scope of application of the European Emissions Trading Directive.
The directive was introduced across Europe to control and reduce carbon dioxide emissions in accordance with the Kyoto Protocol. The objective of this legislation is to reduce greenhouse gas emissions, especially carbon dioxide, which are thought to cause the progressive global warming of the planet known as the 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 each individual plant falling within the scope of the directive an emissions allowance established 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. In 2009, Saras obtained additional allowances due to the start-up of Unit 800.
Once Unit 800 came on stream, and based on the regulation governing new entries (Decree of 28 February 2008), Saras received additional allowances as follows: 489 tons of CO_2 for 2008 and 22,313 tons of CO_2 per year for the period 2009-2012.
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. A new Emissions Trading Directive is planned for the period 2013-2020. The objective of the new directive for the period until 2020 is to reduce CO_2 emissions by 20% compared to the levels recorded in 2005. The system to allocate allowances to companies will also be changed significantly. CO_2 emissions from the Saras site are calculated based on an appropriate monitoring plan, which is defined in accordance with specific European and Italian guidelines[1]. Monitoring is carried out by measuring fuel consumption and applying specific emissions factors for each fuel.
The requirements relating to the monitoring instrumentation are very stringent and must be checked and maintained over time. Moreover, the laboratories that carry out analysis on fuels must obtain specific accreditation[2]. Saras' internal laboratory was one of the first Italian laboratories operating in a refinery (the third in Italy) to obtain the accreditation necessary to carry out checks on some of the fuels used.
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.
The tables and charts on the next page show the annual figures on CO_2 emissions from the site in both absolute and relative terms, as a proportion of the quantity of raw materials processed in a year. The figures for 2010 (like those relating to 2005-2009) have been validated by LRQA Italy, one of the companies on the list of bodies

[1] European guidelines for the period 2005-2007 are contained in Decision 2004/156/EC; they were implemented in Italy through the provisions of DEC/RAS/854/05. For the subsequent five-year period, 2008-2012, the new guidelines contained in Decision 2007/589/EC and implemented by resolution 14/2009 must be applied.
[2] The reference standard for the accreditation of laboratories is ISO 17025.

specifically accredited for this purpose by the Italian Ministry for the Environment. The emissions recorded over the first period (2005–2007), which were also confirmed by the 2008 figures, are typical of the site.

TABLE 43 CO_2 emissions: absolute values and quotas assigned

Parameter	2007	2008	2009	2010
Refinery emissions (t/year)	2,508,281	2,485,255	2,130,113	2,368,781
Allowances assigned to the refinery* (t/year)	**2,615,246**	2,137,872	2,159,696	2,159,696
IGCC emissions (t/year)	3,751,317	3,728,496	3,539,598	3,782,755
Allowances assigned to the IGCC (t/year)	**3,544,794**	444,404	444,404	444,404

*Annual CO_2 allowances assigned for 2005–2008

GRAFICO T43A (t/year)

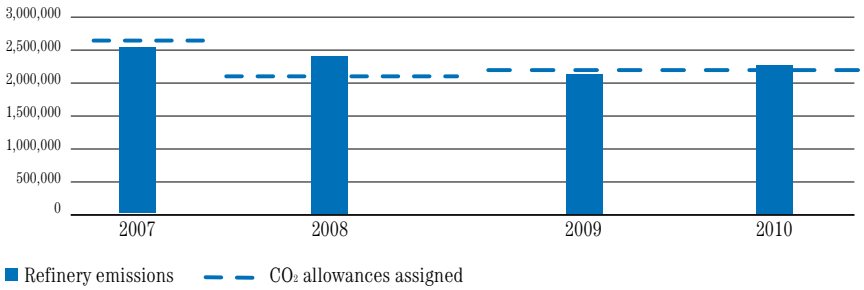


CHART T43B (t/year)

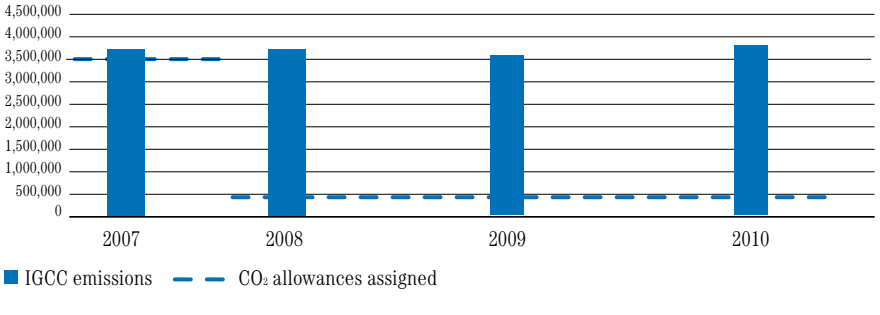
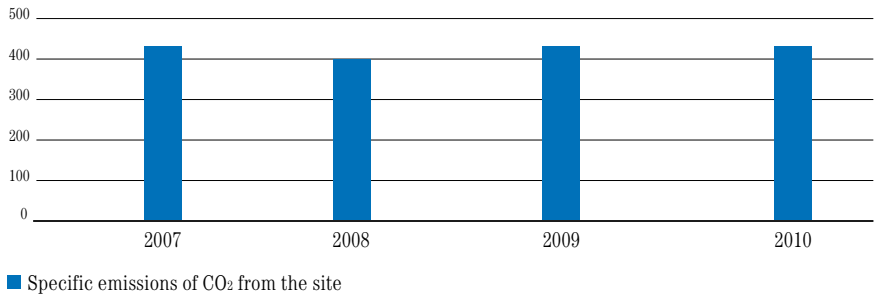


TABLE 44 Specific CO_2 emissions from the site

Parameter	2007	2008	2009	2010
Specific emissions from the site: t CO_2/kt raw materials	429	400	427	429

CHART T44 (t CO_2/kt raw materials)

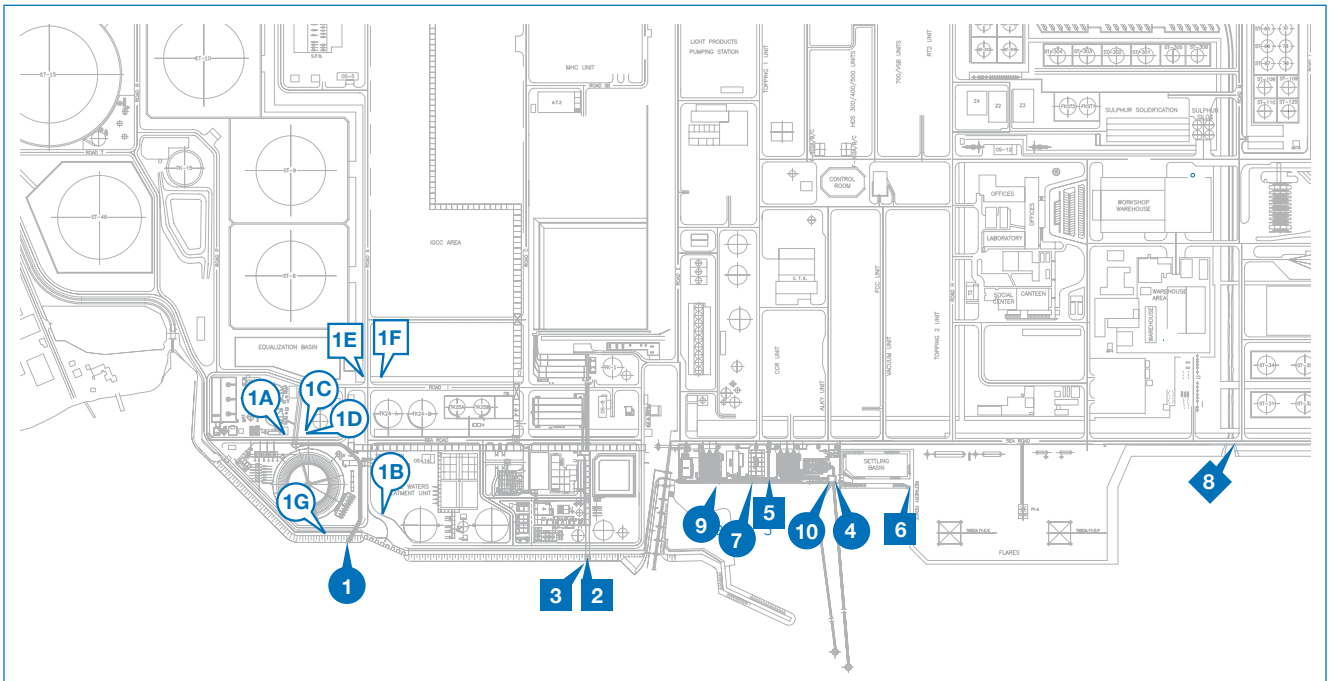


4.2.5 – Discharges into water

4.2.5.1 – General

[AIA permit DSA-DEC-2009-0000230]

Figure 16 shows the location of the points of discharge into water on the Saras site. In accordance with the AIA permit, each discharge point is identified by a specific code.



Discharge points in normal operating conditions

- 1 Principal discharge point.

into this flow the following:

- 1A Discharge from biological plant
- 1B Discharge from new biological plant
- 1C Discharge from BWT (treatment of ballast/bilge water)
- 1D Discharge from filtering reservoir
- 1G Discharge from IGCC cooling tower
- 4 Discharges from primary water treatment plant
- 7 Discharge from refinery desalinator
- 9 Discharge from IGCC South desalinator
- 10 Discharge from IGCC North desalinator

Discharge points in emergency operating conditions

- 2 Emergency process water floodway
- 3 Emergency meteoric water floodway
- 5 Plant emergency meteoric water floodway
- 6 Building Zone emergency meteoric water floodway
- 1E Southern Zone emergency meteoric water floodway
- 1F IGCC Zone emergency floodway

} these flow into the principal discharge (1)

Discharge of meteoric water

- 8 Rio Mascheroni channel

Figura 16 Map showing the locations of the site's discharge points

Discharge points in normal conditions

Water from the plants and units listed below is discharged into the sea via the main discharge point (1).

- treatment plant for the wastewater generated by the facility, which has two discharge points (1a and 1b); the plant carries out chemical, physical and biological treatment of waters from the oily water sewer network, to which wastewater and meteoric water from the plant areas and domestic water are ducted
- treatment plant for ballast water (slops and washing water) and bilge water (section 4.2.6) from tankers that dock at the marine terminal and from private ships, respectively; water pumped from the wells in the site's hydraulic barrier (section 4.2.7); and meteoric water, except for water collected from the plant area; the treatment plant has one discharge point (1c)
- filter tank, which collects water that has been purified in the wastewater treatment plant, equipped with an overflow discharge point (1d)
- discharge point from the IGCC cooling tower (1g)

The following plants also discharge water into the sea from discharge points 4, 7, 9 and 10:

- primary unit for treating water coming into the site, taken from the industrial water supply (4)
- desalinators of the refinery and the IGCC (7, 9, 10)

All the above-mentioned discharges occur under normal conditions and are continuous, with the exception of the discharges from the filter tank and the primary unit for treating incoming water.

Meteoric water principally coming from roads and large paved areas in the northern part of the refinery and from the basins around the LPG spheres, which does not come in contact with pollution sources, is ducted to the Rio Mascheroni and from there to the sea (discharge point 8).

Discharge points in emergency conditions

In emergency conditions caused by extraordinary events (e.g. torrential rain), meteoric water (including water from the roofs of the buildings in the IGCC and the terraces that lead from the IGCC to the sea) is ducted via emergency process water floodways and the plants' drainage systems (1e, 1f, 2, 3, 5, 6).

These discharge points are normally closed and sealed by the supervisory authorities. The integrity of the seal applied by the authorities is periodically checked and any tampering is reported. If it becomes necessary to open one or more of these discharge points, an internal emergency procedure is followed and the supervisory bodies are notified, within the deadline specified by the permit, of the reasons for the removal of the seals and the time taken to restore normal conditions, and a request is made for the insertion of a new seal.

Calculation of water discharge values

In line with the provisions of the AIA permit, monthly samples are taken from discharges into the sea and sent for analysis by an accredited external laboratory, while daily samples are analysed by the site's in-house laboratory. This data (for COD, nitrogen and suspended solids), together with information from continuous hydrocarbon analysis, forms the basis for calculating the annual figures, which are shown below.

CONTRIBUTION TO THE DISCHARGE FLOW (%) 2010

Main discharge point (excluding IGCC tower)	19.07
Discharge from desalinators	54.57
Discharge from IGCC tower	24.55
Discharge from treatment of incoming water	1.81

4.2.5.2 – Water discharge figures

Discharges from wastewater treatment units

The significant parameters regarding quantities of emissions in water ducted to the main discharge point (1) are as follows:

- flow rate of water discharged
- COD
- total hydrocarbons
- nitrogen in various forms (ammoniacal, nitrous or nitric)

The data on these parameters for the four discharge points (1a, 1b, 1c and 1d) ducted to the main discharge point are shown below.

[flow rate]

Table 45 and Charts T45a and T45b show the figures for the hourly average flow rate of the water discharged both in absolute terms and in specific terms as a proportion of raw materials processed. An analysis of the figures for the four years 2007–2010 shows that the trend has been broadly stable both in absolute and specific terms.

TABELLA 45 Discharges from wastewater treatment plants (discharge points 1a, 1b, 1c, 1d) – flow rate

Parameter	2007	2008	2009	2010
Total water discharged – annual average flow rate (m^3/hour)	750	703	729	796
Total water discharged/raw materials processed (m^3/kt raw materials)	450	398	480	486

CHART T45A (m^3/hour)

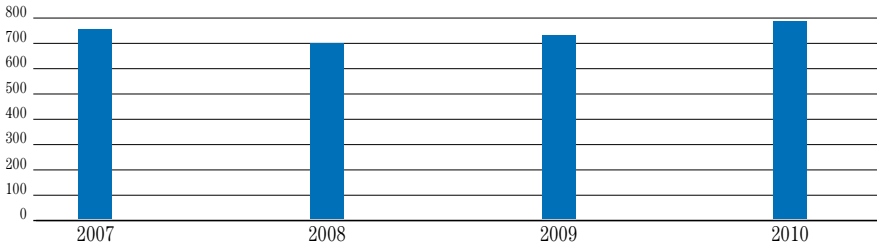
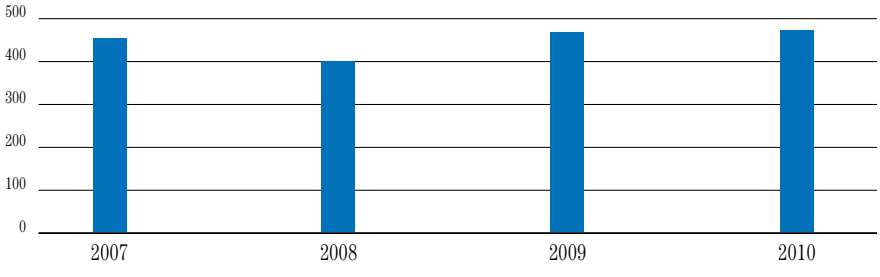


CHART T45B (m^3/kt raw materials)



[COD]

The data relating to the COD indicators, expressed as absolute and specific mass flow values and annual average concentration, are shown in Table 46. The concentration values of COD have fluctuated over the years but have always been well below the legal limit.

TABLE 46 Discharges from wastewater treatment plants (discharge points 1a, 1b, 1c, 1d) – COD

Parameter	2007	2008	2009	2010
Absolute values (t/year)	472	369	561	673
Specific values (t/millions of t raw materials)	32.3	23.8	42.2	46.9
Average concentration values (mg/l)*	66.8	59.7	87.9	96.5

* Compared with the limit of 160 mg/l, stipulated by Legislative Decree 152/06 Part III, Appendix 5

CHART T46A (t/millions of t raw materials)

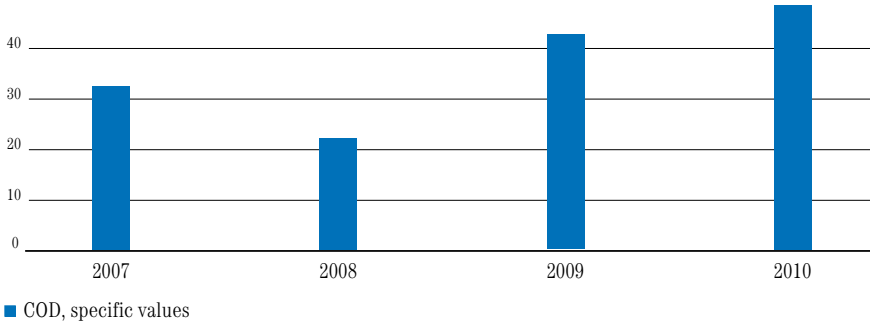
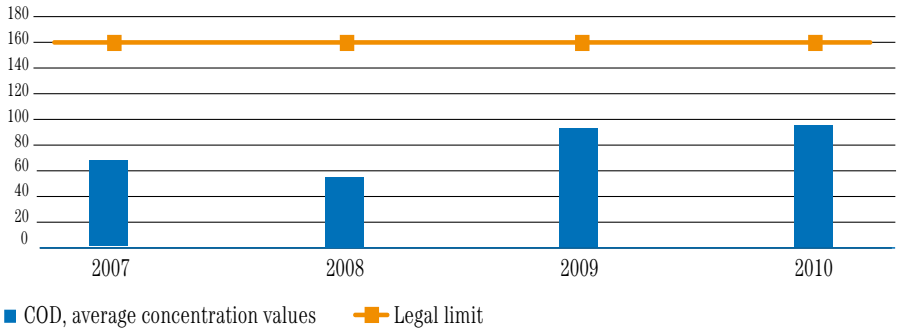


CHART T46B (mg/l)



[Idrocarburi totali]

Table 47 shows the data relating to the total hydrocarbon indicators, expressed as absolute and specific mass flow values and annual average concentration values.

TABLE 47 Discharges from wastewater treatment plants (discharge points 1a, 1b, 1c, 1d) – total hydrocarbons

Parameter	2007	2008	2009	2010
Absolute values (t/year)	14.3	10.4	12.2	13.8
Specific values (t/millions of t raw materials)	0.98	0.67	0.92	0.96
Average concentration values (mg/l)*	2.2	1.7	1.9	2.0

* Compared with the limit of 5 mg/l, stipulated by Legislative Decree 152/06 Part III, Appendix 5

CHART T47A (t/millions of t raw materials)

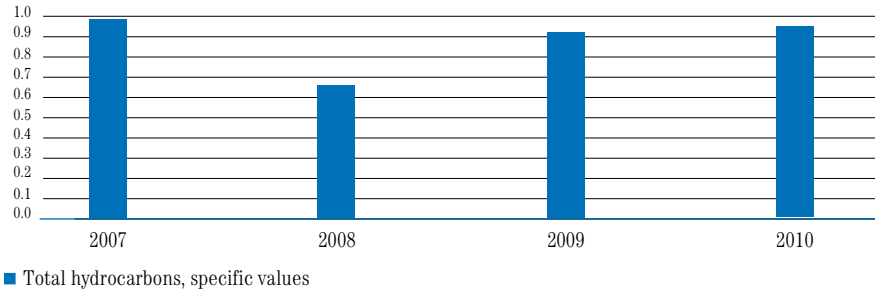
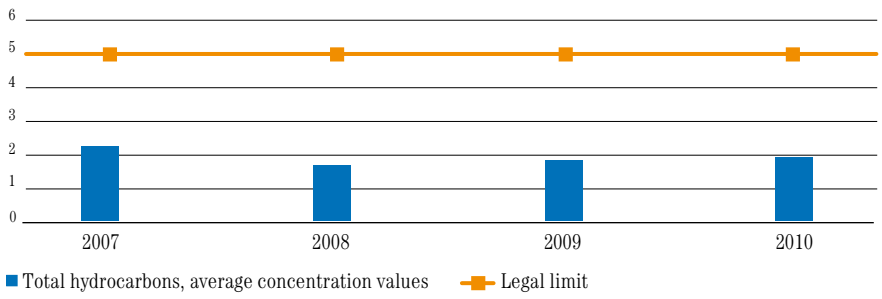


CHART T47B (mg/l)



The average concentration values of total hydrocarbons have always been well below the legal limit.
In the first half of 2007 the values for this parameter increased due to the malfunctioning of flotation units and a prolonged maintenance period.
The problem with the plant was resolved in the second half of 2007 and the values for the parameter in question returned to their previous levels.

[Azoto]

The data relating to nitrogen indicators, expressed as absolute values of total nitrogen mass flow and as annual average concentrations of nitrogen in its individual forms (ammoniacal, nitrous and nitric) are shown in Tables 48 and 49. The indicators remained broadly stable during the period (Table 48).

TABLE 48 Discharges from wastewater treatment plants (discharge points 1a, 1b, 1c, 1d) – total nitrogen (ammoniacal, nitrous and nitric): mass flow

Parameter	2007	2008	2009	2010
Absolute values (t/year)	31.6	19.0	23.2	38.0
Specific values (t/millions of t raw materials)	2.17	1.22	1.74	2.65

CHART T48A (t/year)

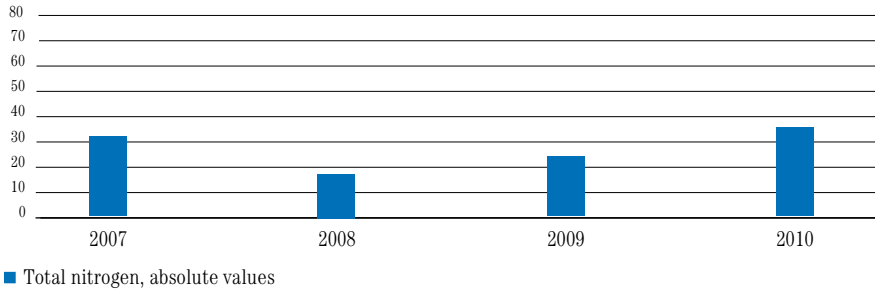
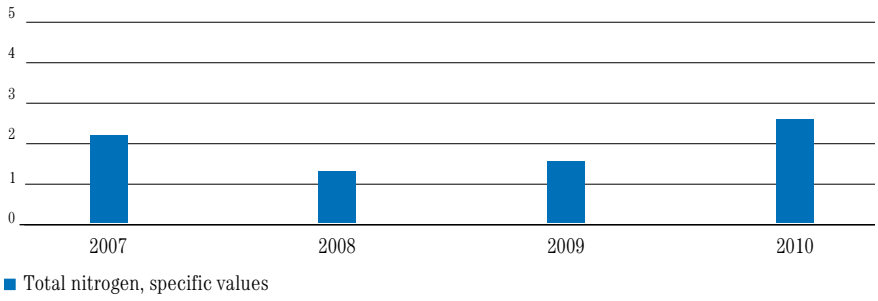


TABLE 49 Discharges from wastewater treatment plants (discharge points 1a, 1b, 1c, 1d) – ammoniacal, nitrous and nitric: average concentrations

Parameter	2007	2008	2009	2010	Valore limite*
Ammoniacal (mg/l)	2.09	2.09	1.82	2.47	15.00
Nitrous (mg/l)	0.04	0.06	0.04	0.06	0.60
Nitric (mg/l)	2.68	1.70	1.77	2.92	20

*Limit stipulated by Legislative Decree 152/06 Part III, Appendix 5

CHART T48B (t/millions of t raw materials)



In 2010, there were no significant variations from the trend over the previous three-year period for the parameter shown in Table 49.
The figures for the last four years are shown in the charts on the next page.

CHART T49A (mg/l)

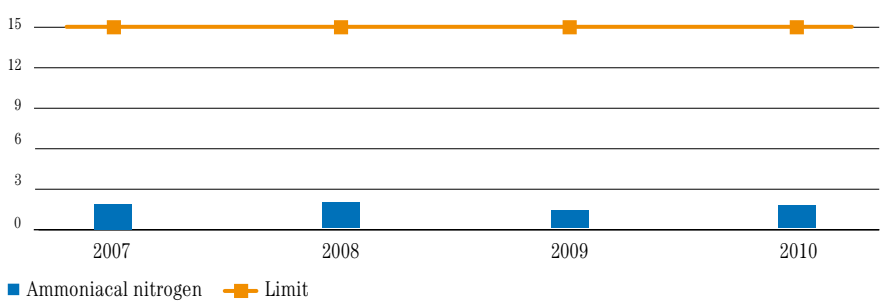


CHART T49B (mg/l)

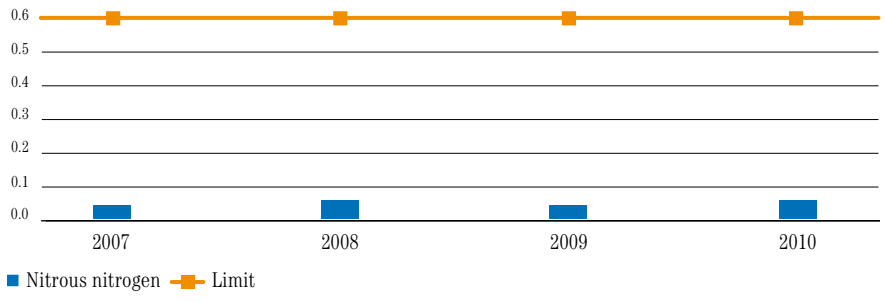
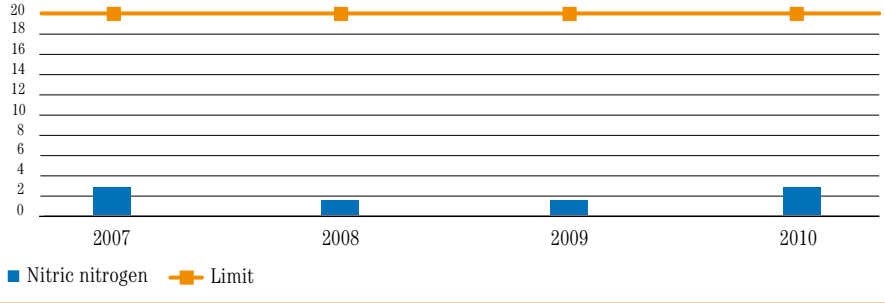


CHART T49C (mg/l)



Discharges from other units

The flow rate of discharged water and suspended solids are the two main parameters for the discharge points from the following units:

- primary treatment units for incoming water (discharge point 4)
- desalinators (discharge points 7, 9, 10)
- IGCC cooling tower (discharge point 1g)

[flow rate]

The figures relating to these parameters for the three types of discharges mentioned above are shown in the tables and charts below.
Table 50 shows the hourly average flow rate of discharged water as both absolute and specific values.
The significant contributions to the total flow rate made by the desalinators and the IGCC cooling tower can also be seen in the charts.

TABLE 50 Discharges from the primary treatment units for incoming water (point 4), desalinators (points 7, 9, 10), the IGCC cooling tower (point 1g) – flow rate

Parameter	2007	2008	2009	2010
Absolute values (m^3/hour)				
Treatment of incoming water	36.5	44.1	48.0	75.5
Desalinators	2,778	2,323	1,925	2,278
IGCC cooling tower	977	972	1,134	1,025
Specific values (m^3/kt raw materials)				
Treatment of incoming water	21.9	25,0	31.6	46.1
Desalinators	1,668	1.315	1,268	1,392
IGCC cooling tower	587	550	747	626

CHART T50A (m^3/hour)

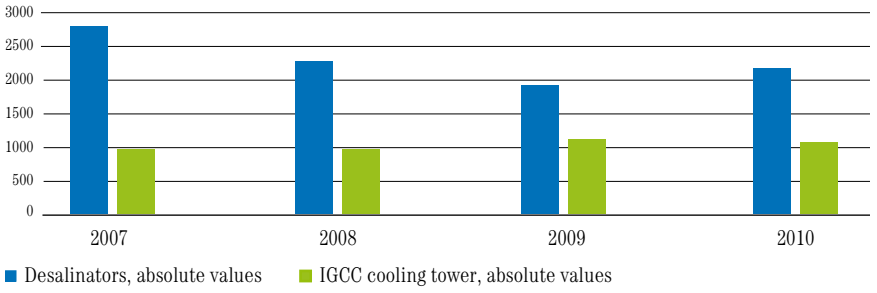
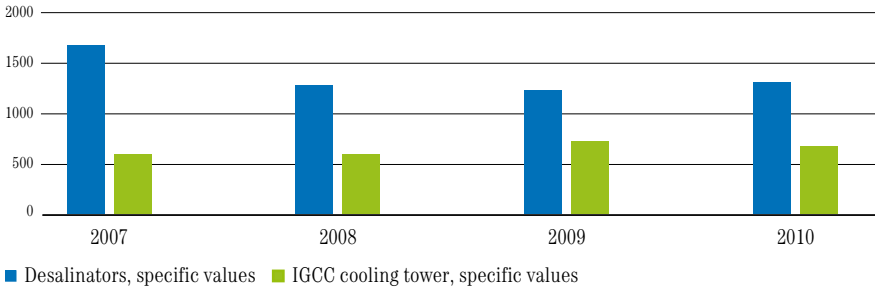


GRAFICO T50B (m^3/kt raw materials)



[suspended solids - mass flow]

Table 51 shows the figures relating to the suspended solids indicators, expressed as absolute and specific mass flow values. These charts also show the significant contributions made to the total flow rate by the desalinators and the IGCC cooling tower. The annual average concentrations are shown in Table 52 and related charts on the opposite page.
The data relating to mass flow and concentrations of suspended solids in discharges from the desalinators and the IGCC cooling tower show variations over the years. The variations in suspended solids are mainly due to the number of sea storms during the year.

TABLE 51 Discharges from the treatment units for incoming water (point 4), desalinators (points 7, 9, 10) and the IGCC cooling tower (point 1g) – suspended solids: mass flow

Parameter	2007	2008	2009	2010
Absolute values (t/year)				
Treatment of incoming water	7	10	6	5
Desalinators	536	507	414	590
IGCC cooling tower	287	289	327	315
Specific values (t/millions of t raw materials)				
Treatment of incoming water	0.5	0.6	0.4	0.3
Desalinators	36.7	32.7	31.1	41.2
	19.7	18.6	24.6	22.0

CHART T51A (t/year)

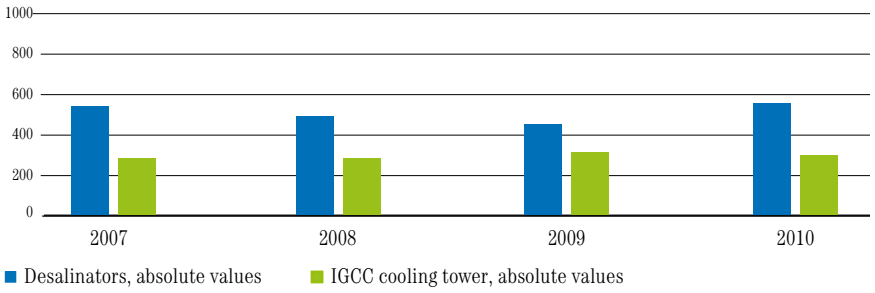
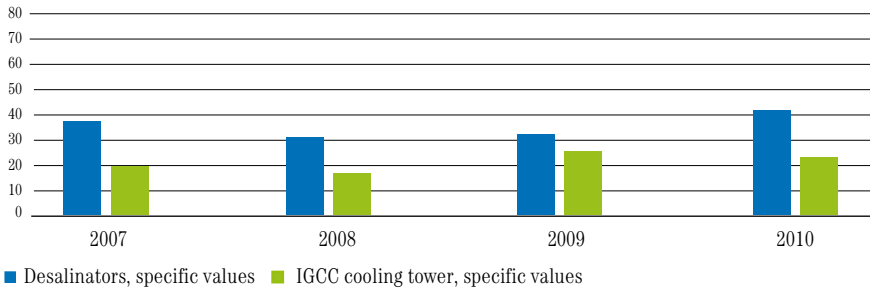


CHART T51B (t/millions of t raw materials)



[suspended solids – concentrations]

TABLE 52 Discharge from treatment units for incoming water (point 4), desalinators (points 7, 9, 10), IGCC cooling tower (point 1g) – suspended solids: average concentrations

Parameter	2007	2008	2009	2010	Limit*
Primary water treatment (mg/l)	21.2	25.1	14.2	6.8	80
Desalinators** (mg/l)	20.7 – 23.6	23.8 – 25.3	24.0-25.7	28.8-29.8	80
IGCC cooling tower (mg/l)	33.0	33.8	33.0	35.1	80

*Limit stipulated by Legislative Decree 152/06 Part III, Appendix 5
**The minimum and maximum values for the three desalinators are shown.

CHART T52A (mg/l)

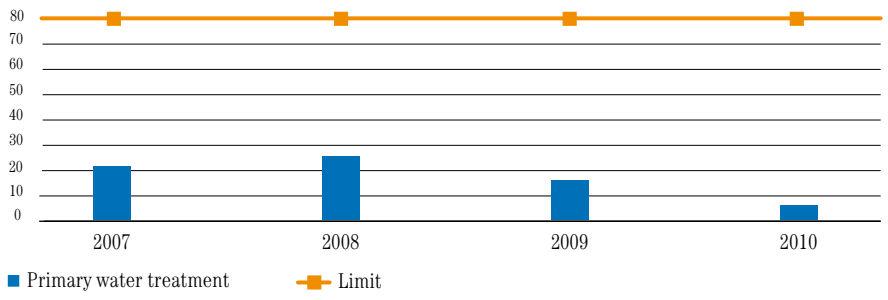


CHART T52B (mg/l)

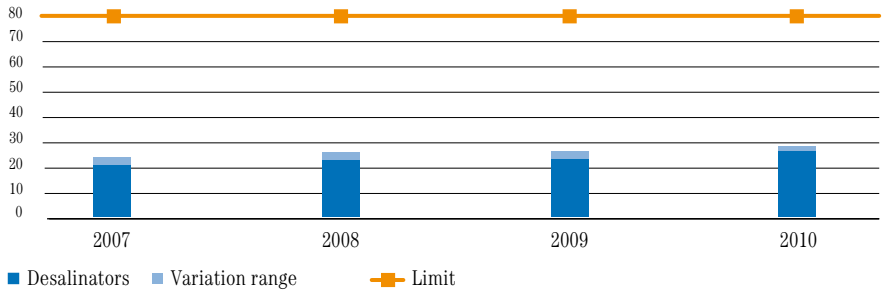
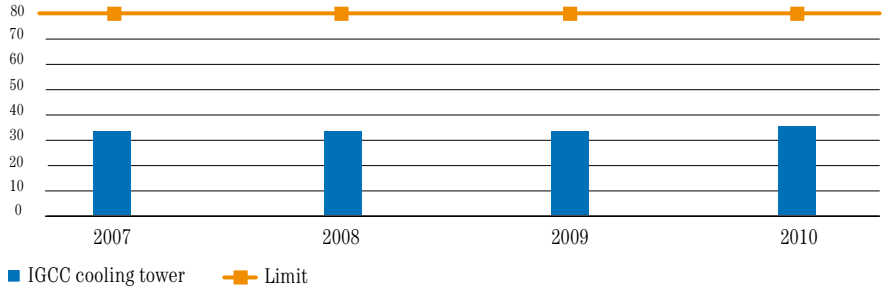


CHART T52C (mg/l)



Emergency situations following spills into the sea

Emergency situations that could affect seawater are caused by spills of hydrocarbons from the marine terminal. These situations are analysed and assessed in the Safety Report (section 3.3, page 38).

Measures to prevent spills into the sea include a programme of inspections carried out on board ships during the loading of products and unloading of raw materials. A high proportion of ships are checked (section 4.3.2, page 113).

A marine pollution prevention plan has been drawn up to deal with emergencies at sea. It describes the different procedures to be taken according to the type of spill.

There were no significant incidents during the period 2007-2010.

4.2.5.3 – Seawater quality

For several years, marine biologists have been carrying out periodic checks on the quality of the seawater in the stretch of sea in front of the area occupied by the Saras site.The surveys include detailed chemical and physical analysis of seawater samples taken at different depths at a series of points positioned along lines perpendicular to the coastline, as shown in figure 17.

Figure 17 Area covered by the seawater quality survey

[TRIX indicator of seawater quality]

The quality of seawater can be described in summary form using an indicator known as the Trophic Index (TRIX[1] for short). This indicator is calculated using a mathematical formula that takes into account chemical values (percentage of dissolved oxygen, concentrations of phosphorous and nitrogen) and biological values (chlorophyll "a") measured in the seawater.

Table 53 on the opposite page provides a key to interpreting the categories of seawater quality. The categories that include the indicator values measured at the points in the above-mentioned survey are also highlighted in the same table.

The results of the seawater surveys in 2007-2010 all fall into the top two bands of the classification (high/good).

[1] TRIX - used by Legislative Decree 152/99 to determine seawater quality - was not included in Legislative Decree 152/06, which replaced the previous Decree. However, until the European Water Framework Directive is fully implemented, this index continues to be used by the supervisory bodies (ARPA), including to enable comparisons with data collected in previous years.

TABLE 53 Trophic index (TRIX): seawater quality categories and results

Trophic index	Trophic state	Seawater quality
2 – 4	High	Good transparency of water; no abnormal water colouration; no undersaturation of dissolved oxygen in the benthic zone.
4 – 5	Good	Occasional turbidity of water; occasional water colouration, occasional hypoxia in the benthic zone.
5 – 6	Mediocre	Poor water transparency; abnormal water colouration, hypoxia and occasional anoxia of the benthic zone; benthic ecosystem under stress.
6 – 8	Poor	High degree of water turbidity; widespread and persistent abnormal water colouration; widespread and persistent hypoxia/anoxia in the benthic zone; kills of benthic organisms; alteration/simplification of benthic communities; economic damage to the tourism, fishing and aquaculture industries.

In recent years a new parameter, the CAM (classification of seawater) index[1], has been introduced to provide an assessment of the trophic state of water. This index is based on specific algorithms for the sea around Sardinia. Generally, 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 transport of sediment-forming nutrient substances (Table 53 bis). 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.

[new parameter: CAM index]

TABLE 53 BIS CAM index (specific to the sea around Sardinia)

		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

The stretch of sea covered by the analysis is also affected by thermal discharges, i.e. discharges of water at a higher temperature than the ambient water. Applicable legislation stipulates that the increase in the temperature of the receiving body should not exceed 3°C over 1000 metres away from the point of introduction. Every six months, in accordance with the IRSA method (Manuale dei metodi analitici per le acque, Quaderno Istituto Ricerca sulle Acque no. 100, 1995, Manual of water analysis methodology, Institute of Water Research Paper 100, 1995) provided for in Ministerial Decree of 16 April 1996, a check is made of temperature differences at 1,000 metres from the point of discharge from the IGCC's seawater cooling circuit along a semi-circular line centred on the discharge point. The results of checks carried out in 2010 show temperature differences of less than 1°C both in the winter and summer surveys, as can be seen in the figures shown in Table 54.

[Law 502 of 6 December 1993]

[1] CAM (classification of seawater) index: this index is used to monitor the coastal marine environment. The indicator converts the measurements into a summary rating of seawater quality.

TABLE 54 Measurements taken at a depth of 0.1 m along the semi-circular curve with a 1 km radius from the discharge point of the IGCC cooling tower (point 1g)

	January 2007	July 2007	January 2008	July 2008	January 2009	July 2009	January 2010	July 2010
Minimum T°C	14.7	24.1	13.1	24.8	12.3	25.6	12.1	26.2
Maximum T°C	15.1	25.2	14.1	26.1	12.5	26.8	12.5	27.1
Thermal increase °C	0.4	1.1	1.0	1.3	0.2	1.2	0.4	0.9

4.2.6 – Waste

4.2.6.1 – General

[SISTRI]

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

Saras registered with SISTRI in February 2010 and now uses the new IT system alongside the paper-based documentation still in use, as permitted by the regulations.

[waste management phases]

Waste management at the Saras site is geared towards the primary objectives of minimising the quantities of waste produced and progressively increasing the waste flows sent for recovery. With reference to the areas indicated in Figure 18, the main operational phases of waste management at the site before the waste is sent off-site for disposal or recovery are described below:

- waste generated, appropriately separated into individual categories, is generally sent to temporary storage areas (point 2, Figure 18)
- filter cake from the IGCC can be stored in the temporary storage area or in an area specifically authorised[1] for this purpose before it is despatched externally for the metals to be recovered (points 3 and 4)
- ferrous scrap metal is recovered in a specially designated area, managed by an authorised[2] external company, which subjects the scrap metal to a selection process and reduces its volumes without altering the type and mass (point 1)
- used oils are stored in designated containers (point 7)
- plastic, glass, aluminium and paper waste is collected separately and stored in a designated area (point 5)
- most of the waste generated, consisting mainly of waste contaminated by hydrocarbons, is sent to an internal plant, which separates it into its oily and aqueous phases and then subjects it to a process to convert it into chemically inert matter. These processes considerably reduce the mass of waste and, by mixing it with an inert matrix, change its type; the recovered oily phase is reused in the refining process and the aqueous phase is collected by the sewerage network and ducted from there to the treatment plant for wastewater generated by the facility. This plant is managed by an external company specifically authorised[3] for this purpose (point 6)

[1] Regional decision no. 739 of 1 June 2006
[2] Regional decision no. 163 of 23 June 2009
[3] AIA permit - decision by the province of Cagliari no. 86 of 21 April 2010

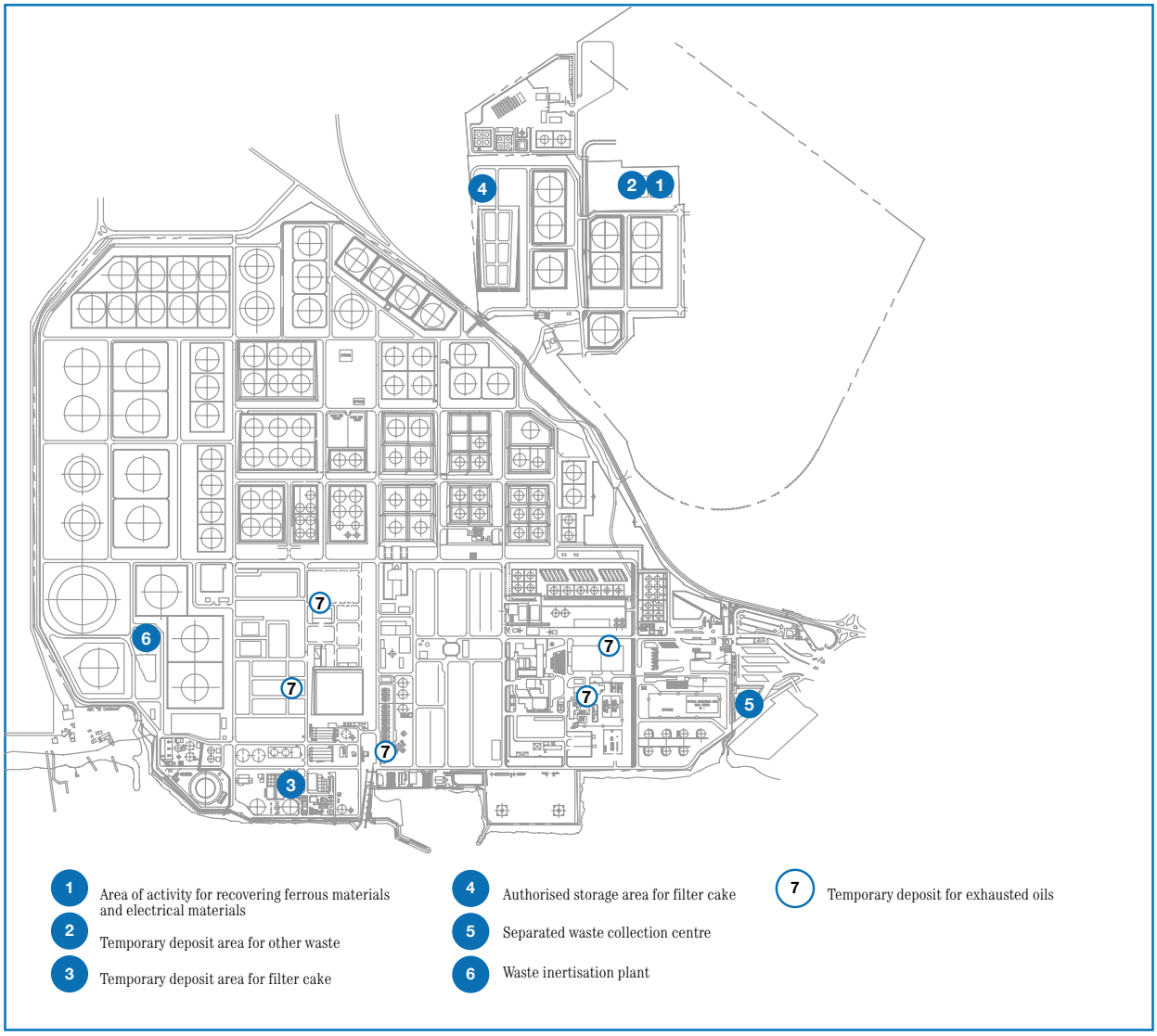


Figure 18 Areas dedicated to the main waste management activities on the site

The two companies are responsible for the waste they receive from Saras, and disclose the quantities of waste sent externally, after carrying out the necessary treatment processes, in their annual declaration. These companies were carefully selected and are checked regularly, including by means of specific audits (section 4.3.3).
Authorisation for the cross-border transport of waste[1] is requested annually pursuant to Regulation EC/1013/2006 for the filter cake from the IGCC, which is sent for recovery to plants located in Germany. Lastly, Saras is authorised[2] to receive and treat waste made up of bilge water, slops and ballast water from ships. This activity is carried out completely free of charge for the ships that dock in the marine terminal and for the ships that send these types of waste to Saras from regional ports in tanker trucks. These types of waste water are treated in the ballast water treatment unit, as mentioned in paragraph 4.2.5. Groundwater pumped from the wells of the hydraulic barrier (paragraph 4.2.7) is also treated in the same unit, and is classified and accounted for as part of the waste generated by activities on the Saras site.

[treatment of bilge water]

[1] Provincial decision no. 148 of 23 June 2009
[2] Regional decision no. 2520/IV of 4 November 2004, supplemented by Decision no. 964/IV of 31 May 2005, replaced by AIA permit DSA-DEC-2009-230 of 24 March 2009

4.2.6.2 – Waste data

Based on the waste management processes described, the figures and assessments relating to waste take into account both the waste generated by Saras' activities (figures disclosed in the MUD) and the waste leaving the site after treatment to convert it into inert matter. In 2010, total waste production fell as an absolute value compared with 2009. This result is even more impressive as it was achieved despite a significant increase in the quantity of groundwater from the hydraulic barrier generated from site remediation work and sent for treatment in the group's ballast water treatment (BWT) plant. On the other hand, there has been a considerable reduction in the volume of solid waste generated from remediation work, all of which was sent for recovery. Table 55 shows the data on total waste generated by Saras' activities, broken down into hazardous and non-hazardous waste.

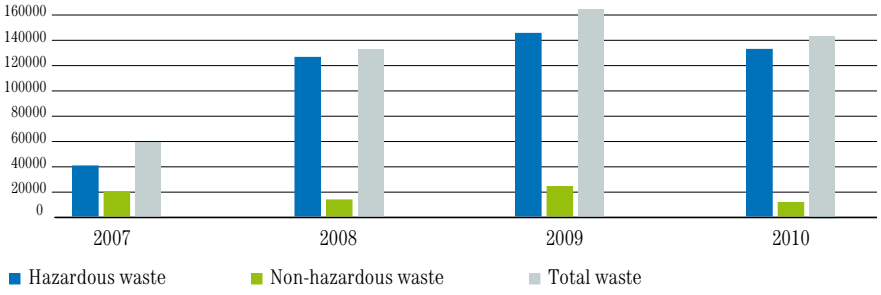
WASTE GENERATED ON SITE	(%) 2010
Waste sent to the internal inertisation plant	19.1
Water from the wells in the hydraulic barrier sent to the wastewater treatment plsnt	74.1
Filter cake sent for external recovery	0.7
Other types of waste	6.1

TABLE 55 Waste generated on site by Saras (refinery and IGCC)*

parameter	2007	2008	2009	2010
Hazardous waste (t/year)	40,735	126,671	141,948	134,540
Non-hazardous waste (t/year)	19,806	10,152	22,035	7,122
Total waste (t/year)	60,541	136,823	163,984	141,662

*Includes all types of waste generated by the refinery and the IGCC disclosed in the Unified Environmental Declaration (MUD).

CHART T55 (t/year)



The large quantity of hazardous waste in the period 2008-2010 is mainly due to site remediation work, as can be seen from the table below. However, the table also shows that the quantity of hazardous waste generated from ordinary operations and site remediation work fell compared with previous years (see Table 55 bis "Hazardous waste (t/year)").

TABLE 55 BIS Hazardous waste (t/year)

Parameter	2009	2010
Water from site remediation (t/year)	91,661	105,027
Soil from site remediation (t/year)	19,497	2,849
Hazardous waste from ordinary operations (t/year)	30,791	26,664
Total (t/year)	141,948	134,540

Table 56 shows the figures relating to outgoing waste from the Saras site: this has also decreased compared with previous years due to site remediation work, which was reduced considerably in 2010.

TABLE 56 Outgoing waste from the Saras site*

Parameter	2007	2008**	2009**	2010
Hazardous waste (t/year)	9,365	38,498	39,644	18,659
Non-hazardous waste (t/year)	22,862	7,917	20,350	3,881
Total waste (t/year)	32,227	46,415	59,993	22,540

* Includes all types of waste generated by the refinery and the IGCC, with the exception of waste sent to the on-site plant to be converted into inert matter and water pumped from the wells in the site's hydraulic barrier. Waste that has been converted into inert matter by the on-site plant is included.
** The increase in the quantity of hazardous waste generated in 2008 and 2009 is mainly due to site remediation work.

CHART T56 (t/year)

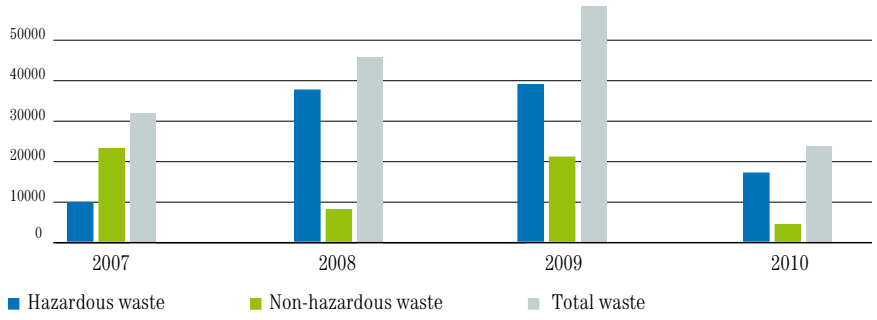


Table 56 bis shows the figures relating to vanadium concentrate (filter cake) leaving the Saras site. This is the solid formed from the gasification of heavy refinery products, which contains high percentages of metals, especially vanadium.

TABLE 56 BIS Outgoing waste from the Saras site - filter cake

Parameter	2007	2008	2009	2010
Filter cake - quantity leaving the site (t/year)	1,585	1,369	1,657	969

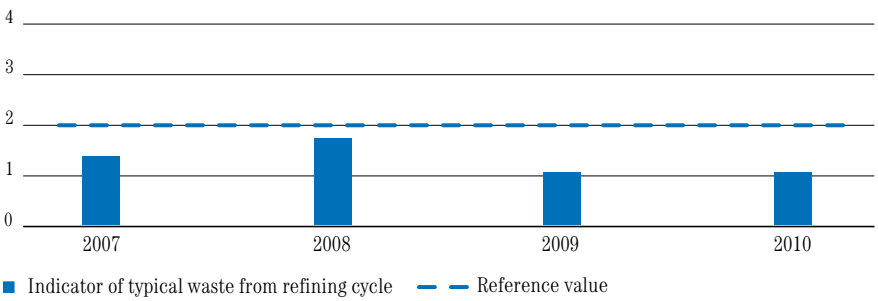
The indicator shown in Table 57 is calculated taking into account the various types of waste from the refining process, as a proportion of the quantity of raw materials processed. The indicator values are compared with the reference values (less than 2 kg of waste per ton of crude processed) contained in the Italian guidelines on best practices in the refining sector.

TABLE 57 Waste generated by Saras' activities

Parameter	2007	2008*	2009	2010	Reference value**
Indicator of typical waste generated from the refining process * (kg/t raw materials)	1.37	1.37	1.07	1.07	≤2

* Indicator calculated by subtracting waste from extraordinary activities and/or waste that does not pertain to the refining process (e.g. excavated soil and rocks, material resulting from the cleaning of the sea floor of the small harbour, vanadium concentrate from the IGCC plant, etc.) from total outgoing waste.
** Value indicated by the Italian guidelines on best practice (Decree issued by the Italian Ministry for the Environment on 29 January 2007)

CHART T57 (kg/t raw materials)



In addition to industrial waste, the site also generates urban solid waste, mainly from its office and catering activities. The separated waste collection of plastic, glass and paper, which started in 2006 with a total amount of 50 tons collected, doubled in 2007 and reached around 117 tons in 2010. This increase was obtained thanks to an in-house campaign to raise awareness and, most importantly, to the contribution of all staff.

[table of objectives and measures: objective 11, page 127]

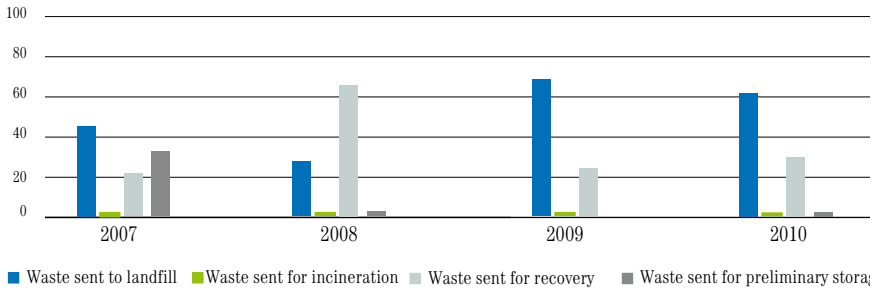
Since 2008, the company has also collected organic waste from the company canteen. The company has a specific objective to improve the collection of separated waste.
Table 58 shows the final destinations of waste and the percentages of waste from the site sent to each of them.

TABLE 58 Destination of outgoing waste from the Saras site

Destination of waste	2007	2008	2009	2010
Waste sent to landfill (% of total waste)	44.7	30.4	73.0	62.9
Waste sent for incineration (% of total waste)	1.31	0.97	0.83	1.73
Waste sent for recovery (% of total waste)	21.2	66.8	26.1	34
Waste sent for preliminary storage (% of total waste)	32.8*	1.85	0.02	1.37

* In 2007, this item included waste consisting of excavated soil to be sent for subsequent recovery. In 2008, this type of waste was correctly included in the item "Waste sent for recovery"

CHART T58 (%)



[table of objectives and measures: objective 12, page 127]

Table 58 shows that waste sent for recovery increased as a percentage of total outgoing waste from the site in tandem with a reduction in the percentage of waste sent to landfill (from 73% in 2009 to 62.9% in 2010). It can be seen that the quantity of outgoing waste from the site sent for recovery increased over time until 2008, from around 12% per year in 2005 to 67%, with a resulting significant reduction in the quantity of waste sent to landfill. The 2009 figure that bucks this trend was due to the smaller recoverable percentage of total excavated soil from site remediation and the waterproofing of tank containment basins. Recovery of the soil is undertaken at an external site located in the industrial area of Macchiareddu.
The breakdown of hazardous and non-hazardous waste sent from the site for recovery is shown in Table 59. It can be seen that more non-hazardous waste than hazardous waste was sent for recovery until 2007. The trend then reversed in 2008 and continued until, in 2010, the percentage of hazardous waste recovered reached 59.1%. 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).

TABLE 59 Outgoing waste from the Saras site sent for recovery: hazardous and non-hazardous

Parameter	2007	2008	2009	2010
Hazardous waste sent for recovery (% of total waste sent for recovery)	38.0	79.7*	81.3*	59.1
Non-hazardous waste sent for recovery (% of total waste sent for recovery)	62.0	20.3*	18.7*	40.9

* The increase is mainly due to site remediation work

4.2.7 – Accidental spills into the soil and subsoil

Previous activities

In accordance with the provisions of Ministerial Decree 471 of 25 October 1999 (regulations containing criteria, procedures and methods for the safety, reclamation and environmental restoration of polluted sites), and having identified a problem of contamination of the soil, subsoil and underground water on its production site, Saras submitted its Site Characterisation Plan on the condition of the terrain and the layers of water beneath the refinery to the competent authorities, pursuant to Art. 9 of the above Decree. The contamination mainly stems from the presence, in concentrations above the limits stipulated for underground waters, of the following substances or categories of substances: total hydrocarbons, benzene, lead, methyl tert-butyl ether (MTBE), p-Xylene and toluene. There have been few instances where the limits for heavy hydrocarbons (C>12) in the soil and subsoil have been exceeded. Subsequently, based on Ministerial Decree 468 of 18 September 2001 and the Ministerial Decree of 12 March 2003, the Sarroch municipal area and 33 other municipalities were included in an area called "Sulcis Iglesiente Guspinese", identified as a site of national interest for remediation. 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, Saras 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, work to assess the site was initiated using the following techniques:

[Ministerial Decree 471/99, replaced by Legislative Decree 152/06, Part IV, Section Five]

- environmental surveys using continuous core drilling at depths of between 5m and 10m, to establish the stratigraphy of the subsoil and extract samples to ascertain whether any contaminants are present and measure their concentrations
- piezometric surveys at depths of between 10m and 20m, which monitor the water table and ascertain the environmental condition of the underground water. Piezometric surveys are conducted by inserting windowed PVC tubes into the aquifer, separated from the surrounding terrain by drainage gravel, in order to periodically take samples of water to check its quality
- gas surveys, to check for the presence of hydrocarbon gas in the soil interstices

[site characterisation work]

The Site Characterisation Plan is currently nearing completion. By December 2010, 879 surveys, 144 piezometric readings and 539 gas survey control points had been completed.

In 2010, sampling and analysis of groundwater was carried out jointly with ARPAS to verify the results of the analysis. 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 first phase of characterisation, 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 the supernatant, while 13 are being used for groundwater replenishment on the sea side, including one outside the plant to the south, to prevent salt inflows. The remaining seven are hydrogeologically upstream, controlling groundwater levels. The upstream and replenishment wells are currently being

[the Intervention Plan]

brought into service. The physical barrier will extend over 2,860 m^2 and will be constructed using jet grouting, waterproofing injections and soil consolidation. The executive project for the physical barrier implemented in November 2009 was consigned to the Ministry for the Environment on 17 May 2010. In March 2009, the construction of jet grouting test fields was completed. The reduction from 3,300 m^2 (as stated in the 2009 Environmental Declaration) to 2,860 m^2 is due to the recalibration of the groundwater directions, which allows the hydrogeologically upstream side of the barrier to be shortened. Saras has advised the Ministry for the Environment of this change. When the wells became operational, a system was also put in place to monitor the effect that the system of extraction wells would have on both the groundwater and the NAPL. The results obtained in 2010 show that the measure has been effective in making the area safe, by fully containing the NAPL emissions and preventing their spread towards the sea and thus enabling these to be completely recovered. During 2010, a significant increase in water drained from wells compared with 2009 was recorded, along with a considerable rise in supernatant recovered (see Table 60). Preliminary surveys were also 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

Figure 19 Location of the wells comprising the dynamic barrier, and planned location of the physical barrier

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.

TABLE 60 Previous activities

Parameter	2007	2008	2009	2010
Ratio of quantity of product recovered to water drained* (%)	0.49	1.05	0.70	1.39

* Activities relating to the hydraulic barrier and product recovery started in 2007

Prevention of soil and subsoil contamination

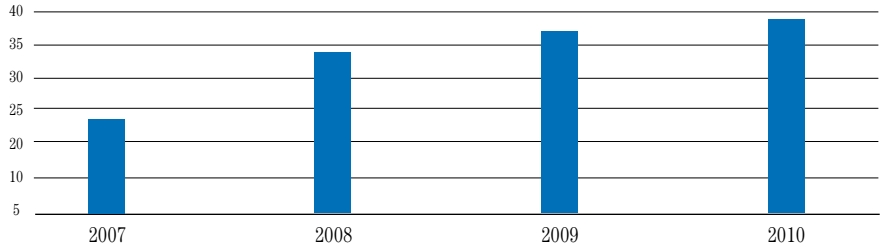
It is not possible for the soil and subsoil to become contaminated under normal conditions. Contamination is only likely to occur after an accidental spill of liquid hydrocarbons (raw materials, semi-processed products or finished products). This type of event may particularly affect storage areas and the stretches of land underneath the pipes that connect the plants, tanks and wharf. Assessments of abnormal and emergency situations associated with the internal movement and storage of hazardous substances are examined and documented in the Safety Report (section 3.3, page 38). The indicators given in Table 61 show how the company is continually implementing additional measures to prevent contamination of the soil and subsoil.
In 2010, the costs of non-destructive controls were lower than in previous years. This is due to the fact that, in accordance with the multi-year plan, fewer audits were required in the period under review. Audit activities are planned and fine-tuned, in broad terms, with reference to risk evaluation. In addition to the initiatives already undertaken, further progress is currently being made in implementing improvement measures to prevent soil and subsoil contamination.

[table of objectives and measures: objective 9, page 126]

TABLE 61 Activities to prevent contamination

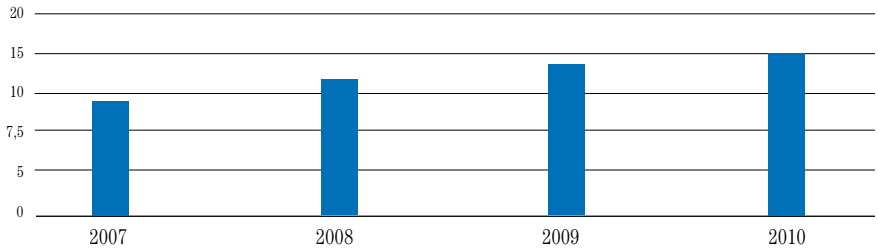
Parameter	2007	2008	2009	2010
Paving of containment basins for crude oil and product tanks: paved surface/total surface (cumulative figure) (%)	24.4	34.5	36.5	39.2
Protection of soil in storage areas: no. of double-bottomed tanks (cumulative figure)	9	12	14	15
Protection of the soil along pipeways: paved surface (cumulative figure) (m^2)	18,207	22,719	33,092	45,285
Inspection and maintenance: non-destructive testing expenses (Euro thousand/year)	2,933	1,640	1,474	870

CHART T61A



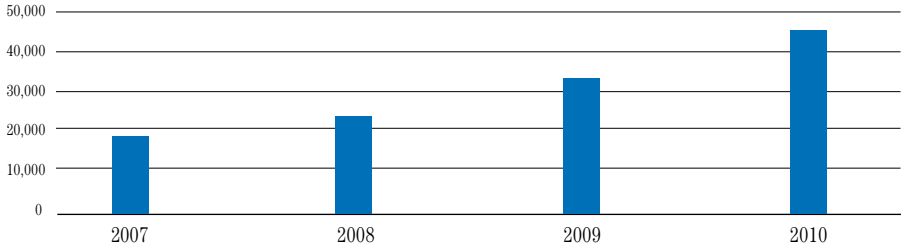
■ Paving of containment basins for crude oil and product tanks

CHART T61B



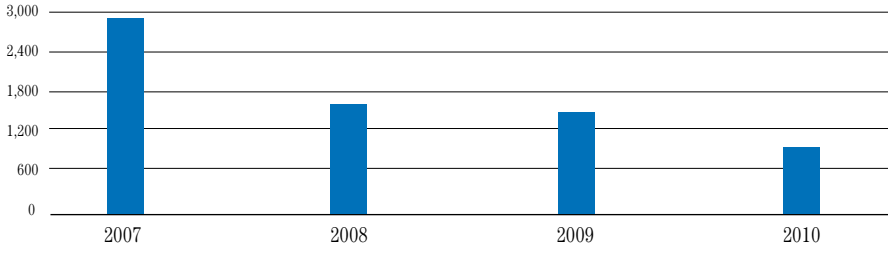
■ Number of double-bottomed tanks

CHART T61C



■ Paving along pipeways

CHART T61D (EUR thousand)



■ Inspection and maintenance costs

4.2.8 – Noise

To monitor noise pollution, in 1999 Saras planned and implemented annual, systematic controls of sound levels in the local area, by means of phonometric surveys to establish the acoustic characteristics of the surrounding environment. The surveys have been repeated over the years at the same measurement points, some of which are located in the Saras plant and in the streets adjacent to its boundaries, while others are in access roads and in Sarroch city centre. The location of the measurement points is shown on the map at Figure 20, which is based on the Municipal Town Plan.

In the absence of an acoustic classification for the municipal area, the thresholds for external ambient noise stipulated by the Prime Ministerial Decree of 1 March 1991 are used. These are shown in the table below.

[D.P.C.M. 1/03/1991]

Figure 20 Location of noise measurement stations

table 62 Thresholds for external ambient noise – Prime Ministerial Decree of 1 March 1991

Categories of the area's intended use	Corresponding areas in the area of interest	Daytime limits*** LAeq [dB(A)]	Night-time limits*** LAeq [dB(A)]
The entire national territory	External areas bordering on the Saras production site	70	60
Zone A*	---	65	55
Zone B**	Sarroch city centre	60	50
Industrial zone only	Saras production site	70	70

*Areas of historic or artistic interest or of particular environmental merit in the region under consideration
**Completely or partially built-up areas other than those in zone A
***The daytime period runs from 6 a.m. to 10 p.m.; the night-time period runs from 10 p.m. to 6 a.m.

Tables 63A and 63B show the noise levels recorded at some of the measurement points for the last three years. The surveys have been repeated over the years at the same measurement points, some of which are located in the Saras plant and in the streets adjacent to its boundaries, while others are in access roads and in Sarroch city centre. The surveys carried out in 2010 did not reveal any significant changes from previous years. Specifically, Table 63A shows the emission values recorded at some of the stations located at the boundaries of the site, i.e. nos. 3 and 6. The applicable limits are those stipulated by the Prime Ministerial Decree of 1 March 1991 (and shown in Table 62), but the limits for Category V, which could reasonably be applied to the areas of the municipality where the measurements in question were recorded, are also shown (these are 5 dB lower and therefore extremely conservative).

TABLE 63A Noise (emission) levels at representative points near the boundary of the Saras site

Acoustic classification Prime Ministerial Decree of 1 March 1991	Measurement point	Values measured [dB(A)] (L90 values)			Emission limit (applicable near emission sources)	
		Year	Day-time period	Night-time period	Day-time period	Night-time period
Predominantly industrial area (**) External areas bordering the Saras production site	3	2010	50.5	53.5	65	55
		2009	48.5	48.5		
		2008	45.2	46.6		
		2007	44.5	51.5		
	6	2010	43.0	41.5		
		2009	38.5	41.0		
		2008	38.7	51.9*		
		2007	37.2	47.0		

* From values obtained from annual monitoring with reference to important indicators used for ascertaining emission limits.
** Values typical of Category V (predominantly industrial areas), which are 5 dB lower and therefore stricter than the limits in force, stipulated by Prime Ministerial Decree of 1 March 1991.

Table 63B shows the noise immission values in the external environment recorded at two stations located in Sarroch city centre, near the boundaries of the industrial site (nos. 14 and 15). These values relate to the statistical parameter L90, i.e. the noise is above this level for 90% of the time. This parameter can be considered to include industrial noise, which is continuous and largely sustained over time, in the sense that the value recorded excludes one-off acoustic events and includes the noise generated by the Saras site, other sites and acoustic events of a significant duration not caused by Saras (e.g. vehicle traffic noise). The applicable limits stipulated by the Prime Ministerial Decree of 1 March 1991 are shown. These limits are the same as the ones for Category III of the municipal area, to which the areas in which these points are located might reasonably be assigned.

TABLE 63B Noise (immission) levels at representative points in the centre of Sarroch

Acoustic classification Prime Ministerial Decree of 1 March 1991	Measurement point	Values measured [dB(A)] (L90 values)			Emission limit (applicable near emission sources)	
		Year	Day-time period	Night-time period	Day-time period	Night-time period
Zone B (Sarroch city centre)	14	2010	45.0	45.5	60*	50*
		2009	45.5	43.0		
		2008	40.5	44.5		
		2007	39.6	43.0		
	15	2010	43.5	43.0		
		2009	47.5	45.5		
		2008	37.5	43.5		
		2007	45.0	43.0		

* Values typical of Category III (mixed areas), which are the same as the limits in force, stipulated by the Prime Ministerial Decree of 1 March 1991.

CHART **T63B** Noise levels at representative points in the centre of Sarroch

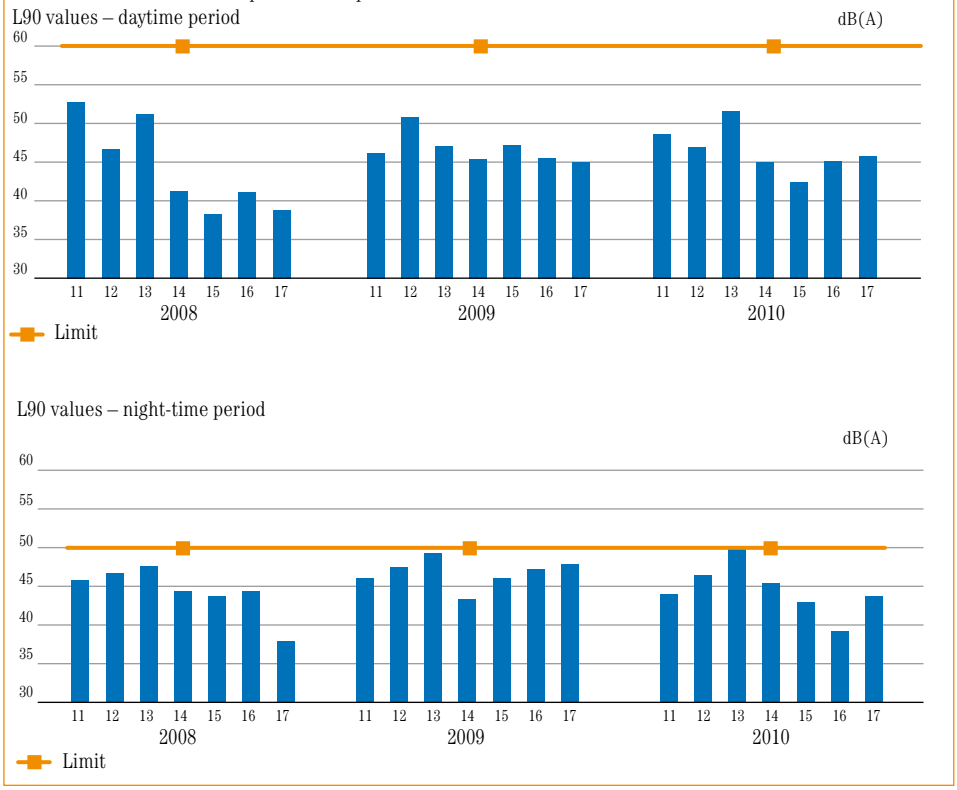


Chart T63B shows the complete series of data recorded at all the measurement points located in Sarroch city centre, compared with the applicable legal limits. Each bar of the histogram is labelled with a number identifying the corresponding noise measurement station shown in Figure 20 on page 103. The differential criterion is not applicable to the existing continuous production cycle plants or plants that already held permits at the time the decree came into force, as in the case of the refinery and the IGCC at the Sarroch site, pursuant to Art. 31 of the Ministerial Decree of 11 December 1996. Following a specific request from the assessment committee for AIA permits, Saras submitted, as a provisional measure prior to the completion of the municipal acoustic classification, an acoustic classification relating to the measurement points being surveyed in April 2008. The provisional classification, which was determined by an acoustics engineer, was based on the zones contained in the Municipal Town Plan, applying the criteria for defining acoustic categories set out in the Ministerial Decree of 14 November 1997. Specifically:

- stations located at the boundaries of the plant (stations 1 to 10) were deemed to fall into Category V: "predominantly industrial area", with limits of 65 dB(A) during the day and 55 dB(A) at night, except for stations 9 and 10, which, given that they fall within the boundaries of the plant, are to be considered, to all extents and purposes, to belong to Category VI with a limit of 65 dB(A) for both daytime and night-time periods
- most of the stations located in Sarroch City Centre (points 11 to 17) were deemed to belong to Category II: "predominantly residential areas" with limits of 55 dB(A) during the day and 45 dB(A) at night; or category III "mixed areas" with limits of 60 dB(A) during the day and 50 dB(A) at night (see stations 14 and 15).

4.2.9 – Visual impact

The company has also made a commitment to improving the plant's visual impact, which has been stepped up since 2000. Improvements were made to structures and spaces that are in direct contact with the outside, 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.

In 2010, a programme was launched to cut down the volume of hydrocarbons being sent to the flare system. The results were extremely successful and also reduced the visual impact of the flame produced by the flare system.

[table of objectives and measures: objective 8, page 126]

4.2.10 – Odours

In the past, the company received a number of reports on the presence of unpleasant odours outside the site. As a result, in 2004, it conducted an initial investigation to identify the sources of the odours reported in the surrounding area. In the following years, the company undertook more in-depth investigations and analysis, which led in 2008, after a phase of experimentation, to the development of a monitoring methodology using a combination of analytical techniques, modelling and olfactometric assessments. The ultimate objective of the work is to arrive at an assessment of the main odour-emitting sources and the possible events that could generate an olfactory impact on the surrounding area.

In 2009, a number of different sampling and analysis activities were performed within the refinery (sources) and in the parts of Sarroch most at risk (receivers). These activities were necessary to validate the methodology and prepare the Monitoring and Control Plan for odour emissions. In accordance with the regulations in the AIA permit (preliminary assessment of 12 January 2009), the Monitoring and Control Plan was submitted to the Ministry for the Environment in October 2009. This document describes the methodology, timeframe and methods of communicating the results obtained.

The methodology is based on an integrated approach that uses instrumentation and sensory techniques to examine the odour-emitting sources and identify the compounds responsible for the odour (tracers), in conjunction with modelling to study the dispersion of odour-emitting compounds into the atmosphere. This approach provides an accurate assessment of the olfactory impact produced by the emitting source on the receivers at risk.

[table of objectives and measures: objective 14, page 127]

The Plan includes two six-monthly monitoring campaigns: a "summer" one in the spring/summer (June-July) and a "winter" one in the autumn/winter period (November-December). In every campaign, an assessment will be carried out at both the refinery and the points at risk in Sarroch.

The first monitoring campaign was carried out in June 2010, while the second was completed in March 2011.

[1] United States Environmental Protection Agency

4.2.11 – Less significant environmental aspects

PCBs

Polychlorinated byphenals (PCBs) are chlorinated organic compounds that are chemically and thermally extremely stable. For this reason, they were widely used in the past as dielectric fluids in electrical equipment (e.g. industrial transformers) before the dangers were recognised and their use banned.

Today, the sale and use of PCBs in new applications is prohibited but, given the recognised difficulties in disposing of such substances, there are various legal provisions that apply to existing equipment, according to the quantities and concentrations of PCBs present.

Following an inventory and periodic analytical checks, the 130 oil-insulated transformers were decontaminated by removing the PCBs. Periodic checks are undertaken to ascertain the condition of the transformers and to ensure that the PCB content is kept below the minimum threshold required by law to consider an item of equipment decontaminated.

[Ministerial Decree of 11 October 2001]

Asbestos

Asbestos was used for a long time in a variety of industrial and domestic applications until the dangers of this material were discovered and its use banned.

Over the years, Saras has implemented the requirements of sector legislation. It has compiled an inventory of materials containing asbestos, notified all the supervisory authorities and decontaminated plant and equipment when any maintenance was carried out. Cement asbestos roofs have gradually been eliminated over the years, from a surface area of 10,800 m^2 in 2004 to the complete absence of such roofs on the site today.

[Law 257/1992, as subsequently amended]

Any asbestos still present (as an insulator used in the layers of insulation on pipes) is protected from the effects of atmospheric agents that could alter its integrity, and is removed when maintenance work is carried out. Specialist firms are used when asbestos is discovered.

Ozone-depleting substances

Legislation stipulates specific management procedures to prevent the dispersal of these substances into the atmosphere and to ensure their progressive elimination from the production process.

All the equipment in the facility is checked via periodic maintenance operations by specialist personnel.

[Regulation EC/2037/00 and Presidential Decree 147/2006]

In recent years, the company has gradually been replacing ozone-depleting substances with others that do not have this effect. Currently, the only substance of this type is Freon R22, which is present in a total quantity of 905 kg. The use of this type of substance as virgin gas in existing air conditioning plants is permitted until 31 December 2009. As recycled or reclaimed gas, it will be permitted until 31 December 2014. From 1 May 2015 its use as recycled or reclaimed gas will also be banned.

Non-ionising radiation (electromagnetic fields)

The main sources of electromagnetic fields in the facility can be broken down into two broad categories:

- point sources such as pumps, electrical switchboards, motors
- linear sources, i.e. conductor cables for transmitting electricity, such as the

buried cable operating at 380 kV that transmits electricity from the IGCC to the ENEL electrical substation situated on the western boundary of the site

A study on the presence of electromagnetic fields was carried out across the whole site and at external measurement points near the boundary in 2004. It was repeated in 2007 using the same methodology but with an increased number of measurement points.

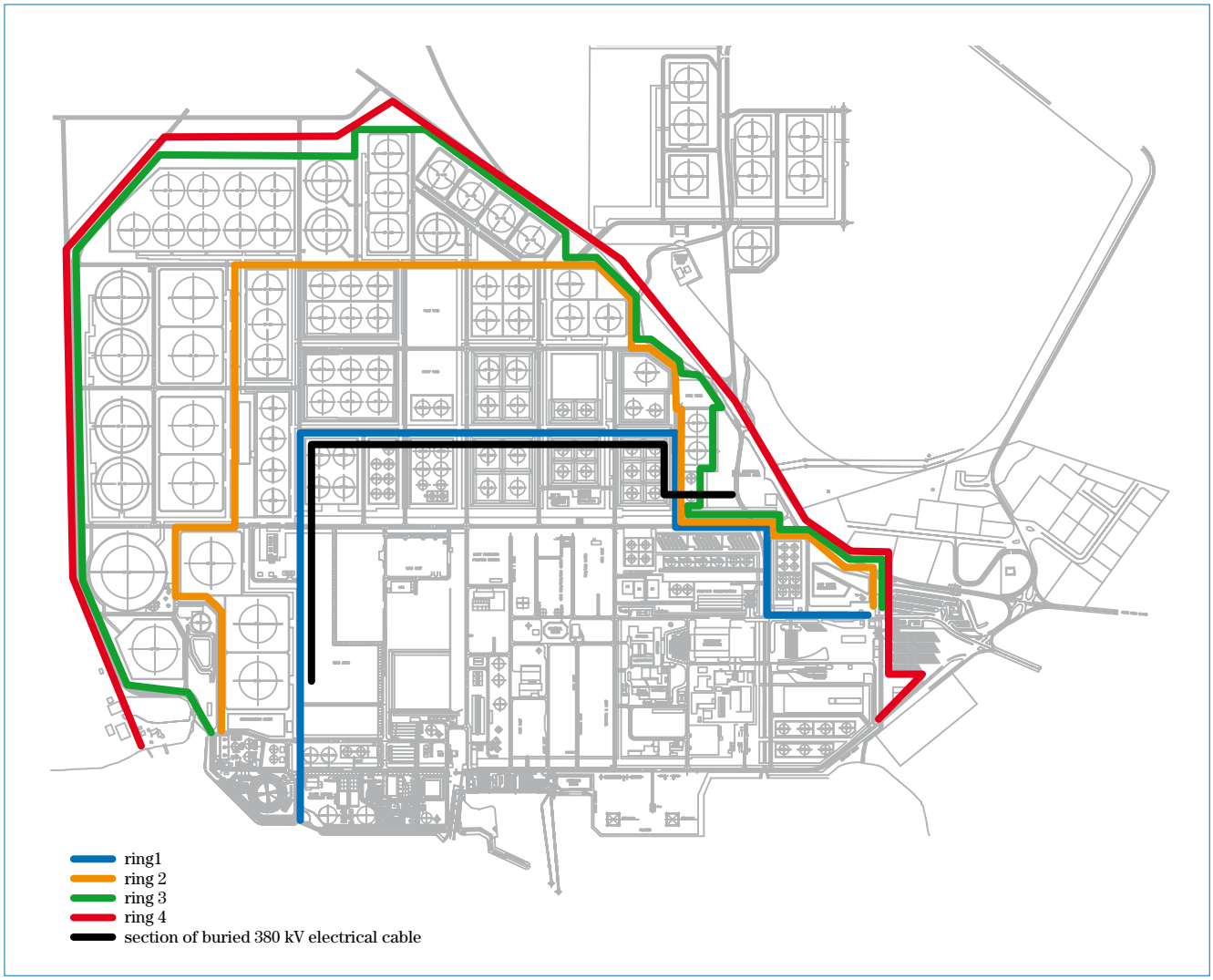


Figura 21 Map of the sampling lines for the survey of electromagnetic fields

As shown in Figure 21, measurements were made along four main lines:

- the first line largely follows the route of the buried 380 kV cable, which constitutes the main source of electromagnetic fields in the plant
- the second follows the route of the buried cable but at a distance of around 200 m
- the third and fourth follow the inside and outside of the site boundaries respectively

The results obtained for both electrical and magnetic fields are much lower than the legal limits stipulated for exposure of the general public.

The electrical field values decrease very rapidly as the distance from the buried cable increases and are undetectable just a few metres away.

The magnetic field values measured along the external boundary do not exceed 1.5 µTesla, compared to a limit of 100 µTesla for exposure of the general public and a

limit of 3 µTesla, set as a qualitative objective. As expected, the maximum values were measured along the route of the buried cable and near to the ENEL electrical substation. These were 20 µTesla and 10 µTesla respectively. The assessments carried out in previous years were repeated in 2010.

[Prime Ministerial Decree of 8 July 2003]

Ionising radiation

The sources of ionising radiation in the facility consist of small radiogenic sources in level gauges and analytical equipment located in the internal laboratory. All radiogenic sources are adequately confined and are checked annually by an appropriately qualified specialist pursuant to Legislative Decree 230/95, as subsequently amended. The assessments already made in 2009, applicable to abnormal and emergency conditions, were repeated in 2010.

[Legislative Decree 230/95]

4.3 – Indirect environmental aspects

4.3.1 - Product design

4.3.1.1 – General

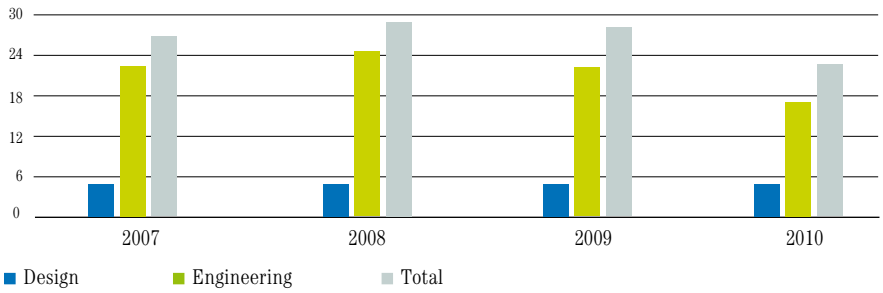
Saras carries out research and development activities aimed at designing products that meet the demands of the market and the requirements of environmental legislation. Bringing plans to modify products to fruition usually also requires adjustments to be made to existing plants. The modifications that need to be carried out on the site's plant and equipment are also designed and developed in-house with the assistance of specialist engineering companies. Product design is mainly developed at the Milan office, while plant design and engineering activity is undertaken through close co-operation between the Sarroch facility and the Milan office.

As shown in Table 64, in 2010 both product innovation and plant engineering design for modifications remained at average levels for the period 2004-2007. In 2008-2009 activities related to major investment, which was subsequently undertaken in 2009, required huge efforts in terms of plant engineering, generating a temporary shift in the distribution of work towards design and engineering. However, the figures for 2010 confirm the group's ongoing commitment in this area.

TABLE 64 ADesign and engineering activities

Parameter	2007	2008	2009	2010
Product design hours/thousands of hours worked	4.7	4.6	4.5	4.5
Plant engineering hours/thousands of hours worked	22.2	24.7	23.2	17.9
Total hours of product design and plant engineering/thousands of hours worked	**26.9**	**29.3**	**27.7**	**22.4**

CHART T64 (hours/thousands of hours worked)



4.3.1.2 – Low-sulphur fuel oil

In recent years, the production of motor vehicle fuels has been guided by legislation on the determined reduction of sulphur, as described below.

["Auto Oil" Directive 98/70/EC, amended by Directive 2003/17/EC]

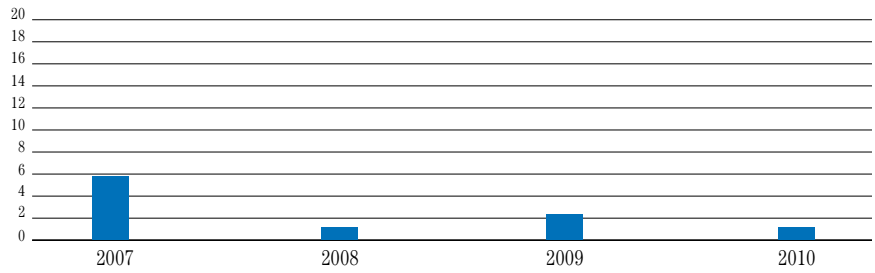
From 1 January 2005	- sulphur content in gasoline and diesel fuel must be less than 50 ppm - the sale of gasoline and diesel fuel with sulphur content of less than 10 ppm
From 1 January 2009	- sulphur content in gasoline and diesel fuel must be less than 50 ppm - the sale of gasoline and diesel fuel with sulphur content of less than 10 ppm - sulphur content in gasoline and diesel fuel must be less than 10 ppm

To enable Saras to achieve the 2009 objective for reducing the sulphur content of gasoline, it was necessary to modify the FCC plant by installing the new U800 desulphurisation unit. Note how from 2005 to 2008 (particularly in 2008) the quantity of sulphur in finished products entering the market decreased significantly, which led to the increase in the quantity of sulphur sold as a product. This can be attributed to the company's ongoing investment in the desulphurisation capacity of the production plants, which led to the completion of the gasoline desulphurisation plant in 2008. This has allowed the refinery to comply with the new European requirements stipulating a sulphur content in gasoline of 10 ppm, which entered into force on 1 January 2009. As shown in Table 65, in 2010, the indicator relating to the sulphur content in products compared with the quantity of sulphur entering the site with raw materials returned to the downward trend that began in 2005. The tail-gas recovery and sulphur treatment plant (TGTU), built in 2008, was fully operational in 2009, allowing the company to significantly reduce the sulphur content of emissions.

TABLE 65 Sulphur content in products

Parameter	2007	2008	2009	2010
Quantity of sulphur in products/quantity of sulphur entering the site with raw materials (%)	5.8	1.3	2.3	1.3

CHART T65 (%)

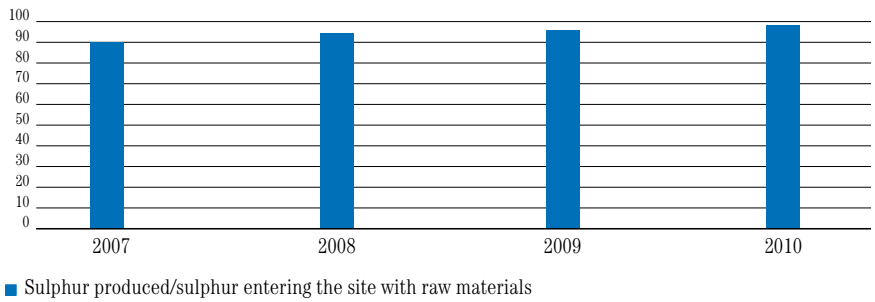


As a result of the above, 2010 saw the highest ever quantity of sulphur recovered in the production cycle in relation to the quantity entering the site, as shown in Table 66.

TABLE 66 Quantity of sulphur recovered in the production cycle

Parameter	2007	2008	2009	2010
Quantity of sulphur produced/quantity of sulphur entering the site with raw materials (%)	91.0	95.5	95.9	97.1

CHART T66 (%)



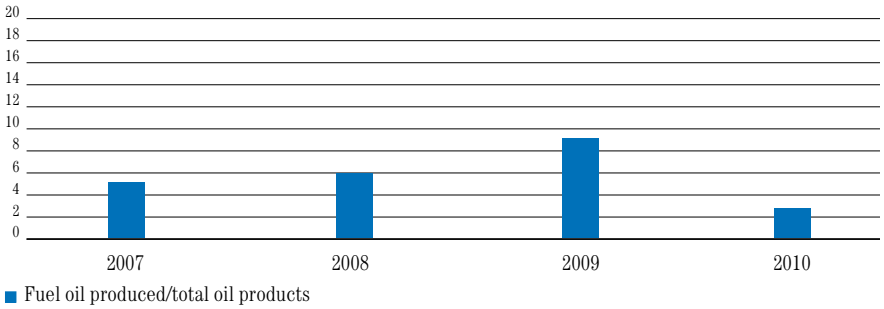
Range of oil products

In recent years, the production and sale of oil products has increasingly revolved around the "light" fractions, while the refinery's production of heavy distillates was for the most part destined to be converted into syngas for the purposes of generating electricity in the IGCC. Table 67 below shows the figures relating to the fuel oil fraction produced compared with total oil products. The figure for 2010 shows a considerable reduction on 2009 (-6.8% of total products) and on the figures for earlier years, due essentially to the negative price developments on the external market, leading to a cut in processing and a focus on production for purely internal consumption instead.

TABELLA **67** Fuel oil fraction as a percentage of total oil products

Parameter	2007	2008	2009	2010
Fuel oil produced/total oil products (%)	5.7	6.1	8.7	2.5

CHART **T67** (%)



As described in section 3, the production cycle of the IGCC removes the pollutants in the heavy hydrocarbons used as feedstock for the plant. This applies particularly to sulphur, which is recovered and sold, thereby contributing to the positive results shown in Table 66 on the previous page.

Summary of considerations relating to the indirect environmental aspects of product design

Based on the foregoing, it can be observed that:

- the lower sulphur content in motor vehicle fuels destined for sale leads to a reduction in SO_2 emissions from vehicle traffic
- the generation of energy from the syngas obtained from the gasification of heavy hydrocarbons maximises the use of incoming raw materials and allows the sulphur content to be recovered
- sulphur recovered from the production cycle is effectively considered a product, which is sold and used as a raw material in other production cycles (e.g. for the production of sulphuric acid), thus reducing the need for natural raw materials (minerals) to be refined, with further savings of energy and other resources

4.3.2. - Transport

Maritime traffic

All raw materials entering the site and a significant portion of oil products leaving the site are transported by sea. Given the large number of ships (around 750–800 per year), Saras has for several years promoted a policy of selecting and checking the ships used, with the aim of preventing accidents and spills of hazardous substances at sea. It has done this ahead of the deadlines stipulated by European regulations for discontinuing the use of single-hulled ships.

[MARPOL 73/74, the International convention on the prevention of pollution from ships, and Regulation 417/2002/EC, as amended by Regulation 1726/2003/EC]

As early as 2006, Saras met the target stipulated by the regulation for 2010 relating to the discontinuation of single-hulled ships and is considerably reducing its use of ships with segregated ballast tanks (SBTs), which must be taken out of operation entirely by 2015.

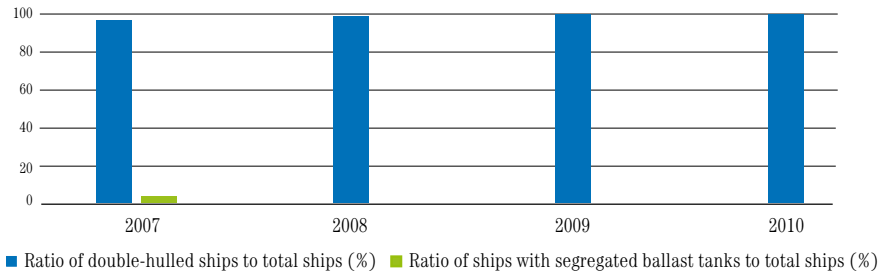
[table of objectives and measures: objective 15, page 127]

As shown in Table 68, in the last two-year period, 2009-2010, Saras has only used double-hulled ships. In the same period, no ships with SBTs were used.

Table 68 Double-hulled ships

Parameter	2007	2008	2009	2010
Ratio of double-hulled ships to total ships (%)	95.0	99.0	100.0	100,0
Ratio of ships with segregated ballast tanks to total ships (%)	5.0	1	0	0

Chart T68 (%)



Given the potential seriousness of accidents at sea, Saras selects ships by consulting international databases (e.g. SIRE) containing the results of checks made on transport ships, and carries out a programme of direct checks, encompassing both technical and operational aspects, on ships arriving at the marine terminal.

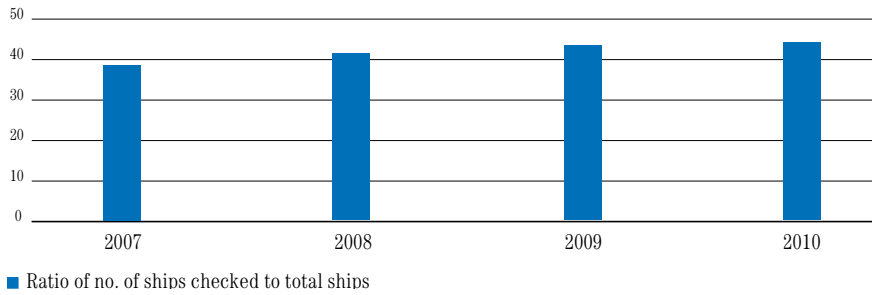
Saras has adopted the "Minimum Safety Criteria" document as its benchmark specification in accordance with the ship inspection protocols established by the Oil Companies International Marine Forum (OCIMF), an organisation that promotes improvements in safety and responsible environmental management in the transportation of oil and its derivatives, and marine terminal management. The number of ships checked is very high and has increased over the years, as can be seen from Table 69. The ships expected at the site are meticulously checked on behalf of Saras at the port of departure before they set sail by specialist companies.

[table of objectives and measures: objective 16, page 127]

Table 69 Ship safety checks

Parameter	2007	2008	2009	2010
Ratio of number of ships checked to total ships (%)	38.3	41.0	42.0	43.2

CHART T69 (%)



Road traffic

The road traffic caused by the activities carried out on the Saras site is due mainly to:

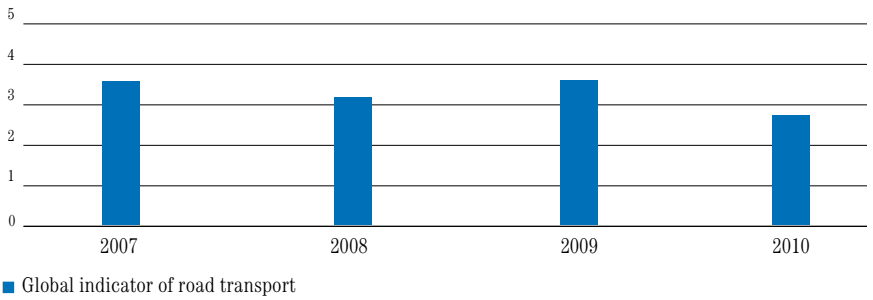
- transport of refined oil products via tanker trucks (around 37,000 vehicles a year)
- transport of sulphur via articulated lorries (around 4,400 vehicles a year)
- transport of auxiliary production materials and substances (around 400 vehicles a month)
- transport of employees of the company and of external companies working on the site (around 1000 motor vehicles and 60 buses a day)

The table below shows the indicator for heavy vehicle traffic, which mainly consists of tanker trucks for transporting products and, to a lesser extent, articulated lorries for transporting sulphur.

TABLE 70 Road traffic

Parameter	2007	2008	2009	2010
No. of heavy vehicles/kt raw materials	3.54	3.25	3.58	2.87

CHART T70 (%)



[table of objectives and measures: objective 17, page 127]

In 2007, the company implemented a regular programme of checks to verify the compliance of the tanker trucks used for transporting products. In 2010, 24.5% of tanker trucks authorised for entry were checked. The number has risen steadily from 17% in 2007.

4.3.3 – Environmental conduct of external companies

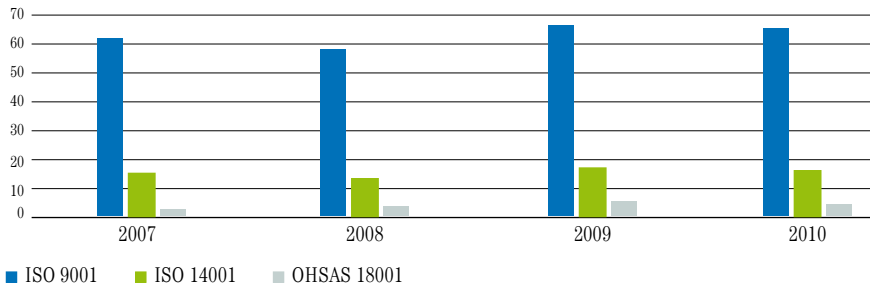
Saras has put in place appropriate procedures governing relationships with third parties involved in the site's activities. These are intended to ensure that the conduct of the staff of external companies complies with Saras' policies on safety, health and the environment.

Saras places great value on the commitment of external companies to achieve and maintain certification of their quality, environmental and safety management systems. In 2010, the number of companies with environmental certification (see Table 71) was the same as in 2009. Other companies are working towards certification.

TABELLA 71 Percentage of external companies with certified management systems

Parameter	2007	2008	2009	2010
Subcontractors with ISO 9001 certification (quality management system) (%)	61.2	58.5	67.7	66.7
Subcontractors with ISO 14001 certification (environmental management system) (%)	14.5	14.0	18.4	17.2
Subcontractors with OHSAS 18001 certification (occupational health and safety management system) (%)	2.3	3.9	5.3	4.9

CHART T71 (%)



Before being allowed to carry out any type of activity at the site, each company must satisfy the necessary conditions by demonstrating that it complies with the basic legal requirements relating to administrative, tax and insurance matters and that it operates in conditions conducive to health and safety and that safeguard the environment both on the industrial site and outside it.

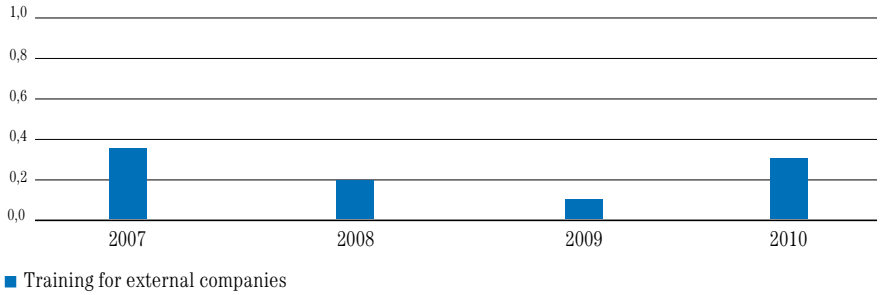
Before entering the facility, employees of external companies undergo further basic training on the risks relevant to the areas in which they will work. This is in addition to the requirement that they must work in accordance with their own company's organisational safety plan.

Saras plays an active role in the provision of training on health, safety and environmental protection to the employees of external companies. With regard to Table 72, note that the number of hours worked by employees of external companies almost doubled compared with the previous year.

TABLE 72 Training for external companies

Parameter	2007	2008	2009	2010
Training for external companies: no. of hours' training provided by Saras on the environment and safety/no. of hours worked by external companies (%)	0.35	0.20	0.14	0.36

CHART T72 (%)



One of the major impacts of external companies' activities, in environmental management terms, relates to the generation and management of waste.
As mentioned in section 4.2.6 on page 94, two specialist waste treatment companies work on the Saras site. Specific procedures govern the methods of waste management at the plant, including the transfer of waste to waste treatment plants and storage areas. The work of the external companies that manage the waste treatment plants is subject to regular checks and various audit activities, in accordance with the waste management procedure. More generally, the conduct of employees of external companies is the subject of checks under the Arrow programme (section 4.4.2, page 118). Note that most of the waste generated by the activities of external companies on the site is dealt with and accounted for by Saras. This applies particularly in periods of general shutdown and plant maintenance when more waste is produced.

4.4 – Management performance indicators

In addition to specific indicators for various environmental aspects and the environmental factors that are or could be involved, Saras has defined other types of indicator that allow it to monitor certain activities essential for improving the environmental management system.
These indicators relate to training and audit activities, and engineering work aimed at developing technological and plant improvements.

4.4.1 – Training on environmental protection and safety

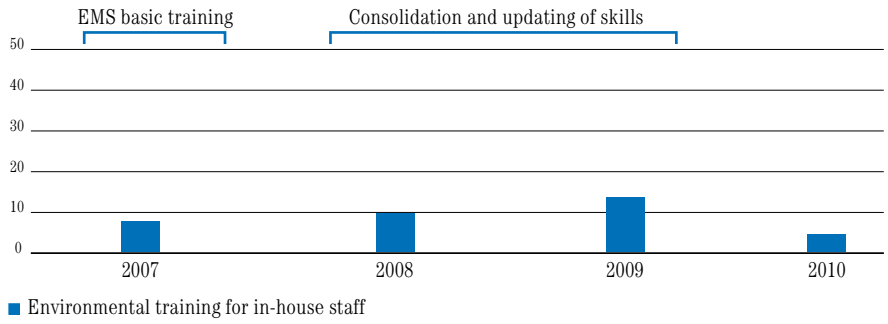
Staff training on environmental protection was given a particular boost in 2005 with the launch of information and awareness-raising initiatives on the environmental management system. Specific in-depth training sessions were arranged for operational staff, focusing particularly on the management of atmospheric emissions and discharges into water. The company's auditors attended specific training modules, to prepare them for conducting internal audits. Thus the indicator on environmental training for in-house staff peaked in 2005, due to the drive to familiarise all staff with the objectives of the environmental management system, and the training on the new concepts introduced. In 2010, Saras continued to train its own staff on protecting and safeguarding the environment in relation to the activities carried out at the Sarroch

site. In particular, 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 in accident scenarios, and courses on the environmental, safety and major accident prevention policies, in which the entire workforce took part. A total of around 1,700 hours of environmental training were provided. The percentage of training hours dedicated to the environment was less than in the previous years due to the combined effect of slightly fewer training hours in 2010 and a considerable increase in total training hours. This training drive mainly focused on activities designed to improve safety awareness. A specific training programme to increase employees' awareness of AIA and REACH issues is planned for the second half of 2011.

TABLE 73 Environmental training for in-house staff

Parameter	2007	2008	2009	2010
Environmental training for in-house staff: no. of environmental training hours/total training hours (%)	7.39	10.30	13.23	4.0

CHART T73 (%)

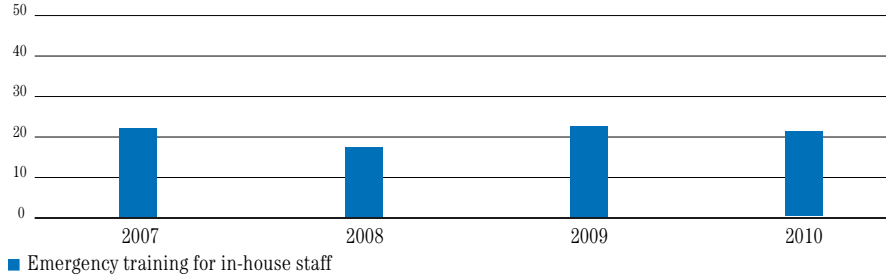


Training on health and safety issues complements environmental training. Training on these issues begins when staff first join the company and continues throughout their working lives with Saras, with theoretical instruction and practical exercises. Staff assigned to fire-fighting teams participate in a series of special training exercises relating to emergency management. Saras' commitment to emergency management training and exercises, which could have an impact on both individual health and environment protection, can be seen from the figures in Table 74.

TABLE 74 Emergency management training for in-house employees

Parameter	2007	2008	2009	2010
Training for emergencies: no. of hours of emergency management training/total training hours	21.76	17.73	23.02	21.0

CHART T74 (%)



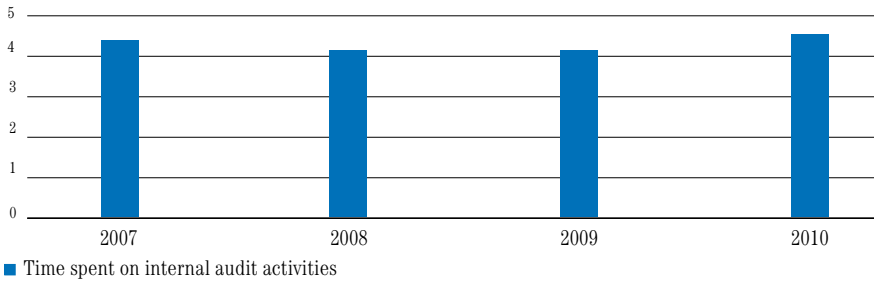
4.4.2 – Audit activities

Saras places particular emphasis on the conduct of internal audits as a verification, training and improvement tool. The company employs 61 internal auditors trained to carry out quality, environmental and safety audits. This equates to around 5% of the total Saras workforce. Internal audit activities are planned annually and combine environmental, safety and quality management issues to ensure that all activities that directly or indirectly influence these areas are included for each process audited. Audits may reveal areas for improvement or failure to comply with the procedures of the management system or reference legislation. These nonconformities are formally reported to the managers of the activities in which they were encountered so that measures can be identified to restore conformity and avoid a repetition of such breaches. This indicator has remained virtually unchanged since 2008.

TABLE 75 Internal audit activities (combined environmental, safety and quality audits)

Parameter	2007	2008	2009	2010
Internal audit activities: no. of hours spent on audit/total hours worked by auditors and employees undergoing audits (%)	4.37	4.15	4.15	4.43

CHART T75 (%)



Other checks on the methods of managing operating activities are also carried out regularly following the launch of the Arrow programme. The programme is a comprehensive plan of field inspection visits (audits) covering the whole of the site, the adjoining national storage facility and the wharf. The aim of the project is to develop an awareness of accident prevention and environmental protection both in the audited employees and the auditors. To achieve this aim, the Arrow programme relies on an extensive programme of inspections in the facility's 24 operational and administrative areas. Arrow inspections underwent fundamental changes in 2010. The number of inspectors dedicated to each inspection was reduced from 4 to 2 from September onwards. From 2011, in a further change, it was decided to carry out Arrow inspections only to check the correct application of the procedure for obtaining work permits. In light of the above, the indicators relating to Arrow activity shown in Table 76 for the year 2010 are not comparable with previous years' figures.

TABLE 76 Arrow programme activities (field inspections)

Parameter	2007	2008	2009	2010
No. of hours spent on activities	1,966	1,942	1,606	1,036
Hours spent/hours worked by auditors and employees undergoing audits (%)	0.12	0.12	0.12	0.12

4.4.3 – Investment in environmental protection and safety

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 77 show the company's strong commitment on this front, with total investment of more than EUR 40 million in the past four years. The reduced investment in environmental issues in 2010 was broadly due to the fact that large infrastructure investment in environmental protection had already been made in previous 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

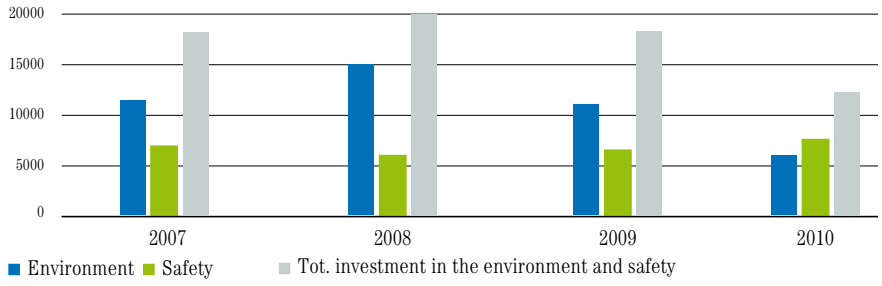
Between 2007 and 2010 Saras invested over EUR 27 million in projects and policies to continually upgrade safety levels at its site, spending on average around EUR 6.75 million a year. The main measures funded in 2010 involved both the improvement of existing safety equipment and modifications to plant 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 77 Investment in improvements to environmental protection and safety

Parameter	2007	2008	2009	2010
Investment in environmental protection (k€/year)	11,320	15,160	11,690	5,680
Investment in safety (k€/year)	6,740	6,345	6,608	7,640
Total investment in the environment and safety (k€/year)	**18,060**	**21,505**	**18,298**	**13,320**

CHART T77 (k€/anno)



5.
Environmental objectives and programmes

Complete, accurate and transparent information remains the solid basis of any dialogue.

In this section, Saras presents its environmental improvement objectives for the period 2009-2013 and the activities it carried out in 2010.

The information and figures contained here show the areas where Saras is working towards new improvements that are expected to be achieved in the next few years: the result of technological and managerial decisions that are consistently aimed at achieving simultaneous progress on health, safety and the environment.

Saras is committed to clarity and completeness of information, which will allow it to engage in clear, concrete and ongoing dialogue with stakeholders, in order to give the surrounding area the answers that it expects.

5.
Obiettivi e programmi ambientali

5.1 – Environmental improvement objectives planned for 2010-2013

With regard to the objectives presented in this section, it should be noted that the environmental objectives for 2009-2013 were rescheduled during the first half of 2009, mainly as a result of the current situation on the international markets and the recent global financial and economic crisis, which meant that the company had to revise its investment plans for 2008-2013 (see objectives 2B, 2C, 2D, 4A, 6A, 6B and 13B). The rescheduling of the investments set out in the table on the next page has caused the period of implementation for the activities to be extended for a maximum of two years. During 2010, the objectives relating to the continuous monitoring of atmospheric emissions from the CO boiler and Topping2 smokestack (see objective 3C and 3D), as defined in the AIA plan, were achieved. The objective relating to the monitoring of the smokestack of the CCR/Alky plant (3B) was also achieved.

For each EMAS objective, one or more actions have been put in place and the indicators for monitoring the progress made towards achieving the objective and the period of implementation have been identified.
As in the previous year, a new column that shows the situation at end-2010 was also included for the 2010 objectives.
The main objectives relating to significant direct environmental aspects are:

- **Atmospheric emissions**, with measures to reduce the quantity of pollutants and extend continuous monitoring
- **Energy consumption**, with measures to recover energy and consequently reduce fuel consumption
- **Prevention of potential spills of hydrocarbons into the soil**, with the extension of paved floors in the storage areas and, in parallel, oil recovery activities using the dynamic barrier

The objectives linked to significant indirect environmental aspects relate specifically to:

- Maritime traffic and road traffic, with increased monitoring of ships used to transport raw materials and road vehicles used to transport products

Key to table overleaf:

OBJECTIVE CLOSED

OBJECTIVE IN PROGRESS

NEW OBJECTIVE

No.	Objective	Actions	Indicator	Implementation period	Situation at end 2010
	Significant environmental aspect: atmospheric emissions (SO_2)				
1	Reduction of SO_2 emissions by around 30% compared to current levels	**A -** Increase the yield from the sulphur recovery plant and reduce the associated SO_2 emissions by bringing the new tail gas treatment unit (TGTU) into service.	% reduction in SO_2 emissions on an annual basis	2009	2009 objective achieved thanks to the regular operation of the TGTU: SO_2 emissions reduced by over 40% compared to 2008. Objective closed.
	Environmental aspect: energy consumption – atmospheric emissions (SO_2, dust)				
2	Energy recovery and reduction of fuel oil consumption by around 30% compared to current levels	**A -** Implement measures to recover energy from the FCC plant.	% reduction in fuel oil emissions on an annual basis	2009	The energy recovery measures planned for the K1T1, GT10 and CO boiler were completed in conjunction with the turnaround of the FCC plant in summer 2009. Thanks to these measures, total emissions resulting from fuel oil consumption in 2009 were cut by around 3.5%: applying this result to the whole of 2009 would produce a reduction of around 10%(1). Objective closed.
		B - Implement measure to recover energy from the U500-U700 desulphurisation units.		2012	Postponed until 2013 due to restructuring of investments (cf. the report from the AIA assessment committee CIPPC_00_2010_0001027 of 19 May 2010).
		C - Install a boiler to recover energy from the sensible heat of the fumes from the Topping1 plant (GVR1).		2013 [10]	Postponed until 2013 due to restructuring of investments (cf. the report from the AIA assessment committee CIPPC_00_2010_0001027 of 19 May 2010).
		D - Install a boiler to recover energy from the sensible heat of the fumes from the Topping2, RT2, VSB, Vacuum1 and Vacuum2 plants, which will be ducted to the new centralised smokestack (GVR2).		2013	Feasibility study completed in 2008. Postponed until 2013 due to restructuring of investments (cf. the report from the AIA assessment committee CIPPC_00_2010_0001027 of 19 May 2010).
	Environmental aspect: atmospheric emissions (SO_2, NO_x, dust, CO)				
3	Extension of continuous monitoring to: - 65% of SO2 emissions - 50% of NOX emissions - 65% of dust emissions - 60% CO emissions	**A -** Entry into service of the continuous monitoring2 system for SO_2, NOX, PTS and CO emissions on the smokestacks of the Z3-F2 and Z4-F2 plants.	% of emissions under continuous monitoring	2009	Analysers delivered in December 2009. After a transition period when emissions were monitored using calculations, continuous monitoring of emissions began in March. Except for a period of downtime in April, the system was fully available. Closed in April 2010.
		B - Install the continuous monitoring system for SO_2, NOX, PTS and CO emissions on the smokestack of the CCR/Alky plant. Installation by the end of 2010.	% of emissions under continuous monitoring	2009 - 2010	The installation, testing and entry into service of the continuous monitoring system for the CCR/ALKY plant has been completed. Objective closed.
		C - Install the continuous monitoring system for SO_2, NOX and CO emissions on the smokestack of the CO boiler plant.	% of emissions under continuous monitoring	2010	The installation, testing and entry into service of the continuous monitoring system for the CO boiler smokestack has been completed. Objective closed.
		D - Install the continuous monitoring system for SO_2, NOX, PTS and CO emissions on the smokestack of the Topping2 plant.	% of emissions under continuous monitoring	2010	The installation, testing and entry into service of the continuous monitoring system for the Topping2 smokestack has been completed. Objective closed
4	Feasibility study for a new centralised smokestack and extension of continuous monitoring to: - 85% of SO_2 emissions - 70% of NOX emissions - 99% of dust emissions - 85% CO emissions	**A -** Implement the continuous monitoring system.	% of emissions under continuous monitoring	2013	Work in progress. Feasibility study completed in 2009.
	Environmental aspect: atmospheric emissions (dust)				
5	Use of fuel oil with a carbon residue in weight of less than 9.5% for 2010, and less than 9.2% for 2011	**A -** Prepare fuel oil with the required characteristics.	annual average % of carbon residue in fuel oil	2010 - 2011	2010: a level of 7.84% compared with a target of 9.5%. Objective confirmed for 2011 as well

1 - The figure for the situation at the end of 2009 (3.5%) refers to the estimated reduction in emissions from fuel oil recorded in 2009 from the moment the recovery systems were installed and/or put into service. The figure of 10% is the estimated value for the whole year had the same systems operated continuously.

2 - The monitoring of SO2, NOX, PTS and CO emissions on the smokestacks of the Z3-F2 and Z4-F2 plants is expected to be implemented before the end of 2010; the change in timescales between 2009 and 2010 is due to technical and contractual issues.

No.	Objective	Actions	Indicator	Implementation period	Situation at end 2010
	Environmental aspect: atmospheric emissions (volatile organic compounds)				
6	Reduction in diffuse and fugitive emissions of volatile hydrocarbons	**A -** Complete[3] the installation of double seals on the gasoline-handling pumps	% replacement completed (cumulative figure)	2007- 2012	Total no. of pumps to which double seals are to be fitted: 229 2009: 205 pumps completed, equal to 89% 2010: 206 pumps completed, equal to 90%
		B -Install a system for sealing the bypass pipes and support pipes in the floating-roof tanks at the refinery perimeter[4].	no. of tanks upgraded / total number of tanks in the refinery perimeter (cumulative figure)	2009 - 2012	A total of 77.7% of bypass tubes have had a sealing system installed in 2010, equating to 100% of the target; for 2011 installation is planned for a further five tanks.
		C - Apply the Smart LDAR methodology to all of the site's units, proceeding in accordance with the monitoring and action timelines specified by the AIA permit.	- IR 100% - PID5 or FID5 100% for components leaking from IR - statistical sampling for components not leaking from IR 100% plants	2009 - 2011	Topping1, FCC, CCR, Alky, MHC1, MHC2, TAME and U800(6) plants monitored using the Smart LDAR methodology in accordance with the timelines specified by the AIA permit. Following two three-monthly monitoring campaigns that revealed leakage levels of less than 2%, in 2010 the plants underwent six-monthly monitoring campaigns. These campaigns again recorded leakage levels of less than 2%. In 2010 the first six-monthly monitoring campaign for the U300, U400, U500, U700, Visbreaking, RT2, T2 and Blow Down plants and for the Interconnecting and Shipment areas were carried out. The Movement area, on the other hand, was the subject of a second three-monthly campaign. In 2011 two three-monthly campaigns are planned for the following areas: Shipment by sea, H2 Linde purification, H2 UOP purification, S1 Fuel Gas, Acide 1 water stripper, Acide 2 water stripper, Acide 3 water stripper, Thermoelectric plant, De-ethaniser, IGCC, Islands/Wharf, Dea1, Dea2, Dea3.
	Environmental aspect: atmospheric emissions – air quality				
7	Prompt identification of potential increases in concentrations of pollutants in emissions prevent any breaches of the warning threshold for concentrations of pollutants in the soil measured by the public air quality monitoring network	**A -** Apply the ISC/AERMOD simulation model of the ground-level effects of atmospheric emissions from the Saras site, based on the weather conditions and relief of the area and the concentrations measured by the air quality monitoring network in the surrounding environment	100% under AIA monitoring plan	2009 - 2010	Application of the simulation model of the ground-level effects of atmospheric emissions from the Saras site: - 100% with ISC/AERMOD model Objective closed
		B - Complete implementation of the CALMET-CALPUFF model. Application of the model.	100% with CALMET-CALPUFF model 100% under AIA monitoring plan	2009 - 2011	Completion delayed until the end of 2011. The process is currently being completed to obtain approval from the Municipality of Sarroch to install the new weather station required, together with the current stations at the national storage facility and the PPS building, to ensure the correct application of the CALMET-CALPUFF model. Degree of completion: 90%.
		C - Develop a prototype system for measuring the temperature of the flare.	% completion of work	2011 - 2013	New objective for 2011
		D - Channelling of automatic drainage of water from gasoline storage tanks and controlled release to the API plant.	% completion of work	2011 - 2012	New objective for 2011
	Environmental aspect: energy consumption – visual impact				
8	Completion of mechanical installations for the new circuit to eliminate the steam plume released into the atmosphere by the U950 deaerator	**A -** Modify the circuit and insert a suitable steam condenser: fully complete mechanical/equipment installations.	% completion of work	2009 - 2010	Work 100% complete[7]. All the mechanical equipment to contain the steam plume has been installed: interconnecting completed during the IGCC turnaround in 2011. Objective closed.
	Environmental aspect: energy consumption – visual impact				
9	Reduction in the risk of soil and subsoil contamination	**A -** Continue work to pave the containment basins for the crude oil and product tanks, in accordance with AIA/CTR requirements.	% of surface paved compared to total planned for 2009/2010.	2009 - 2011	Work 39% complete overall. In 2010, a total of 11,312 m2 was paved, representing all of the work planned for the year. Continuation of the multi-year plan to pave the tank basins: 8,600 m2 of paving planned in 2011.
		B - Fully complete the cement floor for the Rio Mascheroni channel.	% completion of work	2009 - 2010	The authorisation to carry out work on waterways, which was applied for from the Civil Engineering Department in January 2009, was received in Q4 2009. The work, planned to be carried out when the river is at its lowest, is now complete. Objective closed.
		C - Perform instrumentation checks on the integrity of the pipework for transporting crude oil from the marine terminal to the tanks and transporting hydrocarbons internally/externally.	% checks performed/ checks planned	2009 - 2011	2010 objective 100% achieved; reconfirmed for 2011
		D - Motorisation of the intake valves at the foot of the tanks ST-164, ST-165, ST-166, ST-167, ST-168 and ST-169 containing gasoline.	% completion of work	2011 - 2012	New objective for 2011

3 - The work to replace the seals has been further postponed: 93% of the total programme is expected to be complete by the end of 2011.

4 - Limited to the 18 tanks at the refinery perimeter compared to the 65 planned. This work is also being carried out on all the floating-roof tanks that are out of service for maintenance; four of these have currently been completed, in addition to those at the refinery perimeter.

5 - The leakage of VOC (volatile organic compounds) from process components was quantified in accordance with method 21 - DETERMINATION OF VOLATILE ORGANIC COMPOUND LEAKS - EPA using a PID (Photo Ionisation Detector) rather than an FID (Flame Ionisation Detector) for safety reasons.

6 - The objective was revised as shown in the table due to delays in the supply of the instrumentation required for the Smart LDAR methodology.

No.	Objective	Actions	Indicator	Implementation period	Situation at end 2010
	Environmental aspect: prevention of hydrocarbon spills into the soil				
10	Confinement of contamination from past activities	**A -** Build the physical barrier planned as part of the site remediation project.	% completion of work	2009 - 2014	Technical specifications for the RFP completed on the basis of the findings from the test sites. The deadline has been postponed until 2014 to allow time for discussions with the competent authorities and further field tests. Degree of completion: 25%.
	Environmental aspect: waste				
11	Raising awareness among employees about the separated collection of USW to meet the 20% target	**A -** Implement a campaign to raise employee awareness about the separated collection of plastic, aluminium, glass and paper.	% separated USW	2009 - 2011	2010: 23% achieved instead of the 20% planned. Objective closed.
12	Increase quantity of excavated earth sent for recovery to 50%	**A -** Increase the amount of excavated earth sent for recovery.	% terre da scavo uscenti dal sito inviati a recupero	2009 - 2011 (annuale)	2009: 66% 2010: 40%
	Environmental aspect: noise				
13	Containment of noise emissions at the source	**A -** Install sound-absorbent panels in the MHC-2 plant.	% completion of work	2009	Activities to limit noise emissions from the MHC-2 plant fully complete. Objective closed
		B - Complete study and planning for soundproofing the areas of sheds 109 and 110 containing the hydrogen network compressors. Changed to installation of sound-absorbent panels in the shed containing the C101-T1 compressors.	% completion of work	2009 - 2011	30% complete. The feasibility study for limiting the impact of noise from the HNC110 hydrogen network compressors was performed in 2009. The noise measurement tests revealed an opportunity to limit noise more effectively in relation to the covering of the C101 compressors (Topping1 service) next to the hydrogen network compressors. This proposal was included in the 2011 investment budget. Sound-absorbent panels will be installed in the T1 area by 2011
	Environmental aspect: odours				
14	Assessment of the main sources of odour emissions for the prevention or reduction of the odour impact on the surrounding area	**A -** Identify the chemicals responsible for the odour nuisance in the emissions sources at the refinery. Prepare artificial mixtures of these odour-generating substances in order to correlate the odour nuisance to the concentration.	% completion of work	2010 - 2011	By the end of 2010, the odour impact monitoring plan was 90% complete and 90% of the identification of the substances responsible for the odour disturbance had been carried out. The sampling and analysis methodology necessary for the identification of odorous sulphur compounds has been defined. Preparation of mixtures: not defined, as applicability is still being assessed.
		B - Implementation of the six-monthly monitoring plan in accordance with AIA requirements.	% under AIA monitoring plan.	2010 - 2011	The summer campaign to monitor odorous substances was carried out in 2010. The objective for 2011 is to carry out the six-monthly campaigns required by the AIA.
		C - Installation of an anti-odour chemical diffusion system for tank ST99.	% completion of work	2011 - 2013	New objective for 2011
	Environmental aspect: transport – maritime traffic: prevention of emergencies at sea				
15	100% use of double-hulled ships for loading/unloading operations	**A -** Continue to select double-hulled ships.	% double-hulled ships out of total no. of ships	2009	Objectives achieved in full: 100% double-hulled ships for supplying light crude and 100% double-hulled ships for shipping products. Objective closed
	For ships loading and unloading products with a flash point below 55°C at the marine terminal, at least 98% use of ships with an inert gas system	**B** - Select ships equipped with an inert gas system (IGS).	% ships with IGS out of the total no. of ships with products with a flash point below 55°C	2010 - 2011	2010: objective achieved for ships unloading with a flash point below 55°C 2011: objective re-set for ships loading with a flash point below 55°C
16	Performance of on-board checks during loading/unloading on at least 42% of ships in 2010 and 43% in 2011	**A -** Continue inspection activities in line with the criteria adopted by Saras to protect workers' safety and the environment (minimum safety criteria).	% ships checked	2009 - 2011	2010: 43.2%achieved compared with the 42% planned
	Environmental aspect: transport – road traffic: accident prevention				
17	Performance of checks on tanker trucks used to transport products: 21% for 2010 and 25% for 2011	**A -** Continue checking activities in line with Saras internal procedures.	% tanker trucks checked	2009 - 2011	2010: 24% achieved compared with the 21% planned
	Environmental aspect: training and information				
18	Increase employees' awareness of the company's environmental initiatives.	**A**- Every six months, include a section dedicated to environmental topics in the company newsletter, highlighting the initiatives put in place by the company.	% completion of work	2011	New objective for 2011
19	Reduce flare hydrocarbon discharges from the refinery	The objective aims to achieve a reduction in flare discharge from the refinery =< 25% (% weight in relation to processing) to be achieved by optimising the management of fuel gas and hydrogen networks.	% weight in relation to processing	2011	New objective for 2011

7 - The work completed includes minor activities carried out in 2010.

5.2 – Improvement activities carried out in 2010

During 2010, the majority of the environmental objectives set out in the 2010 Environmental Declaration were achieved. Investments mainly concerned the reduction of atmospheric emissions, the reduction of energy consumption, the prevention of potential spills of hydrocarbons into the soil and the monitoring of air quality.

[significant environmental aspect: SO_2 atmospheric emissions]

For many years now, a large portion of investment has been directed towards the environment and safety, and this programme also includes constant monitoring of air quality. The activities targeting atmospheric emissions addressed a number of different aspects. One of the most important of these was the construction of the tail gas treatment unit (TGTU): with the TGTU in regular operation during 2010, it was possible to further increase the percentage of sulphur recovered, reducing SO_2 emissions by more than 30%, thereby meeting the formal commitment made by Saras through its environmental improvement objectives. Work was completed in the last few 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.

[environmental aspect: odours]

Two consecutive quarterly campaigns on reducing diffuse and fugitive emissions of volatile hydrocarbons using SMART LDAR methodology in accordance with the timescales specified by the AIA permit were carried out during the year for the U300, U400, U500, U700, Visbreaking, RT2, T2 and Blow Down plants and for the interconnecting, movement and shipping areas. The leakage levels recorded were less than 2%.

[environmental aspect: prevention of hydrocarbon spills into the soil]

In terms of the protection of the soil and subsoil, measures aimed at reducing the risk of contamination were continued. The cement floor for the Rio Mascheroni channel was fully completed and the percentage of paving in the containment basins for crude oil and product tanks reached 36.5%, in line with the target for 2010. In addition, the programme of instrumentation checks on the integrity of the pipework for transporting crude oil from the marine terminal to the tanks and internal/external transport of hydrocarbons planned for 2010 was successfully carried out.

[environmental aspect: energy consumption, visual impact]

In line with the 2008-2012 investment plan, work on the FCC plant (K1T1, GT10 and CO boiler) aimed at achieving greater energy efficiency was completed. These measures have led to a considerable decrease in fuel consumption, with a resulting drop in CO_2, SO_2 and dust emissions.

[environmental aspect: air quality]

At the same time, in order to ensure the high quality of the fuels used at the site, the company again maintained the excellent result it achieved the previous year on the use of fuel oil with a carbon residue of less than 9.5% by weight.

[environmental aspect: transport - maritime traffic]

There have also been improvements in the data for the transport of products by sea: the company continued to use only double-hulled ships for the supply of light crude, and hit its target of ensuring that 100% of the ships transporting products out of the Saras terminal also had double hulls. The target for checks on board ships during the loading and unloading stages was also met, reaching 44% in 2010.

Finally, in order to prevent road traffic accidents, checks were carried out on 24% of the tanker trucks used to transport products, which was consistent with the objectives set.

[environmental aspect: transport - road traffic]

Last but not least, turning to the activities to reduce noise emissions from the MHC-2 plant, work to install sound-absorbent panels was completed. An acoustic study and a study of the technical and financial feasibility of further measures to limit noise emissions in the area of the TP1 compressors were also carried out, with the work scheduled to be undertaken during 2011. Similarly, significant improvement was achieved in this area in 2010 purely via the reduction in flare hydrocarbon emissions.

[environmental aspect: noise]

6.
Summary of relevant legislation

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6. Summary of relevant legislation

Below is a non-exhaustive list of the main environmental laws that apply to the activities carried out at the Saras site. The detailed list is checked on the basis of section 4.3.2 of the EMS.

Atmosphere

- Resolution 14 of 10 April 2009.
  Provisions implementing decision 2007/589/EC of the European Commission of 18 July 2007, which establishes the guidelines for monitoring and reporting greenhouse gas emissions pursuant to Directive 2003/87/EC of the European Parliament and of the Council.
- Resolution 20 of 27 November 2008.
  Execution of the decision to allocate CO_2 allowances for 2008-2012, drawn up pursuant to Art. 8 (2)(c) of Legislative Decree 216 of 4 April 2006, as subsequently amended, in compliance with the authorisation from the European Commission.
- Legislative Decree 284 of 8 November 2006 with "Corrective and supplementary provisions to Legislative Decree 152 of 3 April 2006, establishing environmental legislation".
- Resolution 14 of 6 August 2008.
  Updates to permits for greenhouse gas emissions.
- Legislative Decree 4 of 16 January 2008 with further corrective and supplementary provisions to Legislative Decree 152 of 3 April 2006, establishing environmental legislation.
- Legislative Decree 152 of 3 April 2006.
  Environmental legislation. Part V: Laws governing the protection of air quality and the reduction of atmospheric emissions.
- Legislative Decree 216 of 4 April 2006, as subsequently amended.
  Implementation of Directives 2003/87 and 2004/101/EC governing greenhouse gas emissions allowance trading within the Community, in respect of the Kyoto Protocol's project mechanisms.
- Resolution 001/2008 of the Italian National Committee for Managing and Implementing Directive 2003/87/EC. Recognition of permits to emit greenhouse gases issued between 2005 and 2007 for the purpose of issuing permits for 2008-2012 pursuant to the Legislative Decree of 4 April 2006.
- Decisions of the European Commission of 29 January 2004 and of 18 July 2007.
  These establish guidelines for monitoring and reporting greenhouse gas emissions pursuant to Directive 2003/87/EC of the European Parliament and of the Council.
- Ministerial Decree 60 of 2 April 2002.
  Implementation of Council Directive 1999/30/EC of 22 April 1999 relating to limits for sulphur dioxide, nitrogen dioxide, oxides of nitrogen, particulate matter and lead in ambient air, and Directive 2000/69/EC relating to limits for benzene and carbon monoxide in ambient air.
- Legislative Decree 183 of 21 May 2004.
  Implementation of Directive 2002/3/EC relating to ozone in ambient air.
- Presidential Decree 322 of 15 April 1971.
  Regulation for the execution of Law 615 of 13 July 1966, containing provisions against atmospheric pollution, limited to the industrial sector.

Water

- Legislative Decree 4 of 16 January 2008.
  Further corrective and supplementary provisions to Legislative Decree 152 of 3 April 2006, establishing environmental legislation.
- Legislative Decree 152 of 3 April 2006.

Environmental legislation. Part III, specifically: Laws governing the prevention of water pollution and the management of water resources.

- Regulation 417/2002 of 18 February 2002, amended by Regulations 1726/2003 of 22 July 2003 and 2172/2004 of 17 December 2004.
  Fast-track introduction of laws governing double hulls or equivalent technology for single-hulled oil tankers, repealing EC Council Regulation 2978/94.

Waste, soil and subsoil

- Legislative Decree 205 of 3 December 2010.
  Directive 2008/98/EC of the European Parliament on waste.
- Ministerial Decree of 17 December 2009.
  Establishment of a system to monitor the traceability of waste, pursuant to Art. 189 of Legislative Decree 152 of 2006 and Art. 14-bis of Decree Law 78 of 2009, converted – with amendments – by Law 102 of 2009.
- Legislative Decree 4 of 16 January 2008.
  Further corrective and supplementary provisions to Legislative Decree 152 of 3 April 2006, establishing environmental legislation.
- Legislative Decree 152 of 3 April 2006.
  Environmental legislation. Part IV: Laws governing the management of waste and the remediation of polluted sites.
- EEC Regulation 259 of 1 February 1993.
  Supervision and control of shipments of waste within, into and out of the European Community.

Noise

- Regional Council Resolution (Sardinia) 62/9 of 14 November 2008.
  Regional directives governing environmental noise pollution.
- Ministerial Decree of 16 March 1998.
  Methods of detecting and measuring noise pollution.
- Ministerial Decree of 11 December 1996.
  Application of the differential criteria to continuous production cycle plants.
- Law 447 of 26 October 1995.
  Framework law on noise pollution.
- Prime Ministerial Decree of 14 November 1997.
  Establishing limits for noise sources.
- Prime Ministerial Decree of 1 March 1991, as subsequently amended.
  Maximum limits for noise exposure in inhabited areas and outdoors.

Asbestos

- Ministerial Decree 248 of 29 July 2004.
  Regulation governing the definition of and rules for the recovery of products and goods made from or containing asbestos.
- Ministerial Decree of 14 December 2004.
  Prohibition on the installation of materials containing asbestos that has been intentionally added.

PCBs

- Legislative Decree 209 of 22 May 1999.
  Implementation of Directive 96/59/EC on the disposal of polychlorinated biphenyls and polychlorinated terphenyls.
- Ministerial Decree of 11 October 2001.
  Conditions for the use of transformers containing PCBs awaiting decontamination or disposal.
- Law 62 of 18 April 2005, European Community Law 2004, Art. 18.
  Obligations on owners of equipment containing PCBs and PCTs.

Ozone-depleting substances

- Presidential Decree 147 of 15 February 2006.

Methods for monitoring and recovering leaks of ozone-depleting substances from refrigeration, air conditioning equipment and heat pumps, pursuant to EC Regulation 2037/2000.
- EC Regulation 2037/2000 of 29 June 2000 on substances that deplete the ozone layer.

Electromagnetic fields

- Legislative Decree 194 of 6 November 2007.
  Implementation of Directive 2004/108/EC on the approximation of the Laws of Member States relating to electromagnetic compatibility and repealing Directive 89/336/EEC.
- Prime Ministerial Decree of 8 July 2003.
  Definition of exposure limits, warning levels and quality objectives for protecting the population from exposure to electrical, magnetic and electromagnetic fields generated at frequencies between 100 kHz and 3,000 GHz.
- Law 36 of 22 February 2001.
  Framework law on protection against exposure to electrical, magnetic and electromagnetic fields.

Ionising radiation

- ISPESL Circular no. 40 of 3 January 2002.
  New methods for sending documentation relating to workers who have been exposed to ionising radiation pursuant to Legislative Decree 230/1995, as subsequently amended (Legislative Decree 241/2000 and Legislative Decree 257/2001).
- Legislative Decree 230 of 17 March 1995.
  Implementation of Directive 89/618/Euratom, 90/641/Euratom, 92/3/Euratom and 96/29/Euratom on ionising radiation.

AIA Permit

- DSA-DEC-2009-230 of 24 March 2009.
  Integrated environmental authorisation (AIA) permit for Saras SpA to operate its refinery and the IGCC plant.
- Ministerial Decree of 1 October 2008.
  Establishing guidelines for the analysis of economic aspects and cross-media effects for the activities listed in Annex I of Legislative Decree 59 of 18 February 2005.
- Ministerial Decree of 7 February 2007.
  Format and method for submitting an application for a state-issued AIA permit.
- Ministerial Decree of 29 January 2007.
  Establishing guidelines for identifying and applying the best practices in the refining sector for the activities listed in Annex I of Legislative Decree 59 of 18 February 2005.
- Ministerial Decree of 19 April 2006.
  Determination of timescales for submitting an application for an AIA permit for plants falling within the state's responsibility, pursuant to Legislative Decree 59 of 18 February 2005.
- Legislative Decree 59 of 18 February 2005.
  Full implementation of Directive 96/61/EC concerning integrated pollution prevention and control.

In addition, the following laws on health and safety in the workplace and the prevention and control of major-accident hazards are also applicable.

Health and safety in the workplace

Legislative Decree 106 of 3 August 2009.
Supplementary and corrective provisions to Legislative Decree 81 of 9 April 2008 on
health and safety in the workplace
Legislative Decree 81 of 9 April 2008.
Implementation of Art. 1 of Law 123 of 3 August 2007 governing health and safety in the workplace.

Prevention and control of major-accident hazards

- Legislative Decree 139 of 24 July 2009,"Regulation governing the forms of consultation with the population on external emergency plans, pursuant to Art. 20 (6) of Legislative Decree 334 of 17 August 1999".

- Legislative Decree 138 of 26 May 2009, “Regulation governing the forms of consultation with members of staff working in the facility in relation to internal emergency plans, pursuant to Art. 11 (5) of Legislative Decree 334 of 17 August 1999”.
- Circular Letter DC-PST/A4/RE/1008 issued by the Interior Ministry on 15 April 2008.
- Fire prevention procedures in the event of changes to activities subject to major-accident hazards.
- Ministerial Decree of 16 February 2007. Fire resistance classification of products and building materials used in building projects.
- Ordinance of the President of the Council of Ministers 3519 of 28 April 2006. “General criteria for the identification of seismic areas and for the creation and updating of lists of those areas”.
- Decree of 28 February 2006. Implementation of Directive 2004/74/EC incorporating the 29th adaptation to technical progress of Directive 67/548/EEC on the classification, packaging and labelling of dangerous substances.
- Legislative Decree 238 of 21 September 2005. Implementation of Directive 2003/105/EC, which amends Directive 96/82/EC, on the control of major-accident hazards involving dangerous substances.
- Ordinance of the President of the Council of Ministers 3431 of 3 May 2005. Further amendments and integrations to the Ordinance of the President of the Council of Ministers 3274 of 20 March 2003, establishing “Initial aspects relating to the general criteria for the classification of Italy into seismic areas and regulations for building in seismic areas”.
- Decree of the President of the Council of Ministers of 25 February 2005. Guidelines for preparing the external emergency plan pursuant to Art. 20(4) of Legislative Decree 334 of 17 August 1999.
- Legislative Decree 260 of 28 July 2004. Corrective and supplementary provisions to Legislative Decree 65 of 14 March 2003 on the classification, packaging and labelling of dangerous preparations.
- Ordinance of the President of the Council of Ministers 3274 of 20 March 2003. Initial aspects relating to the general criteria for the classification of Italy into seismic areas and regulations for building in seismic areas.
- Legislative Decree 65 of 14 March 2003. Implementation of Directives 1999/45/EC and 2001/60/EC on the classification, packaging and labelling of dangerous preparations.
- Ministerial Decree of 9 January 2003. Amendment of Annex III to the Ministerial Decree of 14 June 2002, implementing Directive 2001/59/EC incorporating the 28th adaptation to technical progress of Directive 67/548/EEC, on the classification, packaging and labelling of dangerous substances.
- Ministerial Decree of 7 September 2002. Implementation of Directive 2001/58/EC on the system of specific information on dangerous substances and preparations introduced onto the market.
- Ministerial Decree of 14 June 2002. Implementation of Directive 2001/59/EC incorporating the 28th adaptation to technical progress of Directive 67/548/EC on the classification, packaging and labelling of dangerous substances.
- Ministerial Decree 293 of 16 May 2001. Implementation of Directive 96/82/EC on the control of major-accident hazards involving dangerous substances.
- Ministerial Decree of 10 May 2001. Storage of LPG in fixed tanks with a total capacity of over 5 m^3 located in plants that are subject to major-accident hazards and are required to submit a safety report.
- Decree of the Ministry of Public Works of 9 May 2001. Minimum safety requirements regarding urban and regional planning for the areas affected by plants subject to major-accident hazards.
- Ministerial Decree of 19 March 2001. Fire prevention procedures for activities involving major-accident hazards.
- Decree of 9 August 2000. Guidelines for implementing a safety management system.
- Decree of 9 August 2000. Identification of changes to plants and deposits, industrial processes, or the nature or quantity of hazardous substances that could increase the underlying level of risk.
- Ministerial Decree of 19 April 2000. Creation of a database of dangerous preparations, implementing Art. 10(2) of Legislative Decree 285 of 16 July 1998.
- Legislative Decree 334 of 17 August 1999. Implementation of Directive 96/82/EC on the control of major-accident hazards involving dangerous substances.

7.
Glossary

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AIA: 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.

ARPA: Agenzie Regionali per la Protezione Ambientale (or regional environmental protection agencies). In April 1993 a referendum resulted in the removal of environmental control and protection powers from Italy's national and local health services. That left a gap that was filled by parliament with Law 61 of 1994 (introduced to enact Decree Law 496/93), which gave these powers to special regional agencies responsible for monitoring and protecting the environment at local level. Law 61/94 also set up ANPA, the national environmental protection agency, today known as APAT, or the agency for environmental protection and technical services. APAT has the task of managing and co-ordinating 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 word used in various contexts to mean "check", or "review". In the environmental management field it refers to a systematic, documented check to objectively assess an organisation's compliance with set environmental management criteria.

Ballast water: water deriving from the ballasting of empty ships with sea water.

CAM (classification of seawater) index: this is the indicator used to monitor the coastal marine environment. The indicator converts the measurements into a summary rating of sea quality, which can be interpreted and assigned to three quality classifications, where quality is understood to mean the degree of eutrophication of the coastal systems and the likelihood of a potential heath or hygiene hazard:
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 the combustion, respiration and decomposition of organic material. Its characteristics include the ability to absorb infrared radiation emitted by the earth's surface, thereby contributing to the greenhouse effect.

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

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

dB(A): the unit of measurement of sound, expressed in logarithmic units (deciBels) and frequency-weighted to take account of the varying sensitivity of the human ear to different sound frequencies ("A-weighting" filter).

Desulphurisation: the process of treating oil fractions in order to reduce the sulphur content in refined products.

EMAS (Eco-Management and Audit Scheme): established by EEC Regulation 1836/93, updated 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 APAT.

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 are measured at the point of issuance.

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.

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, carbon vanadium and nickel.

Frequency index: together with the severity index, this is a commonly-used performance indicator for health and safety in the workplace. With reference to a given period of time, it expresses the ratio of the number of accidents occurring to the number of hours worked (calculated using the formula: number of accidents x 10^6/hours worked).

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

GSE (Gestore dei Servizi Elettrici): a company established by Article 3 of Legislative Decree 79/99 and controlled by the Italian treasury, which provides incentives for the production of electricity from renewable sources and other eligible sources and is responsible for assessing renewable energy plants and their electricity production.

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 1,000,000/hours worked).

INES: Inventario Nazionale delle Emissioni e loro Sorgenti (or national inventory of emissions and their sources). The inventory was 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 inventory contains information on the emissions of Italian industrial sites that are subject to IPPC regulations. The regulations state that such companies must submit qualitative and quantitative data to 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): 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.

kt (kiloton): unit of measurement of mass, equal to 1,000 tons.

kWh (kilowatt-hour): unit of measurement of electricity generated or consumed, equal to the power generated by 1 kW in one hour.

Kyoto Protocol: an executive agreement approved by the Conference of the Parties in Kyoto, 1-10 December 1997, containing the initial decisions on the implementation of some commitments (the most urgent priorities relating to certain sectors of national economies) of the United Nations Framework Convention on Climate Change (UN-FCCC), which was approved in 1992 and ratified by Italy in 1994. The Protocol commits industrialised countries and those whose economies are in a transition phase (eastern European countries) to reduce overall emissions of greenhouse gases (carbon dioxide, methane, nitrogen oxide, hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride) by 5% by 2010.

L90: the level of sound pressure exceeded for 90% of the time for which a noise is measured. This statistical indicator is frequently used to describe the background noise caused by continuous sources over time, as is the case with many continuous-cycle industrial sources.

Major-accident hazard: the probability that an event linked to an uncontrolled development in an industrial activity could give rise to serious danger, either immediate 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. For example, a light bulb may use 0.1 kW (100 watts). 1 MW = 1,000 kW.

MWh (megawatt-hour): unit of measurement of electricity generated or consumed, equal to the power generated 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 (N2) 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. Although it does not yet represent an international standard, OHSAS 18001 certification can be obtained by following a similar procedure to that used for the ISO standards.

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 µ (1 µ = 1 millionth of a metre) can pass through the airways and penetrate the lungs, becoming a potential health hazard depending on the substances that they contain.

ppm (parts per million): unit of measurement of the concentration of a substance present in small quantities in a liquid or gas.

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.

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 1,000/hours worked).

SO_2 (sulphur dioxide): a colourless, pungent gas that is released during the combustion of fossil fuels containing sulphur. In the atmosphere high concentrations of SO_2 are the main cause of acid rain.

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

TSPs (total suspended particulates): these are tiny solid particulates suspended in the air. They mostly comprise uncombusted carbonaceous material able to absorb various types of compound onto its surface. Particulates with a diameter of less than 10 µ (1 µ = 1 millionth of a metre) can pass through the airways and penetrate the lungs, becoming a potential health hazard depending on the substances which they contain.

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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