Saras S.p.A.
Environmental Declaration
2008

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drawn up in accordance with EEC Regulation n° 761/2001

Saras S.p.A.

Registered office and production site: Sarroch (CA), Sardinia, Italy
Located at km 19 of National Route SS 195 "Sulcitana"

General management and administrative office: Milan, Italy
Galleria De Cristoforis, 8

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

Revision 25 July 2008 of the Environmental Declaration of Saras S.p.A.
EMAS registration n°: IT – 000995

The accredited Environmental Inspector that validated Saras's Environmental Declaration pursuant to EEC Regulation 761/2001 is Lloyd's Register Quality Assurance Italy S.r.l.

EMAS accreditation n°: IT-V-0010 of 19/09/2008

This document informs the public and all concerned parties about the following:
- The activities carried out by Saras
- The environmental aspects, direct and indirect, associated with these activities
- The objectives for environmental improvement that the company has set itself

The document is aimed at the communities inside and outside the company, and its objective is to establish a transparent relationship with all the social parties concerned, and specifically the general public, the local authorities and the employees, who are an active party to the correct management of the activities carried out.

The Environmental Declaration will be updated annually and reissued completely in 2011.

The Environmental Declaration was written by:
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Presentation

Environment and production, two areas that were once incompatible, are now two sides of the same coin—inseparable values that are the hallmark of a quality company, and values which Saras has always accorded the same importance.
Caring for the environment and developing people add up to greater production efficiency, and therefore more value created.
The major investments we have made in innovating our systems—the results of expertise, technological assets and human resources matured over forty years of working in our sector—have always been made in full observance of these values.
In the early 1990s we were one of the first to carry out an environmental impact assessment, for a gasification plant for heavy hydrocarbons. Over the following years this monitoring has been transformed into a systematic plan of dedicated activities: the health of the marine environment is constantly examined by periodic analyses, the state of health of the vegetation of all areas is monitored using the most advanced methods, which help to assess the degree of survival of the various different species.
Our deep commitment resulted in our obtaining ISO 14001 Environmental Certification in 2004.
For many years, and well before legislation on maritime traffic (which will come into effect only in 2010), Saras has favoured the use of double-hull vessels. Today over 95% of all ships that operate at the site are double-hulled vessels.
In early 2007 Saras submitted its application for Environmental Integrated Authorisation, which addresses the base concepts of the Environmental Code in which all elements—air, water, soil, and visual impact—are considered together.
In the coming months, two new units will be coming on line: one of these will permit major reductions in SO2 emissions, and the other will allow full production of petrol in observance of the latest European environmental legislation, which came into force on 1 January 2009.
To this program, which is aimed at reconciling economic results, industrial development and environmental sustainability, is now added the objective of obtaining EMAS Registration, which requires the direct involvement of the community and which Saras is certain will represent a further stimulus to achieve levels of excellence.
The Environmental Declaration is the tangible demonstration of Saras's willingness to pursue transparent relations with the community, local authorities, suppliers, customers and, especially, with the workers at the site. It is a tool that collects information and data to give a complete and detailed picture of our company, allowing us to continuously improve the internal and external sharing of our development objectives.

Sarroch, 27 June 2008

General Management
Dario Scaffardi

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A NOTE ON THE TEXT

In this document, which gives a detailed illustration of the Saras company in its activities and interactions with the environment and with the region where it is located, a number of graphical conventions have been adopted for an easier reading experience and to aid in the clear comprehension of the document.
These conventions are presented below.

Opening each chapter is a short introductory section containing the main points of the information that is presented in the following pages: this short paragraph highlight highlights the concepts that are explored in more detail in that section.

In the chapters, the blue headings in the margin are extracts from the main points of information that are discussed on that page.

Similarly, in chapter 4, which contains the data on the principal environmental aspects, the margin notes contain the authoritative references that are cited in the main body of text.

Where appropriate, the text refers the reader to the “Environmental objectives and programmes” table (chapter 5, page 120). This table summarises the improvement objectives and actions to which the company will devote particular attention in the coming years.

Of the charts presented, those with an orange frame contain the measurement of a figure in relation to a limit set by current legislation or authorisation.

Lastly, boxes with a blue border contain information that, although it does not refer directly to Saras or its activities, offer useful information for a better and more complete understanding of the company and the context in which it operates.


SARAS

1.
Presentation of the company

Saras's heart is in Sardinia.

From 1962 to the present day, it has become a Group operating in Italy and internationally with diversified activities: production, distribution and sale of oil products, production of electricity from equivalent and renewable sources, computer services, research and environmental services. Refining, however, remains at the heart of Saras's activities, and Sarroch, in Sardinia, is where Saras was founded over 40 years ago.

The site today is one of the most important in Italy and Europe, in terms of complexity, capacity and production quality. Ours is an industrial site where respect for the environment, health and safety guides every corporate decision, and every corporate decision is taken in a climate of ongoing dialogue with the region.

1. Presentation of the company

1.1 – The Saras Group

Saras Group operates in the energy sector and is one of the principal independent European oil refining companies.

[1,900 employees, 7,000 jobs maintained by Saras's economic impact]

At the end of 2007, the Group had around 1,900 employees, of which 1,250 in the parent company Saras S.p.A., which is the subject of EMAS Registration.

With its head office and production site in Sarroch (where 1,050 are employed) and its administrative and financial office in Milan (200 employees), Saras is the most important employer in Sardinia with over 7,000 jobs being supported by its economic impact.

In recent years, activities in oil refining have been extended to include other activities in the energy sector, specifically the production of electricity:

- Through the construction of the IGCC (Integrated Gasification Combined Cycle[1]) plant, closely integrated with the refining cycle, which annually produces over 4.4 billion kWh of electricity, or over 30% of the regional requirements
- Through the construction of a wind farm generating 72 MW in Ulassai (also in Sardinia)

[a group in constant growth]

With sales at end-2007 of over EUR 6.6 billion (+8% versus 2006), a comparable[2] gross operating margin of EUR 587 million – up by 3% – and an adjusted[3] net profit of EUR 250 million – an increase of 3% compared to end 2006 – Saras is a constantly growing company that can remain highly competitive even during the worst periods in the global economy. Since May 2006, the Group has been listed on the electronic share market of Borsa Italiana, in its Blue Chip segment.

[1] **Combined Cycle Gasification**: the IGCC plant transforms the heavy hydrocarbons, deriving from refinery processing, into electricity.

[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

Saras's production site in Sarroch, located to the southwest of Sardinia's capital, Cagliari, around 20 km from the city, hosts one of the biggest refineries in the Mediterranean in terms of production capacity and is one of Western Europe's "super-sites" in terms of complexity (source: Wood Mackenzie, February 2007).
With a refining capacity of 15 million tons a year (300,000 barrels a day), the Saras refinery represents around 15% of the total distillation capacity in Italy. The refining cycle is integrated with the IGCC plant, used to generate electricity.
Over time the geographic location of the Sarroch production facility has shown itself to be optimal and strategic for trade with the western and central Mediterranean, encompassing both European and North African countries, while the close proximity of the Polimeri Europa and Sasol Italy factories 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 is the parent company and a subsidiary of Angelo Moratti S.a.p.a. It was established in 1962 to carry out refining activities, and today it owns the Sarroch production plant. It has shareholdings in a number of subsidiaries in Italy and abroad, which are briefly described below.

Arcola Petrolifera markets oil products on the Italian wholesale market, in Sardinia and in northern and central Italy.

Sarlux, a company 100% controlled by Saras, is the owner of the IGCC plant. Sarlux manages the sale of electricity produced by the IGCC, while the plant's operational management is entirely Saras's responsibility.

Saras Energia SA distributes oil products in the Spanish retail and wholesale market.

Sardeolica manages the wind farm located in the Municipality of Ulassai (OG).

Akhela is a computer technology company, with significant experience gained in managing the computer systems at the Sarroch refinery. The company develops high-end tools and applications for the automotive, audio processing and avionics sectors.

Sartec (Saras Ricerche e Tecnologie) provides industrial engineering and scientific research services nationally and internationally. Sartec also designs, manufactures and implements modular plants to identify environmental emissions.

1.2 – Saras in Sarroch

[in Sardinia since 1962]

Saras' connection with Sarroch dates back to 1962, when Angelo Moratti identified it as a strategic location for an oil refinery. In 1963 work began on building the refinery plant and systems, and in 1965 work began on refining.

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.

[the IGCC project]

In the mid-1990s, as a result of a major reduction in demand for high-sulphur fuel oils, Saras began a project of great industrial importance centring on the construction of a plant to gasify heavy refining distillates and subsequently cogenerate heat and electricity using a combined cycle (an IGCC plant).

With the coming into operation of the IGCC, the oil production cycle is closely integrated with the electrical cycle, which enables us to maximise the conversion of raw materials into finished oil products and energy.

[technological advances continue]

In the meantime we have continued investing in technological upgrades to the existing plants and improving the environmental qualities of the fuels, and this is also in response to increasingly stringent quality levels set by European legislation. These investments have led to a progressive reduction in the percentage of sulphur in the refinery's oil products and to an improvement in the quality of middle distillates and gasoline.

[new construction initiatives]

Currently, two major projects of great environmental importance are underway: one is aimed at further reducing the sulphur content in petrol (construction of the 800 Unit), in application of the "Autoil"[1] European Directive, and the other is aimed at increasing the recovery of sulphur in the production process (construction of the TGTU[2]).

For more information on these programmes, please see Chapter 5.

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[1] **Legislation references:** European Directive 98/70/EC, modified by European Directive 2003/17/EC, and the following provisions in Italy: Decree of the President of the Council of Minist. n° 434 of 23/11/00, Decree of the President of the Council of Minist. n° 29/2002, Law n° 306 of 31/10/03.

[2] **TGTU:** Tail Gas Treatment Unit (unità di trattamento dei gas di coda)

FIGURE 2. The Saras production site and the surrounding region

The Sarroch industrial estate

The industrial estate that grew up in the Sarroch area in the 1960s has helped create employment and wealth in the region. Around the big industrial names in this estate – like Saras, Polimeri Europa, Sasol Italy, Air Liquide, and Liquigas – over the years many small and medium enterprises in related industries have emerged. They work on the construction and maintenance of the plants in the estate, in the process generating major induced economic effects. Saras maintains industrial exchange relationships with all of these factories.

The facility that unites Polimeri Europa and Sasol Italy was started in the early 1970s, under the name of Saras Chimica (with a partial holding owned by Saras). The name was changed several times over the years, until the current names of Polimeri Europa and Sasol Italy were adopted.

The plants in Polimeri Europa receive their raw materials from Saras and use them for production for the plastics industry. The plants in Sasol Italy also receive raw materials from Saras (mainly diesel and kerosene), from which they derive products used in detergents and bases for synthetic lubricant oils. Air Liquide is a company that produces liquid oxygen, which is used in the plants in Saras (the IGCC plant). Lastly, the Liquigas facility stores and sells LPG received from Saras (figure 10, page 36).

1.3 – The company organisation

The chart shown here gives the internal organisation of Saras S.p.A.
In the diagram, all functions that can have an influence on the management of the Sarroch facility are highlighted. Most of these functions report to General Management, except for the Purchasing and Tenders Service which reports to the Chief Financial Officer, to whom the company's Financial Department and Administrative Department also report. The two elements at the top of the organisation - General Management and the Chief Financial Officer - report directly to the company's Board of Directors.

[operations]

General Management is above the Industrial Operations Department, which directs and coordinates Saras's operations along three main lines:
- Site Facility Management, based in Sarroch
- Engineering and Construction Management, based in Sarroch
- The Group's Health, Safety and Environment (HSE) Service, based in Sarroch

Management of operations conducted at the Sarroch site is the responsibility of the Site Facility Department, which takes care of the functions (listed below) that have a direct influence on the management of environmental aspects (see definition on page 44):
- Product Movement, Shipping and Wharf Production Area, responsible for receiving raw materials, internal movements and shipping of products
- Distillation and Desulphurisation Production Area, responsible for the refining plants
- Conversion and Utilities Area, responsible for the conversion plants and auxiliary services
- Targas Production Area, responsible for the IGCC plant
- Materials Warehouse, responsible for the temporary storage of auxiliary materials and substances.

[other services in the facility]

The above functions are assisted and supported in managing the site and the environmental aspects by the following services at the facility:
- Maintenance Service, responsible for maintenance
- Reliability Engineering Service, responsible for promoting and ensuring the ongoing improvement of the operational reliability and safety of plants and equipment
- The site's Prevention and Protection Service

[the Prevention and Protection Service]

The site's Prevention and Protection Service (PPS), in addition to carrying out the tasks specified in health and safety legislation (Legislative Decree n° 81/2008, article 33), provides support to Management and to the other site functions to observe environmental legislation and to carry out the safety and environmental management systems implemented at the site.
The PPS also controls the organisation for handling emergencies. As well as its own personnel, this organisation also has suitably trained and formally designated personnel who belong to the operational organisations of the various different areas.

[communications]

The internal and external communication processes (paragraph 2.3.2, page 25) are managed and coordinated respectively by the Communications & Image Service and by the Institutional & Media Relations Service, which operate in Sarroch and in Cagliari. Although these services do not report to the Site Facility Department, they do have a functional link to it.

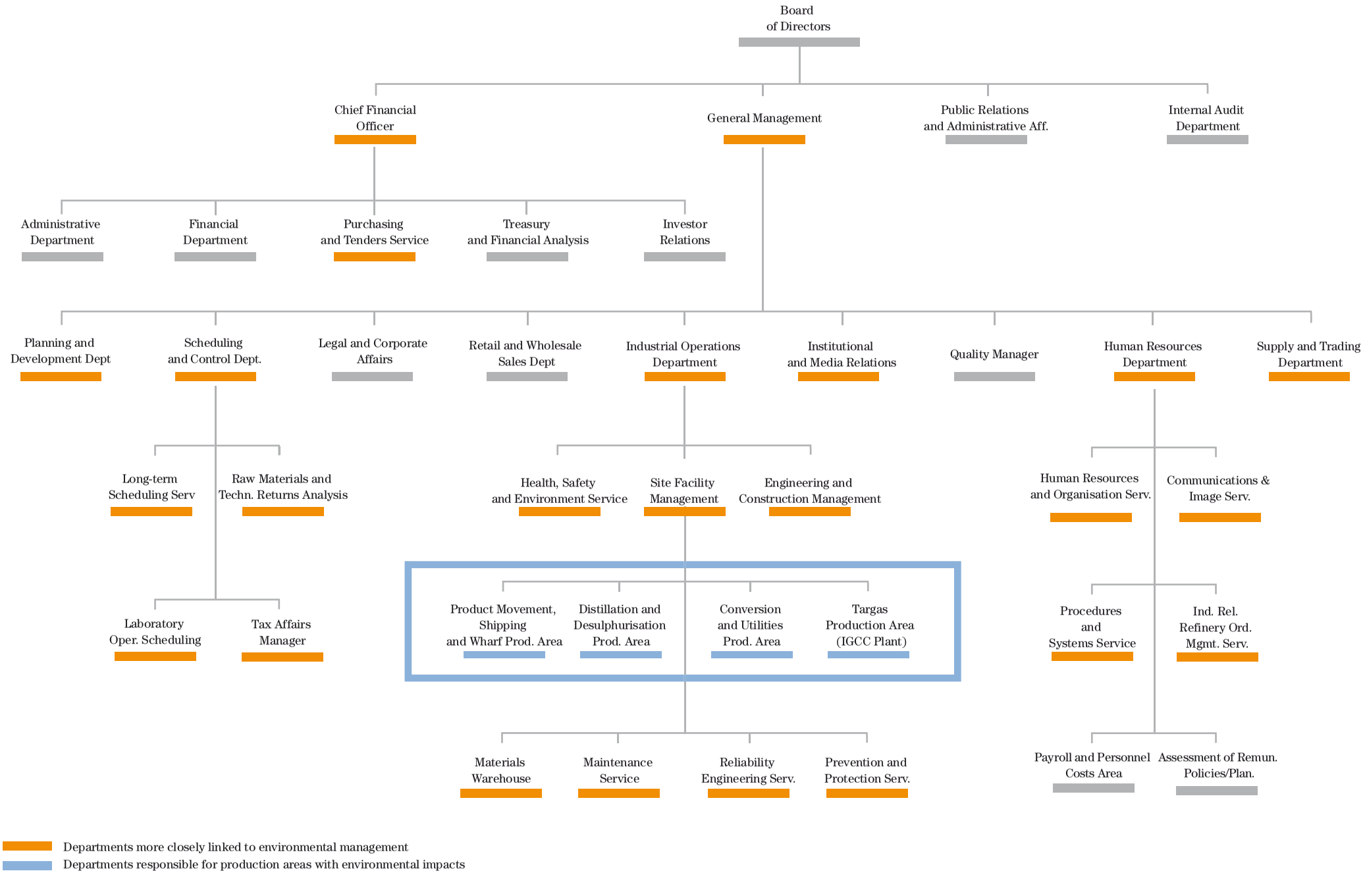


FIGURE 3. Struttura organizzativa della società Saras

1.4 – Object of EMAS registration

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

With reference to Enclosure I, paragraph 3, of EEC Decision n° 2001/681, the object of EMAS registration is the Saras S.p.A. company in its entirety, for the Sarroch site and for the Milan office.
Saras has its registered office at the Sarroch site, and all of its production is carried out there (the extent of the site is indicated by the white outline in figure 2 on page 13).
In 2004 the company obtained environmental certification in accordance with the ISO14001[1] reference standard, issued by Lloyd's Register Quality Assurance Italy.
The activities covered by this certification concern both the Sarroch site and the Milan office. Specifically, they are:

a) On the Sarroch site, the processes of "Production of products from the refining of oil, scheduling, preparation and delivery of finished products, production of electricity. Management of design, engineering and construction of internal plants."
b) At the Milan office, the activities of "Management of design and engineering of internal plants."

All processes and activities that have a direct or indirect influence on the company's environmental management are controlled under the certified Environmental Management System.
It should be pointed out that the Saras activities directly connected to significant environmental aspects are carried out at the Sarroch site, and the environmental aspects of the Milan office are not significant, as was found in the environmental analysis given in paragraph 4.1 on page 44.
Consequently, the principal areas concerned by the environmental aspects of Saras activities are basically located in the Sarroch area and in Cagliari province.

[1] Certificate issued on 1/06/2004 in accordance with ISO standard 14001:1996, subsequently updated to ISO 14001:2004 with LRC certificate n° 180526/14 of 30/07/2007, which expires on 1/06/2010.


SARAS

2.
The commitment to protect the environment, safety and health

Saras's commitment to safety and environmental sustainability is not a recent phenomenon.

The process began many years ago and, in addition to observing legal requirements, it included a search for technical and management solutions that would enable us to go beyond what the law required, to translate our commitment to the region where the site is located into fact.

Important tools adopted along the way include an Environmental Management System certified to ISO 14001 standard in 2004, a Safety Management System certified to OHSAS 18001 standard in 2007, and the consolidation of initiatives for openness and cooperation with the community.

2. The commitment to protect the environment, safety and health

2.1 – Environmental management

The Environmental Management System

[the commitment to ongoing improvement]

The drawing up and public distribution of the Environmental Declaration is part of the process of continually improving our environmental management, which was begun by Saras many years ago:

- In May 2002 all employees were given the company's Environmental Policy, containing the inspiring principles and commitments of Saras's environmental management policy
- Subsequently the Environmental Management System (EMS) Manual was drawn up, together with the related procedures to implement it, thus codifying the actions and conduct for all company personnel
- Objectives for improvement have been defined and approved by the Management Committee. These objectives are verified and updated annually
- Following this, internal audits were conducted to periodically verify that the EMS has been applied correctly

[ISO 14001 certification]

- In June 2004 Saras obtained the certification of its EMS to the ISO 14001:1996 reference standard. Subsequently (in May 2006) certification was obtained to the ISO 14001:2004 reference standard
- In June 2007 the three-year verification of the EMS was carried out, to renew the environmental certification. In addition, as required by the control procedures conducted by certifying body Lloyd's Register Quality Assurance, inspections of the site are carried out every six months by Lloyd's
- In May 2008 the revised Environmental Policy was released (figure 4), and distributed to all direct employees and to all employees of contracting firms working at the site

2.2 – Safety and health management

The Management System for Health and Safety at Work

[health and safety priority commitments]

Saras considers the protection of health and the prevention of all forms of accident or injury (both for its employees and for those of contracting firms) to be primary values, as stated in the Policy for Health and Safety at Work (figure 5 on page 23).

The first Safety Policy was introduced in 1996 and since then Saras has achieved positive results in constantly safeguarding both its employees and the environment. In addition, the implementation of a Management System for Health and Safety at Work (HSW) has introduced performance measurements and the planning of improvement objectives and milestones.

Saras SpA

POLITICA AMBIENTALE SARAS

La SARAS considera il rispetto e la salvaguardia dell'ambiente di primaria importanza per il conseguimento dei propri obiettivi di sviluppo e per una corretta integrazione delle proprie attività nel territorio in cui opera.

I criteri, che sono alla base della gestione delle attività di Saras, prevedono la valutazione preventiva delle possibili conseguenze ambientali di nuove attività e prodotti, l'adozione dei principi, degli standard e delle soluzioni di riferimento che sono quelle indicate nel "BREF per la raffinazione" (Best Available Techniques Reference documents – documento predisposto in applicazione alla direttiva 61/96/CE - Direttiva IPPC: Integrated Pollution Prevention and Control), la massima trasparenza e collaborazione con la collettività esterna e con le autorità, il coinvolgimento e la responsabilizzazione del proprio personale e di quanti accedono al sito sul tema della protezione ambientale.

Attraverso l'introduzione e il mantenimento del Sistema di Gestione Ambientale applicato alle attività di raffinazione e di produzione di energia elettrica nella Raffineria di Sarroch, SARAS vuole garantire un'efficiente e corretta gestione degli impianti e delle attività condotte in sito e conseguire, oltre al dovuto rispetto delle norme vigenti e delle altre prescrizioni sottoscritte dall'azienda, gli obiettivi di miglioramento continuo delle prestazioni ambientali e la prevenzione dell'inquinamento.

La Saras si impegna in particolare a:

- Proseguire nelle attività di riduzione delle emissioni in atmosfera, per garantire il minimo impatto sulla qualità dell'aria
- Proseguire l'attività di prevenzione dell'inquinamento del mare, agendo sui mezzi di trasporto via mare e sul sistema di trattamento degli scarichi idrici
- Minimizzare l'impiego di acqua dolce da fonti esterne
- Migliorare il ciclo di gestione dei rifiuti privilegiando il recupero
- Sviluppare il proprio sistema di monitoraggio delle emissioni e della qualità dell'ambiente
- Migliorare l'accessibilità e la fruibilità dei dati rilevati e degli studi effettuati
- Mitigare gli impatti derivanti dalle proprie attività percepibili dalla comunità circostante.

E' convinzione di Saras che il raggiungimento degli obiettivi di cui sopra sia possibile solo con il contributo attivo di tutto il personale, e su questi temi ha sviluppato un sistema di informazione e formazione continua.

Ogni persona della Saras è direttamente responsabile, durante lo svolgimento delle proprie attività, dell'attuazione della politica ambientale e il comportamento coerente con queste tematiche è uno degli obiettivi individuali e di gruppo.

Gli organi direttivi sono i primi responsabili dell'attuazione di tale politica.

La Saras si è impegnata a diffondere la propria politica ambientale e sollecitarne l'applicazione anche da parte delle imprese appaltatrici, dei fornitori e di qualsiasi altra persona che lavora per conto dell'organizzazione, anche fornendo strumenti di formazione e informazione. La responsabilità, il comportamento e gli atteggiamenti nei confronti degli aspetti ambientali dei soggetti di cui sopra, sono elementi significativi di giudizio della qualità della prestazione resa e, su questi temi, gli stessi dovranno avviare una adeguata formazione e informazione.

La Saras si impegna ad assicurare le risorse umane e tecniche necessarie al raggiungimento e mantenimento della politica ambientale nel sito di Sarroch.

Sarroch, 23 maggio 2008

Saras S.p.A.
Il Direttore Generale

FIGURE 4. Saras Environmental Policy

Saras SpA
SARAS'S 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's 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 to apply the 61/96/EC IPPC Directive: Integrated Pollution Prevention and Control), the utmost transparency and cooperation with the general public and with the authorities, and the involvement and accountability of its personnel and of all those who access the site on the subject of environmental protection.

Through the introduction and maintenance of the Environmental Management System applied to the refining and electricity production activities at the Sarroch Refinery, SARAS aims to guarantee 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 waste water treatment system
- Minimise the use of fresh water from external sources
- Improve the waste management cycle, by favouring recovery
- Develop its own monitoring system for emissions and for environmental quality
- Improve accessibility and usability of the data found and of the studies conducted
- Mitigate the impacts deriving from company activities that can be perceived by the surrounding community.

It is Saras's firm belief that achieving the above goals is only possible with the active contribution of all its people, and to address these issues the company has developed a system of information and ongoing training.
Every person in 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 on 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 to environmental aspects of the abovementioned 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 achieve and maintain the environmental policy at the Sarroch site.

Sarroch, 23 May 2008
Saras S.p.A
The General Manager

[OHSAS 18001 certification]

Following a similar path to that taken by the EMS, in December 2007 Saras obtained certification of its Management System for Health and Safety at Work (HSW) to the OHSAS 18001:2007 standard, issued by Lloyd's Register Quality Assurance Italy[1].
Saras's HSW is integrated with the Management System for the Prevention of Major Hazards, implemented in accordance with the Italian Ministerial Decree of 9 August 2000, to take advantage of the areas they have in common, and a specific Policy for the Prevention of Major Hazards has been drawn up for the Sarroch site (figure 6, page 24).
In the future, Saras's objective is to integrate the Management System for Health and Safety at Work with the Environmental Management System.

Accidents

The principal indicators in the Management System for Health and Safety at Work are the accident indicators.
The indices considered confirm the good results achieved for the ongoing improvement of employee safety, as shown in table 1.

TABLE 1 Accidents

Parameter	2004	2005	2006	2007
INAIL frequency index* (n° accidents per 1,000,000/total n° hours worked)	6.3	5.7	5.7	7.4
Severity index** (n° days lost per 1,000/total n° hours worked)	0.256	0.129	0.120	0.120
Average duration of accidents (days)	32.9	22.8	21.3	16.5

* Accidents of duration longer than 3 days
**Calculated taking the number of days lost due to accidents

The trend in accident indices recorded in recent years is confirmation of the results of the major efforts made by General Management.
In 2007, although the frequency index directly reflecting the number of accidents went up, their severity went down, as shown by the reductions in the severity index and in the average accident duration.

2.3 – Environmental communication

Saras places particular attention and importance on communication, both internally and towards its external stakeholders.

2.3.1 – Internal communication

[involvement of employees]

Internal communications are aimed at increasing the involvement and contribution of Saras's employees, and of the employees of subcontracting firms, in improving the environmental management at the site.
To this end, information tools have been instituted and also information channels, like the "Blu Saras" newsletter which is published every six months in all the Group's companies.
In addition, periodic awareness-raising campaigns and workshops to discuss topics concerning safety, health and the environment are also held for the subcontracting firms, the objective being to encourage and stimulate dialogue and internal feedback.

[1]LRC certificate n° 8180526 of 9/01/2008, which expired on 9/01/2011

POLITICA SALUTE E SICUREZZA SUL LAVORO

SARAS considera la salute e la sicurezza sul lavoro come valore primario e ne assicura la salvaguardia nello svolgimento della propria attività produttiva.

SARAS, oltre al rispetto degli obblighi di legge, si pone come obiettivo il miglioramento continuo e per questo si impegna ad adottare principi, standard e soluzioni che costituiscono le "best practices" del settore.

SARAS si impegna a gestire le proprie attività con l'obiettivo di prevenire incidenti, infortuni e malattie professionali ed in particolare a:

- Garantire che la progettazione, realizzazione e manutenzione di impianti, macchine e attrezzature, destinate al proprio sito proteggano la salute e la sicurezza dei lavoratori;
- Predisporre metodi operativi ed assetti organizzativi sempre più efficaci al fine di preservare la salute e la sicurezza dei lavoratori, dei terzi che accedono al sito e dei componenti della comunità, di cui è parte;
- Comunicare ai dipendenti e ai rappresentanti dei lavoratori i programmi di monitoraggio di igiene industriale e i relativi risultati ottenuti;
- Assicurare a tutti i dipendenti l'informazione e la formazione sui rischi specifici della posizione ricoperta, garantendone l'aggiornamento in occasione di cambio di posizione;
- Assicurare ai terzi che accedono al sito l'informazione e la formazione sui rischi specifici delle attività svolte all'interno dello stabilimento;
- Coinvolgere e responsabilizzare i dipendenti ed il personale delle imprese d'appalto affinché cooperino nel perseguimento degli obiettivi di tutela della salute e della sicurezza;
- Sviluppare un rapporto di costruttiva collaborazione, improntato sulla massima trasparenza e fiducia sia al proprio interno che con la collettività esterna relativamente alle problematiche della salute e della sicurezza.

Ulteriori iniziative di prevenzione a tutela della salute e della sicurezza dei lavoratori saranno attuate anche se non strettamente collegate all'attività del sito.

L'azienda definisce e mantiene attive le modalità per rendere il personale consapevole dell'importanza delle proprie azioni rispetto alla politica ed ai requisiti del Sistema di Gestione della Salute e Sicurezza, evidenziando le conseguenze dell'attività di ogni lavoratore sulla salute e sicurezza.

Gli organi direttivi sono i primi responsabili dell'attuazione di tale politica.

SARAS si impegna a diffondere ai dipendenti, ai fornitori, agli appaltatori e a chiunque acceda al sito la presente politica e a garantire tutte le risorse necessarie (umane, strumentali ed economiche) per renderla operante.
L'attuazione dei suddetti principi, attraverso il Sistema di Gestione della Salute e Sicurezza, ed il comportamento ad essi conforme è obiettivo e responsabilità di tutti i dipendenti dell'organizzazione, ciascuno secondo il proprio ruolo e le proprie responsabilità.

Sarroch, 19 luglio 2007

Il Direttore Generale

FIGURE 5 Saras Policy for Health and Safety at Work

POLICY FOR HEALTH AND SAFETY IN THE WORKPLACE

SARAS considers health and safety in the workplace to be of primary importance and ensures its protection in the execution of its productive activities.
In addition to observing the obligations set out by legislation, SARAS aims at continual improvement and for this reason the company undertakes to adopt principles, standards and solutions that make up the best practices in the sector.

SARAS undertakes to manage its activities with the goal of preventing work-related accidents, injuries and illnesses and in particular it undertakes to:

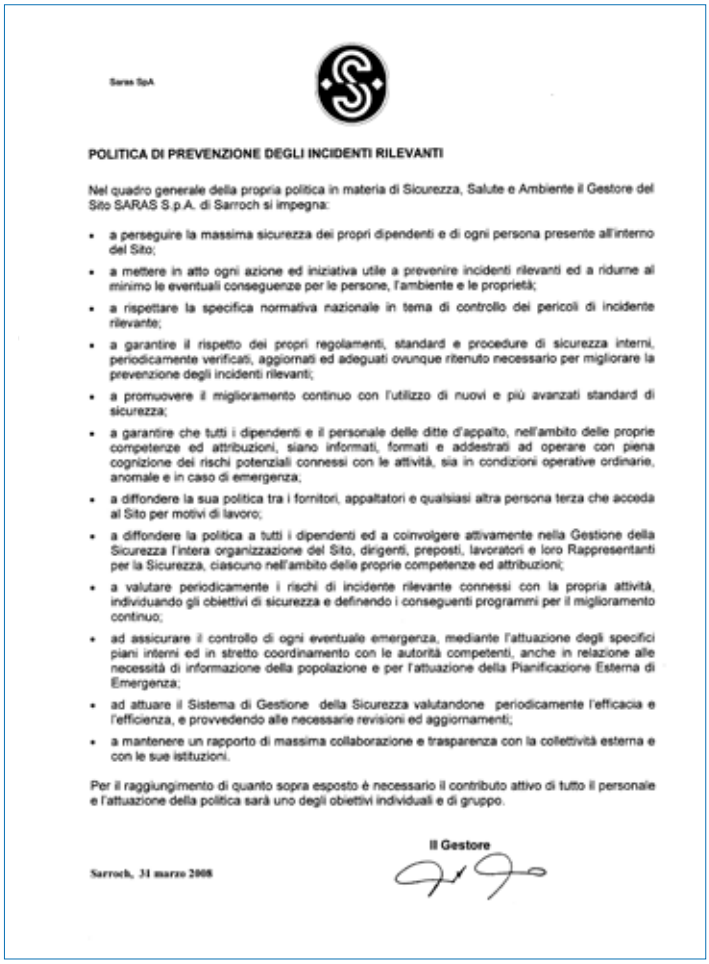
- Ensure that the design, construction and maintenance of plants, machines and equipment destined for its site protect the health and safety of employees
- Draw up increasingly efficient operational methods and organisational structures with the goal of preserving the health and safety of employees, external personnel accessing the site and members of the community, of which Saras is part
- Notify employees and employee representatives of the industrial hygiene monitoring programmes and the results obtained
- Ensure that all employees are provided with information and training on the specific risks inherent in the roles they play, and ensure that employees are updated if they change role
- Ensure external personnel accessing the site are provided with information and training on the specific risks inherent in the activities conducted at the facility
- Involve, and make aware, employees and personnel employed by subcontractors so that they cooperate in the pursuit of the objectives to protect health and safety
- Build up a relationship of constructive cooperation, characterised by the utmost transparency and trust, both within the company and with the general public, regarding the problems associated with health and safety.

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

The company defines, and maintains active, methods to make personnel 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 has on health and safety through their activities.
The management is on the front line of responsibility for putting this policy into practice.

Saras undertakes to distribute this policy to employees, suppliers, contractors and anyone who accesses the site, and undertakes to provide all the necessary resources (human, instrumental and economic) to make the policy operational.
Implementation of the aforementioned principles, through the Health and Safety Management System, and conduct in conformance with it, is the goal and the responsibility of all employees of the organisation, each according to his or her role and responsibilities.
Sarroch, 19 July 2007

The General Manager



Saras SpA

POLITICA DI PREVENZIONE DEGLI INCIDENTI RILEVANTI

Nel quadro generale della propria politica in materia di Sicurezza, Salute e Ambiente il Gestore del Sito SARAS S.p.A. di Sarroch si impegna:

- a perseguire la massima sicurezza dei propri dipendenti e di ogni persona presente all'interno del Sito;
- a mettere in atto ogni azione ed iniziativa utile a prevenire incidenti rilevanti ed a ridurne al minimo le eventuali conseguenze per le persone, l'ambiente e le proprietà;
- a rispettare la specifica normativa nazionale in tema di controllo dei pericoli di incidente rilevante;
- a garantire il rispetto dei propri regolamenti, standard e procedure di sicurezza interni, periodicamente verificati, aggiornati ed adeguati ovunque ritenuto necessario per migliorare la prevenzione degli incidenti rilevanti;
- a promuovere il miglioramento continuo con l'utilizzo di nuovi e più avanzati standard di sicurezza;
- a garantire che tutti i dipendenti e il personale delle ditte d'appalto, nell'ambito delle proprie competenze ed attribuzioni, siano informati, formati e addestrati ad operare con piena cognizione dei rischi potenziali connessi con le attività, sia in condizioni operative ordinarie, anomale e in caso di emergenza;
- a diffondere la sua politica tra i fornitori, appaltatori e qualsiasi altra persona terza che acceda al Sito per motivi di lavoro;
- a diffondere la politica a tutti i dipendenti ed a coinvolgere attivamente nella Gestione della Sicurezza l'intera organizzazione del Sito, dirigenti, preposti, lavoratori e loro Rappresentanti per la Sicurezza, ciascuno nell'ambito delle proprie competenze ed attribuzioni;
- a valutare periodicamente i rischi di incidente rilevante connessi con la propria attività, individuando gli obiettivi di sicurezza e definendo i conseguenti programmi per il miglioramento continuo;
- ad assicurare il controllo di ogni eventuale emergenza, mediante l'attuazione degli specifici piani interni ed in stretto coordinamento con le autorità competenti, anche in relazione alle necessità di informazione della popolazione e per l'attuazione della Pianificazione Esterna di Emergenza;
- ad attuare il Sistema di Gestione della Sicurezza valutandone periodicamente l'efficacia e l'efficienza, e provvedendo alle necessarie revisioni ed aggiornamenti;
- a mantenere un rapporto di massima collaborazione e trasparenza con la collettività esterna e con le sue istituzioni.

Per il raggiungimento di quanto sopra esposto è necessario il contributo attivo di tutto il personale e l'attuazione della politica sarà uno degli obiettivi individuali e di gruppo.

Il Gestore

Sarroch, 31 marzo 2008

FIGURE 6 Policy for the prevention of major hazards

POLICY FOR THE PREVENTION OF MAJOR HAZARDS

In the overall framework of its policy for Safety, Health and the Environment, the Operator of the Saras S.p.A. Refinery in Sarroch undertakes the following:

- To pursue the utmost levels of safety for its employees and for every person present on the Site
- To implement every action and initiative that is useful to preventing major hazards and to reducing to a minimum the possible consequences for persons, the environment and the property
- To observe Italian legislation controlling major accident hazards
- To ensure observance of its internal safety regulations, standards and procedures, which are periodically verified, updated and upgraded wherever and whenever considered necessary, to improve the prevention of major hazards
- To promote continuous improvement through the use of new and more advanced standards of safety
- To ensure that all employees, with respect to their skills and responsibilities, are trained to operate in full knowledge of the potential risks associated with activities, both under ordinary operating conditions and in the event of an emergency
- To distribute the policy to all employees and to actively involve the entire site organisation (executives, managers, employees and their Safety Representatives), each with respect to their skills and responsibilities, in Safety Management
- To distribute the policy to suppliers, subcontractors and any other third party who accesses the site for reasons of work
- To periodically assess the major hazards associated with the company's activity, identifying the safety objectives and defining the consequent programmes for continual improvement
- To ensure control of any emergency, by means of implementing specific internal plans and in close coordination with the respective authorities, including regarding the information needs of the general public and the activation of the External Emergency Plan
- To implement the Safety Management System and periodically assess its effectiveness and efficiency, and make any necessary revisions and updates
- To maintain a relationship of utmost cooperation and transparency with the general public and with public institutions.

To achieve the above-mentioned objectives the active contribution of all personnel will be necessary, and implementing the policy will be an objective at both individual and group level.

The Operator Sarroch, 7 April 2004
SARAS S.p.A.
The Refinery Manager, Antioco Mario Gregu

2.3.2 – External communication

The general public and local communities, authorities, schools, universities, customers and suppliers: for each of these stakeholders, Saras has for some time conducted a series of activities aimed at reinforcing information about the actions taken in line with its environmental commitment.

First and foremost is the Environmental and Safety Report for the site, which has been published since 2003 (it is available on the company website, www.saras.it, in the "Sustainability" section).

[the Environmental and Safety Report]

2.3.2.1 – Open Refinery

[doors open to the region]

In October 2007 the "Open Refinery" event represented an important step in Saras's programme of meeting and dialogue with the local community.

[4,000 visitors]

For the first time ever, the company opened its doors to the public. Over two days, around 4,000 people took guided tours of the plant and systems. Members of the public could avail of specially created areas to find out more about what goes on at the site, with separate programmes designed for adults and children. Saras personnel were on hand to answer visitors' questions and explain what the Group does.

There was also an exhibition of Saras Group's activities and especially the activities carried out at the Sarroch site, with panels, photographs and films. Lastly, there were computer stations where curious visitors could explore topics of interest to them.

Organising the event directly involved over 90 employees of Saras Group, drawn from many areas of the company's business. It was also an important aid to developing teamwork skills and motivation for the personnel, who were closely involved in the planning and implementation of this project.

2.3.2.2 – The Saras School Project

[ccooperation with educational institutions and workshops with children and families]

For the past ten years, the Saras School Project – aimed at children in their final year of primary school in Sarroch and in other nearby municipalities – has been an opportunity to both to work with and get feedback from local educational institutions. It is also an opportunity for dialogue with the children and their families, to give information of interest and to offer the students further opportunities to discuss and find out about energy, the environment, and industrial and professional life at the Saras site.

Other important opportunities include site visits by secondary schools, where students can meet and talk to Saras technicians directly, making these visits reciprocal opportunities for discovery and awareness.

2.3.2.3 – EMAS registration and communication

The road to EMAS registration has led Saras to implement new and specific information and communication initiatives, both internal and external to the facility.

[EMAS and employees at the facility]

To inform employees about this important project and encourage their involvement in it, an information booklet on what EMAS is and what it means for Saras to achieve this objective was distributed to all employees with the payslip for July 2008.

In addition, a system for collecting suggestions was set up, consisting of an "EMAS Space" on the company intranet and a series of notice boards and suggestion boxes ("EMAS Corners") placed throughout the site, where employees of Saras and of subcontracting firms can submit ideas and ask questions about issues to do with health, safety and the environment.

[meeting with representatives of the region]

To share information with and get feedback from communities in the area, meetings are held with the municipal administrations, with environmental associations and with other institutions and associations interested in what Saras is doing in terms of

the environment. Specific meetings are planned for associations in the Municipalities of Sarroch, Villa San Pietro, Pula, and Capoterra and for schools.
Lastly, to encourage and facilitate communications between Saras and the surrounding region, anyone - including individual members of the public - can contact the company to ask questions or request information, using the postal and/or email addresses given at the beginning of this Environmental Declaration.
On the Saras website (www.saras.it) further contact details for specific areas of interest are available on the "Contact Us" page.

2.3.3 – Cooperation with the Municipality of Sarroch and other local institutions

2.3.3.1 – Meetings with local administration

[ongoing feedback]

As mentioned earlier, there is constant and frequent exchange of information and communications between Saras and the Municipality of Sarroch, and some of this is through periodic meetings on topics of mutual interest: protection of the environment, safety, and regional development. There is also frequent contact with other institutions (the Province of Cagliari and the Region of Sardinia).

2.3.3.2 – Initiatives regarding the recent epidemiological study

The requests of the Municipality of Sarroch

[the epidemiological study]

In 2006 the Municipality of Sarroch carried out an epidemiological study of the state of health of the resident population in the municipality, and concentrating specifically on the child population aged under 14.
The results of the study were released at the meeting titled "Sarroch Environment and Health: the Results", held by the Municipality of Sarroch on 9 May 2008.

[the Municipality's guidelines for the companies in the region]

At the same time as the study results were published, the Municipal Administration drew up a number of guidelines for sustainable development, aimed at the industrial companies in its jurisdiction.
The proposal of the Municipality, shared with the Regional and Provincial authorities and by the Sardinia ARPA, can be summed up in the following principal lines:

- Take actions to ensure lower environmental emissions
- Put in place better controls of levels of environmental pollution

Turning to the reduction of emissions, the Municipality has expressed particular emphasis on the following aspects:

- Prevention of peak pollution situations, by defining pre-alarm thresholds and consequent actions to contain the emissions
- Promotion of interventions to reduce small dust particles (PM10, PM2.5)
- Advance application of European standards of air quality for small dust particles

For monitoring, the following are particularly emphasised:

- That the industrial plants in the area be fitted with continuous monitoring systems of atmospheric emissions
- That these systems be properly managed, so as to ensure reliability of operation, reliability of the data collected, and availability of the data for inspection by the control authorities

- That a single monitoring network for air quality be defined in the Sarroch[1] area, paid for by the companies and under public control and management, in order to be able to share objective, certified data

Saras's responses

As for the epidemiological study, Saras followed the development of activities from the beginning of the project and participated proactively in the meetings called by the Authorities.

[Saras's attention and participation]

In particular, in the period April – June 2008, many initiatives were conducted: meetings with representatives of the Municipality of Sarroch, the neighbouring Municipalities, the Province and the Region, and with technicians from the control bodies. These are summarised briefly below.

Date	Initiative	Participants
04/28/2008	Meeting called by the Regional Government – Council Department of Hygiene and Health, on the topic: "Project for sharing a single operational proposal for the Sarroch industrial area". *Saras submitted a document detailing its programmes to reduce atmospheric emissions and to improve the monitoring of emissions and its network for monitoring air quality.*	Region, Municipality of Sarroch, ARPAS, ASL 8 (Health Authority), Saras
05/08/2008	Meeting called by the Provincial Government – Council Department for the Environment, for a programmatic conference on the air quality in the municipalities of Sarroch, Pula, and Villa San Pietro. *Saras submitted a document detailing its programmes to improve the monitoring of emissions and its network for monitoring air quality.*	Province, Municipalities of Sarroch and Pula, Region, ARPAS, ASL 8 (Health Authority), Polimeri Europa, Sasol Italia, Air Liquide, Saras
05/09/2008	Conference held by the Municipality of Sarroch to present the results of the epidemiological study. *Saras sent the press (the Unione Sarda daily, the Videolina TV channel) a document detailing its programmes to improve the monitoring of emissions and its network for monitoring air quality.*	General public, Authorities, Saras
06/03/2008	Meeting called by the Municipality of Sarroch – Environmental Commission on the following topics: *Environmental improvement projects planned by Saras, organisation of meetings with the general public, presentation of Saras's 2007 Environmental and Safety Report.*	Municipality of Sarroch, Saras
06/11/2008	"Expert Group" meeting held by the Provincial Government of Cagliari – Council Department for the Environment, on the air quality in the Municipalities of Sarroch, Villa San Pietro, and Pula. *Discussion of proposals that will be brought during consultation for issuing the Environmental Integrated Authorisation to the companies present. In anticipation: the unification of the air quality monitoring network, avoiding overlapping and bringing the positions of the control units into line with the Regional Plan for Air Quality Restoration, and assigning the tasks of network management and data validation to the ARPAS.*	Province, Region, Municipality of Sarroch, ARPAS, ASL 8 (Health Authority), Polimeri Europa, Sasol Italia, Air Liquide, Saras
06/27/2008	Following the aforementioned meeting, a meeting of the members of the "Expert Group" was held at Saras with a site visit. *Saras submitted documentation on the upgrade projects presented at the time of applying for Environmental Integrated Authorisation.*	Members of the Expert Group

The environmental improvement measures planned by Saras, which have already been presented to the Authorities and to the general public at the meetings mentioned above, are illustrated in Chapter 5.

[table of objectives and interventions, page 123]

The following initiatives for communication in the region are of note:

[new initiatives for dialogue and meetings]

- Participation in meetings with the general public and with local associations, organised by the Municipality of Sarroch (started July 2008)
- Publication in local newspapers of information about the environmental improvement programmes in progress and planned (July 2008)
- Organisation of the second "Open Refinery" event for the general public (November 2008).

[1]Currently there are three air quality monitoring networks in the Sarroch area: a public network, now managed by ARPA Sardegna, a network owned by Saras, and a network owned by Polimeri Europa.

3.
Information about the Sarroch production site

Oil products and electricity from clean technology.

This is what Saras does at its site in Sarroch, and it is the source of products for daily domestic use (vehicle fuels, other fuels, and electricity) and for industrial application.

A facility where over 1,000 employees look after plants and equipment to receive raw materials, process crude and generate electricity, make internal movements and store raw materials and products, and finally ship the finished products and coordinate the support activities performed by external subcontracting firms.

It is a complex system, managed in safety using a dense network of systems and equipment and with constant attention to observing all the legislative authorisations and regulations that regulate the site activities.

3. Information about the Sarroch production site

3.1 – The activities carried out on the site

The activities conducted at the Sarroch site can be functionally divided as follows:

- Reception of raw materials and shipping of products via the marine terminal
- Production of oil products
- Generation of electricity in the IGCC
- Storage of raw materials, liquid products and liquefied gases
- Shipping of products over land
- Auxiliary services (electricity generation in the thermoelectric power plant, inbound water treatment, wastewater treatment)
- Offices, workshops, warehouses
- Activities conducted by contracted firms

figure 7 shows the areas concerned by the various different types of activity carried out within the facility, and the following paragraphs provide a brief description of them.

3.1.1 – Reception of raw materials and shipping of products via the marine terminal

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

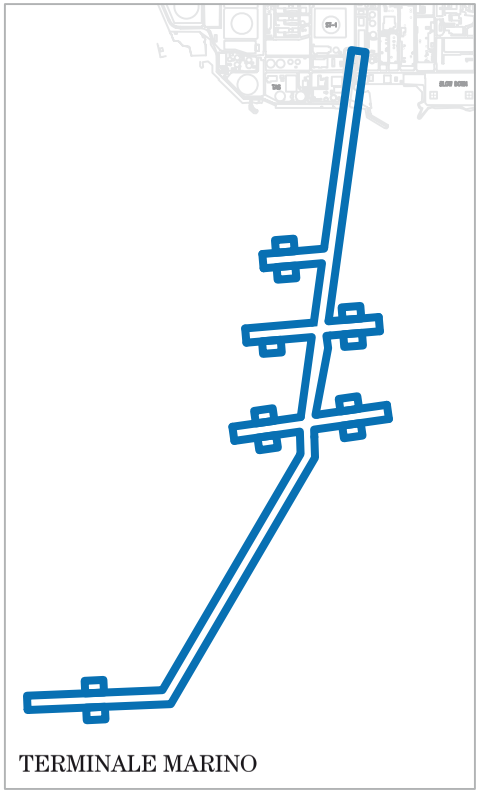
[reception and shipping by sea]

Here all raw materials are received, and from here most oil products are sent. In the three-year period 2005-2007, the percentage of oil products shipped by sea was 79%.
The terminal has eleven independent docking berths, nine of which are for shipping finished oil products and receiving semi-finished products, and can receive oil tankers of up to 65,000 tons, and the remaining two are for receiving raw materials, and can receive oil tankers of up to 300,000 tons. 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 pick-up of crude oils.

[ongoing control of operations and of ships]

The various docking berths can operate simultaneously, thus reducing waiting times for anchored ships. Advanced monitoring systems ensure that all loading and unloading operations take place under conditions of the utmost safety: the phases of docking and mooring of ships and their connection to loading booms to transfer raw materials and finished products from land to ship and vice versa are carried out under continuous surveillance. To be permitted to dock at the Saras marine terminal, all incoming ships must observe high safety standards conforming to internationally-recognised criteria, to which are added requirements defined by Saras (paragraph 4.3.2, page 113). A dedicated control room, which is manned and operational 24 hours a day, is in continuous radio contact with the ships operating in the terminal, and ensures that all operations fully comply with all safety and environmental protection requirements.

FIGURE 7. General plan of the Saras site



3.1.2 – Production of oil products

The production process is graphically illustrated in the simplified diagram given in figure 8 and it takes place through the following units:

- Distillation plants for atmospheric distillation (topping) and vacuum distillation of raw materials to produce the primary fractions
- Conversion plants (visbreaking, mild hydrocracking 1 and 2, fluid catalytic cracking or FCC), which perform the transformation of heavy hydrocarbons and distillates into middle/light fractions. Heavy hydrocarbons are sent from the visbreaking plant to the IGCC plant
- Catalytic reforming plant (CCR), which transforms the light distillates (naphtha) into high-octane components, simultaneously producing hydrogen which is used in desulphurisation treatments
- Plants for improving the technical characteristics (alkylation) and performance (Tert–Anyl–Methyl Ether plant or TAME) of petrols
- Desulphurisation plants, which subject middle distillates (kerosene and diesel) to catalytic hydrogenation processes to remove the sulphur and improve product quality
- Plants to recover the sulphur and convert it to solid form for sale
- Plants for treating non-condensible fuel gas to remove sulphurised compounds and subsequently reuse the gas for internal use

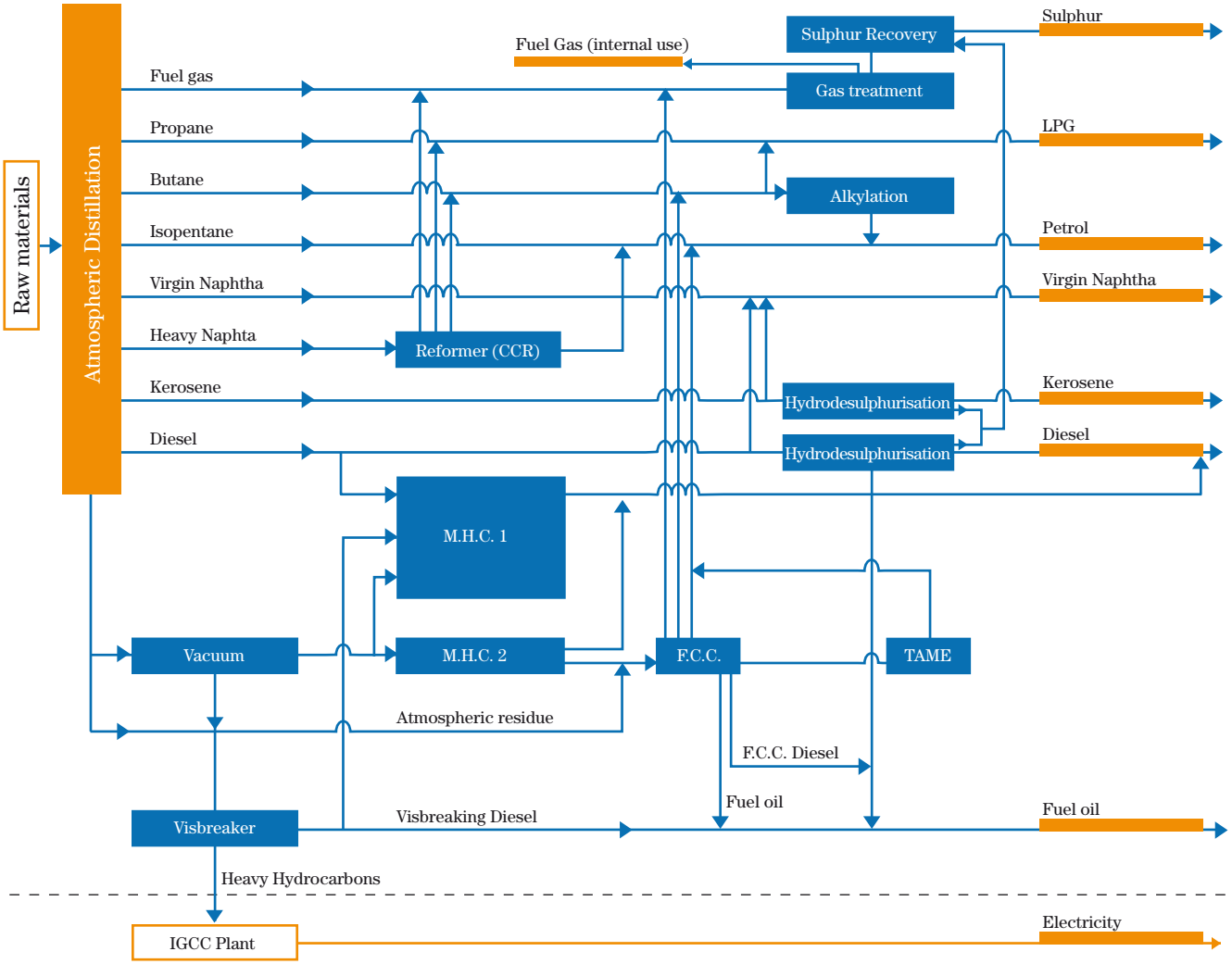


FIGURE 8 Production cycle at the Saras site: oil products and production of electricity

[oil products]

Oil production at the Sarroch facility has a high yield of medium products (diesels) and light products (LPG, naphtha, petrol), which in 2007 represented overall around 80% of total production, as shown in table 2 which gives the production figures for the four-year period, 2004 – 2007.

TABLE 2 Oil products (t/year)

	2004	2005	2006	2007
LPG	360,000	363,000	341,000	323,000
Gasoline	2,890,000	3,036,000	2,945,000	3,110,000
Virgin Naphtha	789,000	873,000	936;000	916,000
Kerosene	290,000	449,000	388,000	467,000
Diesel	6,174,000	6,423,000	6,713,000	6,813,000
Fuel oil	1,567,000	1,149,000	1,033,000	788,000
Sulphur*	114,000	106,000	111,000	112,000
Heavy hydrocarbons in IGCC	1,250,769	1,172,874	1,217,391	1,190,195

* Includes recovered sulphur, both from refining and from the IGCC.

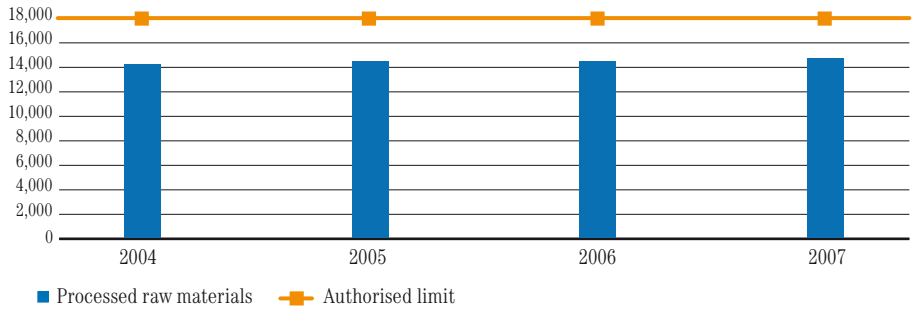
[Saras at the centre of the Mediterranean]

The raw materials come mainly from the Mediterranean area (North Africa and the Middle East) and, less frequently, from Northern Europe and Russia.
The primary, but not sole destination of refinery products is the central and western Mediterranean basin. During the three-year period 2005-2007, almost a quarter of total production of oil products was absorbed by the regional market.
To show the trend of refinery processing for the 2004-2007 period, chart T3 shows the trend in annual production compared with the maximum authorised quantity (18 million tons/year) specified by the Concession to Process Mineral Oils for the refinery (Decree of Italian Ministry for Productive Activities n° 17086 of 07/07/2003).

TABLE 3 Processed raw materials (kt/year)

2004	2005	2006	2007
14,113	14,423	14,515	14,593

CHART T3 (kt/year)



3.1.3 – Power generation

[electricity, hydrogen, steam]

The IGCC (Integrated Gasification Combined Cycle) plant produces electricity, hydrogen, steam and sulphur from the heavy hydrocarbons deriving from the refining process, and overall it is recognised as one of the best available techniques for the refining sector.

As shown in figure 9, the plant is divided into two main sections:

- Gasification
- Combined cycle

In the gasification section, using oxygen supplied by the Air Liquide facility, the heavy hydrocarbons deriving from the visbreaking plant are transformed into a synthesis gas (abbreviated to "syngas") which, purged of the sulphur and metals contained in it, is then burned in the combined-cycle section.

[electricity to the external distribution grid]

The electricity is produced on three identical lines, each comprising a gas turbine, a steam recovery boiler and a steam turbine. The three lines have an overall net rated power of 551 electrical MW, and the electricity is sold to GSE (Gestore Servizi Elettrici, the operator of the national electricity transmission grid). Part of the steam produced and not used to generate electricity, and the hydrogen deriving from the gasification section, are sent to the refinery for use in the refining process.

As with the sulphur recovered from the refining cycle, the sulphur recovered by removing sulphuric acid from the syngas is sold (see table 4 for figures).

[recovery of metals]

The metals removed from the syngas go to create a metal sediment known as "vanadium concentrate" or "filter cake", and this is sent to external plants to recover the metals. Hence the operation of the IGCC plant enables the Saras production site both to maximise the conversion of raw materials into products of value, and also to minimise the generation of waste.

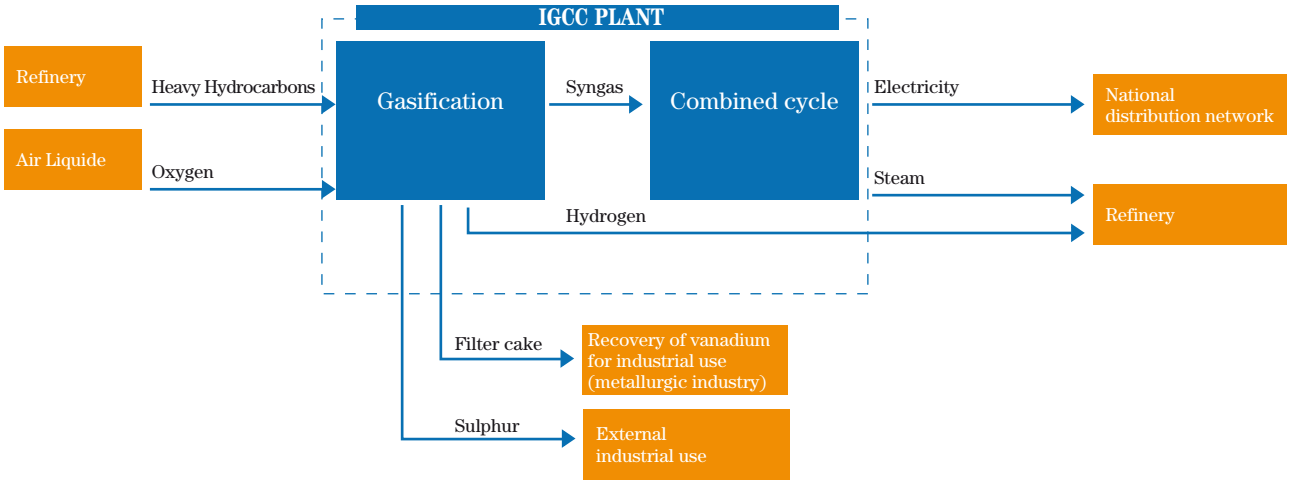


FIGURE 9 The IGCC plant: flow chart

Table 4 gives the production figures for the IGCC for the last four years

TABLE 4 IGCC products

	2004	2005	2006	2007
Electricity (kWh)	4,372,651,530	4,363,035,390	4,473,702,675	4,432,135,634
Low-pressure steam (t/year)	586,864	590,262	608,042	556,828
Medium-pressure steam (t/year)	623,804	702,237	677,703	568,650
Hydrogen (kNm3)	300,596	285,652	360,220	307,083
Sulphur* (t/year)	46,892	53,821	48,184	42,589

*The quantity shown is included in the amount given in Table 2 on page 33, "Oil products"

[efficiency and reliability of the IGCC]

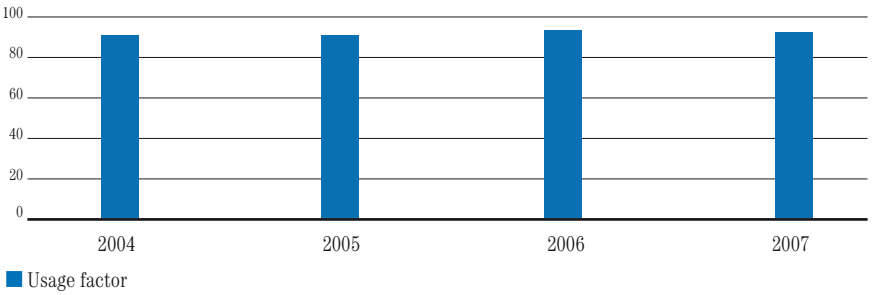
The three-line configuration of the IGCC plant ensures continuity of production, both of electricity and of hydrogen & steam for site internal use. The figures recorded to date confirm the effectiveness of the plant processes and technology, which have shown themselves to be of superior reliability, on average greater than 90%, as shown in table 5 and chart T5.

TABLE 5 The IGCC plant: usage factor

Indicator	2004	2005	2006	2007
Energy produced / that can be produced* (%)	90.0	90.0	92.7	91.5

*Energy that can be produced is calculated by multiplying the available power by the maximum number of hours in 1 year.

CHART T5 (%)



3.1.4 – 3.1.4 – Storage of raw materials and products

The storage facilities on the site are subdivided 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 Deposit which is located outside the "bonded area" beyond National Route n° SS 195
- Storage of liquefied gas in special pressurised tanks ("spheres" and "cigars")

Overall, there are 161 tanks with an overall capacity of approximately 3.8 million cubic metres.

All tanks are fitted with permanent fire-prevention systems and containment basins of reinforced concrete (30 tanks), or with earthworks (131 tanks).

[extensive and widespread safety systems]

The fire prevention system in the liquefied petroleum gas (LPG) storage area 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 fires, the LPG tanks are also equipped with instrumentation that monitors and protects against unexpected pressure surges.

Internal site movement of raw materials and products – between plants, storage areas and for shipping – is done using the following systems and equipment:

- Pumping lines and systems, including oil pipelines connecting to the National Deposit and to the marine terminal
- Systems for measurement and additivation of products before shipping
- Land-loading systems (loading bays)
- Sea-loading systems (marine terminal equipment)

3.1.5 – Shipping of products over land

Products are shipped over land by means of special loading gantries for tanker trucks:

- A gantry with 3 loading points for LPG and 12 loading lanes for liquid products (kerosene, diesel and fuel oil), located near the facility's manned gatehouse
- 10 loading lanes for petrol and diesel, located in the National Deposit.

[the synergy between the companies in the Sarroch petrochemical industry]

The Saras site is connected to the National Deposit and the Liquigas Deposit by gas pipeline, and to the adjacent petrochemical facility by oil pipeline, for commercial exchange of semi-processed products and services (figure 10).

3.1.6 – Servizi ausiliari

The facility is equipped with the following units, which provide services which are necessary to the production cycle:

- Thermoelectric power plant for the refining cycle. This produces an amount of electricity and steam that is necessary for the processes
- Air compression system, comprising 4 compressors and 2 distribution networks, one for the instrumentation and one for services
- Unit for treating water brought in to the site (taken from the industrial aqueduct)
- Treatment plant for the wastewater generated by site activities (Process-Water Purification plant, PWP)

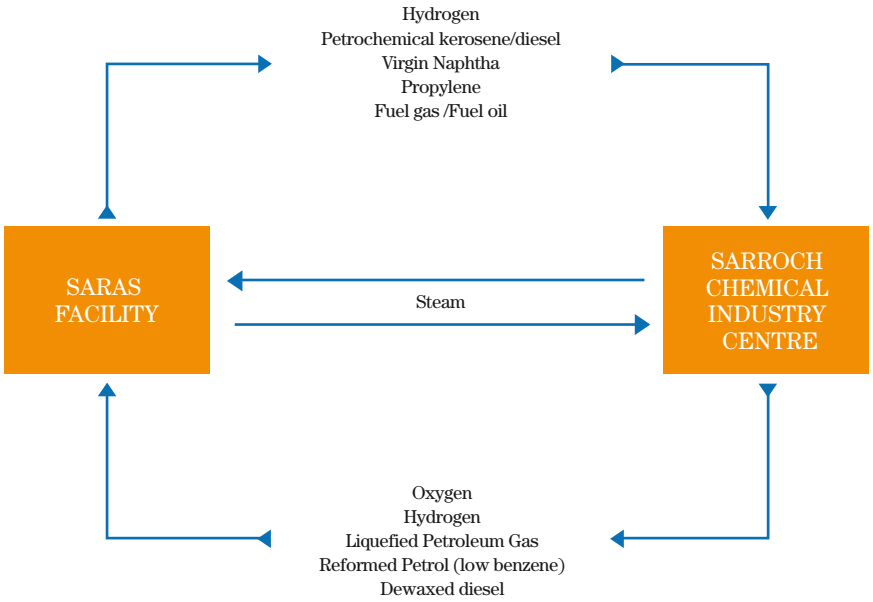


figure 10 Synergy between the Saras facility and the adjacent centre of chemical industry

Internal infrastructures enable the distribution of services (water, steam, electricity, fuels, and nitrogen), and the collection of wastewater to be sent to the treatment plant before being discharged into the sea.

3.1.7 – Offices, workshops, warehouses and other services

The office buildings are located beside the production area. Opposite the offices are the mechanical workshop, the electrical workshop and part of the warehousing space, where auxiliary substances and consumables are stored while waiting to be sent to where they are needed.
Other areas designated for storing materials (pipe fleet) are in the centre of the tank farm and in the National Deposit. In addition, in the office zone there are other general services such as the canteen and the medical centre.

3.1.8 – Activities conducted by contracted firms

Contracted firms which continually carry out activities at the Saras site (maintenance, construction, mechanical & instrumentation controls etc.) have a logistics base on-site in designated, dedicated areas, allowing these firms to optimise the execution of their work and reduce the need for external movements. There are two external companies with which Saras has a long term working relationship. These companies handle waste for managing the waste inertisation plant, and they manage an area where materials (mainly ferrous and electrical) are selected and recovered (paragraph 4.2.8).

3.2 – Authorisation status of Sarroch site

3.2.1 – The Environmental Integrated Authorisation

With the coming into force of European Community directive 96/61/EC, concerning Integrated Pollution Prevention and Control (IPPC) – implemented in Italy with Legislative Decree n° 59 of 18 February 2005 – the Environmental Integrated Authorisation (EIA) has replaced and integrated the principal environmental authorisations, i.e. those for atmospheric emissions, wastewater discharges and waste treatment.
On 26 January 2007, Saras submitted its EIA application to the Sardinia Regional Government to bring its "Refinery + IGCC" complex into line with the new legislation, and in October 2007 the process was begun.

[January 2007: submission of EIA application]

The application was amply supported by documentation, including a description of the production cycle and its environmental aspects, an analysis and assessment of the state of application of the best available techniques and the proposed measures for improvement.
The investigating commission – made up of representatives of the Ministry for the Environment, the Regional Government, the local Provincial Government and Municipality, and technicians from APAT – requested additional information, which was submitted in April 2008. The process is still underway as of the time of writing.

**[February 2008: request for additional information
April 2008: submission of additional information]**

In the documentation enclosed with the EIA application, Saras presented the measures for environmental improvement that it is committed to implementing. The principal measures address the following areas:

- Increasing the yield of the sulphur recovery plant and increasing the abatement of sulphur emissions, by adding a new section to the tail gas treatment unit (TGTU). This project will reduce emissions of sulphur dioxide, which are estimated to represent 30 % of the site's current emissions.

[table of objectives and interventions, objective n° 1, page 123]

[table of objectives and interventions, objective n° 2, page 123]

[table of objectives and interventions, objectives n° 3 and 4, page 123]

[table of objectives and interventions, objective n° 6, page 123]

- Recovering thermal energy and consequently reducing consumption of fuel oil
- Conducting a feasibility study on the ducting of emissions from 100% of the plants in the refining cycle that use fuel oil to a new centralised smokestack, and extension of the continuous monitoring of emissions by the refining cycle
- Installing systems for containing volatile hydrocarbon emissions given off by the tanks; monitoring and measures to repair sources of escaped emissions caused by sealing system components, i.e. flanges, valves etc.

3.2.2 – Existing authorisations

Refining activities at the site are carried out in accordance with the "Concession to Process Mineral Oils", the latest update to which was the Decree of the Minister for Productive Activities on 7/07/2003.

Although Saras is waiting for the EIA to be issued, it already has some existing environmental authorisations. These are as follows:

- Authorisation n° 445 of 22/11/2004, issued to Saras by the Province of Cagliari.
  The authorisation is for discharging water from the facility into the sea and into the Rio Mascheroni channel.
- Judgement of environmental compatibility of the IGCC project, n° DEC/EIA/2025 of 28/12/1994 issued by the Ministry for the Environment, supplemented by the letter ref. n° 854/05/SIAR of the Ministry for the Environment.
  The provisions contain the opinion in favour of building the IGCC and give specifications concerning, in particular, emissions into the atmosphere from the IGCC and from the entire facility.
- Decision n° 2510/IV of 04/11/2004 and Decision n° 964/IV of 31/05/2005 (supplement to the previous Decision), issued to Saras by the Sardinia Regional Government.
  The provisions authorise the treatment of water contaminated by hydrocarbons, to be carried out in the BWT (Ballast Water Treatment) plant. The BWT plant can treat the bilge water collected in the ships' hulls, the ballast water and the water used to wash oil tankers, and the water pumped from wells in the safety containment hydraulic barrier on the Saras site.

3.3 – Plans and procedures for handling emergencies

The Refinery's Safety Report

The activities carried out on site involve the presence and use of substances with which different characteristics and danger levels are associated.

[1989: the first Safety Report]

In 1989, following the coming into force of the Italian legislation implementing the first European directive for "major hazard" facilities, Saras drew up the 1st Safety Report for the activities carried out at the Sarroch site.

[an in-depth analysis of risk]

To draft the site Safety Report, the company carried out an exacting and in-depth analysis of its activities, with regard to their associated risk deriving from the processes and from the substances used.

[Legislative Decree n° 334/99]

Since then the document has been continually updated, in accordance with the applicable legislation (currently this is Legislative Decree n° 334/99 and subsequent modifications and supplements, which requires five-yearly updates), and with the goal of documenting all plant variations carried out over time.

The Safety Report studies all types of dangerous substance, characterised by varying degrees of flammability (e.g. crudes, petrol, liquefied petroleum gas or LPG), toxicity (e.g. hydrogen sulphide), and danger to the environment (e.g. diesel, kerosene).

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

Based on the quantities and types of substances present and on the processes in which they are used, possible events and accident scenarios have been identified, such as fires, explosions, toxic gas clouds, and spills of dangerous substances on the soil or into the sea. The potential consequences of the accident scenarios identified have been studied, in terms of impact on the safety of persons, inside and outside the site, and on the environment. Currently, analysis of possible accident scenarios has led to the exclusion of their being able to have significant consequences outside the site. Any involvement of external areas is limited to one area, towards National Route SS 195, where there are inhabited settlements.
At the marine terminal, limited quantities of hydrocarbons can be potentially spilled or leaked into the sea. To effectively combat the effects of a possible spill into the sea, vehicles and equipment are available internally for prompt intervention. This is briefly discussed on page 41.

[2005: five-yearly update of the Safety Report]

In October 2005, Saras S.p.A. submitted its five-yearly update of the Safety Report, in fulfilment of the provisions of Article 8 of Legislative Decree n° 334/99, and at the same time the company sent the local Municipality an information card which was intended for the general public.

[December 2006: last update to the Safety Report]

In accordance with the provisions of Article 23 of Legislative Decree n° 238/05, which modified and supplemented Legislative Decree n° 334/99, in December 2006 Saras submitted the update of its Safety Report – including the state of progress of the recommendations made by the Sardinia CTR in the investigative phase of the Refinery's Safety Report (October 2000 edition) – and sent the Municipality of Sarroch an updated version of the information card intended for the general public.

[The investigation of the Regional Technical Committee, CTR]

On completion of the investigation phase, the Sardinia Regional Technical Committee for Fire Prevention (known by its Italian acronym, CTR) expressed its Final Technical Evaluations on the cited Safety Report (October 2005 edition) and subsequent supplements, as per the report ref. n° 4921/P12 of the session of 19/07/2007. The conclusions state:

[omitted]
In acknowledging the measures executed, those currently being executed and those planned, we consider that the company has positively followed up on the recommendations made by the CTR upon conclusion of the investigation of the Safety Report (2000 edition) and has, on its own initiative, put in place plant/procedural solutions which have contributed or will contribute to implementing the level of safety overall.
However, as found previously, a number of issues require further investigation and a number of the measures executed or planned could be further improved.
That apart, it is in the company's interest to take action to verify the above, specified in detail according to the priorities identified on the basis of the critical importance of the individual measures, and to provide prompt notification of said action, in whole or in part.
[omitted]

[May 2008 – October 2010: a programme of interventive measures]

In June 2008, Saras notified CTR of the measures taken in the period October 2006–May 2008, with reference to the recommendations received, and the measures planned for the period May 2008–October 2010. On completion of the planned activities, in accordance with Ministerial Decree n° 19/03/2001 concerning fire prevention procedures for major hazard activities, Saras shall submit an application to the Fire Brigade of the Sardinia Region for its Fire Prevention Certificate.

Internal Emergency Plan (IEP)

[effectiveness of intervention thanks to people and equipment]

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 people and vehicles.

The objective of the IEP is to ensure the company reacts as effectively as possible to accidents by:

[prevent and control]

- Preventing and limiting injury and providing assistance to anyone hurt
- Bringing accidents under control and limiting their effects
- Preventing and minimising environmental damage
- Preventing and minimising damage to company property

The IEP also includes the Marine Pollution Prevention Plan, drawn up to deal with emergencies resulting from oil spills into the sea or other critical events that could occur at the site's marine facilities.

[classification of emergencies]

Based on the content of the Refinery's Safety Report, the IEP defines the criteria for a reportable accident, and distinguishes between three types (i.e. three levels) of emergency:

- Limited emergency: an accidental event limited to a well-defined area
- General emergency: an accidental event with the potential to spread to other areas, inside and/or outside the site
- Near accidents: events that potentially could lead to accidents, and for which analysis is essential for the prevention of future accidents

Table 6 gives the data for emergencies recorded in the four year period, 2004 – 2007.

TABLE 6 Emergencies

Parameter	2004	2005	2006	2007
N° of General Emergencies	9	7	4	6
N° of Limited Emergencies	25	25	27	21

In 2007 six General Emergencies were recorded, all of which were managed in accordance with the facility's Internal Emergency Plan, involving only the internal organisation and without resorting to outside assistance. The emergencies always affected limited areas of the facility only, and never generated accidents and/or significant environmental impacts, directly or indirectly. It should also be noted that the duration of the Emergencies never exceeded twenty minutes.

[extensive internal communication system]

Tools for communications and reporting are distributed throughout the refinery area (fire alarm buttons, telephones, radio receiver/transmitters both fixed and portable), which employees can use to obtain a real-time emergency response from the employees reporting to the Emergency Coordination Centre. The Centre notifies and informs external bodies with an interest in the emergency (fire brigade, the Prefecture, adjacent industrial sites, the Municipality of Sarroch, the carabinieri (police) of Sarroch, the Italian State Police and the Port Authority) and provides them with constant updates on the developing situation, until the emergency is completely dealt with.

External Emergency Plan (EEP)

[a plan for the entire industrial area of Sarroch]

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

The plan concerns the Sarroch industrial complex as a whole, and considers hypothetical accidents affecting sites belonging to the various companies located there (Saras, Polimeri Europa, Sasol Italy, ENI, 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, especially 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 intervention by all company and third-party personnel with responsibilities for the various roles required to deal with the emergency, such as direct management of internal accidents at the site, control and monitoring of the surrounding area, dissemination of information to external authorities and services, and providing assistance for local residents (road management, health services, information media etc.).

[a programme of regular drills]

The effectiveness of the EEP and its implementation is monitored via accident response exercises involving the companies and organisations responsible. The EEP currently in place was last reviewed in September 2005.

Safety systems at the facility

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

[the fire prevention/fighting network]

The water distribution system for fires comprises an extensive network that covers the whole plant. All the storage tanks are protected by cooling systems; the most critical 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.

[cooling systems on the tanks]

[7 fire tenders]

The facility also has seven fast and easily manoeuvrable fire trucks carrying powder and foam extinguishers, which can be operated quickly in emergencies and act as a backup to the fixed systems installed. Safety equipment and systems are regularly checked, and carefully and routinely maintained.

[rapid intervention seagoing vessels]

In the event of a spill into the sea, vehicles and equipment are available to deal rapidly with the accident, following procedures laid down in the Internal Emergency Plan, which as stated previously includes the Marine Pollution Prevention Plan.

The facility has 4 vessels, which are operational 24 hours a day, and a wide range of equipment (skimmers, floating booms etc.), all of which ensure the facility's full and rapid capacity to respond to and contain and collect any product spills.

4.
The environmental aspects

Completeness, correctness and transparency of information are the principal basis for any dialogue.

Here, Saras presents all the necessary data to understand how it interacts with the environment and the region. This information and these figures show the improvement that has been achieved over time, and the areas in which we are working towards other improvements expected in the years to come: these are the fruit of technology and management choices that have always aimed at making simultaneous progress in safety, health, the environment, and quality of production.

This is an investment in clarity and completeness that will, over time, allow us to continue to conduct dialogue that is clear and definite, to give the local population the answers they expect.

4.
The environmental aspects

4.1 – General

[the environmental analysis]

In accordance with the EMAS Regulation (761/2001/EC), modified by Regulation 196/2006/EC, a complete environmental analysis has been conducted of the activities carried out by Saras under normal operational conditions, as well as anomalous and emergency conditions. The environmental analysis, which is updated periodically and whenever changes occur, is illustrated in a special document which is available for consultation at the facility's Prevention and Protection Service.

Definitions of Regulation 761/2001/EC
Environmental aspect: *element of an activity, product or service of an organisation which can interact with 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, positive or negative, deriving in whole or in part from the activities, products or services of an organisation.*

[the environmental aspects]

With reference to Enclosure VI of the EMAS Regulation, the direct and indirect environmental aspects of Saras's activities have been identified, and of these the significant aspects have been identified. Direct environmental impacts are those on which the organisation can exert control to manage them. Examples of direct aspects are: atmospheric emissions and wastewater discharges.
Indirect environmental impacts are those on which the organisation can exert an influence, although it does not control them directly. Examples of indirect aspects are: transport of raw materials and products.

In normal operating conditions, the significance of each environmental aspect has been evaluated on the basis of the following criteria:
- Extent of the impact on the environment
- Presence of legislation, authorisations and other regulations to be observed
- Sensitivity of the general public to the issue in question

Anomalous and emergency events that can give rise to major hazards, such as fires, explosions, and spills into the sea, have been analysed and assessed in the Safety Report (described in paragraph 3.3, page 38).

Other types of anomalous or emergency event, which are not included in the category of events that could generate major hazards, have however been identified in the Environmental Analysis and have been assessed based on an estimate of their probability of occurrence and their potential consequences.

In the past no accidents have occurred, nor have environmental responsibilities arisen such to determine significant impacts at the present time, with the exception of accidental spills on soil and subsoil, which are discussed in paragraph 4.2.7, page 99.

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

Significant direct environmental aspects
Consumption of raw materials
Energy consumption (fuels, electricity)
Water consumption
Atmospheric emissions
Waste
Emissions into water
Spills on soil and subsoil (past activities, prevention activities)
Noise
Odours
Visual impact

For indirect environmental aspects, the degree of influence that Saras can indirectly exercise to control these aspects has been evaluated. The evaluation conducted has led to the identification of the following indirect environmental aspects as significant:

Significant indirect environmental aspects
Product design and development
Road transport (of products, materials and substances, of employees of Saras and of external companies)
Sea transport (of raw materials and products)
Environmental conduct of third-party firms

The environmental aspects identified as significant all refer to the Sarroch production site. Assessment of the significance of environmental aspects for the office in Milan has resulted in their being identified as negligible with regard to Saras's activities, and also with regard to the office's location (the city of Milan).

The table on the following page shows the correlation between the significant environmental aspects for the Sarroch site and the consequent environmental impacts.

Significant direct environmental aspects	Environmental impacts
Raw materials	
Consumption	Consumption of a non-renewable resource
Storage and use	Risk of accidents (fires, explosions, spills on soil and into the sea)
Consumption of energy in the form of	
Self-produced fuels	Atmospheric emissions from the site and consequent impacts
Electricity purchased	Indirect impacts in external sites producing electricity
Water consumption	
Seawater desalinated internally	Energy consumption and visual impact
Water from industrial aqueduct	Consumption of local natural resources
Atmospheric emissions	Influence on air quality on the local scale
	Contributions to large-scale effects (greenhouse effect, acid rain)
Waste	
On-site internal deposit and treatment	Indirect impacts in external sites for disposal and recovery
Treatment outside the site	Risk of spills on soil
Emissions into water	Influence on seawater quality
Spills on soil and subsoil	
Prior activities	Contamination of the soil, subsoil and underlying groundwater on the site
Preventive activities	Reduction of risk of contaminating the soil, subsoil and underlying groundwater
Noise	Influence on the acoustic climate outside the site (in the Sarroch area)
Odours	Perceived disturbance outside the site (in the Sarroch area)
Visual impact	Visibility of the site from outside

Significant indirect environmental aspects	Environmental impacts
Product design and development	Indirect impact on the quality of the air (fuel combustion)
Road transport of products, auxiliary materials, personnel	Atmospheric emissions
	Road traffic, risk of road accidents
Sea transport of raw materials	Atmospheric emissions
	Risks of accident and seawater contamination
Environmental conduct of third-party firms	
Internal management of waste	Risk of accidents and contamination of soil and subsoil
Road transport of personnel, materials, equipment	Road traffic, risk of road accidents

The following paragraphs give a qualitative and quantitative review of the significant direct and indirect environmental aspects. For each environmental aspect specific numeric performance indicators have been defined.
The values of the indicators, calculated annually, are in the main provided for the last 4 years (2004-2007). Where appropriate, the values of the indicators are compared with the legal limits.
The tables on the following pages give the list of indicators for the direct and indirect environmental aspects that have been identified as significant.
In keeping with Recommendation 2003/532/EC, the indicators are subdivided into:

- Operational performance indicators
- Environmental section indicators
- Management performance indicators

Direct environmental aspects

Indicators of operational performance

Environmental aspect concerned	Applicability*	Indicator definition	Unit of measurement
Consumption of raw materials	Refinery	Quantity of raw materials processed	kt/year
	Refinery	Low-sulphur crude used/total raw materials processed	%
Energy consumption	Site	Efficiency of integrated cycle: energy output/energy input	% toe output/toe input
	Refinery	Efficiency of refinery cycle: energy output/energy input	% toe output/toe input
	IGCC	Efficiency of IGCC cycle: energy output/energy input	% toe output/toe input
	Refinery	Specific energy consumption: energy consumed/raw materials input	toe/t refinery raw materials
	IGCC	Specific energy consumption: energy consumed/semi-processed products input	toe/t IGCC feedstock
Water consumption	Site	Site water needs	m^3/hour
		Site water needs - specific values	m^3/kt raw materials
		Use of recovered water/site water needs	%
		Use of fresh water/site water needs	%
		Use of water from refinery desalinator/site water needs	%
		Use of water from IGCC desalinators/site water needs	%
Atmospheric emissions	Refinery, IGCC, Site	Emissions of SO_2 in mass flow	t/year
	Site	Specific emissions of SO_2	t SO_2/kt raw materials
	Refinery	Sulphur content of fuels	% (by weight)
	Refinery	Concentration bubble of SO_2	mg/Nm^3
	IGCC	Concentration of S_{02}	mg/Nm^3
	Refinery, IGCC, Site	Emissions of NO_x in mass flow	t/year
	Site	Specific emissions of NO_x	t NO_x/kt raw materials
	Refinery	Concentration bubble of NO_x	mg/Nm^3
	IGCC	Concentration of NO_x	mg/Nm^3
	Refinery, IGCC, Site	Emissions of CO in mass flow	t/year
	Site	Specific emissions of CO	t CO/kt raw materials
	Refinery	Concentration bubble of CO	mg/Nm^3
	IGCC	CO concentration	mg/Nm^3
	Refinery, IGCC, Site	Emissions of dust in mass flow	t/year
	Site	Specific emissions of dust	t dust/kt raw materials
	Refinery	Concentration bubble of dust	mg/Nm^3
	IGCC	Concentration of dust	mg/Nm^3
	Site	Diffuse emissions – Escaped emissions	t/year
	Refinery, IGCC, Site	Emissions of CO_2 in mass flow	t/year
	Site	Specific emissions of CO_2	t CO_2/kt raw materials
Water emissions	Site	Total flow of water discharged	m^3/hour
		Specific flow of water discharged	m^3/kt raw materials
		COD (Chemical Oxygen Demand) in mass flow	t/year
		Specific emissions of COD	t/Mt raw materials
		Average annual concentration of COD	mg/litre
		Total hydrocarbons in mass flow	t/year
		Specific emissions of hydrocarbons	t/Mt raw materials
		Average annual concentration of hydrocarbons	mg/litre
		Emissions of ammoniac/nitrous/nitric nitrogen in mass flow	t/year
		Specific emissions of ammoniac/nitrous/nitric nitrogen	t/Mt raw materials
		Average annual concentration of ammoniac/nitrous/nitric nitrogen	mg/litre
		Total flow of primary treatment unit for input water, desalinators, IGCC tower	m^3/hour
		Specific emissions of primary treatment unit for input water, desalinators, IGCC tower	m^3/kt raw materials

*The term “Site” means “Refinery + IGCC”

Environmental aspect concerned	Applicability*	Indicator definition	Unit of measurement
Water emissions	Site	Emissions of suspended solids in discharges from primary treatment unit for input water, desalinators, IGCC tower in mass flow	t/year
		Specific emissions of suspended solids in discharges from primary treatment unit for input water, desalinators, IGCC tower	t/Mt raw materials
		Average annual concentration of suspended solids in discharges from primary treatment unit for input water, desalinators, IGCC tower	mg/litre
		Seawater temperature difference at 1 km from IGCC tower discharge point	T°C
Waste	Site	Total production of waste (hazardous and non-hazardous)	t/year
		Waste sent outside the site	t/year
		Waste sent to landfill	%
		Waste sent for incineration	%
		Waste sent for recovery	%
		Waste sent for preliminary storage	%
	Refinery	Specific production of typical waste from refining cycle	kg/t raw materials
Accidental spills on soil and sub-soil – Previous activities	Site	Quantity of product recovered/Quantity of water pumped from wells in hydraulic barrier	%
Accidental spills on soil and subsoil – Activities for prevention of contamination	Site	Protection of soil in storage areas: paved containment reservoir surfaces/total surface	%
		Protection of soil in storage areas: number of tanks equipped with double bottom	n°
		Protection of soil along pipeways	m^2
		Inspection and maintenance activities: spending on non-destructive checks	000 Euro/year
	Site	Equivalent level of sound pressure at the site boundary	dB(A)

*The term "Site" means "Refinery + IGCC"

Indicators of quality of the environmental sections

Environmental section concerned	Applicability	Indicator definition	Unit of measurement
Atmosphere	Sarroch area (measurements from the public air quality monitoring network)	SO_2 – Conformance to the three-hourly, hourly, and daily concentration thresholds	n° of times exceeded/year
		SO_2 – Average annual concentration	Micrograms/m^3
		PM10 – Conformance to the hourly concentration threshold	n° of times exceeded/year
		PM10 – Average annual concentration	Micrograms/m^3
		NO_2, NO_x – Average annual concentrations	Micrograms/m^3
		NO_2 – Conformance to the hourly and daily concentration thresholds	n° of times exceeded/year
	Sarroch inland region (measurements with bioindicators)	Index of Atmospheric Purity (IAP)	n° pure, accompanied by a quality rating
Seawater	Stretch of sea in front of the site (chemical measurements)	Trophic Index (TRIX)	n° pure, accompanied by a quality rating
Noise	Sarroch area	L90 statistical indicator of sound pressure at points in the inhabited centre of Sarroch	dB(A)

Indicators of management performance

Environmental section concerned	Applicability	Indicator definition	Unit of measurement
Training	Company employees	Training in environmental protection compared to total hours of training	%
		Training in emergency management compared to total hours of training	%
Audits	Integrated audits Environment, Safety, Quality	Hours taken for audits compared to total hours worked by auditors and personnel subjected to audit	%
	"Arrow" field inspections	Hours taken for field inspections compared to total hours worked by auditors and personnel subjected to audit	%
Product design and development	Planning and development	Product development hours/000 hours worked	hours/1,000 hours worked
Development and engineering Internal plants	Engineering	Plant engineering hours/thousands of hours worked	hours/1,000 hours worked
Investments	Protection of the environment and safety	Extent of investments	000 Euro/year

Indirect environmental aspects

Indicators of operational performance

Environmental section concerned	Applicability	Indicator definition	Unit of measurement
Product characteristics	Oil products	Production of fuel oil compared to total of oil products	%
		Quantity of sulphur in products/Quantity of incoming sulphur with raw materials	%
	Sulphur produced	Quantity of sulphur produced/Quantity of incoming sulphur with raw materials	%
Transport	Sea traffic	Use of double-hulled ships compared to total n° of ships	%
		Use of segregated ballast ships compared to total n° of ships	%
	Road traffic	Total number of heavy transport vehicles compared to the quantity of processed raw materials	n° vehicles/kt raw materials

Indicators of management performance

Environmental section concerned	Applicability	Indicator definition	Unit of measurement
Transport	Sea traffic	Checks on safety of ships: n° of ships checked compared to total n° of ships	%
	Road traffic	n° of company road transport vehicles checked/n° of authorised vehicles	%
External firms	Environmental conduct	Firms with ISO 9001 certification compared to total firms	%
		Firms with ISO 14001 certification compared to total firms	%
		Firms with OHSAS 18001 certification compared to total firms	%
		Training of external firm personnel compared to total hours worked	%

4.2 – Direct Environmental Aspects

4.2.1 – Consumption, storage and use of raw materials

Consumption

Raw materials input to the production cycle are mainly made up of crude oil and, in small quantities, fuel oils and other semi-processed hydrocarbons. The refining of mineral oils (oil) is subject to specific authorisation, which in Saras's case establishes a maximum quantity of 18 million tons per year.

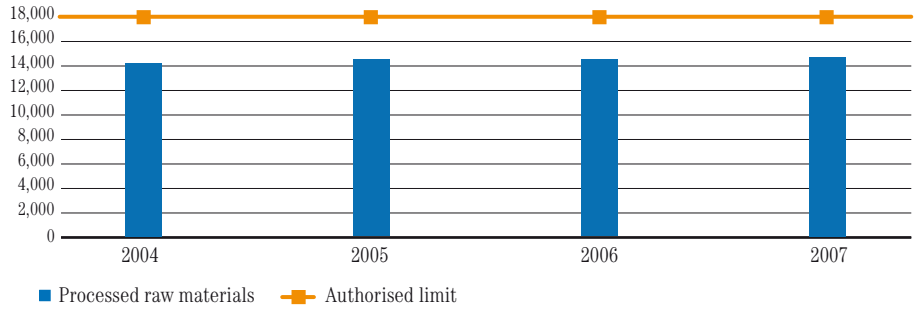
[Decree of the Ministry for Productive Activities n° 17086 of 7/07/2003]

The consumption of raw materials is a significant environmental aspect of the activities carried out on the Sarroch site, because oil is a non-renewable natural resource and the quantities processed are significant, as shown in table 3 above which is repeated below for ease of reference.

TABLE 3 Processed raw materials (kt/year)

2004	2005	2006	2007
14,113	14,423	14,515	14,593

CHART T3 (kt/year)



The figures for the four-year period 2004-2007 show that on the Sarroch site the quantity of raw materials processed has grown constantly, reaching its highest value of 14.6 million tons in 2007.

As well as the quantity of materials processed, an important parameter for managing the refining processes and controlling the product characteristics is the content of sulphur in the crude.

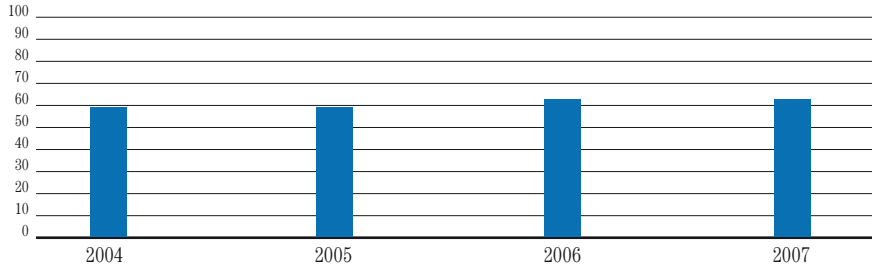
Table 7 and chart T7, below, show the values of the indicator in this area, calculated as the ratio between the quantity of low-sulphur crude oil and the total quantity of crude oil processed.

TABLE 7 Consumption of low-sulphur crudes*

Parameter	2004	2005	2006	2007
Quantity of low-sulphur crude/total quantity of raw materials processed (%)	58.4	58.4	62.9	62.4

*By analogy with the definition of low-sulphur fuel oils (Legislative Decree n° 152/06 Part V, Enclosure X) crudes are defined as "low-sulphur" if they have a sulphur content less than 1%.

CHART T7 (%)



An examination of the figures given above shows an increase over time in the procurement of low-sulphur crude oil. With the construction and coming into service of the new TGTU unit to increase the efficiency of recovering sulphur from the production process, it will be possible to treat types of crude with higher sulphur contents, ensuring increasingly better performance levels from an environmental point of view.

[table of objectives and interventions, objective n° 1, page 123]

In addition to oil, auxiliary chemical substances also enter the refining cycle and the IGCC plant. These can be grouped under the following principal categories:

[auxiliary chemical substances]

- Chemical reaction catalysers
- Treatment and process additives
- Additives for correct product formulation
- Oxygen, nitrogen, hydrogen

The consumption of auxiliary substances is less significant than the consumption of raw materials, because the auxiliary substances are generally renewable resources and the quantities procured are globally much smaller.

Procurement of raw materials and auxiliary substances involves the need for transport via sea and land, as an indirect environmental aspect. This aspect is examined in paragraph 4.3 on page 110.

Storage and use

Under normal operating conditions, the use and storage of raw materials can involve diffuse and escaped atmospheric emissions of volatile organic substances, as an induced environmental aspect. This aspect is examined in paragraph 4.3.2, page 113.

Turning to anomalous and emergency conditions, the events that can involve hazardous substances present at the facility, whether raw materials, auxiliary substances or products, are analysed in the refinery's Safety Report (paragraph 3.3, page 38).

4.2.2. – Energy consumption

Consumption of energy resources, in the form of fuels and electricity, represents a significant environmental aspect for the Saras site as well as one of notable economic impact. Figure 11 is a diagram of the site's energy balance, and the table presents the 2007 data for external energy input to the site, divided into electricity, thermal energy and crude.

Energy input to the site (toe) 2007	
Electricity	178,510
Thermal energy (steam, fuel gas, H2)	105,009
Crude	14,561,670

Energy output from the site (toe) 2007	
Oil products	13,214,267
Electricity	814,183

For the data on oil products: table 2, page 33

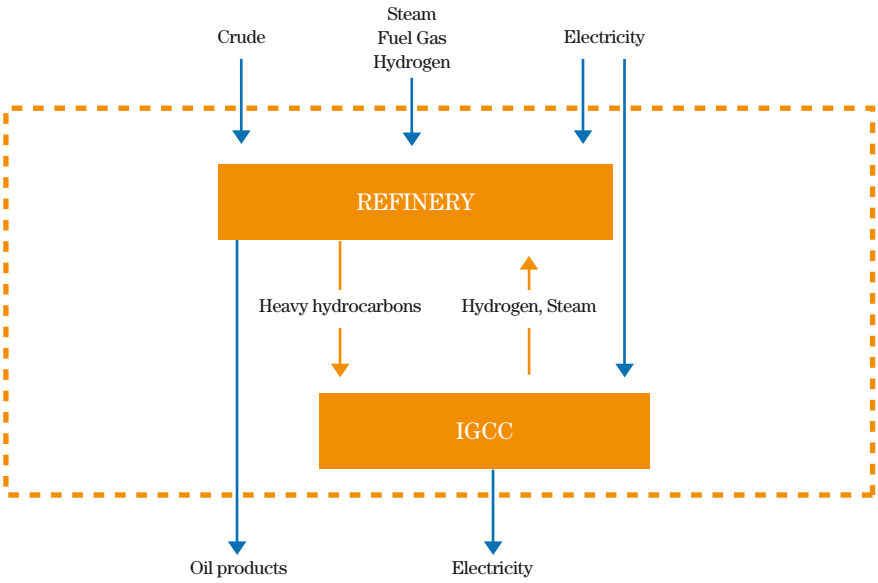


FIGURE 11 Energy balance diagram

Saras's commitment to improve energy efficiency was apparent as far back as the late 1970s and early 1980s, with major energy conservation investments to recover heat and energy.

[Law n° 10 of 9/01/1991]

In accordance with legislation, every year an Energy Manager is appointed, to monitor and promote actions for the conservation and the rational use of energy at the Sarroch site. As already noted, the complex comprising the refinery and IGCC plant represents a grand integrated cycle of transformation of hydrocarbons into refined oil products and energy.

The tables and charts that follow give the indicators for consumption of energy resources. To compare the data for the different forms of energy with each other, a single unit of measurement, the ton of oil equivalent (toe), has been adopted: all quantities of incoming raw materials and outgoing products (fuels), and incoming/outgoing flows of electricity, have been converted to toe.

[energy efficiency of the integrated cycle]

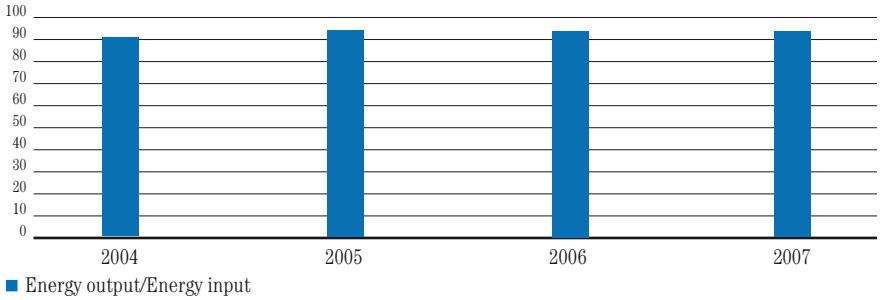
The energy efficiency of the integrated cycle (refinery and IGCC), given in table 8 and chart T8, is given by the ratio between:

- The energy leaving the integrated cycle, as the sum of the energy content of the oil products sold and energy sold
- The energy entering the integrated cycle, as the sum of the energy content of the raw materials for the refining cycle and the energy procured from outside the site

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

Parameter	2004	2005	2006	2007
Energy output/Energy input (% toe Output/toe Input)	90.20	93.57	93.62	94.50

CHART T8 (% toe output/toe input)



An examination of the data given shows the high level of efficiency of the integrated cycle "Raffineria + IGCC", with a consolidated value of higher than 93% in the last year. The difference between the energy input and the energy output is mainly due to the internal consumption of energy necessary for operating the production processes, and the portion lost in carrying out the activities.

[energy efficiency of the IGCC plant]

The IGCC plant, which produces electricity for sale and also steam and hydrogen for use in the refining cycle, converts the energy contained in heavy hydrocarbons (and not usable as such) to energy of value, and contributes to meeting the site's energy needs through the recovery of steam and hydrogen.

The energy efficiency indicator of the IGCC plant - given in table 9 and chart T9 - is given by the ratio between:

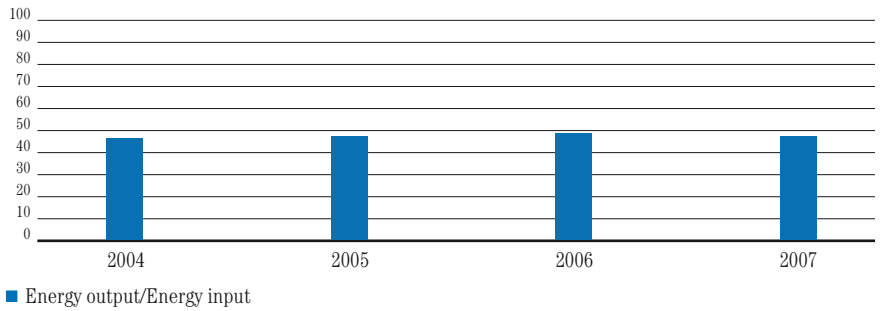
- Energy leaving the IGCC, in the form of electricity, steam, hydrogen and sulphur
- Energy entering the IGCC, in the form of hydrocarbon feedstocks and electricity consumed

The efficiency values of the IGCC are much higher than those obtainable in traditional thermoelectric power stations.

TABLE 9 Energy efficiency in the IGCC plant

Parameter	2004	2005	2006	2007
Energy output/Energy input (% toe Output/toe Input)	46.1	47.0	48.6	46.9

CHART T9 (% toe output/toe input)



[energy efficiency of the refining cycle]

For the refining cycle, the indicator shown is given by the ratio between:

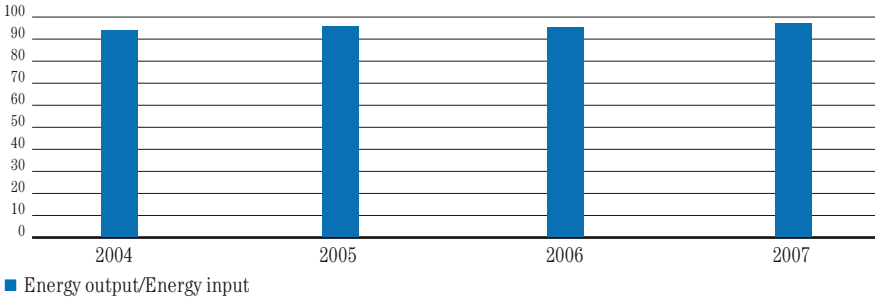
- The energy leaving the refining cycle, as the sum of the energy content of the oil products sold
- The energy entering the refining cycle, as the sum of the energy content of the raw materials for the refining cycle and the energy procured from outside the site (mainly electricity)

In this case also, table 10 and chart T10 show higher values of energy efficiency.

TABLE 10 Energy efficiency in the refining cycle

Parameter	2004	2005	2006	2007
Energy output/Energy input (% toe output/toe input)	93.54	95.30	95.27	96.52

CHART T10 (% toe output/toe input)



[energy consumption]

Internal energy consumption is due to the combustion of oil products and the use of electricity. Small amounts of thermal energy, in the form of steam, can be exchanged with the nearby petrochemical facility, especially when there are plant shutdowns or other unusual situations.

The fuels used in the refining cycle are made up of:

- Fuel gas, i.e. a gas produced by the refining cycle and which is not saleable (because it is not condensable)
- Low-sulphur fuel oil
- Coke, which is consumed directly within the FCC (Fluid Catalytic Cracking) production plant

The fuels used in the IGCC cycle are made up of:

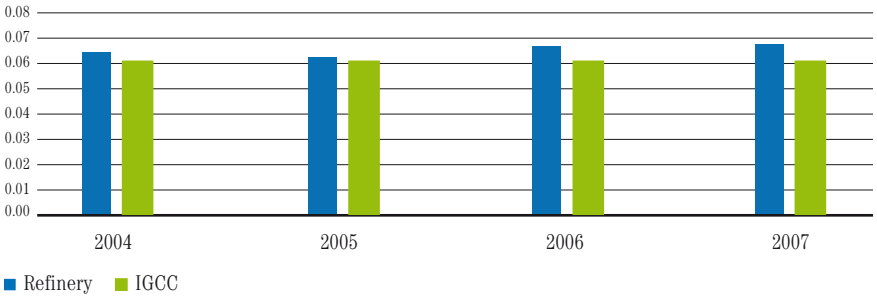
- Syngas, i.e. the gas produced by the gasification section and used in the combined cycle section
- Diesel, which is used only as an emergency fuel

Table 11 and chart T11 give the specific energy consumption indicator data for the raw materials processed in the refining cycle and the materials used as feedstock for the IGCC.

TABLE 11 Specific energy consumption

Parameter	2004	2005	2006	2007
Specific energy consumption of refinery (toe/t refinery raw materials)	0.064	0.062	0.066	0.067
Specific energy consumption of IGCC (toe/t IGCC feedstocks)	0.06	0.06	0.06	0.06

CHART T11 (toe/t raw materials)



In the main the values of the indicators are stable over the years. Objectives for the improvement of energy efficiency and energy recovery have been drawn up to make savings in energy consumption, with consequent reduction in fuel oil consumption.

[table of objectives and interventions, objective n° 2, page 123]

4.2.3 – Use of water resources

In the Sarroch facility the water is mainly used for producing steam for technological use (steam stripping, heat exchangers and electricity generation), to supply the fire prevention system, to replace losses from the cooling cycle, and for civil use. Figure 12 shows a diagram of the water cycle in the facility

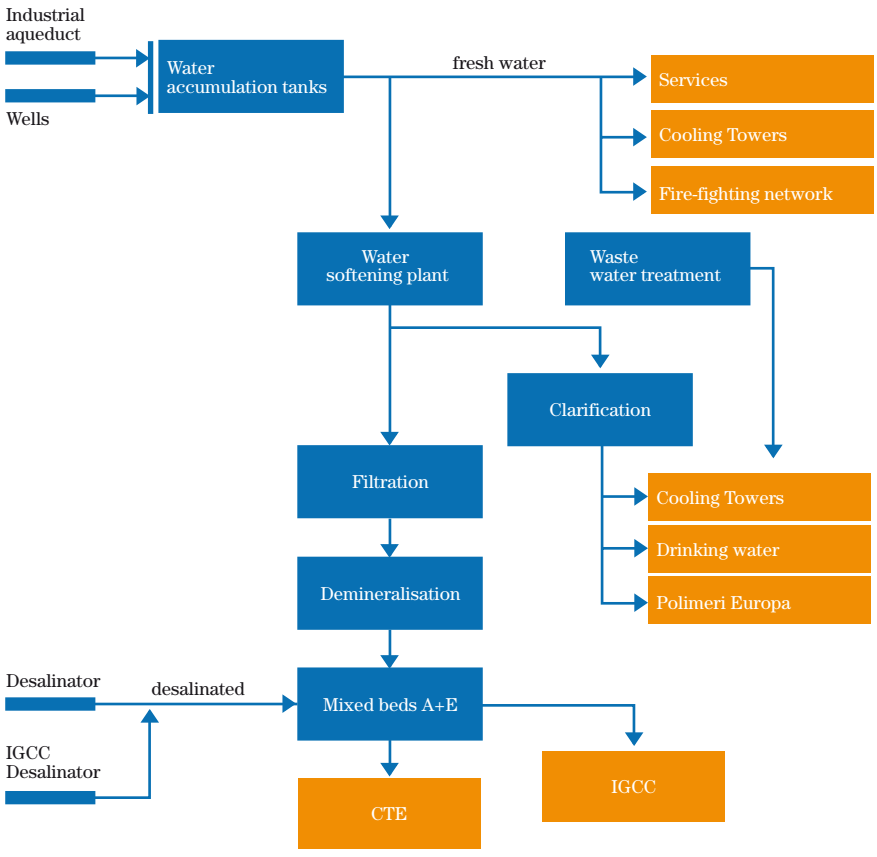


FIGURE 12 Water usage diagram

Aware of the problem of scarce water resources in the region, Saras has over the years adopted a policy of reducing the use of primary water sources originating in the locality. This has been achieved through:

- Installing a first desalinator in 1994, with a capacity of 300 m^3/hr, followed by the installation of six more 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 refining process, following improvements to the treatment process and increased filtering capacity

Currently the principal types of water resources used are the following:

- Seawater, treated by dedicated desalination units
- Fresh water, supplied by the industrial aqueduct, which is fed by the Flumendosa river reservoirs
- Water recovered by the wastewater purification system (water previously filtered)

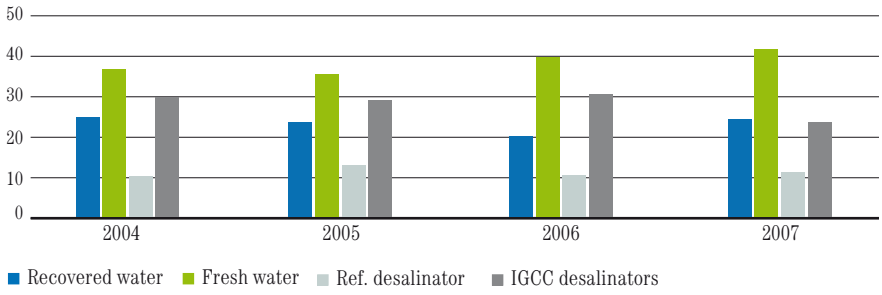
[concession decree Presidential Decree 250/49 Constitutional Law 3/48 of 05/06/98 and application for renewal of 12/06/2007 to the Civil Engineering Service of the Province of Cagliari]

A small portion of water is taken from five internal wells on site and is sent to the storage reservoir for incoming industrial freshwater.
Figures for the site's water consumption are presented in table 12 and chart T12 and are inclusive of the quantity used in the IGCC plant, which mainly uses water from its dedicated desalinators for its production. For cooling the IGCC equipment, a closed-circuit seawater system has been installed which is equipped with a cooling tower.

TABLE 12 Site water sources

Parameter	2004	2005	2006	2007
Recovered water/water needs (%)	24.4	23.3	19.9	24.1
Fresh water/water needs (%)	36.4	35.1	39.4	41.2
Water from refinery desalinator/water needs (%)	10	12.6	10.2	10.9
Water from IGCC desalinators/water needs (%)	29.2	29.1	30.5	23.8

CHART T12 (%)

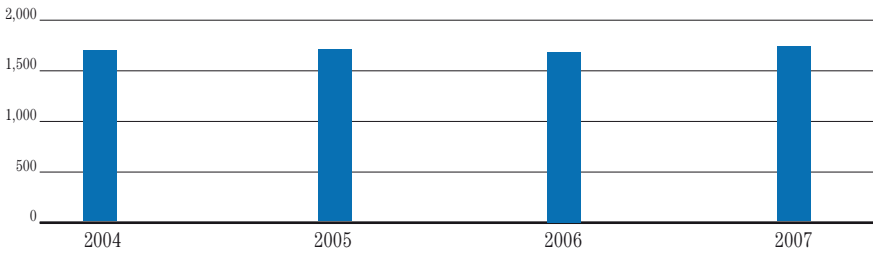


In the four-year period under review, internal recovery annually met approximately 20-25% of the total requirement, and desalination accounted for 30-40% of the total.
The overall percentage contribution of desalinated water and recovered internal water in meeting the site's water requirements reached levels ranging from 60% to 70%.
In 2007, due to problems associated with the incorrect functioning of the IGCC's desalinators, the portion of desalinated water was less than in previous years.
Verification is underway on improvements in the reliability of the desalinators.
In absolute terms, the site's water offtakes are shown in table 13 and chart T13.

TABLE 13 Site water requirements – absolute values

Parameter	2004	2005	2006	2007
Site water requirements - average flows (m3/hour)	1,686	1,697	1,682	1,727

CHART T13 (m^3/hour)

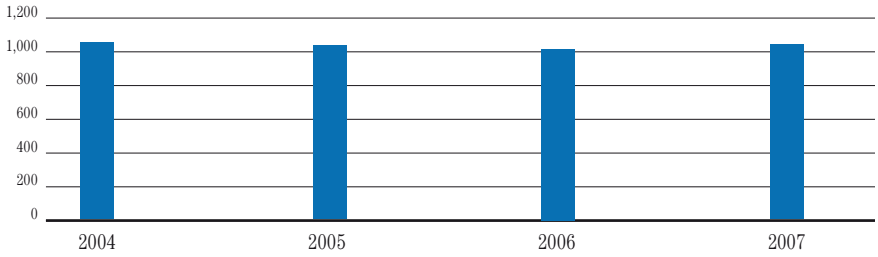


The relation of specific water consumption to raw materials processed is shown by the indicator in table 14 and chart T14.

TABLE 14 Site water requirements – specific values

Parameter	2004	2005	2006	2007
Site water requirements/raw materials processed (m^3/kt raw materials)	1,047	1,031	1,015	1,037

CHART T14 (m^3/kt raw materials)



4.2.4 – Atmospheric emissions

4.2.4.1 – General

Atmospheric emissions represent a significant environmental aspect of the activities conducted at the Saras site, in normal conditions and in specific anomalous and/or emergency conditions.

The Saras facility's authorisation for atmospheric emissions is the judgement of environmental compatibility of the IGCC project, n° DEC/EIA/2025 of 28/12/94 issued by the Ministry for the Environment, supplemented by the letter ref. n° 854/05/SIAR of the Ministry for the Environment.

The above provisions contain the opinion in favour of building the IGCC and give specifications of the limits on emissions into the atmosphere from the IGCC and from the integrated complex comprising the refinery and the IGCC.

[Legislative Decree n° 152/06, Part V]

For the refining cycle, the concentration emission limits specified in Legislative Decree n° 152/06 Part V (Enclosure I, part IV, section 1) apply. These limits are for 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 entire refinery.

In accordance with legislation, atmospheric emissions can be subdivided as follows:

- Emissions ducted to the smokestacks
- Emissions that are not ducted

Ducted emissions

The emissions ducted to the smokestacks are principally due to:

- Combustion processes that take place in the furnaces to provide the thermal energy necessary for the refining cycle
- Combustion processes necessary for the production of electricity and steam (thermal power plant and IGCC).

[table of objectives and interventions, objectives n° 1, 2, 3, 4, 5, 7, page 123]

The principal pollutants present 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 from the IGCC plant. Numerous objectives and areas for improvement have been defined for atmospheric emissions from ducted emissions.

Non-ducted emissions

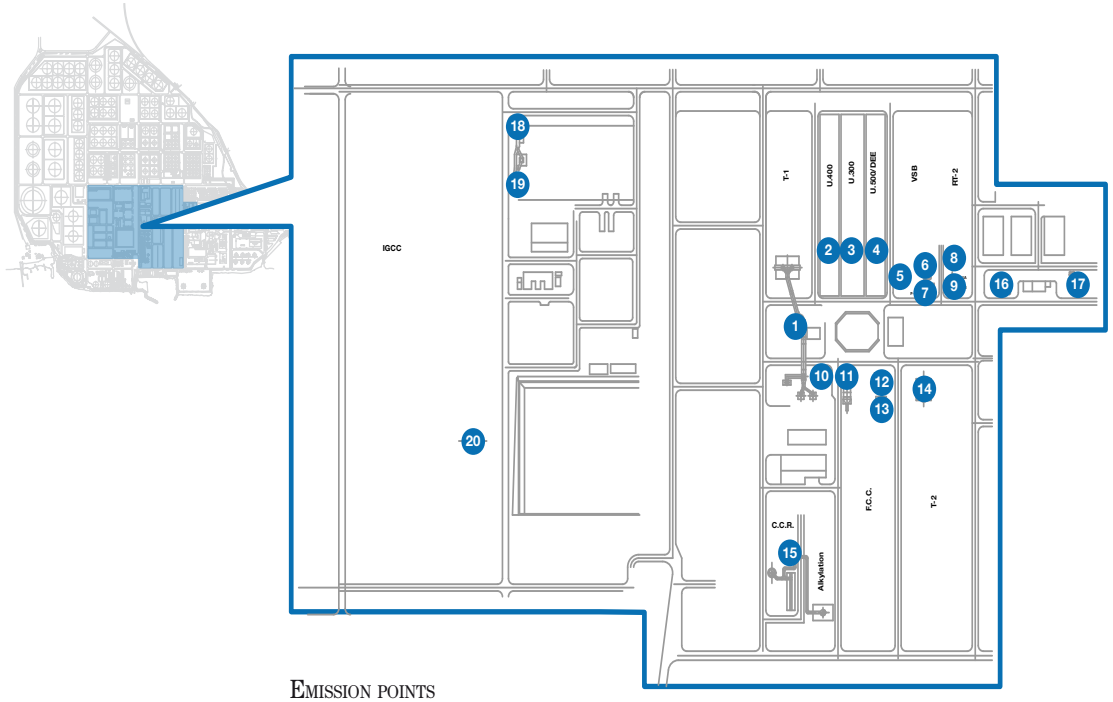
The emissions that are not ducted to the smokestacks are principally due to:

- Storage and movement of raw materials and products, and wastewater treatment (diffuse emissions)
- Small "physiological" emissions from sealing components, i.e. valves and flanges (diffuse emissions, also known as escaped emissions).

Diffuse and escaped emissions are technically not ductable. They can be contained by installing special sealing systems and through monitoring and maintenance.

The substances present in diffuse and escaped emissions are Volatile Organic Compounds (VOCs), made up of light hydrocarbons that can evaporate in environmental conditions and in the process conditions present. With reference to figure 7 (page 31) which shows the general plan of the facility, the areas from which diffuse emissions originate are those for storage, shipping, productive processes and wastewater treatment. Numerous objectives and areas for improvement have also been defined for atmospheric emissions from diffuse and escaped emissions.

[table of objectives and interventions, objective n° 6, page 123]



EMISSION POINTS

1. Centralised smokestack Topping Plant 1, Boiler Plant B1-A, Boiler Plant B1-B, Boiler Plant B1-C } CTE
2. U400-F461 Plant
3. U300-F301 Plant
4. U500-F501 Plant
5. U700-F701 Plant
6. VSB-F102B Plant
7. VSB-F102C Plant
8. RT2-F1A Plant
9. RT2-F1B Plant
10. FCC-K1 F3 Plant
11. CO-Boiler Plant
12. Vacum F1-B Plant
13. Vacum F1-A Plant
14. Topping 2-F1 Plant
15. Alkylation plant CCR-F11
16. Z3-F2 Plant
17. Z4-F2 Plant
18. MHC1 (F101-F251) Plant
19. MHC2-F201 Plant
20. Centralised smokestack IGCC Line 701, Line 702, Line 703

FIGURE 13 Map with location of emission points at the facility

Determination of emissions values

Ducted emissions are determined in several ways. Specifically:

- Emissions of SO_2, NO_x, PTS, CO and smoke load from the Saras centralised smokestack (which collects around 33% of emissions from the refining cycle) and from the IGCC smokestack (which collects 100% of that plant's emissions) are determined using continuous instrument analysis
- Emissions from the other smokestacks are determined through calculation, based on measurement of the consumption of fuels, on laboratory analytical determinations of their quality, and on the characteristics of the burners.

Alternative checks are also carried out annually on all the smokestacks on site, by taking samples and subsequently having them analysed by an external laboratory. Non-ducted emissions are determined by estimates and calculations, using recognised formulas and validity models[1].
Diffuse and escaped emissions for the four-year period 2004 – 2007 were determined using estimates based on recognised formulas and calculation methods (source: U.S.E.P.A., United States Environmental Protection Agency, for emissions from movement and storage of raw materials and products; A.P.I., American Petroleum Institute, for emissions from wastewater treatment; and Italian oil industry group Unione Petrolifera, for escaped emissions). For escaped emissions, an initial test has been conducted using the LDAR[2] monitoring method, which is one of the best available techniques for the sector[3]. The results obtained using this technique have shown that the calculation methods adopted previously are very conservative.
Below are the figures for the four-year period 2004-2007, determined using the method described above, and subdivided as follows:

- Ducted emissions of SO_2, NO_x, dust and CO (paragraph 4.2.4.2 below)
- Non-ducted emissions of Volatile Organic Compounds (paragraph 4.2.4.3, page 70).

Since atmospheric emissions from the facility can influence the quality of the surrounding air, following the emissions data the data collected by the public air quality monitoring network present in the Sarroch area is also provided, processed by the Province of Cagliari (paragraph 4.2.4.4, page 71).
Lastly, the data for the facility's CO_2 emissions are provided (paragraph 4.2.4.5, page 79). Although CO_2 emissions are part of the ducted emissions, it is considered appropriate to give these emissions separately because any effect they have is not local but global, relating as it does to the greenhouse effect.

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

The figures for ducted emissions of SO_2, NO_x, dust and CO are given using the following indicators:

- Absolute mass flow values for the refinery, the IGCC and the site overall (refinery + IGCC)
- Specific mass flow values, related to the raw materials input to the integrated production cycle and referring to the overall site
- Global concentration values for the refinery ("bubble" values) - concentration values for the IGCC.

Of the above indicators, the following are subject to limit values:

- Absolute mass flow values for the site overall
- Concentration values for the IGCC
- Concentration bubble values for the refinery

All indicators are processed annually.

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[1]For diffuse emissions from storage tanks the "TANKS" model is used, source: U.S. Environmental Protection Agency; for diffuse emissions from shipping products and from wastewater treatment baths the specific formulae sourced from the E.P.A. and A.P.I. (American Petroleum Agency), respectively, are used. For escaped emissions, an algorithm sourced from Italian oil industry group Unione Petrolifera and CONCAWE is adopted. The calculation algorithms take account, in particular, of: the quantity of raw materials processed for emissions from storage and for escaped emissions, the quantity of products shipped for shipping emissions, the quantity of wastewater input to water treatment for emissions from that plant.
For emissions from storage, the technical characteristics of the tanks are also relevant.
[2]LDAR: Leak Detection and Repair.
[3]Guidelines on Best Available Techniques, refinery sector, Ministerial Decree 29/01/07.

Sulphur dioxide (SO_2)

The trend of reduction in emissions of SO_2, a regular feature for several years, continues for the entire site and particularly the refinery.

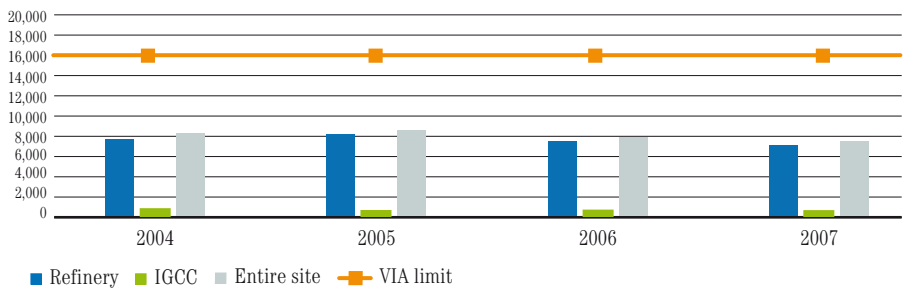
Specifically, in 2007 the best ever result was recorded for emissions of SO_2 for the site. This result is all the more significant because it was obtained despite an increase in the refinery's annual production, as shown by the data in table 3 on page 33. This is shown by the absolute figures for the refinery, the IGCC and for the entire site overall, as shown in table 15 and chart T15.

TABLE 15 Emissions of SO_2: absolute mass flow values

	2004	2005	2006	2007
Refinery (t/year)	7,572	8,065	7,327	6,970
IGCC (t/year)	610	432	467	423
Entire site (t/year)*	**8,182**	**8,497**	**7,794**	**7,393**

*Compared to limit value of 16,000 t/year, established by DEC/EIA/2025 of 28/12/94

CHART T15 (t/year)



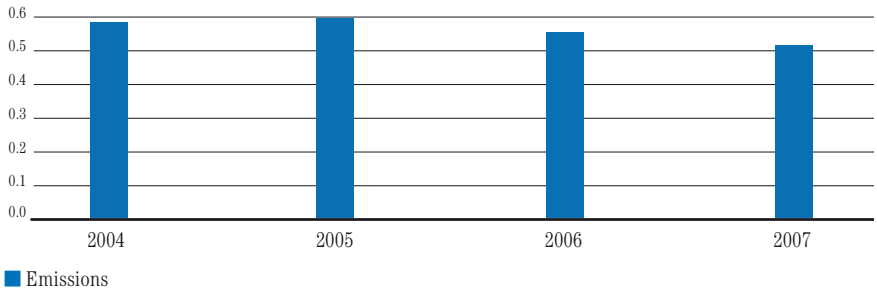
The values of all the mass flow indicators show a general tendency towards reduction over time, for the refinery, the IGCC, and the entire site. In particular the indicator for the site in its entirety has always been comfortably lower than the authorised limit value.

The site's specific emissions also confirm a trend towards reduction, shown in table 16 and chart T16.

TABLE 16 Emissions of SO_2: specific mass flow values

Parameter	2004	2005	2006	2007
Emissions (tSO_2/kt raw materials)	0.58	0.59	0.54	0.51

CHART T16 (t SO_2/kt raw materials)



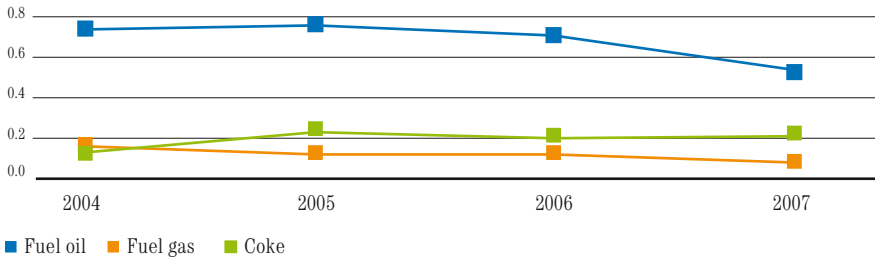
The reduction in SO_2 emissions is consistent with the progressive improvement of the quality of the fuels used, both liquid and gaseous, in which the percentage of sulphur present has been constantly reduced, as shown in table 17 and chart T17.

TABLE 17 Sulphur content of fuels used in the refinery

Parameter	2004	2005	2006	2007
Sulphur content of fuel oil (%)	0.69	0.71	0.66	0.49
Sulphur content of fuel gas	0.16	0.12	0.12	0.08
Sulphur content of coke * (%)	0.13	0.23	0.2	0.21

*A fuel produced and consumed directly within the FCC (Fluid Catalytic Cracking) production plant

CHART T17 (%)



The tendency towards reduction of SO_2 emissions over time is also confirmed by the concentration values given in the tables below, and which are significantly lower than their applicable limits.

TABLE 18 Emissions of SO_2. Concentration bubble values for the refinery

Parameter	2004	2005	2006	2007
Concentrations of SO_2 - refinery (mg/Nm^3)	799	817	734	672
Limit value for the refinery* (mg/Nm^3)	1,700	1,700	1,700	1,700

*Limit value specified by Italian Legislative Decree n° 152/2006 Part V, Enclosure I, part IV.

CHART T18 (mg/Nm^3)

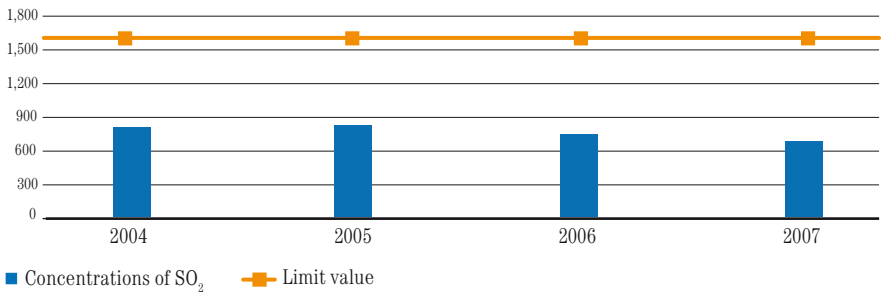
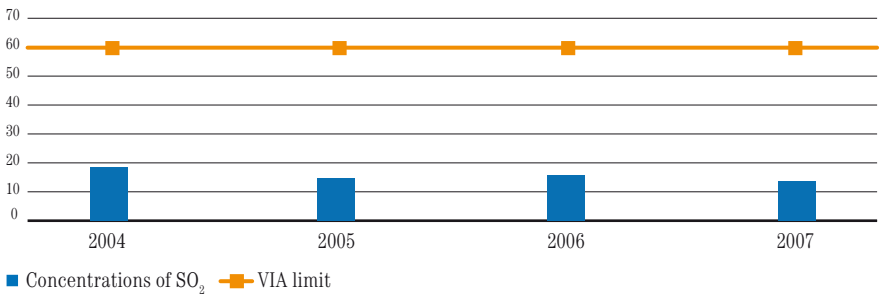


TABLE 19 Emissions of SO_2: Concentration values for the IGCC

Parameter	2004	2005	2006	2007
Concentrations of SO_2 - IGCC (mg/Nm^3)	18	15	16	14
Limit value for the IGCC* (mg/Nm^3)	60	60	60	60

*Limit value established in the conclusion of the Environmental Impact Assessment for the IGCC project (DEC/EIA/2025 of 28/12/94).

CHART T19 (mg/Nm^3)



Objectives and actions for reduction of SO_2 emissions are planned.

[table of objectives and interventions objectives n° 1, 2, 3, 4, page 123]

Nitrogen oxides (NO_x)

NO_x emissions are only marginally affected by fuel quality, and instead they depend highly on combustion techniques, which in turn are related to technological factors such as the burner type installed.

The installation of burners that produce lower NO_x, carried out in 2007 for the furnaces in the Topping RT2 and Visbreaking plants, have resulted in a perceptible reduction in emissions from the refinery, explaining the trends illustrated below.

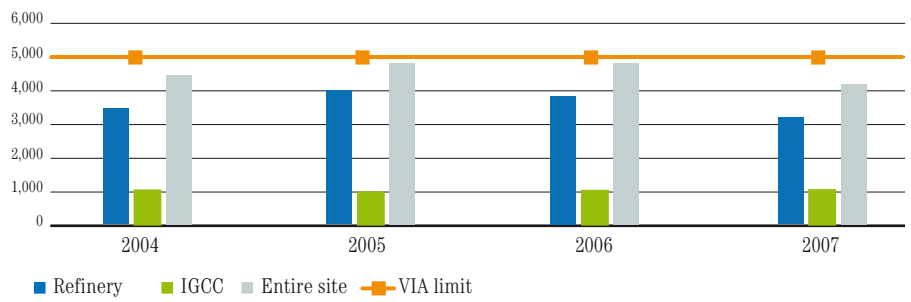
Table 20 and chart T20 give the data for the absolute mass flow indicators.

TABLE 20 Emissions of NO_x: absolute mass flow values

	2004	2005	2006	2007
Refinery (t/year)	3,435	3,964	3,798	3,167
IGCC (t/year)	995	935	983	997
Entire site (t/year)*	**4,430**	**4,899**	**4,781**	**4,164**

*Compared to limit value of 5,000 t/year, established by DEC/EIA/2025 of 12/28/94

CHART T20 (t/year)



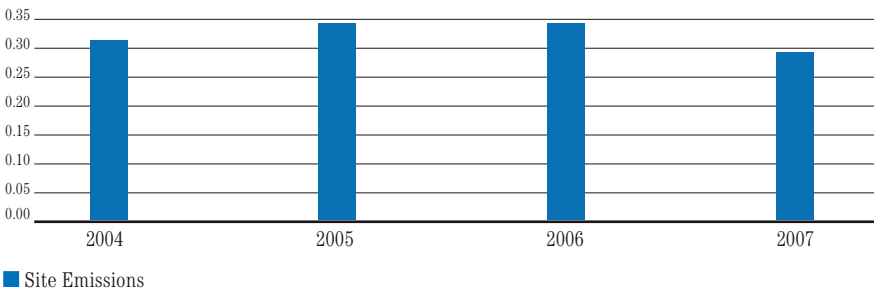
The indicator for the site has always been lower than the authorised limit value, and shows a reduction over time, which is mainly supported by the reduction in values of the indicator for the refinery. For the IGCC, the mass flow indicator values have remained substantially stable over time.

The specific mass flow indicator (data in table 21) has also been on a downward trend over the years, in line with the site's absolute mass flow indicator.

TABLE 21 Specific emissions of NO_x: specific mass flow values

Parameter	2004	2005	2006	2007
Emissions (tNO_x/kt raw materials)	0.31	0.34	0.33	0.29

CHART T21 (t NO_x / kt raw materials)



The concentration indicators are much lower than the applicable limits, as shown in the following tables and charts.

TABLE 22 Emissions of NO_x: Concentration bubble values for the refinery

Parameter	2004	2005	2006	2007
Concentrations of NO_x - refinery (mg/Nm^3)	363	402	381	305
Limit value for the refinery* (mg/Nm^3)	500	500	500	500

*Limit value specified by Italian Legislative Decree n° 152/2006 Part V, Enclosure I, part IV.

CHART T22 (mg/Nm^3)

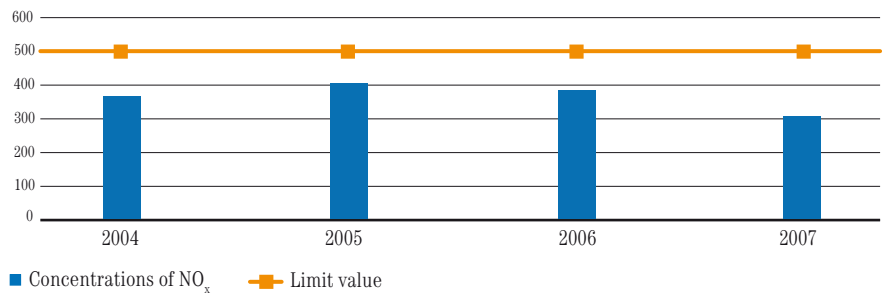
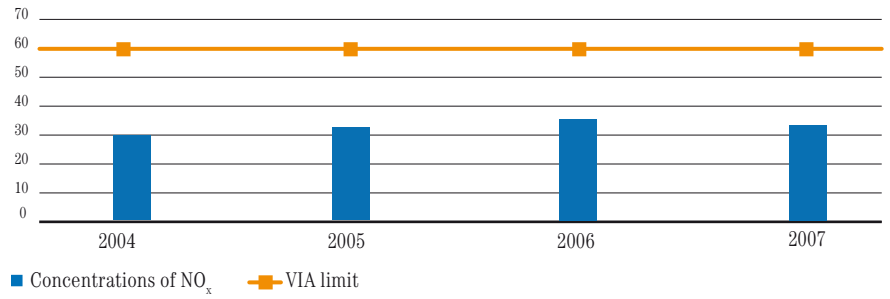


TABLE 23 NO_x: Concentration values for the IGCC

Parameter	2004	2005	2006	2007
Concentrations of NO_x - IGCC (mg/Nm^3)	30	32	35	33
Limit value for the IGCC* (mg/Nm^3)	60	60	60	60

*Limit value established in the conclusion of the Environmental Impact Assessment for the IGCC project (DEC/EIA/2025 of 12/28/94).

CHART T23 (mg/Nm^3)



Objectives and actions for improving the monitoring of NO_x emissions are planned.

[table of objectives and interventions objectives n° 3, 4, page 123]

Dust

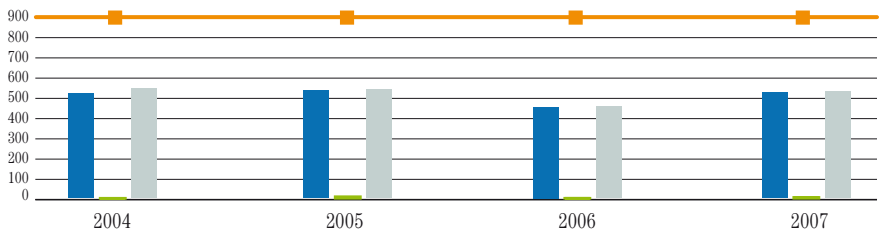
Table 24 gives the data for the absolute mass flow indicators for dust.

TABLE 24 Emissions of dust: absolute mass flow values

	2004	2005	2006	2007
Refinery (t/year)	515	526	453	524
IGCC (t/year)	2	7	3	5
Entire site* (t/year)	517	533	456	529

*Compared to limit value of 900 t/year, established by DEC/EIA/2025 of 28/12/94

CHART T24 (t/year)



The emission indicator for the site has always been much lower than the authorised limit value. The indicator for the refinery showed an increase in 2007 over 2006.
This increase was due to the adoption of a different method of determining dust emissions: because the dust analysis system installed on the refinery's central smoke stack was out of service for a prolonged duration, the 2007 emissions were determined mainly through calculation, and conservative criteria were adopted.
The dynamics described above also influenced the data recorded for specific emissions and indicators of concentration, shown in the following tables and graphs.

TABLE 25 Emissions of dust: specific mass flow values

Parameter	2004	2005	2006	2007
Site emissions, t dust/kt raw materials	0.04	0.04	0.03	0.04

CHART T25 (t dust/kt raw materials)

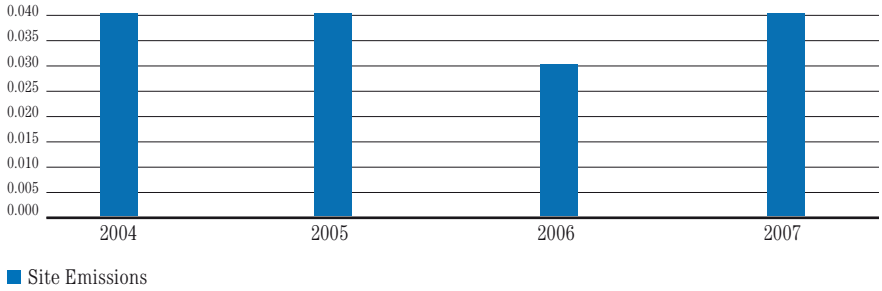


TABLE 26 Dust: Concentration bubble values for the refinery

Parameter	2004	2005	2006	2007
Concentrations of dust - refinery (mg/Nm^3)	54	53	45	51
Limit value for the refinery* (mg/Nm^3)	80	80	80	80

*Limit value specified by Italian Legislative Decree n° 152/2006 Part V, Enclosure I, part IV.

CHART T26 (mg/Nm^3)

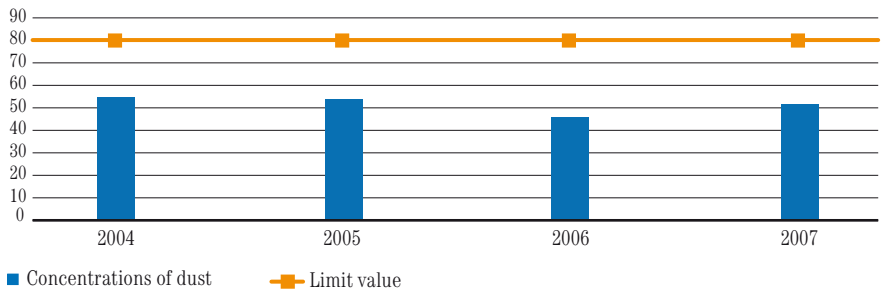
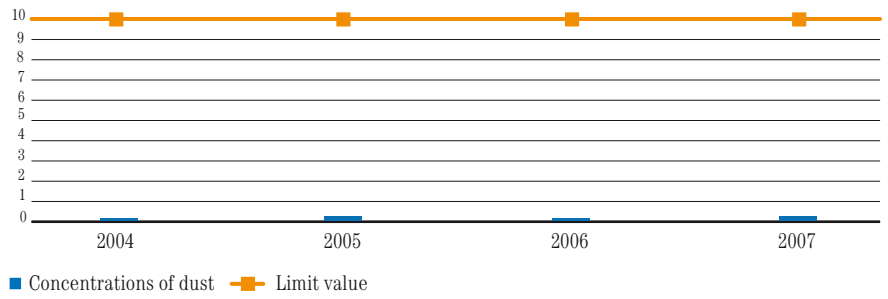


TABLE 27 Dust: Concentration values for the IGCC

Parameter	2004	2005	2006	2007
Concentrations of dust - IGCC (mg/Nm^3)	0.1	0.2	0.1	0.2
Limit value for the IGCC* (mg/Nm^3)	10	10	10	10

*Limit value established in the conclusion of the Environmental Impact Assessment for the IGCC project (DEC/EIA/2025 of 28/12/94).

CHART T27 (mg/Nm^3)



All values presented are much lower than the applicable limits. In addition, objectives and actions to reduce these emissions and to improve their monitoring are planned.

[table of objectives and interventions objectives n° 2, 3, 4, 5, page 123]

Carbon monoxide (CO)

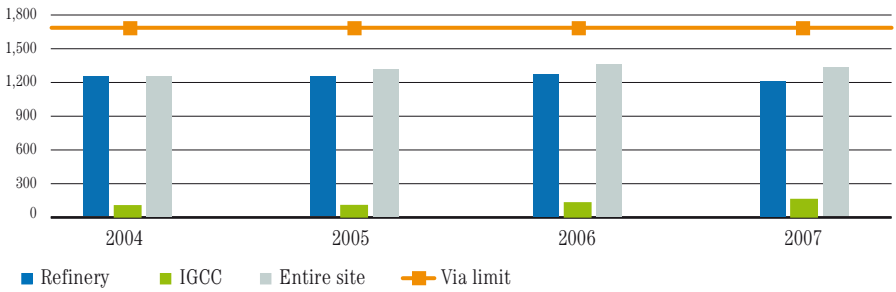
Table 28 and chart T28 give the absolute mass flow indicators.

TABLE 28 Emissions of CO: absolute mass flow values

	2004	2005	2006	2007
Refinery (t/year)	1,241	1,238	1,259	1,195
IGCC (t/year)	84	86	110	138
Entire site* (t/year)	1,325	1,324	1,369	1,333

*Compared to limit value of 1,700 t/year, established by DEC/EIA/2025 of 28/12/94

CHART T28 (t/year)

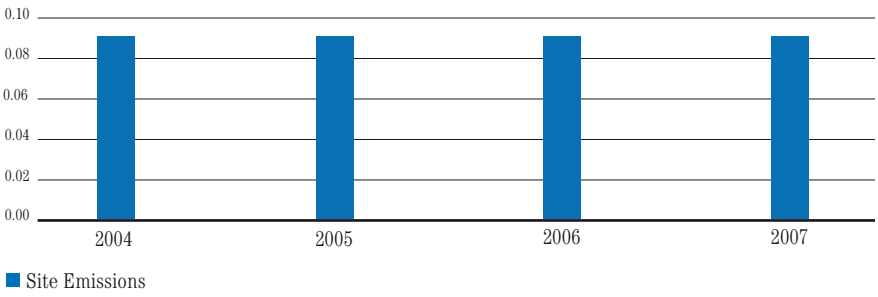


The emission indicator for the site has always been much lower than the authorised limit value, and over time it has shown a substantially stable trend. The indicator for the refinery shows a reduction over previous years, which is linked to the measures taken to optimise the combustion process in a number of furnaces. The values of the indicator for the IGCC are much lower than those for the refinery.
The specific mass flow indicator for the site given in table 29 and chart T29 is constant over time.

TABLE 29 Emissions of CO from the site: specific mass flow values

Parameter	2004	2005	2006	2007
Site emissions, t CO/kt raw materials	0.09	0.09	0.09	0.09

CHART T29 (t CO / kt raw materials)



The values of the concentration indicators shown in the following charts are much lower than the applicable limits.

TABLE 30 Emissions of CO: Concentration bubble values for the refinery

Parameter	2004	2005	2006	2007
Concentrations of CO - refinery (mg/Nm^3)	131	125	126	115
Limit value for the refinery* (mg/Nm^3)	250	250	250	250

*Limit value specified by Italian Legislative Decree n° 152/2006 Part V, Enclosure I, part IV.

CHART T30 (mg/Nm^3)

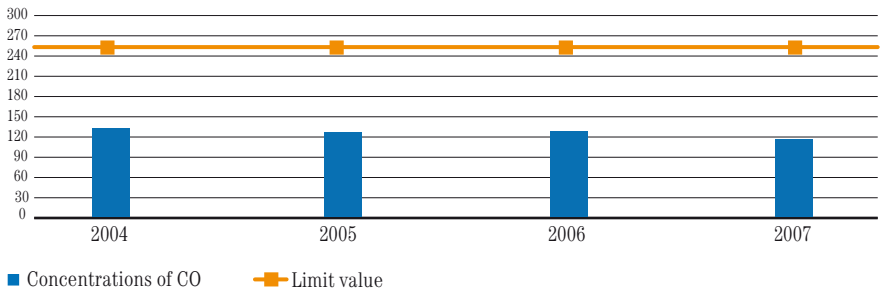
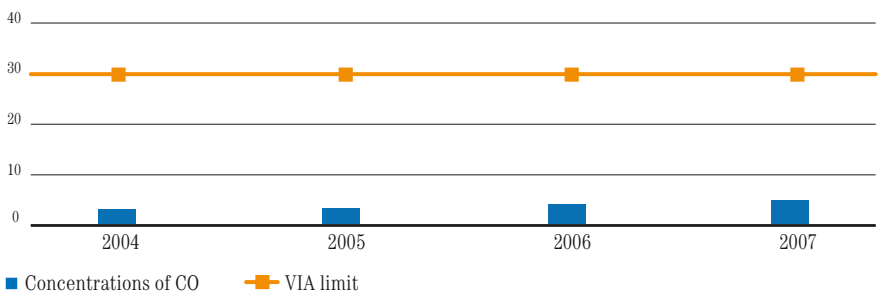


TABLE 31 Emissions of CO: Concentration values for the IGCC

Parameter	2004	2005	2006	2007
Concentrations of CO - IGCC (mg/Nm^3)	2.8	3.0	3.8	4.6
Limit value for the IGCC* (mg/Nm^3)	30	30	30	30

*Limit value established in the conclusion of the Environmental Impact Assessment for the IGCC project (DEC/EIA/2025 of 28/12/94).

CHART T31 (mg/Nm^3)



Objectives and actions for improving the monitoring of CO emissions are planned.

[table of objectives and interventions, objectives n° 3, 4, page 123]

Anomalous and emergency situations

Analysis of anomalous and emergency situations that can affect the facility's atmospheric emissions has resulted in the following event being identified as significant:

- Increase of SO_2 emissions and presence of dense smoke from the smokestack of the incinerator for the refinery's sulphur recovery plants.

[table of objectives and interventions, objective n°1, page 123]

The construction (currently underway) of the unit for treating tail gases coming from the refinery's sulphur recovery plants will reduce the probability and the consequences of this type of anomalous event.

The tail gas treatment unit will contribute to reducing the content of sulphur compounds in the tail gases, before they are sent to the incinerator. The reduction in SO_2 emissions will also apply to conditions of normal operation. A reduction is expected of approximately 30% in total SO_2 emissions from the site, on an annual basis.

To prevent other types of emergency associated with the emissions from the refinery's centralised smokestack and from the IGCC's centralised smokestack, concentration alarm thresholds for the emissions have been defined for internal use: when these thresholds are reached, the appropriate corrective actions are rapidly activated on the plants responsible for the emissions, in order to prevent the ground level impact from increasing.

4.2.4.3 – Data on non-ducted emissions

The data for non-ducted emissions, comprising diffuse emissions and escaped emissions, is summarised in table 32.

TABLE 32 Non-ducted emissions (diffuse and escaped) of Volatile Organic Compounds from the site

Total non-ducted emissions of VOCs	2004	2005	2006	2007
Diffuse (t/year)	484	518	484	449
Escaped (t/year)	1,411	1,442	1,426	1,459
Total (t/year)	1,895	1,960	1,910	1,908

Escaped emissions tend to increase with the increase in incoming raw materials (table 3 on page 33).

Diffuse emissions are reducing, despite the increase in annual processing. This is due to a smaller quantity of wastewater being input to the water treatment plant, and a reduction in emissions from storage.

4.2.4.4 – State of air quality in the Sarroch area

4.2.4.4.1 Monitoring of air quality using fixed sensors

Currently there are three air quality monitoring networks in the Sarroch area: one owned by the Cagliari ARPAS (previously managed by the Province of Cagliari), one owned by Saras, and one owned by Polimeri Europa. The location of the measurement sensors on the public network are shown on the map in figure 14.

FIGURE 14 Map of the locations of the air quality monitoring sensors of the public network.

The sensors measure the ambient air concentrations of the following substances:

- SO_2
- PM10
- NO_x
- CO
- Ozone
- H_2S (hydrogen sulphide)
- Benzene.

The data found by the sensors show contributions from all sources of emissions present in the area - industrial, urban, and originating from vehicle traffic.
The legislation for air quality monitoring methods and for limit values is as follows:
- Ministerial Decree n° 60/2002 for SO_2, nitrogen oxides (NO_2 and NO_x), small dust particles (PM10), CO and benzene
- Legislative Decree n° 183/2004 for ozone
- Presidential Decree 15/04/1971 for hydrogen sulphide.

Below are the results obtained from the network managed by the public authorities, for the four-year period 2004 – 2007, for the pollutants monitored.
Both the data and the considerations illustrated are taken from the reports prepared annually by the Province of Cagliari.

Measurements from the provincial network for SO_2

Turning to the levels of SO_2, the report issued by the Province of Cagliari shows an improved trend in 2007 compared to those of previous years, with no violation of the legal limits, as can be seen from the tables and charts presented here.

In more detail, before 2007, in one of the sensors (CENSA2), the three-hourly alarm threshold was exceeded a number of times, and the hourly and daily limits for the protection of human health were also exceeded regularly for a period, and the number was higher than the values allowed by Ministerial Decree 60/2002.

In 2007 the situation measured by CENSA2 conformed to legal requirements, did not exceed the alarm thresholds, and the numbers of times the hourly and daily limits for protecting human health were exceeded were lower than those permitted by law. The trend described is shown in tables 33, 34, 35 and 36 and in the associated charts.

[table of objectives and interventions objective n° 7, page 123]

With regard to exceeding thresholds and limits on an hourly/daily basis, it should be noted that Saras does not have access to the hourly data taken by the public network in time to bring immediate and useful corrective action to bear. Upon receipt of a report from the control authorities regarding the exceeding of one of the above limits or thresholds, Saras has always promptly executed the necessary checks on the plants and on the sulphur content in the fuels used. If anomalies were found, the fact was notified to the Authority that made the original report, accompanied by a written description of the event and its causes. Even where anomalies were not found, a written reply has always been provided.

Lastly, table 37 shows the figures for the number of reports received by Saras of alarm thresholds for the SO_2 pollutant, detected by the sensors in the public air quality monitoring network.

TABLE 33 SO_2: measurements of the provincial network – n° of days the alarm threshold was exceeded

Sensor	2004	2005	2006	2007
CENSA0	0	0	0	0
CENSA1	0	0	2	0
CENSA2	4	2	3	0
CENSA9	0	0	0	0
Limit value*	500 µg/m3, not to be exceeded for 3 consecutive hours			

* Limit value specified by Ministerial Decree n° 60/2002

CHART T33 (No. of times exceeded)

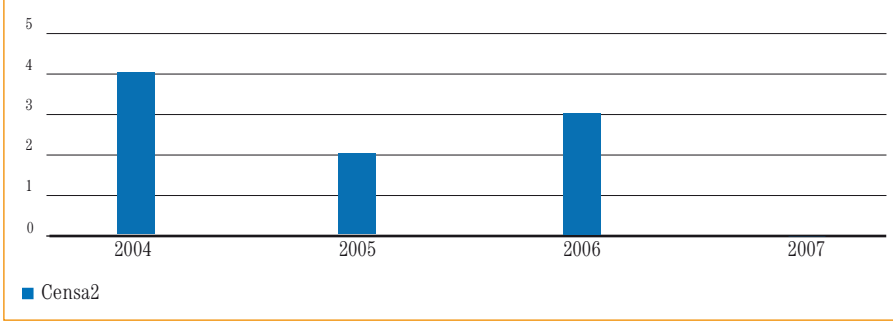


TABLE 34 SO_2: measurements of the provincial network - n° of times hourly limit for protecting human health was exceeded

Sensor	2004	2005	2006	2007
CENSA0	0	1	1	6
CENSA1	4	2	17	0
CENSA2	133	126	55	21
CENSA9	0	1	0	0
Limit value*	350 µg/m3, not to be exceeded more than 24 times in a calendar year			

* Limit value specified by Ministerial Decree n° 60/2002 from 2005 onwards. In 2004 the threshold not to be exceeded was 380 µg/m3

CHART T34 (No. of times exceeded)

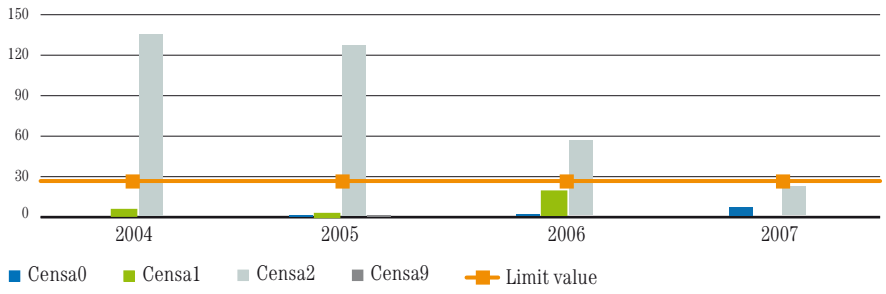


TABLE 35 SO_2: Concentration values measured by the provincial network - n° of times daily limit for protecting human health was exceeded

Sensor	2004	2005	2006	2007
CENSA0	0	0	0	1
CENSA1	0	0	2	0
CENSA2	9	11	7	2
CENSA9	0	0	0	0
Limit value*	125 µg/m3, not to be exceeded more than 3 times in a calendar year			

*Limit value specified by Italian Ministerial Decree n° 60/2002

CHART T35 (N° of times exceeded)

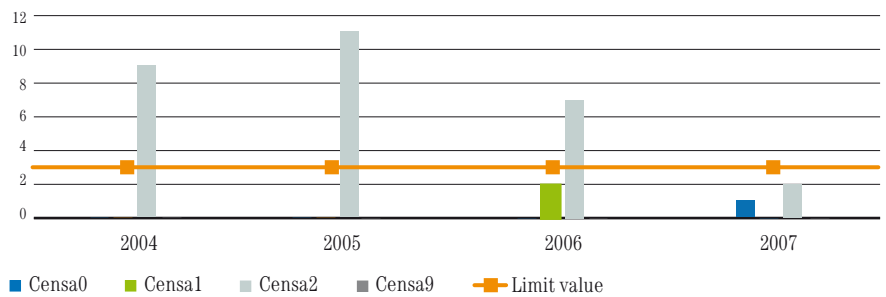


TABLE 36 SO_2: Concentration values measured by the provincial network – Average annual concentration

Sensor	2004	2005	2006	2007
CENSA0 (µg/m³)	5	6	7	7
CENSA1 (µg/m³)	7	7	8	4
CENSA2 (µg/m³)	24	26	15	12
CENSA9 (µg/m³)	4	5	5	4
Limit value*	20 µg/m3 limit for protection of ecosystems			

*Limit value specified by Italian Ministerial Decree n° 60/2002

CHART T36 (µg/m³)

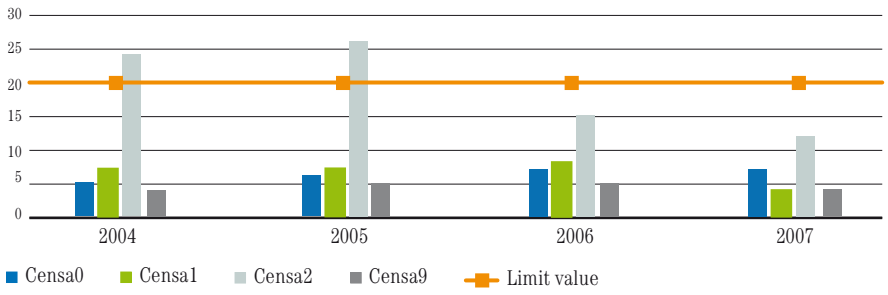


TABLE 37 Reports submitted to Saras regarding the exceeding of alarm thresholds pursuant to Ministerial Decree 60/2002 for SO_2

Parameter	2004	2005	2006	2007
n° of reports/year	5	4	4	6

Measurements from the provincial network for PM10

For PM10, no violation of the legal limits was found in the 2006 – 2007 period, except for the CENSA9 sensor, and that was limited to the year 2005.

The number of times the hourly limit value for protecting human health was exceeded and the annual average concentration values of PM10 are given in tables 38 and 39.

TABLE 38 PM10: Concentration values measured by the provincial network (n° of times hourly limit value for protecting human health was exceeded)

Sensor	2004	2005	2006	2007
CENSA0	---	4	4	12
CENSA1	---	5	10	8
CENSA2	30	15	20	21
CENSA9	---	55	---	0
Limit value*	50 µg/m3, not to be exceeded more than 35 times in a calendar year			

*Limit value specified by Italian Ministerial Decree n° 60/2002; --- : data not available

CHART T38 (N° of times exceeded)

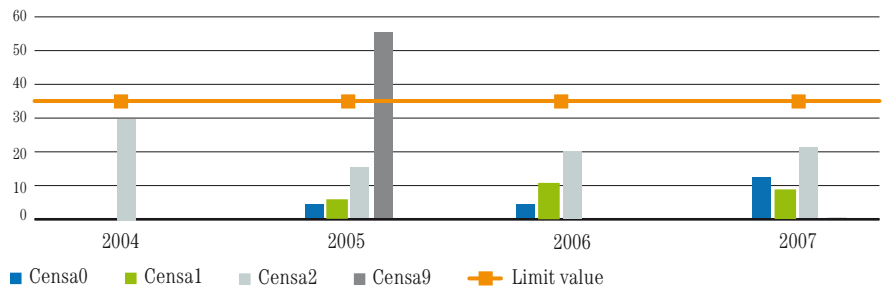
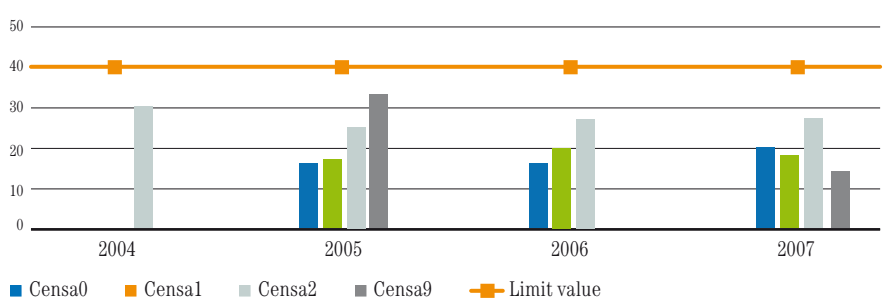


TABLE 39 PM10: Concentration values measured by the provincial network – Average annual concentration

Sensor	2004	2005	2006	2007
CENSA0 (µg/m³)	---	16	16	20
CENSA1 (µg/m³)	---	17	20	18
CENSA2 (µg/m³)	30	25	27	27
CENSA9 (µg/m³)	---	33	---	14
Limit value*	40 µg/m3 limit for protection of ecosystems			

*Limit value specified by Italian Ministerial Decree n° 60/2002; --- : data not available

CHART T39 (µg/m³)



Measurements from the provincial network for NO_2 and NO_x

For NO_2, for all stations the figures indicate that the values are comfortably lower than the legal limits. In the 2004 – 2007 period, no exceeding of the alarm threshold was registered, nor of the hourly limit for the protection of human health. The average concentration values of NO_2 and NO_x are given in tables 40 and 41.

TABLE 40 NO_2:Measurements from the provincial network – Average annual concentration of NO_2

Sensor	2004	2005	2006	2007
CENSA0 (µg/m³)	6	7	8	7
CENSA1 (µg/m³)	9	9	11	13
CENSA2 (µg/m³)	10	11	18	12
CENSA9 (µg/m³)	11	11	12	12
Value limit for protection of human health (µg/m³) *	52	50	48	46

*Limit value specified by Italian Ministerial Decree n° 60/2002; this will become 40 µg/m3 in 2010

CHART T40 (µg/m³)

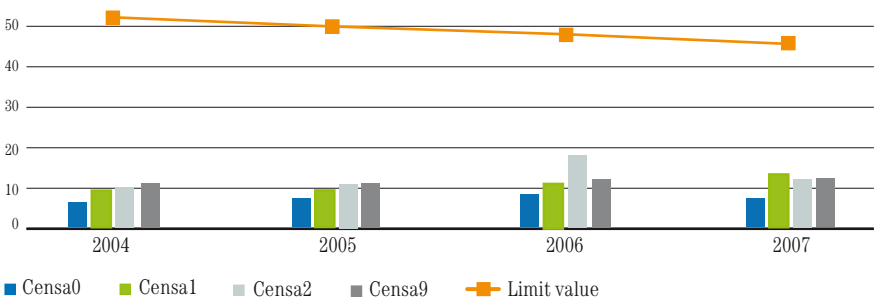
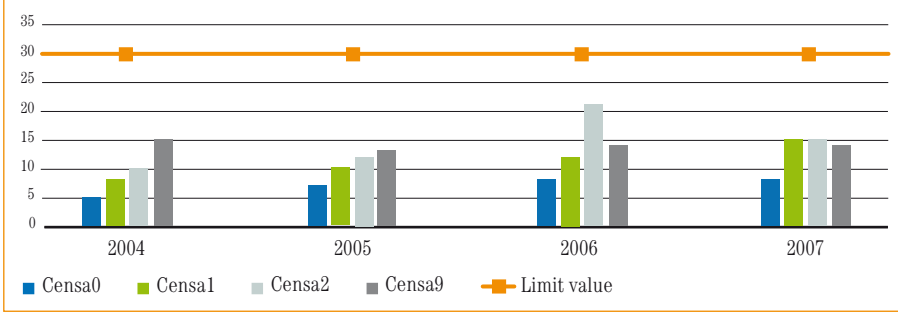


TABLE 41 NO_x: Measurements from the provincial network – Average annual concentration of NO_x

Sensor	2004	2005	2006	2007
CENSA0 (µg/m³)	5	7	8	8
CENSA1 (µg/m³)	8	10	12	15
CENSA2 (µg/m³)	10	12	21	15
CENSA9 (µg/m³)	15	13	14	14
Limit value*	30 µg/m³ limit for protection of vegetation			

*Limit value specified by Italian Ministerial Decree n° 60/2002

CHART T41 (µg/m³)



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

For the other pollutants monitored, the report from the Provincial Authority shows the following:

- For hydrogen sulphide, the average daily concentration values are lower than the legal limit of 40 µg/m3. The influence of this pollutant is limited, except for sporadic events which present concentrations that are still well below the aforementioned limit. Concentrations in 2007 are in line with those for previous years. **[Presidential Decree 15/04/1971]**
- For CO and benzene the values are much lower than the legal limits. For benzene, the 2007 concentrations are in line with those of previous years **[Ministerial Decree n° 60/2002]**
- For ozone, in 2007 the information and alarm thresholds were not exceeded, but the limit for the protection of human health (calculated on a three-year average) was exceeded, and also the long-term objective value for the protection of human health. The report emphasises how the ozone problem can only be tackled on a vast scale, given the phenomenon of this pollutant's being transported over long distances. **[Legislative Decree n° 183/2004]**

4.2.4.4.2 Monitoring of air quality using bioindicators and biodiversity studies

As well as using chemical indicators, the state of air quality can also be monitored using biological indicators. Epiphyte mosses, which are mosses that live on the trunks of trees, are the most-used bioindicators for monitoring air quality. The monitoring method is based on a measurement of biodiversity, i.e. on the abundance of different moss species. The presence of atmospheric pollutants (principally oxides of sulphur and nitrogen) can reduce the biodiversity values.

In a vast area that comprises the inland Sarroch region, shown in figure 15, for many years a study has been conducted by the Botanic Sciences Department of the Faculty of Mathematical, Physical and Natural Sciences at the University of Cagliari. This is a campaign of checks on the state of health of the vegetation, and it also adopts the "epiphyte mosses" method for air quality biomonitoring.

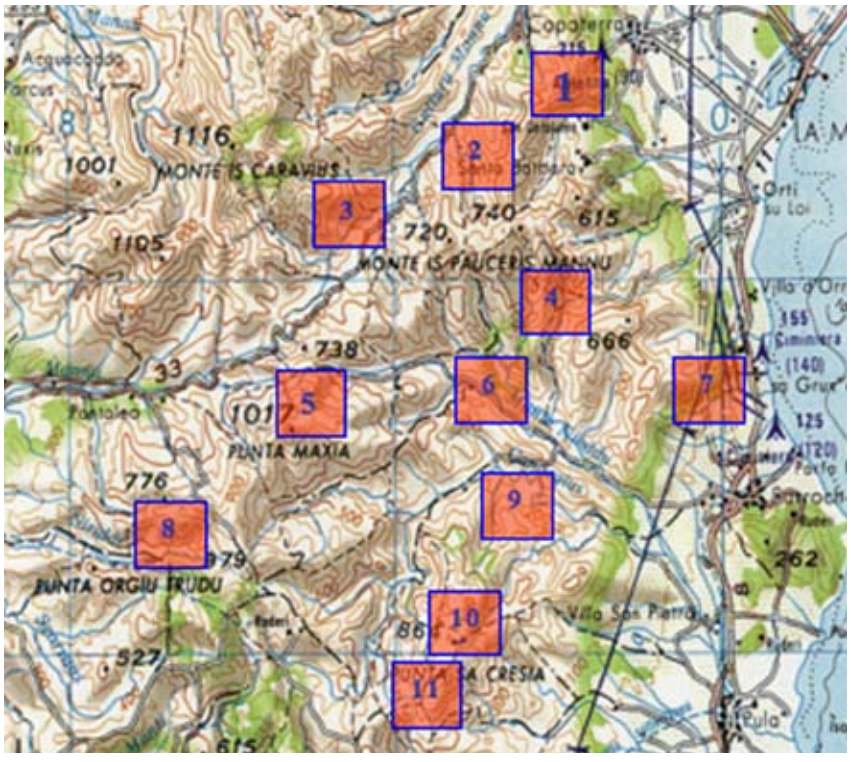


FIGURE 15 Location of air quality biomonitoring stations

Table 42 shows the reference factors for interpreting the classes of air quality and environmental naturalness, with reference to the "Index of Atmospheric Purity" (I.A.P.)[1].

TABLE 42 Index of Atmospheric Purity (I.A.P.): classes of quality and environmental naturalness

I.A.P. classes	I.A.P. values	Quality rating of the air	Naturalness/alteration
7	I.A.P. = 0	Very poor	Very high alteration
6	1 < I.A.P. < 10	Poor	High alteration
5	11 < I.A.P. < 20	Low	Medium alteration
4	21 < I.A.P. < 30	Mediocre	Low naturalness / low alteration
3	31 < I.A.P. < 40	Average	Average naturalness
2	41 < I.A.P. < 50	Fair	High naturalness
1	I.A.P. > 50	Good	Very high naturalness

Table 41 also highlights the classes which cover the index values taken in the stations monitored.

The air quality in the region under examination is in the "I.A.P. 3" class, with an "average" rating of air quality and naturalness, for 7 monitoring stations out of 11; and in the "I.A.P. 4" class, with a "mediocre" rating of air quality, "low" naturalness and "low" alteration, for the remaining stations. These measurements include the station nearest to the industrial area.

The air quality is higher in the stations furthest in to the area examined, and not as high in the station nearest the Sarroch industrial area. This result was to be expected.

However, the picture that emerges from the analyses using bioindicators shows a state of quality that is located in the intermediate band between the extremes of the I.A.P. index assessment scale.

In the area under investigation, a control campaign is also conducted on the state of health of the vegetation. The investigation is conducted by verifying the state of health of the vegetation through visual checks of various different vegetable species, and through verifying the bio-accumulation of pollutant substances.

According to the results of the field measurements, there is no critical threat to the health of the vegetation in the area studied.

[1] The I.A.P. index was created by: P.L. Nimis, "Guidelines for bioindication of the effects of pollution through the biodiversity of epyphitic lichens", Department of Biology, University of Trieste, 1999, and has been adopted in several studies on air quality, including by the Italian ARPAs (Regional Agencies for the Protection of the Environment).

4.2.4.5 – Emissions of greenhouse gases

Greenhouse gas (carbon dioxide, CO_2)

[implemented by Legislative Decree n° 216/95 and subsequent modifications]

The activities carried out on the Sarroch site, i.e. refining and electricity generation, come under the scope of application of the European directive on Emission Trading.
The Directive was introduced across Europe to control and reduce carbon dioxide emissions, under the application of the Kyoto Protocol. The objective of this regulation is to reduce emissions of greenhouse gases, and particularly carbon dioxide, as these gases are considered responsible for the planet's progressive global warming. This is more commonly known as the greenhouse effect.
The Emission Trading scheme was introduced from 2005 onwards, to help member states to observe the requirements of the Kyoto Protocol. It works by assigning each individual plant falling within the directive's field of application 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.
Allocation is decided for each of the reference periods set by the Directive, and the first reference period covers the 2005 – 2007 three-year period.
Subsequent periods will cover the five-year periods 2008 – 2012 and 2013 – 2018, for which more stringent allocations will be defined on the basis of the objectives specified in the Kyoto Protocol.

The tables and charts on the following page give the data for the annual CO_2 emissions from the site, both in absolute and relative terms, relating to the quantity of raw materials processed in one year.
The figures refer to the first three years of the directive's application, i.e. to the 2005 – 2007 period, and they have been validated by LRQA Italy, a company on the list of bodies especially accredited for this purpose by the Ministry for the Environment[1].
Calculation of CO_2 emissions in the Saras site is based on a special Monitoring Plan, defined in accordance with specific European and Italian guidelines[2]. The monitoring is based on measuring the consumption of fuels and on the application of specific emission factors for each fuel.
The requirements to be observed for the monitoring instrumentation are very stringent and must be checked and maintained over time. In addition, the laboratories that carry out analyses on the fuels must obtain special accreditation[3].
The internal laboratory at Saras was one of the first Italian laboratories operating in a refinery (the third in Italy) to obtain the necessary accreditation to carry out checks on some of the fuels used.
The emissions trend of the first period (2005 – 2007) was typical of the site's normal performance, with slight fluctuations caused by plant maintenance, for example (table 43 and the accompanying charts).

The objective of controlling and reducing greenhouse emissions is closely linked to the rational use of energy and the adoption of efficient production systems, areas to

[1]Recognition n° 11, DEC/RAS/096/2006 of the Ministry for the Environment.
[2]The European guidelines for the 2005 – 2007 period are contained in Directive 2004/156/EC. They were implemented in Italy with the implementation provisions contained in DEC/RAS/854/05. For the subsequent five-year period, 2008 – 2012, new guidelines will have to be applied. These are contained in Directive 2007/589/EC. Their implementation in Italy with appropriate implementation provisions is expected.
[3]The reference standard for laboratory accreditation is ISO 17025.

which Saras devotes particular attention, and the company has defined objectives to improve energy efficiency.

TABLE 43 Emissions of CO_2: absolute values and allowances assigned

Parameter	2005	2006	2007
Refinery emissions (t/year)	2,562,344	2,348,553	2,508,281
Allowances assigned to the refinery* (t/year)	**2,615,246**	**2,615,246**	**2,615,246**
IGCC emissions (t/year)	3,704,403	3,878,387	3,751,317
Allowances assigned to the IGCC* (t/year)	**3,544,794**	**3,544,794**	**3,544,794**

*Annual allowances assigned for the 2005 – 2007 period

CHART T43A (t/year)

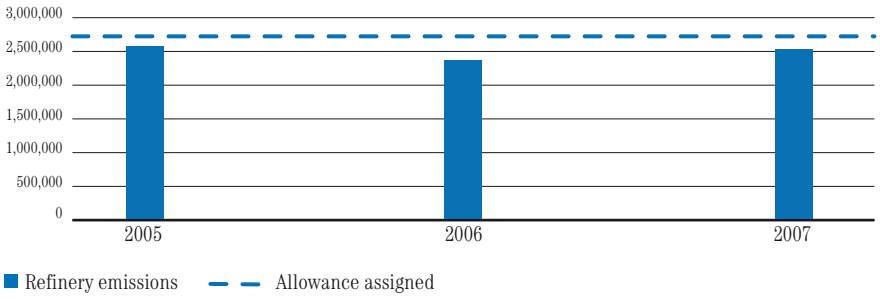


CHART T43B (t/year)

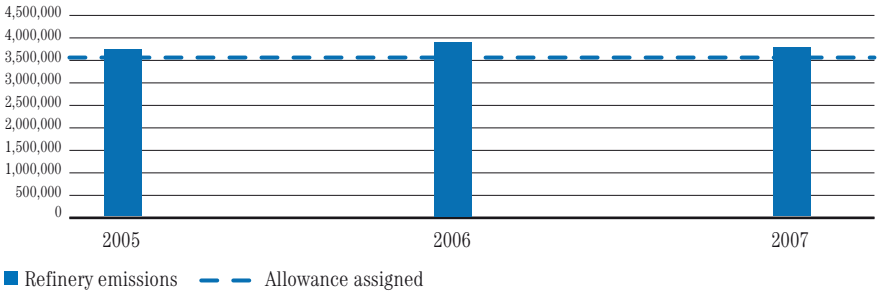
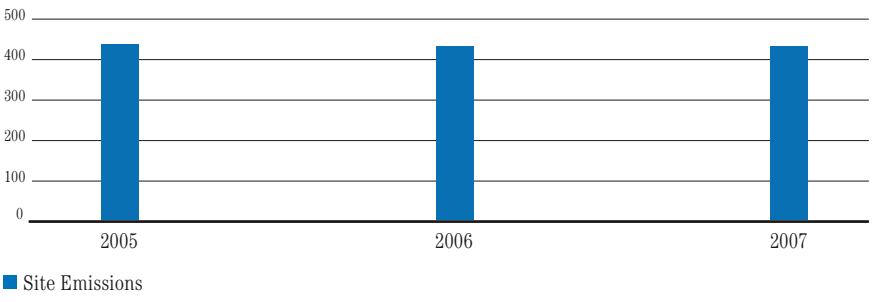


TABLE 44 Specific emissions of CO_2 from the site

Parameter	2005	2006	2007
Specific emissions from the site, t CO_2/kt raw materials	434	429	429

CHART T44 (t CO_2/kt raw materials)



4.2.5 – Emissions into water

4.2.5.1 – General

[Authorisation to discharge n° 445 of 11/22/2004]

Figure 16 shows the location of the Saras site's discharge points into water. In accordance with the authorisation of the Province of Cagliari, each discharge point is identified by a different code.

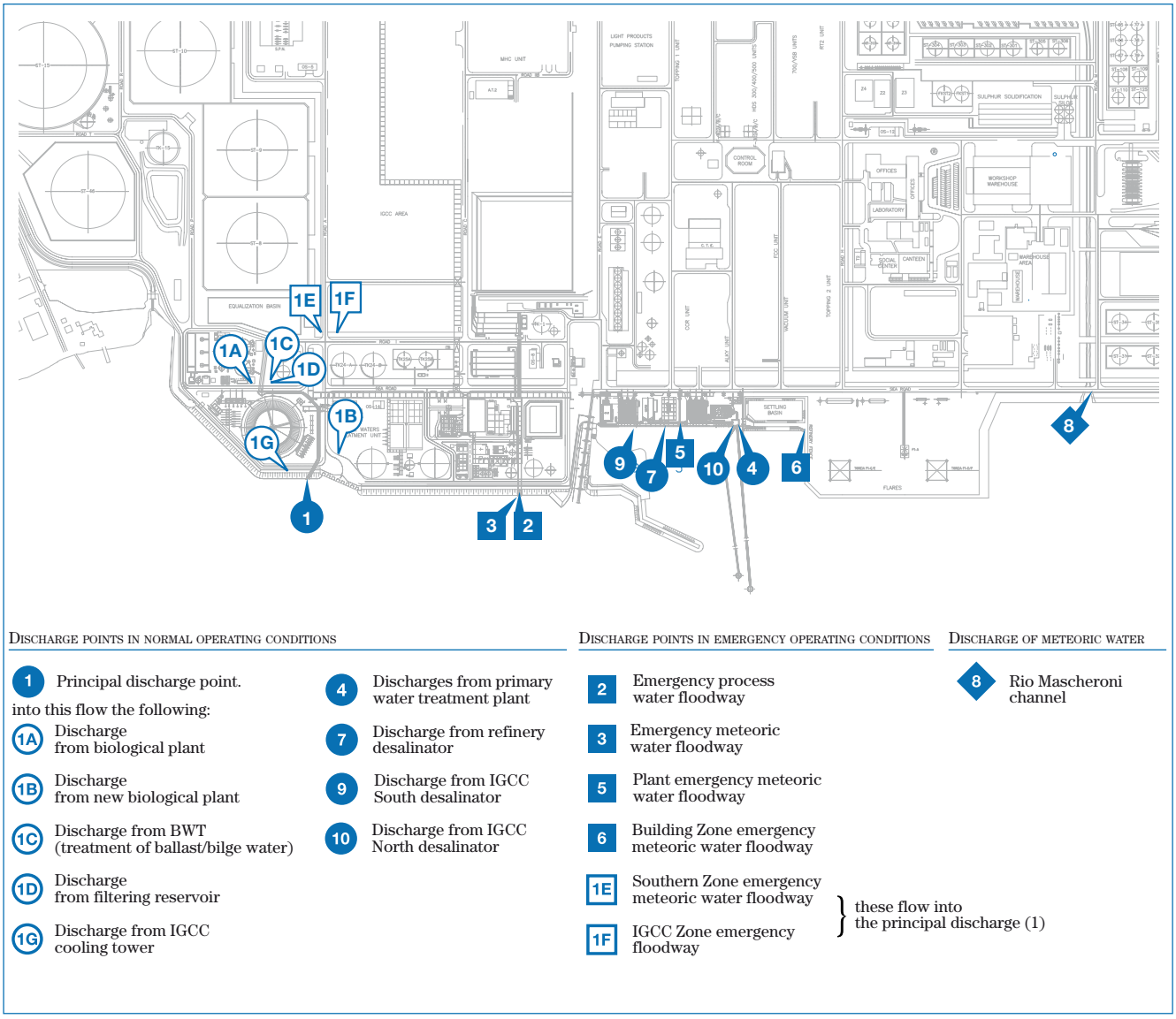


FIGURE 16 Map with location of site discharge points

Discharge points in normal conditions

The principal discharge point, n° 1, ducts the water coming from the following plants and units to the sea:

- The treatment plant for the facility's wastewater, with two discharge points (1a and 1b). The plant performs chemical, physical and biological treatments on the waters coming from the oily sewer network, to which are ducted wastewater and meteoric water from the plant areas, and sanitary water
- The treatment plant for ballast water (slops and washing water) and bilge water (paragraph 4.2.6) coming, respectively, from tanker ships that moor at the marine terminal and from private ships; water pumped from the wells in the site's hydraulic barrier (paragraph 4.2.7); and meteoric waters, excluding those collected from the plants area. The treatment plant has one discharge point (1c)
- The filtering reservoir, which accumulates the water purified by the wastewater treatment plant, and equipped with a defined-level overflow discharge (discharge 1d)
- The discharge from the IGCC cooling tower (1g)

Discharges nos. 4, 7, 9 and 10 are also ducted to the sea. These discharges come from the following plants:

- Primary treatment of water brought in to the site, taken from the industrial aqueduct (4)
- Desalinators of the refinery and of the IGCC (7, 9, 10).

All of the above-mentioned discharges are active under normal conditions and are continuous, except for the discharges from the filtering reservoir and from the primary treatment of water from the aqueduct. Since meteoric water is not subjected to pollution sources, this water (which comes from the roads and paved open areas in the northern zone of the refinery and from the basins of the LPG spheres) is ducted into the Rio Mascheroni channel and from there to the sea (discharge point n° 8).

Discharge points in emergency conditions

In emergency conditions due to exceptional events (torrential rains), the meteoric water, including water from the roofs of the buildings in the IGCC zone and from the sea terracing of the IGCC, are discharged via the emergency process water floodways and the plant sewerage system (1e, 1f, 2, 3, 5, 6).

These discharges are normally closed and sealed by the controlling authorities. The integrity of the seal placed by the Authorities is periodically checked and any deterioration is reported.

If it becomes necessary to activate one or more of these discharges, an internal emergency procedure is followed by the facility, and the Provincial authority is notified (within the timescale required by the authorisation) of the reasons for removing the seals and the time required to restore normal conditions.

Determination of emissions values in water

In accordance with regulations established by the Province of Cagliari regarding the discharge of waste water into the sea, monthly samples are taken by an accredited external laboratory, and the results of the analysis are sent to the provincial authority each quarter. Based on this data (for COD, for nitrogen and for suspended solids) and on information from the continuous hydrocarbon analysers, the annual figures have been arrived at, and these figures are presented below.

CONTRIBUTIONS TO DISCHARGE FLOW (%) 2007

Principal discharge (excluding IGCC tower)	17
Discharge from desalinators	61
Discharge from IGCC tower	22
Discharge from treatment of incoming water	1

4.2.5.2 – Data on emissions into the sea

Discharges from wastewater treatment units

The significant quantitative parameters describing emissions into the water which are ducted to the principal discharge point (point 1) are the following:

- Flow of water discharged
- COD
- Total hydrocarbons
- Nitrogen in different forms (ammoniac nitrogen/nitrous nitrogen/nitric nitrogen).

Below are the figures for the above parameters for the four discharge points (points nos. 1a, 1b, 1c, 1d) taken together, ducted to the principal discharge point.

[flow]

Table 45 and charts T45a and T45b show the average hourly flow figures of discharged water, giving both absolute values and specific values in relation to the raw materials processed.

Analysing the data for the four-year period 2004 – 2007, for both the absolute indicator and the specific indicator we note a substantially constant trend, with slight fluctuations.

TABLE 45 Discharges from wastewater treatment units (points 1a, 1b, 1c, 1d) – Flow

Parameter	2004	2005	2006	2007
Total water discharged – average annual flow (m^3/hour)	703	776	767	750
Total water discharged/raw materials processed (m^3/kt raw materials)	436	471	463	450

CHART T45A (m^3/hour)

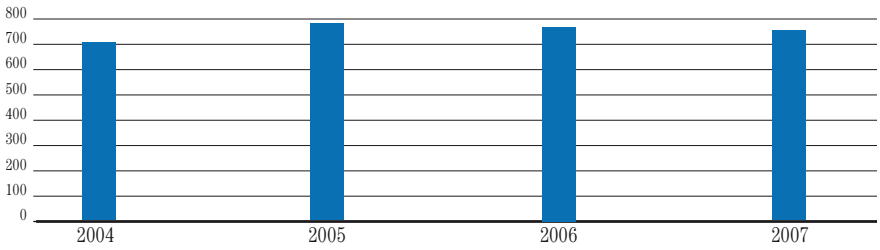
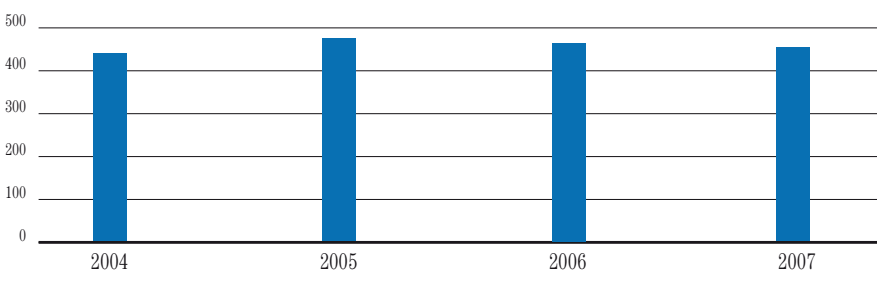


CHART T45B (m^3/kt raw materials)



[COD]

The figures for the COD indicators, expressed as absolute and specific mass flow values and as average annual concentration, are given in table 46. The COD trend shows fluctuations over the years, but always with average concentration values that are well below the legal limit value.

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

Parameter	2004	2005	2006	2007
Absolute values (t/year)	356.1	502.0	368.0	472.0
Specific values (t/millions of t of raw materials)	25.2	34.9	25.4	32.3
Average concentration values (mg/l)*	54.60	72.30	53.10	66.80

*Compared to the limit value of 160 mg/l, specified by Legislative Decree n° 152/2006 Part III, Enclosure 5.

CHART T46A (t/millions of t raw materials)

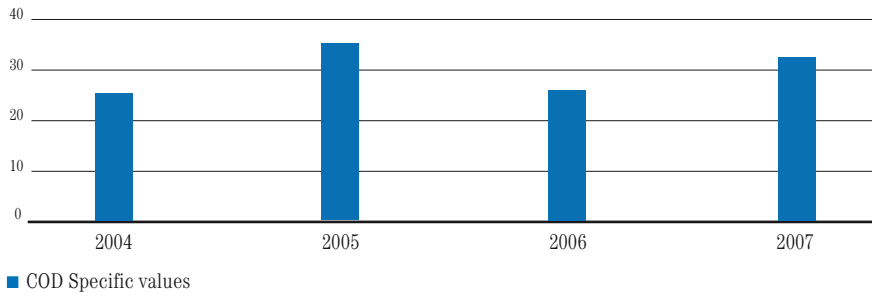
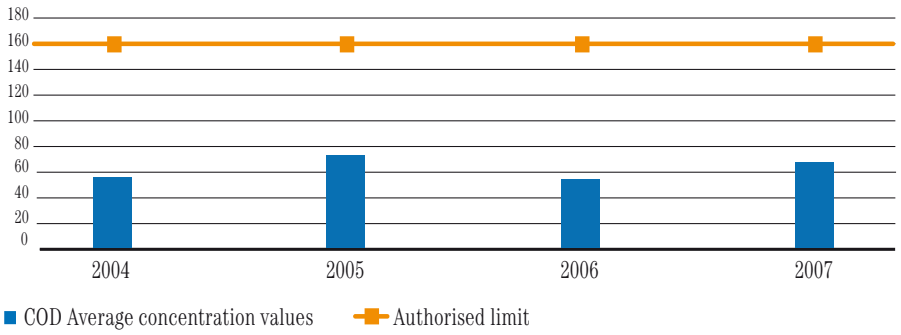


CHART T46B (mg/l)



[Total hydrocarbons]

Table 47 gives the figures for the indicators for total hydrocarbons, expressed as absolute and specific mass flow values and as average annual concentration.

TABLE 47 Discharges from wastewater treatment units (1a, 1b, 1c, 1d) – Total hydrocarbons

Parameter	2004	2005	2006	2007
Absolute values (t/year)	10.2	11.8	10.1	14.3
Specific values (t/millions of t of raw materials)	0.72	0.82	0.70	0.98
Average concentration values (mg/l)*	1.5	1.8	1.5	2.2

*Compared to the limit value of 5 mg/l, specified by Legislative Decree n° 152/2006 Part III, Enclosure 5.

CHART T47A (t/millions of t raw materials)

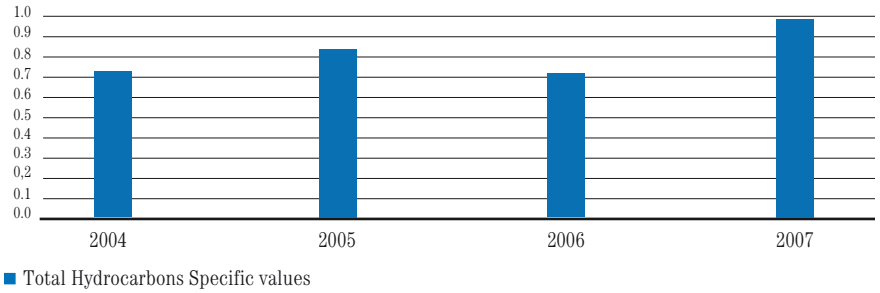
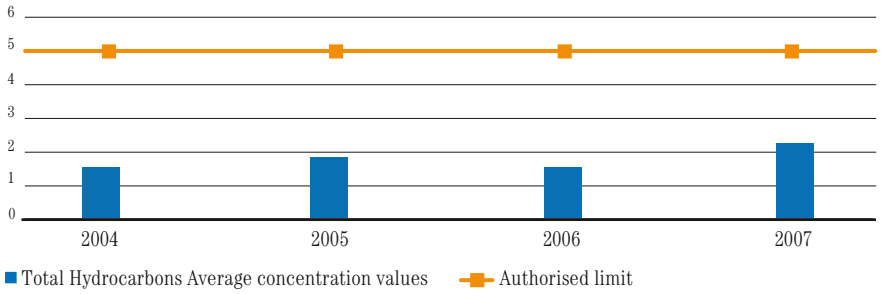


CHART T47B (mg/l)



The total hydrocarbons trend shows average concentration values that are much lower than the legal limit.
In the first half of 2007, due to the malfunctioning of flotation units and a prolonged maintenance period, an increase was recorded for this parameter.
The problem in the treatment system was solved in the second half of 2007, and values of the parameter then returned to their typical levels for the years 2004 – 2006.

[Nitrogen]

Tables 48 and 49 give the figures for the indicators for nitrogen, expressed as absolute mass flow values of total nitrogen and as average annual concentration of nitrogen in its individual forms (ammoniac nitrogen/nitrous nitrogen/nitric nitrogen). The trend in the indicators is substantially constant, except for an overall reduction in total nitrogen in 2007 (table 48).

TABLE 48 Discharges from wastewater treatment units (points 1a, 1b, 1c, 1d) – Total nitrogen (ammoniac, nitrous and nitric): mass flows

Parameter	2004	2005	2006	2007
Absolute values (t/year)	68.7	60.8	56.7	31.6
Specific values (t/millions of t of raw materials)	4.87	4.22	3.91	2.17

CHART T48A (t/year)

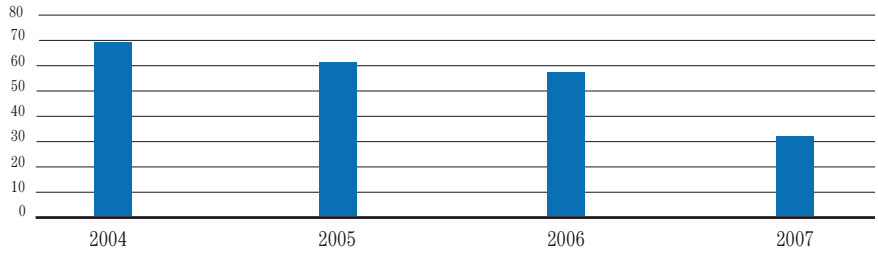


CHART T48B (t/millions of t raw materials)

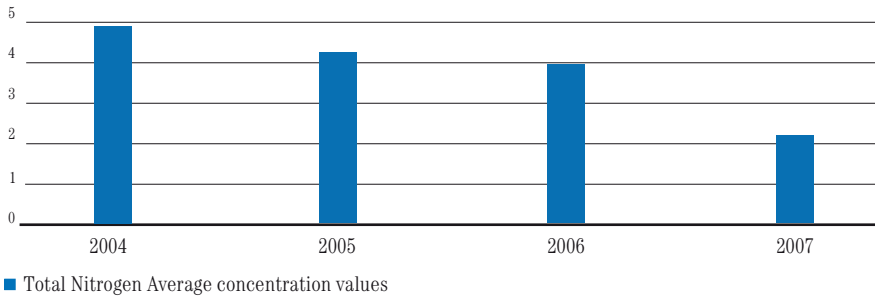


TABLE 49 Discharges from wastewater treatment units (points 1a, 1b, 1c, 1d) – Nitrogen (ammoniac, nitrous and nitric): average concentrations

Parameter	2004	2005	2006	2007	Valore limite*
Ammoniac nitrogen (mg/l)	1.77	0.91	1.12	2.09	15.00
Nitrous nitrogen (mg/l)	0.10	0.10	0.09	0.04	0.60
Nitric nitrogen (mg/l)	8.32	7.92	7.24	2.68	20

* Limit value specified by Italian Legislative Decree n° 152/2006 Part III, Enclosure 5.

In 2007 an increase was recorded for ammoniac nitrogen, with a simultaneous reduction in nitrous and nitric nitrogen, as can be seen from the concentration figures given in table 49. This trend is due to a different management of the nitrification/denitrification section of the wastewater treatment plant, aimed at increasing the distance from the legal limit for nitrates.
The trend over the four years is shown in the charts on the following page.

CHART T49A (mg/l)

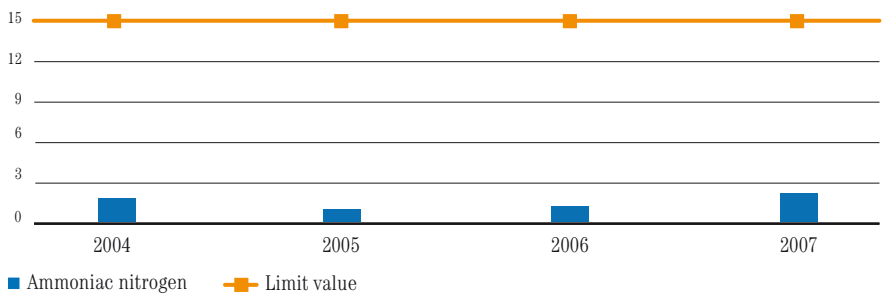


CHART T49B (mg/l)

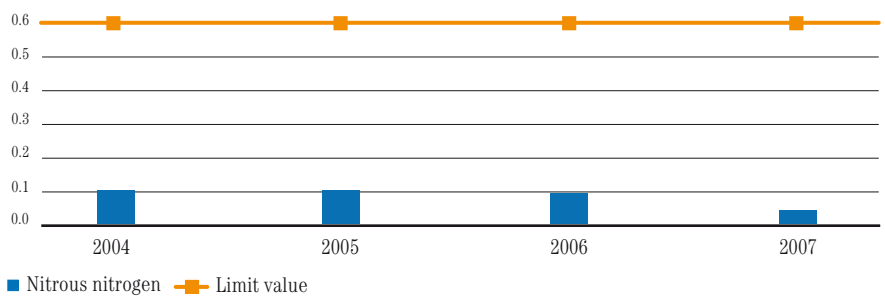
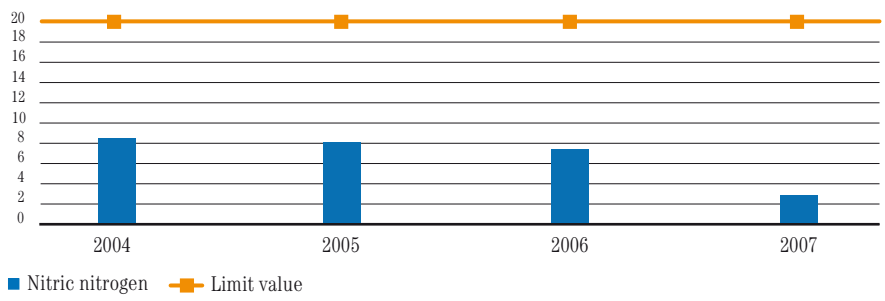


CHART T49C (mg/l)



Discharges from other units

Two principal parameters (discharge water flow and suspended solids) describe the discharges from the following units:

- Primary treatment of incoming water (discharge point n° 4)
- Desalinators (discharge points n° 7, 9, 10)
- IGCC tower (discharge point n° 1g)

The figures for these parameters for the three types of discharge listed above are given in the following tables and charts.

In particular, table 50 presents the figures for the average hourly flow of the discharged water, as absolute and specific values. **[flow]**

The charts give the significant contributions to the overall flow (desalinators and IGCC tower).

TABLE 50 Discharges from the primary treatment units for input water (point n° 4), desalinators (points n° 7, 9, 10), IGCC tower (point n° 1g) – Flow

Parameter	2004	2005	2006	2007
Absolute values (m³/hour)				
Treatment of incoming water	36.2	29.5	36.9	36.5
desalinators	2,478	2,716	2,893	2,778
IGCC Tower	894	918	928	977
Specific values (m³/kt raw materials)				
Treatment of incoming water	2.57	2.05	2.54	2.50
desalinators	1,538	1,650	1,746	1,668
IGCC Tower	555	558	560	587

CHART T50A (m³/hour)

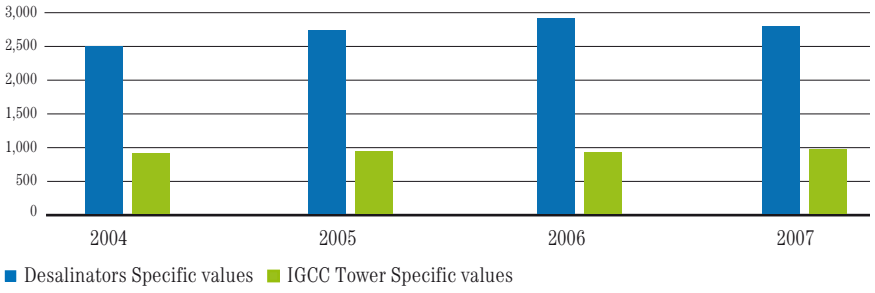
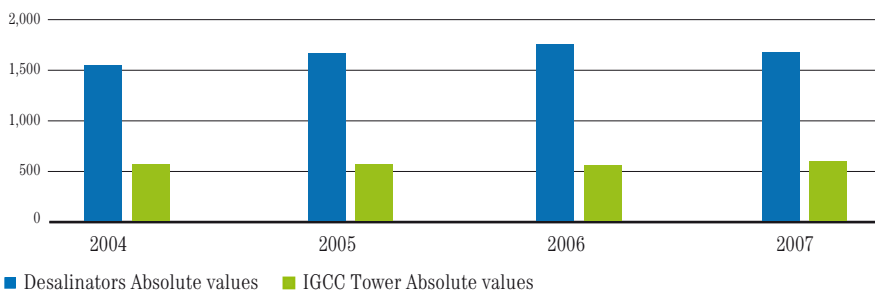


CHART T50B (m³/kt raw materials)



[suspended solids – mass flows]

Table 51 gives the figures for the indicators for suspended solids, expressed as absolute and specific mass flow values. Here too, the charts give the significant contributions (desalinators and IGCC tower). The average annual concentrations are shown in table 52 and its charts, on the facing page. From the mass flow figures and the concentration figures for suspended solids in the discharges from the desalinators and from the IGCC tower, variations can be observed over the years. The variations are basically due to the differing content of suspended solids in the seawater withdrawn and input into the plants, and these differences in content are linked to the greater or lesser occurrence of sea storms over the course of the year.

TABLE 51 Discharges from the primary treatment units for input water (point n° 4), desalinators (points n° 7, 9, 10), IGCC tower (point n° 1g) – Suspended solids: mass flows

Parameter	2004	2005	2006	2007
Absolute values (t/year)				
treatment of incoming water	15	6	10	7
desalinators	877	621	528	536
IGCC Tower	412	340	288	287
Specific values (t/millions of t of raw materials)				
treatment of incoming water	0.5	0.7	0.4	1.0
desalinators	62.2	43.0	36.4	36.7
IGCC Tower	29.2	23.6	19.9	19.7

CHART T51A (t/year)

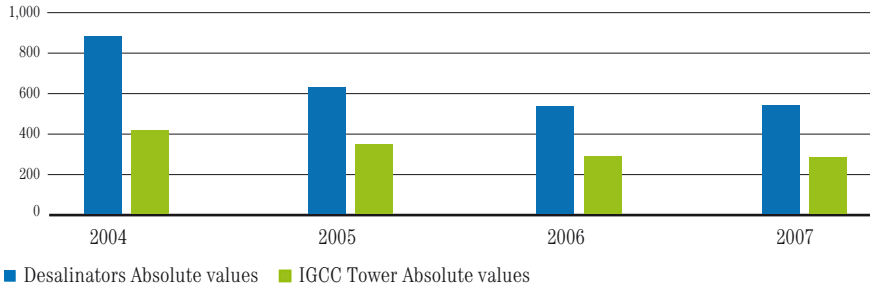
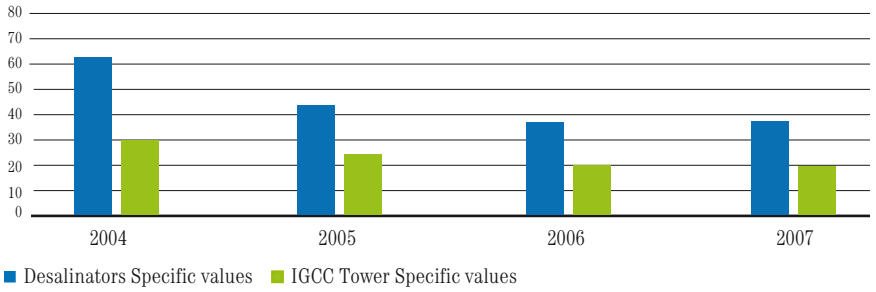


CHART T51B (t/millions of t raw materials)



[suspended solids – concentrations]

TABLE 52 Discharges from the primary treatment units for input water (point n° 4), desalinators (points n° 7, 9, 10), IGCC tower (point n° 1g) – Suspended solids: average concentrations

Parameter	2004	2005	2006	2007	Limit value*
Treatment of primary water (mg/l)	48.0	23.8	29.9	21.2	80
Desalinators** (mg/l)	37.0 – 47.5	24.9 – 27.9	22.4 – 23.9	20.7 – 23.6	80
IGCC tower (mg/l)	52.5	41.5	34.8	33.0	80

* Limit value specified by Italian Legislative Decree n° 152/2006 Part III, Enclosure 5.

**The interval of minimum and maximum values for the three desalinators is shown.

CHART T52A (mg/l)

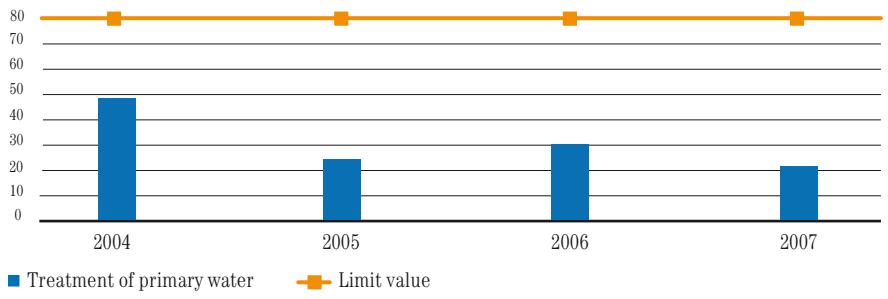


CHART T52B (mg/l)

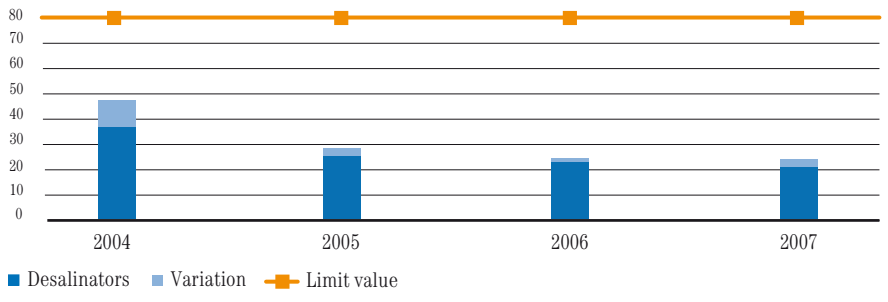
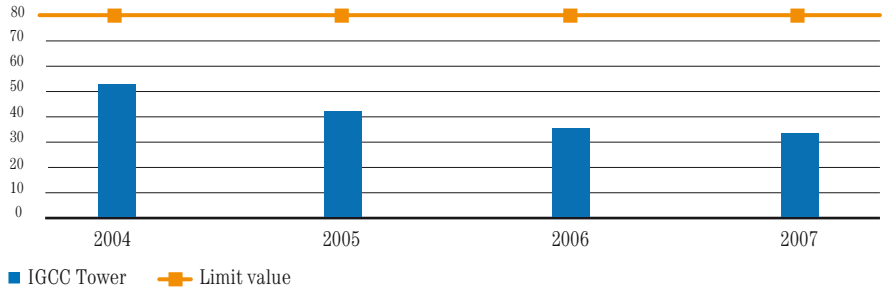


CHART T52C (mg/l)



Emergency situations following spills into the sea

The emergency situations that can affect seawater derive from the accidental spilling of hydrocarbons from the marine terminal. These situations are analysed and assessed in the Safety Report (paragraph 3.7, page 38).

Preventive measures against 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 (paragraph 4.3.2, page 113).

To handle emergencies at sea, the Marine Pollution Prevention Plan has been drawn up. This contains different intervention procedures according to the type of product spilled.

In the four-year period 2004 – 2007 there were no accidents with spills of hydrocarbons into the sea.

4.2.5.3 – State of seawater quality

For several years, marine biologists have conducted periodic studies of the stretch of sea in front of the area occupied by the Saras site, to check the state of quality of the marine water.

Specifically, the study includes the measurement of a great many chemical/physical values at varying depths, at a series of points positioned along lines perpendicular to the coastline, shown in figure 17.

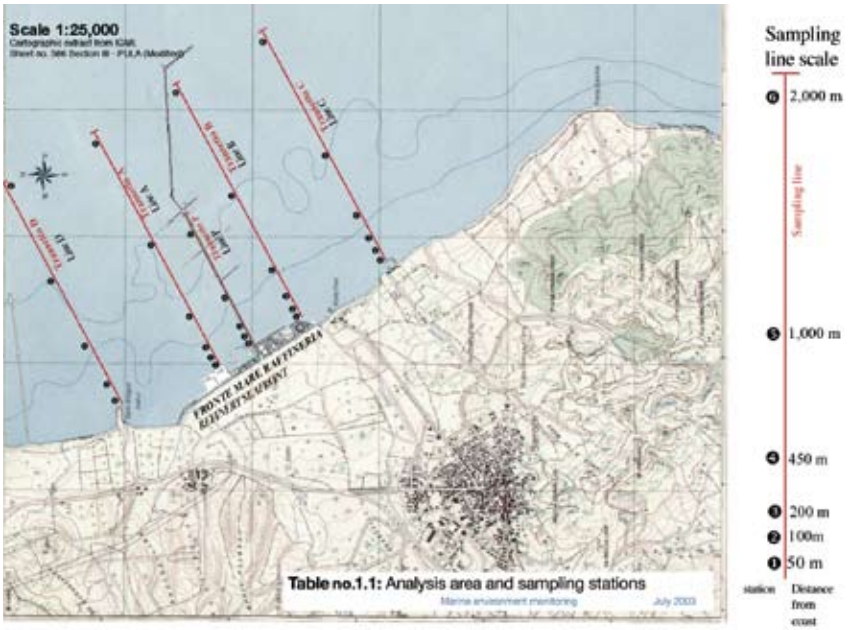


FIGURE 17 Area covered by the study of the seawater quality

["TRIX" indicator of seawater quality]

To describe the state of quality of the seawater, an indicator called the Trophic Index (TRIX[1] for short) is used. This expresses the state of quality of the seawater in a succinct form. The TRIX indicator is calculated using a mathematical formula that considers chemical values (percentage of dissolved oxygen, concentrations of phosphorous and nitrogen) and biological values (chlorophyll "a") found in the seawater.

On the facing page, table 53 shows the reference values for interpreting the classes of quality of seawater. The table also highlights the classes of quality which cover the indicator values taken at the points monitored in the study mentioned above.

The state of quality found is in the high range of the classification ("high"/"good").

[1]The TRIX index – specified by Legislative Decree 152/99 for the characterisation of the state of quality of seawater – was not taken up by Legislative Decree 152/06, which abrogated the previous decree. However, while waiting for a complete implementation of the European directive on seawater, this index continues to be widely used, and is also used the controlling authorities (the ARPAs), partly because it allows comparison with data collected in previous years.

TABLE 53 Trophic Index (TRIX): classes of quality and condition of water

Trophic index	Trophic state	Water conditions
2 – 4	High	Good transparency of water; absence of coloration anomalies from the water; absence of undersaturation of dissolved oxygen in the benthic water.
4 – 5	Good	Occasional turbidity of the water; occasional coloration of the water; occasional hypoxia in the benthic water.
5 – 6	Mediocre	Insufficient transparency of the water; anomalous coloration of the water; hypoxia and occasional anoxia of the benthic water; states of suffering in the benthonic ecosystem.
6 – 8	Poor	High turbidity of the water; widespread and persistent anomalies in the coloration of the water; widespread and persistent hypoxia/anoxia in the benthic water; kills of benthonic organisms; alteration/simplification of the benthonic communities; economic damage to the tourism, fishing and aquaculture sectors.

The stretch of sea covered by the analysis is also affected by thermal discharges, i.e. discharges of water with higher temperatures than that of the ambient water.

The applicable legislation requires that the increase in temperature of the receiving body must not exceed 3°C over 1000 metres away from the immission point. **[Law n° 502 of 6/12/93]**

Every 6 months, in accordance with the IRSA method (Manual of analytical methods for waters, Italian title Manuale dei metodi analitici per le acque, published in Quaderno Istituto Ricerca sulle Acque n° 100, 1995) specified by the Ministerial Decree of 04/16/1996, a check is conducted of the differences in temperature detectable at 1,000 metres from the discharge point from the IGCC seawater cooling circuit, along a semicircumference with its centre at the point of discharge.

The results of these checks show temperature difference values lower than 1°C in the winter study, and not much higher than 1°C (1.0 – 1.4°C) in the summer study, as can be seen from the data in table 54.

TABLE 54 Measurement at depth of 0.1 m along an arc of semicircumference of radius 1 km with its centre on the discharge point of the IGCC tower (point n° 1g)

	January 2004	July 2004	January 2005	July 2005	January 2006	July 2006	January 2007	July 2007
Minimum T°C	13.8	25.0	12.6	24.1	11.5	27.5	14.7	24.1
Maximum T°C	14.5	26.1	13.1	25.1	12.3	28.9	15.1	25.2
°C thermal increase	0.7	1.1	0.5	1.0	0.8	1.4	0.4	1.1

4.2.6 – Waste

4.2.6.1 – General

Waste management at the Saras site is geared towards the twin primary objectives of minimising the quantities produced and progressively increasing the waste flows sent for recovery.

With reference to figure 18, the principal operational phases of managing waste at the site, before the waste is sent off-site for disposal or recovery, are described below:

[waste management phases]

- Waste generated, appropriately divided into homogenous categories, is generally sent to the temporary deposit areas (point n° 2, in figure 18)
- Filter cake coming from the IGCC plant can be stored in the temporary deposit area, or in a specially-authorised storage area[1] before being sent off-site for recovery of the metals contained in it (points nos. 3 and 4)
- Ferrous scrap materials and other types of waste (mainly electrical & electronic materials and equipment) are subjected to recovery in a designated area, managed by an authorised external firm[2], which puts the scrap through a process of selection and reduction in volume, but without altering the type and mass quantity (point n° 1)
- Part of the waste generated, mainly comprising waste polluted by hydrocarbons, is sent to a plant on-site that separates the oily phase and the watery phase contained in the waste, and then subjects it to an inertisation treatment. The treatments carried out considerably reduce the mass quantity of the waste and modify its type, by mixing it with an inert matrix. The recovered oily phase is sent to the refining cycle and the watery phase is collected by the sewerage network, which ducts it to the facility's wastewater treatment plant. Management of the separation and inertisation plant is assigned to an external firm with the appropriate authorisation[3] (point n° 6)
- Exhausted oils are stored in special containers (point n° 7)
- Refuse comprising plastic, glass, aluminium and paper is collected separately and deposited in a designated area (point n° 5).

[Law n° 70 of 25/01/1994]

The waste sent to the two firms mentioned above are accounted for in the annual declaration (Environmental Declaration Unified Form or "Modello Unico") of waste produced by Saras. The two firms receive the waste sent to them, and they account for the waste that they send off-site (after the treatments have been carried out) in their annual declarations.

These firms are selected and verified over time, including by means of specific audits (paragraph 4.3.3).

The filter cake from the IGCC plant is shipped for recovery to plants located in Germany, and so every year authorisation is sought for cross-border movement of waste[4], in accordance with Directive EC/1013/2006.

[1] Regional decision n° 739 of 06/01/2006
[2] Regional decision n° 163 of 08/02/2004
[3] Regional decision n° 2201/IV of 09/23/2004
[4] Provincial decision n° 94 of 06/20/2008

FIGURE 18 Areas designated for the principal activities for managing waste on site.

[bilge water treatment]

Lastly, Saras is authorised[1] to receive and treat waste comprising bilge water, slops and ballast water from ships.

This service is provided completely free of charge for ships that moor at the marine terminal, and for ships that send Saras these types of waste from regional ports via tanker truck. These types of aqueous waste are treated in the ballast water treatment plant, previously mentioned in paragraph 4.2.5.
This plant also treats the groundwater pumped by the wells in the hydraulic barrier (paragraph 4.2.7), and this waste is also classified and accounted for as part of the waste generated by Saras's site activities.

[1]Regional decision n° 2520/IV of 04/11/2004 supplemented by Decision n° 964/IV of 31/05/2005

4.2.6.2 – Data on waste

Based on the management described, the waste figures and evaluations take account of both the waste generated by Saras's activities (figures declared in the Environmental Declaration Unified Form) and the waste leaving the site after treatment by the inertisation plant.

Table 51 gives the figures for the overall waste generated by Saras's activities, subdivided into hazardous waste and non-hazardous waste.

It can be seen that the total quantity of waste fluctuates around a level of 60,000 tons/year, with a prevalence of hazardous waste over non-hazardous waste.

WASTE GENERATED ON SITE (%) 2007	
Waste to on-site inertisation plant	47.7
Water from wells in the hydraulic barrier to wastewater treatment plant	41.3
Filer cake sent for recovery off-site	3.9
Other types of waste	7.1

TABLE 55 Saras waste generated on-site (refinery and IGCC)*

Parameter	2004	2005	2006	2007
Quantity of hazardous waste (t/year)	49,335	52,795	36,731	40,735
Quantity of non-hazardous waste (t/year)	10,504	9,358	22,240	19,806
Total quantity of waste (t/year)	**59,839**	**62,153**	**58,971**	**60,541**

**Includes all types of waste generated by the refinery and by the IGCC plant and accounted for in the Environmental Declaration Unified Form ("Modello Unico") as shipped waste

CHART T55 (t/year)

The total quantity of waste in 2007 was broadly similar to that of previous years, when work began on removing the top layer of soil in the reservoirs, which was necessary to lay concrete floors in order to provide improved subsoil protection.

When the figures in table 55 are compared with those for the waste leaving the site (table 56 following), we can see a considerable reduction in mass of the waste generated. This reduction is due to the recovery of the oily fraction and the water contained in the waste sent to the on-site inertisation plant.

TABLE 56 Outgoing waste from the Saras site*

Parameter	2004	2005	2006	2007**
Quantity of hazardous waste (t/year)	10,830	1,834	4,209	9,365
Quantity of non-hazardous waste (t/year)	30,479	32,465	35,678	22,862
Total quantity of waste (t/year)	**41,309**	**34,299**	**39,886**	**32,227**

*Includes all types of waste generated by the refinery and by the IGCC, excluding the waste sent to the inertisation plant on the site and the water pumped from the wells in the hydraulic barrier, and includes the inertised waste generated by the internal plant.

**The increase in the quantity of hazardous waste in 2007 is due to a different classification assigned to inertised waste as a precautionary measure.

CHART **T56** (t/year)

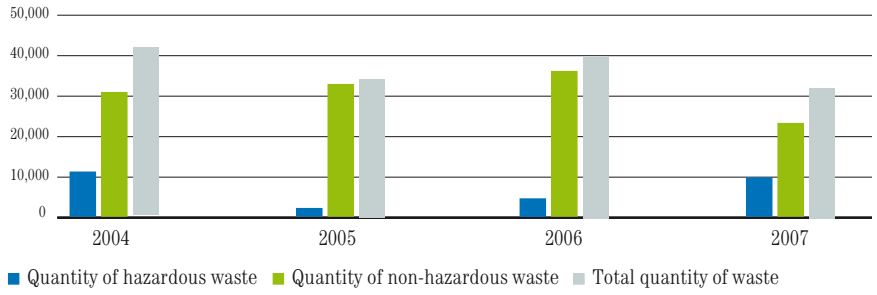


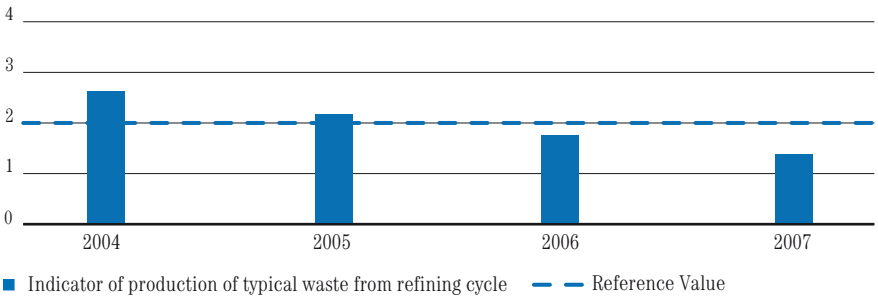
Chart T56 shows that, of the waste leaving the site, the portion of non-hazardous waste is greater than the portion of hazardous waste. In addition, over the years the trend in the total quantity shows a tendency towards reduction.
This result has been considerably assisted by the reduction in waste from the refining production cycle, as shown by the figures for the specific indicator given in table 57 below.

TABLE **57** Waste production from Saras activities

Parameter	2004	2005	2006	2007	Reference value**
Indicator of production of typical waste from refining cycle* (kg/t raw materials)	2.06	2.15	1.72	1.37	≤2

*Indicator calculated by subtracting the waste deriving from extraordinary activities and/or not pertaining to the refining cycle (e.g. excavated rocks and earth, materials resulting from cleaning the sea floor of the small harbour, vanadium concentrate from the IGCC plant etc.) from the total waste leaving the site
**Value indicated by the Guidelines on Best Available Techniques (Decree of Ministry for the Environment 01/29/2007)

CHART **T57** (kg/t raw materials)



The indicator is calculated by taking account of the types of waste originating from the refining cycle, in relation to the quantity of raw materials processed. The values of the indicator are compared with the reference values (less than 2 kg of waste per ton of crude processed), which are contained in the Italian Guidelines on the best available techniques in the refining sector.
In addition to waste of industrial origin, waste equivalent to urban solid waste is also generated on-site. This waste comes mainly from office and canteen activities.
The separated waste collection of plastic, glass and paper, begun in 2006 with an overall collection quantity of 50 tons, doubled in 2007.
This result was achieved partly as a result of a site awareness-raising campaign and, in particular, as a result of the contribution of the entire site personnel.
Separated waste collection is the subject of a specific objective for improvement.

[table of objectives and interventions objective n° 11, page 123]

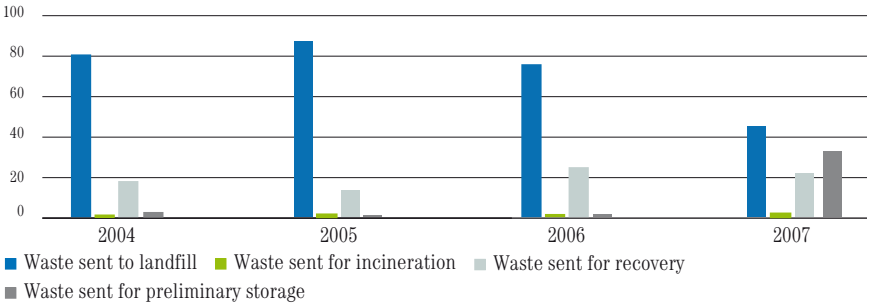
Table 58 shows, in percentage terms, the different types of final destination of the outgoing waste from the site.

TABLE 58 Destination of outgoing waste from the Saras site

Destination of waste	2004	2005	2006	2007
Waste sent to landfill (% of total waste)	79.73	86.33	74.9	44.72
Waste sent for incineration (% of total waste)	1.01	1.09	0.94	1.31
Waste sent for recovery (% of total waste)	17.19	12.7	24.06	21.2
Waste sent for preliminary storage (% of total waste)	2.09	0.01	0.006	32.8*

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

CHART T58 (%)



We can see that in the second two-year period, 2006-2007, the overall quantity of waste sent for recovery was significantly greater, going from 12-15% in the 2004-2005 two-year period to 21-24% in the 2006-2007 two-year period. Consequently, the quantity of waste sent to landfill is significantly reduced.

The good result achieved is due to the ability to send waste comprising excavated soil, from construction site activities and from the tank containment reservoirs, for recovery instead of disposal. Recovery of excavated soil is now possible in an off-site plant, located in the Macchiareddu industrial area.

[table of objectives and interventions objective n° 12, page 124]

Increasing the quantity of waste sent for recovery is the subject of a specific objective for improvement.

The percentage division between hazardous and non-hazardous waste in waste sent for recovery is given in table 59.

As can be seen, non-hazardous waste makes up the larger portion of waste sent for recovery.

TABLE 59 Outgoing waste sent for recovery from the Saras site: Hazardous and Non-Hazardous

Parameter	2004	2005	2006	2007
Portion of hazardous waste sent for recovery (% of total waste sent for recovery)	27.7	42.4	43.7	38.0
Portion of non-hazardous waste sent for recovery (% of total waste sent for recovery)	72.3	57.5	56.3	62.0

4.2.7 – Accidental spills on soil and subsoil

Prior activities

In observance of the provisions of Italian Ministerial Decree of 25 October 1999, n° 471 (regulations containing the criteria, procedures and methods for the safety containment, reclamation and environmental restoration of polluted sites), Saras, having identified a contamination problem in the soil and subsoil and underlying groundwater at its production site in Sarroch, has submitted its proposed Characterisation Plan, for the state of the lands and groundwater underlying its site, to the environmental authorities, pursuant to article 9 of the Decree. The contamination derives from the presence, in concentrations higher than the limits specified for underlying groundwater, principally of the following substances or categories of substance: total hydrocarbons, benzene, lead, methyl tert-butyl ether, p-Xylene and toluene. In the soil and subsoil, few cases of exceeding the limits have been recorded, principally for heavy hydrocarbons (C>12).

[Ministerial Decree n° 471/99 replaced by Legislative Decree n° 152/06, Part IV, Title V]

Subsequently, pursuant to Ministerial Decree n° 468 of 09/18/2001 and the Ministerial Decree of 03/12/2003, the region of the Municipality of Sarroch was included, together with 33 other Municipalities, in the area named "Sulcis Iglesiente Guspinese", identified as a site of national interest for reclamation.

In 2004 Saras, in conjunction with the Ministry for the Environment, the Region of Sardinia, the Province of Cagliari, Local Health Authority (ASL) n° 8 and the Municipality of Sarroch, defined the procedures for implementing the Site Characterisation Plan, which set out a series of surveys to be carried out and proposed the measures that may be needed to protect the environment and safeguard public health.

In July 2004, characterisation activities were initiated at the site using the following techniques:

[site characterisation activities]

- Surveys of the terrain by extracting "carrot" core samples from depths of from 5 to 10 metres to establish the subsoil stratigraphy, ascertain whether any contaminants are present and measure their concentrations
- Piezometry, special surveys of the terrain conducted by extracting "carrot" core samples at depths of from 10 to 20 metres that can monitor the surface groundwater. This type of survey not only takes a stratigraphy of the subsoil and its quality (as in the surveys), but also allows examination of the condition of the water in the subsoil. Piezometry is carried out with a tube made of transparent glass inserted in the area where the water flows, which periodically takes samples of water to check its quality.
- Gas surveys, a technique to verify the presence of hydrocarbon gas in the soil interstices.

In the first phase – which included approximately 490 surveys, 109 piezometry readings and 500 gas survey control points – the following situations were recorded:

- Results of the surveys of terrain beneath the refinery have shown that the situation complied with the limits set out in regulations for industrial sites. Only at some limited and non-adjoining areas did concentrations of contaminants in the soil exceed the limit, which confirmed that these were isolated cases, rather than a widespread problem

- Water samples taken with piezometers have identified a “supernatant” product (hydrocarbon phase) in certain clearly defined areas floating above the groundwater, in the form of a thin layer in the soil interstices
- The gas survey showed no gas present in the terrain.

[the plan for intervention]

Based on the results described above, reclamation work was begun immediately (April 2005) to extract the supernatant from the piezometers where supernatant had been found (at 14 of the 90 control points). At the same time studies into the design of a decontamination project started, and work on the Site Characterisation Plan continued, and to date has included approximately 538 surveys and 128 piezometer readings. The project was submitted to the Ministry for the Environment, and, after appropriate amendments, was approved in April 2007.

During the authorisation process, works commenced on the first phase of the proposed project: a dynamic barrier made up of wells to extract the groundwater and recover the supernatant. The final project is for a combined system comprising a dynamic barrier along three axes and a physical barrier along the refinery’s boundary with the sea on the southern side, as shown in Figure 19.

[table of objectives and interventions objective n° 9, page 124]

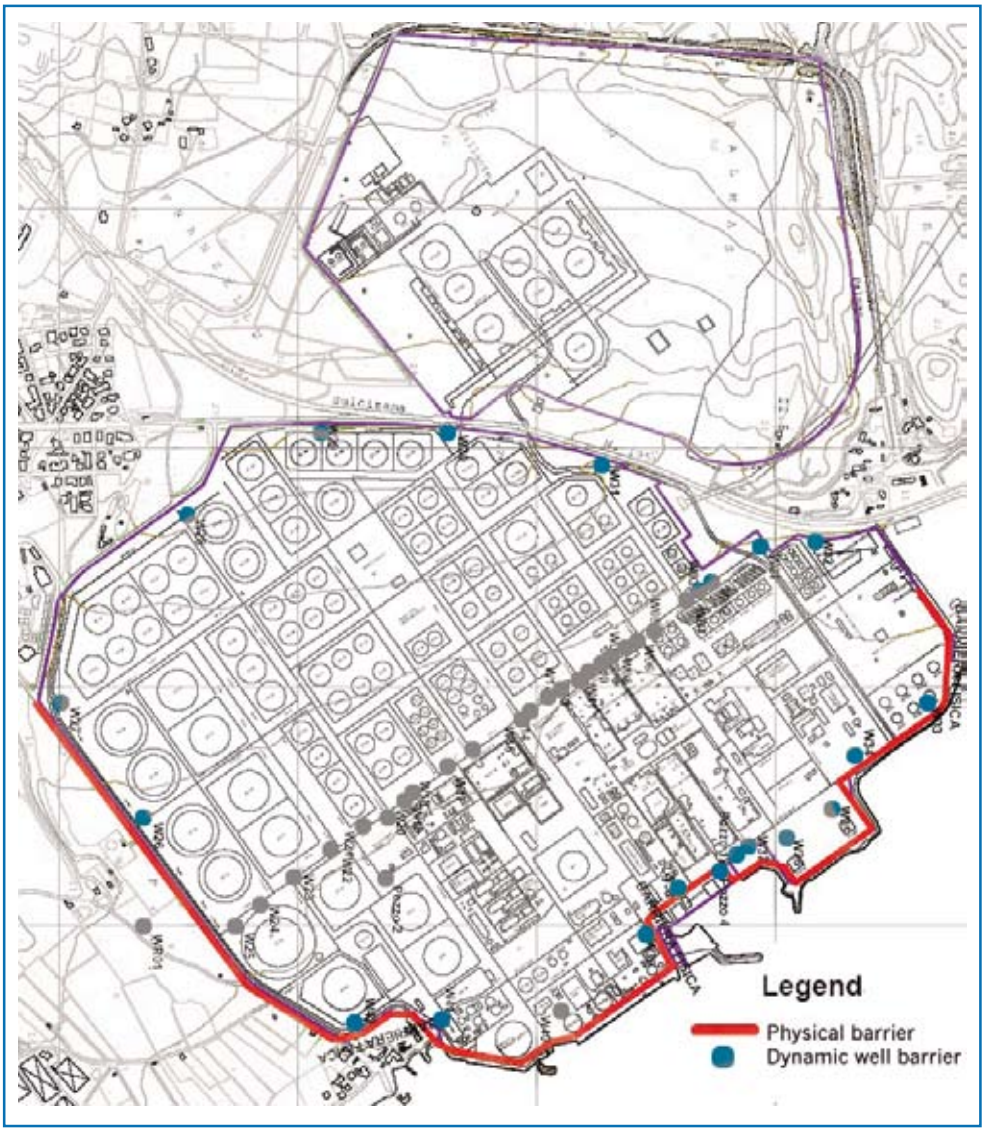


FIGURE 19 Location of the wells comprising the dynamic barrier, and planned location of the physical barrier

The physical barrier will confine the surface groundwater that flows slowly seawards, while the dynamic barrier (consisting of water-extracting wells) will keep the level of the groundwater constant while at the same time removing and recovering the supernatant. An investment of approximately EUR 15 million will be required to build this system.
The dynamic barrier along the main axis will be completed by 2007, while the other two parts upstream from the plant and on the sea side are currently being completed. Field tests are currently in progress for the physical barrier, as these are necessary to establish with precision how it will be completed. Overall, the physical barrier will be over 3 km in length and for the main part it will be 20 metres deep.
Following the latest meeting with the environmental authorities, in the period of June–July 2008 Saras submitted information on the state of progress of the activities scheduled for building the physical barrier and carrying out the reclamation.

[Decisory Services Conference regarding the "Sulcis Iglesiente Guspinese" reclamation site of national interest, of 03/13/2008]

TABLE 60 Prior activities

Parameter	2004	2005	2006	2007
Ratio of quantity of product recovered to water pumped* (%)	--	--	0.27	0.49

*The hydraulic barrier construction and product recovery activities entered operation in 2007

Prevention of contamination of the soil and subsoil

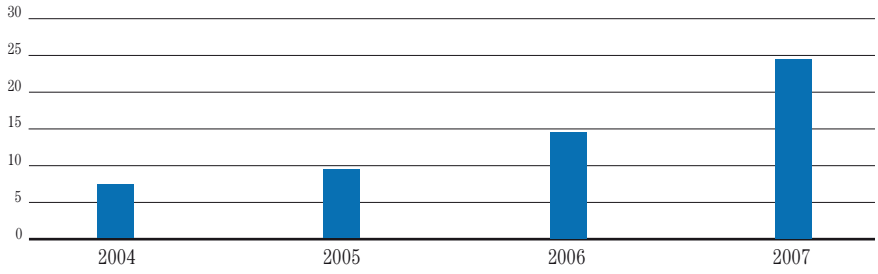
In ordinary conditions, contamination of the soil and subsoil is not possible. Such an event can only occur following an accidental spill of liquid hydrocarbons (raw materials, semi-processed products and finished products).
This type of event can especially affect the storage areas and the routes under the pipes that connect the plants, tanks and wharf. The assessments of anomalous and emergency situations relating to the internal movement and storage of hazardous substances are examined and documented in the Safety Report (paragraph 3.7, page 38).
In terms of indicators, table 61 shows how the measures to prevent contamination of the soil and subsoil are being constantly increased.
In addition to what has already been done, further progress is underway on the activities to improve measures to prevent contamination of the soil and subsoil.

[table of objectives and interventions, objective n° 9, page 124]

TABLE 61 Activities to prevent contamination

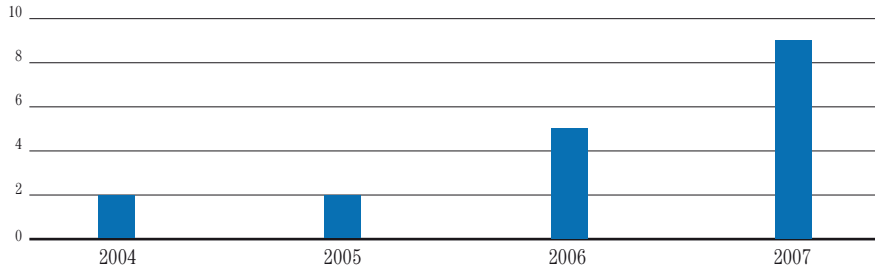
Parameter	2004	2005	2006	2007
Paving of containment reservoirs for crude/product tanks: paved surface/total surface (cumulative figure) (%)	7.3	9.9	14.5	24.4
Protection of soil in storage areas: number of tanks equipped with double bottom (cumulative figure)	2	2	5	9
Protection of soil along pipeways: paving of paved surface (cumulative figure) (m^2)	14,503	17,107	18,207	18,207
Inspection and maintenance activities: spending on non-destructive checks (000 €/year)	1,446	1,257	2,155	2,933

CHART T61A (%)



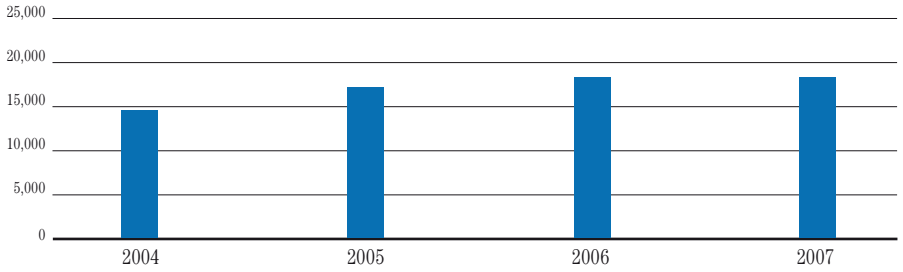
■ Paving of containment reservoirs

CHART T61B (n°)



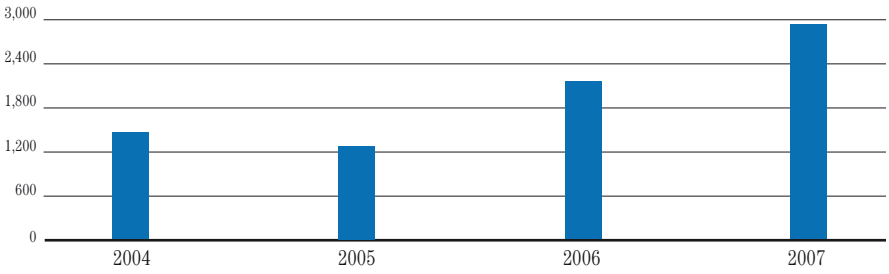
■ Number of tanks equipped with double bottom

CHART T61C (m^2)



■ Paving along pipeways

CHART T61D (000 Euro/year)



■ Inspection and maintenance activities expenses

4.2.8 – Noise

To control noise pollution, since 1999 Saras has drawn up and implemented annual periodic controls of noise levels emitted into the surrounding environment, using phonometric measurements to establish the acoustic characteristics of the surrounding environment. These measurements have been repeated over the years at the same measurement points, some of which are located within the premises and on the roads running along the perimeter of the Saras site, while others are located on the access roads and within the inhabited centre of Sarroch.
The location of the measurement points can be seen in the map shown in figure 20. The map base is taken from the municipal town plan.

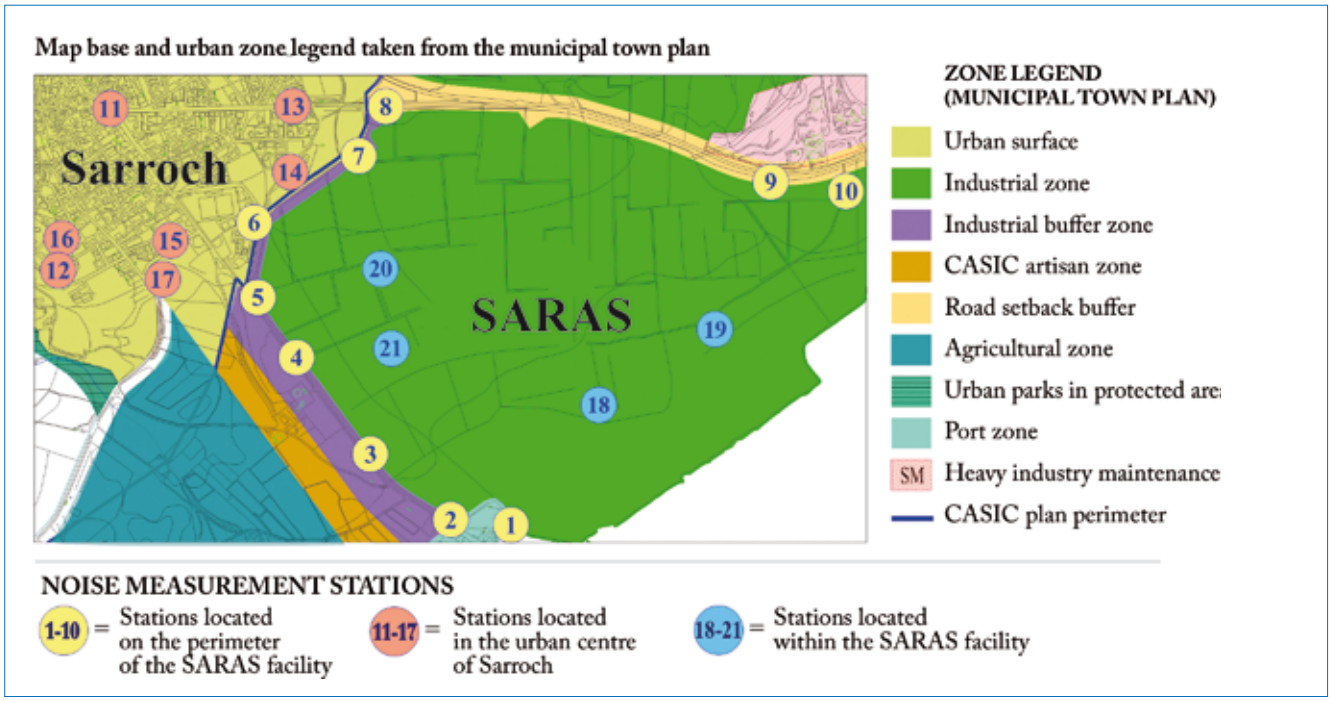


FIGURE 20 Location of noise measurement stations

In the absence of an acoustic classification for the municipal territory, the limit values for noise in outdoor environments, specified by the Prime Ministerial Decree of 03/01/1991, apply. These are presented in the following table.

[Prime Ministerial Decree 03/01/1991]

TABLE 62 Limit values for noise in the outside environment – Prime Ministerial Decree 03/01/1991

Classes of use destination of the territory	Zones corresponding to the area of interest	Daytime period limits, LAeq [dB(A)]	Night-time period limits, LAeq [dB(A)]
All of the national territory	External zones bordering with the Saras production site	70	60
Zone A*	-	65	55
Zone B**	Inhabited centre of Sarroch	60	50
Exclusively industrial zone	Saras production site	70	70

*These are parts of the region that contain urban conglomerations with historic or artistic value or which are of particular environmental value
**These are parts of the region, entirely or partially built up, other than the A zones
***Daytime period runs from 06:00 to 22:00. Night-time runs from 22:00 to 06:00.

Tables 63a and 64b show, for some of the points investigated, the trend in noise levels measured in the last three years.
In particular, table 63a shows the emissions values measured at some of the stations located at the facility boundary, at n°3 and n°6.

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

Acoustic classification, Prime Ministerial Decree 03/01/91	Measurement point	Values measured [dB(A)] (equivalent level values, LAeq)			Emission limit (applicable near sources of emissions)	
		Year	Daytime*	Night-time period*	Daytime*	Night-time period*
All of the national territory (External zones bordering with the Saras site)	3	2007	44.5	51.5	65	55
		2006	49.7	51.7		
		2005	45.5	43.2		
	6	2007	37.2	47.0		
		2006	42.3	43.4		
		2005	40.5	39.1		

*Il periodo diurno si estende dalle 06:00 alle 22:00, il periodo notturno dalle 22:00 alle 06:00.

Table 64b gives the immission values measures in the outdoor environment, at two stations located in the inhabited centre of Sarroch, near the boundary of the industrial site, at n° 14 and n° 15. These values refer to the statistical parameter L90, i.e. the noise level exceeded for 90% of the time measured. This parameter can be considered inclusive of industrial noise, which is continuous and for the most part stationary over time, in the sense that the value measured excludes accidental acoustic events and includes the noise generated by the Saras site, by other industrial sites and by acoustic events of significant duration.

TABLE 63B Noise (emission) levels at the representative points near the boundaries of the Saras site

Acoustic classification, Prime Ministerial Decree 03/01/91	Measurement point	Values measured [dB(A)] (L90 values)			Immission limit (applicable in the outdoor environment)	
		Year	Daytime*	Night-time period*	Daytime*	Night-time period*
Zone B (inhabited centre of Sarroch)	14	2007	39.6	43.0	60	50
		2006	41.4	43.8		
		2005	49.3	38.0		
	15	2007	45.0	43.0		
		2006	39.8	48.3		
		2005	43.6	46.5		

*Daytime period runs from 06:00 to 22:00. Night-time runs from 22:00 to 06:00.

Chart T63b gives the complete data series taken in all the measurement points located in the inhabited centre of Sarroch, and compares them with the applicable legal limits. Each bar in the histogram is labelled with the identification number of the corresponding noise measurement station, shown in figure 20 on page 103.

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

The differential criterion is not applicable to the existing continuous production cycle plants, or plants already authorised, at the time the decree came into force, as is the case with the refining plants and the IGCC on the Sarroch site, pursuant to article 31, Ministerial Decree of 12/11/1996.

[Framework Law 447/95, article 22]

Following a specific request put forward by the investigating commission for issuing the Environmental Integrated Authorisation, on an anticipatory basis and while awaiting the municipal acoustic classification, in April 2008 Saras submitted an acoustic classification referring to the measurement stations being studied. Developed by an acoustic engineer, the anticipatory classification is based on the subdivision into zones contained in the municipal town plan, and applying the acoustic class definition criteria specified by the Ministerial Decree of 11/14/1997.

Specifically:

- For the stations located on the facility's boundaries (points from n° 1 to n° 10), class V has been identified as appropriate: "Predominantly industrial zone", with limit values of 70 dB(A) in the daytime and 60 dB(A) at night
- For most of the stations located in the inhabited centre of Sarroch (points from n° 11 to n° 17), class II has been identified as appropriate: "Predominantly residential zone", with limit values of 55 dB(A) in the daytime and 45 dB(A) at night

Forthcoming studies – if the municipal Acoustic Classification Plan has not been approved – will refer to both the legal limits in force, and the limits deriving from the anticipatory classification.

An objective for improvement has been defined for noise reduction, and two implementing actions are associated with this objective.

[table of objectives and interventions objective n° 13, page 124]

4.2.9 – Visual impact

The company is also committed, with intensified activity in the years from 2000 onwards, to improving the visual impact of the facility. Improvement measures have covered structures and spaces that constitute areas of direct contact with the world outside Saras: these consisted of naturalisation measures, to create continuity areas between the facility and the surrounding region. In particular, the junction on S.S. 195 road was rebuilt, and the green areas in the parking area were improved.

In 2007, in the IGCC plant (boiler U702), the new condensation circuit to reduce the plumes of smoke emitted into the atmosphere resulting from steam emissions was put into service.

[table of objectives and interventions objective n° 8, page 123]

A similar intervention is planned for 2008 for the other two boilers in the IGCC.

4.2.10 – Odours

In the past reports were submitted from outside Saras of the presence of unpleasant odours, following which a first instrumental investigation was conducted in 2004 with the objective of identifying the sources of the odours perceived outside the site.

The study did not show any particular connection between the measurements taken outside and those taken inside the facility. Over the following years the analysis and assessment methodologies were widened and improved to include more advanced methods that were more appropriate to the case under examination. This led to the definition of a methodology founded on a combination of analytic techniques and simulations using an atmospheric dispersion model (AERMOD), recommended by USEPA[1], together with evaluations by a group of qualified assessors.

The methodology is illustrated in detail in the documentation submitted in response to the request for more information, following Saras's application for Environmental Integrated Authorisation submitted in April 2008.

[table of objectives and interventions objective n° 14, page 124]

In 2008 the experimental phase began and the new monitoring campaign for identifying odours was begun. The sampling points have been identified, by acting on the results of interviews with personnel and also by taking account of specific aspects of the processing phases (the substances present and their characteristics). Air samples have been taken from the pre-established points, and subsequently subjected to analysis. The results of the analysis have led to the identification of around twenty hydrocarbonic substances, belonging to the sulphurised and oxygenated classes.

The experimental phase will continue until the end of 2008, when a monitoring campaign will be started. The end objective of this work is to arrive at a preventive assessment of possible events that could generate an olfactory impact on the area outside the facility.

[1]United States Environmental Protection Agency

4.2.11 – Environmental aspects of low significance

PCB

Polychlorinated biphenyls (PCBs) are chlorinated organic compounds that are very stable, both chemically and thermally. For this reason, in the past PCBs were widely used as dielectric (insulating) fluids in electrical devices (e.g. industrial transformers). This was before the dangers of PCBs were recognised, leading to prohibitions on their use.

Today the sale and use of PCBs in new applications is banned but, given the recognised difficulties of disposing of these substances, the law has different provisions for existing equipment depending on the quantity and concentration of PCBs present.

Following an inventory and periodic analytic controls, the 130 oil-insulated transformers present are decontaminated from PCBs. Periodic checks are conducted to verify the state of conservation of the transformers and maintain the PCB content below the minimum threshold specified by law to consider an appliance decontaminated.

[Ministerial Decree 11/10/2001]

Asbestos

Asbestos was for many years used for a variety of applications, in both the industrial and civil sectors, before its use was prohibited because of the dangers.

Over the years Saras has implemented the sector legal requirements: it has drawn up an inventory of materials containing asbestos, it has sent all necessary notifications to the supervisory authorities and carried out decontamination during plant maintenance operations.

[Law n° 257/1992 and subsequent modifications and supplements]

Over the years asbestos covers have been progressively eliminated, going from a surface of 10,800 m2 in 2004 to 700 m2 currently, and this is in any case subjected to periodic checking of the state of integrity.

The asbestos still present as an insulator inside layers of insulation on pipes, structures etc. is subject to periodic (annual) verification of its state of conservation. It is protected from the action of atmospheric agents that could alter its integrity, and it is removed during maintenance operations with the assistance of specialist firms.

Substances damaging to the ozone layer

The law imposes specific management procedures on this type of substance, in order to avoid its dispersal into the atmosphere and to favour its progressive elimination from the production process. All the devices present in the facility are kept under control by means of periodic maintenance carried out by specialist personnel.

[Directive EC/2037/00 and Presidential Decree n° 147/2006]

In recent years Saras has been progressively replacing substances that are damaging to the ozone layer with other substances that do not have such an impact.

Currently the only substance of this type is Freon R22, of which overall the quantity is 1,203 kg. The use of this type of substance in existing air conditioning plants in operation will be prohibited from 1/01/2010 onwards.

Non-ionising radiation sources (electromagnetic fields)

The principal sources of electromagnetic fields in the facility can be classified into two general types:

- Point sources, such as pumps, electrical switchboards, motors
- Linear sources, i.e. the conductor cables for transporting electricity. There is a buried cable operating at a voltage of 380 kV and which transports electricity from the IGCC plant to the ENEL electrical substation located along the western boundary of the facility.

A survey of the presence of electromagnetic fields, extended to the entire site and including external measurement points near the boundary, was carried out in 2004 and was repeated in 2007, using the same methods but increasing the number of measurement points.

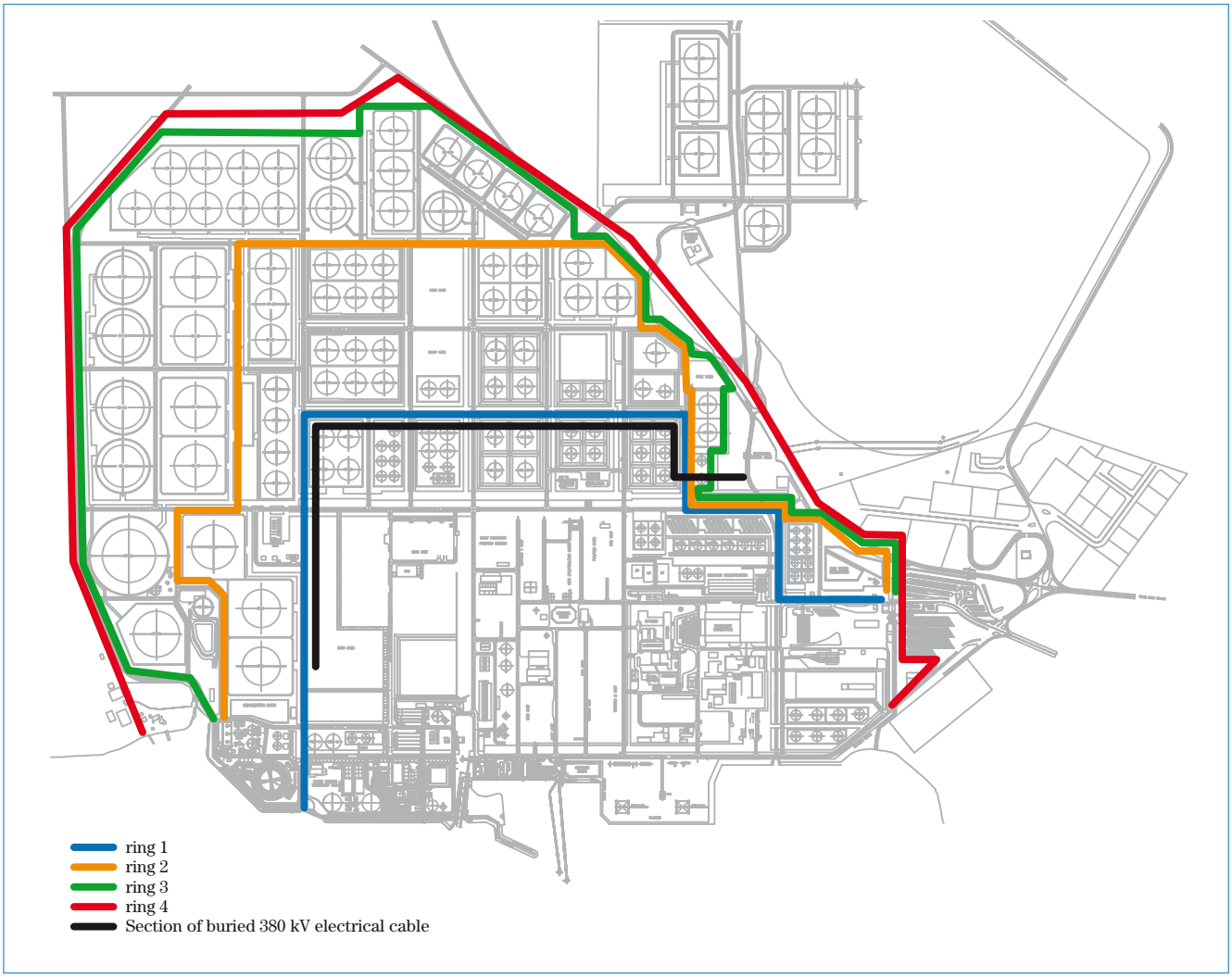


FIGURE 21 Map of sampling lines for investigation of electromagnetic fields

As can be seen from figure 21, the measurements were taken along four main lines:

- The first mainly follows the path of the 380 kV buried cable, which is the main source of electromagnetic fields in the facility
- The second follows the path of the buried cable, but at a distance of approximately 200 metres
- The third and the fourth follow the boundary of the facility, from the inside and from the outside respectively

[Prime Ministerial Decree 8/07/2003].

The results obtained for both the electrical and magnetic fields are much lower than the legal limits for exposure to the general public.
The values for the electrical field decrease very rapidly as the distance from the buried cable increases, and are undetectable at distances of a few metres.
The magnetic field values measured along the external perimeter do not exceed the value of 1.5 µTesla, compared with an limit value for exposure to the population of 100 µTesla and a quality objective of 3 µTesla. The maximum values were taken, as was to

be expected, along the path of the buried cable and near the Enel electrical substation, with maximum values of 20 µTesla and 10 µTesla respectively.

Ionising radiation sources

The sources of ionising radiation present in the facility are made up of small radiogenic sources in level gauges and from analysis equipment located in the internal laboratory. All radiogenic sources are adequately confined and are checked annually by an expert, qualified in accordance with Legislative Decree n° 230/95 and subsequent modifications and supplements.

[Legislative Decree n° 230/95]

4.3 – Indirect Environmental Aspects

4.3.1 – Product design and development

4.3.1.1 – General

Saras conducts research and development activities, which are aimed at the development of products to meet the needs of the market and the requirements set down by environmental laws. The practical implementation of design modifications to products generally also requires upgrades to the existing plants. Saras internally carries out the design and engineering of plant modifications to be implemented in its facility, with the assistance of specialist engineering firms.

The product design and development activities are mainly conducted in the Milan office, while the design and engineering of plants are conducted in close cooperation between the Sarroch facility and the Milan office.

Design and development activities, both for product innovations and the engineering of plant modifications, have seen a considerable boost in recent years, as can be seen from the indicators shown below.

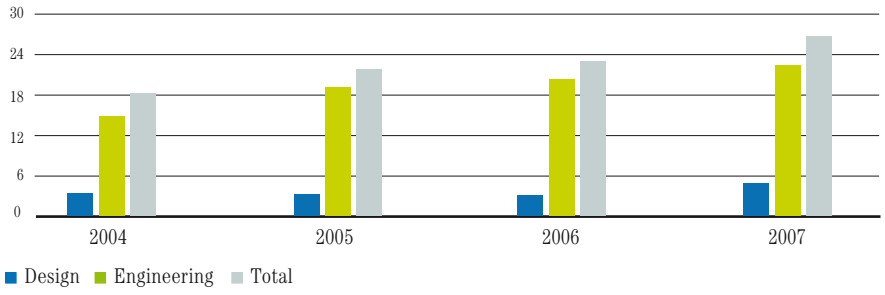
[table of objectives and interventions objective n° 15, page 124]

The increase in the indicators is linked to the large investments that have been made in recent years, and which are currently being implemented or are scheduled to be implemented.

TABLE 64 Design, development and engineering activities

Parameter	2004	2005	2006	2007
Product development hours/000 hours worked	3.2	3.1	3.0	4.7
Plant engineering hours/thousands of hours worked	14.7	18.9	20.1	22.2
Total product development and plant engineering hours/thousands of hours worked	**17.9**	**22.0**	**23.1**	**26.9**

CHART T64 (hours/thousands of hours worked)



4.3.1.2 – Low-sulphur fuels

[directive 98/70/EC, "Autoil", modified by directive 2003/17/EC]

In recent years the production of motor-vehicle fuels has been guided by legislation towards the drastic reduction of sulphur content, described as follows:

Since 1 January 2005	- sulphur content of petrol and diesel fuel compulsorily lower than 50 ppm - sale of petrol and diesel fuel with sulphur content lower than 10 ppm
Since 1 January 2009	- sulphur content of petrol and diesel fuel compulsorily lower than 10 ppm

For Saras, reaching the 2009 objective for petrol desulphurisation has dictated the need to upgrade the FCC plant, which is currently underway and is planned to be completed for the end of 2008.

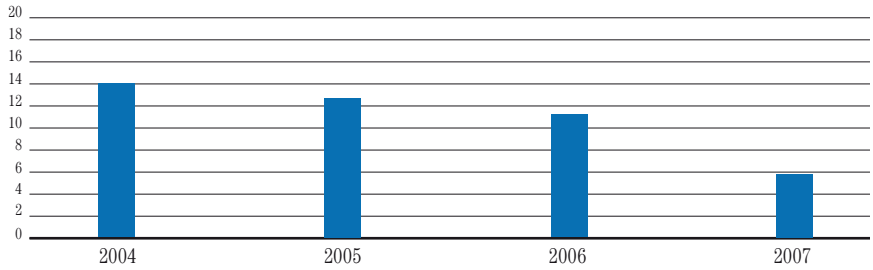
[table of objectives and interventions objective n° 15, page 124]

For the performance figures for the four-year period 2004 – 2007, table 65 shows the trend of the indicator of the level of sulphur in the products compared to the quantity of sulphur input to the production cycle with the raw materials. There is a major reduction over time in the values of the indicator. The trend to reduction is even more interesting when it is considered that the comparison value, i.e. the sulphur input with the raw materials, is also progressively reducing over time, due to increasing procurement of low-sulphur crude oil (paragraph 4.2, page 50).

TABLE 65 Sulphur content of products

Parameter	2004	2005	2006	2007
Quantity of sulphur in products/Quantity of incoming sulphur with raw materials (%)	13.9	12.6	11.2	5.8

CHART T65 (%)



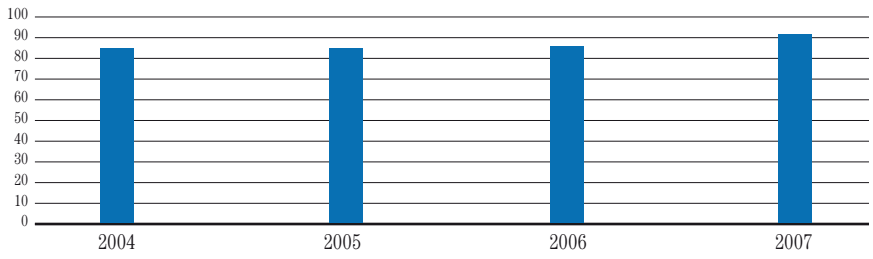
■ Quantity of sulphur in products/Quantity of incoming sulphur with raw materials

As a consequence of the above factors, increases have been recorded in the quantity of sulphur recovered in the production cycle, compared to the quantity of incoming sulphur, as can be seen from table 66.

TABLE 66 Quantity of sulphur recovered in the production cycle

Parameter	2004	2005	2006	2007
Quantity of sulphur produced/Quantity of incoming sulphur with raw materials (%)	83.9	84.1	85.9	91.0

CHART T66 (%)



■ Quantity of sulphur produced/Quantity of incoming sulphur with raw materials

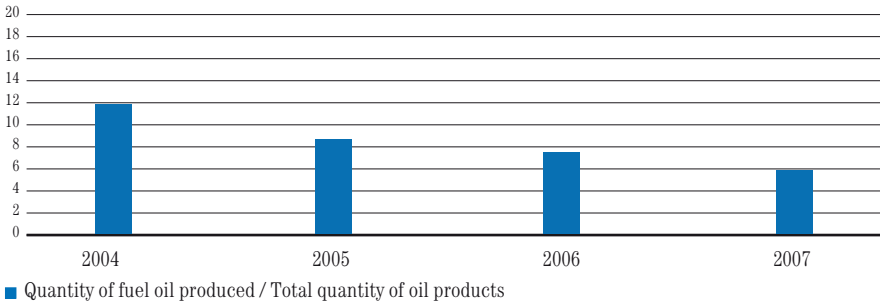
Range of oil products

In recent years the production and sale of oil products has increasingly favoured the fraction of "light" products. In particular, production of fuel oil has been reduced, meaning that the heavy refinery distillates are converted into syngas for the production of electricity in the IGCC.
Table 67 below gives the figures for the fraction of fuel oil produced compared to all oil products.

TABLE 67 Fraction of fuel oil of total oil products

Parameter	2004	2005	2006	2007
Quantity of fuel oil produced / Total quantity of oil products (%)	11.7	8.5	7.5	5.7

CHART T67 (%)



As already discussed in chapter 3, the production cycle in the IGCC eliminates the pollutants contained in the heavy hydrocarbons sent as feedstock to the plant, and particularly sulphur, which is recovered and sold, so contributing to the positive figures shown in table 66 on the previous page.

Summary of considerations of the indirect aspects of product design and development

Based on the above discussion, the following can be observed:

- Lower sulphur content in the fuels for sale means a reduction in emissions of SO_2 from vehicle traffic
- The production of energy from syngas obtained from the gasification of heavy hydrocarbons maximises the use of the incoming raw materials and the recovery of the sulphur contained in them
- At the same time, the reduction in the sale of fuel oils reduces atmospheric emissions of SO_2, dust and other pollutants following their combustion, for example, in thermoelectric power plants
- The sulphur recovered from the production cycle is to all intents and purposes a product, which is sold and used as a raw material in other production cycles (e.g. to produce sulphuric acid). This avoids resorting to natural raw materials (minerals) which would need to be refined, and which would therefore require further consumption of energy and other resources.

4.3.2. – Transport

Sea traffic

All raw materials entering the site and a significant portion of the oil products leaving the site are transported by sea. Because of the large number of ships (around 750 – 800 ships per year), for many years Saras has implemented a policy of selection and control of the ships used, with the aim of preventing accidents and spills at sea of dangerous substances. Saras has already met the deadline for European regulations banning the use of single-hulled vessels.

[International convention for prevention of pollution caused by ships MARPOL 73/78, and Regulation 417/2002/EC modified by Regulation 1726/2003/EC]

By 2006 Saras had already met the directive's 2010 deadline for eliminating single-hulled ships, and the company is considerably reducing the use of ships with segregated ballast tanks (SBT), which are to be eliminated by 2015.

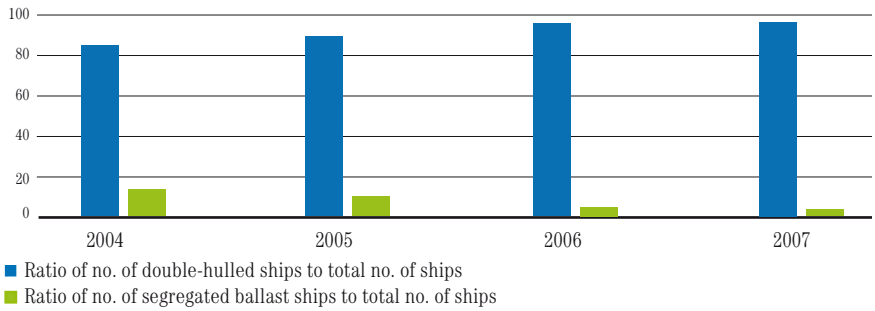
[table of objectives and interventions objectives n° 16, 17, page 124]

Table 68 gives the figures for the number of ships equipped with double hulls, and the number of ships out of the total number of ships calling to the Sarroch site: As can be seen, the percentage of double-hulled ships has increased notably in the space of a few years, while the percentage of SBT ships is falling sharply.

TABLE 68 Double-hulled ships

Parameter	2004	2005	2006	2007
Ratio of n° of double-hulled ships to total n° of ships (%)	84.1	88.6	95.0	95.8
Ratio of n° of segregated ballast ships to total n° of ships (%)	13.0	9.0	5.0	4.0

CHART T68 (%)



Data the potential seriousness of an accident at sea, Saras selects ships by consulting international databases (e.g. SIRE) containing the results of inspections conducted on transport ships, and the company also has a programme of direct controls (both technical and management) on arriving ships.

[table of objectives and interventions objective n° 18, page 124]

The reference specification for controls is the "Minimum Safety Criteria" document, adopted by Saras in accordance with the ship inspection protocols drawn up by the OCIMF (Oil Companies International Marine Forum), an organisation that promotes the improvement of safety and responsible environmental management in the transport of oil and its derivatives and in the management of marine terminals.

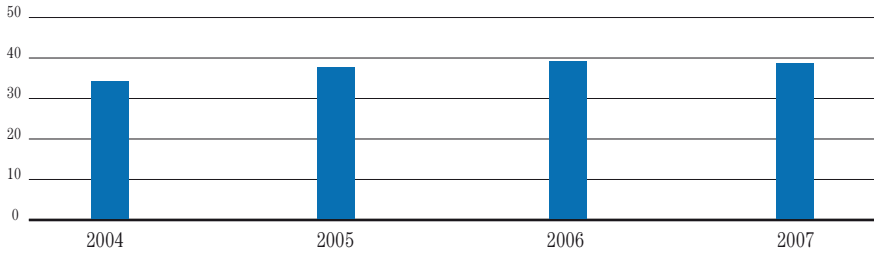
The number of ships checked is very high and has increased over the years, as can be seen from table 69.

Accurate checks on the ships expected at the site are conducted on behalf of Saras by specialist firms before the ships even set sail, at their port of departure.

TABLE 69 Checks on safety of ships

Parameter	2004	2005	2006	2007
Ratio of n° of ships checked to total n° of ships (%)	34	37.3	39.1	38.3

CHART T69 (%)



Road traffic

The road traffic induced by the activities carried out at Saras's site is due principally to:

- Transport of refined oil products via tanker trucks (around 47,000 vehicles/year)
- Transport of sulphur via articulated lorry (around 3,900 vehicles/year)
- Transport of materials and substances that are auxiliary to production (around 400 vehicles/month)
- Transport of employees of the company and of external firms working at the site (around 800 cars/day and 60 buses/day).

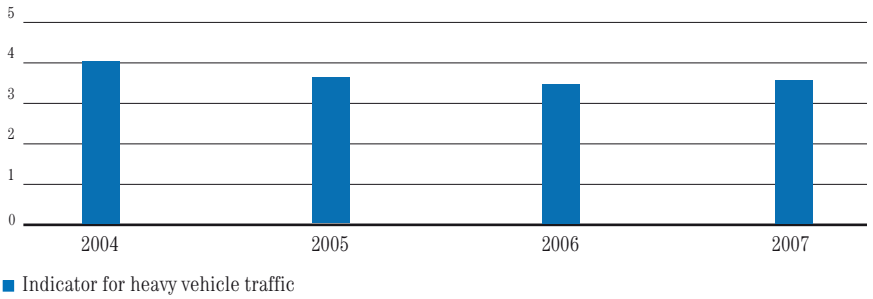
The following table gives the indicator for heavy vehicle traffic, which mostly comprises tanker trucks for transporting products. A small proportion is made up of articulated lorries for transporting sulphur.

The indicator assumed a higher value in 2004 when, because of the temporary closure of the marine terminal of Porto Torres, shipping of products to the north of Sardinia was done by land instead of by sea.

TABLE 70 Road traffic

Parameter	2004	2005	2006	2007
n° heavy vehicles/kt raw materials (n° vehicles/ kt raw materials)	4.01	3.60	3.44	3.54

CHART T70 (%)



[table of objectives and interventions objective n° 19, page 124]

Since 2007 a programme of checks has been in place, which aims to verify the conformance of the tanker trucks used for transporting products. The number of tanker trucks checked compared to the number of tanker trucks authorised for entry was 17%.

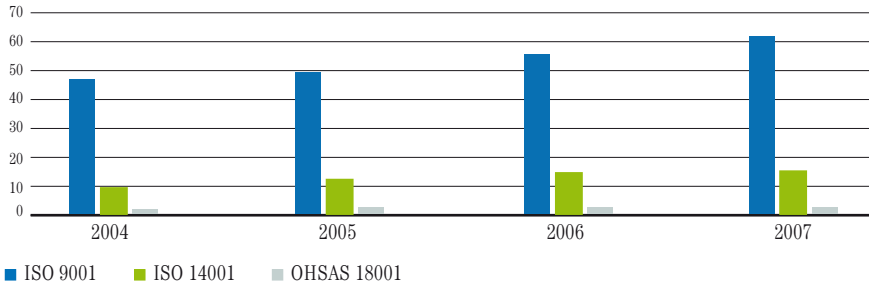
4.3.3 – Environmental conduct of third-party firms

Saras has drawn up adequate procedures for governing relations with external firms that interact with the activities of the facility, to ensure that the conduct applied by personnel belonging to third-party firms conforms to the company's policies for the protection of safety, health and the environment.
Saras accords a positive assessment to the commitment of external firms to obtain and maintain certifications of quality/environmental/safety management systems.
The trend in the number of external companies that have obtained certifications is growing rapidly, as can be seen from table 71.

TABLE 71 Number of external firms with certified management systems

Parameter	2004	2005	2006	2007
Subcontracting companies with ISO 9001 certification (quality management system) (%)	46.5	48.8	55.2	61.2
Subcontracting companies with ISO 14001 certification (environmental management system) (%)	8.7	11.6	13.9	14.5
Subcontracting companies with OHSAS 18001 certification (management system for health and safety in the workplace) (%)	1.7	2.3	2.3	2.3

CHART T71 (%)

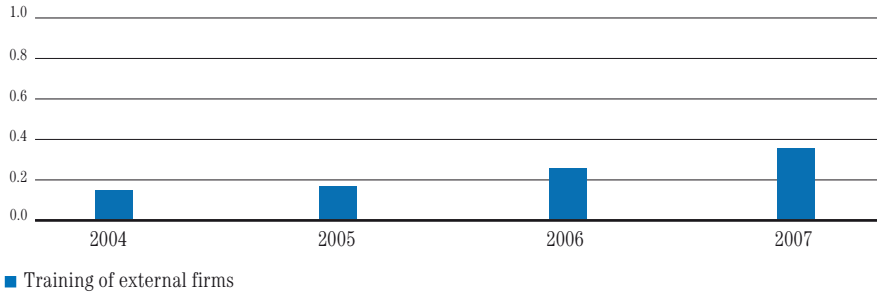


The first half of 2008 confirmed the growth trend in the number of firms with certifications of their environmental management system (15.7%) and of their safety management system (3%). Other firms have projects underway to obtain certification.
Before being able to conduct any type of activity at the facility, each company must be qualified by demonstrating that they meet the basic requirements laid down in the administrative regulations. Before entering the facility, personnel belonging to external companies must receive basic training, which varies according to the areas of the facility where they are to work.
Saras plays an active role in the training of external firms' personnel in safety and in environmental protection. Over the years the effort spent in this area has increased, and the growth is shown by the increase in the number of hours devoted to training activities (table 72, page 116).

TABLE 72 Training activities for third-party firms

Parameter	2004	2005	2006	2007
Training of external firms: n° training hours conducted by Saras on environment and safety/ n° hours worked by external firms (%)	0.14	0.16	0.25	0.35

CHART T72 (%)



In environmental management, one of the principal impacts associated with the activities of external firms is the result of the production and management of waste. Two specialist waste-treatment firms operate at the Saras site, as discussed in paragraph 4.2.6, on page 94. Specific procedures govern how waste is managed at the facility, including the sending of waste to treatment plants and to areas for waste storage.
The work of the third-party firms that manage the waste treatment plants is subject to regular checks and audits, which are carried out by personnel from Saras's Prevention and Protection Service in accordance with the waste management procedure.
More generally, the conduct of personnel belonging to third-party firms is one of the activities being controlled through field inspections in the "Arrow" programme (paragraph 4.4.2, page 118).
Most waste produced during the activities that external firms carry out on-site is received and accounted for by Saras. This consideration applies particularly in general shutdowns and plant maintenance operations, during which a larger quantity of waste is produced.

4.4 – Management performance indicators

As well as the specific indicators of the various different environmental aspects and of the environmental matrices concerned, or potentially concerned, by the impacts of their environmental aspects, Saras has defined other types of indicator to monitor a number of activities that are essential to the improvement of the environmental management system.
These are indicators of activity in training, audits and engineering to develop technological and plant-related improvements.

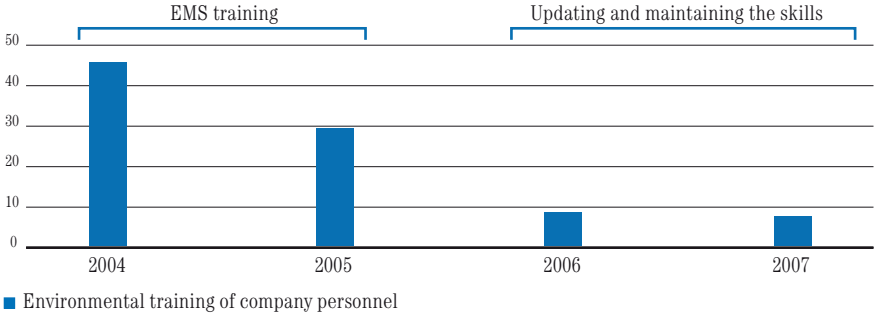
4.4.1 – Training in environmental protection and safety

Training of personnel in environmental protection has seen a considerable boost in 2004 and 2005, with the implementation of awareness-raising initiatives and the dissemination of information about the environmental management system. Sessions exploring specific topics have been conducted in the training of operational personnel, and these have been particularly focused on handling emissions into the atmosphere and bodies of water. The group of auditors has taken part in specific training modules to prepare them for conducting internal audits.
The trend in the indicator for the environmental training of internal personnel therefore shows a peak in 2004 – 2005, which was due to the programme of aligning all personnel to the objectives of the environmental management system and training on the new concepts introduced. For the following years, the indicator displays a high incidence compared to the global indicator of activity for training imparted, and this is oriented to updating and maintaining the skills. In 2008 a phase was begun to raise the awareness of personnel of the requirements of the EMAS directive, and this phase is still underway.

TABLE 73 Environmental training activities for internal personnel

Parameter	2004	2005	2006	2007
Environmental training of company personnel: n° hours environmental training/total n° hours of training (%)	45.32	28.95	8.28	7.39

CHART T73 (%)

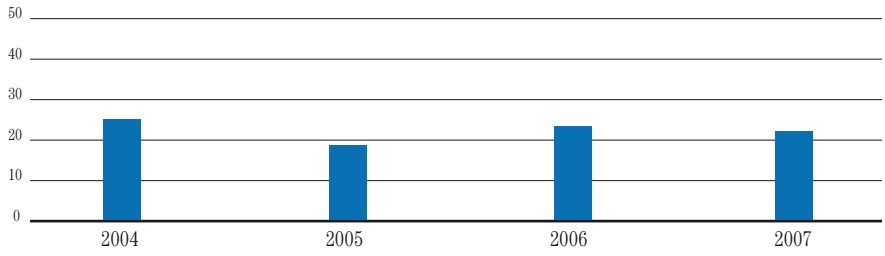


An activity complementing environmental training is training on safety and the protection of health. Training in this area, which consists of both theory and practical sessions, begins when employees join the company and progresses throughout their time at Saras. Personnel assigned to firefighting teams take part in a series of special drills for handling emergencies. The commitment to training and drills for handling emergencies, which can affect both the safety of persons and the protection of the environment, is shown by the figures in table 74, on the following page.

TABLE 74 Emergency management training activities for internal personnel

Parameter	2004	2005	2006	2007
Emergency training: n° hours of training for emergencies/total n° hours of training (%)	24.80	18.29	23.06	21.76

CHART T74 (%)



4.4.2 – AUDIT ACTIVITIES

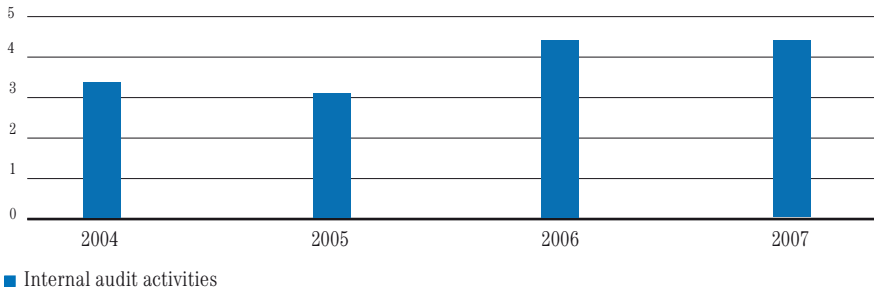
Saras pays particular attention to internal audits, as an instrument for verification, training and improvement. The company has a group of auditors who are trained to conduct quality, environment and safety audits, comprising around 55 persons, or approximately 4% of the total Saras workforce.

Internal audits are planned annually, in such a way as to address all activities having an influence, direct or indirect, on environmental, safety and/or quality management. The audits are conducted in an integrated fashion, i.e. for each activity subjected to an audit, the aspects of interest to all three audit areas are examined. During an audit, areas for improvement or elements not conforming to the management system procedures may emerge. "Non-conformities" are formally reported to the persons responsible for the activities in which they were found, in order to identify actions to restore conformity and avoid a repetition of the non-conformity. The indicator for time spent on audit activities for the two-year period 2006-2007 shows values higher by over 1% than the values for the previous two-year period.

TABLE 75 Internal audit activities (integrated for Environment, Safety and Quality)

Parameter	2004	2005	2006	2007
Time spent on internal audit activities: n° hours taken per audit/n° hours worked by auditors and personnel subjected to audit (%)	3.35	3.08	4.38	4.37

CHART T75 (%)



Other verification activities on field activity management methods are regularly carried out, with the implementation of the "Arrow" programme. The programme is an organic project of field inspection visits (audits), covering the entire facility, the associated National Deposit, and the wharf. The purpose of the project is to develop the spirit of accident prevention and environmental protection, both in the persons who are subject to audit and in the persons who conduct the audit.
To achieve this goal, the "Arrow Project" conducts an extended programme of inspections in the 22 operational and administrative areas into which the facility has been divided. The Arrow inspections are conducted by groups comprising, as a rule, an executive or manager as group leader, 3 or 4 technical and/or administration personnel, and staff safety representatives. There are 22 audit groups, their composition varies monthly and, each month, the area that each group is tasked with inspecting changes. The Arrow programme has been in operation for many years and it is regularly put into practice, as shown by the trend in the indicators given in table 76.

TABLE 76 "Arrow" programme activities (field inspections)

Parameter	2004	2005	2006	2007
Hours taken (n°)	1,650	1,848	1,774	1,966
Hours taken/Hours worked by auditors and personnel subjected to audit (%)	0.12	0.12	0.12	0.12

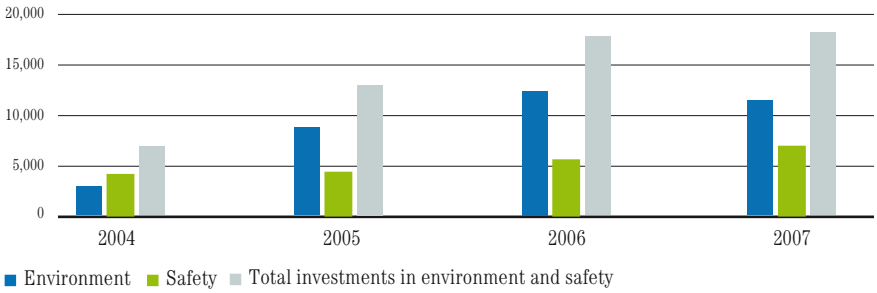
4.4.3 – Investments in protecting the environment and safety

Saras has made and is planning to make major investments in projects to improve environmental performance, safety at the facility and personnel protection. Below are the figures on investments in environment and safety. The investments show a considerable increase: From 2004 to 2007 the size of global investments in environment and safety almost tripled. As demonstrated by the increase in Development and Engineering activities (paragraph 4.3.1), the increase in investments is consistent with the improvement activities currently being implemented or scheduled to be implemented (see Chapter 5).

TABLE 77 Investments to improve safety and the protection of the environment

Parameter	2004	2005	2006	2007
Investments in environmental protection (000 €/year)	2,840	8,682	12,250	11,320
Investments in safety protection (000 €/year)	3,955	4,170	5,395	6,740
Total investments in environment and safety (000 €/year)	**6,795**	**12,852**	**17,645**	**18,060**

CHART T77 (k€/year)



5.
Environmental objectives and programmes

Completeness, correctness and transparency of information are the principal basis for any dialogue.

Here Saras presents its programme of commitments to protect the environment and the landscape.

This information and these figures show the areas in which Saras is working towards further improvements expected in the years to come: these are the fruit of technology and management choices that have always aimed at making simultaneous progress in safety, health and the environment.

This is an investment in clarity and completeness that will, over time, allow us to continue to conduct dialogue that is clear and definite, to give the local population the answers they expect.

5.
Environmental objectives and programmes

5.1 – Objectives for improvement and scheduled interventions for the period 2008 – 2012

Below are the environmental improvement objectives that Saras has set itself for the period 2008 – 2012.
For each objective one or more actions have been defined, and indicators have been identified to monitor whether the objective will be reached by the end of the specified period.
The principal objectives concern the following direct environmental aspects:

- Atmospheric emissions, with measures to reduce the quantity of pollutants and extend continuous monitoring
- Energy consumption, with measures to recover energy and consequent reduction of fuel consumption
- Prevention of potential spills of hydrocarbons onto soil, with the extension of paved surfaces in the storage areas and parallel site reclamation activities.

Other objectives have been defined for waste, for noise, and for odours.

For indirect environmental aspects, the following objects are present:

- Development of the product, with measures to reduce the sulphur content in the petrol and diesel
- Transport, with selection and checks on the ships for transporting raw materials and products and with checks on the road vehicles for transporting products.

N°	Objective	Actions	Indicator	Implementation period
	Significant environmental aspect: Atmospheric emissions (SO_2)			
1	Reduction of SO_2 emissions by approximately 30% over current levels	**A** – Increase the yield of the Sulphur Recovery Plant and the abatement of SO_2 emissions, by construction of the new Tail Gas Treatment Unit (TGTU)	Annual % reduction of SO_2 emissions	Completion of work: end of 2008 Plant comes into operation: 2009
	Environmental aspects: Energy consumption – Atmospheric emissions (SO_2, dust)			
2	Energy recovery and reduction of consumption of fuel oil by approximately 30% over current levels	**A** – Energy recovery interventions in the FCC plant and in the U500 and U700 desulphurisation units (by 2010)	Annual % reduction of fuel oil emissions	Completion of work: 2011
		B – Installation of a boiler for energy recovery of sensitive heat of fumes from Topping Plant 1 (by 2011)		
		C – Feasibility study for a boiler for energy recovery of sensitive heat of fumes from the following plants: Topping 2, RT2, VSB, Vacuum1 and Vacuum2, which will be ducted to the new centralised smoke stack (by 2009)		
		D – Installation of the boiler for energy recovery of sensitive heat of fumes from the following plants: Topping 2, RT2, VSB, Vacuum1 and Vacuum2, which will be ducted to the new centralised smoke stack (by 2011)		
	Environmental aspect: Atmospheric emissions (SO_2, NO_X, dust, CO)			
3	Extension of continuous monitoring methods to: – 65% of SO_2 emissions – 50% of NO_X emissions – 65% of dust emissions – 60% of CO emissions	**A** – Installation of continuous monitoring system of emissions of SO_2, NO_X, PTS and CO on the smoke stacks of the following plants: Z3-F2 and Z4-F2	% of emissions continuously monitored	2008
		B – Installation of continuous monitoring system of SO_2, NO_X, PTS and CO on the smoke stack of the CCR/Alky plant		2009
4	Verification of feasibility of a new centralised smoke stack and further extension of continuous monitoring methods to: – 85% of SO_2 emissions – 70% of NO_X emissions – 99% of dust emissions – 85% of CO emissions	**A** – Draw up feasibility study	% progress in activity	2009
		B – Implement continuous monitoring system	% of emissions continuously monitored	2011
	Environmental aspect: Atmospheric emissions (dust)			
5	Use of fuel oil with carbon residue by weight lower than 9.5%.	**A** –Preparation of fuel oil with the required characteristics.	Annual average % carbon residue in fuel oil	2008
	Environmental aspect: Atmospheric emissions (Volatile Organic Compounds)			
6	Reduction of diffuse and escaped emissions of volatile hydrocarbons	**A** – Completion of the installation of double seals on the pumps to move petrol, beginning from the figure of 88% of replacements already made by the end of 2007.	% replacements made (cumulative figure)	88% in 2008 97% in 2009 100% in 2010
		B – Installation of a system for sealing the calming pipes and support pipes in the tanks with floating roofs	n° of tanks subject to intervention	2011
		C – Application of a methodology for monitoring and repairing escaped emissions in the refining plants through the use of: identification of the sources of emissions (via infrared (IR) video camera), measurement of concentrations of volatile hydrocarbons at the sources (via flame ionisation detector (FID)), and subsequent repair of any leaks found.	Progress Activities: IR 100%, FID 50% FID 100%	2008 2009
	Environmental aspect: Atmospheric emissions – State of air quality			
7	Prompt identification of possible increases in concentrations of pollutants in emissions, to prevent the exceeding of alarm thresholds for the concentrations found at ground level by the public air quality monitoring network	**A** – Development of the simulation model of the ground level impact of atmospheric emissions from the Saras site, based on the climate conditions and the contours of the area, and on the concentrations measured by the air quality monitoring network in the external environment	100 % Progress in activity	2008
	Environmental aspect: Energy consumption – Visual impact			
8	Reduction of energy loss and of the visibility of the plume of vapours coming from the combined cycle boilers of the IGCC	**A** – Completion of energy recovery from the boilers in the combined cycle section of the IGCC for two of the three boilers (the third boiler was modified in 2007), by means of recovering heat and condensate, to be sent to the internal distribution network for demineralised water.	100 % Progress in activity	2008

N°	Objective	Actions	Indicator	Implementation period
	Environmental aspect: Prevention of hydrocarbon spills on soil			
9	Reduction of risk of contaminating the soil and subsoil	**A** – Continuation of work on paving the retaining reservoirs for the crude oil and oil product tanks: from 24.4% of paved surface at the end of 2007, to 34.4%.	% surface paved over total surface of crude/product tank containment reservoirs	2008
		B – Completion to 100% of concrete paving of the Rio Mascheroni channel	% progress in activity	2009
		C – Execution of instrumental checks on the integrity of the pipes for transporting crude oil from the maritime terminal to the tanks, and the pipes for transporting hydrocarbons internally/externally	% controls conducted/controls planned	2008
10	Confinement of contamination from prior activities	**A** – Construction of the physical barrier outlined in the site reclamation project.	% progress in activity	2008 – 2012
	Environmental aspect: Waste			
11	Increase to 15% of differentiated refuse collection of waste equivalent to urban solid waste (USW)	**A** – Execution of an awareness-raising campaign for personnel on differentiated refuse collection for plastic, aluminium, glass, and paper.	% USW differentiated	2008
12	Increase to 25% of the quantity of industrial waste sent for recovery	**A** – Increase in excavated soil being sent for recovery	% waste leaving the site being sent for recovery	2008
	Environmental aspect: Noise			
13	Containment of noise emissions at source	**A** – Installation of sound-absorbent panels in the MHC-2 plant	% progress in activity	2009
		B – Design and installation of soundproofing of sheds 109 and 110, which contain the compressors for the hydrogen network		
	Environmental aspect: Odours			
14	Monitoring of the presence of odours and identification of possible sources	**A** – Development of a monitoring methodology using a combination of analytical, modelling and assessment techniques by experts, and implementation of the monitoring.	% progress in activity	2008
	Environmental aspect: Development of product design			
15	Reduction to 10 ppm (parts per million) of the concentration of sulphur in 100% of the petrol and diesel sent to the European market. Reduction of indirect emissions of SO_2	**A** – Upgrading of petrol desulphurisation processes and optimisation of hydrogen production to support petrol and diesel desulphurisation processes.	% petrol and diesel at 10 ppm for the European market	Since 1 January 2009
	Environmental aspect: Transport – Sea traffic: emergency prevention at sea			
16	Procurement of light crude via double-hulled ships in a percentage of at least 98%.	**A** – Continuation of selection of double-hulled ships for transportation of light crude	% double-hulled ships over total n° of ships	2008
17	Shipping of products via double-hulled ships in a percentage of at least 95%	**A** – Continuation of selection of double-hulled ships for shipping of products (diesel, kerosene, petrol)	% double-hulled ships over total n° of ships	2008
18	Execution of on-board controls of ships during loading and unloading	**A** – Continuation of inspections in accordance with the criteria adopted by Saras for safety and for protecting the environment (Minimum Safety Criteria)	% ships checked	2008
	Environmental aspect: Transport – Road traffic: Accident prevention			
19	Execution of checks on at least 18% of the tanker trucks used to transport products	**A** – Continuation of controls in accordance with Saras's internal procedures	% tanker trucks checked	2008

5.2 – Improvement activities already carried out

To complete the information we have provided on programmes for environmental improvement that are currently underway, we believe it is appropriate to also give a brief summary of the principal improvements carried out in the last four years.
To address emissions ducted into the atmosphere, in 2007 burners with low emissions of nitrogen oxides were installed in a number of process furnaces.
To reduce non-ducted emissions (diffuse and escaped), the vapour recovery system in the National Deposit was upgraded (2006 – 2007), and a programme of installation of double seals was begun on the pumps that move hot hydrocarbons and petrol (2005 – 2007), and as of the time of writing 88% of the pumps targeted by the programme have been covered.
Measures to contain energy consumption and water consumption have addressed improvements in efficiency of the cooling towers and the reduction of their flushing (2005).
To protect the soil and subsoil from possible contamination, a series of activities were carried out, including:

- The start-up of the programme to pave the containment reservoirs for the tanks for raw materials and products, which in three years has doubled the paved surface, reaching 24% of the surface targeted by the programme
- The start-up of the programme to install double bottoms in the tanks (2005 – 2007)
- The start-up of the programme to pave the soil along the pipeways (2005 – 2006)
- The verification of the sewer system via a system of video cameras, and the cleaning and inspection of the wells and sewerage courses (2004 – 2007)
- The execution of specific risk analysis (RBI analysis) on the safety of the tanks (as of 2007, a total of 121 tanks have been analysed).

Turning to noise, the installation of sound-absorbent panels in the FCC plant area was completed (2006).
To prevent accidents at sea, and anticipating the deadlines imposed by international and European law, the programme to use double-hulled ships is in an advanced phase (95.8% of the total number of ships in 2007), and the progressive elimination of ships with segregated ballast tanks is also underway (4% of the total number of ships in 2007).
Another measure to prevent emergencies was repairing the channels of the watercourses that flow within the site (2005), and personnel was trained to handle emergency events such as torrential rains and pollution.

6.
Summary of reference legislation

6. Summary of reference legislation

Below is a (non-exhaustive) list of the principal environmental laws that are applicable to the activities carried out on the Saras site.

Atmosphere

- Legislative Decree n° 152 of 03/04/2006 Environmental legislation
  Part V: Laws governing the protection of air quality and reduction of atmospheric emissions.
- Legislative Decree n° 216 of 4 April 2006 and subsequent modifications and supplements
  Implementation of directives 2003/87 and 2004/101/EC governing the exchange of emissions quotas of greenhouse gases in the European Community, with reference to the project mechanisms of the Kyoto Protocol.
- Deliberation n° 001/2008 of the National Committee for Managing and Implementing the 2003/87/EC directive
  Recognition of authorisations to emit greenhouse gases released in the period 2005-2007, in order to issue authorisations for the period 2008-2012 pursuant to the legislative decree of 4 April 2006
- Decisions of the European Commission of 29/01/2004 and of 18/07/2007
  These institute guidelines for monitoring and notification of emissions of greenhouse gases pursuant to directive 2003/87/EC of the European Parliament and Council.
- Ministerial Decree 02/04/2002 n° 60
  Implementation of directive 1999/30/EC of the Council of 22 April 1999 concerning the limit values of ambient air quality for sulphur dioxide, nitrogen dioxide, nitrogen oxides, particles and lead, and of directive 2000/69/EC for the limit values for the ambient air quality for benzene and carbon monoxide.
- Legislative Decree n° 183 of 21/05/2004
  Implementation of Directive 2002/3/EC on ozone in the atmosphere
- Presidential Decree n° 322 of 15/04/1971
  Directive for the execution of Law n° 615 of 13 July 1966, containing provisions against atmospheric pollution, limited to the industrial sector.

Water environment

- Legislative Decree n° 152 of 03/04/2006 Environmental legislation
  Part III, specifically: Laws governing the protection of water from pollution and the management of water resources.
- Regulation n° 417/2002 of 18/02/2002, modified by Regulations n° 1726/2003 of 22/07/2003 and n° 2172/2004 of 17/12/2004.
  Accelerated introduction of the laws governing double-hulls or equivalent technology for single-hulled oil tankers and which abrogates (EC) directive n° 2978/94 of the Council.

Waste, soil and subsoil

- Legislative Decree n° 152 of 03/04/2006 Environmental legislation
  Part IV: Laws governing the management of waste and the reclamation of polluted sites.
- EC Regulation n° 259 of 1/02/1993
  Surveillance and control of shipments of waste in the European Community, as well as entering and exiting its territory.

Noise

- Decree of the President of the Council of Minist. of 1/03/1991 and subsequent modifications and supplements. Maximum limits of exposure to noise in inhabited environments and in the outside environment
- Law n° 447 of 26/10/1995 Framework law on acoustic pollution
- Decree of the President of the Council of Minist. of 14/11/1997 Determination of limit values of noise sources

Asbestos

- Ministerial Decree n° 248 of 29 July 2004
  Directive on the determination and discipline of activities to recover products and goods made of asbestos and/or containing asbestos.
- Ministerial Decree of 14 December 2004
  Prohibition of installation of materials containing asbestos that has been intentionally added.

PCBs

- Legislative Decree n° 209 of 22/05/1999
  Implementation of Directive 96/59/EC on the disposal of polychlorinated biphenyls and polychlorinated terphenyls.
- Ministerial Decree of 11/10/2001
  Conditions for use of transformers containing PCBs awaiting decontamination or disposal.
- Law of 18 April 2005 n° 62, European Community Law 2004, article 18
  Obligations of holders of equipment containing PCBs and PCTs

Substances damaging to the ozone layer

- Presidential Decree n° 147 of 15/02/2006
  Methods for control and recovery of leaks of substances damaging to the ozone layer in the stratosphere by refrigeration and air conditioning equipment and heat pumps, pursuant to EC Directive n° 2037/2000.
- Regulation 2037/2000/EC of 29/06/2000 on substances that reduce the ozone layer

Electromagnetic fields

- Law n° 36 of 22/02/2001
  Framework law on protection from exposure to electrical, magnetic and electromagnetic fields.
- Decree of the President of the Council of Minist. of 8/07/2003
  Establishment of exposure limits, attention values and quality objectives for protecting the general public from exposure to electrical and magnetic fields at mains frequency (50 Hz) generated by power lines.

Ionising radiation sources

- Legislative Decree n° 230 of 17/03/1995 integrated and corrected by Legislative Decree n° 241 of 26/05/2000 and by Legislative Decree n° 257 of 09/05/2001.
  Implementation of directives 89/618/Euratom, 90/641/Euratom, 92/3/Euratom and 96/29/Euratom governing ionising radiation sources

Environmental Integrated Authorisation

- Legislative Decree n° 59/05 and subsequent modifications and supplements
  Full implementation of Directive 96/61/EC on the combined prevention and reduction of pollution.
  Additionally, the following laws are applicable for health and safety in the workplace and for the prevention and control of major hazards:

Health and safety in the workplace

- Legislative Decree n° 81 of 09/04/2008
  Implementation of article 1 of law n° 123 of 3 August 2007 governing the protection of health and safety in the workplace.

Prevention and control of major hazards

- Legislative Decree n° 334 of 17/08/199 and subsequent modifications and supplements
  Implementation of EC directive n° 82/501, governing the major hazards associated with determined industrial activities, pursuant to law n° 183 of 16 April 1987.
- Ministerial Decree 09/08/2000 Guidelines for Implementing the Safety Management System
- Ministerial Decree 19/03/2001 Procedures for fire prevention for major risk activities


MARE TIRRENUM

7.
Glossary

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7. Glossary

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

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

ARPA: Agenzie Regionali per la Protezione Ambientale (or regional environmental protection agencies). In April 1993 a referendum resulted in the removal of powers from Italy's national and local health services in the area of environmental control and protection. That left a gap which 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 setting guidelines 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 was created under Regional Law n° 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.

Desulphurisation: Process for treating oil fractions in order to reduce the sulphur content in refined products.

Carbon monoxide (CO): A gas produced by the incomplete combustion of fossil fuels. The main source is petrol engines not equipped with 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 nonbiodegradable matter.

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

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

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

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

Emission Trading: On 13 October 2003 the European Commission published the European directive on emissions trading (Directive 2003/87/EC), better known as the emissions trading system. The key points established by the directive are as follows:
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 return CO_2 allowances equal to those released into the atmosphere to the competent national authority; maximum CO_2 allowances have been set for every plant regulated by the directive; CO_2 emissions effectively released into the atmosphere are monitored in accordance with the requirements of the competent national authority and certified by an accredited inspector.

Emission: The discharge of any solid, liquid or gaseous substance into the ecosystem from a plant or any other source, which can have a direct or indirect effect on the environment. Emissions are measured at the point of exit.

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 Europe's first and most wide-ranging record of emissions into the air and water from industrial plants.

Wholesale: The channel for selling oil products to wholesale customers, such as industries, consortia and public bodies.

Filter Cake: The solid product formed by the filter presses and so named because of its physical, cake-like consistency, filter cake is the result of the process of gasification of heavy refinery products. It contains high percentages of metals such as iron, carbon vanadium and nickel.

GSE (Gestore dei Servizi Elettrici): Set up by article 3 of Legislative Decree n° 79/1999, GSE is the publicly-traded company with shares held by the Ministry for the Treasury. GSE provides incentives for the generation of electricity from renewable and assimilated sources, and it also takes care of the qualification of plants using renewable sources and their electricity production.

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

Frequency index: Together with the severity rate, 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 106/hours worked).

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 (number of accidents reported to INAIL x 1,000,000/hours worked).

Severity index: Expresses, with reference to a given period of time, the ratio of the number of days' sick leave due to accidents to the number of hours worked (calculated using the formula: number of working days lost x 1,000/n° hours worked).

INES (Inventario Nazionale delle Emissioni e loro Sorgenti, or national inventory of emissions and their sources): National register of emissions 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. It consists of information on emissions from industrial sites in Italy which 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 environment ministry 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.

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

kt (kilotons): Unit of measurement of mass, equal to 1,000 tons.

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

MW (Megawatt): A multiple of kW (kilowatt), the unit of measurement of a power station's power, i.e. its energy-generating capacity. It also measures the power consumed by an item of electrical equipment. 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 produced or consumed, equal to the power produced by 1 MW in one hour and equivalent to 1,000 kWh.

NO_x (nitrogen oxides): Gaseous compounds consisting of nitrogen and oxygen (NO, NO2 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, the OHSAS 18001 certification can be obtained by following a path similar to that for the ISO standards.

Piezometer: 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 level of piezometry (the line where points with a height equal to that of the body of water are located) at a set point.

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

Kyoto Protocol: 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 and highest priority, 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 Kyoto Protocol requires industrialised countries and countries whose economies are in a transition phase (eastern European countries) to reduce overall emissions of greenhouse gases (carbon dioxide, methane, nitrous oxide, hydrated fluorocarbons, perfluorocarbons, and sulphur hexafluoride) by 5% by 2010.

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

Major hazard: Probability that an event linked to uncontrolled development of an industrial activity could give rise to serious danger, either immediate or in the future, for people and the environment.

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.

Management system: The organisational structure, planning activities, responsibilities, procedures, practices, processes and resources to formulate, implement, obtain, re-examine and maintain control, where possible, over all the internal and external variables of an organisation.

SO_2 (sulphur dioxide): It is a colourless, pungent gas that is released during the combustion of fossil fuels containing sulphur. High concentrations of SO_2 in the atmosphere are the principal cause of the formation of acid rain.

TOE (Ton of Oil Equivalent): Unit of measurement conventionally used to determine the energy contained in various sources taking into account their calorific potential.

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