Sarlux Srl
Environmental Declaration 2014

SARLUX
SARAS
Refining & Power

English translation from
original Italian document
EMAS validated

Sarlux Srl
Environmental Declaration
2014

Revised version of 1 June 2014
(performance data updated to 31 December 2013)

prepared according to the requirements of EC Regulation 1221/2009

Sarlux Srl

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

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

Version 3, revision 0 of 1 June 2014
(performance data updated to 31 December 2013)
of the Sarlux Srl Environmental Declaration EMAS registration
no.: IT – 000995 on 20 October 2008

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

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

This document describes for the public and all stakeholders:

- the activities conducted by Sarlux
- the direct and indirect environmental aspects associated with these activities
- the objectives that the company has set itself in order to improve its environmental performance

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

The Environmental Declaration will be updated on an annual basis and a complete version will be re-issued in 2017.

This Environmental Declaration has been prepared with the collaboration of all organisational units by:
Francesco Grosso, HSEQ Management System Manager

Checked by:
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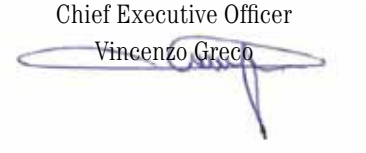
Foreword

A year has passed since Sarlux started operating in the refining sector by virtue of the transfer on 1 July 2013 of the production of oil products from its parent company, Saras.
My intention, since my appointment as CEO on 13 November 2013, is to continue with those projects and activities, covered by our EMAS registration, that will commit our organisation to a more sustainable future.
Our EMAS registration, which was originally obtained by Saras in 2008, was renewed in 2011 and has now been extended for a second time.
Over these years, and thanks in part to the adoption of best-in-industry principles, standards and solutions, we have achieved positive results and demonstrated our commitment to continually improving our environmental performance.
Registration reinforces the commitment of myself and the entire staff at the production site to pay close attention to the environment at all times with a view to making steady progress – because promoting sustainability and developing the expertise to achieve it is our daily duty. And because responsibility towards the surrounding environment is fundamental to the company's productivity and competitiveness.

I hope that this Environmental Statement will provide our stakeholders with understanding and awareness, as well as be a means of sharing the commitment to achieve, maintain and reinforce the very best standards of environmental performance.

Sarroch, 12 June 2014

Chief Executive Officer
Vincenzo Greco



Contents

Note to the reader

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

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

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

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

Where relevant, reference is also made to the table "Environmental objectives and programmes" (Section 5, page 123), which summarises the objectives and improvement measures that will be the company's particular focus over the next few years, as well as the improvement measures implemented in 2013.

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

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

1.
The company

Sarlux, a Saras Group company, has its production site in Sarroch, in the province of Cagliari.

The company was founded in 1996 as a joint venture between Saras and the Enron Group. It was wholly acquired by Saras on 28 June 2006. On 1 July 2013, pursuant to a resolution of the Saras Board of Directors, the company's refinery plants and activities were transferred to Sarlux, in order to centralise all the Group's industrial production of oil products and energy in one company.

The Sarroch refinery in Sardinia, in the heart of the Mediterranean, has been the island's primary operation for over 45 years.

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

1. The company

1.1 – Sarlux

[about 1,000 employees, 7,000 employed in related industries]

Sarlux is active in the energy sector. It is one of the main independent oil refining operators in Europe, and an electricity producer in Italy.
Since 1 July 2013, when it obtained EMAS registration, Sarlux has been the employer of around 1,000 people.
With its registered offices and production site in Sarroch, Sarlux represents the most important employment hub in Sardinia, with more than 7,000 people employed in related industries.
Since 2001, Sarlux has been active in electricity generation via an IGCC (Integrated Gasification Combined Cycle[1]) plant that is highly integrated with the refining cycle; this plant produces more than 4.4 billion kWh of electricity each year.
Recently, in July 2013, Sarlux added refining activities, which were previously carried out by Saras, to its electricity generation business.

[refining and electricity generation]

Processing approximately 12.9 million tons in FY 2013 (-2% compared to 2012), Sarlux is a leading European independent oil refiner; in addition, it generated in excess of 4,200,000 MWh of electricity in FY 2013 (+1% compared to 2012), which is more than 30% of Sardinia's energy requirement.

1.2 – Sarlux in Sarroch

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

[1] **Gasification Combined Cycle:** the IGCC enables the company to convert heavy hydrocarbons from the refinery's processing activities into electricity.

FIGURE 1. Location of the Sarlux site

The Sarroch production site

The Saras production site in Sarroch, around 20 km south-west of the Sardinian capital, Cagliari, is the location for one of the largest refineries in the Mediterranean region by production capacity, and its complexity makes it one of six "super sites" in western Europe (source: Wood Mackenzie, February 2007). With production capacity of 15 million tons per year (or 300,000 barrels per day), this plant accounts for about 15% of Italy's total refining capacity. The refining cycle is integrated with the IGCC plant, which generates electricity.
Thanks to its excellent geographical position, the Sarroch plant has proved strategic for trade with central-western Mediterranean countries, both in Europe and North Africa; and its proximity to the Versalis and Sasol Italy plants means its refinery operations include petrochemical production (see box on page 13).

sulphur present in oil products and the improvement in the quality of medium distillates and gasolines; this allowed the company to produce gasoline in accordance with the new European restrictions, which stipulate a sulphur content of 10 ppm, thereby helping reduce the indirect environmental impact of the sulphur content of motor fuels.

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

Throughout the entire process, from selecting raw materials to fitting efficient desulphurisation systems (U800 for gasoline and DEA4 for better removal of H_2S from the fuel gas used on-site) and treating Claus tail gases (TGTU))[2] , the choices made and projects implemented at the site have produced impressive results.

The 2013 figure, which is on a par with the improvement in recent years, above all as regards sulphur in emissions, validates the technical decisions made over the years. This confirms the site's desulphurisation capacity, together with a marked reduction in the quantity of sulphur released into the atmosphere.

1.3 – Company organisation

The functions carried out by Sarlux in terms of environmental management of the Sarroch site (see Fig. 3) are: **Operations Management, Technical, Asset Management, Prevention and Protection, and Security and Shared Services**; these functions report directly to the CEO, who is the Employer pursuant to Legislative Decree 81/2008 and Site Manager.

Operations Management develops and implements the production programme, optimises plant productivity and maximises the energy efficiency of all operations on the site. Operations Management's reports include the production areas listed below, which have a direct influence on the management of environmental aspects (see definition on page 46):

- the Movement, Shipping and Wharf production area, which is responsible for the delivery of raw materials, and the internal movement and shipping of products
- the Distillation and Desulphurisation/Conversion production area, which is responsible for the refinery plants
- the Targas and Utilities production area, which is responsible for the IGCC plant and auxiliary services

Within each production area, the Reliability and Area Maintenance unit is responsible for ordinary maintenance operations.

Also in Operations Management, Service Technology plays an important role regarding atmospheric emissions.

The **Technical** department is responsible for maximising the productivity and energy efficiency of the site's plants via continuous performance monitoring and the use of the most advanced monitoring and process optimisation technologies. Within the Technical department, the Blow-down Technology and Networks area plays a major role in relation to flare emissions.

Asset Management ensures that the assets are reliable and available, and implements maintenance and investment programmes. It also supports the other functions in managing the site and other environmental aspects. The following organisational units report to Asset Management:

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[1] **Relevant legislation:** Directive 98/70/EC, amended by Directive 2003/17/EC and within Italy, the following provisions: Prime Ministerial Decree 434 of 23 November 2000, Prime Ministerial Decree 29/2002, and Law 306 of 31 October 2003.

[2] **TGTU:** Tail Gas Treatment Unit.

FIGURE 2. The Sarlux production site and the surrounding region

The Sarroch industrial hub

The production hub that built up around Sarroch in the 1960s has helped generate employment and wealth in the region.

Over the years, numerous small and medium-sized companies have sprung up around the large industrial companies present in the region, such as Sarlux, Versalis, Sasol Italy, Air Liquide, Liquigas and ENI Gas GPL. These companies build and maintain the plants of the larger firms, and therefore represent a significant satellite industry. Sarlux maintains mutually beneficial industrial relations with all these production companies.

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

The Versalis plants receive the raw materials from Sarlux and use them in products for the plastics industry, while those of Sasol Italy produce detergents and the bases for synthetic lubricants, again from raw materials received from Sarlux (mainly diesel and kerosene).

Air Liquide produces liquid oxygen, which is used in the Sarlux IGCC plants.

Lastly, the Liquigas site stores and sells the LPG from Sarlux (Figure 10, page 36).

- Reliability and Availability, responsible for promoting and ensuring the continuous improvement of the reliability and safety of plants and equipment
- Maintenance Planning and Budgeting, responsible for planning maintenance work
- Operating Maintenance, responsible for carrying out scheduled and unscheduled maintenance work
- Investment, responsible for implementing the approved asset investment programme
- Material Management, responsible for the temporary storage of materials and auxiliary substances

Prevention and Protection of the site, which in addition to performing the prevention and protection tasks stipulated by legislation on health and safety in the workplace (Legislative Decree 81/2008, Art. 33) is also responsible for supporting the Employer, Site Manager and the other functions in implementing and fulfilling the obligations arising from health and safety and environmental legislation. This involves planning and launching processes that affect this area, with a view to continuous improvement, ensuring that the environmental management system is consistent and compliant with the certificates and registrations voluntarily adopted, including ISO 14001 and EMAS in terms of the environment. The Prevention and Protection unit's reports also include the HSEQ management system, the medical centre and the Safety department, which is also responsible for managing emergencies in accordance with the Internal Emergency Plan.

Security and Shared Services is responsible for defining security policies and managing access and personnel transport.

Sarlux is supported by its parent company, Saras, in its work with regard to the following organisational units:

- Purchasing and Tenders (including monitoring supplier quality)
- ICT (Information, Communication and Technology)
- Human Resources and Organisation, which is supported by the Organisation unit in matters of internal communication
- Group's HSE Quality and Policies
- Legal and Corporate Affairs
- External and investor relations, for external communication

1.4 – Subject of EMAS registration

[the EMAS-registered Sarroch site]

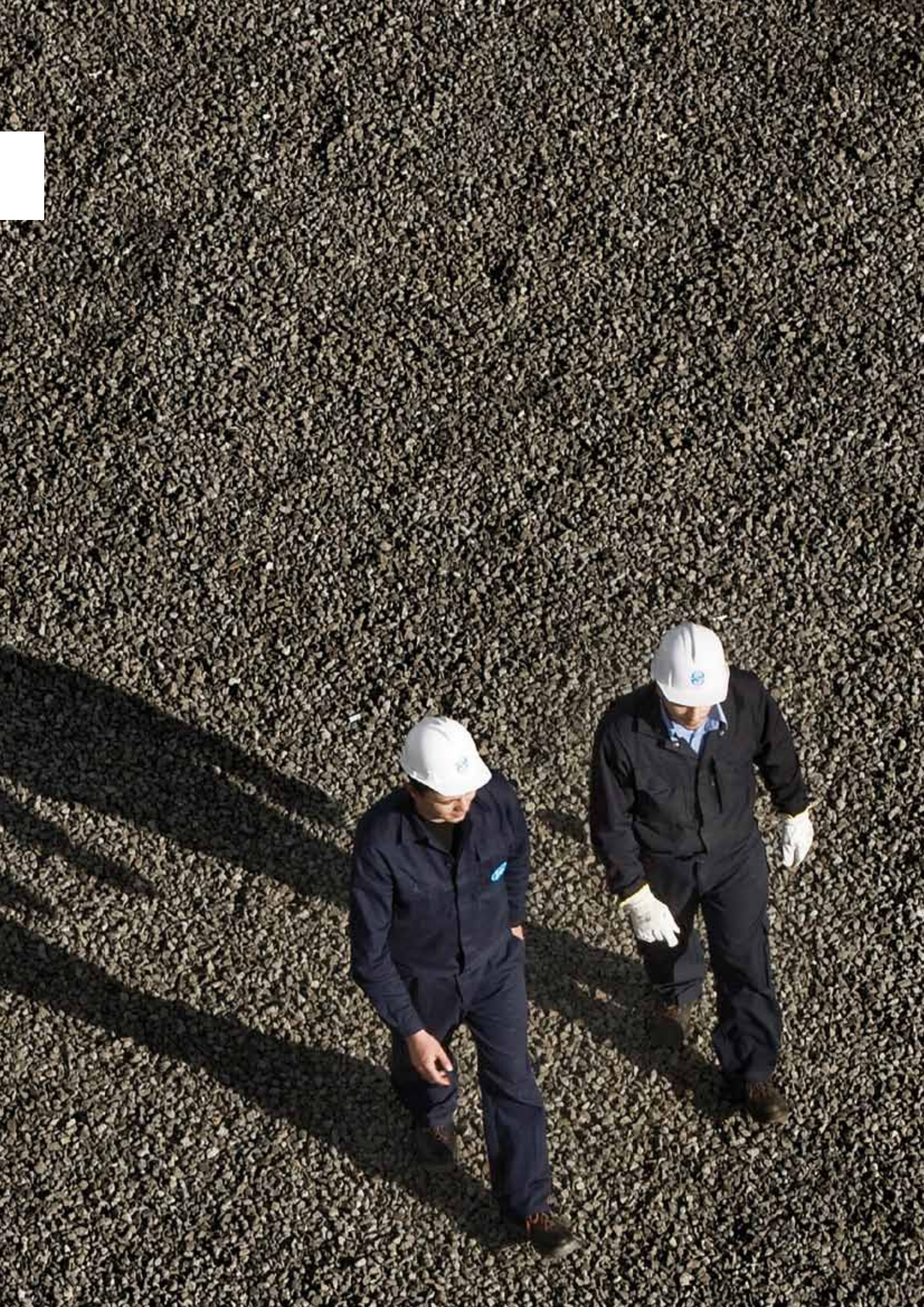
On 20 October 2008, the Ecolabel and Ecoaudit Committee (EMAS Section) in Italy approved the registration under no. IT-000995. of Saras SpA The subject of EMAS registration was Saras SpA, in its entirety, for the Sarroch site and the Milan headquarters. The EMAS registration[1] on 20 October 2008 brought the Environmental Management System (EMS) into line with EC Regulation 761/2001. The validation was updated to EC Regulation 1221/2009 during third-party verification in July 2010. Since 1 July 2013, the Environmental Declaration has been produced by Sarlux Srl following the transfer of refining activities from Saras SpA to Sarlux Srl, as approved by the Board of Directors of Saras SpA on 24 June 2013. In July, the certifying body, Lloyd's Register Quality Assurance (LRQA), validated the Sarlux 2013 Environmental Declaration, which was prepared in accordance with EC Regulation 1221/2009, and recommended annual renewal of registration to the EC Control Body, ECOLABEL; at

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

FIGURE 3. Organisational structure of Sarlux

the same time, the company submitted a request to transfer the certificate to Sarlux.
Sarlux has its registered offices at the Sarroch site and it is here that it conducts all its production activities (the area of the site is indicated by the white boundary in Figure 2 on page 13).
The activities covered by registration concern the Sarroch site, whose processes and activities with a direct or indirect influence on the company's environmental management are monitored as part of the ISO 14001-certified Environmental Management System.
The main areas involved in the environmental aspects of Sarlux's activities are therefore located in Sarroch and in the province of Cagliari.


★CARLOTTA ONORATO★
CAGLIARI



2.
Commitment to protect the environment, health and safety

Sarlux's commitment to environmental sustainability and safety follows the same pattern as that of Saras SpA

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

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

2. Commitment to protect the environment, health and safety

2.1 – Environmental management

The Environmental Management System

[the commitment to continuous improvement]

Preparing and publishing the Environmental Declaration is part of the continuous improvement process for environmental management that has been in place for many years, implemented by Saras up to 30 June 2013 and thereafter by Sarlux. Initial certification was obtained in June 2004 and in May 2013, following maintenance and renewal visits, the certificate was renewed for the third time pursuant to ISO 14001:2004.

[ISO 14001 certification]

In October 2008, the process of developing the EMS was completed, enabling the Sarroch site to register in accordance with the Eco-Management and Audit Scheme (EMAS), firstly under EC Regulation 761/2001 and thereafter, following updates and renewals, under EC Regulation 1221/2009, the European eco-management and audit standard.

[EMAS registration]

Registration then led to the public dissemination of the first Environmental Declaration of 2008.

In July 2013, following the transfer of refining operations from Saras SpA to Sarlux Srl, the certification body changed the certificate registration from Saras to Sarlux.

2.2 – Health and safety management

The Safety Management System

The company introduced its first Safety Policy in 1996, and since then has achieved positive results in continuously protecting its workers: “Saras will treat safety as being equally as important as production, quality and costs.” Since 2008, the company has had a specific Major Accident Prevention Policy, created for the Sarroch site following the enactment of the Ministerial Decree of 9 August 2000, which sets out the legislative framework for implementing a management system for the prevention of major accidents.

The subsequent introduction of specific legislation on the protection of workers’ health and safety (formerly Legislative Decree 626/94, now Legislative Decree 81/2008, the Consolidated Law on Occupational Health and Safety) suggested the need to do something above and beyond simply complying with the law. The company considers the protection of health and the prevention of any form of accident or injury (for all people working at its site) as core values, as stated in the Occupational Health and Safety Policy (Figure 4, page 21), as defined by the CEO and the Employer. The implementation of an Occupational Health and Safety Management System introduced performance measures and the setting of improvement objectives and goals.

[health and safety are key priorities]

SARLUX
SARAS Refining & Power

Policy for Health and Safety, the Prevention of Major Accidents and the Environment

For Sarlux, the health and safety of workers, preventing major accidents, environmental protection and service quality are core values that it applies when conducting its refining activity and electrical energy production on a sustainable basis; it thereby ensures it meets its goals – be they purely economic or social – in complete harmony.

Sarlux believes that the achievement of its objectives is predicated on the successful integration of its activities within the surrounding area and responsible management of relationships with stakeholders.

To achieve this, Sarlux:

- supports implementation of integrated safety management systems for safety, security and the environment and EMAS registration in accordance with European and international standards
- ensures the utmost safety of its employees and any other person on site, by implementing all the measures and initiatives necessary to prevent any type of accident, and to minimise the potential consequences for individuals, the environment and property
- complies with the specific regulations on environmental protection and the reduction of risks associated with the company's activities, and the prevention of major accidents
- periodically assesses the risks associated with the company's activities, identifying safety objectives and defining appropriate programmes for continuous improvement
- improves its performance by adopting principles, standards and solutions that constitute "best practice" in the sector
- ensures that plants, machinery and equipment are designed, implemented and maintained with the protection of the health and safety of workers and the environment, and the prevention of major accidents in mind
- ensures that all its employees and those of subcontractors, and any other person with access to the site, are, with respect to their skills and responsibilities, informed, trained and equipped to work with full awareness of the potential risks associated with their activities, both under ordinary and abnormal operating conditions and in the event of an emergency
- develops a relationship of constructive co-operation, based on complete transparency and trust, both internally and with all external stakeholders, in respect of health and safety issues, the environment, and the prevention of major accidents
- disseminates its policy to all employees, suppliers, contractors and any other external person who has access to the site, actively involving the whole of the site's organisation in the integrated management system, in accordance with each person's competences and attributes

These objectives can only be met through the active contribution of the entire operational staff at the site, and, in particular, all Sarlux employees have a duty to behave in accordance with these principles and to take care and periodically check that these are respected.

The policy is periodically reviewed and updated if there are significant variations to the risk of accidents, or changes in legislation, technical expertise or the environmental impact of processes.

Sarroch, 13 June 2014

Sarlux Srl
Chief Executive Officer
Vincenzo Greco

figure 4. Policy for health and safety, the prevention of major accidents and the environment

[OHSAS 18001 certification]

The Safety Management System (SMS) has now become an integrated system (Major Accidents, Occupational Health and Safety) that shares components to generate synergies. Following a similar process to that undertaken for the SMS, in December 2007, the company obtained certification for its Safety Management System in accordance with the OHSAS 18001:2007 standard; the certificate was switched by the certification body from Saras to Sarlux as a result of the company transfer on 1 July 2013.
The main objectives of Sarlux's commitment to safety management have always been accident prevention and the identification of the most effective methods of reducing the likelihood of accidents. This approach is the same as that which underlies Legislative Decree 334/99 (Seveso II), which stipulated the adoption of a Safety Management System for the prevention of major accidents. To exploit synergies between the common components of the safety management systems, Sarlux's SMS, which was already integrated with the Management System for the Prevention of Major Accidents pursuant to the requirements of Ministerial Decree 09/08/2000, has been integrated with the Environmental Management System.
The manual for the Sarlux integrated environmental and safety management system is currently being approved.

Accidents

The policy of continuous improvement that the site has adopted in a number of areas, such as the environment, technology and training, can also be applied to safety.
To evaluate the correctness of the decisions made by the company in terms of safety, the figures are analysed in detail against suitable indicators.
The total frequency of injuries, which in this renewal replaced the INAIL index, confirms the continuous improvements made to the safety of workers, although the company believes that further improvements are still achievable.
Of fundamental importance to the prevention of accidents is the reporting, collection and analysis of near misses or accidents that could have caused an injury. There was a further increase in such reports in 2013 compared with 2012.

TABLE 1 Eventi incidentali Sarlux

Parameter	2010	2011	2012	2013
Total frequency index (no. accidents + medical treatment x 1,000,000/total no. hours worked)	10.7	6.8	2.5	2.6
Severity index* (no. days lost x 1,000/total no. hours worked)	0.434	0.065	0.069	0.093
Average duration (days)**	58.0	41.8	38.0	48.0
Near miss			176	268

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

LRQA
Business Assurance

CERTIFICATE OF APPROVAL

It is hereby certified that the Environmental Management System of:

Sarlux Srl
Head Office:
Galleria de Cristoforis, 1 - 20122 Milan - Italy
Registered office and operational site:
S.S. Sulcitana 195 - Km 19 - 09018 Sarroch (Cagliari) - Italy

has been approved by Lloyd's Register Quality Assurance for compliance with the following environmental management system standards:

ISO 14001/2004

The Environmental Management System applies to:

Refining, delivery, storage, preparation and shipping of oil products. Generation and sale of electricity.

Certificate of Approval
No. LRC 4180526/EMS/U/IT

Original Approval: 1 June 2004

Current Certificate: 1 June 2013

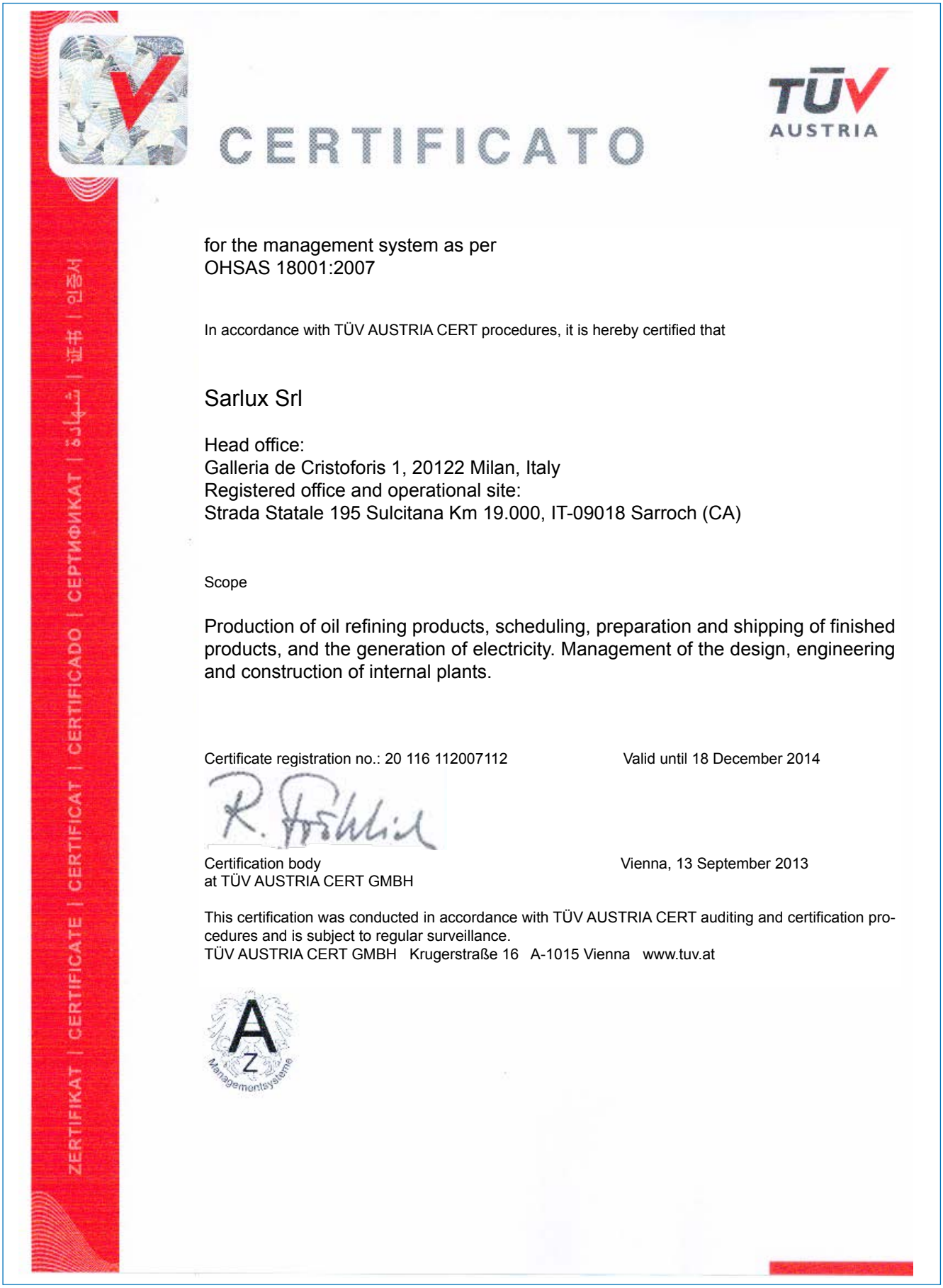
Expiry of Certificate: 31 May 2016

Issued by: Lloyd's Register Quality Assurance Italy Srl
on behalf of Lloyd's Register Quality Assurance Ltd

UKAS MANAGEMENT SYSTEMS 001

This document is subject to the conditions set out on the reverse
LRQA Italy – Via Cadorna, 69 20090 Vomodrone (MI)
on behalf of LRQA Ltd, 71, Fenchurch St., London, EC3M 4BS United Kingdom
Approval is executed pursuant to the assessment and certification procedures of LRQA and monitored by LRQA. Use of the UKAS accreditation logo indicates accreditation relating to the activity covered by

Figure 5 ISO 14001environmental certificate



CERTIFICATO

TÜV AUSTRIA

ZERTIFIKAT | CERTIFICATE | CERTIFICAT | CERTIFICADO | СЕРТИФИКАТ | شهادة | 证书 | 인증서

for the management system as per
OHSAS 18001:2007

In accordance with TÜV AUSTRIA CERT procedures, it is hereby certified that

Sarlux Srl

Head office:
Galleria de Cristoforis 1, 20122 Milan, Italy
Registered office and operational site:
Strada Statale 195 Sulcitana Km 19.000, IT-09018 Sarroch (CA)

Scope

Production of oil refining products, scheduling, preparation and shipping of finished products, and the generation of electricity. Management of the design, engineering and construction of internal plants.

Certificate registration no.: 20 116 112007112 Valid until 18 December 2014

Certification body
at TÜV AUSTRIA CERT GMBH

Vienna, 13 September 2013

This certification was conducted in accordance with TÜV AUSTRIA CERT auditing and certification procedures and is subject to regular surveillance.
TÜV AUSTRIA CERT GMBH Krugerstraße 16 A-1015 Vienna www.tuv.at

A Z Managementsysteme

Figure 6 OHSAS 18001 safety certificate

2.3 – Environmental communication

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

2.3.1 – Internal Communication

[involving employees]

Again in 2013, the primary aim of internal communication activities was to share information about projects and initiatives and increase the involvement in and contribution to improving environmental management at the site by employees of the company and of subcontractors operating on site.
The company newsletter continued to be published regularly. It is distributed in paper format and available digitally on the company's intranet (five editions to date). The newsletter includes a large section on health, safety and the environment, and, on average, more than a quarter of each issue was devoted to these topics.
With regard to the environment in particular, it was decided to illustrate aspects of environmental protection within the Eleonora project in detail; the aim of this project is to find natural gas through exploration of the subsoil and to highlight projects and initiatives on energy efficiency. A report about the marine terminal of the plant also described the company's activities to prevent marine pollution.
Environmental protection within the Eleonora project was a core topic in an internal exhibition about the project. The exhibition gave 350 visitors – employees of Saras Group and its contractors – the opportunity to learn more about environmental and health and safety issues; further information was provided by the specialists who collaborated on the Environmental Impact Study.
As in previous years, the final reports on occupational health monitoring carried out during the year were published on the company intranet.
Lastly, the suggestion box system is still in place, allowing all employees of the site and of subcontractors to submit questions and comments, either via email or on paper, to which the company responds publicly on notice boards and in the EMAS section of the company intranet.

2.3.2 –Sarlux Communication

There is a constant dialogue with the region and its stakeholders, sharing information about environmental performance and setting new goals for environmental sustainability. This shows the commitment of Sarlux, which took over the Saras Group's activities in 2013, to constantly support initiatives promoting social, economic and cultural development in the region. This year, in particular, saw the launch of a new approach to corporate social responsibility. The Group's commitment to keeping a channel of communication open with institutions, residents and stakeholders is aimed specifically at the community around the Sarroch production site and the whole of Cagliari. But Sarlux supports those who promote the social and economic development of the whole island.

2.3.2.1 – Environment: dialogue with the Community

EMAS registration is based on achieving a perfect mix between showing respect for the region and establishing a channel of communication with residents to develop a constructive dialogue about health, safety and the environment.
Sarlux has been involved in various meetings. In November, Sarlux presented the performance figures of its plants at a meeting of the Sarroch Environmental Committee,

[incontri con il territorio e le autorità locali]

illustrating how the company had reduced emissions between 2009 and the present to 45% of what they were in 2008. This result was also acknowledged by Legambiente, one of the most representative of Italy's environmental associations, which urged Sarlux to continue along the path it had taken.

2.3.2.2 –Education: safety and new training projects

[collaborazione con le istituzioni scolastiche]

As in the past, a specific page is reserved for Sarlux's relationship with schools and universities, which has always involved a host of educational initiatives and training programmes. Sarlux aims to disseminate a culture of safety, starting with the very youngest, by promoting "Safe Schools", a project devised by the National Fire Service in Cagliari and organised by the Sarroch elementary/middle school, in association with the Municipalities of Sarroch and Villa San Pietro. The initiative provides lessons on safety to children in language that is easy to understand to make them aware, especially in a domestic setting, of the risks around them.
New forms of partnerships with high schools were launched in 2013: in addition to the usual regular site visits, usually by students with specific training (from the Industrial or Chemical institutes), Sarlux staff recently welcomed high school students on work experience as part of the "work-related learning" programme. The purpose of the ministerial programme, which recognises training periods spent in companies, is to provide young people with short spells of work that may help them identify aptitudes and propensities at a key moment in their lives: when they choose which university subject or training course to take. For this reason, the students spent four days attending lessons, not only on environmental issues and safety but also on more general topics, such as the organisation of a large company or the rules for a successful job interview. They also visited the marine terminal, which is the refinery's door to the sea.
Lastly, Sarlux has a solid link with Cagliari University through apprenticeships and scholarships for doctorate students. The relationship was recently strengthened with the renewal of the memorandum of understanding, which was first signed in 1999.

2.3.2.3 Social commitment: participation in important events for the island

There were two major events in Sardinia in 2013: Cyclone Cleopatra (19 November), which devastated more than half the island, causing the deaths of 19 people and damage estimated at EUR 650 million, and the visit of Pope Francis to Cagliari on 22 September.

Sarlux employees, together with their colleagues in the Sarroch industrial area, came to the aid and assistance of the people affected by the disaster; in this way, they were able to get involved personally, as well as participate in a company-organised monetary collection.
During the Holy Father's visit, the Saras Group supported the organising committee, providing 20,000 bottles of water for pilgrims.
In summary, the Group continues its unwavering support of charities and other voluntary organisations on the island.

2.3.2.4 The culture of sport

In 2013, the Group continued to sponsor the world of sport through its support of local sports clubs, such as Sarroch Polisportiva Pallavolo, a team that competes in Serie B2 of the National Volleyball League, and Sarroch Football Club. Sarlux is also one of the sponsors of the Dinamo-Sassari basketball team, a nationally successful Sardinian team that won the Italian Cup halfway through the 2013/2014 championships.

3.
Information about the Sarroch production site

Oil products and electricity from clean technology.

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

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

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

3. Information about the Sarroch production site

3.1 – Activities carried out at the site

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

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

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

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

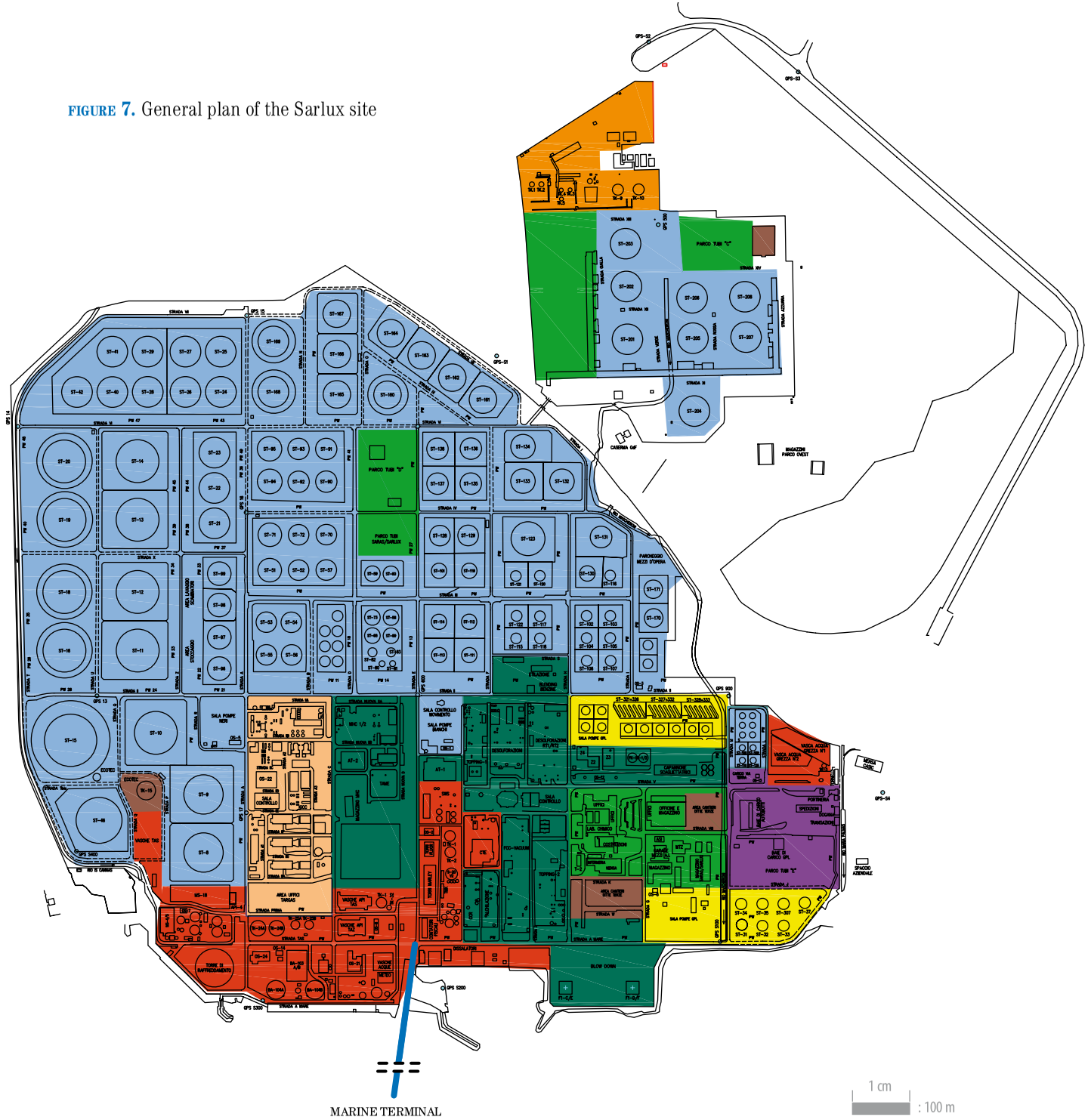
[delivery and shipping by sea]

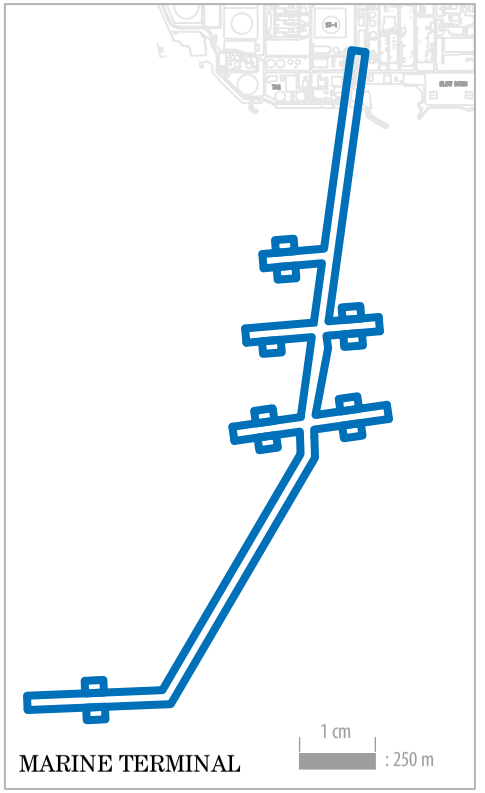
The marine terminal linked to the refinery has a 1,600-long wharf and fixed platforms connected to it by a 1,200m piling. All raw materials are delivered here, and the bulk of the oil products are shipped from here. In 2013, 87% of oil products were shipped by sea. The terminal has 11 independent docking berths, nine of which are for shipping finished oil products and the delivery of semi-finished products, docking oil tankers of up to 65,000 tons of deadweight capacity. In addition to these docking berths, there are also two platforms which enable ships of up to 300,000 tons of deadweight capacity to dock for the delivery of crude oils.

[continuous monitoring of operations and ships]

The various docking berths can operate simultaneously, thus reducing waiting times for anchored ships. Advanced monitoring systems ensure that all deliveries and shipping operations take place under conditions of the utmost safety: the phases relating to the docking and mooring of ships and the connection between the ship and the loading arms transferring raw materials to the shore and finished products to the ship are carried out under continuous surveillance. In order to be admitted to the Sarlux marine terminal, all incoming ships must comply with rigorous safety standards that conform to internationally recognised criteria as well as additional requirements laid down by Sarlux (section 4.3.2, page 115). A dedicated control room, which has been completely renovated and updated with the latest monitoring technology, is manned and operational 24 hours a day, and is in continuous radio contact with the ships operating in the terminal, ensuring that all operations fully comply with all safety and environmental protection requirements.

FIGURE 7. General plan of the Sarlux site





- Delivery of raw materials and shipping of products by sea
- Production of oil products
- Power generation (IGCC)
- Storage of raw materials and products (tanks)
- Storage of liquefied gas (LPG spheres and bullets)
- Storage of liquid products (national storage facility)
- Shipping of products over land
- Auxiliary services
- Offices, workshops and warehouses
- Area for subcontractors

3.1.2 – Production of oil products

The production process is illustrated in the simplified diagram shown in Figure 8, and involves the following units:

- atmospheric distillation plants (topping) and vacuum distillation plants for raw materials, which produce the primary fractions
- conversion plants (visbreaking, mild hydrocracking 1 and 2, fluid catalytic cracking – FCC), where heavy hydrocarbons and distillates are converted into medium-light fractions; heavy hydrocarbons are sent from the visbreaking plant to the IGCC plant
- catalytic reforming (CCR) plant, where light distillates (naphtha) are converted into high-octane components; hydrogen, which is used in the desulphurisation treatment, is produced at the same time
- plants that improve the quality (alkalisation) and performance (TAME, Tertiary-Amyl-Methyl-Ether plant) of gasoline
- desulphurisation plants, where middle (kerosene and diesel) and light (gasoline) distillates are subjected to catalytic hydrogenation processes to remove sulphur and improve product quality, in particular Unit 800 of the catalytic cracking plant
- plants to recover and convert sulphur into a solid for subsequent sale
- non-condensable fuel gas treatment plant for the removal of sulphur compounds and subsequent internal re-use of gas, in particular the TGTU unit, which increases the sulphur recovery yield, thereby reducing SO_2 emissions

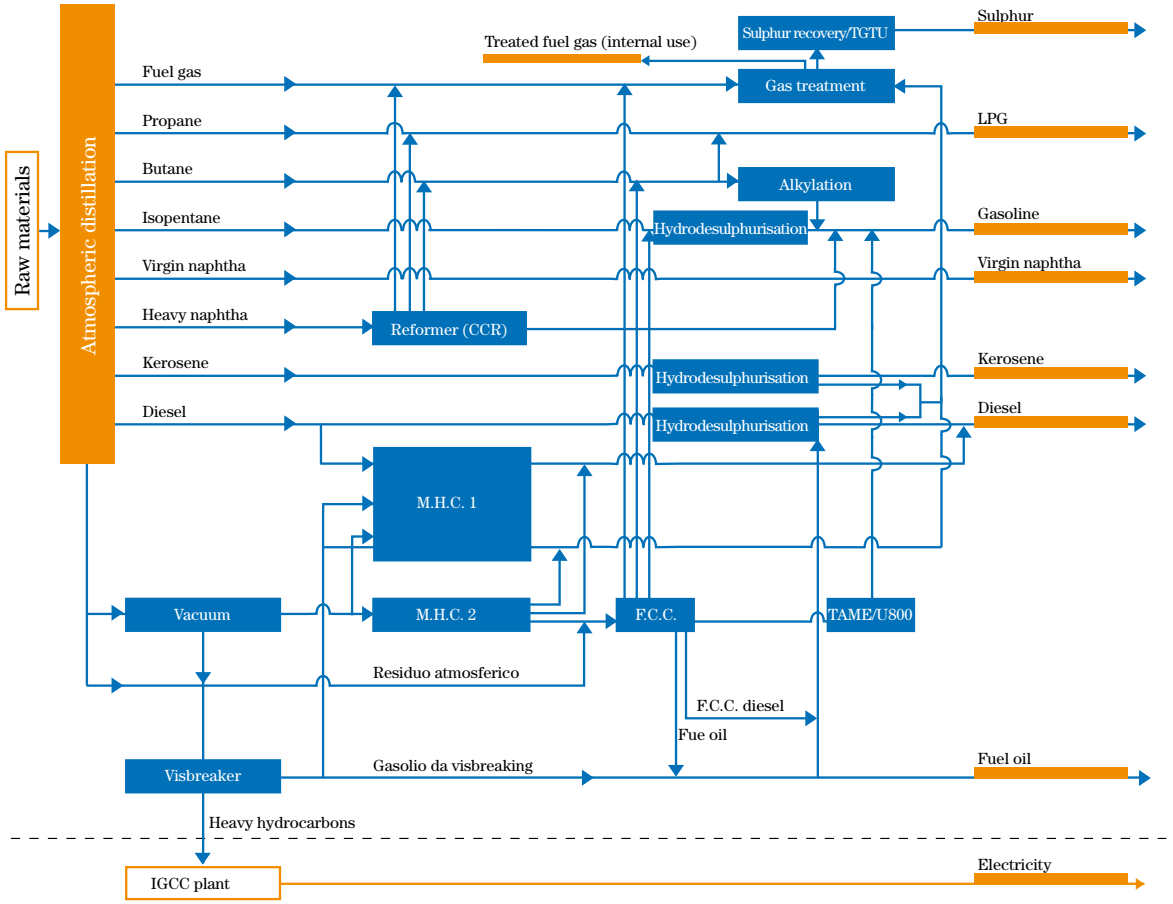


Figure 8 Sarlux plant production cycle: oil production and electricity generation

[oil products]

The Sarroch plant has a high output of medium oil products (diesel) and light oil products (LPG, naphtha and gasoline), which in 2013 accounted for around 88% of total production, as shown in Table 2, which contains production data relating to the period 2010-2013.
In the last few years, more light products have been produced, with fuel oil being kept to a minimum and heavy distillates from refining (TAR) being used to produce electricity.

TABLE 2 Oil products (tons/year)

	2010	2011	2012	2013
LPG	323,000	238,000	205,000	267,000
Gasoline and virgin naphtha	4,024,000	3,824,000	4,002,000	3,558.000
Middle distillates (gasoil and kerosene)	7,517,000	7,415,000	6,891,000	6,959,000
Fuel oil and other	463,000	623,000	272,000	195,000
Sulphur*	130,000	113,000	122,000	109,000
TAR	1,166,000	1,075,000	1,146,000	1,123,000

* Includes sulphur recovered both from refining and the IGCC.

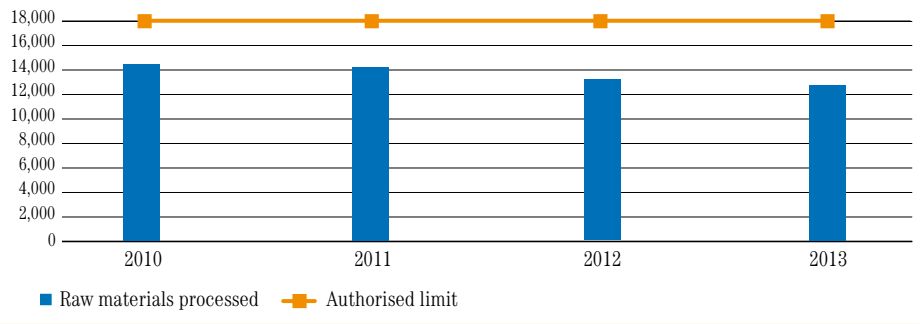
[Sarlux at the heart of the Mediterranean]

Raw materials mainly come from the Mediterranean area (North Africa and the Middle East), the former Soviet Union and North Europe. The primary destination of refinery products is the central and western Mediterranean region, with more than 20% of total production absorbed by the Sardinian market. In 2013 (see Table 3), the Sarroch refinery processed approximately 13.0 million tons of raw materials (crude oil and fuel oils), which is an average figure for recent years. Between 2010 and 2013, a total of around 55 million tons was processed with an average of 13.7 million tons of raw materials. Chart T3 shows the change in the level of raw materials processed in comparison with the maximum authorised quantity (18 million tons/year) specified by the refinery's Concession to Process Mineral Oils (Decree of the Italian Ministry for Productive Activities no. 17086 of 7 July 2003).

TABLE 3 Raw materials processed (kt/year)

2010	2011	2012	2013
14,340	14,006	13,309	12,980

CHART T3 (kt/year)



3.1.3 – Energy Generation

[electricity, hydrogen, steam]

The Integrated Gasification Combined Cycle (IGCC) plant generates electricity, hydrogen and steam from heavy hydrocarbons deriving from the refining process, and, as a unit, is recognised as one of the best techniques available in the refining sector.
As shown in Figure 9, the plant is divided into two main sections:

- gasification
- combined cycle.

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

[electricity to the external distribution grid]

Electricity is produced in three identical lines, each comprising a gas turbine, a steam recovery boiler and a steam turbine, with an overall net rated power of 551 MW; it is sold to GSE (Gestore Servizi Elettrici, the operator of the Italian national grid). Part of the steam produced and not used to generate electricity is sent to the refinery for use in refining processes, along with the hydrogen produced by the gasification section.
As with the sulphur recovered from the refining cycle, the sulphur recovered through the removal of hydrogen sulphide from the syngas is also sold (see figures in Table 4).

[recovery of metals]

The metals removed from the syngas are used to form a solid panel called "vanadium concentrate" or "filter cake", which is sent to external plants to recover the metals.
The IGCC plant therefore enables the Sarlux production site to maximise the conversion of raw materials into value-added products and to minimise the generation of waste.

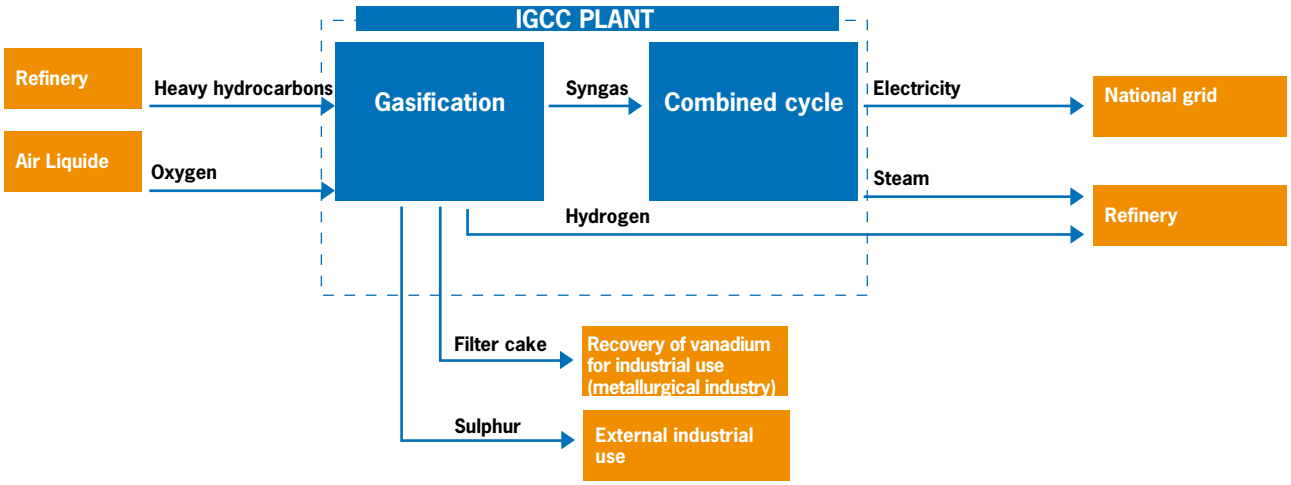


Figure 9 Flow chart of the IGCC plant

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

TABLE 4 IGCC products

	2010	2011	2012	2013
Electricity (kWh)	4,339,335,000	4,034,163,000	4,211,290,000	4,240,392,000
Low-pressure steam (t/year)	586,626	555,647	582,843	659,696
Medium-pressure steam (t/year)	737,033	699,486	743,660	859,248
Hydrogen (kNm^3)	376,074	338,952	386,887	303,928
Sulphur* (t/year)	52,666	37,872	43,196	38,932

* The quantity shown here is already included in the figure in Table 2 on page 33, "Oil products"

[IGCC efficiency and reliability]

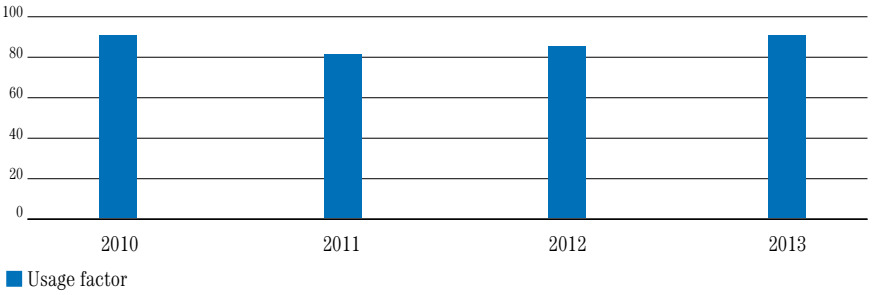
The three-line configuration of the IGCC plant ensures continuity in electricity generation and the production of hydrogen and steam for internal use on the site. The figures recorded to date confirm the effectiveness of the plant processes and technology. The plant is extremely reliable, as shown in Table 5 and Chart T5.

TABLE 5 IGCC plant usage factor

Indicator	2010	2011	2012	2013
Energy produced/potential energy* (%)	89.9	83.6	87.0	87.9

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

CHART T5 (%)



3.1.4 – Storage of raw materials and products

The storage facilities on the site are divided into the following areas:

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

[extensive and widespread safety systems]

In total, there are 161 tanks with an overall capacity of around 3.5 million cubic metres. All tanks are fitted with permanent fire-prevention systems and containment basins of reinforced concrete (45 tanks), or earthworks (116 tanks).

The fire prevention system in the LPG storage areas is controlled by a device that, depending on various factors (including wind direction), activates systems to prevent fires and contain any product leaks. In addition, to prevent accidents, the LPG tanks are equipped with instruments that monitor and protect against unexpected pressure surges. Raw materials and products are moved within the site between plants and storage and shipping areas using the following systems and equipment:

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

3.1.5 – Shipping of products by land

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

- a gantry with three loading points for LPG and 12 loading bays for liquid products (kerosene, diesel and fuel oil), located near the facility's manned entrance
- ten loading bays for diesel and fuel oil, located in the national storage facility

The Sarlux site is linked via the ENI Gas GPL and Liquigas gas pipelines and two pipelines to the national storage facility and the Liquigas storage facility and the neighbouring petrochemical plant, for the commercial exchange of semi-finished products and services (Figure 10).

[synergies between companies in the Sarroch petrochemical industrial hub]

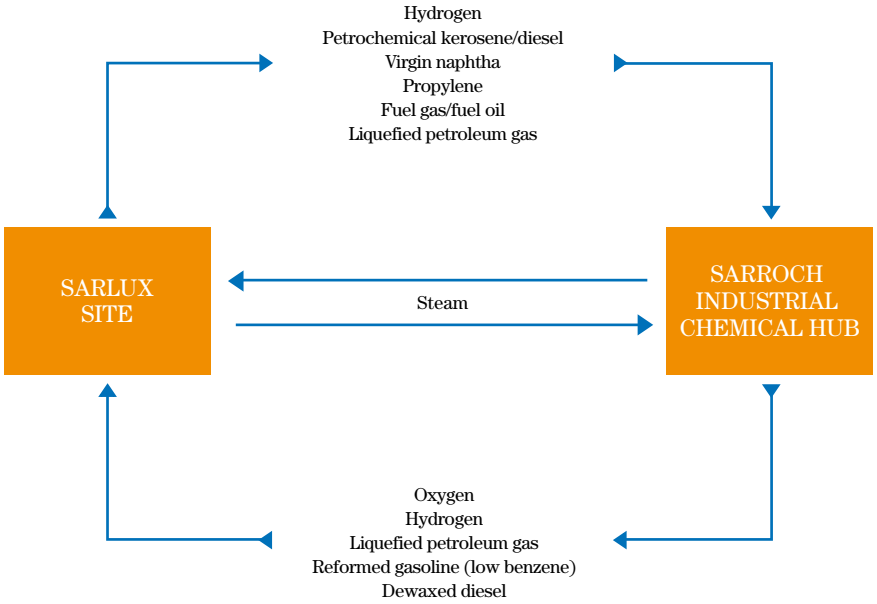


Figure 10 Synergies between the Saras plant and neighbouring chemical companies

3.1.6 – Auxiliary services

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

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

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

3.1.7 – Offices, workshops, warehouses and other services

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

3.1.8 – Activities of the subcontractors

Subcontractors operating continuously within the Sarlux site (maintenance, construction, mechanical and instrument checks, etc.) have logistics bases in dedicated areas on the site, which enables them to perform their work to the highest possible standard and reduces the need to leave the site. Specifically, two external companies work permanently on the site in waste management: one to manage the waste inertisation plant and one to manage an area in which mainly ferrous and electrical materials are sorted and recovered (section 4.2.6).

3.2 – Authorisation status of the Sarroch site

3.2.1 – Integrated environmental authorisation (aia)

[AIA permit DSA-DEC-2009-0000230]

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

IPPC (Integrated Pollution Prevention and Control) is a new strategy in place throughout the European Union, aimed at enhancing the "environmental performance" of industrial complexes that are subject to authorisation. The key aim of the Directive is to make a comparative assessment of the various environmental sectors and to unify authorisation procedures, so that separate approaches to the control of air, water and soil emissions do not encourage the transfer of pollution from one environmental category to another, and to protect the environment as a whole. This also introduces the requirement to assess the various solutions to prevent an improvement in one environmental area from creating an unacceptable deterioration in another.

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

The main features introduced by the permit are:

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

In 2013, the following activities were begun:

- installation of the system to measure dust in CO boilers
- installation of the system to measure H_2S and VOCs at points where emissions produced from the combustion of fuel oil are ducted

These activities will be completed in 2014.

The prototype used to measure flare temperature was installed and became operational. In 2014, engineering work will be carried out on the prototype to make it a "true" tool.

3.2.2 – Existing authorisations

The refining activities at the site are performed in accordance with the "Concession to Process Mineral Oils", which was last updated by the Decree of the Italian Ministry for Productive Activities issued on 7 July 2003. As of 9 April 2009, all of the environmental authorisation permits were combined and replaced by AIA permit DSA-DEC-2009-0000230 of 24 March 2009.

3.3 – Plans and procedures for handling emergencies

The site's Safety Report

The activities performed at the site involve the presence of substances with hazardous properties or that are hazardous when used at certain levels.

[1989: the first Safety Report]

In 1989, following the entry into force of the Italian law implementing the first European Directive on establishments where there are major-accident hazards, the company prepared the first Safety Report on activities at the Sarroch site. In drawing up the Safety Report for the site, the company conducted a precise and in-depth analysis of its activities and the risks associated with them on the basis of the processes and substances used.

[an in-depth risk analysis]

[Legislative Decree 334/99]

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

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

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

In fulfilment of the provision of Art. 23 of Legislative Decree 238/05, which amended and supplemented Legislative Decree 334/99, in December 2006 the company submitted the update to its Safety Report, including the progress made on the recommendations of the Sardinia Regional Technical Committee for Fire Prevention (CTR) during the assessment stage for the site's Safety Report (October 2000 edition), and sent the Municipality of Sarroch the updated information sheet for the general public.

[The assessment of the Regional Technical Committee]

Upon completion of the assessment stage, the Sardinia CTR issued its Final Technical Evaluations on the above-mentioned Safety Report (October 2005 edition, as amended), as per the report ref. 4921/P12 of the session on 18 July 2007. The conclusions state:

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

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

In June 2008, the CTR was notified of the measures implemented between October 2006 and May 2008, in relation to the recommendations received, and the measures planned for the period May 2008 to October 2010. Upon completion of the planned activities, in accordance with the Ministerial Decree of 19 March 2001 regarding fire prevention procedures for activities involving major-accident hazards, on 26 November 2008 an application was submitted to the Sardinia regional fire service for a Fire Prevention Certificate.
Regular inspections of the site's production areas by the fire service restarted in May 2011 for the purpose of issuing the Fire Prevention Certificate and checking progress on the observations made during previous inspections (for the same purpose) and reported in document no. 0006220 of 20 April 2009.
At the end of 2009, inspection work was begun by the Italian Ministry for the Environment and the Conservation of Land and Sea in order to assess the programmes and measures in place to prevent major accidents, with specific reference to the suitability of management procedures and plant solutions adopted.
The inspection was completed, with a successful outcome for the company, in early April 2010. The five-year review of the Safety Report was completed in October 2010 (the previous review took place in 2005) pursuant to the regulatory requirements, and was delivered to the competent authorities in the same month. The review of the document included detailed analysis of the company's existing plant and management system, and a reassessment of the risk scenarios and potential incidents, and hence the consequences that these could have for workers, the plant and the surrounding area. The document was also modified to include all the important changes to plants, procedures and the organisation implemented at the site between 2005 and 2010.

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

In relation to continuous improvement, the Sardinian Regional Technical Committee for Fire Prevention suggested a number of areas for further examination and possible implementation. The analysis method used is based on indices, pursuant to the regulatory requirements. Each plant has therefore been divided into logical units. The logical units were chosen according to pre-established criteria to enable the plant equipment in question to be grouped in a logical way (e.g. equipment operating under similar temperature and pressure conditions and processing the same fluids).
Each logical unit was then analysed, with prior assessment of penalising factors due to:
- risks related to the substances processed

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

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

- measures helping to reduce the number of accidents (e.g. control and safety instruments, operating and maintenance procedures and staff training) and
- measures helping to reduce the potential scale of accidents (e.g. fire prevention systems and fixed fire fighting systems).

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

2005 Safety Report

258 logical units analysed

Risk category distribution:

88% minor/low

11% moderate

1% high I

2010 Safety Report

276 logical units analysed

Risk category distribution:

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

11% moderate

0% high I

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

Following the entry into force of EC Regulation 1272/2008, better known as the CLP Regulation, fuel oil has been reclassified and, therefore, pursuant to article 6 of Legislative Decree 334/99, the 2010 Safety Report sent to the competent authorities in November 2011 required updating. The update also included a review of the crude oil classification detailed in CONCAWE Report no. 11/10.

In 2011, an inspection visit arranged by the Environment Ministry was carried out at the site, pursuant to Ministerial Decree of 5 November 1997. The purpose of the inspection, which took place over eight and a half days, was to ascertain progress in implementing a security management system. The inspection was carried out by a committee appointed for the purpose by the ministry.

It concluded the following: "The safety management system, as currently in existence, is largely adequate, and its essential elements comply, in terms of both structure and content, with the provisions of legislation and the Policy Document." Following the disposal by Saras of its refining activity, since 1 July 2013 all activities relating to compliance with Legislative Decree 334/99 are the responsibility of Sarlux Srl.

Internal Emergency Plan (IEP)

After defining the risk scenario for the internal plant area, the company drafted its Internal Emergency Plan (IEP), which includes the procedures to be adopted and action to be taken in the event of an accident, with the aim of managing any such occurrence with maximum efficiency and minimum impact via the coordinated intervention of personnel and vehicles. At the same time as updating the Safety Report, the company is also updating its Internal Emergency Plan.

[personnel and equipment for effective intervention]

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

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

[prevention and control]

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

Based on the content of the refinery's Safety Report, the IEP defines the criteria for reportable accidents, and distinguishes between two types (i.e. levels) of emergency:

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

[classification of emergencies]

A localised emergency refers to an accident affecting a distinct area of the plant that can be quickly handled using locally available resources. This generally means that a fire is not involved. A general emergency is an accident that, due to its nature or because of particular environmental conditions, risks spreading to other parts of the plant or areas outside the refinery.

To ensure that accidents are dealt with quickly and efficiently, it is crucial to have reliable procedures for raising the alarm and alerting all personnel concerned, according to the type of event. Another important requirement of the IEP is to have clear and direct lines of communication to alert those involved in executing the plan, all personnel within the plant, the emergency services (Carabinieri, fire service, etc.) and the general public.

Communication and alarm devices (fire alarm buttons, telephones, fixed and mobile intercom units at various plant locations or in the possession of key personnel) are widely available throughout the refinery, so that personnel and equipment can be mobilised immediately.

[extensive internal communication system]

Following a list of priorities, the refinery's Emergency Co-ordination Centre distributes information and updates on the management of accidents to certain organisations, as appropriate to the nature of the accident:

- the fire service
- the prefecture
- neighbouring industrial sites

Other relevant organisations include the Sarroch municipal authorities, the Sarroch Carabinieri, the police, the Guardia di Finanza and the port authority. Continuous updates are provided to these organisations until the emergency is fully resolved, so that the local communities can be kept informed.

Table 6 shows the data on emergencies for the four years between 2010 and 2013.Table

6 Emergencies

Parameter	2010	2011	2012	2013
No. of general emergencies	3	1	2	2
No. of localised emergencies	17	4	3	4

The overall figures for emergencies in 2013 are broadly the same as in 2012. The two general emergencies, which occurred in the Expander and CCR plants, did not have a significant environmental impact.

[a plan for the entire Sarroch area]

External Emergency Plan (EEP)

The External Emergency Plan (EEP) is closely related to the Internal Emergency Plan. The EEP is drawn up in conjunction with the Prefecture of Cagliari following a consultation phase involving numerous local bodies, law enforcement agencies and emergency services, including the regional and provincial authorities, the Municipality of Sarroch, the fire service and the local health authority. The plan concerns the Sarroch industrial complex as a whole, and considers hypothetical accidents concerning sites belonging to the various companies located there (Sarlux, Versalis, Sasol Italy, ENI RM, Liquigas, Air Liquide) that could result in harmful consequences for the area outside the facilities. In addition, the safety reports for the various production facilities and analyses of hypothetical accident scenarios (study of the local area, urban districts and infrastructure) are used to plan the best way of managing accidents given the potential effects on people living nearby. Procedures have been defined for executing and managing the EEP, from raising the alarm to the intervention of all company and external personnel responsible for carrying out particular actions in accordance with the various roles assigned to them, including: direct management of accidents at the site, monitoring of the surrounding area, dissemination of information to the relevant external bodies and the provision of assistance to local residents (road management, health services, information media, etc.). The EEP provides for the involvement in various ways of the prefecture, police headquarters, fire service, traffic police, Carabinieri, Guardia di Finanza, forestry authority, harbour authority, health authority, Sardinian regional environment agency, regional and provincial authorities, municipality of Sarroch) to ensure that accidents are managed quickly and effectively, and contained within the site if possible. In February 2011, the Cagliari prefecture approved the 2011 External Emergency Plan for the Sarroch industrial area, which takes account of updates to the Safety Reports of the various sites at risk of a major incident in the industrial hub.

The plan is available in the Civil Protection - Provincial Civil Protection Plans section of the prefecture's website (www.prefettura.it/cagliari). Amendments to the EEP currently in place (2011 version) were last added in March 2014.

Safety systems at the site

[fire prevention system

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

[tank cooling systems]

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

All the storage tanks are protected by cooling systems; the most important of these are activated automatically if a tank overheats. Similar systems are installed on all the pressure tanks, LPG storage and loading equipment and any other piece of equipment for which a rise in temperature could compromise safety.

[nine fire trucks]

The site also has nine fast and easily manoeuvrable fire trucks carrying powder and foam extinguishers, which can be operated quickly in emergencies and act as a back-

up to the installed systems. Safety equipment and systems are regularly checked, and carefully and routinely maintained. In the event of a spill at sea, vessels and equipment are available to respond quickly to the problem, following procedures laid down in the Internal Emergency Plan which, as mentioned above, includes the Marine Pollution Prevention Plan.

[rapid-response seagoing vessels]

The site has four seagoing vessels that operate 24 hours a day and a wide range of equipment (skimmers, floating booms, etc.), all of which ensure that the site is fully capable of responding quickly to contain and collect any product spills.

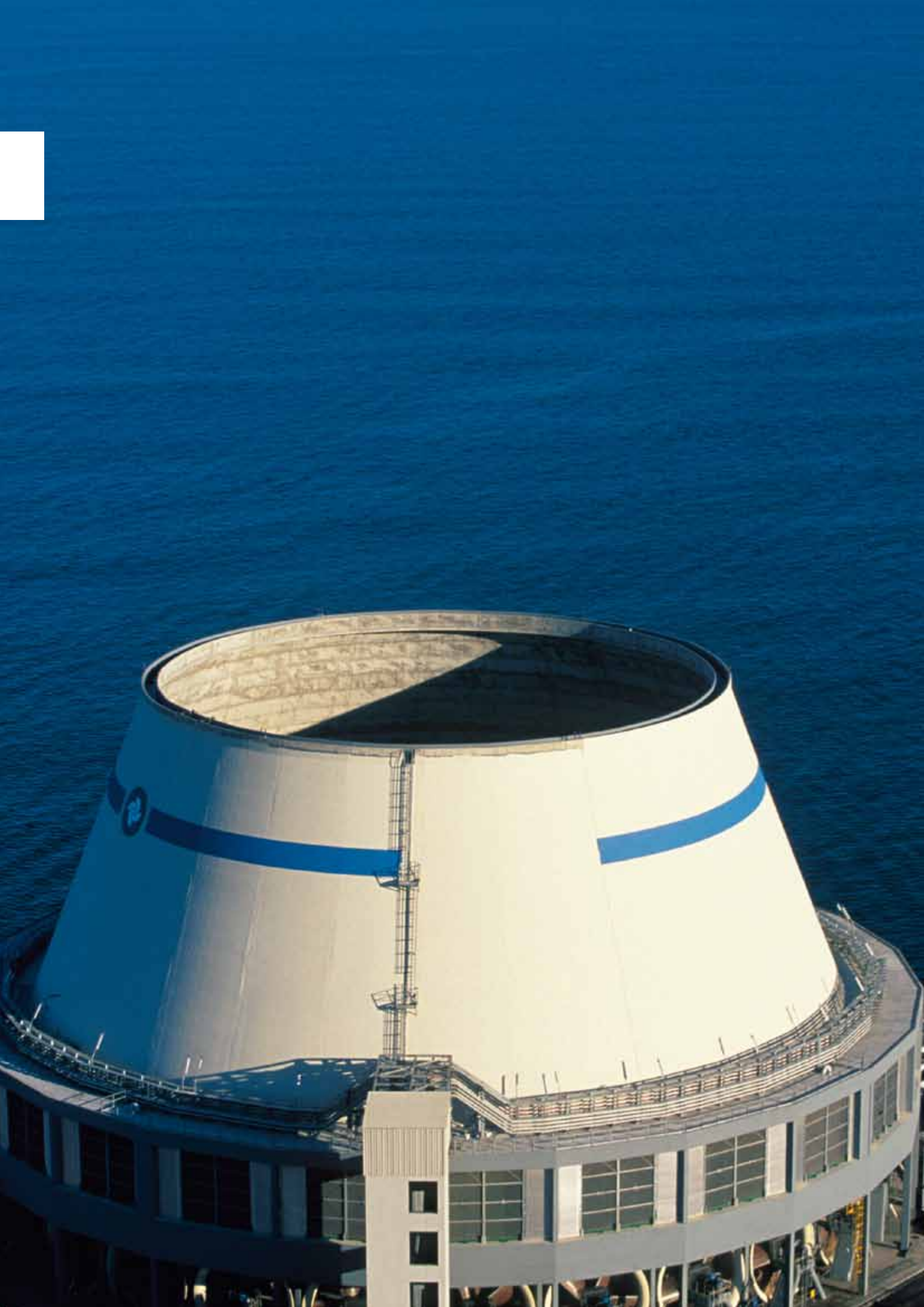
Emergency situations following spills into the sea

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

Measures to prevent spills into the sea include a programme of inspections carried out on board ships during the loading of products and unloading of raw materials. A high proportion of ships are checked (section 4.3.2, page 115).

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

There were no significant emergencies during the period 2010-2013.



4.
Environmental aspects

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

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

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

4. Environmental aspects

4.1 – General information

[environmental analysis]

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

Definitions contained in EC Regulation 1221/2009
Environmental aspect: *an aspect of an organisation's activities, products or services that has or can have an impact on the environment; a* ***significant environmental aspect*** *is an environmental aspect that has or can have a* ***significant environmental impact.***

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

[environmental aspects]

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

The significance of each direct environmental aspect under normal operating conditions is assessed using the following criteria:
- the extent of the impact on the environment
- the existence of legislation, authorisation and other regulations to be followed
- the sensitivity of the issue for the local community.

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

were identified as part of the environmental analysis and assessed using estimates of their probability of occurrence and their potential consequences.

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

The assessment led to the identification of the following indirect environmental aspects as significant:

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

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

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

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

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

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

A qualitative and quantitative description of the significant direct and indirect environmental aspects is set out in the tables on the following pages. Specific numerical performance indicators are given for each environmental aspect.
The indicator values, calculated on an annual basis, are generally provided for the last four years (2010-2013). Where relevant, the indicator values are compared with legal thresholds.
The indicators are divided into:

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

Direct environmental aspects

Operating Performance Indicators

Relevant environmental aspect	Applicability	Definition of indicator	Unit of measurement
Consumption of raw materials	Refinery	Quantity of raw materials processed[1]	kt/year
	Refinery	Low-sulphur crude oil used/total raw materials processed	%
	Refinery	Refinery hydrocarbons burned in the flare system	kt/year
	Refinery	Refinery hydrocarbons burned in the flare system	% weight relating to processing
Energy consumption	Site*	Energy input to the site	TOE/year GJ/year
	Site	Energy output from the site	TOE/year GJ/year
	Site	Efficiency of integrated cycle: output/input energy	%
	Refinery	Efficiency of refinery cycle: output/input energy	%
	IGCC	Efficiency of IGCC cycle: output/input energy	%
	Refinery	Specific energy consumption: energy consumed/raw materials input	TOE/t refinery raw materials - GJ/t refinery raw materials
	IGCC	Specific energy consumption: energy consumed/semi-processed goods input	TOE/t IGCC load GJ/t IGCC load
Water consumption	Site	The site's water requirement[2]	m^3/hour - m^3/year
		Site water requirement – specific values	m^3/kt raw materials
		Use of recovered water/site water requirement	%
		Use of freshwater/site water requirement	%
		Use of water from refinery desalinator/site water requirement	%
		Use of water from IGCC desalinators/site water requirement	%
Atmospheric emissions	Refinery, IGCC, Site	SO_2 emissions in mass flow	t/year
	Site	Specific SO_2 emissions	t SO_2/kt raw materials
	Refinery	Sulphur content in fuels	% (in weight)
	Refinery	SO_2 concentration bubble	mg/Nm^3
	IGCC	SO_2 concentration	mg/Nm^3
	Refinery, IGCC, Site	NO_x emissions in mass flow	t/year
	Site	Specific NO_x emissions	t NO_x/kt raw materials
	Refinery	NO_x concentration bubble	mg/Nm^3
	IGCC	NO_x concentration	mg/Nm^3
	Refinery, IGCC, Site	CO emissions in mass flow	t/year
	Site	Specific CO emissions	t CO/kt raw materials
	Refinery	CO concentration bubble	mg/Nm^3
	IGCC	CO concentration	mg/Nm^3
	Refinery, IGCC, Site	Dust emissions in mass flow	t/year
	Site	Specific dust emissions	t dust/kt raw materials
	Refinery	Dust concentration bubble	mg/Nm^3
	IGCC	Dust concentration	mg/Nm^3
	Refinery	PM10 emissions in mass inflow	t/year
	Refinery	Specific PM10 emissions	t PM/10kt raw materials
	Refinery	PM10 concentration bubble	mg/Nm^3
	Site	Diffuse emissions – fugitive emissions	t/year
	Refinery, IGCC, Site	CO_2 emissions in mass flow	t/year
	Site	Specific CO_2 emissions	t CO_2/kt raw materials
Discharges into water	Site	Total capacity of discharged water[2]	m^3/hour
		Specific capacity of discharged water	m^3/kt raw materials
		COD (chemical oxygen demand) in mass flow	t/year
		Specific COD emission	t/Mt raw materials
		Annual average COD concentration	mg/litre
		Total hydrocarbons in mass flow	t/year
		Specific hydrocarbon emission	t/Mt raw materials
		Annual average concentration of hydrocarbons	mg/litre
		Emission of nitrogen (ammoniacal, nitrous or nitric) in mass flow	t/year
		Specific emission of nitrogen (ammoniacal, nitrous or nitric)	t/Mt raw materials
		Annual average concentration of nitrogen (ammoniacal, nitrous or nitric)	mg/litre
		Total capacity of primary treatment units for incoming water, desalinators, IGCC towers[2]	m^3/hour
		Specific emissions of primary treatment units for incoming water, desalinators, IGCC towers	m^3/kt raw materials

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

*"Site" is understood to mean refinery + IGCC

Quality indicators for specific environmental sectors

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

*"Site" is understood to mean refinery + IGCC
(1) With reference to EC Regulation 1221/2009, Annex IV, it should be noted that for Sarlux it is not total annual production that is significant, but rather total annual processing of crude oil.
(2) With reference to EC Regulation 1221/2009, Annex IV, it should be noted that Sarlux, believing the hourly figure to be more intuitive, also expresses its water consumption in (m^3/hour) and not just in (m^3/year) to make the figure more immediately comprehensible.

Management performance indicators

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

Indirect environmental aspects

Operating performance indicators

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

Management performance indicators

Relevant environmental sector	Applicability	Definition of indicator	Unit of measurement
Transport	Maritime traffic	Safety checks of ships: number of ships checked/total number of ships	%
	Road traffic	Number of in-house company vehicles checked/number of authorised vehicles	%
External companies	Environmental	Companies that have ISO 9001 certification/total companies	%
		Companies that have ISO 14001 certification/total companies	%
		Companies that have OHSAS 18001 certification/total companies	%
		Training provided to employees of external companies/total hours worked	%

4.2 – Direct environmental aspects

4.2.1 – Consumption, storage and use of raw materials

Consumption

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

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

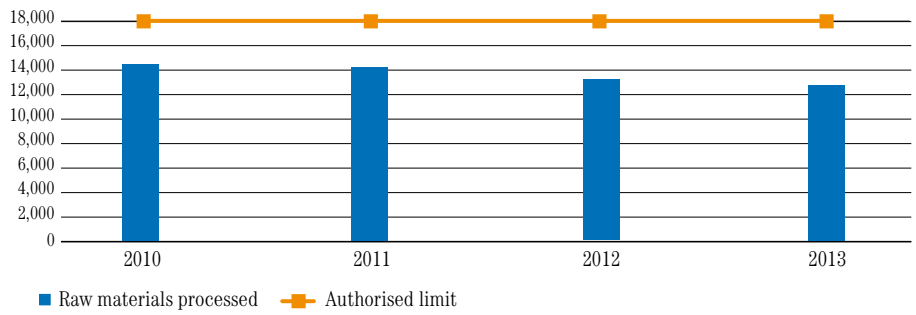
The refining of mineral oils (oil) is subject to specific authorisation. In Sarlux's case, an upper limit of 18 million tons a year has been set.

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

TABLE 3 Raw materials processed (kt/year)

2010	2011	2012	2013
14,340	14,006	13,309	12,980

CHART T3 (kt/year)



In 2013, the Sarroch refinery processed 12,980 kilotons (kt) of raw materials (crude oil and fuel oils), which is in line with the average for recent years. Between 2010 and 2013, a total of 55,000 kt of raw materials were processed, an average of 13,700 kt per year. In the last few years, more light products have been produced, with fuel oil being kept to a minimum and heavy distillates from refining (TAR) being used to produce electricity.

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

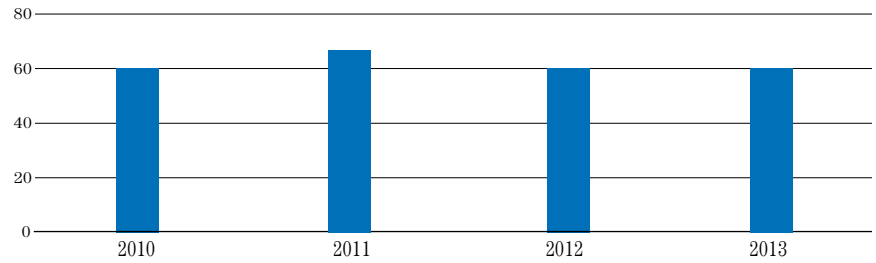
Table 7 and Chart T7 below show the values of the key indicator, which is calculated as the quantity of low-sulphur crude oil used as a proportion of the total quantity of crude oil processed.

TABLE 7 Consumption of low-sulphur crude oils*

Parameter	2010	2011	2012	2013
Low-sulphur crude oil used/total raw materials processed (%)	60.0	66.0	60.0	60.0

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

CHART T7 (%)



An examination of the above-mentioned figures shows that the use of low-sulphur crude oil was broadly stable over the four-year period 2010-2013.
In addition to oil, auxiliary chemical substances are also used in refining and the IGCC. These auxiliary substances can be classified under the following main categories:

[auxiliary chemical substances]

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

The consumption of auxiliary substances is less significant than that of raw materials as they are generally renewable resources and the total quantities used are much lower. However, the supply of raw materials and auxiliary substances involves the need for sea and road transport, which is an indirect environmental aspect. This aspect is examined in section 4.3.2 on page 115.

Storage and use

Under normal operating conditions, the use and storage of raw materials may involve, as an induced environmental aspect, diffuse and fugitive emissions of volatile organic substances into the atmosphere. This aspect is discussed in section 4.2.4.3 on page 72.
As regards abnormal or emergency conditions, any events that may involve hazardous substances on the premises, such as raw materials, auxiliary substances or products, are analysed in the plant's Safety Report (section 3.3, page 38).

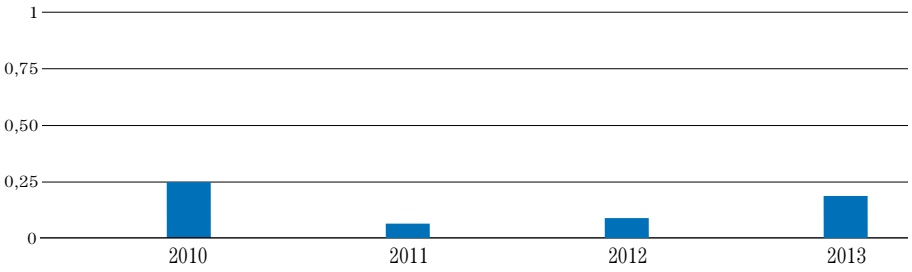
Flare emissions management

In 2013, the Group continued activities relating to a project launched in 2010 aimed at minimising flare emissions from the refinery (Flare Minimisation Plans), to be achieved by optimising management of the fuel gas and hydrogen networks.
The work in 2013 included a critical analysis of the start-up and shut-down procedures of the units undergoing maintenance activities to implement preventive measures that would help reduce the impact on flare emissions. The results obtained in 2013, although appreciable, were affected by two general plant stoppages caused by electricity failures at the end of January and in the first week of February.
The actual discharge amounted to 28.7 kt 0.21% weight in relation to processing. Table 7 bis and Chart T7 bis below show the values of the key indicator (expressed in kt/year) for hydrocarbons burned in the blow-down system.

TABLE 7 BIS Refinery hydrocarbons burned in the flare system

Parameter	2010	2011	2012	2013
Refinery hydrocarbons burned in the flare system (kt/year)	36.0	11.9	12.9	28.7
Refinery hydrocarbons burned in the flare system (% weight in relation to processing)	0.25	0.08	0.09	0.21

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



4.2.2. – Energy consumption

The consumption of energy resources in the form of electricity and fuels represents a significant environmental aspect for the Sarlux site, and has a considerable economic impact on the business. Figure 11 shows a diagram of the site's energy balance and a table with the 2013 figures for external energy coming into the site, broken down into electricity, thermal energy and crude oil.

ENERGY INPUT TO THE SITE 2013	(GJ)	(TOE)
Electricity	**7,413,574**	**177,071**
Thermal energy (steam, H2)	**3,170,124**	**75,717**
Crudes	**543,445,342**	**12,980,000**
Total energy input to the site	**554,029,040**	**13,232,788**

ENERGY OUTPUT FROM THE SITE 2013	(GJ)	(TOE)
Oil products	**473,515,901**	**11,309,760**
Electricity	**32,631,393**	**779,389**
Fuel gas	**1,715,825**	**40,982**
Total energy output from the site	**507,863,119**	**12,130,131**

For data on oil products, see Table 2 on page 33

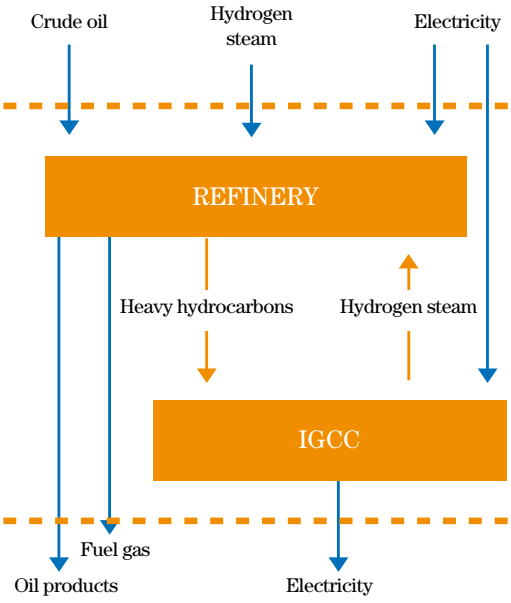


FIGURE 11 Energy balance chart

The company's commitment to improving energy efficiency dates back to the end of the 1970s/early 1980s, when it began to invest heavily in energy and heat conservation. Today, energy saving and efficiency are still strategic objectives and part of the improvement of the plant's overall environmental performance. As part of this commitment, important initiatives in thermal recovery implemented in 2009, together with the management activities identified in the FOCUS project (including the reduction of over-consumption in kilns and the maximisation of thermal integration between plants), reduced consumption by about 50,000 TOE in 2013.

For these significant investments, applications were filed with the AEEG for certification of energy savings and for energy efficiency credits (also known as white certificates), which are an incentive towards making and maintaining investments to improve energy efficiency.

In accordance with legislation, an Energy Manager is appointed each year to monitor and promote energy conservation activities and efficient energy use on the Sarroch site. As mentioned earlier, the combined operations of the refinery and the IGCC plant effectively represent a large integrated cycle that transforms hydrocarbon inputs into refined oil products and energy.

[Law 10 of 9 January 1991]

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

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

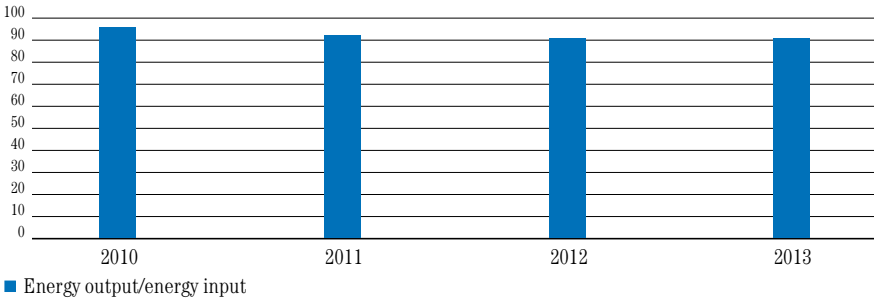
[energy efficiency of the integrated cycle]

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

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

Parameter	2010	2011	2012	2013
Energy input (GJ)	611,424,036	596,691,048	566,902,619	554,029,040
Energy output (GJ)	577,055,445	550,018,697	519,337,353	507,863,119
Energy output/energy input (%)	94.4	92.2	91.6	91.7

CHART T8 (% output/input)



It can be seen from the figures that the integrated cycle (refinery and IGCC) is extremely efficient, with a total value of over 91% in the last four years. The difference between energy input and energy output is mainly due to the internal consumption of energy necessary for the operation of the manufacturing processes and to an amount lost during operations.

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

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

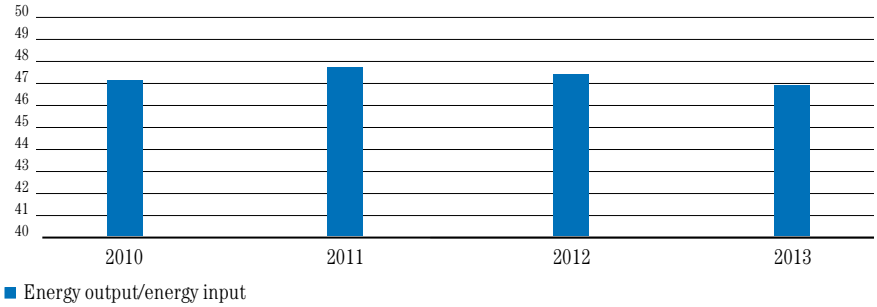
The efficiency values obtained by the IGCC are much higher than those of traditional thermoelectric plants.

TABLE 9 Energy efficiency of the IGCC

Parameter	2010	2011	2012	2013
Energy output/energy input (% TOE output/TOE input)	47.1	47.8	47.3	46.9

[energy efficiency of the IGCC plant]

CHART T9 (% TOE output/TOE input)



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

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

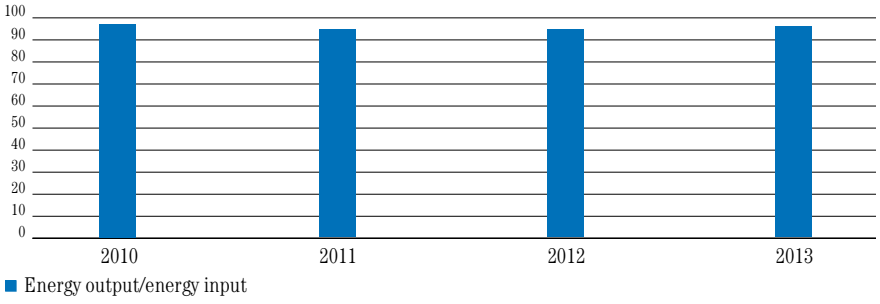
Here too, Table 10 and Chart T10 show high energy efficiency values.

[energy efficiency of the refining cycle]

TABLE 10 Energy efficiency of the refining process

Parameter	2010	2011	2012	2013
Energy output/energy input (% TOE output/TOE input)	96.7	94.3	94.0	94.1

CHART T10 (% TOE output/TOE input)



[energy consumption]

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

Fuels used in the refining process comprise:

- fuel gas generated automatically from the refining process, which is not saleable as it is non-condensable

- low-sulphur fuel oil
- coke consumed directly in the fluid catalytic cracking (FCC) process

Fuels used in the IGCC cycle comprise:

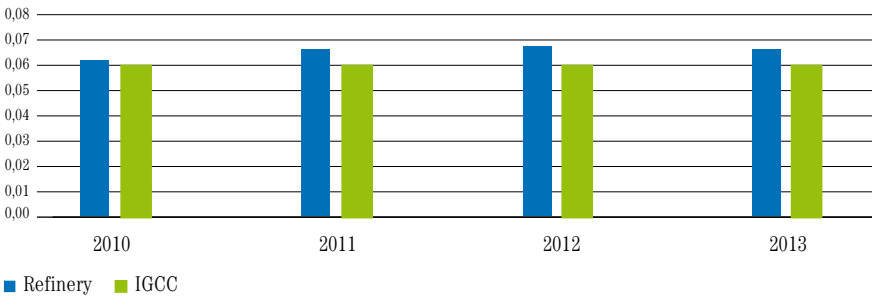
- syngas generated automatically from the gasification section and used in the combined cycle section
- diesel, used only as an emergency fuel

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

TABLE 11 Specific energy consumption

Parameter	2010	2011	2012	2013
Specific energy consumption: refinery (TOE/t raw materials used in refining)	0.062	0.066	0.067	0.066
Specific energy consumption: IGCC (TOE/t IGCC load)	0.060	0.060	0.060	0.060
Specific energy consumption: refinery (GJ/t raw materials used in refining)	2.650	2.745	2.805	2.758
Specific energy consumption: IGCC (GJ/t IGCC load)	2.512	2.512	2.512	2.512

CHART T11 (TOE/T raw materials)



The value of the "specific energy consumption: IGCC" indicator is constant over the years. The "specific energy consumption of the refinery" rose in the period 2010-2012 due to the different mix of crudes processed (shift towards those that are more energy-consuming) and the tendency to maximise finished products, which had taken precedence over reducing energy consumption since 2009. In 2013, thanks to the measures carried out to reduce consumption, the trend reversed.

4.2.3 – Use of water resources

At the Sarroch site, water is mainly used to generate steam for technological use (steam stripping, heat exchangers and power generation), to supply the fire prevention system, to replace cooling cycle losses and for civil use. Figure 12 shows a diagram of the site's water cycle.

Aware of the problem of scarce water resources in the region, Sarlux (previously Saras) has adopted a policy, over the years, to reduce its dependence on primary water sources from the surrounding region, by:

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

Specifically, a new "filtration, ultra-filtration and reverse osmosis" plant (known as the BE-5, with a capacity of 230 m^3/h of demineralised water) was introduced in 2012. This innovative system for producing demineralised water has enabled the Group to further increase the percentage of wastewater reused after purification by the wastewater treatment plant (TAS).

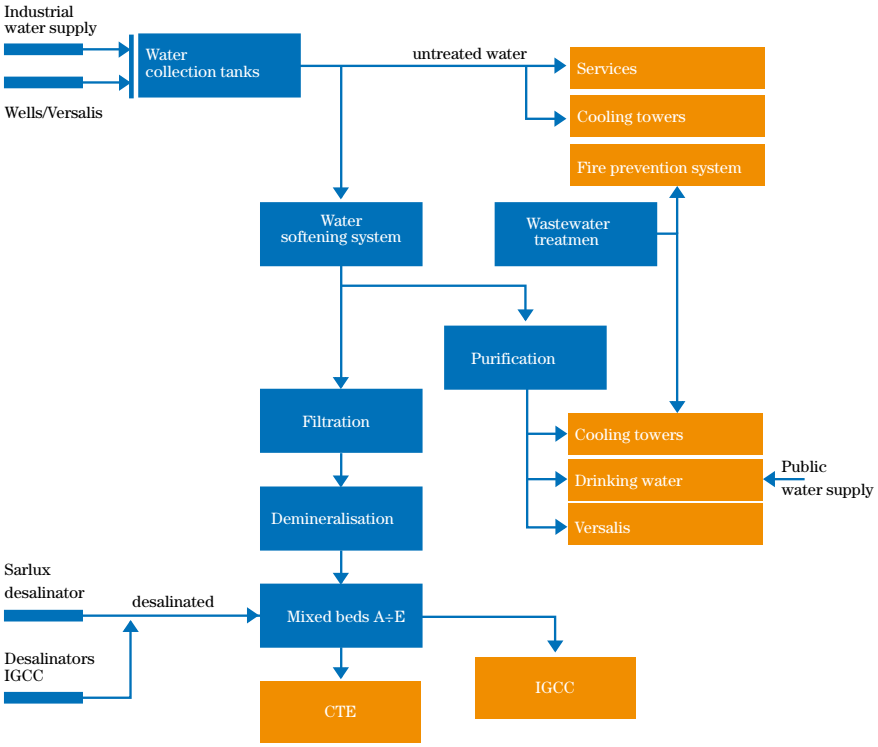


FIGURE 12 Water usage chart

Currently, the main types of water resources used are:

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

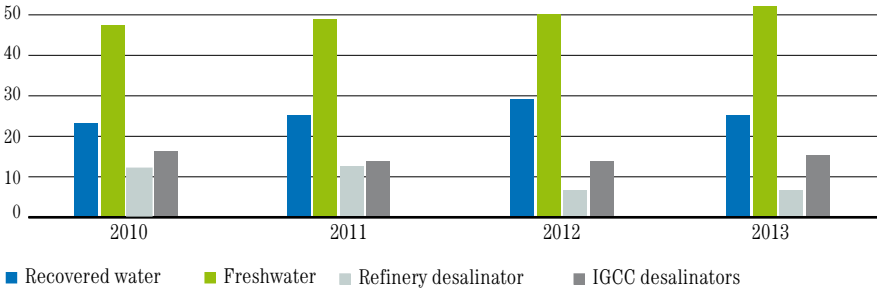
A limited quantity of demineralised water obtained through an exchange with the Versalis industrial site was also used in 2013. The figures on the site's water consumption are shown in Table 12 and Chart T12. These also include quantities relating to the IGCC, which mainly uses water from the dedicated desalinators for its production activities. A closed-circuit seawater system with a cooling tower has been installed for cooling the IGCC equipment.

Supply sources in 2013 continued the trend seen in previous years, as shown in Table 12 and Chart T12.

TABLE 12 Water sources for the site

Parameter	2010	2011	2012	2013
Recovered water/water requirement (%)	23.4	24.4	29.3	26.3
Freshwater/water requirement (%)	47.9	49.3	49.6	51.1
Water from refinery desalinator/water requirement (%)	11.4	11.4	8.0	7.3
Water from IGCC desalinators/water requirement (%)	17.1	14.4	12.6	14.8
Demineralised water from Versalis (%)	0.2	0.5	0.5	0.5

CHART T12 (%)

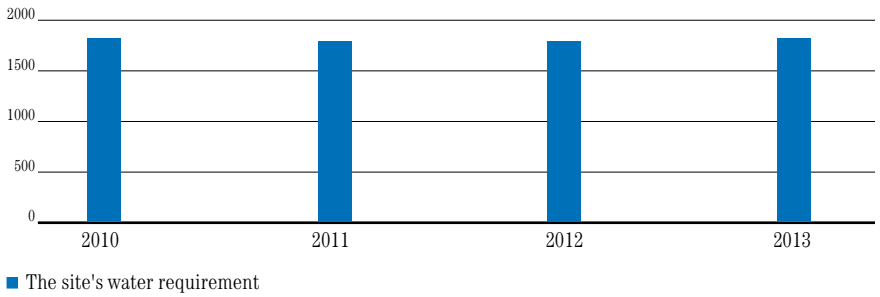


In the period under review, internal recovery on average met approximately 26% of the total annual requirement, and desalination was also a source of supply, accounting for 22.1% of the total. Taken together, desalination and recovered water met almost 50% of the requirement. This is a significant result for the site, confirming the strategy undertaken: to rationalise consumption and internal recycling. The average mix produced contained a slightly higher proportion of water from IGCC desalinators, while the proportion of freshwater used also showed a rising trend, relating to major remedial work to plants during maintenance phases. Both increases came at the expense of a lower proportion of water recovered from industrial use not linked to the production of demineralised water.
The site's water consumption (in absolute terms) is shown in Table 13 and Chart T13.

TABLE 13 The site's water requirement – absolute values

Parameter	2010	2011	2012	2013
The site's water requirement – average flow rate (m^3/hour)	1,891	1,796	1,849	1,869
The site's water requirement (m^3/year)	16,565,160	15,732,960	16,241,616	16,372,440

CHART T13 (m^3/hour)

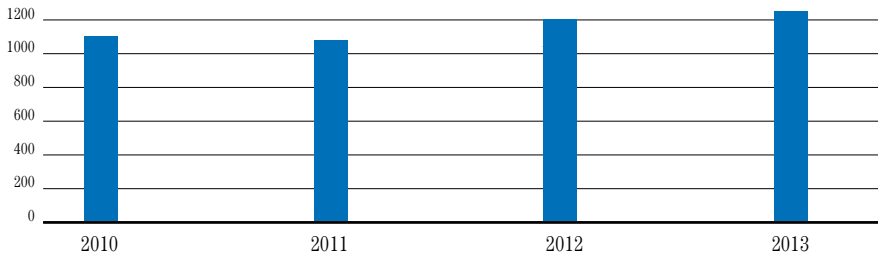


The site's water requirement remains in line with the prior-year value, apart from a slight increase in the proportion of freshwater, as shown in Chart T12.

TABLE 14 The site's water requirement – specific values

Parameter	2010	2011	2012	2013
Site's water requirement/raw materials processed (m^3/kt raw materials)	1,157	1,123	1,223	1,261

CHART T14 (m^3/kt raw materials)



4.2.4 – Atmospheric emissions

4.2.4.1 – General

Atmospheric emissions represent a significant environmental impact for the activities carried out at the Sarlux site under normal conditions and in specific abnormal and emergency conditions. In 2013, the reference legislation governing atmospheric emissions by the Sarlux plant consisted of the AIA permit DSA-DEC-2009-0000230 of 24 March 2009, which entered into force on 9 April 2009. The AIA permit contains the regulations on the limits for atmospheric emissions from the refinery and the IGCC. As regards the refining process, the limits on emission concentrations relate to the concentration "bubble", i.e. the ratio of the total quantity of the mass of each pollutant to the total volume of the gaseous effluents of the refinery as a whole.
In accordance with legislation, atmospheric emissions can be divided into:

- emissions ducted to smokestacks
- non-ducted emissions.

Ducted emissions

Emissions ducted to smokestacks are mainly due to:

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

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

Non-ducted emissions

Non-ducted emissions are mainly due to:

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

Diffuse and fugitive emissions are technically not ductable. These may be contained by installing appropriate sealing systems and through monitoring and maintenance.
The substances present in diffuse and fugitive emissions are volatile organic compounds (VOCs), which contain light hydrocarbons and can evaporate in ambient and in processing conditions.

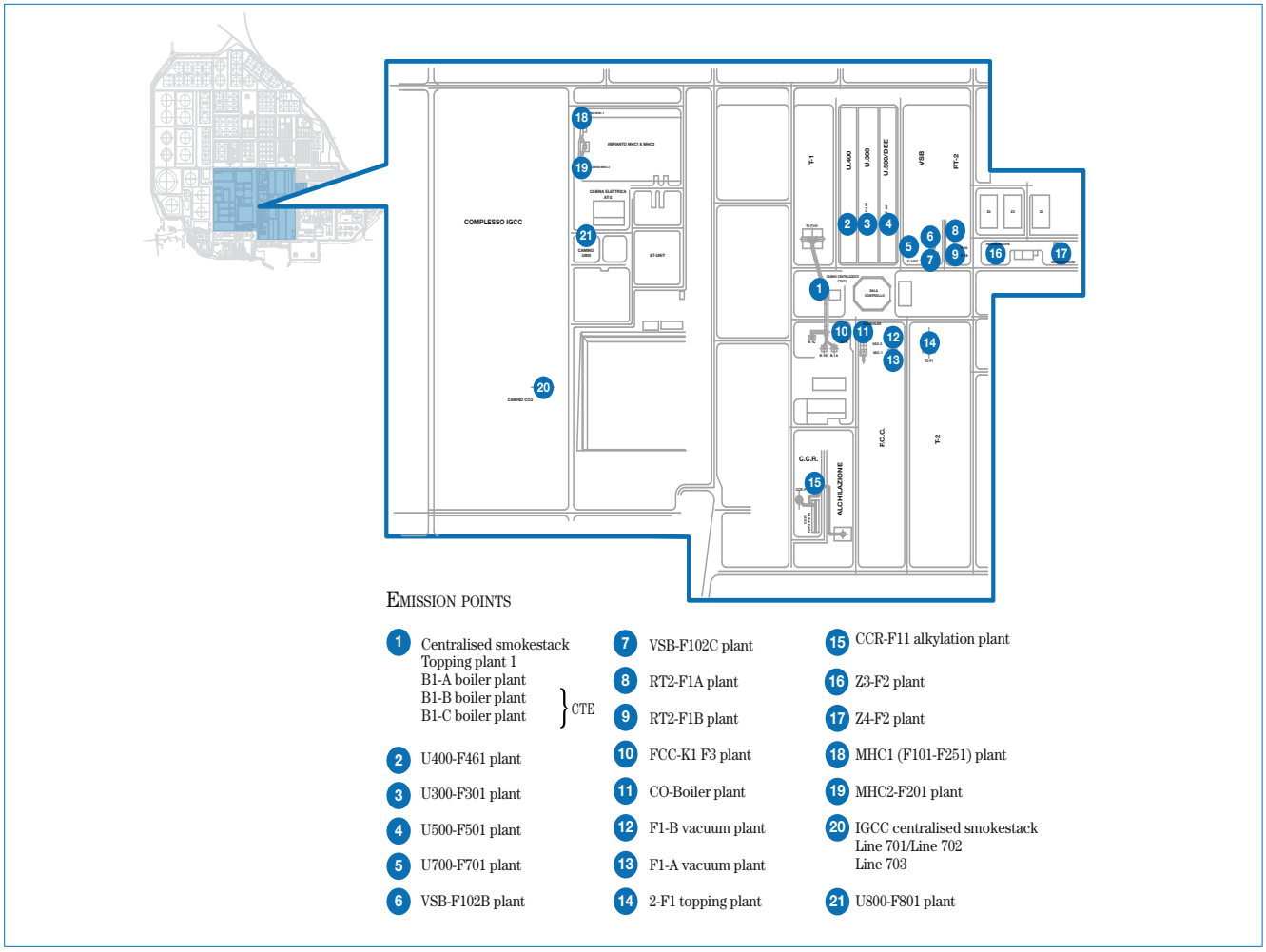


FIGURE 13 Map showing the location of the plant's emissions points

As can be seen from the plan of the facility in Figure 7 (page 31), the areas in which diffuse emissions can arise relate to storage, shipment, the production processes and wastewater treatment. Objectives and improvement measures have also been defined for diffuse and fugitive atmospheric emissions.

Calculation of emissions values

Ducted emissions may be calculated in various ways. Specifically:

- emissions of SO_2, NO_x, dust, CO and the flue gas flow rate from the centralised smokestack (which collects approximately 33% of the emissions from the refining process) and from the IGCC smokestack (which collects 100% of the emissions from the plant) are determined using continuous instrument analysis; instruments were also subsequently installed for carrying out the continuous measurement of emissions from the sulphur plants (Z3-F2 and Z4-F2) and CCR/Alkalisation, CO-Boiler and Topping 2 plants
- emissions from the other smokestacks are calculated based on the measurement of fuels consumed, laboratory analysis of their quality and the characteristics of the burners

The calculation methods used for 2013, in line with the procedures implemented in 2009, also took account of the H_2S, VOC and NH3 parameters + chlorine-based compounds and follow the instructions contained in new European and international guidelines[1].
From 2009, alternative checks will also be made on all smokestacks in the site every six months. This will involve taking a sample and sending it for analysis by an external laboratory. Non-ducted emissions are determined based on estimates and calculations using widely accepted formulae and models[2].
Diffuse and fugitive emissions for 2010-2013 were determined using estimates based on accepted formulae and calculation methods (source: United States Environmental Protection Agency (USEPA) for emissions from the transportation and storage of raw materials and products; American Petroleum Institute (API) for emissions from wastewater treatment; and Unione Petrolifera for fugitive emissions).
A monitoring campaign is currently under way for fugitive emissions using LDAR monitoring methodology[3], which is considered one of the best techniques available in the sector[4]. The results obtained with this technique show that the calculation methods adopted previously were very conservative.
The next few sections set out the figures for 2010-2013, calculated according to the above-mentioned methodologies and broken down into the following categories:

- ducted emissions of SO_2, NO_x, dust, PM10 and CO (section 4.2.4.2 below)
- non-ducted emissions of volatile organic compounds (section 4.2.4.3, page 72)

Since atmospheric emissions from the facility may affect the air quality in the locality, the data collected by the public monitoring network on the air quality in the Sarroch area and processed by the Sardinian regional environment agency (ARPA Sardegna) are also presented after the figures on emissions (section 4.2.4.4, page 72).
Lastly, the data on CO_2 emissions from the facility are also provided (section 4.2.4.5, page 81). Although these emissions fall into the category of ducted emissions, it was considered appropriate to show them separately as their impact is global rather than local, given that they contribute to the "greenhouse effect".

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

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

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

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[1] CONCAWE – Air pollutant emission estimation methods for E-PRTR reporting by refineries – 2009 edition
RTI International - Emission Estimation Protocol for Petroleum Refineries – December 2009
European Environment Agency – Air pollutant emission inventory guidebook – 2009
[2] For diffuse emissions from the storage tanks, the "TANKS" model is used (source: US Environmental Protection Agency (E.P.A.); for diffuse emissions from the shipping of products and wastewater treatment tanks, specific formulae are used from the E.P.A. and A.P.I. (American Petroleum Agency) respectively .
For fugitive emissions, an algorithm from Unione Petrolifera and CONCAWE is used, as well as, from 2008 onwards, new monitoring technologies (varifocal infrared video camera) and a new monitoring approach (SMART LDAR programme). The calculation algorithms take account of: the quantity of raw materials processed for storage emissions and for fugitive emissions, the quantity of products delivered for delivery emissions and the quantity of incoming wastewater to be treated for emissions from the wastewater treatment plant.
For storage emissions, the technical characteristics of the tanks are also relevant.
[3] LDAR: Leak Detection and Repair.
[4] Guidelines on the Best Available Techniques in the Refining Sector, Ministerial Decree of 29 January 2007

Of the indicators given above, the following are subject to limits:
- absolute mass flow values for the refinery
- concentration values for the IGCC
- concentration "bubble" values for the refinery

All indicators are determined annually.

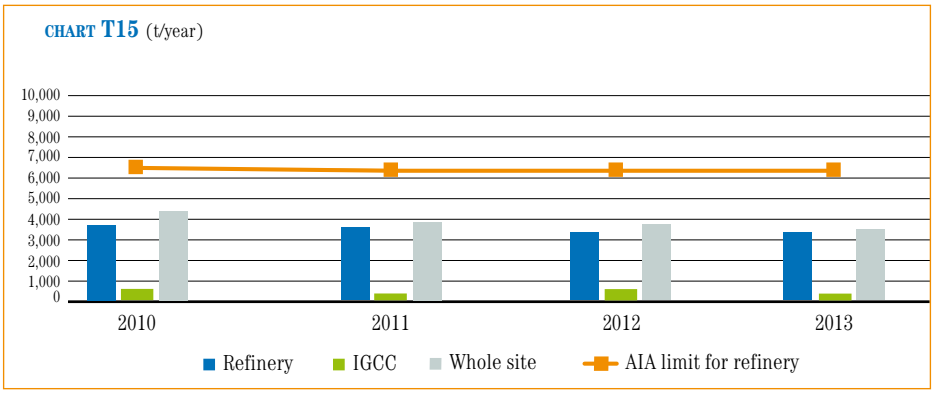
Sulphur dioxide (SO_2)

The site recorded its best ever year for total SO_2 emissions in 2013, confirming the downward trend under way for several years.
This result is due to steady improvement in the quality of the fuels used (Chart 17) and the stability of the TGTU, and in particular to the closure of the B1C boiler plant following technical decisions by the company.

TABLE 15 SO_2 emissions: absolute mass flow values

Parameter	2010	2011	2012	2013
Refinery (t/year)*	3,709	3,566	3,348	3,323
IGCC (t/year)	463	389	443	223
Whole site (t/year)	**4,172**	3,955	3,791	3,547

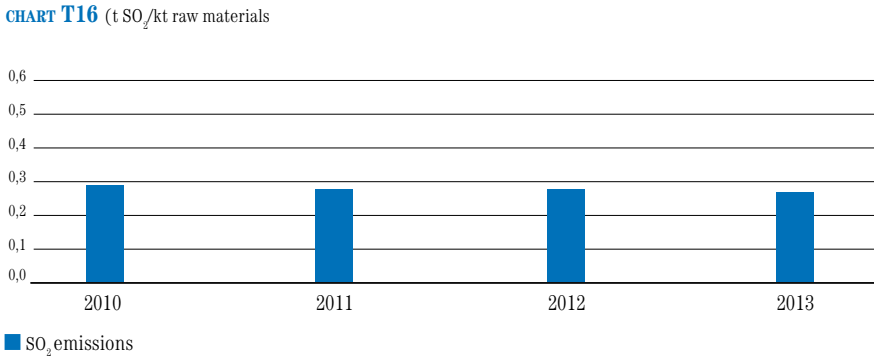
* Compared with the limit of 6,700 t/year valid (for the refinery alone) from 9 April 2009 until 31 December 2010; as of 1 January 2011, this limit was changed to 6,400 t/year.



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

TABLE 16 SO_2 emissions: specific mass flow values

Parameter	2010	2011	2012	2013
Emissions (t SO_2/kt raw materials)	0.29	0.28	0.28	0.27



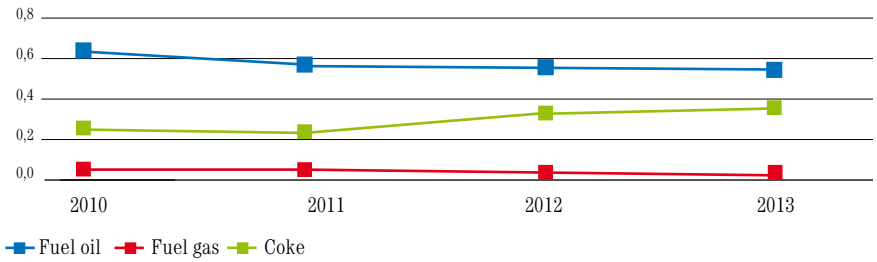
As mentioned above, the reduction in the total quantity of SO_2 emissions is consistent with the balance between the gradual improvement in the quality of fuels and the relative quantity used: in 2013, the tendency to prefer the use of fuel gas, in which the percentage of sulphur is gradually being reduced, was confirmed, as shown in Table 17 and Chart T17.

TABLE 17 Sulphur content of fuels used in the refinery

Parameter	2010	2011	2012	2013
Sulphur content of fuel oil (%)	0.62	0.59	0.58	0.57
Sulphur content of fuel gas (%)	0.05	0.05	0.03	0.01
Sulphur content of coke* (%)	0.23	0.22	0.33	0.37

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

CHART T17 (%)



The parameter for SO_2 concentration in the refinery increased in 2013 as the sulphur content in the various crudes processed was increased in response to the situation on the international markets.

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

Parameter	2010	2011	2012	2013
SO_2 concentrations – refinery (mg/Nm^3)	335	314	309	386
Limit for the refinery* (mg/Nm^3)	650	600	600	600

* From 9 April 2009, limit of 650 mg/Nm^3 in accordance with the AIA permit (DSA-DEC-2009-0000230 of 24 March 2009) valid until 31 December 2010; from 1 January 2011, this limit was changed to 600 mg/Nm^3

CHART T18 (mg/Nm^3)

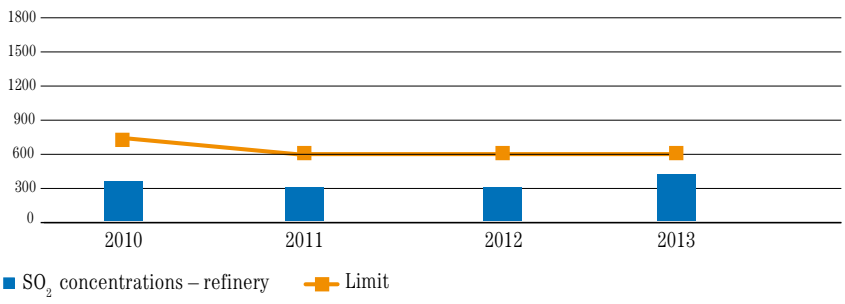
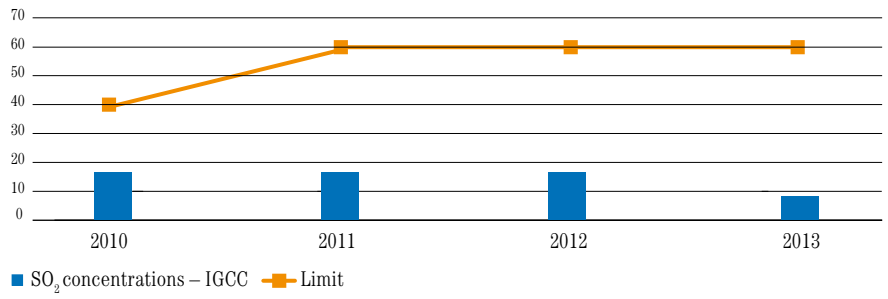


TABLE 19 SO_2: emissions: concentration values for IGCC

Parameter	2010	2011	2012	2013
SO_2 concentrations – IGCC (mg/Nm^3)	16	16	17	9
Limit for the IGCC* (mg/Nm^3)	40	60	60	60

* From 9 April 2009, limit of 40 mg/Nm^3 in accordance with AIA permit (DSA-DEC-2009-0000230 of 24 March 2009).
From 27 July 2010, the Ministry followed the Operator's recommendation and changed the SO_2 emission limit in the VIA Decree to 60mg/Nm^3

CHART T19 (mg/Nm^3)



Nitrogen oxide (NO_x)

NO_x emissions are only marginally affected by fuel quality, and largely depend on combustion techniques, which in turn are related to technological factors such as burner type. The installation in 2007 of burners that produce low levels of NO_x, for the furnaces of the Topping RT2 and Visbreaking plants, led to a significant reduction in emissions from the refinery. This performance, shown below, was repeated in subsequent years.

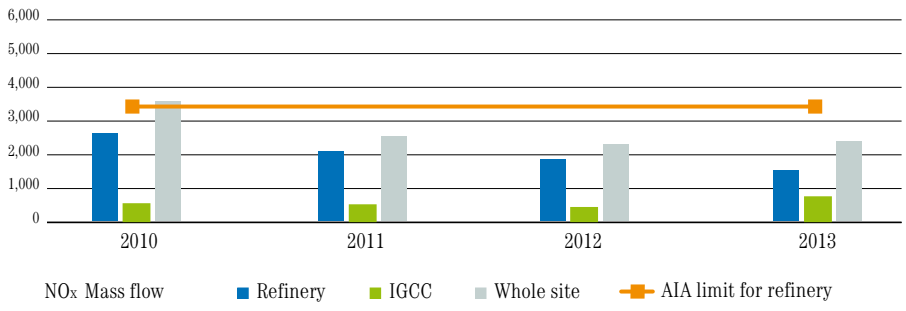
The trend in emissions concentrations in 2013 confirmed that of previous years. The figures for the absolute mass flow indicators are shown in Table 20 and Chart T20.

TABLE 20 NO_x emissions: absolute mass flow values

Parameter	2010	2011	2012	2013
Refinery (t/year)*	2,854	2,133	1,907	1,760
IGCC (t/year)	600	565	519	669
Whole site (t/year)	**3,454**	**2,698**	**2,426**	**2,429**

* Compared to the limit of 3,400 t/year applicable (for the refinery only) from 9 April 2009, in accordance with AIA permit (DSA-DEC-2009-0000230 of 24 March 2009).

CHART T20 (t/year)

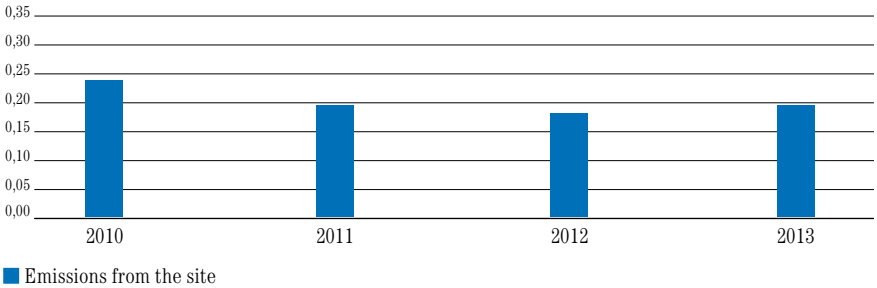


The indicators relating to the site and the refinery have always been lower than the authorised limits, and have decreased over time, assisted in particular by the reduction in the indicator values relating to the refinery. The specific mass flow indicator (figures in Table 21) has also come down in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

TABLE 21 NO_x: emissions: specific mass flow values

Parameter	2010	2011	2012	2013
Emissions (t NO_x/kt raw materials)	0.24	0.19	0.18	0.19

CHART T21 (t NO_x / kt raw materials)



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

TABLE 22 NO_x: emissions: concentration "bubble" values for the refinery

Parameter	2010	2011	2012	2013
NO_x concentrations – refinery (mg/Nm³)	258	188	176	204
Limit for the refinery* (mg/Nm³)	300	300	300	300

* From 9 April 2009, limit of 300 mg/Nm³ in accordance with AIA permit (DSA-DEC-2009-0000230 of 24 March 2009).

CHART T22 (mg/Nm³)

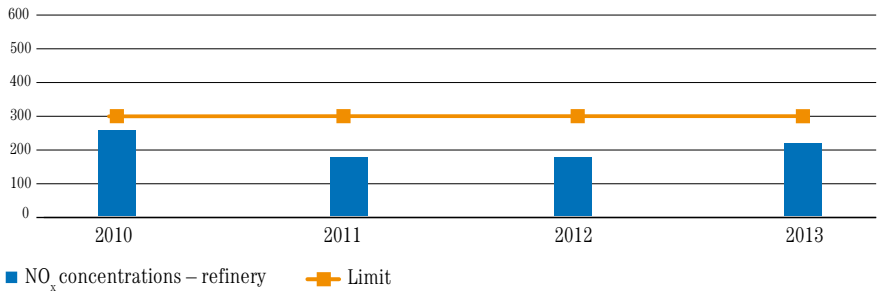
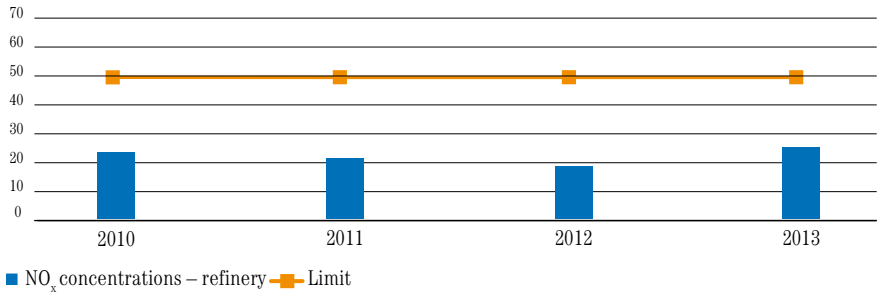


TABLE 23 NO_x: emissions: concentration values for the IGCC

Parameter	2010	2011	2012	2013
NO_x concentrations – IGCC (mg/Nm³)	22	21	19	25
Limit for the IGCC* (mg/Nm³)	50	50	50	50

* From 9 April 2009, limit of 50 mg/Nm³ in accordance with AIA permit (DSA-DEC-2009-0000230 of 24 March 2009).

CHART T23 (mg/Nm³)



Dust

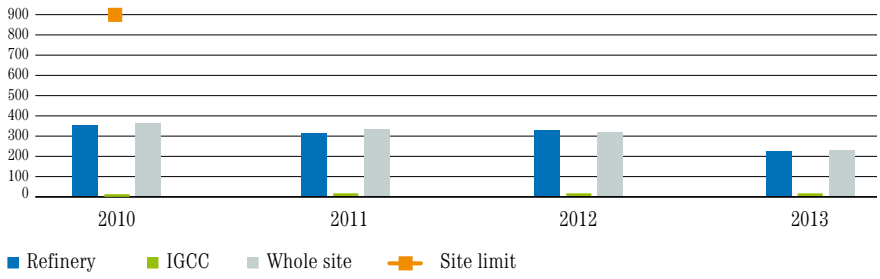
Tables 24 and 25 show the figures relating to the absolute mass flow indicators for dust and for the specific value indicators.

TABLE 24 Dust emissions: absolute mass flow values

Parameter	2010	2011	2012	2013
Refinery (t/year)	348	324	328	209
IGCC (t/year)	28	35	28	5
Whole site* (t/year)	376	358	355	214

* Compared with the limit of 900 t/year, established by DEC/VIA/2025 of 28 December 1994, in force until 8 April 2009. The AIA permit DSA-DEC-2009-0000230 of 24 March 2009, in force from 9 April 2009, stipulates mass flow limits only for PM10, which are reported in Table 24 bis. The dust emissions figure for 2013 is also provided for comparison purposes.

CHART T24 (t/year)



The refinery's exclusive use of fuel oil with a low sulphur content (BTZ) in the past few years has kept dust emissions at low levels. The emissions indicator for the site has always been much lower than the authorised limit. Concentration values have remained broadly stable (Table 26). The concentration indicators, shown in the tables and charts below, are in line with previous years.

TABLE 25 Dust emissions: specific mass flow values

Parameter	2010	2010	2012	2013
Emissions from the site: t dust/kt raw materials	0.02	0.03	0.03	0.02

CHART T25 (t dust/kt raw materials)

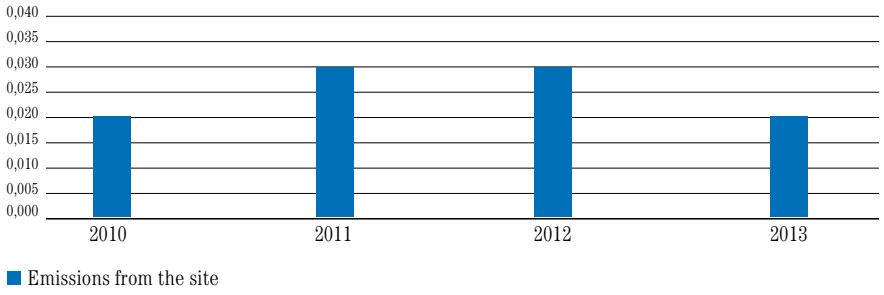


TABLE 26 Dust emissions: concentration "bubble" values for the refinery

Parameter	2010	2011	2012	2013
Dust concentrations – refinery (mg/Nm^3)	31	29	30	24
Limit for the refinery* (mg/Nm^3)	50	40	40	40

* From 9 April 2009, limit of 50 mg/Nm^3 in accordance with the AIA permit (DSA-DEC-2009-0000230 of 24 March 2009); from 1 January 2011, this limit was changed to 40 mg/Nm^3

CHART T26 (mg/Nm³)

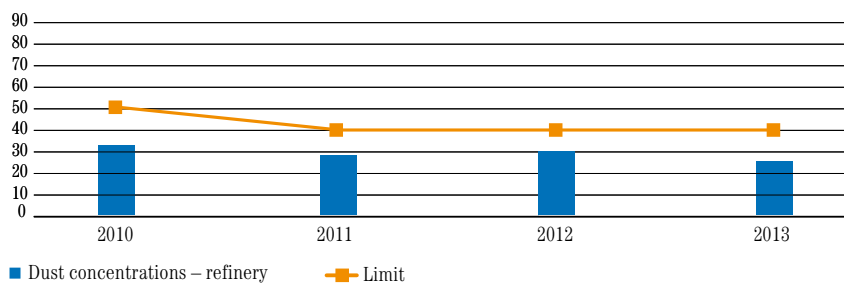
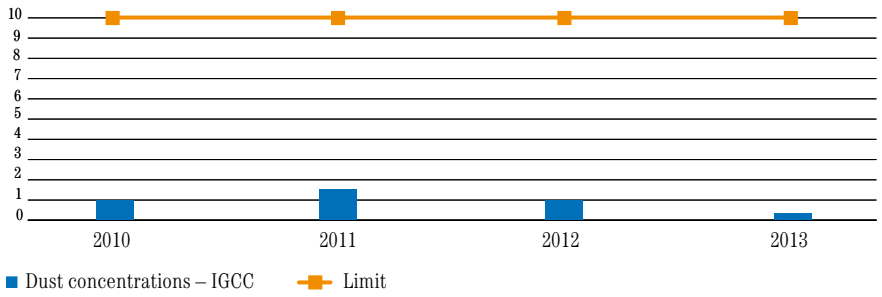


TABLE 27 Dust emissions: concentration values for the IGCC

Parameter	2010	2011	2012	2013
Dust concentrations – IGCC (mg/Nm³)	1.0	1.4	1.04	0.2
Limit for the IGCC (mg/Nm³)	10	10	10	10

CHART T27 (mg/Nm³)



All the values shown are much lower than the applicable limits.

PM10

[PM10]

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

TABLE 24 BIS PM10 emissions: absolute mass flow values

Parameter	2010	2011	2012	2013
Refinery (t/year)*	250	223	213	171
Limit for the refinery (t/year)	330	330	330	330

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

The figures reported in the three tables below are calculated using the US-EPA 1998 method. In 2013, the absolute mass flow value of PM10 was lower than the limit. Table 25 bis below shows the specific values. The concentration indicator values given in the next table (Table 26 bis) show that the new legal limits have been complied with.

TABLE 25 BIS PM10 emissions: absolute mass flow values

Parameter	2010	2011	2012	2013
Emissions from the site: t PM10/kt raw materials	0.017	0.018	0.016	0.013

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

Parameter	2010	2011	2012	2013
PM10 concentrations – refinery (mg/Nm^3)	23	20	20	20
Limit for the refinery* (mg/Nm^3)	30	30	30	30

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

All the values shown are lower than the applicable limits.

Carbon monoxide (CO)

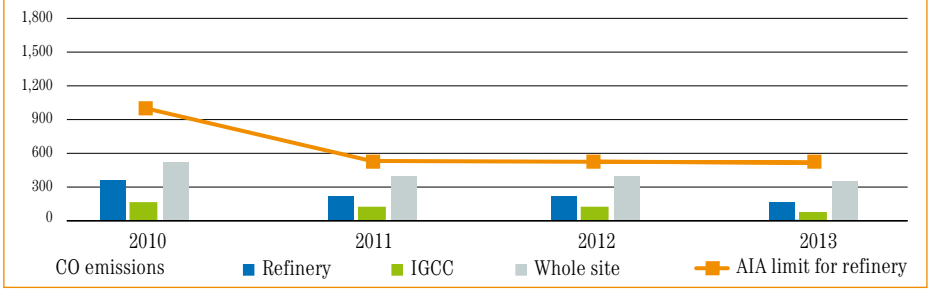
The figures for the absolute mass flow indicators are shown in Table 28 and Chart T28.

TABLE 28 CO emissions: absolute mass flow values

Parameter	2010	2011	2012	2013
Refinery (t/year)*	360	255	248	229
IGCC (t/year)	159	173	196	158
Whole site* (t/year)	519	428	444	387

* Compared with the limit of 1,000 t/year valid (for the refinery alone) from 9 April 2009, in accordance with the AIA permit (DSA-DEC-2009-0000230 of 24 March 2009) valid until 31 December 2010; as of 1 January 2011, this limit was changed to 500 t/year.

CHART T28 (kt/year)

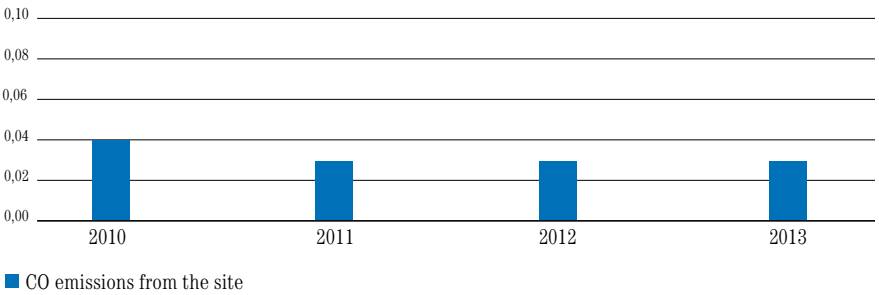


The emissions indicator for the site has always been lower than the limit and reveals a broadly positive trend over time: the IGCC figure has fallen, due to the optimisation of the combustion process in certain furnaces, and especially to the new contribution made by the TGTU in this area since 2009. The figure relating to the specific mass flow indicator for the site shown in Table 29 and Chart T29 is also positive and in 2013 was similar to previous years' values.

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

Parameter	2010	2011	2012	2013
Emissions from the site: t CO/kt raw materials	0.04	0.03	0.03	0.03

CHART T29 (t CO/kt raw materials)



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

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

Parameter	2010	2011	2012	2013
CO concentrations – refinery (mg/Nm^3)	33	22	23	27
Limit for the refinery* (mg/Nm^3)	50	50	50	50

* From 9 April 2009, limit of 50 mg/Nm^3 in accordance with AIA permit (DSA-DEC-2009-0000230 of 24 March 2009).

CHART T30 (mg/Nm^3)

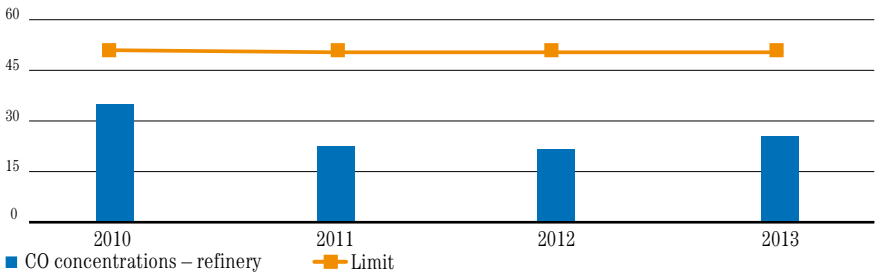
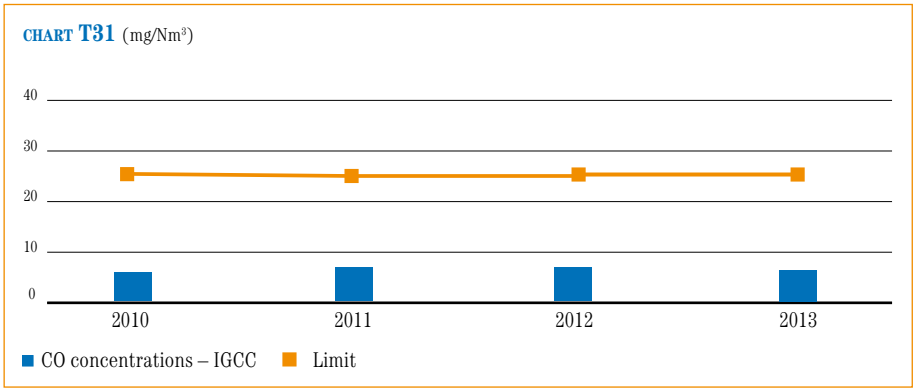


TABLE 31 CO emissions: concentration values for the IGCC

Parameter	2010	2011	2012	2013
CO concentrations – IGCC (mg/Nm^3)	5.9	6.6	7.4	6
Limit for the IGCC* (mg/Nm^3)	25	25	25	25

* From 9 April 2009, limit of 25 mg/Nm^3 in accordance with AIA permit DSA-DEC-2009-0000230 of 24 March 2009).

CHART T31 (mg/Nm^3)



Lastly, the AIA permit stipulates new limits for the refinery in terms of concentrations for VOCs (volatile organic compounds).

Abnormal or emergency situations

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

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

The operation of the treatment unit for tail gases from the refinery's sulphur recovery plants reduces the probability of this type of event and its consequences.

In effect, the tail gas treatment unit helps reduce the sulphur compound content in tail gases before they are sent to the incinerator. SO_2 emissions have also been reduced under normal operating conditions, generating a total reduction of over 30% in such emissions from the site per year. To prevent other types of emergency relating to emissions from the centralised smokestacks of the refinery and the IGCC, warning thresholds for emission concentrations have been defined for internal use: as soon as the thresholds are reached, the appropriate corrective measures are rapidly activated in the plants responsible for the emissions in order to prevent the spread of the ground-level effects of the pollutants. In 2013, two electricity

black-outs caused the closure of a number of production plants, generating dense smoke from the refinery flares.

4.2.4.3 – Data on non-ducted emissions

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

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

Parameter	2010	2011	2012	2013
Diffuse (t/year)	443	386	792	1,115
Fugitive (t/year)	320	220	53	13
Total (t/year)	**763**	606	846	1,128

Fugitive emissions tend to increase as raw material inputs increase (Table 3 on page 33). In 2008, based on the new monitoring technology (varifocal infrared video camera) and new monitoring approach (Smart LDAR programme)* used, it was found that these emissions had been overestimated by at least 50% in previous years, and stood at no more than 16% of estimated emissions in 2011. In 2012, the monitoring/repair service was further optimised, allowing the site to achieve an emissions value of no more than 4% of emissions estimated with the EPA formulas; in 2013, the figure was 1%.

The diffuse emissions value increased in 2013 due to a larger concentration of hydrocarbons in the API tanks caused by a smaller operating factor for certain plant equipment (skimmers).

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

* See note 2 on page 62

4.2.4.4 – Air quality in the Sarroch area

4.2.4.4.1 Air quality monitoring using fixed measurement sensors

Air quality outside the Sarroch refinery (immissions) is checked by three monitoring networks (CENSAs). Sarlux manages its own air quality measurement sensors (four), while Versalis is currently restructuring its own monitoring network and ARPA Sardegna (ARPAS) operates the three sensors owned by the Sardinian regional authorities; the CENSA9 station, Sarroch Villa d'Orri, was dismantled in May 2011 to be used in another location. The location of the measurement sensors of the public network is shown in Figure 14.

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

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

The ARPAS network records hourly average concentrations in all the stations of the following pollutants:

SO_2; NO_2; H_2S; PM10 and ozone

In two stations:

Benzene; PM2.5; and CO

The Sarlux network – managed alongside those of the local authorities and other companies in the region – provides data on changes in parameters relevant to air quality in real time, to ensure that pollution is kept below the minimum levels set out by the laws in force and that immediate steps can be taken when necessary. Each of the four Sarlux monitoring stations (Villa d'Orri, Sarroch, Porto Foxi and the national storage facility) is equipped with analysers that continuously gauge levels of the following pollutants in the air:

- SO_2; NO_2; CO; H_2S (hydrogen sulphide); PM10; ozone; hydrocarbons

Since 2013, continuous measurement of PM10 has been recorded and archived only for the Porto Foxi station, as the software is currently being updated. The station located in the area of the national storage facility also has a weather station. In the second half of 2010, two stations (at Sarroch and at the national storage facility) were fitted with PM2.5 continuous analysis equipment.

A dedicated monitoring system constantly checks emissions from the IGCC plant for: SO_2; NO_X; PTS; CO and flue gas flow rate, providing a high degree of reliability, as shown by the data availability index (the ratio between the device's operating hours and normal plant operating hours), which in 2013 was around 98%. A similar system monitors emissions from the refinery's central smokestack, which collects approximately 30-35% of total emissions (Topping 1 and thermoelectric plant), monitoring the same parameters as described above. Similar monitoring systems have also been installed for emissions from the smokestacks of the Z3 and Z4 sulphur recovery plants, Topping 2, Reformer/Alkalisation (CCR/Alky) and CO Boiler. The remaining emissions are monitored periodically through half-yearly sampling.

The results obtained by the public network for the pollutants monitored in 2010-2013 are shown below. The figures and comments are taken from reports prepared annually by ARPAS.

Measurements of SO_2 recorded by the provincial network

As regards SO_2, the report issued by ARPAS shows that the improvement on previous

years continued in 2013, and that no legal limits were breached. These results are shown in the tables and charts below. The report also shows that average long-term SO_2 levels have decreased substantially over the years. Since 2009, a further clear improvement in the effects of SO_2 emissions has been recorded, associated with the start-up of the TGTU. This was fully confirmed in subsequent years, when the limit was not exceeded, except for once in 2012 when the hourly limit was exceeded. This trend is shown in Tables 33, 34, 35, 36 and associated charts. Note that Sarlux does not have access to the hourly data measured by the public network in sufficient time to allow it to implement immediate corrective action when the hourly/daily thresholds are exceeded. Following receipt of a report by the monitoring authorities that one of the above-mentioned limits or thresholds had been exceeded, Sarlux always promptly instituted the necessary checks of the plants' systems and the sulphur content in the fuels used. If anomalies were found, details were provided to the authority that notified the company of the breach, with a written summary of the event and its causes. Even if no anomalies were found, a written reply was always provided. Lastly, Table 37 shows the number of reports submitted to Sarlux of warning thresholds reached in respect of the pollutant SO_2, measured by the sensors of the public air quality monitoring network. The table shows that the reports sent by the regional authorities are in line with the number of breaches registered. No reports were submitted in 2010, 2011 or 2013, as a result of the clear improvement recorded in the impact of SO_2 emissions. The same was true of 2010 and 2011. In 2012, one report of an hourly limit being exceeded was submitted.

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

Parametro	2010	2011	2012	2013
CENSA1	0	0	0	0
CENSA2	0	0	0	0
CENSA3	0	0	0	0
Limit*	500 µg/m³ not to be exceeded for 3 consecutive hours			

*Valore limite previsto dal D.M. 60/2002

CHART T33 (No. of times limit exceeded)

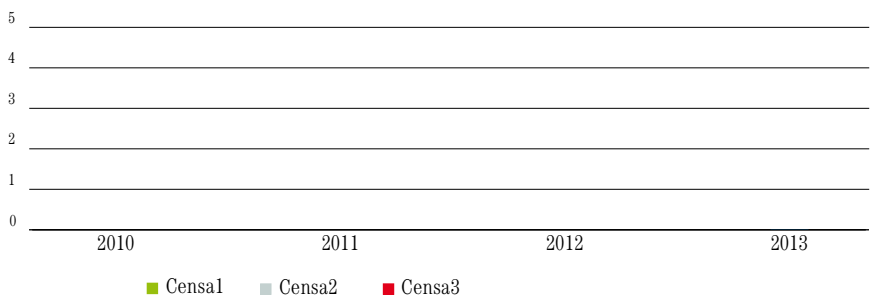


TABLE 34 SO_2: measurements recorded by the provincial network – no. of times the hourly limit for the protection of human health was exceeded

Centralina	2010	2011	2012	2013
CENSA1	0	0	1	0
CENSA2	0	0	0	0
CENSA3	0	0	0	0
Limit*	350 µg/m³ not to be exceeded more than 24 times in a calendar year			

* Limit stipulated by Ministerial Decree 60/2002 from 2005. In 2004, the threshold that should not have been exceeded was 380 µg/m³

CHART T34 (No. of times limit exceeded)

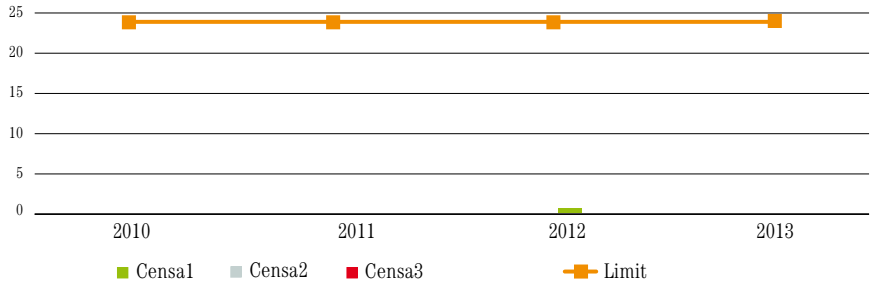


TABLE 35 SO_2: Levels recorded by the provincial network – no. of times the daily limit for the protection of human health was exceeded

Parameter	2010	2011	2012	2013
CENSA1	0	0	0	0
CENSA2	0	0	0	0
CENSA3	0	0	0	0
Limit*	125 µg/m³ not to be exceeded more than 3 times in a calendar year			

* Limit stipulated by Ministerial Decree 60/2002

CHART T35 (No. of times limit exceeded)

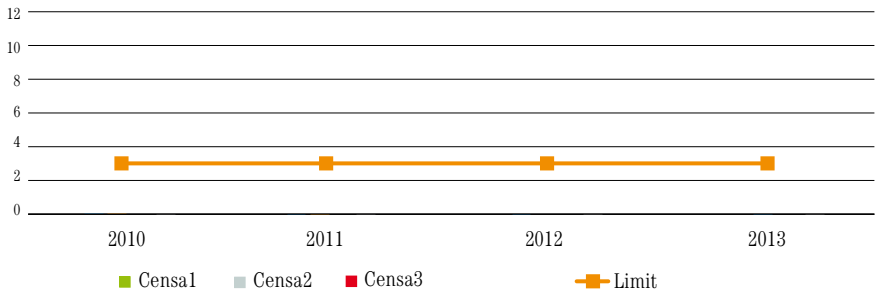


TABLE 36 SO_2: Concentration values measured by the provincial network – Annual average concentration.

Parameter	2010	2011	2012	2013
CENSA1 (µg/m³)	n.d.	3	3	2.5
CENSA2 (µg/m³)	n.d.	3	3.5	2.7
CENSA3 (µg/m³)	n.d.	3	2.5	2.3
Limit*	20 µg/m³ limit for the protection of eco-systems			

* Limit stipulated by Ministerial Decree 60/2002
n.a. figure not available as not supplied by ARPAS

CHART T36 (µg/m³)

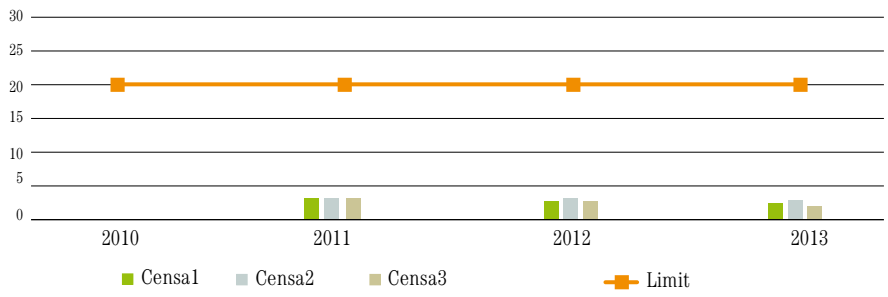


TABLE 37 Reports received by Sarlux on breaches of warning thresholds for SO_2 stipulated in Ministerial Decree 155/2010.

Parameter	2010	2011	2012	2013
No. of reports/year	0	0	1	0

PM10: measurements recorded by the provincial network

No breaches of the legal limit for PM10 were recorded in 2010-2013, except at CENSA3 in 2010. An official published report on the breach at CENSA 3 is available on the Sardegna Arpas* website, which explains that, in the winter period, the sources of small dust particles include a significant contribution from the combustion of heating plants, especially wood-fired plants. The number of times that the hourly limit for the protection of human health was exceeded and the annual average concentration values for PM10 are shown in Tables 38 and 39.

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

TABLE 38 PM10: PM10: Concentration values measured by the provincial network

Parameter	2010	2011	2012	2013
CENSA1	2	9	13	6
CENSA2	15	18	1	0
CENSA3	59	32	3	1
Limit*	50 µg/m³ not to be exceeded more than 35 times in a calendar year			

* Limit stipulated by Ministerial Decree 60/2002; ---: data not available

CHART T38 (No. of times limit exceeded)

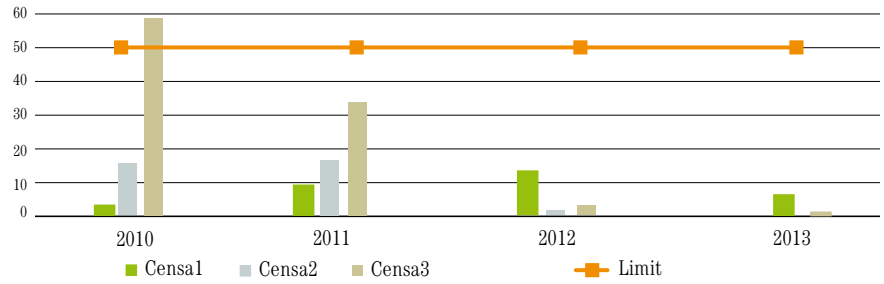
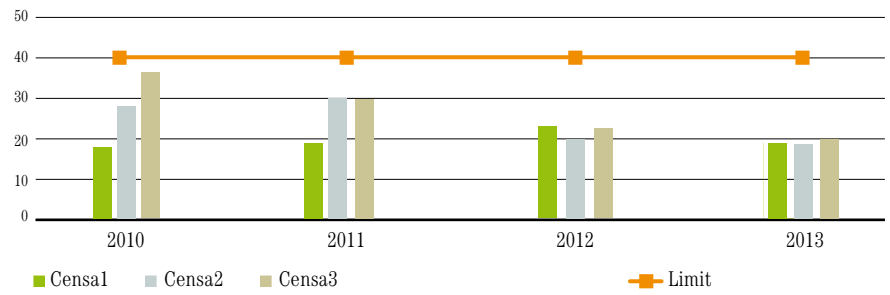


TABLE 39 PM10: Concentration values measured by the provincial network – Annual average concentration.

Parameter	2010	2011	2012	2013
CENSA1(µg/m³)	18	19	22.2	19.5
CENSA2 (µg/m³)	28	30	20.3	19.5
CENSA3 (µg/m³)	36	30	22.1	20.2
Limit*	40 µg/m³ limit for the protection of eco-systems			

* Limit stipulated by Ministerial Decree 60/2002;

CHART T39 (µg/m³)



Measurements of NO_2 recorded by the provincial network

The indicators at all stations show that the values for NO_2 are well below the legal limits. In 2010-2013, no breaches of the hourly limit for the protection of human health were recorded.

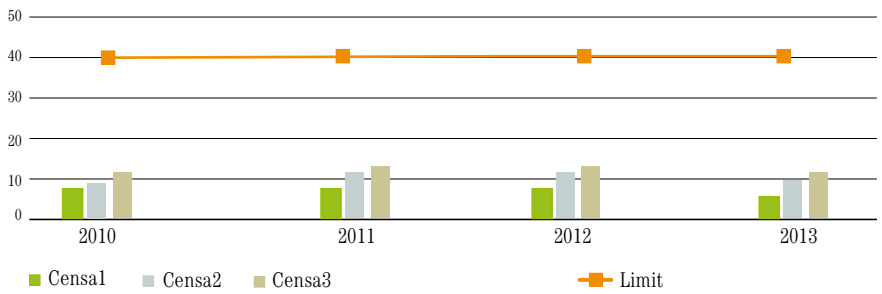
The average concentration values of NO_2 are shown in Table 40.

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

Parameter	2010	2011	2012	2013
CENSA1(µg/m³)	8	8	8	6.3
CENSA2 (µg/m³)	9	11	11.1	9.5
CENSA3 (µg/m³)	11	13	13	11.4
Limit for the protection of human health (µg/m³)*	40	40	40	40

* Limit stipulated by Ministerial Decree 60/2002; from 2010 this became 40 µg/m³

CHART T40 (µg/m³)



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

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

- the values for **CO** in 2013 were again much lower than the legal limits and in line with those of previous years; in 2010, the only data received related to the CENSA2 station and confirmed that there were no breaches of the legal limit; in 2011, the data received related to CENSA2 and CENSA3 and confirmed that there were no breaches of the legal limit; in 2012, the data received related to CENSA1, CENSA2 and CENSA3 and confirmed that there were no breaches of the legal limit

[Ministerial Decree 155/2010]

- for **benzene**, the values registered in the period 2010-2012 were below the legal limit. In 2012, the annual average registered by the ARPAS stations did not exceed 1.8 µg/m³ (CENSA2 and CENSA3) and did not exceed 1.5 µg/m³ in 2013 (CENSA2 and CENSA3).

[Legislative Decree 183/2004]

- the problem of **ozone** emissions can only be tackled on a large scale given the long-distance transportation of this pollutant; in 2010, one breach of the target value for the protection of human life was recorded (by CENSA1), but there were no breaches of the warning thresholds; in 2012, 29 breaches of the target value for the protection of human health were recorded by CENSA1, 24 by CENSA2 and 19 by CENSA3, but no breaches of the information or warning thresholds; finally, in 2013, four breaches of the target value for the protection of human health were recorded by CENSA1, 6 by CENSA2 and 38 by CENSA3, but no breaches of the information or warning thresholds.

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

- for **hydrogen sulphide**, the concentration values in the period 2010-2013 did not register any breaches, either of the legal limit of 40 µg/m^3 for average daily concentrations, or of the legal limit of 100 µg/m^3 for average half-hourly concentrations. **[Presidential Decree 15/04/1971]**

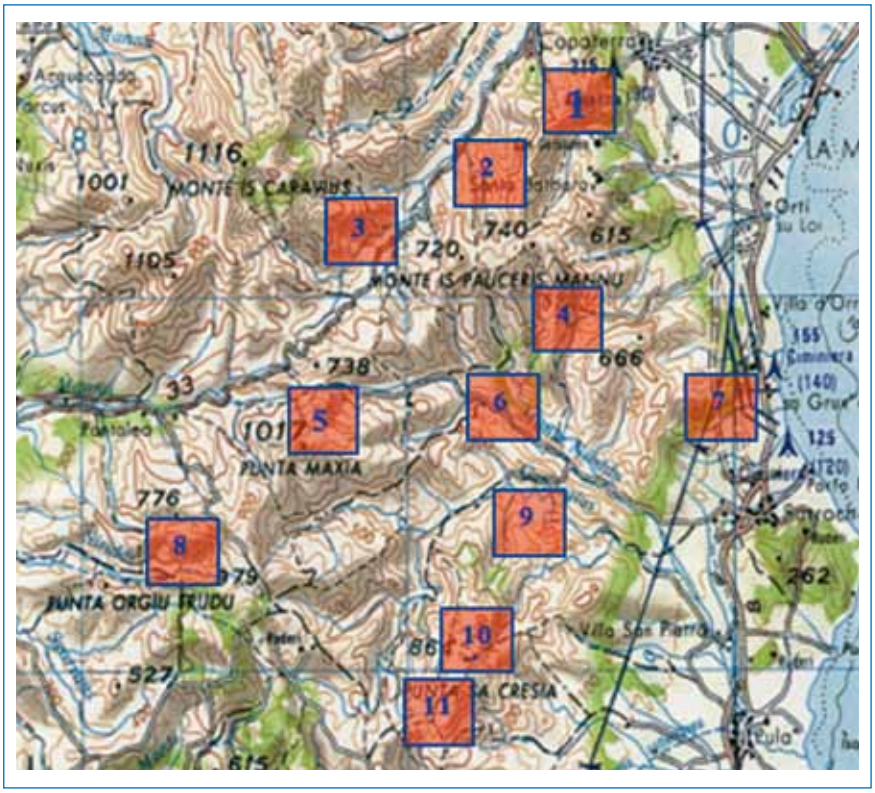


Figure 15 Location of the air quality bio-monitoring stations

4.2.4.4.2 Monitoring of air quality using bio-indicators and biodiversity studies

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

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

For some years, the Botanical Sciences Department of the Mathematical, Physical and Natural Sciences Faculty at Cagliari University has been monitoring the condition of the vegetation over a very wide area covering the inland region of Sarroch, as illustrated in Figure 15. It also uses the epiphytic mosses methodology as a bio-monitor of air quality.

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

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

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

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

The categories that include the indicator values measured in the stations being monitored are highlighted in Table 42.
In 2013, air quality in the area studied again fell into category IAP3, with an assessment of "average" for air quality and atmospheric purity at seven out of the ten monitoring stations. Two units fell into category IAP4 with an assessment of "mediocre" for air quality, "low" for atmospheric purity and "low" for pollution. The unit closest to the industrial area again recorded "low" quality of IAP5.
As could reasonably be expected, air quality is generally higher in the stations further inland and lower in the one nearest to the Sarroch industrial area.
The picture that emerges from an analysis using bio-indicators shows, therefore, that the air quality falls in the mid-range of the IAP index.
In the area under review, a survey was also carried out to monitor the condition of the vegetation. The survey is conducted through visual checks of the condition of different species of vegetation and by monitoring the bioaccumulation of pollutants.
According to the results of these field measurements, in 2013 there was again no particularly critical threat to the condition of the vegetation in the area studied.

4.2.4.5 – Greenhouse gas emissions

Greenhouse gas (carbon dioxide, CO_2)

The activities carried out on the Sarroch site, i.e. refining and electricity generation, fall within the scope of application of the European Emissions Trading Directive.
The directive was introduced across Europe to control and reduce carbon dioxide emissions in accordance with the Kyoto Protocol. The objective of this legislation is to reduce greenhouse gas emissions, especially carbon dioxide, which are thought to cause the progressive global warming of the planet known as the greenhouse effect.
The emissions trading scheme was introduced in 2005 to help member states comply with the requirements of the Kyoto Protocol. It works by assigning each individual plant falling within the scope of the directive an emissions allowance established by the member state through a national allocation plan.
Surplus allowances may be traded and/or stockpiled, and any deficit must be covered by purchasing emissions allowances on the market.
In 2013, the directive's third period of application began and will last until 2020. The previous rules for assigning allowances were changed: Directive 2009/29/EC, which amends Directive 2003/87/EC, assigned free allowances of CO_2, on the basis of harmonised EU regulations, for those sectors with a high risk of carbon leakage.
For the Sarroch site, Sarlux received free allocations (for 2013) totalling 2,601,956 tons as determined by Resolution 29/2013 of the national committee for the management of Directive 2003/87/EC.

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

Emissions by the IGCC in 2013 were also in line with previous figures. On the other

hand, the figures for the refinery show that CO_2 emissions are continuing the downward trend under way since 2010, a reduction that is due to investments in energy saving.

The figures for 2013 also demonstrate that the route taken by Sarlux, involving rational energy use and the adoption of efficient production systems, is the key mechanism for controlling and reducing CO_2 emissions.

CO_2 emissions from the Sarlux site are calculated based on an appropriate monitoring plan, which is defined in accordance with specific European and Italian guidelines. Monitoring is carried out by measuring fuel consumption and applying specific emissions factors for each fuel.

The requirements relating to the monitoring instrumentation are very stringent and must be checked and maintained over time. Moreover, the laboratories that carry out analysis on fuels must obtain specific accreditation. Sarlux's internal laboratory was one of the first Italian laboratories operating in a refinery (the third in Italy) to obtain the accreditation necessary to carry out checks on some of the fuels used.

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

The tables and charts on the next page show the annual figures on CO_2 emissions from the site in both absolute and relative terms, as a proportion of the quantity of raw materials processed in a year. As has been the case since 2005, the figures for 2013 were approved by LRQA Italy, one of the companies on the list of bodies specifically accredited for this purpose by the Italian Ministry for the Environment.

TABLE 43 CO_2: emissions: absolute values and allowances assigned

Parameter	2010	2011	2012	2013
Refinery (t/year)	2,368,781	2,353,582	2,239,006	2,182,955
IGCC (t/year)	3,782,755	3,519,056	3,689,724	3,698,706
Total (t/year)	6,151,536	5,872,638	5,928,730	5,881,661
Total allowances (Refinery + IGCC)	2,604,100*	2,604,100*	2,604,100*	2,601,956**

* Separate allowances: Refinery (2,159,696 tons) IGCC (444,404 tons)
** Allowances for the site as a whole

TABLE 44 Specific CO_2 emissions from the site

Parameter	2010	2011	2012	2013
Specific emissions from the site	429	419	445	453
t CO_2/kt raw materials				

CHART T43A (t/year)

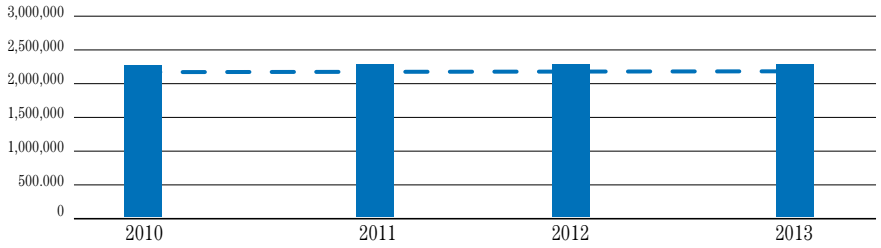


CHART T43B (t/year)

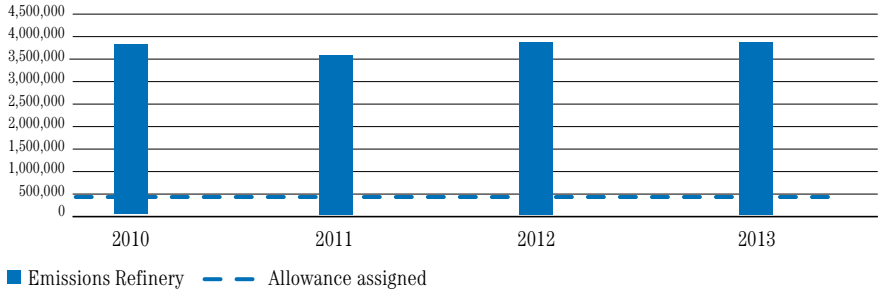
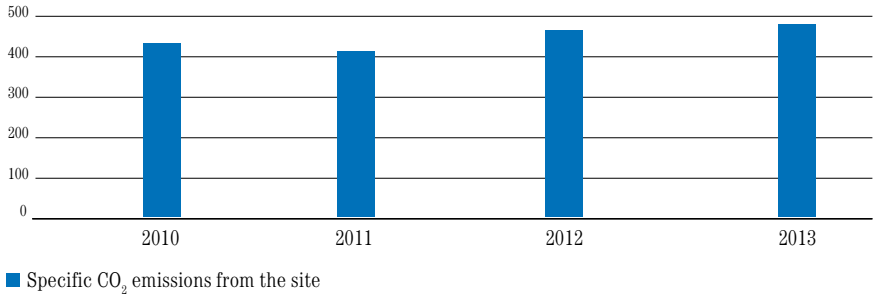


CHART T44 (t CO_2/kt raw materials)



4.2.5 – Discharges into water

4.2.5.1 – General

[AIA permit DSA-DEC-2009-0000230]

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

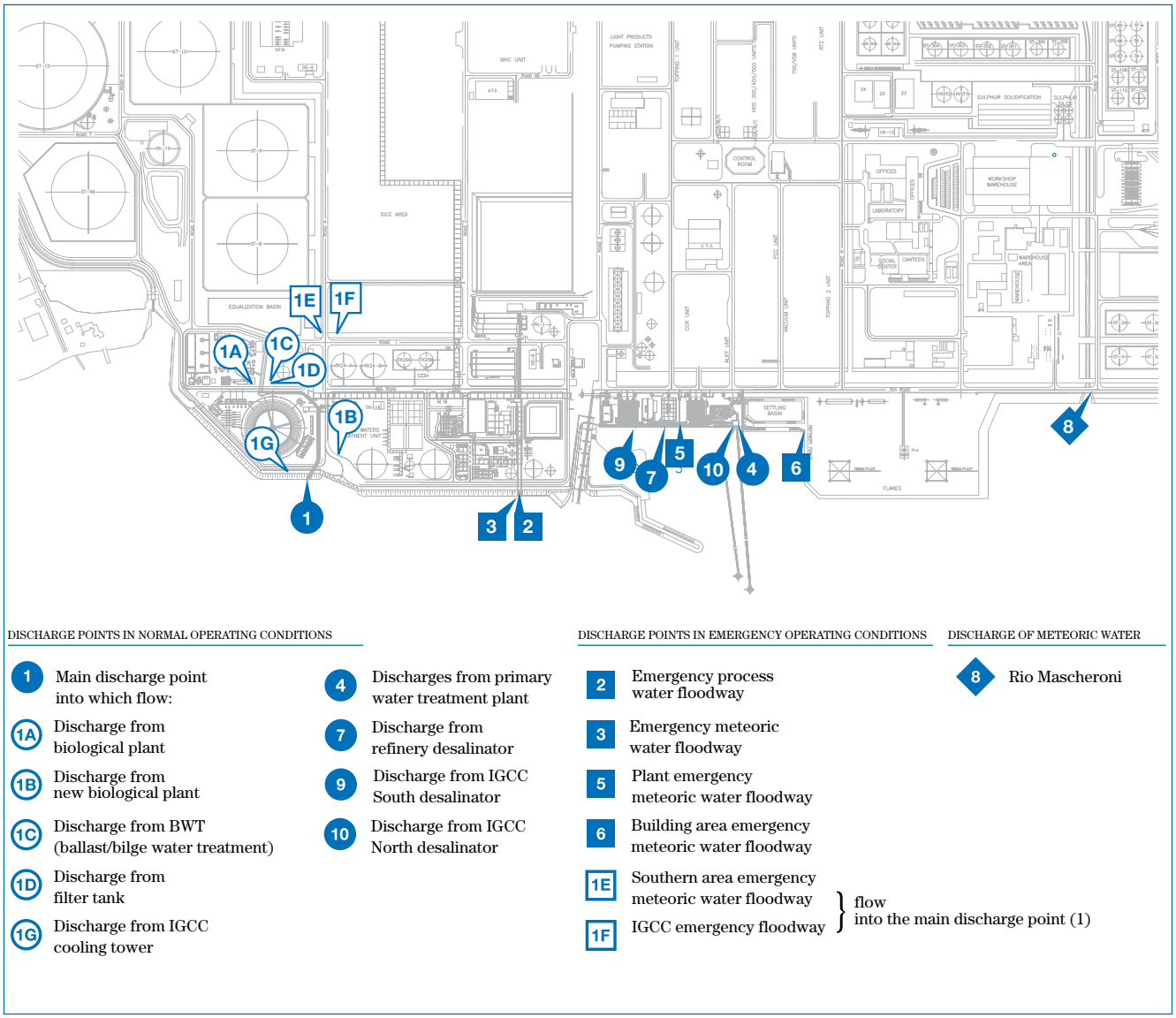


Figure 16 Map showing the location of the site's discharge points

Discharge points in normal conditions

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

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

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

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

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

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

Discharge points in emergency conditions

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

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

Calculation of water discharge values

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

CONTRIBUTION TO THE DISCFARGE FLOW (%)	2012	2013
Main discharge point (excluding IGCC tower)	16.1	18.6
Discharge from desalinators	51.5	52.5
Discharge from IGCC tower	31.2	27.7
Discharge from treatment of incoming water	1.1	1.2

4.2.5.2 – Water discharge figures

Discharges from wastewater treatment units

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

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

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

[flow rate]

Table 45 and Charts T45a and T45b show the figures for the hourly average flow rate of the water discharged both in absolute terms and in specific terms as a proportion of raw materials processed. An analysis of the figures for the four years 2010-2013 shows that the historic trend has continued in both absolute and specific terms. A new plant using reverse osmosis technology was built and brought on stream in 2012. Using purified wastewater, it produces around 230 mc/hr of pure, demineralised water to feed the refinery's boilers. All demineralised water produced using reverse osmosis is removed from purified waste discharged into the sea. In 2013, average production of demineralised water was stabilised at about 170 mc/h. However, total wastewater was in line with the trend of previous years, and thus greater than in 2012, since more water was put into the treatment plant due to significant plant maintenance work.

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

Parameter	2010	2011	2012	2013
Total water discharged – annual average flow rate (m3/hour)	796	751	615	727
Total water discharged/raw materials processed (m3/kt raw materials)	486	470	385	486

CHART T45A (m^3/hour)

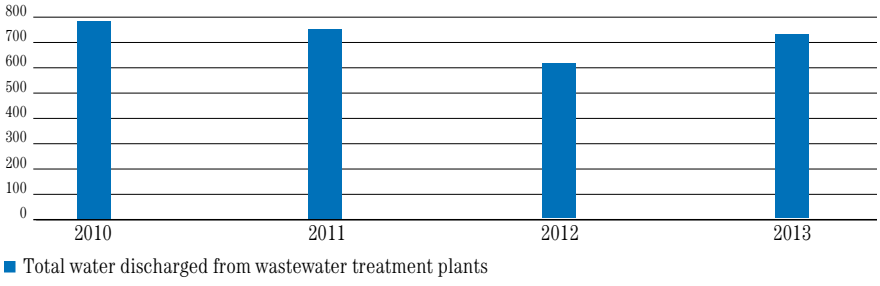
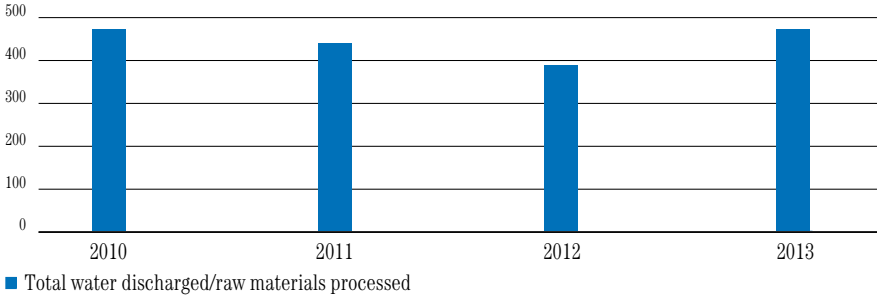


CHART T45B (m^3/kt raw materials)



*Discharge points 1G, 1E and 1F are excluded from these figures, as these do not discharge from wastewater treatment units.

[COD]

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

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

Parameter	2010	2011	2012	2013
Absolute values (t/year)	673	571	368	573
Specific values (t/millions of t raw materials)	46.9	40.8	27.7	44.2
Average concentration values (mg/l)*	96.5	86.8	71.8	91.1

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

CHART T46A (t/millions of raw materials)

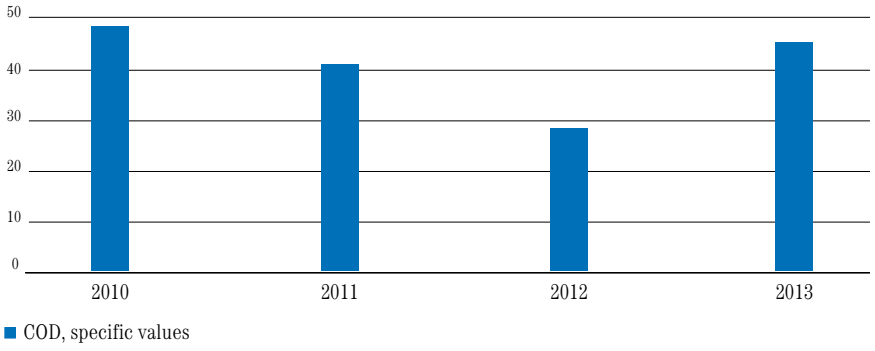
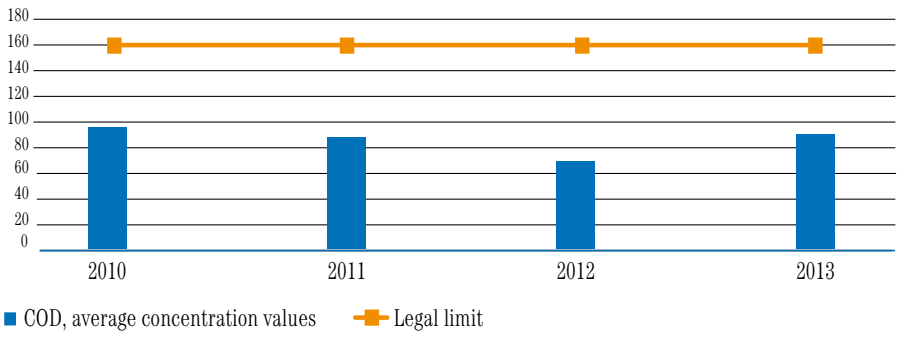


CHART T46B (mg/l)



[total hydrocarbons]

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

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

Parameter	2010	2011	2012	2013
Absolute values (t/year)	13.8	14.8	13.5	17.8
Specific values (t/millions of t raw materials)	0.96	1.05	1.02	1.37
Average concentration values (mg/l)*	2.0	2.2	2.6	2.8

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

CHART T47A (t/millions of t raw materials)

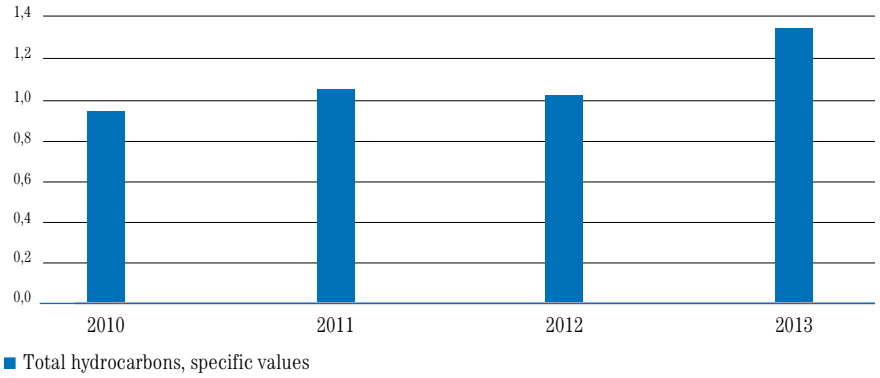
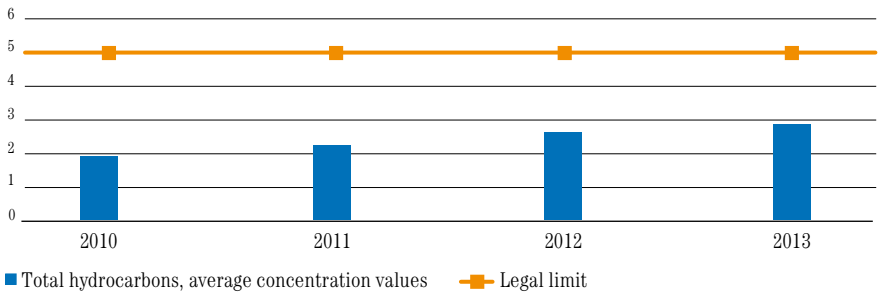


CHART T47B (mg/l)



The average concentration values of total hydrocarbons are well below the legal limit.

The parameter values under review are aligned with typical values. The incremental rise in total hydrocarbons is being studied in relation to the change in the typical mix of processed crudes caused by the crisis in Libya/Middle East, whereby there is less paraffinic content and a higher proportion of aromatics, which are more resistant to biological degradation.
In view of the above, work is currently under way to restore/improve the efficiency of the purification system in order to optimise its performance.

[nitrogen]

The data relating to nitrogen indicators, expressed as absolute values of total nitrogen mass flow and as annual average concentrations of nitrogen in its individual forms (ammoniacal, nitrous and nitric) are shown in Tables 48 and 49.
The performance of the indicators in 2013 was within the historical range (Table 48).

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

Parameter	2010	2011	2012	2013
Absolute values (t/year)	38.0	18.9	12.0	38
Specific values (t/millions of t raw materials)	2.65	1.35	0.90	2.93

CHART T48A (t/year)

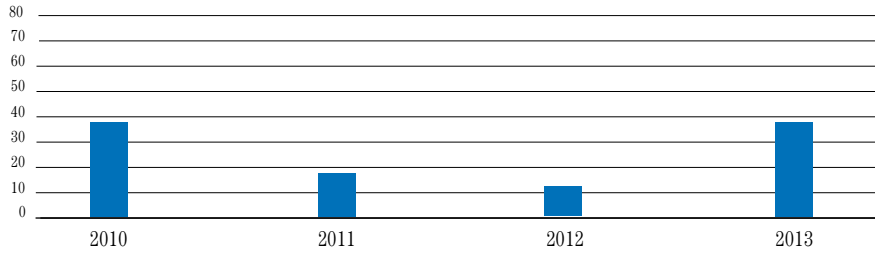


CHART T48B (t/millions of raw materials)

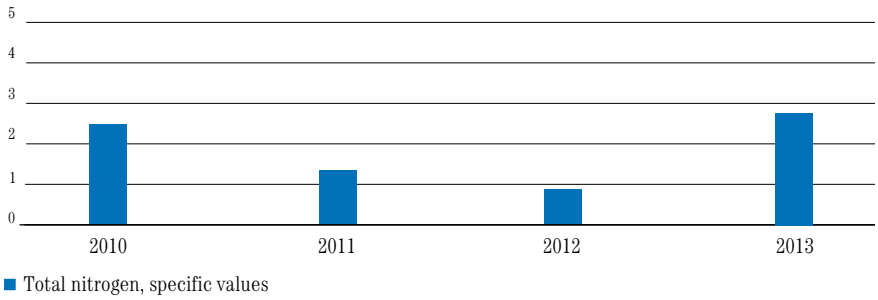


TABLE 49 Discharges from wastewater treatment plants (discharge points 1a, 1b, 1c, 1d) – ammoniacal, nitrous and nitric nitrogen: average concentrations

Parameter	2010	2011	2012	2013	Limit*
Ammoniacal (mg/l)	2.47	1.55	1.20	4.63	15.00
Nitrous (mg/l)	0.06	0.04	0.04	0.13	0.60
Nitric (mg/l)	2.92	1.28	1.09	1.28	20

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

In 2013, there were no significant variations from the trend over the previous three-year period for the parameters shown in Table 49. For the nitrogen parameter only, which was well within the limits, there was an upward trend due to the same considerations set out in Chart T47B.
The figures for the last four years are shown in the charts on the next page.

CHART T49A (mg/l)

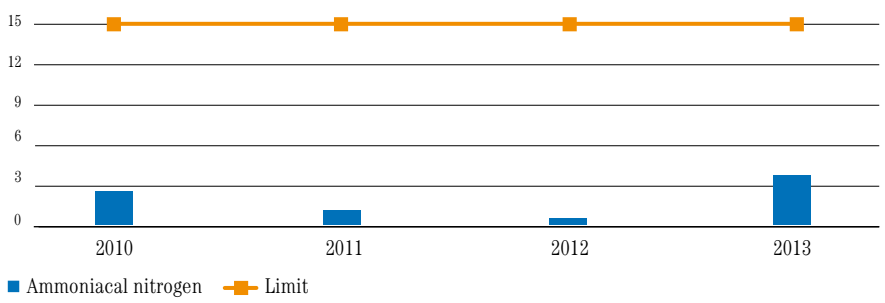


CHART T49B (mg/l)

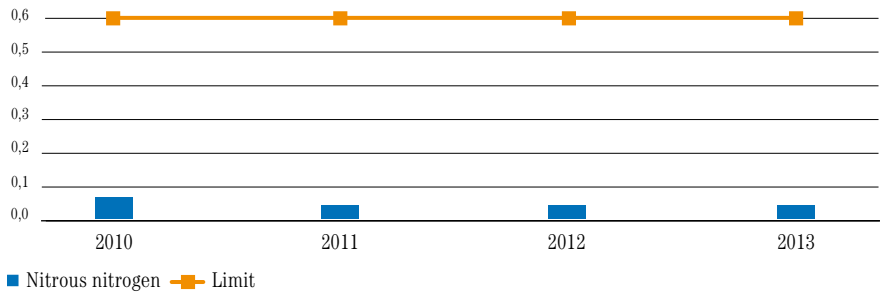
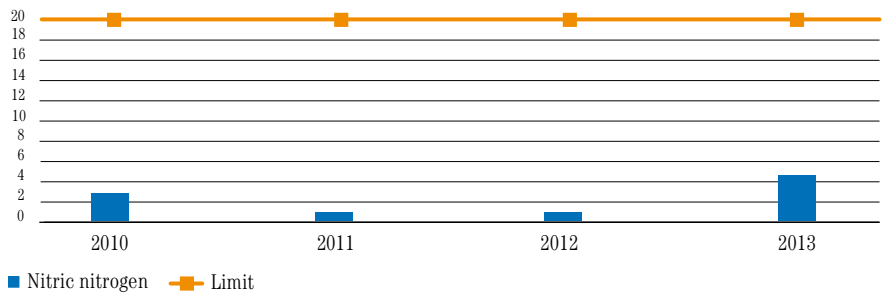


CHART T49C (mg/l)



Discharges from other units

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

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

The figures relating to these parameters for the three types of discharges mentioned above are shown in the tables and charts below.

Table 50 shows the hourly average flow rate of discharged water as both absolute and specific values. **[flow rate]**

The significant contributions to the total flow rate made by the desalinators and the IGCC tower can also be seen in the charts.

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

Parameter	2010	2011	2012	2013
Absolute values (m³/hour)				
Treatment of incoming water	75.5	66.0	42.7	46.6
Desalinators	2,278	2,286	1,965	2,051
IGCC tower	1,025	819	1,189	1,080
Specific values (m³/kt raw materials)				
Treatment of incoming water	46.1	41.3	26.9	30.3
Desalinators	1,392	1,430	1,148	1,198
IGCC tower	626	512	785	730

CHART T50A (m³/hour)

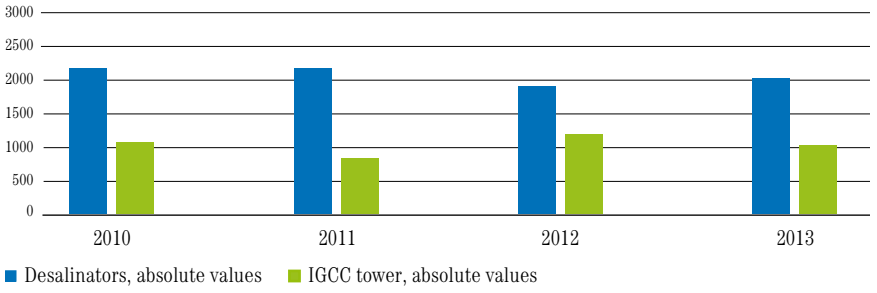
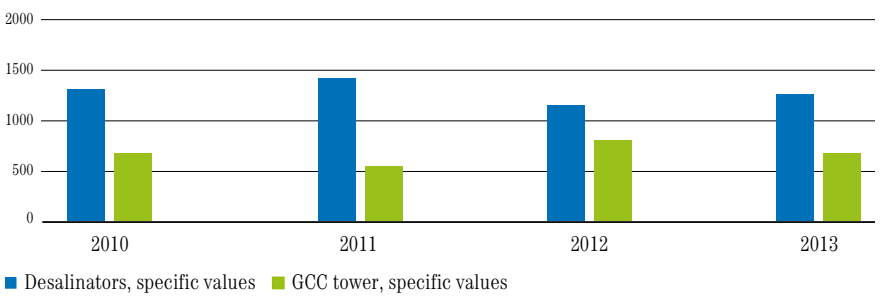


CHART T50B (m³/kt raw materials)



[suspended solids - mass flow]

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

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

Parameter	2010	2011	2012	2013
Absolute values (t/year)				
Treatment of incoming water	5	15	5	5
Desalinators	590	517	254	375
IGCC tower	315	184	266	208
Specific values (t/millions of t raw materials)				
Treatment of incoming water	0.3	1.1	0.4	0.4
Desalinators	41.2	36.9	19.1	29
IGCC tower	22.0	13.2	20.0	16.1

CHART T51A (t/year)

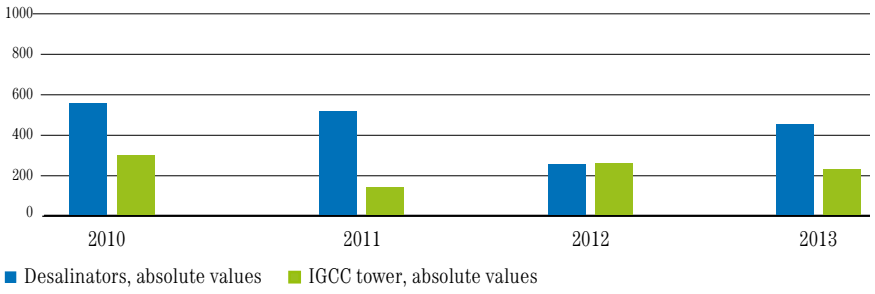
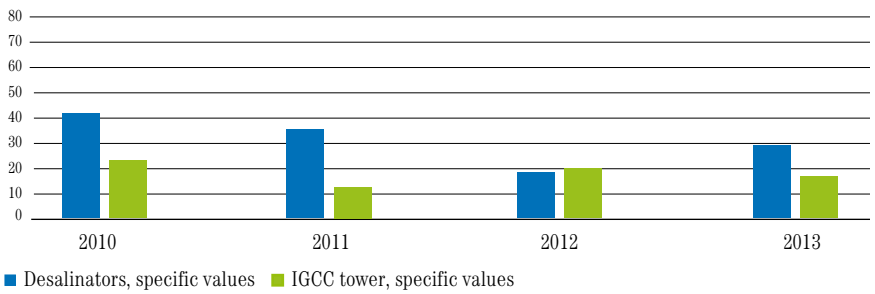


CHART T51B (t/millions of t raw materials)



[suspended solids – concentrations]

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

Parameter	2010	2011	2012	2013	Limit*
Primary water treatment units (mg/l)	6.8	26.0	14.7	13.7	80
Desalinators** (mg/l)	28.8-29.8	24.1-26.4	15.9-19.7	20.2-32.9	80
IGCC tower (mg/l)	35.1	25.7	25.5	22	80

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

CHART T52A (mg/l)

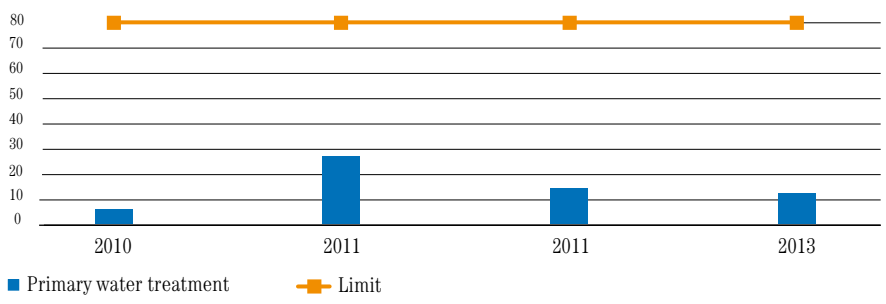


CHART T52B (mg/l)

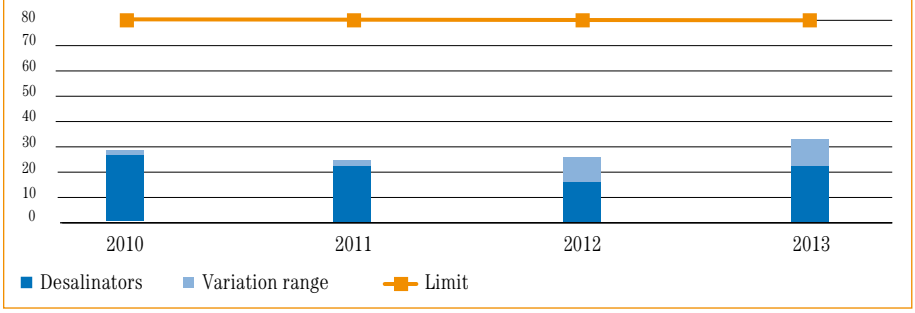
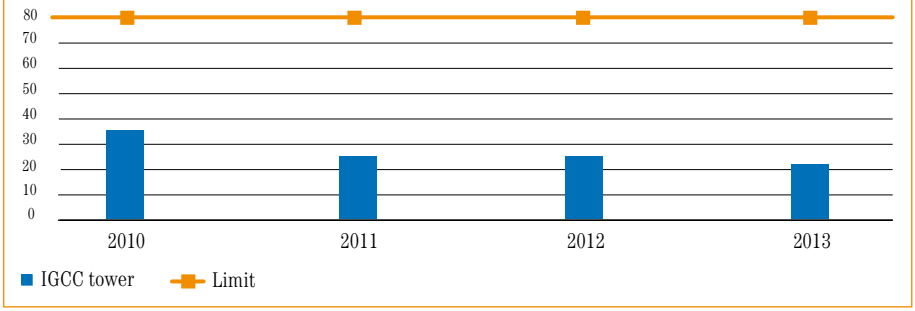


CHART T52C (mg/l)



Emergency situations following spills into the sea

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

Measures to prevent spills into the sea include a programme of inspections carried out on board ships during the loading of products and unloading of raw materials. A high proportion of ships are checked (section 4.3.2, page 115).

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

There were no significant incidents during the period 2010-2013.

4.2.5.3 – Seawater quality

For several years, marine biologists have been carrying out periodic checks on the quality of the seawater in the stretch of sea in front of the area occupied by the Sarlux site.

The surveys include detailed chemical and physical analysis of seawater samples taken at different depths at a series of points positioned along lines perpendicular to the coastline, as shown in Figure 17.

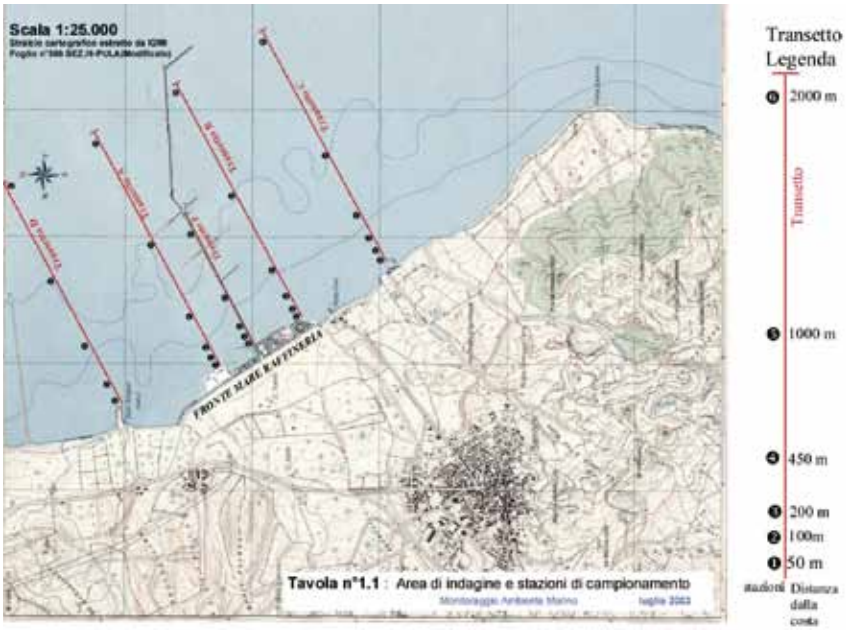


Figure 17 Area covered by the seawater quality survey

[TRIX indicator of seawater quality]

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

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

The results of the seawater surveys in the four-year period 2010-2013 all fall into the top two bands of classification (good/high).

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

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

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

[new parameter: CAM index]

In recent years a new parameter, the CAM (seawater classification) index[1], has been introduced to provide an assessment of the trophic state of water. This index is based on specific algorithms for the sea around Sardinia. Generally, the CAM index showed that water quality was "average" throughout the surveyed area. Low water quality was registered in winter 2013 due to high rainfall, but the situation improved during the summer with a return to high quality (Table 53 bis). In any case, these indices are meaningful over long periods rather than in a single period.

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

	Surface water	Bottom water
January 2010	average	average
July 2010	low	low
January 2011	average	average
July 2011	high	high
January 2012	average	average
July 2012	average	average
January 2013	low	low
July 2013	high	high

[Law 502 of 6 December 1993]

The stretch of sea covered by the analysis is also affected by thermal discharges, i.e. discharges of water at a higher temperature than the ambient water. Applicable legislation stipulates that the increase in the temperature of the receiving body should not exceed 3°C over 1,000 metres away from the point of introduction. Every six months, in accordance with the IRSA method (Manuale dei metodi analitici per le acque, Quaderno Istituto Ricerca sulle Acque no. 100, 1995, Manual of water analysis methodology, Institute of Water Research Paper 100, 1995) provided for in Ministerial Decree of 16 April 1996, a check is made of temperature differences at 1,000 metres from the point of discharge from the IGCC's seawater cooling circuit along a semi-circular line centred on the discharge point.
The results of checks carried out in 2013 show temperature differences of 1.4°C in the summer survey and 1.1°C in the winter survey, as can be seen in the figures shown in Table 54, which fall within the variability range of coastal seawaters.

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

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

Parametro	January 2010	July 2010	January 2011	July 2011	January 2012	July 2012	January 2013	July 2013
Minimum T°C	12.1	26.2	11.4	25.3	9.8	24.1	11.9	25.7
Maximum T°C	12.5	27.1	12.4	26.0	12.3	25.0	13.0	27.1
Temperature increase °C	0.4	0.9	1	0.7	2.5	0.9	1.1	1.4

4.2.6 – Waste

4.2.6.1 – General

[SISTRI]

With Ministerial Decree of 17 December 2009, as subsequently amended, the Ministry for the Environment set out a series of new requirements for businesses, largely consisting of registration with SISTRI[1] (waste traceability control system) and the use of new IT procedures in waste management. These IT procedures will definitively replace paper-based documents (registers, forms and MUDs [unified environmental declarations]) in January 2015.

In accordance with current legislation, Sarlux introduced the use of SISTRI alongside paper-based documentation starting 1 October 2013, as a company disposing of hazardous waste, and starting 3 March 2014 as a producer of hazardous waste.

[waste management phases]

The site's waste management policy is aimed at optimising the quantity of waste recovered.

With reference to the areas indicated in Figure 18, the main operational phases of waste management at the site before the waste is sent off-site for disposal or recovery are described below:

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

These processes considerably reduce the quantity of waste and, by mixing it with an inert matrix, change its type.

This plant is managed by an external company specifically authorised for this purpose[3] (point 6).

Two companies are responsible for the waste they receive, and disclose the quantities of waste sent externally, after carrying out the necessary treatment processes, in their annual declaration. These companies were carefully selected and are checked regularly, including by means of specific audits (section 4.3.3).

[1] Regional decision no. 35 of 1 March 2011

[2] Regional decision no. 163 of 23/06/2009

[3] AIA permit – decision by the province of Cagliari no. 86 of 21 April 2010

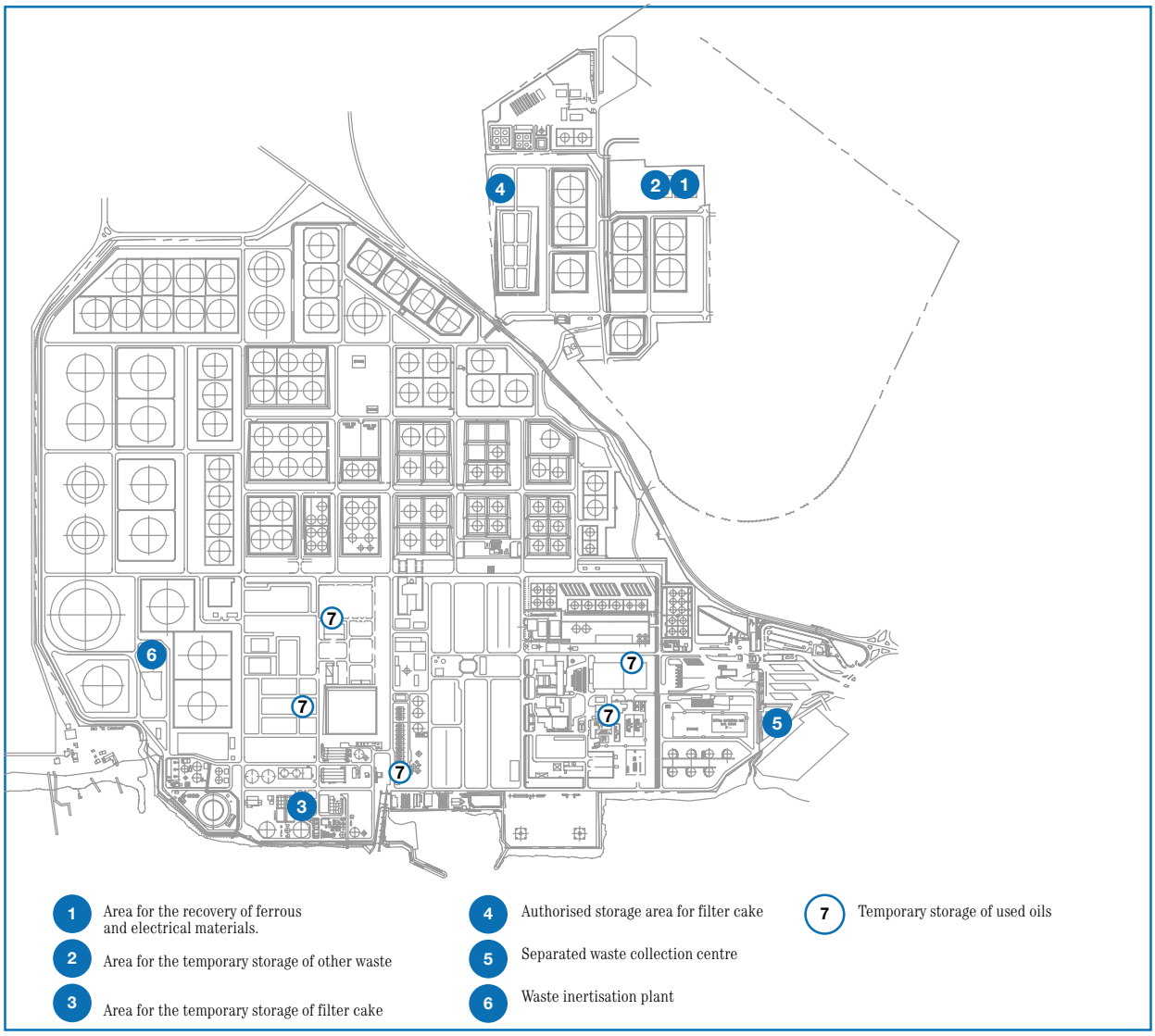


Figure 18 Areas dedicated to the main waste management activities on the site

As the filter cake from the IGCC is sent for external recovery to plants located in Germany, the company applies for a permit for the cross-border shipment of waste every year[1], in accordance with EC Regulation 1013/2006.

Lastly, Sarlux is authorised[2] to receive and treat waste comprising bilge water, slops and ballast water that has come from ships. This activity is carried out completely free of charge for the ships that dock in the marine terminal and for the ships that send these types of waste to Sarlux from regional ports in tanker trucks. These types of aqueous waste are treated at the ballast water treatment plant mentioned in section 4.2.5. This plant also treats the groundwater pumped from the wells in the site's hydraulic barrier (section 4.2.7): this waste is also classified and disclosed as part of the waste generated by the activities of the Sarlux site.

[treatment of bilge water]

[1] Provincial decision no. 112 of 25 July 2011

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

4.2.6.2 – Waste data

Based on the waste management processes described, the figures and assessments relating to waste take into account both the waste generated by Sarlux's activities (figures disclosed in the MUD) and the waste leaving the site after treatment to convert it into inert matter. Total waste production increased slightly in 2013 compared with previous years, following an extraordinary maintenance plan for the wastewater treatment plants, which involved cleaning some of the tanks and then disposing of the sludge accumulated in them. Table 55 shows the data on total waste generated by Sarlux's activities, broken down into hazardous and non-hazardous waste.

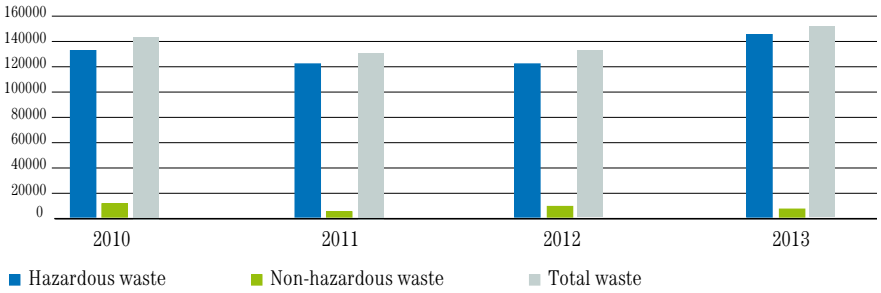
WASTE GENERATED ON SITE (%)	2012	2013
Waste sent to the internal inertisation plant	14.8%	26.39%
Water from the wells in the hydraulic barrier sent to the wastewater treatment plant	77.8%	67.40%
Filter cake sent for external recovery	1.2%	0.71%
Other types of waste	6.2%	5.51%

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

Parameter	2010	2011	2012	2013
Hazardous waste (t/year)	134,540	123,962	125,193	141,642
Non-hazardous waste (t/year)	7,122	5,151	6,793	5,724
Total waste (t/year)	141,662	129,113	131,986	147,366

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

CHART T55 (t/year)



The large quantity of hazardous waste from ordinary activities compared with previous years is mainly due to site remediation work, as can be seen from the table below (see Table 55-bis "Hazardous waste (t/year"). Also in 2013, no solid waste was generated from remediation work.

TABLE 55 BIS Hazardous waste (t/year)

Parameter	2010	2011	2012	2013
Water from site remediation (t/year)	105,027	102,599	102,676	99,322
Soil from site remediation (t/year)	2,849	0	0	0
Hazardous waste from ordinary operations (t/year)	26,664	21,363	22,516	48,044
Total (t/year)	134,540	123,962	125,193	147,366

Table 56 shows the figures relating to outgoing waste from the Sarlux site. The total quantity was again in line with previous years, and was again due to site remediation work, which had started to tail off considerably from 2010.

TABLE 56 Outgoing waste from the Sarlux site*

Parameter	2010	2011	2012	2013
Hazardous waste (t/year)	18,659	11,832	14,844	20,073
Non-hazardous waste (t/year)	3,881	3,830	6,205	5,614
Total waste (t/year)	22,540	15,662	21,050	25,687

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

CHART T56 (t/year)

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

TABLE 56 BIS Outgoing waste from the Sarlux site – filter cake

Parameter	2010	2011	2012	2013
Filter cake – quantity leaving the site (t/year)	969	1,128	1,570	1,039

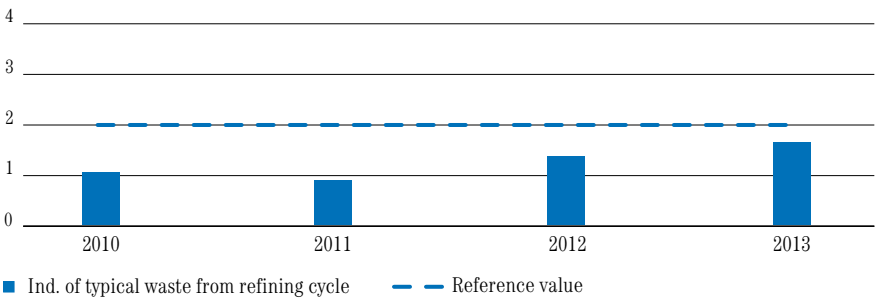
The indicator shown in Table 57 is calculated taking into account the various types of waste from the refining process, as a proportion of the quantity of raw materials processed. The indicator values are compared with the reference values (less than 2 kg of waste per ton of crude processed) contained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

TABLE 57 generated by Sarlux's activities

Parameter	2010	2011	2012	2013	Benchmark value**
Indicator of typical waste generated from the refining process* (kg/t raw materials)	1.07	0.99	1.37	1.71	<=2

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

CHART T57 (kg/t raw materials))



In addition to industrial waste, the site also generates urban solid waste, mainly from its office and catering activities.
The separated waste collection of plastic, glass and paper, which started in 2006 with a total amount of 50 tons collected, has nearly tripled over the years and reached around 135 tons in 2013.
This increase was partly obtained thanks to an in-house campaign to raise awareness and, most importantly, to the contribution of all staff. Since 2008, the company has

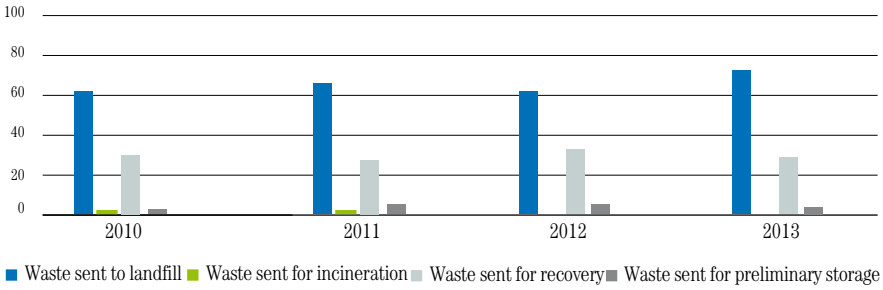
also collected organic waste from the company canteen, which in 2013 amounted to approximately 22 tons. The company has a specific objective to improve the collection of separated waste.

Table 58 shows the final destinations of waste and the amount of waste from the site sent to each of them as a percentage of total waste. The percentage of waste sent for recovery and the percentage of waste sent for landfill were broadly in line with the previous years.

TABELLA 58 Destination of outgoing waste from the Sarlux site

Destination of waste	2010	2011	2012	2013
Waste sent to landfill (% of total waste)	62.9	66.1	63.2	69.11%
Waste sent for incineration (% of total waste)	1.73	1.90	0.1	0.00%
Waste sent for recovery (% of total waste)	34.0	32.0	34.1	29.37%
Waste sent for preliminary storage (% of total waste)	1.37	2.80	2.6	1.52%

CHART T58 (%)



Around 106,869 tons of waste were recovered or recycled in 2013, in line with recent years. This was mainly due to site remediation activity and to the delivery of used catalysts to companies specialising in the recovery of metals (Pt, Co, Mo, Ni).

TABLE 58 BIS Total waste for recovery (within and external to the site)

Parameter	2010	2011	2012	2013
Waste sent for recovery	112,691	107,611	109,854	106,866

The breakdown of hazardous and non-hazardous waste sent from the site for recovery is shown in Table 59. It can be seen that more non-hazardous waste than hazardous waste was sent for recovery again in 2013.

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

Parameter	2010	2011	2012	2013
Hazardous waste sent for recovery (% of total waste sent for recovery)	59.1	44.9	32.4	41.85%
Non-hazardous waste sent for recovery (% of total waste sent for recovery)	40.9	55.1	67.6	58.15%

4.2.7 – Ental spills into the soil and the subsoil

Previous activities

On the basis of Ministerial Decree 468 of 18 September 2001 and the Ministerial Decree of 12 March 2003, the Sarroch municipal area, in which the Sarlux production site is located, and 33 other municipalities were included in an area called "Sulcis Iglesiente Guspinese", identified as a site of national interest for remediation. For this reason, in accordance with the provisions of Ministerial Decree 471 of 25 October 1999 (regulations containing criteria, procedures and methods for the safety, remediation and environmental restoration of polluted sites), and having identified a problem of contamination of the soil, subsoil and underground water on the Sarroch production site, the company submitted its Site Characterisation Plan on the condition of the terrain and the layers of water beneath the refinery to the competent authorities.

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

In 2004, in conjunction with the Italian Ministry for the Environment, the Region of Sardinia, the Province of Cagliari, Local Health Authority no. 8 and the Municipality of Sarroch, the company defined the procedures for implementing the Site Characterisation Plan, which set out a series of surveys to be carried out, and proposed the measures needed to protect the environment and safeguard public health. These principally involved:

1) execution of the Site Characterisation Plan
2) emergency safety plan (MISE) through the construction of a dynamic water-extracting barrier (see Figure 19)
3) emergency operational plan (MISOP) through construction of a physical water-extracting barrier on the sea side (see Figure 19)
4) a remediation project for soil hot spots in the West Tank Farm area and subsequently, at the Site Manager's request, a specific project to decontaminate soil in the area of the disused Basin ST1

[site characterisation work]

The Site Characterisation Plan was completed in December 2010, with 879 surveys, 144 piezometric tests and 539 gas surveys carried out. All documentation for the Characterisation Plan was finalised during 2011 and 2012, and was submitted to the supervisory bodies for approval.

The planning phase for the MISE emergency safety plan was completed in 2007 with the construction of a hydraulic barrier and supernatant recovery systems. All 46 wells required have been created and put into operation: of these, 26 are operating on the mid-line, extracting contaminated water and recovering the supernatant, while 13 are being used for groundwater replenishment on the sea side, including one outside the plant to the south, to prevent salt inflows. The remaining seven wells are hydrogeologically upstream, controlling groundwater levels, and became operational in early 2011. In September 2011, replenishment tests were carried out on the 13 wells on the sea side.

The physical barrier planned under the MISOP will extend over 3,050m and will be constructed using jet grouting and waterproofing injections. Field tests were carried out in 2009 to test operating and construction conditions in preparation for the implementation project. Preliminary surveys were carried out in 2010 to assess the best techniques for installing barriers on the southern side of the refinery. The tender specifications for the whole project, subdivided into operational lots, were defined in 2011.

The remediation project for hot spots in the West Tank Farm area began in 2008, while the emergency safety plan for soil in the area of the disused Tank ST1 began in 2009.

[the Intervention Plan]

In line with the specific project schedules approved by the Ministry, the process of earth excavation, soil washing for removal of hydrocarbons and the subsequent resto-

ration of washed soil to the original site has been ongoing at the West Tank Farm area, while contaminated earth from the former ST1 area has been removed and delivered to the authorised landfill.

In 2010, sampling and analysis was carried out jointly with ARPAS to approve the replacement of washed soil and uncontaminated soil in the West Tank Farm area. With regard to the former ST1 area, in December 2011 the plan to make the site permanently safe was presented. After the plan has been implemented, restitution of the former ST 1 area will be required.

In 2013, a draft procedural change was presented to the Ministry for the Environment and competent authorities with a request to expand the extraction and replenishment system rather than building a physical barrier. The draft is currently being reviewed by the ministries and authorities in charge. The site risk analysis was also forwarded in 2013.

In 2013, the quantity of supernatant recovered fell appreciably compared with the previous year, indicating a clear improvement in the condition of the contaminated subsoil (see Table 60).

TABLE 60 Previous activities

Parameter	2010	2011	2012	2013
Ratio of quantity of product recovered to water drained* (%)	1.39	0.30	0.16	0.05

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

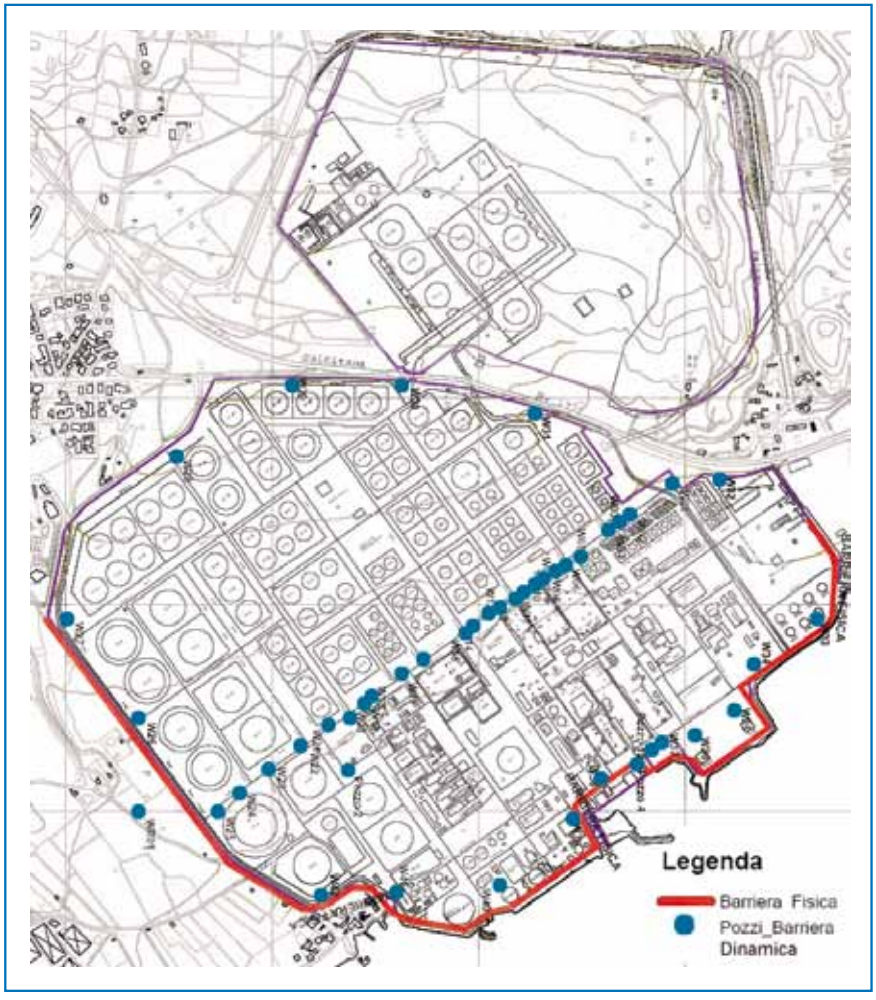


FIGURE 19 Location of wells constituting the dynamic carrier and planned location of physical barrier

Prevention of soil and subsoil contamination

In condizioni ordinarie, non sussiste la possibilità di una contaminazione del suolo e sottosuolo, evento ipotizzabile soltanto a seguito di un rilascio accidentale di idrocarburi liquidi (materie prime, semilavorati e prodotti). Questa tipologia di eventi può interessare, in particolare, le aree di stoccaggio ed i percorsi sottostanti le tubazioni che collegano impianti, serbatoi e pontile. Le valutazioni relative alle situazioni anomale e di emergenza correlate alla movimentazione interna e allo stoccaggio delle sostanze pericolose sono studiate e documentate nel Rapporto di Sicurezza (paragrafo 3.3, pagina 38). In termini di indicatori, la tabella 61 mostra come gli interventi per la prevenzione della contaminazione di suolo e sottosuolo siano in costante crescita. Nel 2013 è stato attuato oltre il 90% delle attività ispettive previste per l'anno dal piano pluriennale e dal budget.

TABLE 61 Activities to prevent contamination

Parameter	2010	2011	2012	2013
Paving of containment basins for crude oil and product tanks: paved surface/total surface (cumulative figure) (%)	39.2	40.1	42.0	44.8
Protection of soil in storage areas: no. of double bottom tanks (cumulative figure)	15	16	20	22
Protection of the soil along pipeways: paved surface (cumulative figure) (m2)	45,285	50,504	53,831	56,981
Inspection and maintenance: non-destructive testing expenses (€ thousand/year)	870	1,562	1,420	2,140

CHART T61A

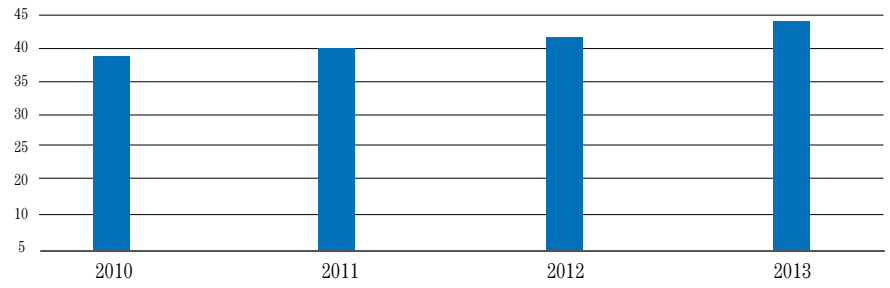


CHART T61B

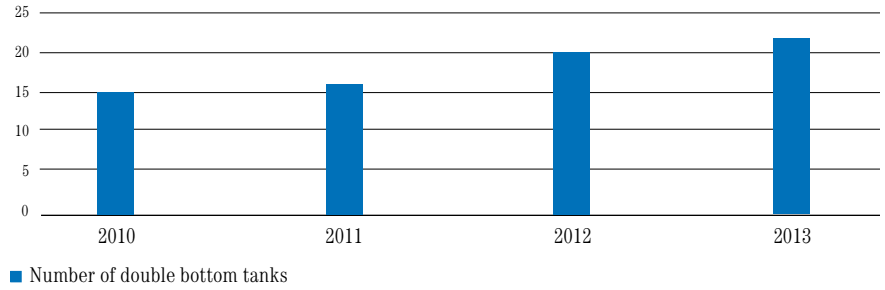


CHART T61C

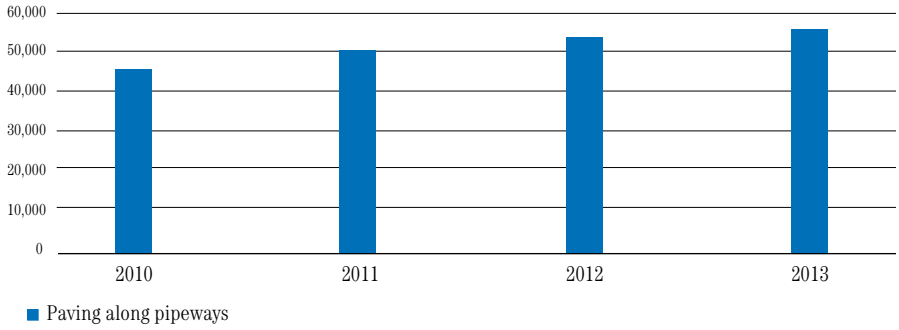
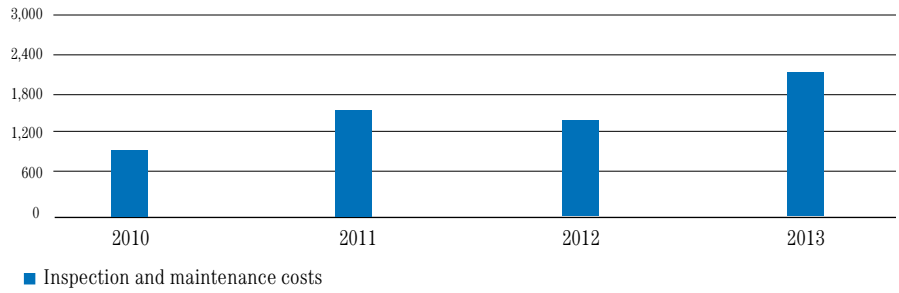


CHART T61D (EUR thousand)



4.2.8 – Noise

To monitor noise pollution, the production site was involved in annual, systematic controls of sound levels in the local area, by means of phonometric surveys to establish the acoustic characteristics of the surrounding environment. The surveys have been repeated over the years at numerous measurement points, some of which are located in the plant and in the streets adjacent to its boundaries, while others are in access roads and in Sarroch city centre. The location of the measurement points is shown on the map in Figure 4c, which is based on the Municipal Town Plan.

[Prime Ministerial decree of 1 March 1991]

The limits that must be complied with at the measurement points derive from the Acoustic Classification Plan, which was approved by the municipal administration with municipal council resolution no. 6 of 13 April 2011. This plan divides the region into uniform acoustic areas governed by limits specified by Art. 2 of Law 477/98 (shown in Table 62A for emission limits, measured near the source, and 62B for immission limits, measured near the receptors) and defines the acoustic category and consequently the absolute emission and immission limits that must be complied with at the sampling points.

In 2013, the sampling programme was amended to achieve a better representation of the emissive impact of the source on Sarroch city centre, again pursuant to the AIA permit.

The 2013 sampling programme represents a transition phase towards the 2014 target, i.e. shifting the monitoring system towards continuous sampling positions (H24) in the city centre, rather than intermittent measurements.

The figures recorded will therefore not always be comparable with data from previous years.

In the network monitoring configuration for 2014, four internal positions have been planned, including three within the confines of the site and six outside, in the city centre.

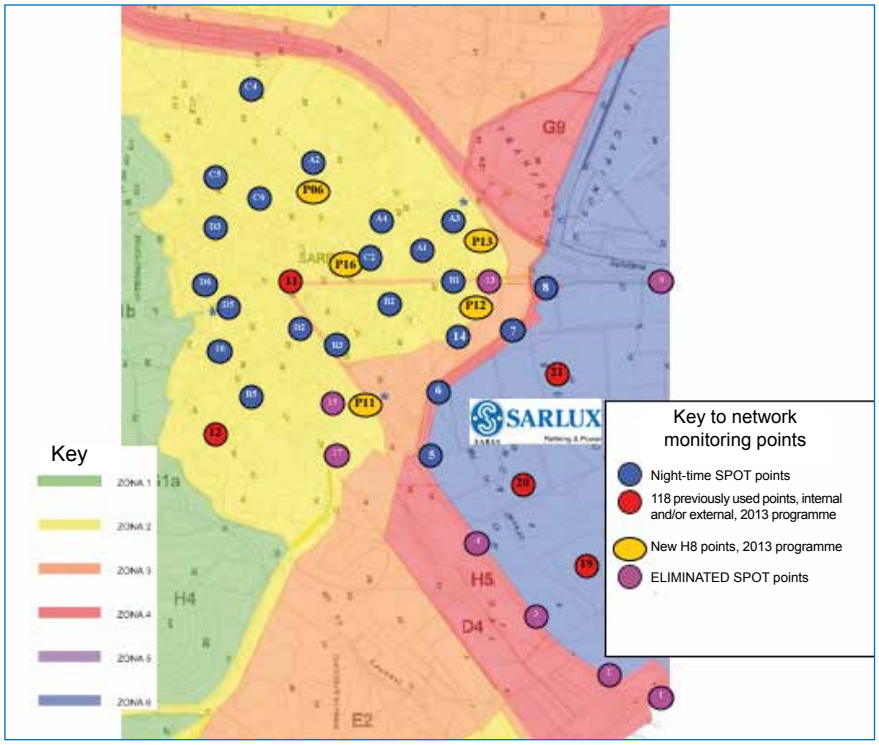


Figure 4c Municipal Acoustic Classification – the circled numbers are for measurement stations (source: Sarroch municipal website, regional planning area)

All ten positions (internal and external) will be measured continuously for at least 24 hours to give a more coherent picture between emissions from the production site and immissions attributable to it in the city centre. Only point 10, which is inside the class VI industrial area, is not shown.

Table 62 A Emission limits, Prime Ministerial Decree of 14 November 1997 – Municipal Acoustic Classification, Municipal Council Resolution no. 6 of 13 April 2011

Categories of the area's intended use	Daytime limits* LAeq [dB(A)]	Night-time limits* LAeq [dB(A)]
I particularly protected areas	45	35
II predominantly residential areas	50	40
III mixed areas	55	45
IV areas of intensive human activity	60	50
V predominantly industrial areas	65	55
VI exclusively industrial areas	65	65

* The daytime period runs from 6 a.m. to 10 p.m.; the night-time period runs from 10 p.m. to 6 a.m.

TABLE 62 B Immission limits, Prime Ministerial Decree of 14 November 1997 – Municipal Acoustic Classification, Municipal Council Resolution no. 6 of 13 April 2011

Categories of the area's intended use	Daytime limits* LAeq [dB(A)]	Night-time limits* LAeq [dB(A)]
I particularly protected areas	50	40
II predominantly residential areas	55	45
III mixed areas	60	50
IV areas of intensive human activity	65	55
V predominantly industrial areas	70	60
VI exclusively industrial areas	70	70

* The daytime period runs from 6 a.m. to 10 p.m.; the night-time period runs from 10 p.m. to 6 a.m.

Tables 63A and 63B show the noise levels recorded at some of the measurement points during the last programme. The noise recordings in the city centre, at points both within and outside the production site, provide a record of both overall emissions and immissions in the adjacent urban areas. Table 63A shows the emissions values recorded at some of the points monitored inside the production site (no. 19 and no. 21); these values provide a comparison with the emission limits set for the industrial area, given that compliance in the internal areas guarantees compliance in the external areas. For 2013, these values were compared with the values recorded in previous years inside the external boundary of the site. For applicable limits, see those set out by the Municipal Acoustic Classification (and shown in Table 62A).

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

Acoustic classification	Measurement point	Values measured [dB(A)] (L90 values)			Emission limit (applicable close to emission sources)	
		Year	Daytime	Night-time	Daytime	Night-time
VI	**3/19(**)**	2013	(*)	59.7	**65**	**65**
		2012	51.0	59.0		
		2011	54.0	56.5		
VI		2010	50.5	53.5		
	6/21(**)	2013	(*)	61.6		
		2012	40.5	40.0		
		2011	42.0	34.5		
		2010	43.0	41.5		

* The 2013 programme does not include day-time measurements.

** From 2013, the reference points for measuring emissions are those used for the internal monitoring network (19, 20 and 21), based on the consideration that if compliance with emissions limits within the site is ensured, it is all the more likely that this is ensured for emissions limits outside the site.

Table 63B shows the noise immission values in the external environment recorded at three stations located in Sarroch city centre, near the boundaries of the industrial site (nos. 11, P12 and P06, which record the immissions value for the Sarlux production site).

These values relate to the statistical parameter L90, i.e. the noise is above this level for 90% of the time. This parameter can be considered to include industrial noise, which is continuous and largely sustained over time, in the sense that the value recorded excludes one-off acoustic events and includes the noise generated by the Sarlux production site, other industrial sites and acoustic events of a significant duration not caused by the activities taking place at the production site (e.g. vehicle traffic noise).

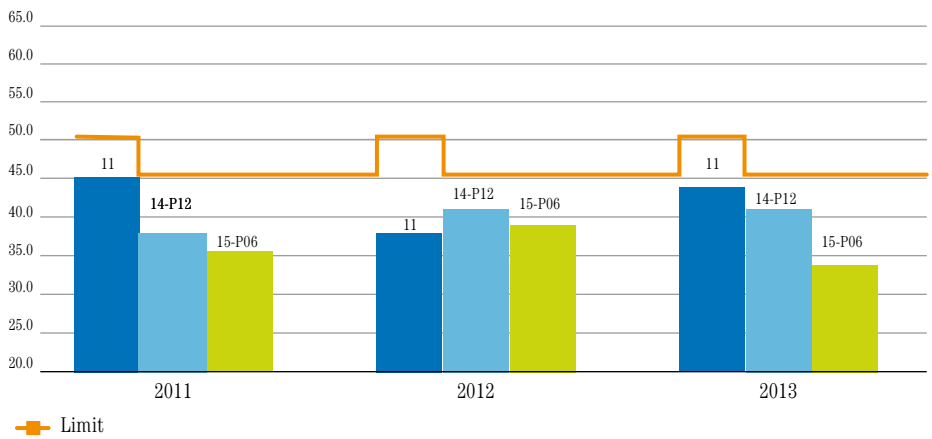
This is therefore the parameter that is most representative of the refinery's specific contribution.
For applicable limits, see those set out by the Municipal Acoustic Classification for the types of area in which the measurement points are located (and shown in Table 62B); in 2010, the Municipal Acoustic Classification was not in force, and the values applied were those set out in Article 6 of the Ministerial Decree of 1 March 1991.

TABLE 63B Night-time noise (immission) levels at representative points in the centre of Sarroch

Acoustic classification	Measurement point	Values measured [dB(A)] (L90 values)			Immission limit (applicable to the external environment)	
		Year	Daytime	Night-time	Daytime	Night-time
III	11	2013	(*)	44.0	60	50
		2012	43.3	38.3		
		2011	50.6	44.9		
		2010	49.5	44.5		
II	14/P12 (**)	2013	(*)	40.9	55	45
		2012	39.0	41.5		
		2011	42.0	38.0		
		2010	45.0	45.5(****)		
	15/P06 (***)	2013	(*)	33.5		
		2012	39.0	39.0		
		2011	41.0	34.5		
		2010	43.5	43.0		

* The 2013 programme does not include daytime measurements at the continuous monitoring points outside the production site.
** Point 14 has been replaced by point P12 for continuous night-time monitoring.
*** Point 15 has been replaced by point P06 for continuous night-time monitoring.
*** 2010 limit = 60dB (A) as the Municipal Acoustic Classification Plan was not yet in effect.

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



Immissions were measured exclusively during the night as noise emissions are essentially constant; compliance during the night-time is a guarantee of compliance during the daytime, as was widely shown in previous measurement programmes. Graph T63B shows the trend in the data recorded at the measurement points in Sarroch city centre, shown in Table 63B, compared with the limits specified by the Municipal Acoustic Classification, shown in Table 62B. Measuring points 14/P12 and 15/P06 are located in the Class II "Mainly residential area", while point 11 is located in the Class III "Mixed area". The charts summarise the results of measurements in the city centre, at night-time only, for the past three years, and the relative limits that apply.

Each bar of the histogram is labelled with a number identifying the corresponding noise measurement station shown in Figure 20 on page 103.
The differential criterion is not applicable to the existing continuous production cycle plants or plants that already held permits at the time the decree came into force, as in the case of the refinery and the IGCC at the Sarroch site, pursuant to Art. 31 of Ministerial Decree of 11 December 1996. In 2013, two electricity black-outs caused the closure of a number of production plants. They were subsequently restarted, and while the CO Boiler steam production section was being restarted at the FCC plant, unusual levels of noise were recorded. The anomaly was duly reported to the competent authorities for Sarroch city centre. As a corrective action, the silencing system in this unit was immediately upgraded.

4.2.9 – Visual impact

The company has also made a commitment to improving the plant's visual impact, which has been stepped up since 2000. Improvements were made to structures and spaces comprising areas in direct contact with the outside: these involved naturalisation projects to provide areas of continuity between the site and the region. In particular, the junction on the S.S. 195 was rebuilt and the green spaces in the car park were improved. Work has been completed in recent years to prevent a steam plume from rising from the boilers in the combined-cycle section of the IGCC unit. The new installation has eliminated the visual impact of the steam plume, and also enabled heat to be recovered for use in process activities.
In 2013, the programme to cut down the volume of hydrocarbons being sent to the flare system was continued.

4.2.10 – Odours

In the past, the company received a number of reports on the presence of unpleasant odours outside the site. As a result, in 2004, it conducted an initial investigation to identify the sources of the odours reported in the surrounding area. Over the next few years, the company undertook more in-depth investigations and analysis, which led in 2008, after a testing phase, to the development of a monitoring methodology using a combination of analytical techniques, modelling and olfactometric assessments. The ultimate aim of the work is to arrive at an assessment of the main odour-emitting sources and the possible events that could generate an olfactory impact on the surrounding area.
In 2009, a number of different sampling and analysis activities were performed within the refinery (sources) and in the parts of Sarroch most at risk (receivers). These activities were necessary to validate the methodology and prepare the Monitoring and Control Plan for odour emissions. In accordance with the regulations in the AIA permit (preliminary assessment of 12 January 2009), the Monitoring and Control Plan was submitted to the Ministry for the Environment in October 2009. This document describes the methodology, timeframe and methods of communicating the results obtained.
The methodology is based on an integrated approach that uses instrumentation and sensory techniques to examine the odour-emitting sources and identify the compounds responsible for the odour (tracers), in conjunction with modelling to study the dispersion of odour-emitting compounds into the atmosphere. This approach provides an accurate assessment of the olfactory impact produced by the emitting source on the receivers at risk.
The Plan includes two six-monthly monitoring campaigns: a "summer" one in the

spring/summer (June-July) and a "winter" one in the autumn/winter period (November-December). In each campaign, assessments are carried out at both the refinery and the points at risk in Sarroch.
The first monitoring campaign was carried out in June 2010, while the second was completed in March 2011.
In 2011, a study on the dispersion of odour emissions into the atmosphere was conducted using an atmospheric diffusion model to simulate the transport and diffusion of odours. The main aim of the study was to define a monitoring plan and an analytical plan appropriate for the phenomenon of dispersion from the industrial site under examination.
It also emerged that the use of statistical methodology for the monitoring and management of odour emissions from the site needs to be consolidated over time, increasing the statistical sample (number of statistical measures) in order to examine in more depth potential correlations between the odour impact and the statistical concentrations identified. An odour monitoring plan has been developed based on the results of the work carried out from 2011 to date. This involves two monitoring campaigns, with the first to be carried out in the summer period (as the worst case), and the second in the winter period, in order to increase the statistical analysis of the results.

4.2.11 – Less significant environmental aspects

PCBs

[Ministerial Decree 11/10/2001]

Polychlorinated byphenals (PCBs) are chlorinated organic compounds that are chemically and thermally extremely stable. For this reason, they were widely used in the past as dielectric fluids in electrical equipment (e.g. industrial transformers) before the dangers were recognised and their use banned.
Today, the sale and use of PCBs in new applications is prohibited but, given the recognised difficulties in disposing of such substances, there are various legal provisions that apply to existing equipment, according to the quantities and concentrations of PCBs present.
Following an inventory and periodic analytical checks, the 130 oil-insulated transformers were decontaminated by removing the PCBs. Periodic checks are undertaken to ascertain the condition of the transformers and to ensure that the PCB content is kept below the minimum threshold required by law to consider an item of equipment decontaminated.

Asbestos

[Law 257/1992, as subsequently amended]

Asbestos was used for a long time in a variety of industrial and domestic applications until the dangers of this material were discovered and its use banned.
Over the years, the site has implemented the requirements of sector legislation. It has compiled an inventory of materials containing asbestos, notified all the supervisory authorities and decontaminated plant and equipment when any maintenance was carried out.
Cement asbestos roofs have gradually been removed over the years, from a surface area of 10,800 m^2 in 2004 to the complete absence of such roofs on the site today.
Any asbestos still present (as an insulator used in the layers of insulation on pipes) is protected from the effects of atmospheric agents that could alter its integrity, and is removed when maintenance work is carried out. Specialist firms are used when asbestos is discovered.

Refrigerant gases

[Regulation EC/2037/00 and Presidential Decree 147/2006, Regulation EC 842/2006]

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

All the equipment in the facility is checked via periodic maintenance by specialist personnel. In recent years, the company has gradually been replacing ozone-depleting substances with others that do not have this effect.

Currently, the only substance of this type is Freon R22, which was present in a total quantity of 278.7 kg in December 2013, down by approximately 17% compared with the previous year. The use of this type of substance as virgin gas in existing air conditioning plants is permitted until 31 December 2009. As recycled or reclaimed gas, it will be permitted until 31 December 2014.

From 1 January 2015, its use as recycled or reclaimed gas will also be prohibited. The declaration to be sent to ISPRA relating to the substances that could have a greenhouse effect is currently being prepared.

Non-ionising radiation (electromagnetic fields)

[Prime Ministerial decree of 8 July 2003].

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

- point sources such as pumps, electrical switchboards, motors
- linear sources, i.e. conductor cables for transmitting electricity, such as the buried cable operating at 380 kV that transmits electricity from the IGCC to the ENEL electrical substation situated on the western boundary of the site

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

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

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

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

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

The magnetic field values measured along the external boundary do not exceed 1.5 µTesla, compared to a limit of 100 µTesla for exposure of the general public and a limit of 3 µTesla, set as a qualitative objective. As expected, the maximum values were measured along the route of the buried cable and near to the ENEL electrical substation. These were 20 µTesla and 10 µTesla respectively. In 2013, another periodic check was carried out: this confirmed the low values previously recorded, which are well below the legal limit for population exposure.

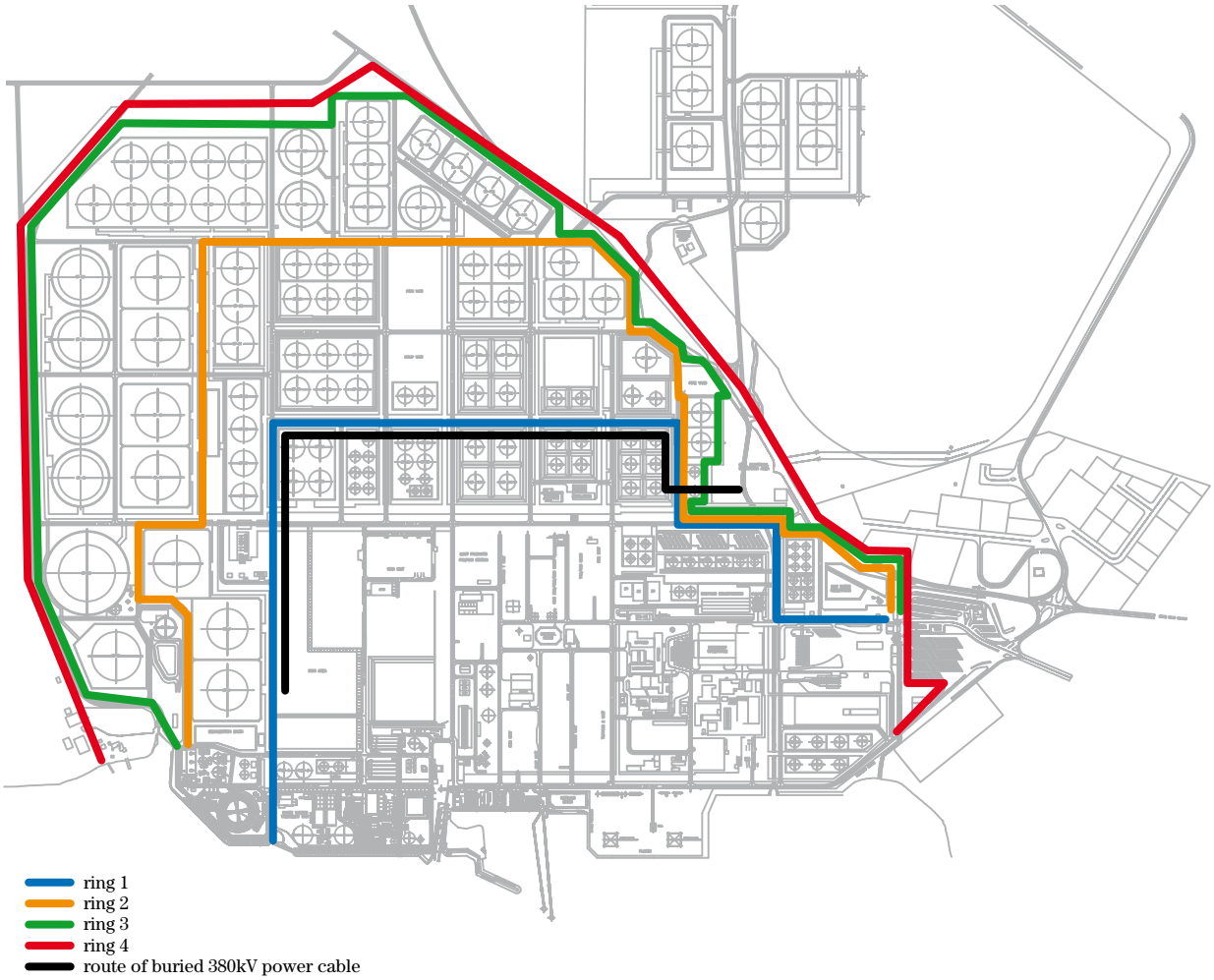


FIGURE 21 Map of the sampling lines for the survey of electromagnetic fields

Ionising radiation

The sources of ionising radiation in the facility consist of small radiogenic sources in level gauges and analytical equipment located in the internal laboratory. All radiogenic sources are adequately confined and are checked annually by an appropriately qualified specialist pursuant to

Legislative Decree 230/95, as subsequently amended.

The assessments made in previous years, applicable to abnormal and emergency conditions, were repeated in 2013.

[Legislative Decree 230/95].

4.3 – Indirect environmental aspects

4.3.1 – Product design

4.3.1.1 – General

Sarlux carries out research and development activities aimed at designing products that meet the demands of the market and the requirements of environmental legislation. Implementing plans to modify products usually also requires adjustments to be made to existing plants. The modifications that need to be carried out on the site's plant and equipment are also designed and developed in-house with the assistance of specialist engineering companies.

As shown in Table 64, the total number of hours spent on product design and plant engineering in 2013 increased in line with previous years.

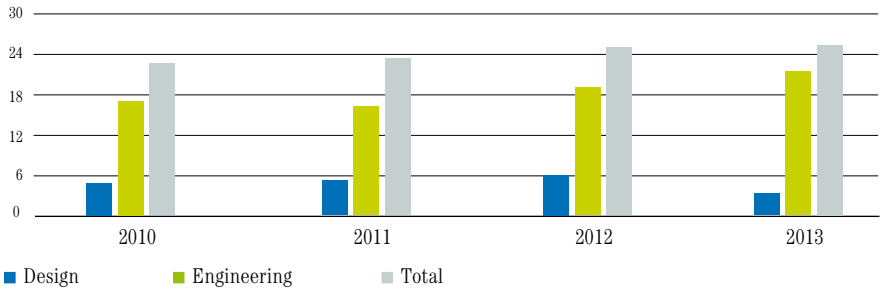
In the second half of the year, a new company structure was implemented, whereby greater resources were deployed in plant engineering by comparison with product design. In absolute terms, this generated an overall increase (25.7 hours in total, compared with 25.3 hours in 2012).

The total hours recorded in 2013 confirm the ongoing commitment to the research and engineering required.

TABLE 64 Design and engineering

Parameter	2010	2011	2012	2013
Product design hours/thousands of hours worked	4.5	5.4	5.8	3.6
Plant & equipment engineering hours/thousands of hours worked	17.9	17.5	19.5	22.1
Total hours of product design and plant engineering/thousands of hours worked	**22.4**	**22.9**	**25.3**	**25.7**

CHART T64 (hours/thousands of hours worked)



4.3.1.2 – Low-sulphur fuel oil

In recent years, the production of motor vehicle fuels has been guided by legislation towards a decisive reduction in sulphur, as described below.:

[direttiva 98/70/CE "Autoil", modificata dalla direttiva 2003/17/CE]

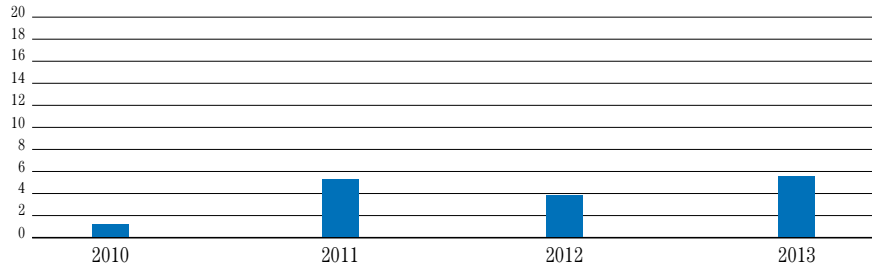
From 1 January 2005	- sulphur content in gasoline and diesel fuel must be less than 50 ppm - the sale of gasoline and diesel fuel with sulphur content of less than 10 ppm
From 1 January 2009	- sulphur content in gasoline and diesel fuel must be less than 10 ppm

To enable the plant to achieve the 2009 objective for reducing the sulphur content of gasoline, it was necessary to adapt the FCC plant by installing the new U800 desulphurisation unit. Note how from 2005 to 2008 (particularly in 2008) the quantity of sulphur in finished products entering the market decreased significantly, which led to the increase in the quantity of sulphur sold as a product.
This can be attributed to the company's ongoing investment in the desulphurisation capacity of the production plants, which led to the completion of the gasoline desulphurisation plant in 2008. This has allowed the refinery to comply with the new European requirements stipulating a sulphur content in gasoline of 10 ppm, which entered into force on 1 January 2009.
As shown in Table 65, the sulphur content in products that entered the market showed a significant increase in 2013 compared with the previous year. This was a consequence of the long-scheduled closure of MHC2, partially replaced with MHC1 atmospheric vacuum gas oil resulting in less desulphurisation.

TABLE 65 Sulphur content in products

Parameter	2010	2011	2012	2013
Quantity of sulphur in products/quantity of sulphur entering the site with raw materials (%)	1.3	5.4	3.8	5.6

CHART T65 (%)

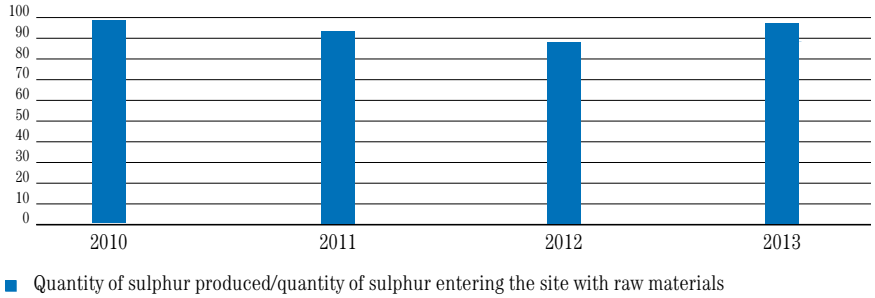


2013 saw another increase in the quantity of sulphur recovered in the production cycle compared with the quantity entering the site, as shown in Table 66

TABLE 66 Quantity of sulphur recovered in the production cycle

Parameter	2010	2011	2012	2013
Quantity of sulphur produced/quantity of sulphur entering the site with raw materials (%)	97.1	92.7	89.6	94.4

CHART T66 (%)



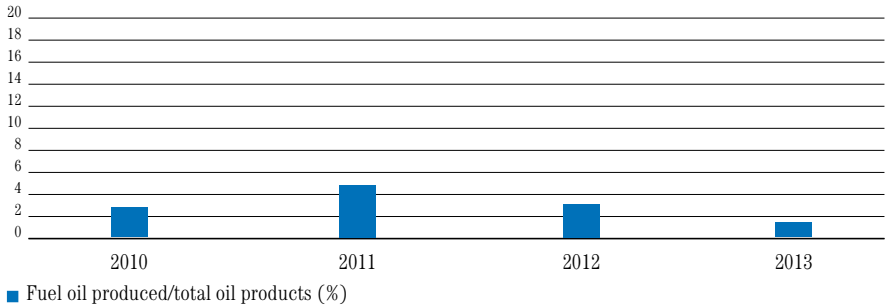
Range of oil products

In recent years, the production and sale of oil products has increasingly revolved around the "light" fractions, while the refinery's production of heavy distillates was for the most part destined to be converted into syngas for the purposes of generating electricity in the IGCC. Table 67 below shows the figures relating to the fuel oil fraction produced compared with total oil products. The result for 2013 also confirms the strategy of keeping the fuel oil quota at minimum values and focusing on production for purely internal use.

TABLE 67 Fuel oil fraction as a percentage of total oil products

Parameter	2010	2011	2012	2013
Fuel oil produced/total oil products (%)	2.5	4.7	2.0	1.6

CHART T67 (%)



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

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

Based on the foregoing, it can be observed that:

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

4.3.2. – Transport

Maritime traffic

All raw materials entering the site and a significant portion of oil products leaving the site are transported by sea.

[MARPOL 73/78, the international convention on the prevention of pollution from ships, and Regulation 417/2002/EC, as amended by Regulation 1726/2003/EC]

Given the large number of ships (around 650-750 per year), the plant has for several years promoted a policy of selecting and checking the ships used, with the aim of preventing accidents and spills of hazardous substances at sea. It has done this ahead of the deadlines stipulated by European regulations on discontinuing the use of single-hulled ships.

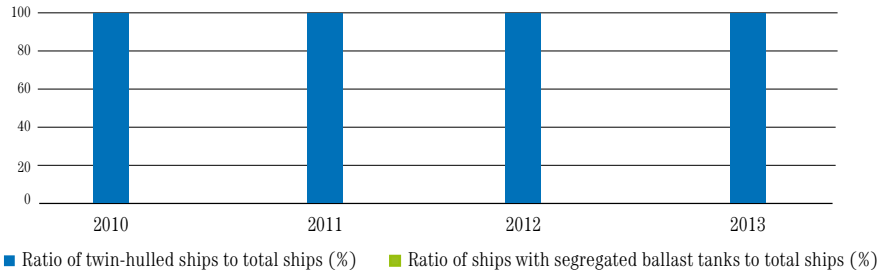
The company (then Saras) met the target stipulated by the regulations for discontinuing single-hulled ships (2010) well ahead of schedule in 2006. Sarlux is currently continuing the activity begun by Saras aimed at considerably reducing its use of ships with segregated ballast tanks (SBTs), which must be taken out of operation by 2015.

As shown in Table 68, in the last four-year period, 2010-2013, only twin-hulled ships have been used. In the same period, no ships with SBTs were used.

TABLE 68 Twin-hulled ships with segregated ballast tanks

Parameter	2010	2011	2012	2013
Ratio of twin-hulled ships to total ships (%)	100.0	100.0	100.0	100.0
Ratio of ships with segregated ballast tanks to total ships (%)	0	0	0	0

CHART T68 (%)



Given the potential seriousness of accidents at sea, ships have always been and still are selected by consulting international databases (e.g. SIRE) containing the results of checks made on transport ships. In addition, the company carries out a programme of direct checks, encompassing both technical and operational aspects, on ships arriving at the marine terminal.

[table of objectives and measures: objective 4B, page 127]

The benchmark specification for checks is the “Minimum Safety Criteria” document adopted first by Saras and now by Sarlux, in accordance with the ship inspection protocols established by the Oil Companies International Marine Forum (OCIMF), an organisation that promotes improvements in safety and responsible environmental management in the transportation of oil and its derivatives, and marine terminal management. A high number of ships are checked and this has increased over the years, as shown in Table 69. The ships expected at the site are meticulously checked by specialist companies at the port of departure before they set sail.

TABLE 69 Ship safety checks

Parameter	2010	2011	2012	2013
Ratio of number of ships checked to total ships (%)	43.2	46.2	45.9	46.4

CHART T69 (%)

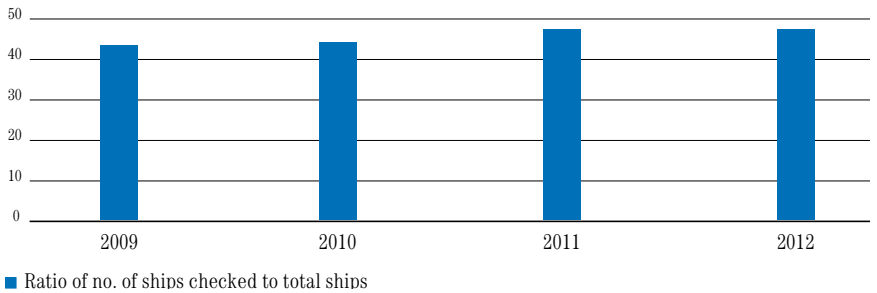


table of objectives and measures: objective 4C, page; 127]

Road traffic

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

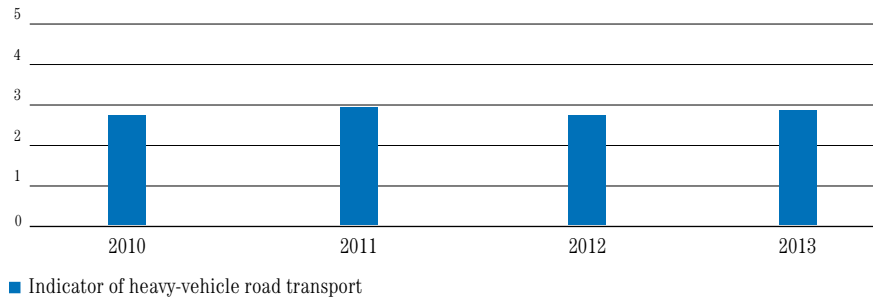
- transport of refined oil products via tanker trucks (around 33,000 vehicles a year)
- transport of sulphur via articulated lorries (around 3,600 vehicles a year)
- transport of auxiliary production materials and substances (around 400 vehicles a month)
- transport of employees of the company and of external companies working on the site (around 1,000 motor vehicles and 60 buses a day)

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

TABLE 70 Road traffic

Parameter	2010	2011	2012	2013
No. of heavy vehicles/kt raw materials	2.87	2.90	2.79	2.81

CHART T70 (%)



In 2007, the company implemented a regular programme of checks to verify the compliance of the tanker trucks used for transporting products. In 2013, 26.7% of tanker trucks authorised for entry were checked. The number has risen steadily from 17% in 2007.

4.3.3 – Environmental conduct of external Companies

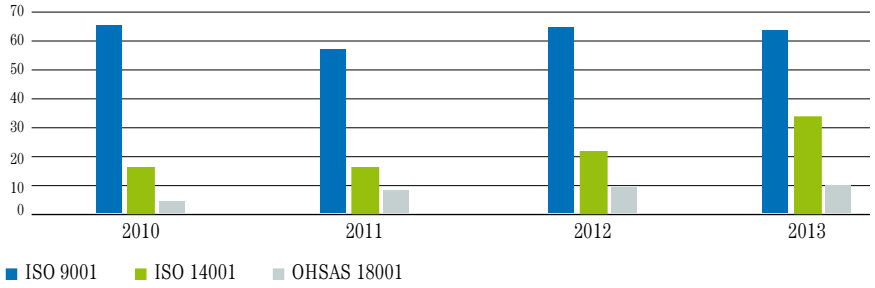
Sarlux has put in place appropriate procedures governing relationships with third parties involved in the site's activities. These are intended to ensure that the conduct of the staff of external companies complies with Sarlux's policies on safety, health and the environment.

Sarlux places great value on the commitment of external companies to achieve and maintain certification of their quality, environmental and safety management systems. In 2013, the number of companies with environmental certification (see Table 71) significantly increased versus the figure for 2012.

TABLE 71 Percentage of external companies with certified management systems

Parameter	2010	2011	2012	2013
Subcontractors with ISO 9001 certification (quality management system) (%)	66.7	58.2	64.9	64.8
Subcontractors with ISO 14001 certification (environmental management system) (%)	17.2	17.0	21.2	31.1
Subcontractors with OHSAS 18001 certification (occupational health and safety management system) (%)	4.9	7.4	9.6	9.7

CHART T71 (%)



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

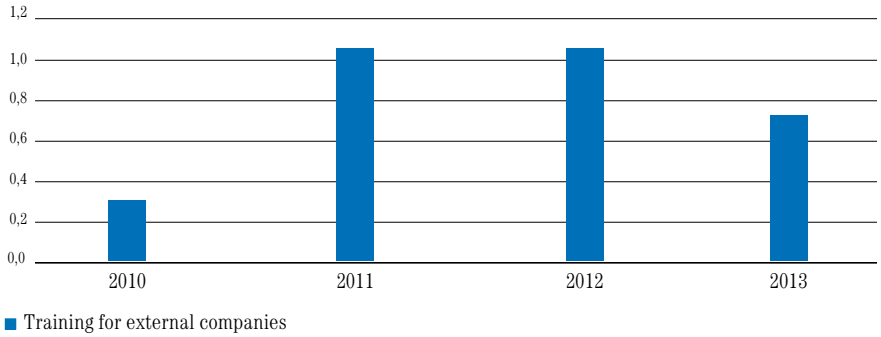
Before entering the facility, employees of external companies undergo further basic training on the risks relevant to the areas in which they will work. This is in addition to the requirement that they must work in accordance with their own company's organisational safety plan.

Sarlux plays an active role in training the employees of external companies on health, safety and environmental protection. Table 72 shows how the number of training hours provided to employees of external companies has increased significantly compared with previous years.

TABLE 72 Training for external companies

Parameter	2010	2011	2012	2013
Training for external companies: no. of training hours on the environment and safety run by the site/no. of hours worked by external companies (%)	0.36	1.06	1.07	0.76

CHART T72 (%)



One of the major impacts of external companies' activities, in environmental management terms, relates to the generation and management of waste.
Two specialist waste treatment companies operate on the site, as shown in section 4.2.6 on page 96. Specific procedures govern the methods of waste management at the plant, including the transfer of waste to waste treatment plants and storage areas. The work of the external companies that manage the waste treatment plants is subject to regular checks and various audit activities, in accordance with the waste management procedure. More generally, the conduct of employees of external companies is subject to checks under the Arrow programme (section 4.4.2, page 120). Note that most of the waste generated by the activities of external companies on the site is dealt with and accounted for by Sarlux. This applies particularly in periods of general shutdown and plant maintenance when more waste is produced.

4.4 – Management performance indicators

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

4.4.1 – Training on environmental protection and safety

Staff training on environmental protection was given a particular boost in 2005 with the launch of information and awareness-raising initiatives on the environmental management system throughout the company. Specific in-depth training sessions were arranged for operational staff, focusing particularly on the management of atmospheric emissions and discharges into water. In order to achieve ongoing environmental improvements, it is essential to provide training to personnel, both to bring them up to date and to raise awareness of the importance of their individual roles.
In 2013, operational resources were concentrated on instruction during three phases of company training:

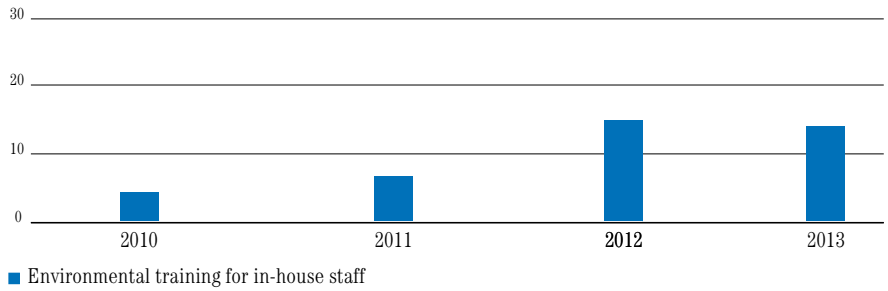
- a two-hour module on the Environmental Management System, provided as part of general orientation training for new recruits
- dedicated continuous training, as every year, on issues of environmental conservation and protection with a special emphasis in 2013 on procedures with a high environmental impact
- technical training for specialists

In total, 4,500 hours of environmental training were delivered, representing13.1% of total training hours.

TABLE 73 Environmental training for in-house staff

Parameter	2010	2011	2012	2013
Environmental training for in-house staff: no. of environmental training hours/total training hours (%)	4.0	6.0	13.7	13.1

CHART T73 (%)

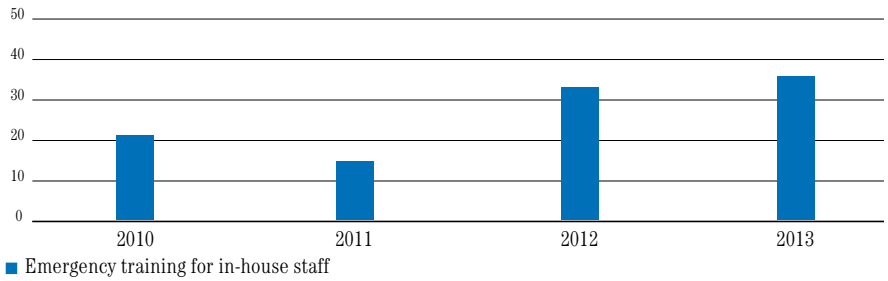


Training on health and safety issues complements environmental training. Training on these issues begins when staff first join the company and continues throughout their working lives at the site, with theoretical instruction and practical exercises. Of the more than 23,700 hours dedicated to health and safety, specific training was given in emergency management for staff assigned to fire-fighting teams. Sarlux's commitment to emergency management training and exercises, which could have an impact on both the safety of individuals and environment protection, can be seen from the figures in Table 74.

TABLE 74 Emergency management training for in-house employees

Parameter	2010	2011	2012	2013
Emergency training: no. of emergency training hours/total no. of training hours (%)	21.00	14.00	32.40	33.40

CHART T74 (%)



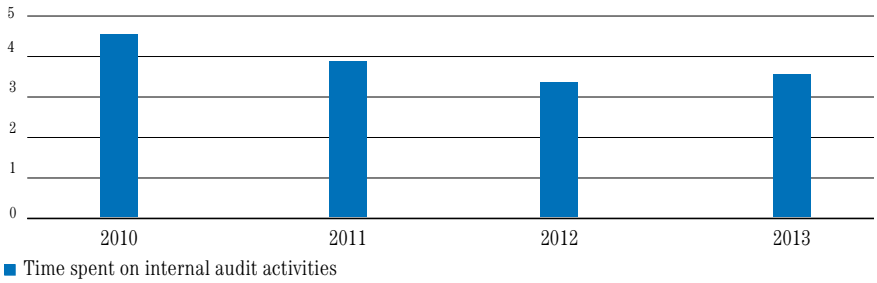
4.4.2 – Audit activities

Sarlux places particular emphasis on internal audits as a verification, training and improvement tool. The company has a team of 52 internal auditors, from both Saras and Sarlux, trained to carry out quality, environmental and safety audits. Internal audit activities are planned annually and cover all activities that directly or indirectly affect environmental, safety and quality management issues for each audited process. Audits may reveal areas for improvement or failure to comply with the procedures of the management system or reference legislation. These nonconformities are formally reported to the managers of the activities in which they were encountered so that measures can be identified to restore conformity and avoid a repetition of such breaches. The indicator rose slightly compared with 2012, reflecting greater participation in the activity.

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

Parameter	2010	2011	2012	2013
Internal audit activities: no. of hours spent on audit/total hours worked by auditors and employees undergoing audits (%)	4.43	3.97	3.40	3.58

CHART T75 (‰)



Other checks on the methods of managing operating activities, carried out by subcontractors, are also performed regularly following the launch of the Arrow programme. The programme is a comprehensive plan of field inspection visits (audits) covering the whole of the site, the adjoining national storage facility and the wharf. The aim of the project is to develop an awareness of accident prevention and environmental protection both in the audited employees and the auditors. To achieve this aim, the Arrow programme relies on an extensive programme of inspections in the facility's 24 operational and administrative areas. Each inspection is carried out by a team of two assessors. The activity is solely focused on checking the correct application of work permit procedures.

TABLE 76 Arrow programme activities (field inspections)

Parameter	2010	2011	2012	2013
No. of hours spent on activities	1,036	855	1,125	1,115
Hours spent/hours worked by auditors and employees audited (%)	0.12	0.12	0.12	0.12

4.4.3 – Investment in environmental protection and safety

The site's commitment to continually improving environmental performance can also be measured and evaluated in terms of the financial investment devoted to this purpose. The figures in Table 77 show the company's strong commitment on this front, with total investment of EUR 50 million in the past four years. In 2013, the main investments were as follows:

- Study to reduce dust from the CO-Boiler
- Study and preparations to recover energy efficiency in various site systems
- Ongoing tank and pipeway paving
- Ongoing installation of double bottoms in tanks
- Creation of emissions monitoring systems

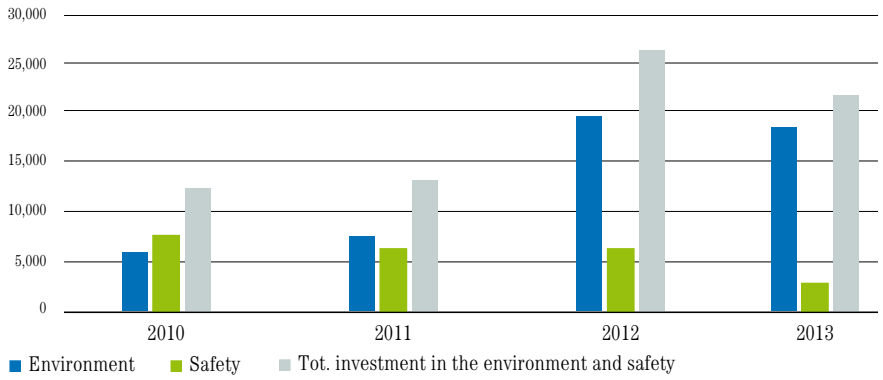
Between 2010 and 2013, the company (first Saras and later Sarlux) invested nearly EUR 25 million in continually upgrading safety levels at the site. The main measures funded in 2013 involved both the improvement of existing safety equipment and modifications to plant and product handling systems, as follows:

- fitting of further product volume interception valves to the FCC plant
- the continued upgrading of the fire prevention system and new equipment
- the continued upgrading of the fire and hydrocarbon detection systems (alkalisation plant)
- the completion of the upgrade of the fire prevention systems at the facilities
- safety improvements within the tank containment basins;

TABLE 77 Investment in improvements to environmental protection and safety

Parameter	2010	2011	2012	2013
Investment in environmental protection (k€/year)	5,680	6,485	19,445	19,152
Investment in safety (k€/year)	7,640	6,889	7,300	3,161
Total investment in the environment and safety (k€/year)	**13,320**	**13,374**	**26,745**	**22,313**

CHART T77 (k€/year)



5.
Environmental objectives and programmes

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

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

The facts and figures show the plant's commitments to expected new improvements in the next few years: the result of technological and managerial decisions always made with an eye to improving the environment as well as health and safety.

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

5. Environmental objectives and programmes

5.1 – Environmental improvement objectives planned for 2010-2013

With regard to the objectives presented in this section, the programme of investments for the period 2010-2013 had to be revised, mainly due to the current situation on the international market and the recent global economic and financial crisis.
Because of the rescheduling, as set out in the table on the next page, implementation of some investments has been postponed for up to two years.

The key environmental aspects covered by the objectives set out in the plan are as follows:

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

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

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

For each EMAS objective, one or more actions have been put in place and the indicators for monitoring the progress made towards achieving the objective and the period of implementation have been identified.
The objectives tables have been changed as of this edition of the Environmental Declaration, by comparison with their original structure, in order to provide a better organic picture of how the individual objectives have developed, as well as more detail on the various phases designed to assess the progress made towards the goals.

Implementation sheets for the Improvement Plan

OPEN OBJECTIVES

Discharges into water **(objective 1A)** **from the 2013-2016 plan**

Environmental aspect	Objective	Actioning manager Approved costs	Goals and scheduled actions	Completion date	Progress at 31/12/2013
DISCHARGES INTO WATER	Reduction of discharges into sea water	Technology Manager 5,700 k€	**Goals:** Creation of a demineralisation plant for wastewater from strippers (SWS) in order to reduce the inflow into the wastewater treatment plant (TAS) upstream by around 15%. At the same time, the new plant would reduce the need to desalinate sea water (which costs more) to produce demineralised water. **Scheduled actions:**	31/12/2016	In progress
			1. Assignment of contract	December 2013	DONE
			2. Authorisations	October 2014	In progress
			3. Material provisions	December 2014	Not started
			4. Construction	December 2015	Not started
			5. Launch and testing	December 2016	Not started

Notes:

Discharges into water, water consumption **(objective 1B)** **from the 2013-2016 plan**

Environmental aspect	Objective	Actioning manager Approved costs	Goals and scheduled actions	Completion date	Progress at 31/12/2013
DISCHARGES INTO WATER	Reduction of discharges into sea water and water consumption	Technology Manager 100 k€	**Goals:** Recovery of backwash water from Bernardinello filters. This flow can be recovered at the reactivator, reducing the need for untreated water by around 6-9% of the total supply. This would reduce the load on the wastewater treatment plants (TAS) by the same amount. **Scheduled actions:**	31/12/2014	In progress
			1. Material provisions	July 2014	In progress
			2. Construction	September 2014	In progress
			3. Entry into service	December 2014	Not started

Notes:

Atmospheric emissions **(objective 2A)** **from the 2013-2016 plan**

Environmental aspect	Objective	Actioning manager Approved costs	Goals and scheduled actions	Completion date	Progress at 31/12/2013
ATMOSPHERIC EMISSIONS	Prompt identification of potential increases in concentrations of pollutants in emissions, to prevent any breaches of warning thresholds for concentrations of pollutants in the soil measured by the public air quality monitoring network.	Prevention and Protection Manager 150 k€	**Goals:** Installation of a new tool to measure the flame temperature. **Scheduled actions:**	31/12/2014	In progress
			1. LA opening	March 2014	DONE
			2. Assignation of contract	May 2014	DONE
			3. Material provisions	August 2014	Not started
			4. Installation	October 2014	Not started
			5. Testing and delivery	December 2014	Not started

Notes:

Atmospheric Emissions **(obiettivo 2B)** **from the 2013-2016 plan**

Environmental aspect	Objective	Actioning manager Approved costs	Goals and scheduled actions	Completion date	Progress at 31/12/2013
ATMOSPHERIC EMISSIONS	Reduction in diffuse and fugitive emissions of volatile hydrocarbons	Manager of Operations, Energy, Utilities, Movement 22-35 kE per tank	**Goals::** Install a system for sealing the bypass pipes and support pipes in the floating-roof tanks at the refinery **Scheduled actions:**	31/12/2016	In progress
			1. Installation completed on 4 tanks	December 2013	DONE
			2. Installation completed on 2 tanks	December 2014	Not started
			3. Installation completed on 2 tanks	December 2015	Not started
			4. Installation completed on 2 tanks	December 2016	Not started

Notes:

Atmospheric emissions **(objective 2C)** **from previous plan**

Environmental aspect	Objective	Actioning manager Approved costs	Goals and scheduled actions	Completion date	Progress at 31/12/2013
ATMOSPHERIC EMISSIONS	Reduction in diffuse and fugitive emissions of volatile hydrocarbons	Manager Maintenance 6,500 k€	**Goals:** Complete the installation of double seals on the 229 gasoline-handling pumps. **Scheduled actions:**	31/12/2016	In progress
			1. Installing double seals on 4 fuel pumps (94.7% of the total)	December 2013	DONE
			2. Installing double seals on 4 fuel pumps (96.5% of the total)	December 2014	In progress
			3. Installing double seals on 4 fuel pumps (98.2% of the total)	December 2015	Not started
			4. Installing double seals on 4 fuel pumps (100% of the total)	December 2016	Not started

Notes: 2013: of the total of 229 scheduled, 217 pumps have been fitted with double seals (95%)

Atmospheric emissions **(objective 2D)** **from previous plan**

Environmental aspect	Objective	Actioning manager Approved costs	Goals and scheduled actions	Completion date	Progress at 31/12/2013
ATMOSPHERIC EMISSIONS	Energy recovery and a reduction in fuel oil consumption of around 30% compared with current levels	Manager Prevention and Protection N.A.	**Goals:** The shutdown and dismantling of the B1C boiler plant will reduce atmospheric emissions enough to offset immissions from the future steam-reforming plan and make fuel-gas available for the network. Completion of activity by 2014 (pursuant to objectives 2C and 2D) **Scheduled actions:**	31/12/2014	In progress
			1. Dismantling of the boiler plant	December 2014	Not started

Notes:

Atmospheric emissions **(objective 2E)** **from previous plan**

Environmental aspect	Objective	Actioning manager Approved costs	Goals and scheduled actions	Completion date	Progress at 31/12/2013
ATMOSPHERIC EMISSIONSS	Reduction in hydrocarbon flare emissions from the refinery	Technology manager N.A.	**Goals:** Reduction in flare emissions from the refinery by optimising management of the fuel gas and hydrogen networks **Scheduled actions:**	31/12/2014	In progress
			1. Reduction of discharges with target =< 0.15% by weight in relation to processing	December 2013	NOT ACHIEVED
			2. Reduction of discharges with target =< 0.15% by weight in relation to processing	December 2014	In progress

Notes: 2013: the result achieved was 0.21% by weight. The difference was due to unplanned stoppages or shutdowns, which had an impact on the total figure for blow-down discharges.

Atmospheric emissions **(objective 2f)** **from previous plan**

Environmental aspect	Objective	Actioning manager Approved costs	Goals and scheduled actions	Completion date	Progress at 31/12/2013
ATMOSPHERIC EMISSIONS	Reduction of dust in atmospheric emissions	Manager of Operational Planning, Laboratory, Shipping N.A.	**Goals:** Reduce the level of carbon residue in the fuel oil used internally **Scheduled actions:**	31/12/2016	In progress
			1. Preparation of fuel oil with RCC characteristics =< 9.1%	December 2013	DONE
			2. Preparation of fuel oil with RCC characteristics =< 9.0%	December 2014	In progress
			3. Preparation of fuel oil with RCC characteristics =< 8.9%	December 2015	Not started
			4. Preparation of fuel oil with RCC characteristics =< 8.8%	December 2016	Not started

Notes: 2013: 8.51% achieved (compared with a planned figure of 9.5%).

Waste **(objective 3A)** **from previous plan**

Environmental aspect	Objective	Actioning manager Approved costs	Goals and scheduled actions	Completion date	Progress at 31/12/2013
WASTE	Increase the amount of waste leaving the site sent for recovery	Manager Prevention and Protection N.A.	**Goals:** Increase the amount of excavated earth sent for recovery **Scheduled actions:**	31/12/2016	In progress
			1. Recovery target for excavated earth => 50%	December 2013	DONE
			2. Recovery target for excavated earth => 80%	December 2014	In progress
			3. Recovery target for excavated earth => 83%	December 2015	Not started
			4. Recovery target for excavated earth => 85%	December 2016	Not started

Notes: The recovery performance for excavated earth in 2013 was 86%

Waste **(objective 3B)** **from previous plan**

Environmental aspect	Objective	Actioning manager Approved costs	Goals and scheduled actions	Completion date	Progress at 31/12/2013
WASTE	Increase the amount of waste leaving the site sent for recovery	Manager Prevention and Protection N.A.	**Goals:** Increase the separated collection of plastics, aluminium, glass and paper. **Scheduled actions:**	31/12/2016	In progress
			1. Increase separated collection to 30%	December 2013	NOT ACHIEVED
			2. Increase separated collection to 30%	December 2014	In progress
			3. Increase separated collection to 32%	December 2015	Not started
			4. Increase separated collection to 33%	December 2016	Not started

Notes: 2013: recovery of 26.1%, compared with the target of 30%; objective repeated, emphasising the campaign to raise awareness on the subject and initiating further actions to provide stronger support for the planned target.

Maritime traffic - prevention of emergencies at sea **(objective 4A)** **from previous plan**

Environmental aspect	Objective	Actioning manager Approved costs	Goals and scheduled actions	Completion date	Progress at 31/12/2013
TRANSPORT	Mitigate and minimise the risk of emergencies at sea	Operations manager Shipping 75 k€/year	**Goals:** Increased selection of ships equipped with IGS (Inert Gas System) for unloading products with a flash-point of <55° **Scheduled actions:**	31/12/2016	In progress
			2. Select 99% of ships equipped with an inert gas system (IGS)	December 2013	DONE
			3. Select 100% of ships equipped with an inert gas system (IGS)	December 2014	In progress

Notes: IGS systems are employed in oil and chemical tankers to prevent the build-up of gases and vapours capable of producing combustions or explosions by reducing the amount of oxygen inside the tanks

Maritime traffic – prevention of emergencies at sea **(objective 4B)** **from previous plan**

Environmental aspect	Objective	Actioning manager Approved costs	Goals and scheduled actions	Completion date	Progress at 31/12/2013
TRANSPORT	Mitigate and minimise the risk of emergencies at sea	Operations manager Shipping 425 k€	**Goals:** Goals: Increase, with the Safety service, the controls on board ships during the loading and unloading phases **Scheduled actions:**	31/12/2016	In progress
			1. Inspect 44% of total ship traffic	December 2013	DONE
			2. Inspect 45% of total ship traffic	December 2014	In progress
			3. Inspect 46% of total ship traffic	December 2015	Not started
			4. Inspect 47% of total ship traffic	December 2016	Not started

Notes: The Safety service are qualified inspectors from a third-party firm, who attend and supervise unloading/loading operations to ensure better pollution prevention and improved safety during onboard operations.

Road traffic – prevention of accidents **(objective 4C)** **from previous plan**

Environmental aspect	Objective	Actioning manager Approved costs	Goals and scheduled actions	Completion date	Progress at 31/12/2013
TRANSPORT	Mitigate and minimise the risk of road accidents for tankers	Operations manager Shipping 20 k€/year	**Goals:** Goals: Increase controls on the tankers used to transport the site's oil products **Scheduled actions:**	31/12/2016	Attività in corso
			1. Inspect 26% of tankers entering the refinery	December 2013	FATTO
			2. Inspect 27% of tankers entering the refinery	December 2014	In corso
			3. Inspect 28% of tankers entering the refinery	December 2015	Da avviare
			4. Inspect 29% of tankers entering the refinery	December 2016	Da avviare

Notes: Ensures compliance with the ADR directives, which govern the safety of transporting hazardous goods, by taking specialist external advice.

Prevention of hydrocarbon discharges into soil **(objective 5A)** **from the 2013-2016 plan**

Environmental aspect	Objective	Actioning manager Approved costs	Goals and scheduled actions	Completion date	Progress at 31/12/2013
DISCHARGES INTO THE SOIL AND SUBSOIL	Prevention of soil and subsoil contamination	Investment manager 2,000 k€	**Goals:** Increase in number of double bottom tanks **Scheduled actions:**	31/12/2016	In progress
			1. Installation of double bottom in 1 tank (25%)	December 2013	DONE
			2. Installation of double bottom in 1 tank (50%)	December 2014	In progress
			3. Installation of double bottom in 1 tank (75%)	December 2015	Not started
			4. Installation of double bottom in 1 tank (100%)	December 2016	Not started

Notes: 2013: double bottom installed in ST117 and 109.

Prevention of hydrocarbon discharges into soil (objective 5B) from previous plan

Environmental aspect	Objective	Actioning manager Approved costs	Goals and scheduled actions	Completion date	Progress at 31/12/2013
DISCHARGES INTO THE SOIL AND SUBSOIL	Prevention of soil and subsoil contamination.	Manager Investment 1,200 k€/year	**Goals:** Paving of containment basins for crude oil and product tanks	31/12/2016	In progress
			Scheduled actions:		
			1. Reflooring 3 tanks (1 crude and 2 products)	December 2013	DONE
			2. Reflooring 3 tanks (1 crude and 2 products)	December 2014	In progress
			3. Reflooring 3 tanks (1 crude and 2 products)	December 2015	Not started
			4. Reflooring 3 tanks (1 crude and 2 products)	December 2016	Not started

Notes: Reflooring of basins of a crude tank (ST11) and 2 product tanks (ST115, 125); overall progress with reflooring of basins amounts to 44.8% of the planned total.

Prevention of hydrocarbon discharges into soil (objective 5C) from previous plan

Environmental aspect	Objective	Actioning manager Approved costs	Goals and scheduled actions	Completion date	Progress at 31/12/2013
DISCHARGES INTO THE SOIL AND SUBSOIL	Prevention of soil and subsoil contamination.	Manager of Reliability, Planning, Budgeting 1,800 k€	**Goals:** Perform instrumentation checks on the integrity of the pipework for transporting crude oil from the marine terminal to the tanks and transporting hydrocarbons internally/externally.	31/12/2014	In progress
			Scheduled actions:		
			1. Instrument checks pursuant to annual plan	December 2013	DONE
			2. Instrument checks pursuant to annual plan	December 2014	In progress

Notes: Remaining checks not executed in 2012 were completed. All of the 2013 programme executed

Prevention of hydrocarbon discharges into soil (objective 5D) from previous plan

Environmental aspect	Objective	Actioning manager Approved costs	Goals and scheduled actions	Completion date	Progress at 31/12/2013
DISCHARGES INTO THE SOIL AND SUBSOIL	Prevention of soil and subsoil contamination.	Manager Investment 200 k€/year	**Goals:** Motorisation of the aspirator valves at the bottom of the gasoline tanks	31/12/2016	In progress
			Scheduled actions:		
			1. Motorisation of asp./delivery valves of a tank	December 2013	DONE
			2. Motorisation of asp./delivery valves of a tank	December 2014	In progress
			3. Motorisation of asp./delivery valves of a tank	December 2015	Not started
			4. Motorisation of asp./delivery valves of a tank	December 2016	Not started

Notes: Installation of new hold-up aspirator/delivery valve and jet mix at tank bottom (ST131)

Prevention of hydrocarbon discharges into soil (objective 5E) from previous plan

Environmental aspect	Objective	Actioning manager Approved costs	Goals and scheduled actions	Completion date	Progress at 31/12/2013
DISCHARGES INTO THE SOIL AND SUBSOIL	Confinement of contamination from past activities	Prevention and Protection manager 1,500 k€	**Goals:** Installation of a second line of dynamic barrier to replace the physical barrier. This barrier will be positioned in areas of the plant parallel to the existing barrier on the sea side. Definitive version of the plan presented in January 2014. Ministerial Decree pending	31/12/2016	In progress
			Scheduled actions:		
			1. Presentation of the definitive version of the plan to the Ministry.	December 2013	DONE
			2. Detailed planning of dynamic barrier	December 2014	Not started
			3. Purchase of materials and assembly	December 2015	Not started
			4. Testing and entry into service of the barrier	December 2016	Not started

Notes:

Training and information (objective 6A) from previous plan

Environmental aspect	Objective	Actioning manager Approved costs	Goals and scheduled actions	Completion date	Progress at 31/12/2013
Training	Raise awareness of the company's environmental initiatives among employees.	Organisation manager (Saras, parent company) N.A.	**Goals:** Include a section on environmental issues in the company newsletter, every six months, detailing the initiatives undertaken by the company	31/12/2014	In progress
			Scheduled actions:		DONE
			1. Produce 3 articles, 2 infographics and 2 Learn More boxes on environmental issues.	December 2013	Not started
			2. Produce 3 articles, 2 infographics and 2 Learn More boxes on environmental issues.	December 2014	

Notes: 2013: Produce 3 articles, 6 Learn More boxes on environmental issues and 1 wharf report

Implementation sheets for the Improvement Plan

CLOSED OBJECTIVES

Atmospheric emissions **(objective ex 2B)** **from previous plan**

Environmental aspect	Objective	Actioning manager Approved costs	Goals and scheduled actions	Completion date	Progress at 31/12/2013
ENERGY CONSUMPTION	Energy recovery and a reduction in fuel oil consumption by around 30% compared with current levels	Prevention and Protection manager N.A.	**Goals:** Objective replaced, following the application submitted by the company on 5 December 2012 and approved by MATMM on 11 April 2013, with heat recovery from the new steam generator on MHC2 in operation with the same modifications for the MHC2. **Scheduled actions:**	31/12/2013	Work ompleted
			1. Installation and assembly of new generator	December 2012	DONE
			2. Entry into service of new steam generator	December 2013	DONE

Notes: Entry into service of a new steam generator, and the launch of the new section of MHC2 – WORK COMPLETED

Atmospheric emissions **(objective ex 6B)** **from previous plan**

Environmental aspect	Objective	Actioning manager Approved costs	Goals and scheduled actions	Completion date	Progress at 31/12/2013
ATMOSPHERIC EMISSIONS	Reduction in diffuse and fugitive emissions of volatile hydrocarbons	Manager of Operations, Energy, Utilities, Movement 630 k€	**Goals:** Install a system for sealing the bypass pipes and support pipes in the floating-roof tanks at the refinery perimeter (18 tanks). **Scheduled actions:**	31/12/2013	Work c ompleted
			1. Installation of 6 tanks completed (33%)	December 2008	DONE
			2. Installation of 4 tanks completed (55%)	December 2009	DONE
			3. Installation of 4 tanks completed (77%)	December 2010	DONE
			4. Installation of 2 tanks completed (88%)	December 2011	DONE
			5. Installation of 1 tank completed (94%)	December 2012	DONE
			6. Installation of 1 tanks completed (100%)	December 2013	DONE

Notes: ATTIVITA' COMPLETATA

Atmospheric emissions **(objective ex 6C)** **from previous plan**

Environmental aspect	Objective	Actioning manager Approved costs	Goals and scheduled actions	Completion date	Progress at 31/12/2013
ATMOSPHERIC EMISSIONS	Reduction in diffuse and fugitive emissions of volatile hydrocarbons	Prevention and Protection manager 250 k€/year	**Goals:** Apply the Smart LDAR methodology to all of the site's units, proceeding in accordance with the monitoring and action timescales specified by the AIA permit. **Scheduled actions:**	31/12/2013	Work com-pleted
			1. Execute 2 quarterly campaigns under AIA plan	December 2011	DONE
			2. Monitoring programmes under AIA plan	December 2012	DONE
			3. Conducting half-yearly and annual programmes under the AIA plan.	December 2013	DONE

Notes: Application of SmartLDAR methodology SmartLDAR is continuing; monitoring campaigns are planned annually in the manner prescribed by the AIA permit, aimed at identifying possible sources of VOC leaks and repair of the same. – WORK COMPLETED

Atmospheric emissions **(objective ex 7B)** **from previous plan**

Environmental aspect	Objective	Actioning manager Approved costs	Goals and scheduled actions	Completion date	Progress at 31/12/2013
ATMOSPHERIC EMISSIONS	Prompt identification of potential increases in concentrations of pollutants in emissions, to prevent any breaches of warning thresholds for concentrations of pollutants in the soil measured by the public air quality monitoring network.	Prevention and Protection manager 80 k€/year	**Goals:** Complete development of the CALMET-CALPUFF model. Apply the model. **Scheduled actions:**	31/12/2013	Work com-pleted
			1. Installation of new weather sensor for correct application of the CALMET-CALPUFF model	December 2012	DONE
			2. Complete development of the CALMET-CALPUFF model	December 2013	DONE

Notes: In 2013, the CALMET-CALPUFF system was implemented. The system uses the CENSA1 and CENSA3 weather sensors (data available from January 2013) owned by the Sardinian regional environment agency (ARPA Sardegna) to reconstruct the meteorological vector field on the ground and the vertical profiles of the meteorological values required by the model. The modelling results did not produce a match between the simulated concentration levels on the ground of sulphur dioxide, assumed to be a trace amount, and the values measured on the ground by the sensors of the public air quality monitoring network. However, a match was achieved using the ISC-AERMOD model, as the calculations sent to MATTM show. This activity has continued, pursuant to the AIA permit. – **WORK COMPLETED**

Odours **(objective ex 14B)** **from previous plan**

Environmental aspect	Objective	Actioning manager Approved costs	Goals and scheduled actions	Completion date	Progress at 31/12/2013
ODOURS	Assessment of the main sources of odour emissions to prevent/mitigate the olfactory impact on the surrounding area.	Prevention and Protection manager 2013: 90 k€	**Goals:** Implementation of the six-monthly monitoring plan in accordance with AIA requirements. **Scheduled actions:**	31/12/2013	Work completed
			1. Identify the chemicals responsible for the odour nuisance in the emissions sources at the refinery. Identify analytical methods to manage and control problems with odour emissions and carry out half-yearly programmes pursuant to the AIA plan	December 2011	DONE
			2. Execute 2 half-yearly programmes under AIA plan	December 2012	DONE
			3. Execute 2 half-yearly programmes under AIA plan to strengthen the statistical analysis of the results	December 2013	DONE

Notes: This activity has continued pursuant to the AIA permit – WORK COMPLETED

Odours **(objective ex 14C)** **from previous plan**

Environmental aspect	Objective	Actioning manager Approved costs	Goals and scheduled actions	Completion date	Progress at 31/12/2013
ODOURS	Assessment of the main sources of odour emissions to prevent/mitigate the olfactory impact on the surrounding area.	Responsabile Operations Manager of Operations, Energy, Utilities, Movement 135 k€	**Goals:** Create a chemical diffusion system with an anti-odour effect for the ST99 tank (SLOP) **Scheduled actions:**	31/12/2013	Work completed
			1. Materials planning and purchase	December 2011	DONE
			2. Assembly	December 2012	DONE
			3. Testing and entry into service	December 2013	DONE

Notes: WORK COMPLETED

5.2 – Improvement activities carried out in 2013

During 2013, the majority of the environmental objectives set out in the 2013 Environmental Declaration were achieved. Investments mainly concerned the reduction of atmospheric emissions, the reduction of energy consumption, the prevention of potential spills of hydrocarbons into the soil and the monitoring of air quality. For many years now, a large portion of investment has been directed towards the environment and safety, and this programme also includes constant monitoring of air quality. With regard to reducing atmospheric emissions, in line with the 2010-2013 investment plan, important initiatives in thermal recovery were implemented, which, together with the management activities identified in the FOCUS project (including the reduction of over-consumption in kilns and the maximisation of thermal integration between plants), reduced consumption by about 50,000 TOE in 2013. At the same time, in order to ensure the high quality of the fuels used at the site, in 2013 the company again maintained the excellent result it achieved in the previous year through the use of fuel oil with a carbon residue of less than 8.5% by weight, compared with a target objective of 9.5% by weight. These measures have resulted in a considerable reduction in fuel consumption, with a consequent reduction in emissions of CO_2, SO_2 and dust. There have also been measures to reduce emissions from various sources, achieved by:

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

- continuing the programme to install double seals on all gasoline-handling pumps (95% of the total)
- completing, on the 18 floating-roof tanks planned within the perimeter of the refinery, the installation of casings on the bypass pipes (this activity is being continued for the refinery's remaining tanks)
- regular monitoring programmes for all of the site's plant units using SmartLDAR methods aimed at identifying and eliminating sources of fugitive emissions (VOC)

With regard to measures to reduce energy consumption, the new MHC2 steam generator plant has been brought into service as part of the energy recovery projects. With regard to the prevention of potential discharges and protection of the soil and subsoil, the following activities, aimed at reducing the risk of contamination, continued in 2013:

[Environmental aspect: Atmospheric emissions, diffuse emissions, fugitive emissions

- installation of double bottoms in tanks (another two tanks completed)
- motorisation of the aspirator valves at the bottom of the gasoline tanks (ST131)
- reflooring of the containment basins and the crude and product tanks, which involved another 3 tanks and amounts to nearly 45%
- reflooring of the pipeway, which in 2013 amounted to nearly 57,000 sq m of paved surface (cumulative data)

In addition, the instrumentation checks on the integrity of the pipework for transporting crude oil from the marine terminal to the tanks and transporting internal/external hydrocarbons, which were scheduled for 2013, were completed.

There have also been improvements in the data for the transport of products by sea: the company continued to use only twin-hulled ships for the supply of light crude, and hit its target of ensuring that 100% of the ships transporting products out of the Sarlux terminal also had twin hulls. The target for checks on board ships during the loading and unloading stages was also met, with a result of 46%. Lastly, in order to prevent road traffic accidents, checks were carried out on 27% of the tanker trucks used to transport products, which was consistent with the objectives set.

[Environmental aspect: Transport - maritime traffic]

6.
Summary of relevant legislation

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6. Summary of relevant legislation

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

Atmosphere

- DSA-DEC-2009-230 of 24 March 2009.
  Integrated environmental authorisation (AIA) permit for Sarlux Srl to operate its refinery and the IGCC plant.
- Legislative Decree 152 of 3 April 2006, as subsequently amended
  Environmental legislation – Section V: Laws governing the protection of air quality and the reduction of atmospheric emissions.
- Ministerial Decree 60 of 2 April 2002.
  Implementation of Council Directive 1999/30/EC of 22 April 1999 relating to limits for sulphur dioxide, nitrogen dioxide, oxides of nitrogen, particulate matter and lead in ambient air, and Directive 2000/69/EC relating to limits for benzene and carbon monoxide in ambient air.
- Legislative Decree 183 of 21/05/2004.
  Implementation of Directive 2002/3/EC relating to ozone in ambient air.

Updated by
- Law 228 of 12 July 2006
- Decree Law 262 of 3 October 2006 (and the relative transposition law 286 of 24 November 2006)
- Legislative Decree 284 of 8 November 2006
- Decree Law 300 of 28 December 2006 (and the relative transposition law 17 of 26 February 2007)
- Law 296 of 27 December 2006
- Presidential Decree 90 of 14 May 2007
- Legislative Decree 205 of 6 November 2007
- Law 243 of 19 December 2007
- Decree Law 248 of 31 December 2007
- Legislative Decree 4 of 16 January 2008
- Decree Law 59 of 8 April 2008
- Decree Law 90 of 23 May 2008
- Legislative Decree 117 of 30 May 2008
- Ministerial Decree 131 of 16 June 2008
- Legislative Decree 188 of 20 November 2008
- Decree Law 208 of 30 December 2008
- Law 205 of 30 December 2008
- Law 210 of 30 December 2008
- Law 2 of 28 January 2009
- Law 13 of 27 February 2009
- Legislative Decree 30 of 16 March 2009
- Ministerial Decree 56 of 14 April 2009
- Law 77 of 24 June 2009
- Law 102 of 3 August 2009
- Law 99 of 23 July 2009
- Decree Law 135 of 25 September 2009
- Law 166 of 20 November 2009
- Law 25 of 26 February 2010
- Law 36 of 25 February 2010
- Legislative Decree 128 of 29 June 2010
- Legislative Decree 104 of 2 July 2010
- Law 129 of 13 August 2010
- Presidential Decree 168 of 7 September 2010
- Legislative Decree 205 of 3 December 2010
- Legislative Decree 219 of 10 December 2010

Emissions Trading

- Legislative Decree 216 of 4 April 2006, as subsequently amended.
  Implementation of Directives 2003/87 and 2004/101/EC governing greenhouse gas emissions allowance trading within the Community, in respect of the Kyoto Protocol's project mechanisms.
- EC Regulation 601/2012
  Concerning the monitoring and reporting of greenhouse gas emissions pursuant to Directive 2003/87/EC of the European Parliament and of the Council.
- Resolution 27/2012
  Compliance pursuant to Regulation 601/2012
- EC Decision 2011/278/EC
  Transitional Union-wide rules for harmonised free allocation of emission allowances pursuant to Article 10 bis of Directive 2003/87/EC
- EC Decision 2013/448/EC
  Relating to the national implementing measures for the transitional free allocation of greenhouse gas emission allowances in accordance with Article 11(3) of Directive 2003/87/EC
- Resolution 29/2013
  Notification to the European Commission of the national allocation table pursuant to Article 51 of Regulation 389/2013 and of the relative final total annual quantity of free allowances allocated to every existing plant, calculated in accordance with Article 10 bis, paragraph 1, of Directive 2003/87/EC and Article 10, paragraph 9, of Decision 2001/278/EC
- Legislative Decree 30 of 13 March 2013
  Implementation of Directive 2009/29/EC, which amends Directive 2003/87/EC so as to improve and extend the greenhouse gas emission allowance trading scheme of the Community.
- Resolution 22/2011
  Governs the authorisation to issue greenhouse gases for plants or parts of plants not authorised pursuant to Legislative Decree 216 of 4 April 2006 as subsequently amended.

Water

- DSA-DEC-2009-230 of 24 March 2009.
  Integrated environmental authorisation (AIA) permit for Sarlux Srl to operate its refinery and the IGCC plant.
- Legislative Decree 4 of 16 January 2008.
  Further corrective and supplementary provisions to Legislative Decree 152 of 3 April 2006, establishing environmental legislation.
- Legislative Decree 152 of 3 April 2006, as subsequently amended *
  Environmental legislation – Section III, specifically: Laws governing the prevention of water pollution and the management of water resources.
- Regulation 417/2002 of 18 February 2002, amended by Regulations 1726/2003 of 22 July 2003 and 2172/2004 of 17 December 2004.
  Fast-track introduction of laws governing twin hulls or equivalent technology for single-hulled oil tankers, repealing EC Council Regulation 2978/94.

Waste, soil and subsoil

- DSA-DEC-2009-230 of 24 March 2009.
  Integrated environmental authorisation (AIA) permit for Sarlux Srl to operate its refinery and the IGCC plant.
- Legislative Decree 152 of 3 April 2006, as subsequently amended
  Section IV environmental legislation: Laws governing the management of waste and the remediation of polluted sites.
- Ministerial Decree of 17 December 2009.
  Establishment of a system to monitor the traceability of waste, pursuant to Art. 189 of Legislative Decree 152 of 2006 and Art. 14-bis of Decree Law 78 of 2009, converted – with amendments – by Law 102 of 2009.
- EEC Regulation 259 of 1 February 1993.
  Supervision and control of shipments of waste within, into and out of the European Community.

Noise

- DSA-DEC-2009-230 of 24 March 2009.
  Integrated environmental authorisation (AIA) permit for Sarlux Srl to operate its refinery and the IGCC plant.
- Municipality of Sarroch – Municipal Acoustic Plan approval of 19 April 2011.
  Acoustic Classification Plan of the Municipality of Sarroch, pursuant to Law 447/1995 and the guidelines set out in Regional Council Resolution 30/9 of 8 July 2005
- Regional Council Resolution (Sardinia) 62/9 of 14 November 2008.
  Regional directives governing environmental noise pollution.
- Ministerial Decree of 16 March 1998.
  Methods of detecting and measuring noise pollution.
- Ministerial Decree of 11 December 1996.
  Application of the differential criteria to continuous production cycle plants.
- Law 447 of 26 October 1995.
  Framework law on noise pollution.
- Prime Ministerial Decree of 14 November 1997.
  Establishing limits for noise sources.
- Prime Ministerial Decree of 1 March 1991, as subsequently amended.
  Maximum limits for noise exposure in inhabited areas and outdoors.

Asbestos

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

PCBS

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

Ozone-depleting substances

- Presidential Decree 147 of 15 February 2006.
- Methods for monitoring and recovering leaks of ozone-depleting substances from refrigeration, air conditioning equipment and heat pumps, pursuant to EC Regulation 2037/2000.
- EC Regulation 2037/2000 of 29 June 2000 on substances that deplete the ozone layer.
- Regulation 842/2006/EC of 17 May 2006 on certain fluorinated greenhouse gases.
- Presidential Decree 43 of 27 January 2012
  Implementing Regulation 842/2006/EC on certain fluorinated greenhouse gases.

Electromagnetic fields

- Legislative Decree 194 of 6 November 2007.
  Implementation of Directive 2004/108/EC on the approximation of the Laws of Member States relating to electromagnetic compatibility and repealing Directive 89/336/EEC.
- Prime Ministerial Decree of 8 July 2003.

Definition of exposure limits, warning levels and quality objectives for protecting the population from exposure to electrical, magnetic and electromagnetic fields generated at frequencies between 100 kHz and 3,000 GHz.

- Law 36 of 22 February 2001.
  Framework law on protection against exposure to electrical, magnetic and electromagnetic fields.

Ionising radiation

- ISPESL Circular 40 of 3 January 2002.
  New methods for sending documentation relating to workers who have been exposed to ionising radiation pursuant to Legislative Decree 230/1995, as subsequently amended (Legislative Decree 241/2000 and Legislative Decree 257/2001).
- Legislative Decree 230 of 17 March 1995.
  Implementation of Directive 89/618/Euratom, 90/641/Euratom, 92/3/Euratom and 96/29/Euratom on ionising radiation.

Health and safety in the workplace

- Legislative Decree 106 of 3 August 2009.
  Supplementary and corrective provisions to Legislative Decree 81 of 9 April 2008 governing health and safety in the workplace.
- Legislative Decree 81 of 9 April 2008.
  Implementation of Art. 1 of Law 123 of 3 August 2007 governing health and safety in the workplace.
- Presidential Decree 117 of 14 September 2011
  Regulations for the qualification of companies and self-employed workers operating in areas of suspected pollution or confined areas, pursuant to Article 6, paragraph 8, letter g) of Legislative Decree 81/2008
- Agreement of 21 December 2011
- Agreement between the Ministry of Employment and Social Policy, the Ministry of Health and the regions and the autonomous provinces of Trento and Bolzano for the training of workers, pursuant to Article 37, paragraph 2, of Legislative Decree 81/2008
- Agreement of 22 February 2012
  Identification of work equipment for which specific certification of operators is required (Article 73, paragraph 5, of Legislative Decree 81/2008)

Prevention and control of major-accident hazards

- Legislative Decree 334 of 17 August 1999.
  Implementation of Directive 96/82/EC on the control of major-accident hazards involving dangerous substances.
- Decree of 9 August 2000.
  Guidelines for implementing a safety management system.
- Decree of 9 August 2000.
  Identification of changes to plants and deposits, industrial processes, or the nature or quantity of hazardous substances that could increase the underlying level of risk.
- Decree of the President of the Council of Ministers of 25 February 2005.
  Guidelines for preparing the external emergency plan pursuant to Art. 20 (4) of Legislative Decree 334 of 17 August 1999.
- Legislative Decree 238 of 21 September 2005.
  Implementation of Directive 2003/105/EC, which amends Directive 96/82/EC, on the control of major-accident hazards involving dangerous substances.


MARE TIRRENUM

7.
Glossary

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7. Glossary

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

ARPA: Agenzie Regionali per la Protezione Ambientale (or regional environmental protection agencies). In April 1993, a referendum resulted in the removal of environmental control and protection powers from Italy's national and local health services. This left a gap that was filled by parliament with Law 61 of 1994 (introduced to enact Decree Law 496/93), which gave these powers to special regional agencies responsible for monitoring and protecting the environment at local level. Law 61/94 also set up ANPA, the national environmental protection agency, today known as APAT (agency for environmental protection and technical services). APAT has the task of managing and co-ordinating the regional agencies and those based in Italy's autonomous provinces. In the years that followed, all of Italy's regions and autonomous provinces set up their own agencies. ARPA Sardinia (ARPAS) was created under Regional Law 6 of 18 May 2006.

Audit: a word used in various contexts to mean "check", or "review". In the environmental management field it refers to a systematic, documented check to objectively assess an organisation's compliance with set environmental management criteria.

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

CAM (classification of seawater) index: the indicator used to monitor the coastal marine environment. The indicator converts the measurements into a summary rating of sea quality, which can be interpreted and assigned to three quality classifications, where quality is understood to mean the degree of eutrophication of the coastal systems and the likelihood of a potential heath or hygiene hazard:
High quality – uncontaminated water
Average quality – water with varying degrees of eutrophication, but ecologically intact
Low quality – eutrophic water with evidence of environmental changes that are partly due to human activity

CO (carbon monoxide): a gas produced by the incomplete combustion of vehicle fuels and fossil fuels. The main source is gasoline engines that are not fitted 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 non-biodegradable matter.

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

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

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

EMAS (Eco-Management and Audit Scheme): established by EEC Regulation 1836/93, updated by EC Regulation 1221/2009 (EMAS III), this is a voluntary scheme intended to promote continuous improvement in the environmental efficiency of industrial activities. Under the regulations, participating companies must adopt environmental management systems at their production sites based on policies, programmes, procedures and objectives aimed at improving the environment, and must publish an environmental declaration. Before a site can be added to the register set up by the European Commission, this declaration must be approved by an inspector accredited by an authorised national body. In Italy, this body is the Ecolabel and Ecoaudit committee, which has been operational since 1997 and works with the technical support of APAT.

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

Emissions trading: on 13 October 2003, the European Commission published the European directive on emissions trading (Directive 2003/87/EC), better known as the emissions trading system. The key points established by the directive are as follows: from 1 January 2005 no plants falling within the scope of the directive may emit CO_2 (i.e. continue to operate) without appropriate authorisation; each year the operators of these plants must 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.

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 (IPPC). It is the EU's first and most wide-ranging record of emissions into the air and water from industrial plants.

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

Greenhouse effect: the gradual rise in average atmospheric temperature due to the increased concentration of gases in the atmosphere. Substances that contribute significantly to the greenhouse effect (greenhouse gases) include chlorofluorocarbons (CFC), carbon dioxide (CO_2), methane (CH4), nitrogen oxides (NO_x) and sulphur hexafluoride (SF6).

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

IGCC: Integrated Gasification Combined Cycle.

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

INAIL frequency index: calculated using the number of accidents reported by the company to the work accident compensation authority (INAIL) and the number of hours worked (calculated using the formula: number of accidents reported to INAIL x 1,000,000/ hours worked).

INES (Inventario Nazionale delle Emissioni e loro Sorgenti – National Inventory of Emissions and their Sources): national inventory of emissions set up pursuant to Legislative Decree 372 of 4 August 1999 (implementing Directive 96/61/EC) and to decrees issued by the environment ministry on 23 November 2001 and 26 April 2002. It consists of information on emissions from industrial

sites in Italy subject to IPPC regulations. The regulations state that such companies must submit qualitative and quantitative data to APAT each year in relation to a set list of pollutants present in gaseous and aqueous waste from their plants. This information is then submitted to the Ministry for the Environment for forwarding to the European Commission and inclusion in the EPER register.

IPPC (Integrated Pollution Prevention and Control): European directive of 1996 relating to the reduction of pollution from the various places where it is emitted throughout the European Union, implemented in Italy by Legislative Decree 59/2005.

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

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

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

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

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

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

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

MW (megawatt): a multiple of kW (kilowatt), the unit of measurement of a power station's power, i.e. its energy-generating capacity. It also measures the power consumed by an item of electrical equipment. For example, a light bulb may use 0.1 kW (100 watts). 1 MW = 1,000 kW.

MWh (megawatt-hour): unit of measurement of electricity generated or consumed, equal to the power generated by 1 MW in one hour and equivalent to 1,000 kWh.

NO_x (nitrogen oxides): gaseous compounds consisting of nitrogen and oxygen (NO, NO_2, etc.), normally released during the combustion of fossil fuels when free nitrogen (N2) is oxidised. In the atmosphere they are the main agents responsible for photochemical smog and, after SO_2, the biggest cause of acid rain.

OHSAS (Occupational Health and Safety Assessment Series): regulations developed to replace the previous British Standard 8800 in order to meet the growing demand for a recognised standard on the organisation needed to manage health and safety. OHSAS 18001 certification was developed to be compatible with ISO 14001 and ISO 9001 and to allow for the adoption of an integrated management system. Although it does not yet represent an international standard, OHSAS 18001 certification can be obtained by following a similar procedure to that used for the ISO standards.

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

PM10: particulates with a diameter of less than 10 µm (1 µm = 1 millionth of a metre) can pass through the airways and penetrate the lungs, becoming a potential health hazard depending on the substances that they contain.

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

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

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

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

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

Total frequency index: together with the severity index, this is a commonly-used performance indicator for health and safety in the workplace. With reference to a given period of time, it expresses the relationship between the number of accidents occurring, medical treatment given and the number of hours worked (calculated using the formula: number of accidents + medical treatment x 1,000,000/hours worked).

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

Wholesale: refers to the wholesale market in oil products sold to customers such as industries, consortia and public bodies.

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

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