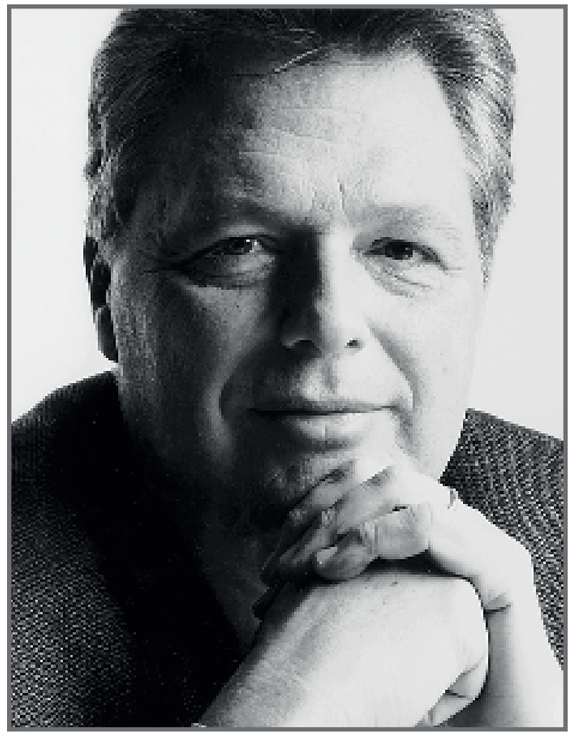
ECGA Annual Report 2011

European Carbon and Graphite Association

ECGA

FOREWORD BY THE PRESIDENT



The year 2011 has seen many developments impacting the businesses of our Members.

The international and the European discussion on raw materials has led to a much higher awareness of the importance of such raw materials on the one hand while the continued economic difficulties have brought Europe to understand the importance of a solid industrial infrastructure.

The activities of the ECGA in 2011 continued to focus on the implementation of the wide-ranging European Union "REACH" (Registration, Evaluation, and Authorisation of Chemicals) regulation. The aim in 2011 was to

- secure completion of the HT coal tar pitch dossier, its chemical risk assessment and its exposure scenarios of relevance for the synthetic graphite industry, as well as to
- develop the "REACH dossier" for the acid treated graphite.

In parallel the association's EHSA Committee was preparing the recommendations for the new BAT(Best Available Technology) note under the Industrial Emissions Directive (former IPPC) which will have substantial impact on the permitting conditions for existing and future manufacturing installations in Europe.

On the issue of Emission Trading Scheme (ETS), another stringent regulation introduced by the European Union in the framework of the reduction of greenhouse gases, the Association has been very successful in ensuring that the graphite industry is recognised as an "energy-intensive industry with risk of carbon leakage" i.e. that this industry might be forced, because of too high economic burdens deriving from ETS, to relocate their plants outside of the European Union. Furthermore the association conducted a specialised study to demonstrate that the sector due to its limited direct CO2 emissions and its vast product range was not in the position to develop a product benchmark. In 2011 this work was continued with regard to the legislation that would govern the eligibility for state aid measures to compensate for expected increases in the electricity prices due to the ETS regulation. It should still be kept in mind that the synthetic graphite industry continues to be under competitive pressure from many producers around the world that are not exposed to the same climate change measures and related costs as in the European Union.

The fierce competition on the world market can also clearly be seen from continued subsidy and dumping cases as well as the launch of a debate on a safeguard measure request filed by Russia, Belarus and Kazakhstan.

I want to sincerely thank our Secretary, Mrs. Hebestreit, and her team for the work performed in this past year.

Dr. B. Toniolo, President

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Carbon and graphite plays an important role in the EU's industrial fabric. Main industrial sectors such as the aluminium and steel industries are dependent in their fabrication process on industrial products made from carbon and graphite. And as a consequence many downstream-industries in Europe, such as the automotive, construction, railway, infrastructure sectors, are dependent on the delivery of these industrial components. But also in other areas many sectors rely on speciality applications without which many products of our day-to-day life would not function.

1.1 The Aluminium Industry

One of the major global markets for carbon and graphite products is the primary aluminium industry. The carbon and graphite industry supplies furnace linings for the primary aluminium industry in the form of cathode blocks with which the floor of the electrolytic reduction cells are lined as well as pieces for the surrounding sidewalls. Both types of blocks are manufactured in a number of different qualities. Carbon ramming pastes are used to seal the joints between the blocks.

2010 had seen a recovery of demand which continued in the first half of 2011. The second half of the year, however, was weaker and the double dip crisis started in the fourth quarter of 2011. The demand for rolled products remained positive, mainly due to the continued recovery in the automotive market. The packaging market declined slightly and the building and constructions markets have not really recovered. This affected the extrusions market.

The high electricity prices and the expected potential impact of the upcoming new ETS regime in 2013 have led to further closures and leave Europe up to 30% of its demand dependent on non-European imports of aluminium.

"A world without carbon and graphite – not possible"

1.2 The Steel industry

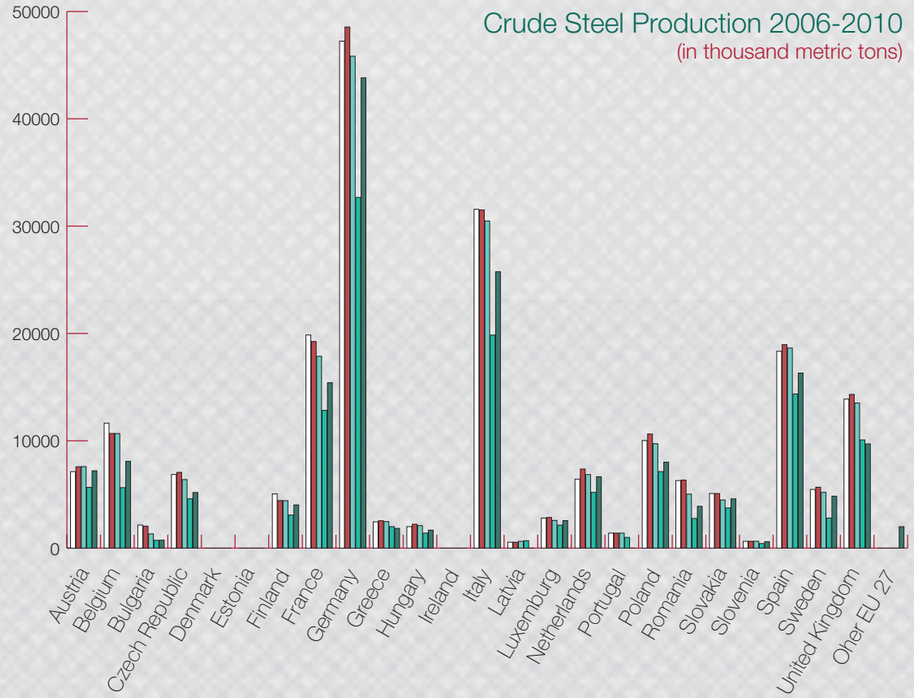
The steel markets development paralleled the general economic development.

Key contributing factors included:

- Global supply chain disruptions caused by the earthquake/tsunami that hit Japan.
- Greater-than-anticipated weakness in United States activity and renewed financial volatility in the euro area.
- Rising inflation in China (and other emerging countries), along with political unrest in the MENA region.

2011 was another year of record steel production. The strong recovery worldwide peaked in a production of 130 mill t per month. In total 1.5 billion tonnes of steel were produced in 2011 with China contributing 43 % of the world production.

Worldwide 20 countries produced 93% of world steel.



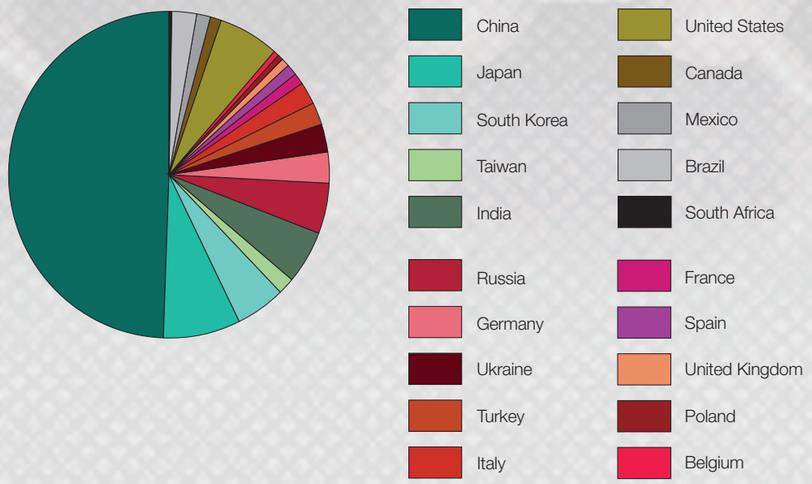
With regard to the recycled steel production in electric arc furnaces its worldwide share rose to 28 %, however here China held only 8.6 %.

The steel inventories were back to pre-crisis levels. In terms of capacity utilisation which had dropped from a very high 90 % to a low 60 % in the crisis, the recovery has brought back a utilisation rate of 73 %.

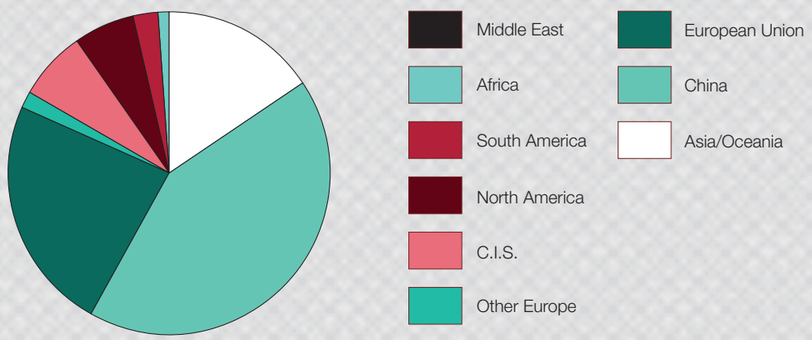
The European recovery was slower than in other parts of the world and there was a continuation of cuts in blast furnaces capacity. Within the EU Germany is still the largest steel producer.

The only market that continued to grow was China.

Total Steel Production by Top Countries
Year 2011



Allocation of Total Steel Production
September 2009



Chapter 1 ▪ Contributing to sustainable resource management

Other Industrial Applications 1.3

Deriving benefit from graphite – mechanical industrial applications 1.3.1

Many green technologies drive growth in demand for natural and synthetic graphite applications.

Expected annual growth of 20% in the electrical vehicle market for example will drive growth in the battery market, but also in other applications. Here in particular the lithium battery market expects growth rates in the range of 30 to 40%. Since there is 10-20 times more graphite for the anode than lithium in a lithium-ion battery, the demand for graphite is estimated to rise sharply.

Many mechanical industrial applications contain carbon and graphite.
Seals, components for compressors and vacuum pumps, bearings and sliding components for dry and wet running applications as well as carbon tubes, blanks, fillers and granules are made out of graphite because of its good mechanical properties such as strength, good sliding properties, high temperature resistance, high thermal shock resistance, low wettability, high corrosion resistance, high thermal conductivity, high purity and good electrical conductivity.

Such seals are applied in all types of pumps such as pumps for fuel and cooling water in cars, for chemicals and water, household and garden appliances and many other industrial applications.

Carbon axial and radial bearings perform well in various applications ranging from machine tools to chemical engineering apparatus.

Sliding beams and sliding rails are used for linear motion applications. In those cases where mechanical forces are high, metallic bearings with graphite lubrication deposits are used.

1.3.2 Carbon brushes for extreme requirements – electrical industrial applications

Carbon brushes
So called brushes are indispensable hardware for electrical machines, also in the microelectronic era. At the beginning of electrical engineering brushes were bundles of tiny copper wires, used as elastic contacts. Now the material has changed into carbon and graphite.

Examples of application of carbon brushes

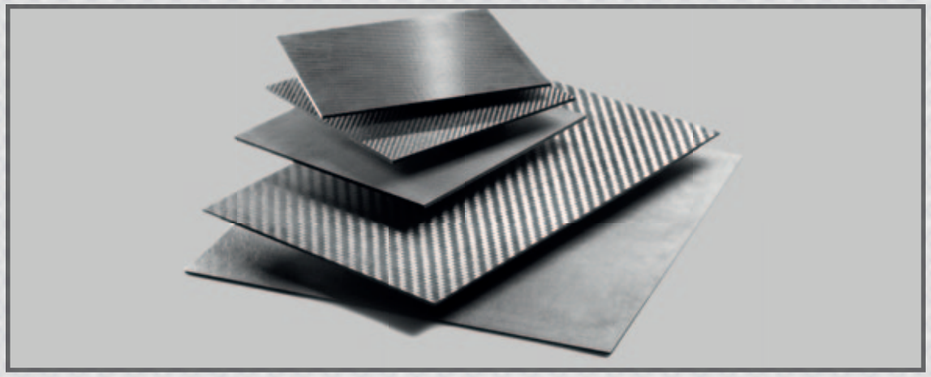
- Motors for stationary machinery
- Traction motors for railway technology in diesel and electric trains

Current collectors
Carbon current collectors provide a reliable contact with the electric wires. They show low wear, good electrical loading capacity, they are environmentally friendly and easy to maintain.

1.3.3 Carbon and graphite fibre for technical products

Since technical grade carbon fibres were developed in the mid 1960s, they have been gradually introduced in technical products. The application is connected with material questions such as matrix materials, fibre/matrix adhesion promoters and long term behaviour, component production techniques or textile semi-finished materials.

Fibre composites can be used in machine, equipment and apparatus construction, medical technology and vehicle building.

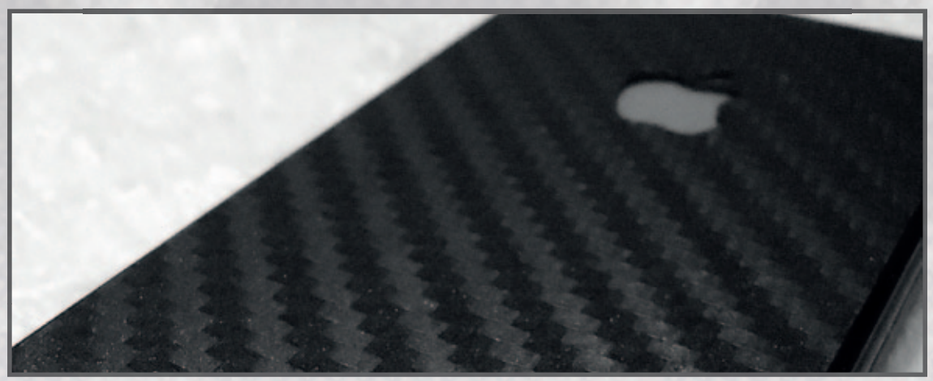


Chapter 1 ▪ Contributing to sustainable resource management

Carbon foil - meeting the exact requirements 1.3.4

Many applications today use composite materials with tailor-made properties.
The materials currently used are glass, aramid, carbon and graphite fibres in combination with epoxy and phenolic resins. Elements manufactured from fibre composites can be designed in such a way that they exactly meet the requirements imposed on them.

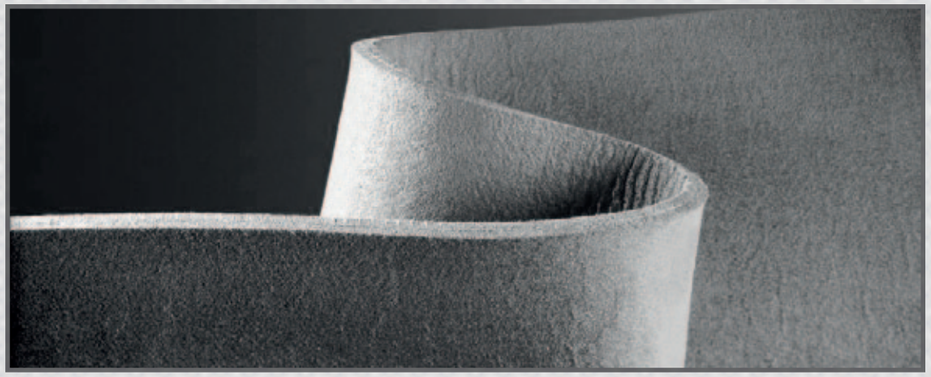
When the fibres are processed into knitted or woven fabrics, they make up a foil. This foil can be used for interior furnishings, protective clothing or as industrial applications for packaging and gaskets.



Graphite and carbon felt – unique textile, chemical and thermal properties 1.3.5

Felt has unique textile, chemical and thermal properties. Graphite felt as well as carbon felt are produced.

Felt is applied as thermal insulation, as filters, and as catalyst support. It can also be applied for porous electrodes, as backing strips for soldering and welding, as an adsorption agent and as a corrosion-resistant vessel lining.



1.3.6 For difficult deployment in the atmosphere – aerospace industry

The vast field of rockets and missiles takes advantage of many of the properties of graphite. Rapid temperature rise and unusually high operating temperatures are encountered and unusual cone, nozzle and vane shapes are needed. Graphite is one of the few materials that can reasonably meet the demands encountered under these conditions.

Semiconductors – solutions for a broad number of market areas 1.3.7

In the semi-conductor technology the key properties of graphite provide the possibility of matching certain material properties with a given specification through varying raw materials and production methods

Fiber-Optics

High purity isostatic-molded superfine graphite with its combination of thermal characteristics, chemical inertness, high purity, superfine grain texture, and structural integrity at elevated temperatures is eminently suitable.

Semiconductors

There are several major applications for graphite in the semiconductor sector with most requiring purification to at least 10ppm ash.

- Silicon is the most widely used material for the manufacture of integrated circuits and other semiconductor devices.
- Graphite is extensively used in this application for a number of reasons related to its properties.

Widespread uses in nuclear technology 1.3.8

Graphite finds widespread use in many areas of nuclear technology based on its excellent moderator and reflector qualities, which are combined almost uniquely with strength and high temperature stability. Nuclear grade graphite was developed for fission reactors.

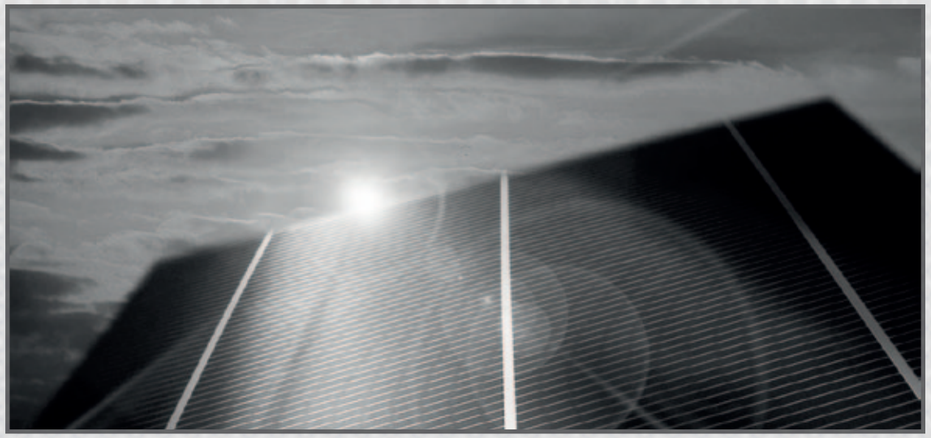
Carbon and graphite in innovative products 1.3.9

Industrial corrosion protection

Like graphite, hard carbon elements can be rendered impermeable by resin impregnation. In this impermeable form, it is used in the construction of thermally insulating, corrosion-resistant linings for columns and vessels.

The fuel cell

The bipolar plate that is made of graphite is one of the most important components for fuel cell. Until now no other material is able to meet the extremely high requirements with respect to chemical stability, conductivity and thermal stability. Graphite will surely play an important role in this technology of the future.



The carbon and graphite industry's products contribute actively to the saving of resources and energy.

2.1 Raw materials

The European Carbon and Graphite industry supports the EU's Imitative on the sustainable access to resources which was published in 2008 and was reinforced by the new Communication in 2011which will address three basic pillars:

- increasing access to resources from world markets;
- increasing access to resources from European sources;
- improving the efficiency of resource use in the EU coupled with the increase of the knowledge base about our resources.

The expectation is that this will give a boost to the development of raw materials and eventually also intermediate products which are needed by the EU's downstream industries.

Raw material prices have increased substantially in the past few years and have had an impact on the competitiveness of the carbon and graphite, but also on the downstream user industries.

Since natural graphite had been identified as a critical raw material, increased research into its uses and applications has been launched.

Energy and climate change 2.2

Cost of energy and competitiveness

Of equal importance is securing energy at competitive prices for European industries.

In this context in particular the sector, itself also a user of considerable amounts of electrical energy, has been monitoring the rising costs in the past few years which have threatened its competitiveness in comparison to its global competitors.

Parts of the carbon and graphite industry can be considered energy-intensive due to the fact that, for example, the graphitisation step in the production leading to electrodes - an integral part of all types of steelmaking - requires substantial amounts of energy in order to achieve higher longevity of the electrode in the steel furnace.

The EU's climate change policy – the ETS scheme

However, the new proposal for the European Emission trading scheme post 2013 will be another constraint on the competitiveness of the European graphite industry by imposing further costs on the enterprises which competing producers worldwide do not have to reckon with.

It is therefore crucial that energy-intensive industries which face fierce competition are given special allowances in this new scheme.

In 2011 the ECGA actively engaged in discussions with the Commission about the establishing of a benchmark or a "fallback" solution for the allocation of emissions rights under the ETS Directive for the sector due to its size in Europe. Furthermore the debate about the eligibility of the sector under the new revised EU guidelines for state aid measures continued in 2011 and 2012.

The potential impact of the legislation after 2013 is immense and hence the sector will continue to argue its case vis-à-vis the authorities.

Chapter 2 ▪ Resource and energy efficiency through carbon and graphite products

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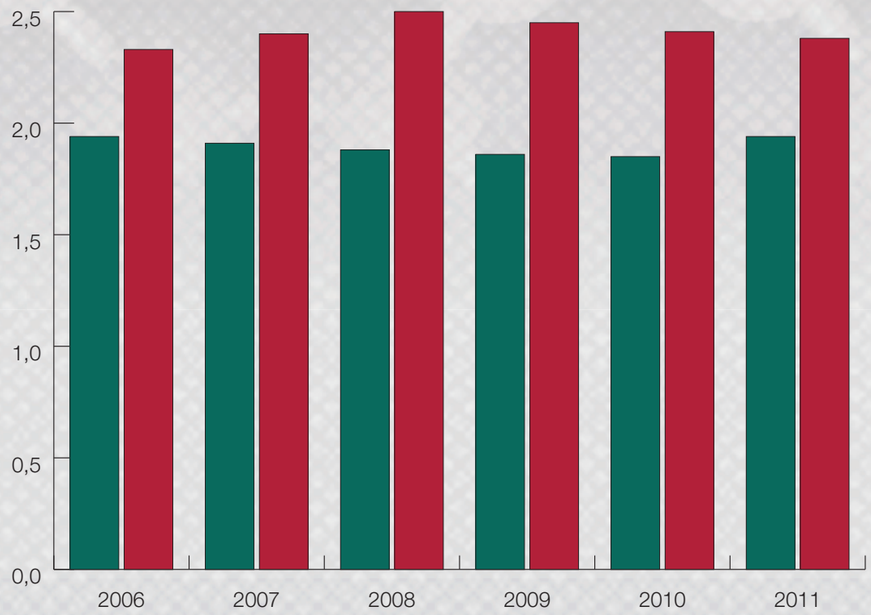
2.3 The products and their contribution to energy efficiency

The carbon and graphite sector is contributing to the goal of energy efficiency in many different ways. On the one hand through these products and on the other had through a continued strive of the operations to reduce their own energy consumption and optimisation of processes.

Example: steel making
In the steel making process, through the continuously increased efficiency of the specific graphite electrode consumption the industry has actively contributed to a saving in resources and energy consumption.

Whilst the specific consumption of electrodes in furnaces per ton of steel has decreased over the past decades and continues to decrease the improved quality of the graphite electrode and the abatement techniques for the environmental protection overall have increased the energy consumption per ton of product, only partly offsetting process efficiency.

GE specific consumption



Graphite electrodes also contribute to the optimal use of the resource iron and steel by being used to an ever growing extent in Electric Arc Furnace which is operated to recycle steel scrap.

The slight increase in the EU average consumption was due to the non-continuous operation of the steel furnaces due to the low capacity utilisation which increases the consumption as well as the increased use of imported electrodes of lower quality.

Example: aluminium industry
The product quality improvement in the area of cathodes and anodes used for the aluminium industry have seen similar improvements and therefore - also here –contribute to resource and energy savings.

Example: Energy generation
In other areas such as new developments in the fuel cell technology or in wind power generators for example, graphite contributes to the generation of new and cleaner energy generation which will in the long term save fossil fuels and reduce emissions.

Example: Transportation
Energy savings are also achieved when applying carbon fibres in transportation since its light-weight factor reduces fuel consumption whilst at the same time providing strength and performance.

Chapter 2 ▪ Resource and energy efficiency through carbon and graphite products

2.4 The operations and their contribution

But not only the carbon and graphite products are contributing to resource and energy savings, the operations itself have also made a continuous strive to improve their EHS and energy management in order to become more sustainable and more competitive in an international context.

In fact, the carbon and graphite industry has for years been actively contributing to the efficient resource management by making the best possible use of wastes and by-products from the coal and oil industry and turning them into valuable carbon and graphite products, some of them substituting the use of natural graphite.

Since ECGA members operate manufacturing sites across Europe and outside of Europe their performance improvement is based on a global approach and very often international standards whilst respecting the local legislative requirements.

Amongst the performance highlights are a reduction of various environmental parameters over the past decade:

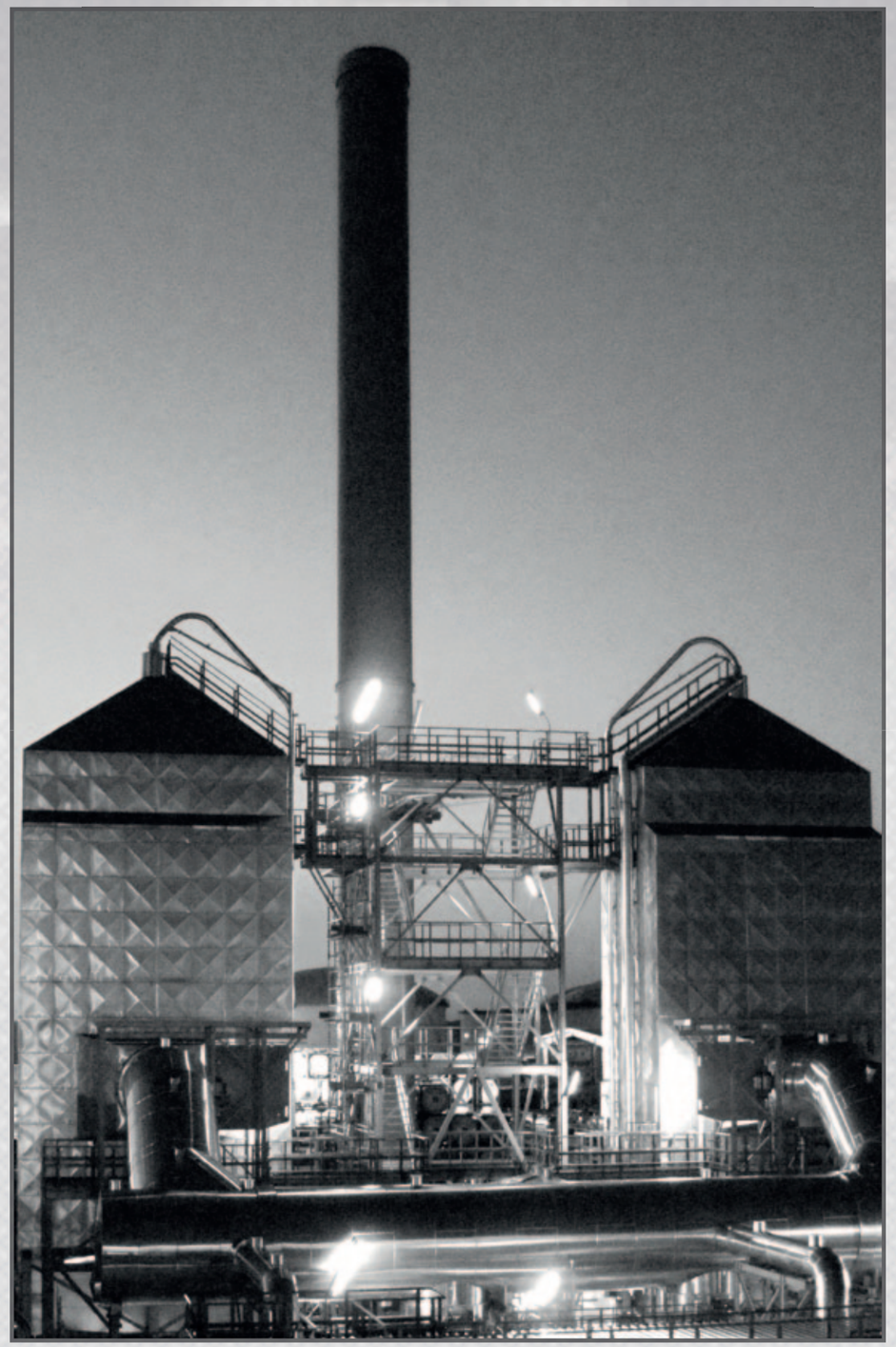
- ECGA members have reduced CO2 emissions per produced ton of material from their factories by more than 20% over the last ten years;
- the emission of non-hazardous wastes was reduced by 20% over a ten-year period;
- the reduction of cooling water consumption per ton of produced material over ten years amounted to 45%;
- dust emissions were reduced by 50% over the same period of ten years.

The capital expenditure of ECGA members for environmental protection and improvement of the working and safety conditions will amount to more than 50 million € in the next few years. To protect the environment and meet future legal requirements based on EU directives, the carbon and graphite industry is continuing to invest significantly in environmental protection installations to prevent air pollution in the coming years.

IED Directive

In 2011 the EHSA Committee has continued to monitor the development of further EU and national EHS legislation and the recast of the Integrated Prevention Pollution and Control Directive (IPPC) into the Industrial Emissions Directive as well as the related updating of the so-called BREF note for Non-ferrous metals which also covers a part of the carbon and graphite sector.

The revision of this BREF note – now being linked to the framework of the IED will have substantial impact in terms of permitting requirements since the BEF notes now include stringent BAT (Best Available Technology) recommendations to be respected by the Authorities when permitting existing or new installations. This work is being continued in 2012.



Chapter 3 ▪ Safety

3.1 REACH and the safety of substances

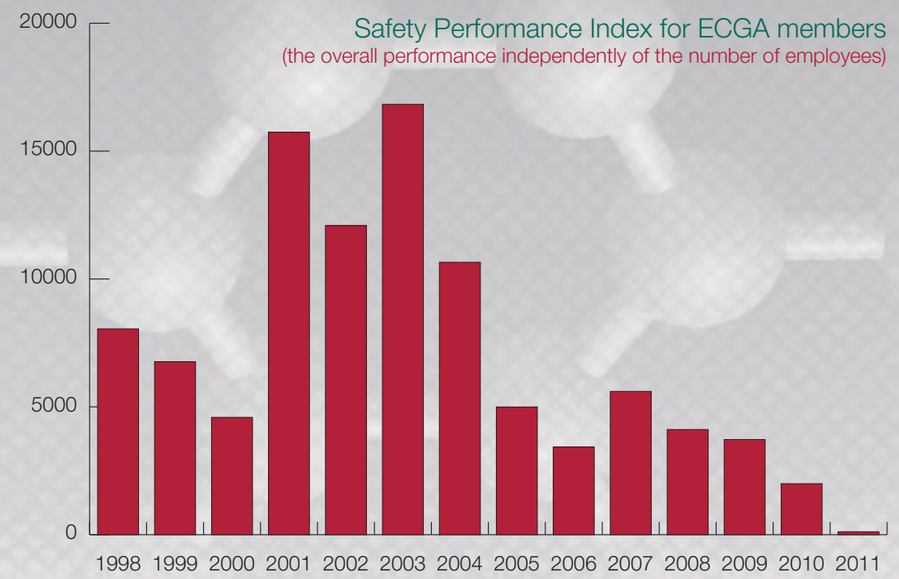
According to this regulation all chemical substances and their different applications have to be registered, evaluated and finally authorised. Having submitted the bulk of the dossiers in 2010,the Association continued its work in 2011 and is preparing one more dossier on acid treated graphite to be filed in 2013.

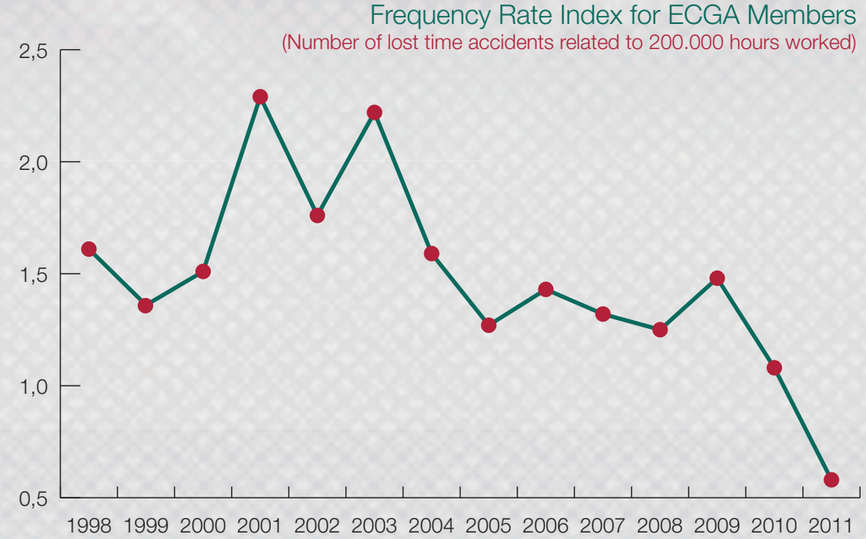
Following a reassessment of the dossier on HT coal tar pitch, submitted in 2010, the industry decided to review the chemical risk assessment and the exposure scenario situation with regard to the graphite industry from a downstream user point of view.

It decided to appoint a specialized consultant (Prosacon) to review the assessment and to develop a different approach which was then completed as an alternative Chemical safety report for HTR coal tar pitch applications in the graphite industry. In dialogue with the pitch producers, and in particular the lead registrant and their consultants, the industry is now assessing the update of the original dossier which could be submitted by end 2012.

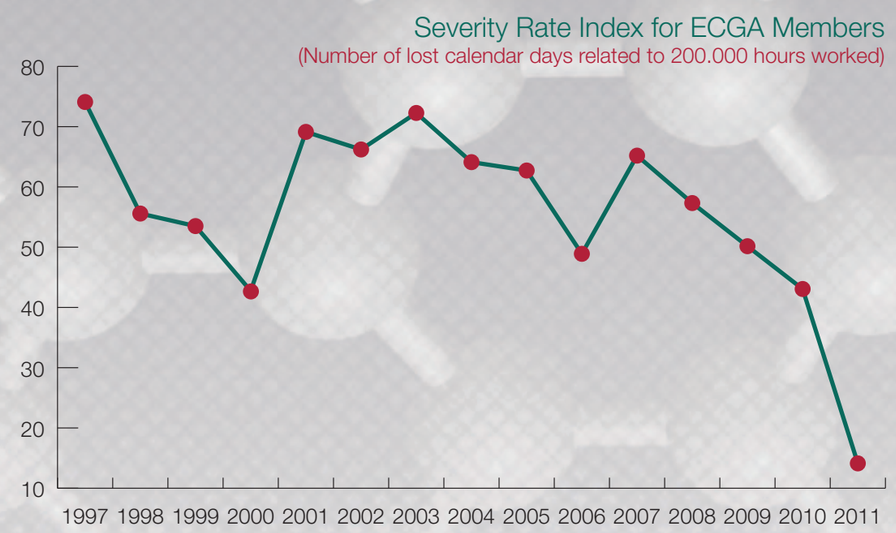
3.2 Safety Performance at the work place

Thanks to the continuous and sustainable application of highly developed Health and Safety practices by the ECGA members in the past few years a successful improvement of the Safety Performance Index and a significant regression of the key accident indicators could be attained.





By means of plant modernisation and streamlining, specific process instructions, consistent internal auditing and detailed accident and incident investigations this improvement could be made possible. As it can be seen in the presented charts not only the number of accidents (frequency rate) declined but also the absence of the job – time (severity rate) caused by accidents



Also, the review of the exposure data in the sector with regard to PAHs has led to even stricter risk management measures in many plants across Europe.

The sector expects that as a result of the REACH registration exercise after 2010 many more reviews of health and safety practices in the plants will be due, although already much effort has been put into making work places safe in the carbon and graphite industry.

Although the efforts and measures of the ECGA members to establish and maintain high-levelled environmental standards during the last years as a result of stringent legislative requirements the future requirements might hamper the industrial activities and the global competition.

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