Environmental Report 2003/2004

Partners in Responsibility

www.mobility-and-sustainability.com

Contents

1

Page 20

A bridge to the future

China is the world's largest growth market and the demand for individual mobility is on the increase. Aware of its responsibility for both people and the environment, Volkswagen – which has been a partner to China for the past 25 years – is banking on clean and economical diesel engines, and on higher-quality fuel. With synthetic fuel derived from biomass, which is like filling the tank with sunlight, whole new horizons open up.

2.2

Page 41

Still the one to beat

The Golf has been setting the standards for compact-class mobility for almost 30 years now, and the fifth generation is no exception. 150,000 people turned out for the launch in "Golfsburg" which starred German rock legend Udo Lindenberg. Like all Volkswagen models, the New Golf was designed in accordance with the Technical Development department's 7 Environmental Goals.

2.4

Page 69

Putting people first

South Africa is still suffering from the legacy of apartheid and is hard hit by AIDS. In Eastern Cape Province, such problems are exacerbated by high unemployment. As the largest employer in the Port Elizabeth region, Volkswagen is acting to combat all three threats, and keeping an eye on the environment at the same time.

3

Page 100

Turning the wheel of time

The advancement of women is a central principle of human resources policy at Volkswagen. Many of the company's activities, such as info days, development seminars and mentoring, are designed to attract more women to commercial/technical professions and qualify them for leading roles.

Innovation Overcomes Obstacles to Growth

More than almost any other company, Volkswagen and its past progress stand for an approach to business which looks beyond the company's own products to take account of its social responsibility. And as we were well aware even before the Environmental Summit in Rio, we can only achieve lasting economic success if our business activities are guided not only by social considerations but by ecological aspects as well.

Perhaps the most visible and convincing proof of our successful progress down the road to sustainable development is a lastingly satisfied customer base. As a globally active automobile manufacturer and employer, we are aware of the significance that our products and activities have for society. Safeguarding the future of personal mobility poses to a manufacturer of environmentally compatible products a challenge on a truly global scale – stretching from the conurbations of industrialised countries to the nascent transport infrastructures of emerging nations.

The close relationship between our long-term corporate policy and the fields of activity associated with sustainable development is visible in our operations in China. Since the onset of our activities in China in 1978, investments have progressively been made and expertise amassed, with the result that this flourishing economy has in the meantime become our second largest market after Germany in terms of unit sales. At the same time, through a process of dialogue with our local partners in the business and political sectors, we are endeavouring to play our part in making sustainable mobility a reality in China.

As an automobile manufacturer, it is mainly through our products that we can help to meet the demands of sustainable development. The creation of the fifth-generation Golf is a case in point. When this model, which still lends its name to a whole class of cars, was being designed, our engineers systematically took account of the 7 Environmental Goals laid down by our Technical Development department. From 2004 onwards, we will be offering a diesel-engined Golf with a particulate filter that works without a fuel additive. That said, our emissions reduction strategy is not restricted to particulate matter but targets all exhaust components. The TDI technology developed by Volkswagen has become the prototype of the clean diesel engine and was crucial to our ability to meet the requirements of the Euro 4 exhaust emissions standard in advance.

Closely related to this are our efforts to develop an innovative and sustainable fuel strategy. Substantial environmental benefits can be achieved by using synthetically manufactured fuels derived from natural gas (SynFuel) and biomass (SunFuel). What is more, we have already set automotive standards through the development of innovative fuel-economy concepts: for the fourth year in succession, the 3-litre Lupo came overall top of the "Most Eco-friendly Cars" table compiled by the environmental institute ÖKO-TREND. In addition, the 1-litre car which we presented in April 2002 provided some insight into what state-of-the-art technology can now achieve. The experience we have accumulated with the 3-litre and 1-litre cars is currently being channelled into the development of new low-consumption models which we are aiming to bring to market in 2006.

Volkswagen has always stood for a comprehensive view of social responsibility. Consequently we have never allowed ourselves to be tied down in our sustainability strategy to a purely environmental approach. In any workable sustainability model, the market acceptance of our vehicles is just as indispensable as a successful partnership in industry and with society at large. We are proud to say that Volkswagen has not only been among the leaders in environmental protection for many years now, we have also regularly set new milestones with our innovative employment models which serve as benchmarks well beyond the company itself.

Wolfsburg, December 2003
Dr.-Ing. e.h. Bernd Pischetsrieder
Chairman of the Board of Management

Sustainable Development – or "Foundations for the Future"

Leaving behind a better basis for development for future generations than the one on which the present generation had to build – such is one hallmark of the far-sighted goals of sustainable development. We are not talking here about simply preserving the ecological foundations of life by conserving resources, but about making overall provision for the future. As such, sustainable development is at the same time a principle and a guideline. And sustainable development takes on special significance in the context of globalisation. For globalisation leads to mutual dependency in many respects, which in turn calls for a three-way balance between ecological provision for the future, economic performance and social responsibility, in order to assure a stable basis for development. As a company that transcends national borders, Volkswagen is both a "medium" of globalisation and a creative force in sustainable development. As such, it must also take account of codetermination and employee representation, and live up to its responsibilities in this respect as well.

On this basis, the corporate bodies that stand for codetermination and employee representation see themselves as creative partners and innovation drivers, linking the future development of Volkswagen inseparably with ecological progress. That is why ecological topics are given due priority at the annual symposia on research and development into safeguarding jobs and corporate sites, initiated by the General Works Council. For without ecological sustainability there can be no reliable perspectives for the development of employment either. The same applies to social responsibility. Models and projects such as the "four-day week", "5000x5000" and "AutoVision" are all based on a strategy for maintaining and improving the foundations of social development at the company. This includes avoiding redundancies as well as implementing the principle of lifelong learning in order to safeguard the sustainable employability of the formerly unemployed. That said, social sustainability is by no means restricted to the national arena. With our European and Global Works Councils we have created platforms for dialogue which have, on the one hand, helped to formulate the rules of competition governed by social responsibility and, on the other, made possible the cross-border transfer of innovative employment concepts, adapted in each case to the respective national conditions. At present, the focus in this respect is on models of more flexible working hours. Social sustainability must, however, always go handinhand with economic performance as we safeguard jobs and assure the competitiveness of the company – two goals of equal importance.

Sustainability demands that we consciously take account of the interplay between company, environment and society. For this reason, under the motto "One Hour for the Future", Volkswagen's Global Works Council has lent its support to projects helping street children, setting an example of socially responsible globalisation and providing a powerful symbol of sustainability in the sense of "Foundations for the Future". It is good to note that, in the perception of a large proportion of the population, the name Volkswagen is inseparably linked with such principles.

Klaus Volkert
Chairman of the General and Group Works Council

Dear reader,

“Partners in Responsibility” is the motto at the heart of the latest Volkswagen Environmental Report. The idea is to underline the fact that, in a society marked by the division of labour, responsibility is never borne in isolation but always shared with others. Our appreciation of this fact has led to some decisive successes, not least in the field of environmental protection. As we have always been aware, such achievements are only possible with the support of external partners.

Even as we move towards publishing our own full sustainability report, our focus today is still on environmental reporting. At the same time, we are working together with other organisations to put in place the methodological backdrop for sustainability reporting in line with the guidelines from the United Nations Environmental Programme (UNEP) and the Global Reporting Initiative.

On the pages of this report, you will find a photography concept through which we have put a face to a selection of our partners: the lady who buys a 3-litre Lupo and is thus perhaps our most important partner; our partners at the environmental institutions with whom we regularly work together to draw up strategies and strive for solutions; or the suppliers who, through their innovations, support us on the road to sustainable mobility – but also the people who support our social commitment through their involvement in numerous projects.

In order to keep this report as short as possible, we have networked its contents with our Internet portal www.mobility-and-sustainability.com.

One major innovation in this year’s report is the inclusion of a chapter on the Volkswagen Group. While the report as a whole is largely focused on Volkswagen AG with the products, companies and sites of the Volkswagen brand, in this chapter you will find the figures representing the environmental performance of all of the Group’s brands. The Audi, Seat and Škoda brands also publish their own environmental reports.

Another new aspect is that, for the first time, the report has not been subjected to an external audit. Over the years, we have learned that our Environmental Management System and the monitoring methods we apply to acquire the key indicators ensure highly dependable, accurate data. We also take due account of the fact that the methods of recording the complex realities of sustainability are still in the development stage.

One aspect which has not changed is that our Environmental Report represents an invitation for you to enter into dialogue with Volkswagen – be it as a partner or a challenger. Thank you for all your suggestions and constructive criticism in recent years. Finally, our sincere thanks go to everyone who has contributed thoughts, facts, figures and energy to the production of this issue of the Environmental Report.

The Editorial Team of the
Volkswagen Environmental Report

The Volkswagen Group is the largest car manufacturer in Europe and with a global market share of 12.1 percent in 2002, the fourth largest in the world. On 31 December, 2002 we had 324,892 employees, of whom 167,005 were employed at our German companies. In 2002, the recorded sales of the Group amounted to 86.948 billion euros and profits amounted to 2.597 billion euros after taxes. In the same period, we produced 5.023 million vehicles and 4.996 million were sold. The largest year-on-year increase in sales was recorded in the Asia-Pacific region.

The Volkswagen Group's leading brands are divided into the VW and Audi brand groups. The VW brand group focuses on classic values and comprises the VW, Škoda, Bentley and Bugatti brands. The Audi brand group focuses on sporty values and comprises the Audi, SEAT und Lamborghini brands. All brands operate independently with individual financial responsibility. Volkswagen Commercial Vehicles, Volkswagen Financial Services, Europcar and other companies represent further business areas of the Group.

Group Headquarters, Wolfsburg

Volkswagen's production facilities are spread over eleven countries in Europe and a further seven in Africa, America and Asia. Altogether, the Group manufactures at 45 locations, while the organisation is separated for regional control into four areas of responsibility: Europe/Rest of the World, North America, South America/South Africa, and Asia-Pacific. Financial Services and Europcar are allocated to the Financial Services division. Volkswagen AG consists of the VW factories in Wolfsburg (Group Headquarters), Braunschweig, Hanover, Kassel, Emden and Salzgitter and, as the parent company, represents all of the other companies of the Volkswagen Group.

For further information visit

www.volkswagen.de

www.volkswagen-ag.com

Back to the Future

Volkswagen and sustainable development

Not a day goes by without someone, somewhere on this planet discussing what a responsible and meaningful approach to shaping the Earth's future might look like. Beyond any shadow of a doubt sustainability is "in" and has actually become one of our modern world's buzzwords. But what does it really mean? Back in the 18th century, the term sustainable development was already being used to describe a careful and thoughtful form of forestry management in response to the growing demand for wood. The idea was to harvest no more timber than could be regrown. In 1987, the Brundtland Commission took up the term in its report to the United Nations, raising it to the status of a principle of social development which can be maintained over time:

> Sustainable development is development that meets the needs of the present, without compromising the ability of future generations to meet their own needs.

Peter Zollinger

"Guided by the principles of sustainable development, ever since 1987 SustainAbility Ltd. has been helping successful companies sharpen their awareness of social values, shoulder responsibility and develop business models that are fit for the future. For three years now, Volkswagen has been a partner in our Engaging Stakeholder Programme. The focus here is on building trust and demonstrating accountability through systematic reporting on economic, social and ecological achievements and challenges. Like our other partners, Volkswagen regularly receives honest feedback and suggestions as to how sustainable development can go on being implemented at the company. The vision underlying our joint project is that the company should understand the global opportunities and challenges, and act accordingly."

Peter Zollinger (38) is Executive Director of SustainAbility Ltd., Zurich, Switzerland

As a result of the Brundtland Report and the 1992 UN Conference on Environment and Development in Rio de Janeiro, the principle has become a global model; a model which calls for a responsible approach not only from society and politics but from companies, too. Today, sustainable development is by no means restricted to aspects of environmental protection. Instead, it is increasingly coming to be seen as an objective for any far-sighted social and economic policy.

For the business sector, attaining sustainability has become an internal and external challenge. Social interest groups including consumer and environmental associations, and thus the political sphere, set the bar high for companies, be it at national or international level. As a result, large international companies with prominent global brands are today caught more firmly in the spotlight of public attention than ever before.

It is a challenge which, like other major international players, we at Volkswagen have taken up from the outset – not least by making a voluntary commitment to enter into target agreements and reduce the fuel consumption of our cars. This opens up additional scope for the company to break new ground on its own initiative and at its own responsibility. With their two 3-litre cars (100 km on just three litres of fuel), Volkswagen and Audi have generated new impetus, bringing to market alternative products with the highest energy efficiency without waiting for the state to introduce new legislation. We are convinced that long-term economic

success can only be achieved if both social and ecological aspects form an integral part of corporate policy. The concept of the "triple bottom line" – economic, environmental and social accountability – which has been around for some time now, neatly encapsulates this three-dimensional perspective.

Companies are obliged to act in line with economic considerations. Their primary function is to create economic value and satisfy the needs of their customers. In order to ensure that they can do so in the long term, however, companies must also be aware of the social and ecological impacts of their operations and wisely take these into account when shaping their policies. We see our commitment to sustainable development as an investment in the future. The short-term costs will be offset by medium- and long-term benefits for the company's shareholders and stakeholders. Examples of this strategic direction include our module strategy in the production sector (see page 16), the development of high-efficiency engine technology such as TDI and FSI, and our expertise in lightweight design using aluminium. Then there are the fields of financial services, fleet management and car rentals, in which we offer vehicle-related services for your personal mobility.

The challenge of globalisation

As the sustainable development debate progresses, the notion of "globalisation" has become a topic of increasingly heated discussion. To be sure, the opening up of the world's markets holds both risks and opportunities and stands for a new challenge for international trade. Companies from industrialised nations in particular are expected to play a model role in terms of both ecological and social aspects wherever their operations are based. Volkswagen is committed to living up to these expectations.

Accordingly, we make local commitments by promoting socially-oriented initiatives, for example, or voluntarily introducing environmental and social standards which go beyond the requirements of the law. "If leading global companies profess to have firmly-anchored moral concepts, they cannot treat their workforce differently in Europe than in the USA, Central or South America," said Dr. Peter Hartz, Member of the Board of Management of Volkswagen AG at the signing of the "Declaration on Social Rights and Industrial Relationships" (see page 98).

Dr. Bernd Pischetsrieder, Chairman of the Board of Management of Volkswagen AG, Dr. Peter Hartz, Member of the Board of Management of Volkswagen AG responsible for Human Resources, Klaus Zwickel, President of the International Metalworkers' Federation (IMF), Hans-Jürgen Uhl, General Secretary of the Volkswagen Group Global Works Council, and Klaus Volkert, President of the Volkswagen Group Global Works Council, (from left) at the signing of the "Declaration on Social Rights and Industrial Relationships".

Hallmarks of the sustainability process at Volkswagen

For Volkswagen, sustainability means having access to – and the long-term safeguarding of – resources at all levels: capital, employees, technology, raw materials, knowledge and reputation – among clients and the general public. As they manufacture products and provide services, companies make use of natural resources. A responsible approach to these resources is fundamental to sustainability. On the social side, companies are dependent upon qualified employees, a reliable legal system and an efficient research and scientific community. Consequently, companies not only provide jobs and pay taxes, they also take on social duties. This could be within the scope of economic or urban development measures, such as AutoVision (see page 93), or by advising the political sphere, as was the case with the Hartz Commission which advised the German government.

The hallmarks of the sustainability process at Volkswagen are as follows:
- evolution (continuous development)
- integration
- innovation
- communication
- learning

Evolution

The way we see it, sustainability is a continuous development process. In other words, basing our efforts on Volkswagen's traditions, cultural values and operating environment, we follow our own company-specific route to sustainability. Long-term planning, a careful approach to natural resources, and displaying social responsibility in our dealings with employees and other partners in society have long been central to the way we work.

Corporate Stakeholders

Source: Volkswagen AG

Integration

When it comes to solving problems and taking decisions, we believe above all in taking an overall view. This means, for example, that when we consider strategic business issues, such as the planning of new facilities for Volkswagen, ecological and social viewpoints are invariably also considered. This policy finds expression in, among other things, the way we take account of the "worldwide environmental protection standards" for production operations and involve our experts on environmental protection and human resources in our discussions from the outset.

Innovation

This holistic perspective, together with the interests of external stakeholders, lead us to subject our current achievements to an ongoing critical review in search of improvements. The review process also includes active dialogue with stakeholder groups. In this way, Volkswagen's sustainability culture also opens up new potential for innovation, leading to new ideas such as "the breathing company", "Time Asset Bonds" (see page 92) or the world's first 1-litre car (see page 50).

Communication and learning

Social interest groups such as the electorate and its representatives, companies, initiatives and associations need to reach consensus regarding their expectations and requirements of sustainable development and their own part in achieving it.

For us, that means providing the public with important information voluntarily and in a credible manner. Through the life cycle assessments that we have drawn up for models such as the Golf and Lupo, we provide insight into the materials and energy that go into our products. Our environmental reports supply comprehensive and regular information on our activities in the fields of environmental protection and sustainable development. And we make use of the Internet to serve up a constant flow of information on the latest environmental activities at Volkswagen.

Any process of fair dialogue presupposes mutual respect, a willingness to reach an understanding and the ability to deal with criticism. For Volkswagen, being open for dialogue means not only welcoming invitations to enter into discussions but also actively seeking out direct contact to interest groups. In this way, we are aiming to lay the foundations for acceptance and trust, and enable a process of mutual learning. In this issue of our Environmental Report, we have provided

several of our most prominent partners and critics with a platform from which to air their views in the shape of the Sustainability Partner items and Challenger Statements. Further examples of this constructive communications culture from which both sides benefit can be found in our environmental cooperation with the German Society for Nature Conservation (NABU) and the Institute of Applied Ecology (Öko-Institut), while our involvement in the work of associations and initiatives provides additional forums from which all concerned can learn.

Volkswagen is an active founder member of the World Business Council for Sustainable Development (WBCSD) whose Sustainable Mobility project represents a major joint initiative of the automotive sector. The project brings together car manufacturers, oil companies and automotive suppliers, working to formulate a shared vision of global mobility in the year 2030 (see page 87). Volkswagen also cooperates with other international automobile manufacturers on aspects of global environmental protection and sustainable development within the Mobility Forum set up by the United Nations Environmental Programme (UNEP). At present, the Mobility Forum is focusing on automobile-specific indicators for external cor-

Volkswagen and the Global Reporting Initiative (GRI)

The Global Reporting Initiative (GRI) was established in Boston, USA, in 1997 with the aim of creating a common framework for sustainability reporting worldwide. Contributors to this multi-stakeholder process at the GRI include companies, NGOs, consultants, auditors, associations and other stakeholder groups. The GRI publishes guidelines based on the respective status of the process. These are designed to provide orientation in the production of sustainability reports. The latest update was published in 2002 and takes into account current buzzwords such as globalisation and governance, accountability and citizenship. GRI sees the guidelines as a key element in the GRI framework. This includes such items as sector supplements, technical protocols and issue guidance documents (www.globalreporting.org).

In the 2001/2002 Volkswagen Environmental Report, we took account of a large number of GRI indicators. In the present report we have gone one step further. Of particular interest here is the revised structure of the chapters in this report which take more precise account of the three dimensions of sustainability than in the past. Moreover, the chapter on strategy ensures that the ecological, social and economic topics are embedded in the appropriate overall context. An overview of the extent to which we currently meet the core and additional GRI indicators can be found on our website at **www.mobility-and-sustainability.com.**

Within the UNEP Mobility Forum, Volkswagen works closely with other automobile manufacturers, the GRI and other international stakeholders from the environmental, business and social sectors to draw up industry-specific indicators for sustainability reporting. These are intended to complement the general guidelines issued by the GRI.

The debate on the sector supplement for the automotive industry commenced in May 2002 and is due to be concluded by the end of 2003 with the appearance of a pilot version. Volkswagen will be testing this version within the framework of its communication activities. As the pilot version was not yet available when the present Environmental Report was published, we were only able to take account of some of the topics and indicators which will figure in the sector supplement. That said, we also believe that the complete and exclusive fulfilment of the requirements of the GRI framework should not be the sole standard applied en route to a sustainability report. Because while verifiable standards do indeed make for a high degree of comparability and clarity, given the differences in their business models, structures and processes, direct comparison of different companies, e.g. by means of quantitative indicators, will invariably prove extremely difficult. Consequently, it is important that companies should retain a certain amount of freedom in the way they describe their chosen route to sustainability. Particularly in view of the complexity of sustainability, applying excessively rigid standards could lead to important, decentralised development processes being omitted and restrict companies' options of bringing their own constructive, creative input to bear on the process. As a result, for Volkswagen, a critical dialogue with our stakeholders, partners and challengers, and the careful consideration of the contents of other guidelines and standards published by external institutes, rating organisations and consultants, formed cornerstones of our work as we drew up this report and updated our website.

porate reporting to complement the guidelines of the Global Reporting Initiative (GRI) – see opposite page.

At European level, since 1995 Volkswagen has been involved in the work of the European business initiative, Corporate Social Responsibility Europe. The aim of CSR Europe is to support companies in their efforts to unite high profitability, sustainable growth and social progress (www.csreurope.org). Within Germany, Volkswagen is an active member of the sustainable mobility forum, econsense, an initiative of leading German companies and organisations which have integrated the vision of sustainable development into their corporate strategies. econsense was founded in the summer of 2000 under the auspices of the Confederation of German Industry (BDI) in Berlin (www.econsense.de) – see page 85.

Volkswagen's model of sustainable development

At the World Summit on Sustainable Development in Johannesburg in 2002, in our declaration on the Global Compact we formulated Volkswagen's model of sustainable development:

Volkswagen's Model of Sustainable Development

- At Volkswagen, our model of sustainable development is the benchmark for a long-term corporate policy which squares up not only to economic challenges but ecological and social ones as well.
- Together, commercial success, far-sighted environmental protection and social competence enhance the global competitiveness of the Volkswagen Group.
- The Volkswagen Group develops, manufactures and markets automobiles and services throughout the world in order to provide its customers with attractive solutions for their personal mobility.
- It is Volkswagen's goal to make advanced technologies available across the globe while taking account of environmental protection and social acceptability considerations.
- Along with economic success, the primary objectives of Volkswagen's corporate policy include the continuous improvement of the environmental acceptability of its products and the reduction of its consumption of natural resources.
- Volkswagen is a company with German roots, European values and global responsibility. The rights, personal development, social security and economic participation of its employees are core elements of corporate policy.
- A spirit of cooperation and partnership forms the basis of successful collaboration between management and employee representatives, in Germany, in Europe and around the world.
- For Volkswagen, globalisation is a decisive factor in securing international competitiveness and safeguarding the future of the company. Shaping globalisation to be environmentally and socially compatible is the task of a modern and responsible corporate policy. This same policy serves the long-term interests of Volkswagen's customers, stakeholders, employees and partners. Globalisation must not be based on exploitation.
- Volkswagen also actively promotes an environmentally and socially compatible approach to business among its suppliers.
- Wherever it operates, Volkswagen considers itself a partner to society and the political sphere.

This model is reflected in the company's specific guidelines for the environmental and social sectors. For major international companies in particular, guidelines and principles are very important, because with diverse regional operating environments and cultures to contend with, a stronger focus on integration is called for. With its environmental policy statement issued in May 1995, Volkswagen laid down general principles for the protection of the environment. These are valid worldwide and have been modified to suit the needs of the individual brands and regions within the Group.

Thus as early as 1995, Volkswagen declared that it would "work hand-in-hand with society and policy-makers to shape a development process that will bring sustainable social and ecological benefits".

Following the first Volkswagen Group Environmental Conference in 1998, the company issued globally applicable guidelines on environmental protection standards for the production sector. Through these guidelines, we are aiming to ensure that above-average uniform minimum standards are applied to the production process at all our plants. The guidelines also provide a point of reference for the construction of new facilities and for modernisation measures. At the same time, the Factory Agreement on Environmental Protection was concluded for the Volkswagen brand between management and the General Works Council, setting out the "rules of good environmental practice".

The 1-litre car at the second Group Environmental Conference in 2002

With its "Declaration on Social Rights and Industrial Relationships", in 2002 Volkswagen became the first company in the automotive sector to agree globally applicable employee relations standards with its Global Works Council and the International Metalworkers' Federation (IMF).

Further information on this topic can be found at

wwww.mobility-and-sustainability.com

www.vw-personal.de

Dr. Horst Minte, Head of Environmental Strategy at Volkswagen at the second Environmental Conference

The Global Compact

At international level greater things are expected of companies, as reflected in various external guidelines, codes and initiatives. While respecting these principles is entirely voluntary, they do act as beacons for companies such as Volkswagen.

Since the World Summit in South Africa, the Volkswagen Group has been supporting the UN Global Compact (www.unglobalcompact.org). The Global Compact is an initiative triggered by UN Secretary-General Kofi A. Annan at the 1999 World Economic Forum in Davos. Within the Global Compact, companies commit themselves to a set of common, globally applicable values in the fields of human rights, labour and the environment. Volkswagen is one of those companies. Our commitment was confirmed in a letter to Kofi A. Annan from the Chairman of the Board of Management, Dr. Bernd Pischetsrieder.

The Global Compact lists nine principles. Those which concern the environment state that businesses should support a precautionary approach to environmental challenges, and that they should encourage the development of environment-friendly technologies and of initiatives to promote greater environmental responsibility. The key objective is to improve living conditions in developing

countries through joint initiatives of the UN and global companies. The actual wording of the nine principles is as follows:

Human Rights
- Businesses should support and respect the protection of internationally proclaimed human rights within their sphere of influence; and
- make sure that they are not complicit in human rights abuses.

Labour Standards
- Businesses should uphold the freedom of association and the effective recognition of the right to collective bargaining;
- the elimination of all forms of forced and compulsory labour;
- the effective abolition of child labour; and
- eliminate discrimination in respect of employment and occupation.

Environment
- Businesses should support a precautionary approach to environmental challenges;
- undertake initiatives to promote greater environmental responsibility; and
- encourage the development and diffusion of environmentally friendly technologies.

Through its Corporate Environmental Policy (1995) and its "Declaration on Social Rights and Industrial Relationships" (2002), Volkswagen has already complied with the Global Compact at the highest level. The exchange of information among the organisations associated with the Global Compact takes place at what are known as Global Compact Learning Forums which Volkswagen also attends. In December 2002, for example, we presented a paper on the subject of "The Global Works Council and Peaceful Conflict Resolution" at one such forum in Berlin.

OECD-guidelines

In June 2000, the Organisation for Economic Cooperation and Development (OECD) published its "Guidelines for Multinational Enterprises". To date, these guidelines represent the only comprehensive code of conduct for companies that has been approved at government level, and they form the frame of reference for Volkswagen's global activities (www.oecd.org). The guidelines challenge companies to champion compliance with internationally agreed human rights and rights of association, environmental protection and consumer protection, and the fight against corruption. Child labour and forced labour are condemned, as are discrimination with reference to the recruitment and remuneration of individual groups and races. Furthermore, compa-

"We have to choose between a global market driven only by calculations of short-term profit, and one which has a human face. Between a world which condemns a quarter of the human race to starvation and squalor, and one which offers everyone at least a chance of prosperity, in a healthy environment. Between a selfish free-for-all in which we ignore the fate of the losers, and a future in which the strong and the successful accept their responsibilities, showing global vision and leadership.

On its side, business has come to realise that if it wishes to thrive in a complex and sometimes hostile global economy, it must respond to the major social and environmental trends and challenges that are reshaping our world."

Kofi A. Annan, Secretary-General of the United Nations

Further statements can be found at **www.mobility-and-sustainability.com.**

nies are called upon to promote the training and development of their employees and to inform them of relevant decisions on the investment front.

WBCSD and econsense
Through its membership in the WBCSD and econsense, Volkswagen is supporting the principles and maxims of these organisations. The aim of the WBCSD is not only to apply the influence of the business sector to drive progress towards sustainable development, but also to promote eco-efficiency, innovation and a responsible approach to business. The aim of the German business sector initiative econsense is, based on the tenet of commercial success, to offer ecologically and socially acceptable products and services, and to apply and continuously develop sustainable business practices. Member companies are committed to dealing with all resources in a manner aligned with the principle of sustainability, as well as to transparency and dialogue, and to gearing their activities to national and international codes of sustainability. Through the application of competence, initiative and innovation, the companies which have joined forces within the scope of econsense are out to play an active part in shaping sustainable development.

Since 1991, Volkswagen has been supporting the International Chamber of Commerce's Charta of Sustainable Development. The ICC Charta includes 16 principles of environmental management (www.icc-deutschland.de).

Of Methods and Structures

How sustainability is organised at Volkswagen
Volkswagen takes an integral approach to the sustainability process. The basic guidelines which govern sustainability at Volkswagen are coordinated by the cross-divisional Sustainability Steering Group. The group comprises members from the Corporate Government Relations, Environmental Protection (product- and production-related), Personnel, Finance, Communications and Legal departments. Among the concrete tasks confronting the steering group in 2002 and 2003 was preparing the Group's activities at the World Summit on Sustainable Development, held in South Africa.

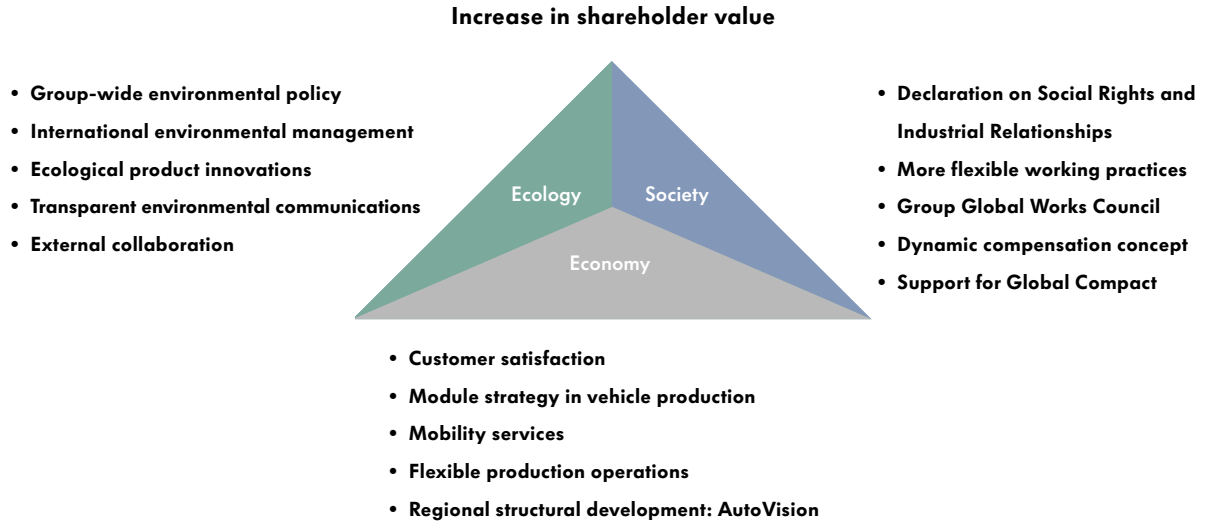
The brands and regional organisations within the Volkswagen Group are permitted some leeway. This is necessary in order to arrive at solutions and concepts tailored to the respective brand or region. Shared guidelines and international bodies such as the Group Task Force – Environment (GTFE) or the Human Resource Executives Conference and Regional Conferences all help to build a common platform.

Responsibility for coordination and strategic consulting lies with two departments: Corporate Government Relations and Environment and Industrial Safety. Coordination and consulting means that Volkswagen's sustainability goals are discussed with the respective specialist departments and integrated into their processes and projects. The specific departmental indicators set out in Chapter 2 (The Environment) and Chapter 5 (The Group) are an important tool in this respect.

Monthly information services and studies keep the relevant interest groups at the company up to date with the latest developments in respect of the environment, transport and sustainability in political, scientific and social contexts. External communications on the subject of sustainability address different target groups through different media, such as the Environmental Report and Global Compact Report; p:news for political news; the Internet portal www.volkswagen-environment.de and a range of public debates on topics such as "Family and Profession" or "Volkswagen's Fuel Strategy".

The effectiveness of a sustainability management strategy is ultimately measured by the results that it generates. Independent rating agencies which assess the performance of companies in respect of sustainable development have confirmed that we are on the right track with our existing strategy and have rated Volkswagen's performance in recent years as "exemplary" (see page 104).

Strategic contributions to sustainable development at Volkswagen



Source: Volkswagen AG

Daring to be Decisive

Global minimum standards

For Volkswagen, sustainability is a key principle which defines the framework for our activities when there are strategic decisions to be made in the environmental, social or economic sectors – a principle that aligns with our selfperception as a multinational group with a far-sighted approach. The application of this principle provides a uniform global framework for our environmental and business policies. It also ensures that above-average standards are in place at all our locations. In turn, these standards provide new impetus for the local economy and for regional environmental and social standards.

But how does the company stand to benefit from the introduction of global minimum standards? One the one hand, risks can be reduced. Then there are advantages on the planning and management sides, since environmental and quality management systems only need developing once, and can then be deployed at every corporate site all over the world. Environmental and social standards are not least a question of how high a company sets the bar for the quality of its own production operations and products. The fact is that high-quality, complex products like automobiles call for high-standard production processes and highly-qualified employees, requirements with which a company can only comply in the long term by applying the appropriate environmental and social standards. In this respect,

the company's economic, ecological and social objectives overlap.

That said, in the short and medium-term there may also be conflicting objectives. It is not always the case that, given the competitive situation, there is sufficient financial leeway for planned environmental protection measures to be rapidly implemented. In such cases, incremental deployment is called for. At other times the municipal infrastructure restricts the scope of specific environmental protection measures. Here the answer lies in close cooperation with the local authorities.

The introduction of international minimum standards is not the only fundamental consideration for us, though. Other important aspects include serving as a model for the respective region and the transfer of advanced product- and production-related technologies, as shown by the examples in Chapter 2.4.

Economic Value Added

Volkswagen's financial strategy targets a sustainable increase in shareholder value. The key tool here is Economic Value Added (EVA®), a concept which helps to measure the contributions to earnings of the subgroups and companies that make up the automotive division. Prior to and during implementation, processes, projects and products are also monitored to ensure that they are preserving or enhancing the shareholder value at Volkswagen (see page 105).

Flexible product and production strategies

For a company that has to deal with a large number of models and variants, as well as with specific customer requirements and cyclical demand, a flexible product and production strategy is an important competitive factor. Not least as a result of the module strategy applied within the various model series, Volkswagen achieves product-related synergies of both technical and economic kinds. Selected modules are used in parallel in different models which meet similar technical requirements. This way, the company can offer its customers a wider range of models at competitive prices as well as shortening its development cycles. For the production sector, Volkswagen has developed the "turntable" concept. At plants which produce a number of different models, this enables the unit output of each model to be varied rapidly and with relative ease. Such shifts in output figures can take place within a single production plant or across several plants. With the turntable concept, equipment capacities at the plants can be kept lower since Volkswagen can respond more flexibly and faster to surges in demand.

Technological competence

For us, the core of our policy of sustainability remains the technological competence that will ultimately allow us to safeguard the future of personal mobility. In order to guarantee this in the long-term, the most important thing is to develop innovative pre-prototypes. Consequently, in the drive technology sector, ever since the 1970s Volkswagen has been working on concepts for electric and hybrid vehicles. Now, with prototypes such as the Bora Electric or the fuel-cell-powered Bora HyMotion (see page 56), we have reached a new stage in the development process. In the field of lightweight vehicle design using aluminium, we have been playing a leading role since 1994. With the launch of the world's first 3-litre car (100 km on three litres of fuel), the Lupo 3L TDI, Volkswagen demonstrated that high-efficiency drive technology can be implemented in production models. And with the 1-litre car, which made its debut in April 2002, Volkswagen has indicated what can already be achieved in the fields of advanced lightweight design and drive technology (see page 50).

Despite such innovate drive concepts as the fuel cell or hybrid drive, the traditional spark-ignition and diesel engines will continue to dominate the street scene in the future – at least in the short and medium term. The fuel cell will only come to play a significant role in the long term (see page 55).

Sustainable mobility

In our opinion, any sustainable mobility strategy must take account of different time frames. On the one hand it must be devised for the long term, in order to generate impulses for future traffic technologies and forms of mobility. But on the other hand, it must also have a bearing on the present and make use of the unexploited efficiency reserves of existing technologies.

Consequently, Volkswagen is targeting two objectives:

- the development of innovative vehicles with maximum efficiency, in order to exploit the full environmental protection potential of standard production technology (innovator effect), and
- the integration of environmentally efficient technology in the mass production sector (volume effect).

If sustainable mobility is to be assured, we must raise our sights from individual solutions to the bigger picture – system solutions. As a key mode of transport in any mobility scenario, automobiles help to meet the need for personal mobility. The efficient networking of different modes of transport (known as intermodal transport) and assuring the availability of a high-capacity infrastructure represent challenges for Volkswagen and the automotive industry as a whole – challenges which are set to grow. In response, the Sustainable Mobility project is looking into means of enhancing intermodal networking and improving the overall transport infrastructure (see page 87).

Another important angle of approach to sustainable mobility leads via fuels. Through its fuel strategy, presented in 2001, Volkswagen is endeavouring to integrate the various time frames in respect of fuels and drive technologies into a convincing overall concept and build bridges to the future (see page 44).

The World Summit on Sustainable Development in South Africa, 2002

Having already taken part in the 1992 environmental summit in Rio de Janeiro, Volkswagen was also present at the 2002 World Summit on Sustainable Development staged in Johannesburg. At the summit, the corporate sector was assigned the important role of Promoter of Sustainable Development. UN Secretary-General Kofi A. Annan called on companies not to wait for politicians to catch up before they take decisions,

From left: Dr. Cornis van de Lugt, Global Compact Officer, Dr. Peter Hartz and Klaus Volkert at the World Summit on Sustainable Development in Johannesburg

and referred to the business sector as a key driving factor on the road to sustainable development.

At the heart of our activities at the summit lay the Volkswagen Group's public undertaking to support the Global Compact (see page 12). As the Group's Global Compact Officer, Dr. Cornis van der Lugt, looked on, Dr. Peter Hartz, Member of the Board of Management of Volkswagen responsible for Human Resources, and Klaus Volkert, President of the Group Global Works Council, re-emphasised the company's support for the initiative. "Our strategic orientation towards sustainability means for Volkswagen above all the will and the ability to go on learning. If you constantly subject your achievements to a critical review, you open up new scope for innovation. If not for this approach, there would be no 'breathing company', no Time Asset Bonds, no Declaration on Social Rights and no 1-litre car," said Dr. Hartz, underpinning Volkswagen's commitment to sustainable development.

Volkswagen also showcased its commitment to innovation through the Technology Exhibition at the Volkswagen Conference Centre. Visitors had a chance to test drive the Group's two 3-litre models, the

Lupo 3L TDI and the Audi A2 TDI, and take a look under the bonnet of a fuel-cell powered Bora HY.POWER®. The cross-section of innovations on show was rounded off by two further topics: Fuel Strategy/SunFuel (see page 44) and Lightweight Design, based on the example of a transparent 3-litre Lupo (see photo) and the aluminium space frame of an Audi A2. But the highlight of the exhibition was, of course, the world's first 1-litre car.

Dr. Ina Thurn, Volkswagen Environmental Strategy, with "reporters" Ayanda Thabede (left) and Neo Mathope at the Volkswagen Technology Exhibition in Johannesburg

Multimedia terminals, display boards and short videos informed visitors about Volkswagen's efforts in the field of sustainable development, including local activities in South Africa, under the auspices of the Volkswagen Community Trust. The presentations were complemented by a dedicated website on the Internet, which – in keeping with our responsibility for future generations – primarily targeted a younger audience and provided information around and about the World Summit.

Along with a large number of special topics, the site featured daily news presented by two South African high school students who acted as roving reporters, as well as dialogue forums, and interviews, not least with Prof. Klaus Töpfer, Executive Director of the United Nations Environmental Programme (UNEP).

On the German Business Day staged by the Confederation of German Industry (BDI), high-ranking representatives of Volkswagen were among those who fielded questions in the debate on the global challenges posed by sustainable development. A joint initiative of Volkswagen and terre des hommes entitled "One Hour for the Future" was introduced by the Managing Director of terre des hommes Deutschland, Peter Mucke: "This campaign is an example of how different players can work together to help resolve social problems such as those discussed at the World Summit", said Mucke, pointing out that this was the largest joint venture between his organisation and a commercial enterprise.

Coordinated by the UNEP's Technology, Industry and Economics division (www.uneptie.org), a total of 22 industry reports were produced to mark the World Summit under the heading of "Industry as a Partner for Sustainable Development". The automotive industry report was drawn up at the Mobility Forum by the international automobile manufacturers and their associations in Europe (ACEA) and Japan (JAMA). Volkswagen was among the contributors. In the chapter of the report entitled "Best Practice", the 3-litre cars from Volkswagen and Audi, the Time Asset Bond (see page 92), and our business activities in the Chinese market were all singled out for special mention.

The World Summit in Johannesburg confirmed the status of sustainable development as a beacon for the political sector worldwide. Governments, political and social organisations and companies are all challenged to integrate the agreements reached at the Summit into their own decision-taking and activities. Directly after the Summit, Volkswagen gave thought to which fields of the company's activities could be aligned with – and thus support – the agreements, and identified the following sectors:

- supplier performance
- water management
- resource conservation/optimised resource consumption
- renewable energy resources
- personal and professional development

As part of the sustainability process at the company, Volkswagen is currently formulating the appropriate strategic goals in order to drive forward existing worldwide activities in these fields of activity.

Joining Forces

Volkswagen's Sustainability Partners
As we strive for sustainable added value worldwide at Volkswagen, we do so in harness with a number of partners, each a leader in its own domain. In this issue of our Environmental Report, we introduce one Sustainability Partners at the beginning of each chapter and offer them a platform for their views.

Dr. Petra Boxler (terre des hommes)
"A dedicated works council and a workforce with a big heart for children can make a real difference when they join forces with a partner with experience of helping children in need..."

Dr. Bodo Max Wolf (Choren Industries)
"Fossil fuels are finite – a fact that affects the automotive industry more than most. Given the current state of the art, sustainability can only be achieved by using a solar energy resource such as biomass, along with wind energy and hydroelectric power..."

Ingo Schoenheit (imug)
"We at imug feel there is a special bond between us and Volkswagen. Because in the research sector and in consulting in particular, what counts is not so much 'meaning well' as 'doing well'..."

For the full statements and other Sustainability Partners, visit **www.mobility-and-sustainability.com.**

Sunrise in the East

China and Volkswagen – a partnership for sustainable mobility

The People's Republic of China is today the world's largest automotive growth market, with an increase in car output in 2002 to over 1.2 million. Assuming the economy grows at between 7 and 7.5 percent annually, the volume of production is likely to soar to 4.5 million by 2008. The trend has been aided by China's accession to the World Trade Organisation in late 2001, which made private cars more affordable for Chinese buyers, and by the boom which has followed the naming of Beijing as host city to the Summer Olympic Games in 2008. In a further sign of the times, another Chinese city, Shanghai, will be hosting EXPO 2010, China's first-ever world exhibition and an event which has always been associated with innovation and a new start.

Volkswagen is a trailblazer among the international automobile manufacturers now working in China. The Volkswagen Group has been providing capital and know-how to help develop the Chinese economy ever since it conducted its first negotiations here in 1978. Its first car-making joint venture, Shanghai-Volkswagen Automotive Company Ltd., was established back in 1985, with FAW-Volkswagen Automotive Company Ltd. in Changchun following in 1991 and Volkswagen Transmission, Shanghai, in 2001. China is now Volkswagen's second largest market after Germany. We are looking to build on this tradition by meeting the growing Chinese demand for individual mobility in an environmentally responsible and efficient manner.

How to save 650,000 litres of fuel a day

Consequently, automotive development work at Volkswagen is closely focused on reducing fuel consumption, exhaust emissions and CO_2 output. The diesel engine is one globally proven way of meeting these goals. Today, state-of-the-art injection technology has put the diesel engine ahead of all other mass-produced engines on fuel consumption and CO_2 emissions. The diesel's potential can be illustrated by some simple arithmetic. Take Beijing's taxi fleet for example: assuming that the city's 60,000 taxis cover an average of 300 kilometres a day, replacing the current petrol-engined vehicles with state-of-the-art diesel taxis would result in a saving of approximately 650,000 litres of fuel every day. This would reduce annual CO_2 emissions by up to 45 percent and would also bring economic benefits for the taxi operators in the form of reduced operating costs. Volkswagen is currently working to increase the penetration of diesel engines in the Chinese car market.

Shanghai skyline

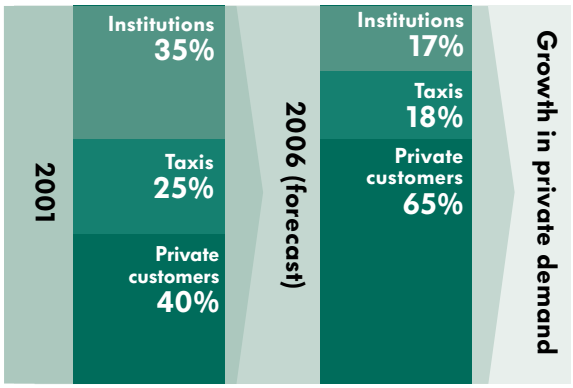
One aspect which is crucial to the effectiveness of Volkswagen's technical innovations in China is fuel quality. Irrespective of future developments on fuel strategy, however, all Volkswagen models sold in this market meet the national emissions standards for 2004/2005 and some engines already meet the prospective standards for 2008. The introduction of optimised "designer fuels" in the Chinese market would be an important step towards responsible mobility. China's vast natural gas reserves hold fertile potential for the production and use of synthetic fuels based on synthesis gases (SynFuel) (see page 46), while produc-

tion and use of biomass-based fuels, for which Volkswagen has coined the term “SunFuel”, would also lessen China’s dependence on imported crude oil. Imports currently supply approximately 20 percent of China’s total crude oil requirements. Substituting biomass for some proportion of fossil fuels would also open up new economic opportunities for Chinese agriculture. At the same time, introducing SynFuel and SunFuel would have only a negligible impact on the region’s fuel distribution infrastructure.

Volkswagen advising on standards

Long-established partnerships give Volkswagen the opportunity to play a part in economic policy-making in China. For example, Volkswagen is advising the State Environmental Protection Administration (SEPA – www.sepa.gov.cn) on new technical standards for diesel engines (see page 29).

Passenger car sales in China



Source: Volkswagen AG

Furthermore, an agreement was recently signed governing Volkswagen’s involvement in the drafting of emissions standards. Volkswagen was also the first foreign company to be appointed a member of the National Technical Committee for Automotive Standardisation. Volkswagen will continue to seek dialogue with the aim of giving sustainable mobility a higher profile in China.

To Meet Your Goals, First You Must Know What They Are

Our last Environmental Report listed 45 major strategic corporate goals and measures. The list that follows describes our new goals on sustainable corporate development as well as informing you about the status of the goals listed in our last report. As pointed out in our previous report, more extensive detailed lists of objectives can be found in the Environmental Statements of our plants.

New Goals

Sustainability and Social Responsibility
Publication of the final report of the WBCSD Sustainable Mobility 2030 project in the first quarter of 2004, with scenarios
Development of sustainable mobility scenarios
Active involvement in international sustainability initiatives
Ongoing presence in sustainability indexes worldwide
Further development of sustainability management
Maintaining high quality standards in environmental and sustainability reporting
Research project into the integration of environmental and social standards in the supplier selection process
Active involvement in the Global Compact: – regular participation in the Global Compact learning forums – participation in the "German Friends of the Global Compact" network – coverage of Volkswagen's Global Compact activities in company publications (Annual Report, Environmental Report, Internet, p:news magazine, Global Compact brochure) – development of strategic goals based on the results of the 2002 World Summit
Continued dialogue and cooperation with stakeholder groups
Aggregation of local performance indicators into company-wide sustainability indexes
Integration of the automotive supplement to the GRI guidelines into our sustainability communication
Ongoing integration of sustainable development themes into staff and management training programmes
Extension of the AutoVision concept to further plants
Ensuring the sustainability of employee pension schemes
Ensuring sustainable training standards based on Job Family Development
Attainment of nine percent return on investment (ROI) for the automobile division
Environmental Management
Organisation of the first regional environment conferences in North America, South America/South Africa and Asia-Pacific regions
Continuation of life cycle assessments for vehicles, components and processes
Partial computerisation of life cycle assessments
Initial certification of the Poznan plant during the reporting period
EMAS/ISO 14001 recertification of our plants worldwide
Procuring and Producing
Development of standard procedures for handling fire-fighting water at the plants
Development of additional flood protection measures at high-risk locations
Introduction of improved methods for forecasting airborne pollution distribution

Restoration of the River Aller near Wolfsburg and creation of a "natural" landscape in the Aller Valley between Kästorf and Armenau by 2005
Introduction of new GPS transponder systems for simplified and reliable noise data acquisition
Product, Researching and Developing
In Germany, Volkswagen will play its part in meeting the Voluntary Agreement on the part of the VDA (German Association of the Automotive Industry) by reducing average fuel consumption of our newly registered vehicles by 25 percent between 1990 and 2005
At a European level, Volkswagen will play its part in meeting the undertaking given by the ACEA (European Automobile Manufacturers Association) vis-à-vis the European Commission to reduce the CO_2 emissions of the new vehicle population to an average of 140 g/km by 2008
Volkswagen will continue to develop future-oriented vehicle drive systems
Volkswagen will offer FSI technology in all of its petrol engine series
Diesel particulate filters will be phased in as standard specification on vehicles in which the Euro 4 emissions standard cannot be met by engine modifications alone
For vehicles which are Euro-4-compliant even without a diesel particulate filter, Volkswagen will offer such filters as an option
Volkswagen is working with the oil industry to develop optimised fuels, with the mid-term aim of introducing CO_2-neutral fuels (e.g. SunFuel)
Volkswagen will continue to pursue Euro 4 compliance for its diesel vehicles ahead of time
Since 1980, Volkswagen has reduced particulate emissions from its diesel-engined vehicles by more than 90 percent. By 2005, when the Euro 4 standard is introduced, this level will have been cut by a further 50 percent
Volkswagen will avoid causing additional soil and water pollution by using state-of-the-art technologies to make its vehicles leakproof during their service life
In newly developed models, Volkswagen will be aiming to achieve the best possible external noise levels and the best possible internal noise levels in everday operation
In Europe, Volkswagen is taking steps to comply with the provisions of the EU Directive on End-of-Life Vehicles (ELV) banning the use of certain heavy metals
Volkswagen is stepping up the use of environmentally friendly materials in its vehicles, with a view amongst other things to minimising interior emissions and odours
Volkswagen is making intensive use of the International Material Data System (IMDS) and working on ways of improving it
As Volkswagen develops its vehicles, it does so with the aim of using advanced, environmentally efficient production processes
Volkswagen continues to work in high gear on optimising the dismantling- and recycling-friendly design of its products and on ecologically and economically efficient ways to dispose of end-of-life vehicles
Marketing and Recycling
Planning of a facility incorporating cost-optimised post-shredder technologies
Development of our own dismantling centre
Development of new types of tools for more efficient dismantling
Development of a new software module which will use data from a recycling database for recycling type approval and will also calculate volumes of shredder residue
Continued expansion of our network of authorised ELV dismantlers in Germany to encompass some 80–100 operators
Support for importers in EU member states and accession countries in implementing the ELV Directive at national level
Development of reliable technology for neutralising pyrotechnics components
INVENT (intelligent traffic and user-friendly technology) research programme to increase traffic efficiency and road safety; possibly ready for commercial application by 2010
Testing of additional system components in the "Mietermobil" project
Standardisation of a vehicle-vehicle communication system which will help to improve traffic flows and road safety

Status of Goals Defined in 2001/2002 Environmental Report (ER)

Goals Defined in 2001/2002 ER	Remarks	Status
Sustainability and Social Responsibility		
Developing sustainable mobility scenarios	In addition to its own internal scenario development Volkswagen has also, as a partner in the Sustainable Mobility project, worked with GBN (Global Business Network, Berkeley, USA) on scenarios for 2030. These scenarios were presented at stakeholder workshops and at the World Economic Forum in Davos. They are also presented in the final report of the Sustainable Mobility project.	+
Active involvement in international sustainability initiatives	Volkswagen is a member of the global WBCSD initiative Sustainable Mobility 2030 and of the UNEP Mobility Forum and is participating in the GRI dialogue on sector-specific sustainability reporting in the automotive industry	+
Participation in the 2002 World Summit on Sustainable Development in Johannesburg	The Volkswagen Group held its own exhibition in Johannesburg, took part in national and industry-specific initiatives and committed itself to the principles of the Global Compact	+
Expansion of dialogue and cooperation with stakeholders	Successful progress and creation of an institutionalised framework at many levels, e.g. the Neighbourhood Forum at the Hanover plant (local), cooperation with NABU (national) and participation in the Global Compact, the UNEP Mobility Forum and the GRI dialogue (international)	+
Ongoing presence in the leading sustainability indexes worldwide	Included in DJSI World, DJSI STOXX, Ethibel Sustainability Index (ESI) and FTSE4GOOD	+
Further development of sustainability-oriented management systems and tools	Completion of Sustainability Balanced Scorecard pilot project, which failed to adequately model the complexity of sustainability in the automotive industry	–
	Development and initial introduction of environmental product profiles by the Technical Development department	+
	Establishing linkage between materials flow management and the key performance indicator Economic Value Added (EVA®)	+
Local projects to reduce unemployment	The AutoVision project has created 4,800 new jobs in Wolfsburg	+
Further development of innovative approaches to provision for old age	Introduction of the pension fund in 2001. Compliance with statutory provisions on deferred compensation.	+
Maintaining high quality standards in environmental and sustainability reporting	Closer gearing to international standards such as the GRI guidelines in the current report	+
Development of an internationally binding declaration on social standards	In June 2002, an agreement on the Declaration on Social Rights and Industrial Relationships was formally adopted by the Board of Management, the Group World Works Council and the International Metalworkers' Federation, guaranteeing minimum social standards and equality at Volkswagen plants	+
Environmental Management		
Certification of the plants in Bratislava, Martin, Taubaté and Changchun in line with ISO 14001 and of the Brussels plant in line with EMAS and ISO 14001	The ISO 14001 certification of the plants in Bratislava, Martin, Changchun and Taubaté and the EMAS certification of the Brussels plant were completed. The Resende plant in Brazil and the Poznan foundry in Poland were also certified in accordance with ISO 14001 during the reporting period.	+

Status of goals + **Goal achieved** o **Ongoing** – **Goal not achieved**

Goals Defined in 2001/2002 ER	Remarks	Status
Optimisation of the systematic acquisition and documentation of environmental data from non-European plants	Development of a software program for standardised electronic recording and evaluation of environmental data at all plants worldwide	+
Extension of the international network of Volkswagen Environmental Officers and expansion of the intranet offering in the field of environmental protection and industrial health and safety	Second Group Environment Conference held in June 2002 Continued provision of training programmes for employees of foreign plants in German and English Worldwide access to relevant documents via the intranet	+
Further expansion of the company's Internet presence in the field of environmental protection	Internet reporting was extended	+
Establishment of an Internet information system on sustainability issues	Presentation of the Internet sustainability portal www.vw-in-johannesburg.de to mark the 2002 World Summit	+
Continuation of life cycle inventories of vehicles and components	Component life cycle inventories drawn up for interior components, fuel tank, carbon-fibre fabric etc.	o
Targeted expansion of training opportunities for employees and partners of Volkswagen (e.g. more "Priority A" workshops for suppliers)	In June 2003, the 100th "Priority A" workshop was held. More than 1,200 participants from 1,100 supplier production plants have now attended such workshops worldwide	+
Expansion of the "AutoVision" concept to other plants	The project has been extended to the Kassel (1999), Emden (2000) and Uitenhage (2001) plants	+
Integration of the automotive industry's International Material Data System (IMDS) into internal procedures	IMDS was integrated into the internal procedures of the Technical Development department (Material Controlling Team)	+
Testing of new noise abatement technologies: GPS data acquisition and 3D noise mapping	Pilot projects, not as yet incorporating GPS, were implemented throughout the Mosel and Salzgitter plants to measure noise sources	o
Procuring and Producing		
Further development of environmental certification procedures (including pilot projects with universities and suppliers)	Research project "sustainability in the supply chain" in association with Oldenburg University (completion early 2004)	+
Development of low-odour binder systems at the Hanover sand-casting foundry by 2002	New binder system prototypes were developed as part of a state-sponsored research programme. The programme, including operational tests, is continuing.	o
Further development of solar wastewater technology	Tests on the upgraded reactors were completed. Further work to ensure the suitability of the technology for industrial use is planned.	o
Further development of low-emission paint technology at German and overseas plants	Taubaté plant: use of air washers for filler and top coats and an afterburner for the dryers Wolfsburg plant: changeover from solvent-based to water-based fillers in bumper painting Puebla plant: changeover from solvent- to waster-based paints on a topcoat painting line	o

Status of goals **+ Goal achieved** **o Ongoing** **– Goal not achieved**

Goals and Measures

Goals Defined in 2001/2002 ER	Remarks	Status
Adaptation and introduction of the register for handling potentially water-polluting substances on the basis of the Volkswagen standards for foreign plants	Ongoing	+
Measures to reduce freshwater consumption at the production plants	Reduction achieved at Volkswagen de Mexico Ongoing	o
Introduction of transponder systems to improve waste logistics	Introduction of transponder systems for improved waste logistics largely completed at the German plants. The introduction of transponders for detailed tracking of waste movements is currently also under review at some foreign plants.	+
Product, Researching and Developing		
In Germany, Volkswagen will play its part in meeting the Voluntary Agreement on the part of the VDA (German Association of the Automotive Industry) by reducing average fuel consumption of our newly registered vehicles by 25 percent between 1990 and 2005	Ongoing	+
At European level, Volkswagen will play its part in meeting the undertaking given by the ACEA (European Automobile Manufacturers Association) vis-à-vis the European Commission to reduce the CO_2 emissions of the new vehicle population to an average of 140 g/km by 2008	Ongoing	+
Volkswagen will try to meet the Euro 4 exhaust emissions standard for diesel vehicles, too, ahead of time	More than 60 percent of Volkswagen diesel cars sold in Germany already (third quarter of 2003) comply with the D4/Euro 4 emissions standard and the proportion continues to grow	+
Volkswagen will develop prototypes with alternative drive systems	In February 2002, the Bora HY.POWER® fuel cell vehicle was driven over the Simplon pass between Switzerland and Italy. In association with the Paul Scherrer Institute in Zurich, Volkswagen had fitted the Bora with a low-cost hydrogen fuel cell with extra-high-performance "supercap" capacitors. The aim was to test a completely new hydrogen fuel cell system in sub-zero temperatures and on steep gradients.	o
By 2005, Volkswagen will offer FSI technology in all its petrol engine series	Ongoing	+
Volkswagen will continue to campaign actively for the rapid introduction of sulphur-free fuels (sulphur content < 10 ppm)	Cooperation with Shell on the introduction of Shell Optimax fuel	+
Since 1980, Volkswagen has reduced particulate emissions from its diesel-engined vehicles by more than 90 percent. By 2005, when the Euro 4 standard is introduced, this level will have been cut by a further 50 percent.	Ongoing	o
Development and adaptation of new jointing techniques, in particular low-temperature techniques, which will make assembly more environmentally compatible.	Development of new jointing techniques completed	+
	Implementation of optimised jointing systems in the Group – initially in small-batch production – is underway	o

Status of goals + **Goal achieved** o **Ongoing** – **Goal not achieved**

Goals Defined in 2001/2002 ER	Remarks	Status
In newly developed models, Volkswagen will be aiming to undercut the mandatory external noise emission limits by at least 1 dB(A)	Achieved	+
Marketing and Recycling		
INVENT (intelligent traffic and user-friendly technology) research programme to increase traffic efficiency and road safety	Ongoing	o
Systematic operational introduction of the Volkswagen Dial-a-Bus system to continue	Support for launch of Dial-a-Bus project in Wolfsburg and Niedernwöhren	+
Development of new applications and technical system components for the "Mietermobil" project	"Mietermobil" project launched in Hanover with additional technical components	+
As early as 2005, we are aiming to assure a recycling rate of 95 percent in our new vehicles	Will be achieved by the time recycling type approval comes into effect	+
Development of our own dismantling centre	Ongoing	o
Development of new types of tool concepts for more efficient dismantling	Ongoing	o
Development of software for the virtual recycling of end-of-life vehicles	New recycling database up and running	+
Continued expansion of our ELV recycling network in Germany to encompass some 200 operators	Ongoing, 71 operators at present	o
Support for European importers in implementing the ELV Directive at national level	Ongoing	+

Status of goals **+ Goal achieved** **o Ongoing** **– Goal not achieved**

A Never-Ending Story

Volkswagen and environmental protection

The Volkswagen brand's environmental strategy – part of the company's overall sustainability strategy – is based on the Volkswagen Group Strategic Principles described in Chapter 5 of this report. In 1995, the existing Environmental Guidelines were replaced by a new Group Environmental Policy, on the basis of which the individual brands within the Group, together with a number of international subsidiaries, then developed their own policies according to their particular corporate culture. Both the Guidelines and the Environmental Policy are thus the end result of a development dating back to the early 1970s, when Volkswagen's very first Environmental Department was set up. German-speakers will find more details in a recent Volkswagen publication entitled "Wasser, Boden, Luft" ("Water, Soil and Air", Historical Notes No. 5). In addition to the activities of the various plants and the development of fuel-efficient vehicles like the 3-litre Lupo, the impact of Volkswagen's environmental strategy can currently be seen in a wide variety of other areas set out in detail in this report (climate protection, fuel strategy, alternative drive systems, etc.).

Luo Yi

"Economic growth and higher living standards in China have put more vehicles on the roads and as a result air pollution has worsened in recent years. SEPA and Volkswagen have been working together since 1999 to reduce emissions, especially from diesel-engined vehicles. Together, we are striving to develop eco-friendly technology, cleaner diesel fuels and modern testing procedures. Based on this collaboration, we have produced technical guidelines for emissions reduction in diesel-engined vehicles which represent a milestone in the history of automobile development in China. We aim to continue working with Volkswagen to promote innovative diesel technology in China, so that the people of our country can benefit from technological progress without having to surrender a clean environment."

Luo Yi (48) is Deputy General Director of the Technical Guidelines Department of the Chinese State Environmental Protection Administration (SEPA) in Beijing, People's Republic of China

Volkswagen's Guidelines and environmental-protection measures are supplemented by the Factory Agreement on Environmental Protection, which defines the scope of the measures, describes the regulations at the level of individual companies and plants, and lays down "Environmental Good Practice Rules". These contain principles that are binding for all members of the workforce, including a workplace code of behaviour and rules on how to handle resources such as energy (see page 63), raw materials and water (see interview on page 31) as well as residual materials and waste. All matters related to environmental protection are regulated by the Environmental Management System.

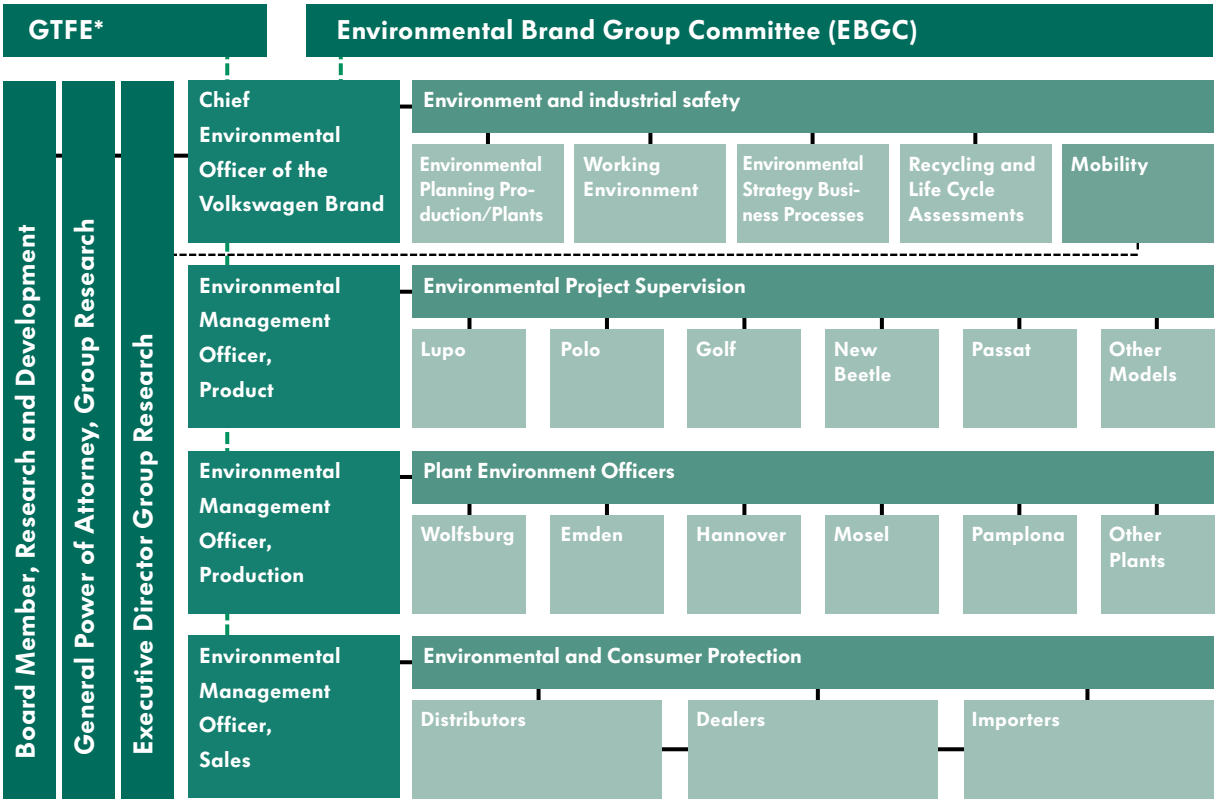
You can find details on Volkswagen's Environmental Policy, the Factory Agreement on Environmental Protection and the history of environmental protection at Volkswagen on the Internet at

www.mobility-and-sustainability.com

A Systematic Approach

To improve coordination of its global environmental protection activities, Volkswagen has set up a Group Task Force – Environment (GTFE), which is responsible for developing the Group and brand strategies, goals and measures and coordinating these at regional level. To ensure an ongoing exchange of information, Volkswagen uses international audits (see page 74) and regional conferences (see below), which help identify scope for synergies and cost cutting and at the same time minimise liability risks.

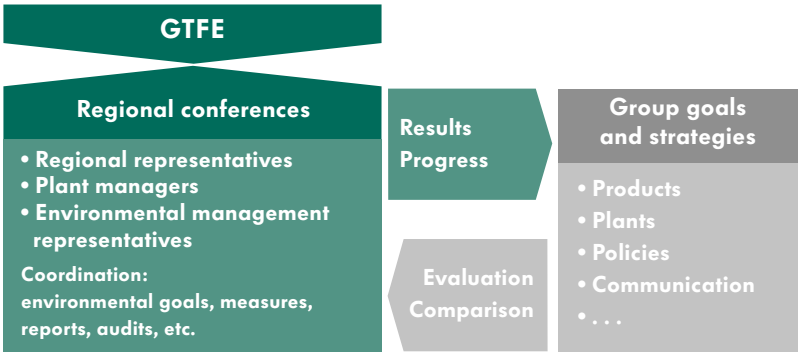
Volkswagen environmental management system



* GTFE, Group Task Force – Environment, develops strategies, goals and measures. It replaces STEP, the Strategic Task Force for Environmental Protection.

Source: Volkswagen AG

Regional conferences



Source: Volkswagen AG

"The Volkswagen world has expanded – we now have 45 plants all over the globe – so it is important for us to improve the coordination and networking of our environmental protection activities. By harmonising our efforts internationally, we must make sure that we avoid making the same mistakes twice."

Günter Sager, Volkswagen Environmental Management Officer

Klaus Pahlmann (51), Head of the Water Conservation Unit, talks to Martin Gebhardt of the Environmental Report editorial team about water at Volkswagen

"We Try to Save Water Wherever We Can"

Klaus Pahlmann, did the outcome of the Sustainability Summit in Johannesburg with reference to water have any implications for Volkswagen?
Well, we have been considering ways to save water ever since the first Volkswagen plant was set up. For example, we have been using closed-loop water systems since the very outset. And one of the outcomes of our current international audit is an environmental action plan for our Mexican plant that aims to cut the intake of freshwater by 25 to 30 percent over the next three years. That's just one example of the kind of measures we have been taking at our various production plants.

The UN declared 2003 the "Year of Water". How did Volkswagen respond?
As part of the "Year of Water", we have been involved in organising the national and regional conference of the German Wastewater Association here in Wolfsburg. This is a body that draws together technical and organisational players concerned with various water-related issues, ranging from flood prevention to freshwater extraction and wastewater treatment. Volkswagen has also responded by introducing a number of internal measures to reduce freshwater consumption and avoid water pollution.

And how does Volkswagen set about saving water across Europe?
We have calculated that in Wolfsburg, for example, every drop of water passes through the system six or seven times before it leaves the plant. We also make extensive use of rainwater – not just in Wolfsburg but at other European plants as well.

What does Volkswagen's water strategy for the future look like?
At present, we are drawing up environmental action plans for our sites around the world containing technical and organisational measures aimed at conserving resources. Three of Volkswagen's current eleven Worldwide Environmental Standards are directly concerned with water conservation, and another one is indirectly relevant, because it involves conserving resources through the use of closed-loop water systems and residue recovery.

But are there not regional differences? Surely technologically advanced countries require a different approach from less advanced nations?
Well, we are already using state-of-the-art German technology in other countries. But to achieve environment-friendly patterns of behaviour in the long term, the vital thing is to trigger a change of attitude among the local workforce. Every employee has to understand the importance of saving water at the workplace. We are basically doing our best to save water wherever we can (see page 62 of the Environmental Report 2003/2004 on the Hannover plant's "Watching the Waterline" campaign). Where we can use processes that consume no water at all, we do so, and when water is essential we make sure it is reconditioned and returned to the cycle. We are also keen to use rainwater in certain production processes that don't require high water quality.

Can the state-of-the-art technology you mentioned be used at every site?
Of course we have to consider to what extent a technology is transferable before we try using it in another location. Sometimes there's a knock-on effect – if we tackle a new project, say, in Brazil, we might remember the technology that worked in Spain and try to use it there as well. It all depends whether the technology can be integrated into local processes. The use of the latest filtration technology in South Africa, for example, is sometimes not possible because the technical environment just isn't compatible.

You can read the full text of this interview at **www.mobility-and-sustainability.com**

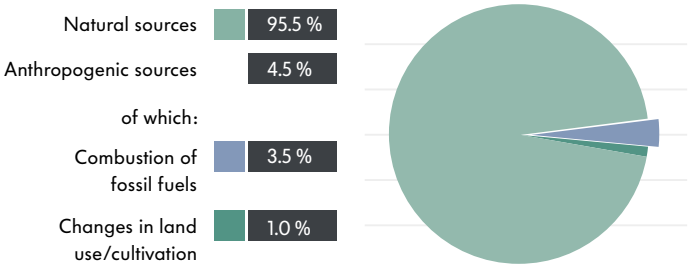
A Special Atmosphere

Volkswagen and the climate protocol

Climate change is an ongoing process triggered by changes in the earth's energy balance (solar radiation, heat loss, etc.) caused, amongst other things, by greenhouse gases, water vapour and solar activity.

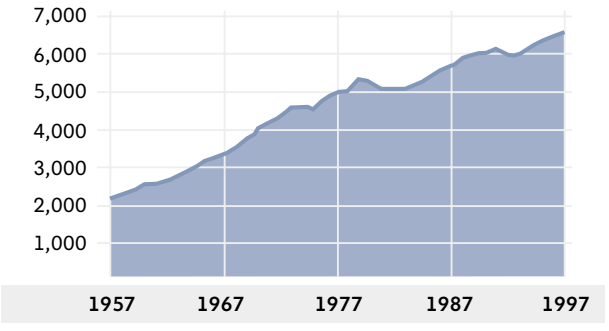
Every time someone, somewhere in the world, burns wood or coal, oil or natural gas, climate-relevant gases are released, in addition to existing natural emission levels. Following the 1997 United Nations Climate Conference in Kyoto, the world community set itself the target of reducing emissions of six greenhouse gases caused by human activity: carbon dioxide (CO_2), methane (CH_4), nitrious oxide (N_2O) as well as hydrofluorocarbons (HFC), perfluorocarbons (PFC) and sulphur hexafluoride (SF6). Between 2008 and 2012, global emissions of these gases are to be reduced by at least 5 percent against 1990 levels. During the same period, the European Union has agreed to reduce emissions by at least 8 percent and Germany by 21 percent. At present, the anthropogenic share of global emissions of the main climate gas, CO_2, is about 4.5 percent, but the figure is on the increase.

Global CO_2 emissions



Global annual CO_2 emissions from fossil fuels

in millions of metric tonnes of carbon (MtC)



Period	Average annual growth rate
1957–1997	2.7 %
1970–1997	1.8 %
1980–1997	1.3 %
1990–1997	1.1 %

Source: Marland/Boden/Andres. Global, Regional, and National Fossil Fuel CO_2 Emissions, 2001.

Growing mobility requirements

In its Environmental Outlook 2001, the Organisation for Economic Cooperation and Development (OECD) attributes 5.5 percent of anthropogenic CO_2 emissions to the motor car. Volkswagen is assuming that this share will increase worldwide, mainly as a result of a sharp upward trend in mobility requirements in newly industrialised countries and lifestyle changes in the established industrialised nations. On the other hand, certain industrial states have already achieved some success in reducing emissions. In Germany, for example, CO_2 emissions from road traffic have been declining in absolute terms for several years – despite an increase in the vehicle population (see page 51). Even though cars account for only a small overall share of worldwide CO_2 emissions, one of the main goals in developing new vehicles is to reduce fuel consumption and with it CO_2 emissions. This aim is reflected in Volkswagen's drive system strategy and fuel strategy (see page 44).

Emissions trading

What control instruments are available to climate policymakers? At present, they rely on a mix of administrative measures, eco-taxes and voluntary undertakings, but from 2005 onwards a new instrument is

likely to become available: plant-specific emissions trading in Europe. The basic idea of emissions trading is quite simple. First, companies are allocated CO_2 emission allowances, which are reduced every year in line with agreed CO_2 reduction targets. Only companies in possession of an allowance are allowed to emit CO_2 – any additional allowances that become necessary have to be purchased on the market. A company can also sell allowances that are surplus to its requirements. This all sounds very simple in theory, but in practice there are many minor problems. That was why Volkswagen became involved in the debate at an early stage and helped draw up proposals such as the Greenhouse Gas Protocol, produced jointly by the WBCSD (World Business Council for Sustainable Development) and the WRI (World Resources Institute). This means that Volkswagen is well prepared for emissions trading, which will be particularly relevant with regard to the company's energy generation activities.

Calculating the True Cost

The full picture of a car's life

Nowadays, when an environmentally friendly product is being developed, its entire life cycle has to be taken into account – production and disposal processes have to be eco-friendly as well as actual product use. At the same time, the costs involved must not be allowed to rise to a level where many customers cannot afford to buy the product. What is needed for developing an eco-friendly product is a method of calculating the environmental impact over its entire life.

Life cycle assessments offer transparency

Life cycle assessments are a useful instrument for this purpose, as they enable us to assess the total potential impact of a product on the environment. The first step in drawing up a life cycle assessment is to prepare an inventory of the input (raw materials and energy) and output (products, solid waste, wastewater, waste gases, waste heat) streams over all stages of the product's life – production (sourcing of raw materials, their preparation and processing), product use, servicing, maintenance and end-of-life disposal. The next step is to estimate the potential environmental impact of the respective material streams. It should be kept in mind, however, that recognised, scientifically reliable models for calculating the environmental impact are not always available. Nor is it helpful simply to weight the various different environmental impacts identified and then publish a single overall figure. Such an approach is arbitrary and insufficiently objective.

Equipment for processing shredder residues

Gathering this data provides a basis for measures designed to minimise the environmental impact of the product concerned. Without the information provided by life cycle assessments it is not possible to draw up plans, measures and improvement proposals in a targeted manner.

Tracing the entire life cycle

The advantage of such an assessment is that it enables the environmentally relevant characteristics of a product or process to be viewed in their entirety. The focus is not on any single phase in a product's life but rather on the entire cycle "from cradle to grave". Such a comprehensive view enables us to avoid merely transferring a problem from one stage in the product's life to another.

When an entire vehicle is subjected to a life cycle assessment, the result is a detailed overview of all the environmental factors related to manufacture, ownership and the final disposal process. Volkswagen started to draw up life cycle assessments in the early 90s, and in 1996 published the first life cycle inventory for an entire vehicle. You can download the life cycle inventory for the Golf IV from the Internet at

www.mobility-and-sustainability.com

Disposal of end-of-life vehicles is a special case, as the life cycle assessment can also be used as a basis for developing disposal processes, enabling the environmentally impact of various disposal strategies to be compared at a very early stage in their development. The Golf IV provides a good example:

According to the EU End-of-Life Vehicle Directive, 95 percent (by weight) of a vehicle has to be recovered (85 percent as material, 10 percent as energy) by the year 2015 (see page 88). For a Golf IV to achieve this level, not just metals but other materials as well have to be recycled. There are different ways of doing this and Volkswagen compared two possible scenarios within the scope of a life cycle assessment: in the first, the quota was achieved by disassembling the various components and recycling the materials. In the other scenario, only a few components were disassembled and the remaining materials were shredded, separated, processed and recycled in a process known as the VW-SiCon Process (see page 57).

Intelligent separation

The life cycle assessment showed that the VW-SiCon Process would achieve a better outcome than component disassembly followed by materials recycling, as it generates between 9 and 16 percent fewer greenhouse gas emissions. This is achieved through intelligent separation technology that

An ELV shredder

enables virtually 100 percent of the shredded and processed materials to be recycled.

To ensure the quality of life cycle assessments, close cooperation with suppliers is becoming increasingly important, as many parts and components of a vehicle are nowadays outsourced. That is why Volkswagen now offers regular supplier training sessions on life cycle assessments (see page 60). In collaboration with other automotive manufacturers within the VDA (German Association of the Automotive Industry) we have also produced a document that makes the often complex collection of life cycle assessment data much easier and thus facilitates dialogue with suppliers.

Ideas that Pay their Way

A workforce committed to the environment

If a globally active company is to meet the ever-changing challenges that maintaining a consistent sustainability strategy invariably implies, it will need the support of its workforce. Without the energy and commitment of our employees, we could never meet our environmental and sustainability goals.

That is why one of Volkswagen's ongoing priorities is to increase employees' motivation and build their knowledge. We are determined to encourage learning processes within our company and develop new environmental and sustainability management tools geared to the Volkswagen setting.

With this in mind, we offer a wide range of seminars and workshops, regularly organise information and training events and encourage individuals to use their initiative at all levels of the company. The recently founded AutoUni (see page 96) is a further example of our creative approach to human resource development en route to sustainable success for our company.

Human Resource Development and Environmental Communication Programme

Environmental Protection Seminars and Sourses	Initiatives/Projects	Information/Motivation
Management seminars: between 1997 and 2001, 224 out of a total of 905 members of management received training in half-day seminars at Volkswagen's German plants	"Green Team" recycling initiative (see page 36)	Company newspaper "autogramm", monthly
Training of supervisors: training of 839 out of 1,963 Volkswagen supervisors in two-day workshops up to the end of 2002	"Internal environmental award" competition (see page 36)	Environmental Report, every two years
Environmental protection specialists: between 1990 and the end of 2002 training of 659 specialists as links between supervisors and Environmental Protection Officers and contact persons for colleagues	Environmental Service Centre (see page 37)	Environmental statements, at regular intervals with eco-audit
Training of employees at Auto 5000 GmbH: 92 employees in 2002	OFF campaign (see page 63)	"Umweltbrief", monthly
Resource managers: training of 508 managers as part of the eco-audit at Volkswagen's German plants since 2001	Paper recycling initiative (see page 36)	Environment Newsletter, every two months
	Regional conferences (see page 30)	Poster campaigns
	Group environmental conferences (see page 12)	Information events/talks
	Training of environmental protection staff from non-European plants	Factory meetings
	Level 5 (see page 95)	Open days
	Job rotation	"Green factory tour"
	Exchange of experience between environmental officers from all plants	Intranet
	AutoUni (see page 96)	Internet
	Environmental centres (e.g. Hannover plant)	Idea management
		"Green factory rally" for apprentices
		Environment films

Paper Recycling Initiative

In a Group-wide competition sponsored by the company newspaper "autogramm", a prize is awarded to the department which, by the end of the year, has ordered the highest proportion of recycled paper via the internal supply system. This year, the staff of the "Assembly" cost centre in Emden were the lucky winners, and Environmental Protection Specialist Albert Reck and his colleague Eugen Julifs accepted the prize – free eco-safety driver training sessions for all concerned – on behalf of their ten colleagues. The proportion of recycled paper used has doubled since last year, but the competition will continue in an attempt to further improve on this impressive result.

Internal Environmental Award

EUR 40,000 per year in energy costs have been saved thanks to an idea that Sylke Feil, an assembly-line worker at the Wolfsburg plant, came up with. She managed to convince the computer specialists that it made environmental and economic sense to modify the software so that the high-pressure pumps in individual testing sections are now switched off automatically. As a result, she was selected to receive one of the 2003 internal environmental awards. The awards are presented in recognition of the achievements of employees who have proposed and implemented measures to protect the environment.

This year a prize also went to two trainees from the Hannover plant, Agnes Stockmann and Andreas Weber, who applied the principle of minimum lubrication to their machines, thereby reducing the amount of emulsions required. In addition, plant-based lubricants are now increasingly being used, bringing economic and ecological advantages and also reducing the risk to health. Winner of the third prize was Gerhard Kämpfer from Central Services who has been canvassing for several years for the use of environment-friendly office materials. He was honoured for his campaign to make more use of recycled paper.

"Green Team" Recycling Scheme

Following its successful integration into work2work (see page 100), the environmental team under Norbert Loeper has once again proved that environmental protection and entrepreneurial thinking are not mutually exclusive. The principle of creating and securing jobs for colleagues with disabilities or a reduced capacity to work has also been proved to make economic sense.

The scheme involves collecting packaging material and, where necessary, cutting it to size before sending it back to suppliers in return for a fee or selling it to recycling companies. In September 2002, the team was equipped with three new cardboard cutting machines for this purpose, enabling the packaging material to be cut precisely to the desired dimensions for customers. An opto-electronic sorting machine for used plastic components was also acquired.

This investment in new equipment indicates just how successful the scheme has been. It has not only helped cut down waste, but also raised a total of EUR 1.6 million from sales of recyclable packaging in 2002. In recent years, the main focus has been on recycling cardboard, as this generates higher revenues while using the same number of staff.

"Green Team" Recycling Initiative (Results for 2002)

Cost cutting through resale of recyclable packaging or reduction of material requirements

Plastics	EUR 0.58 million
Cardboard packaging	EUR 0.97 million
Nopa foam	EUR 0.05 million
Total	**EUR 1.60 million**

Waste reduction

Cardboard packaging	607,522 kg
Plastics	97,571 kg
Nopa foam	10,449 kg
Total	**715,542 kg**

Savings per vehicle

1996	EUR 0.09
1997	EUR 0.14
1998	EUR 1.23
1999	EUR 2.33
2000	EUR 1.96
2001	EUR 2.63
2002	EUR 3.10

Environmental Service Centre

Protecting the environment doesn't come naturally – like so many other things, it has to be learnt. That is why environmental protection is an integral part of the training curriculum at Volkswagen. Every year, some 550 trainees in commercial and industrial/technical occupations at the Wolfsburg plant complete the first part of their training at the Environmental Service Centre. Since the summer of 2003, the classes in environmental protection have been more closely linked to business and working processes within the individual trades. However, during the first part of the module, all the trainees spend one week at the ESC dealing with more general environmental issues.

The syllabus covers topics such as sustainability, eco-audits and mobility, as well as energy use, energy conservation and Volkswagen's general environmental policy. But practical aspects of environmental protection are also dealt with. Thus, for example, trainees visit the wastewater centre (Abwasserzentrum West) and also carry out an environment-related project on behalf of individual departments (for example measuring groundwater levels at a former landfill site). Applying a wide range of teaching methods helps draw the trainees into the learning process and interest them in what is often seen as a dry subject.

The second part of the module is taught by instructors from the individual specialist occupations. Topics dealt with are related to specific issues, the idea being that in the long term, protection of the environment and safety at work should become part and parcel of the daily working routine.

A Tradition of Progress

Technical innovations for more eco-friendly cars

In this section of the Environmental Report, as in the previous issue, we have followed our readers' wishes by confining ourselves to the most salient environmental features of our models and providing examples. On centre stage this time is the fifth-generation Golf, which was unveiled to the public in September 2003. The Golf is traditionally a best-selling line and demonstrates our company's leading role in the development of fuel-efficient, low-emission vehicles. Regularly updated, detailed information from us about all the models in our range including statistics on engine performance, fuel consumption and emissions and information about materials, recycling and technical features can be found on the Internet at

www.mobility-and-sustainability.com

Less weight means less fuel consumption, and less fuel consumption means less emissions. That's the basic thinking behind lightweight design. But of course it's not quite as simple as that. Actually, most vehicles are not getting any lighter at all in overall terms,

Birte Hauß

"Today it is more important than ever to do what we can for the environment – for the sake of our children and our children's children, who will be here long after we've gone. In 1999 my husband and I were among the first to order a Lupo 3L TDI, and we were delighted with it. It consumes very little fuel, it's exempt from vehicle taxes for five years, it's nippy and, very importantly, we can feel that we're doing something for the environment. True, the 3-litre Lupo isn't exactly cheap, but progress has its price. Some people say it's too small for four people but it's the perfect car for around town. We now drive our third 3-litre Lupo although sadly demand for this model seems to be fading. That will change, though, just as soon as the politicians bring taxes closer into line with fuel consumption. And let's not stop there. How long till we get the 1- or 2-litre car?"

Birte Hauß (36) is an interior decorator and mother of two children. She lives in Germany.

since customers are demanding not only reduced fuel consumption and emissions but also greater safety and comfort. To meet the environmental goals despite the many electrical and electronic assistance features and an increased total number of components, the use of lightweight materials is becoming more and more important.

Lightweight design has a long tradition at Volkswagen. The Beetle, for example, was well ahead of its time in this respect. It featured magnesium long before lightweight alloys and plastics had become commonplace in vehicle manufacturing. Right through to the present day, however, the advances in this field have been only very gradual. As well as many other practical questions, there are also manufacturing issues to be taken into consideration before lightweight components go into regular production. By way of example, new materials usually require new joining or painting processes. The manufacture, intelligent combination and installation of lightweight materials has therefore become a key technology in automotive manufacturing.

Just what can be achieved by systematic use of lightweight materials was first demonstrated by the Lupo 3L TDI. Now, the prototype 1-litre car has gone a step further (see page 50). The Lupo can cover 100 kilometres on three litres of diesel fuel. Determined to keep on setting the standard, Volkswagen is carrying out intensive research and development

work on new materials. Lightweight aluminium, titanium, magnesium and fibre-reinforced high-performance plastics will all play their part in reducing the weight of our vehicles, and thus easing their impact on the environment.

On the following pages we present the main environmental features of each model series.

The Lupo
The Lupo FSI, the first Volkswagen to feature eco-friendly direct petrol injection (see Environmental Report 2001/2002), is the first mass-produced vehicle in the world to be fitted with extra-lightweight titanium springs. With its very low average fuel consumption for a petrol-engined vehicle of just 4.9 litres/100 km (CO_2 emissions: 118 g/km), it took the number one spot for the second time running in the "Cars and Environment" table 2003/2004 prepared by the German Association for Transport and the Environment (VCD) (see page 86).

The Polo
The amazing fuel consumption that can be achieved with a standard Polo model was demonstrated in August 2003 by Austrian journalist Gerhard Plattner in the "100 euros Eco-Tour". Plattner, a long-distance driving specialist, averaged a fuel consumption of just 3.95 litres/100 km on his four-day, 3,129 km journey. The 1.9 litre 74 kW TDI engine consumed a total of 123.6 litres of diesel, around 20 percent below the standard consumption, which meant that the trip cost Plattner just EUR 90.89. The Polo could easily have done even better if the journey had not been carried out in a heat wave, with daytime highs of 35 degrees centigrade and more. As it was, Plattner had to have the air-conditioning on for almost a third of the total distance, thus using extra fuel.

The Eco-Tour Polo in Vienna

The New Beetle
The three-layer laminated soft top of the New Beetle Cabriolet is virtually PVC-free. A layer of rubber means that there is no need for impregnation. The composite aluminium/steel construction of the soft-top frame presents an ideal compromise between high rigidity and low weight (approx. 26 kilograms). The eye-catching side-turn indicators in the door mirrors use long-life, energy-saving LEDs in place of conventional bulbs.


Paul McCartney gave away a New Beetle Cabriolet to Laura Andrew, the two-millionth fan to attend his recent concert tour

The Golf

By June 2003, Volkswagen had sold 22.4 million units of the first four generations of the Golf, the model that created a whole new class of car. In fact the Golf has been built in greater quantities than any other German car, so the Golf V, which took to the road in October 2003, has a great deal to live up to. The new model was unveiled to the public at an open day at the Wolfsburg plant in September 2003, which drew a crowd of over 150,000. By then, the development engineers had overcome a whole string of hurdles, not least on the environmental front where the Golf V was of course also expected to outperform its predecessor. Its design was geared strictly to the 7 Environmental Goals of the Technical Development department, which formed the basis for the internal specification briefs. Some of the most environmentally significant features of the new model are listed below:

Dr. Bernd Pischetsrieder presents the new Golf

In 2004, the Golf 2.0 TDI will be offered with a particulate filter. There is no need for a separate oxidation catalyst or a fuel additive due to the filter's close proximity to the engine and its innovative catalytic coating. This pioneering system requires no maintenance and is designed to last the lifetime of the car. Reliability and minimised complexity – and thus lowest possible costs – are further features of this new technology from Volkswagen.

The Golf V and the 7 Environmental Goals of the Technical Development department at a glance

Materials

- Antimony-, asbestos-, lead- and cadmium-free brake linings
- Floor insulation using cotton-fibre matting
- Use of cotton in carpet backing
- Reduced use of PVC by substituting underbody panelling and optimised wheelarch linings for underseal
- PVC-free door seals

Production

- Low wastewater discharges from painting operations
- Reduced use of solvents due to optimised painting processes
- Dry machining dispenses with emulsions
- Aluminium bearing brackets do not require painting

Recycling

- Fuel tank clamp-mounted for easier dismantling
- Minimised PVC waste due to use of underbody panelling
- Electromechanical power steering requires no hydraulic fluid and does not have to be drained

Fuel consumption

- Electromechanical power steering reduces fuel consumption by 0.2 l/100 km
- Timer-controlled rear windscreen heater
- Use of low-friction oils
- Tyres with optimised rolling resistance
- Underbody panelling designed for optimised drag
- Use of higher-strength sheet metal on A- and B-pillars and rear axle subframe
- Use of tailored blanks in inner door panels
- Use of magnesium in steering wheel skeleton
- Brake callipers and heat shields made of aluminium
- Spare wheel replaced by repair kit
- Rear wheelarch linings of lightweight fibre matting

Exhaust emissions

- All engines Euro-4-compliant

Soil/water

- Oil change and servicing intervals extended to max. two years for both petrol and diesel engines
- Electromechanical power steering requires no hydraulic fluid

Acoustics

- Weight-optimised damping/insulation package
- Quieter fan

The Bora

Both for the Bora and for the Bora Variant, Volkswagen offers special fittings and driving aids for the disabled, including controls for drivers without arms, special starters, forward-folding front passenger seats, foot plates to raise the level of the floor, accelerator pedals with a prosthesis guard, hand accelerator and brake controls, steering wheels with spinner knobs, and extra-light action power steering systems. A multi-functional infra-red remote control can be fitted to allow drivers to operate the indicators, horn, wipers and lights without having to take their hands off the steering wheel. These fittings are, of course, also available for other Volkswagen models as well. Volkswagen offers a 15 percent discount to disabled drivers buying a new vehicle.

The Touran

Following the debut of the Touran mini-MPV in March 2003, Volkswagen now offers three MPV series: the Touran, the Sharan and the new-generation Multivan. The Touran is based on the Golf V platform and like all newly developed Volkswagen models was designed in line with the 7 Environmental Goals of the Technical Development department. Looking at the "Acoustics" goal for example, a weight-optimised damping and insulation package was installed to minimise in-service exterior and interior noise, while the engine incorporates noise-optimised pistons, and cylinder heads with increased rigidity. On the FSI engines optimised combustion processes with twin-phase injection also reduce noise, while on the pump/injector TDI diesel engines injection noise has been reduced.

The car that's game for anything: the Touran can hold up to seven seats

The Passat

The mid-range Passat model is now being offered with two new six-cylinder TDI engines. Both units are combined as standard with six-speed manual transmissions and are Euro-4-compliant, which means they are exempt from road tax in Germany until 2005. Thanks to state-of-the-art technology, even these high-displacement engines are low on fuel consumption. For the 120 kW engine the average figure is 6.8 litres of diesel fuel per 100 km and for the 132 kW version 7.6 litres. Since 2003 a particulate filter has been available for the Passat 2.0 TDI.

The Sharan

The Sharan, the Volkswagen people carrier, has been built at the Palmela plant in Portugal since 1995. Renewable natural materials, such as cotton-fibre insulation matting, are used in the construction of every Sharan. We also fit some eleven kilograms of moulded wood-fibre material in the doors and side trim.

The Phaeton

The Phaeton is Volkswagen's luxury-class model and presents a very special blend of engineering and styling. Technical innovations include intelligent aerodynamic design. The Phaeton's excellent drag coefficient of 0.32 is achieved by flowing overhangs, recessed windscreen wipers, very slender join lines between the panels, an extremely smooth underside, a V-shaped front end and an aerial-free body. The innovative air suspension system automatically lowers the body at higher speeds. What's more, the sunroof air deflector is electrically controlled in line with the speed of the vehicle and the position of the sunroof in order to prevent turbulence. An innovative solar sliding roof with 28 monocrystalline solar cells provides 37 watts of eco-friendly

UNICEF ambassador Nina Ruge steps out of a Phaeton

power. This energy is used to operate a fresh-air fan which can reduce the temperature inside a parked vehicle by as much as 20 degrees centigrade.

The Touareg

The Touareg off-roader combines high-tech engineering for both on- and off-road environments with the comfort of a luxury-class saloon. Extensive use of lightweight design ensures high fuel economy and low CO_2 emissions. For example, aluminium has been used in transmission components, in the front and rear suspension arms, in the crankcase of the V10 TDI engines, in the cylinder housing of the five-in-line and V8 engines and in the bonnet. On the V8 engines, the variable intake manifold and the cylinder head covers are made of magnesium. Plastic wings bring further weight savings. Instead of the customary ladder frame, the body features integral side members running the length of the vehicle. At the front and rear these are made of weight-optimised, welded tailored blanks of differing thicknesses and grades.

The Touareg has a towing capacity of 3.5 tonnes

The Multivan

Like the Golf, the Multivan was responsible for creating a whole new class of vehicle. And like the Golf, this model too has now entered its fifth generation. The first standard-production Volkswagen minivan, based on an idea dreamed up by Dutchman Ben Pon, came off the line in 1950. Now the great-great-grandchild of that vehicle, known in-house as the T5, has taken to the road. The wide range of applications in which light-duty commercial vehicles are used, from goods

IAA 2003: filling up with SunFuel

transport to passenger transport, makes anti-corrosion protection a particularly important concern – especially in an area that is normally hidden from view, the underside. Instead of the customary spray-on underseal, the new Multivan is fitted with multi-part plastic panelling. The two sliding doors fit flush with the body all round, so that they are not exposed to spray and stones flung up by the front wheels. This avoids the need for wax undersealing and has the useful spin-off effect that noise from these sources is also substantially reduced.

Last Exit the Sun

The biofuel era has begun

People are quick to learn, as countless examples of this undeniably positive feature have shown. People can also put what they have learnt into practice quickly and accurately, achieving great things, be it for themselves or for society as a whole. Sometimes, though, it can take quite a long time before people draw effective conclusions from their knowledge of a specific subject.

According to the latest information, oil will only remain available for a limited time. Perhaps it will be viable to continue oil production for 50 years or so. Furthermore, in view of its outstanding properties and chemical composition, oil is far too precious to use as a fuel. The quantity of fossil fuel which, 200 years ago, would have met the energy demand of the whole world for a whole year, today cannot even satisfy the appetite for energy of a dramatically enlarged global population for a single day.

Mark Gainsborough

"Meeting the growth in demand for transport energy in a sustainable way is one of our key challenges for the future. Shell is committed to the development of new fuels and is actively developing capabilities in biofuels, synthetic fuels from gas (gas-to-liquids, GTL) and hydrogen. I believe that the years ahead will see more active cooperation between leading automotive and energy companies in order to continue the introduction of cleaner and more efficient vehicle technology and fuels. This is one reason why Shell and Volkswagen are working together in the WBCSD Sustainable Mobility Project. Shell and Volkswagen also have a strong tradition of technical partnership in the development of new fuels, our most recent collaboration being the testing of Shell's ultra-clean GTL diesel in a Volkswagen fleet in Berlin."

Mark Gainsborough (44) is Vice-President Fuels, Shell International, London, UK

At the same time, the debate surrounding the pollution of the atmosphere by the products of oil combustion has intensified. Climatologists express widely divergent opinions on the severity of damage to the climate caused by these gases. A large majority of scientists believe that carbon dioxide (CO_2) contributes to the greenhouse effect, causing global warming. Each year, the earth's population pollutes the air with an additional 25 million tonnes of this gas. If we wait for positive confirmation that this pollution has a sustained effect on our climate and the conditions for life on earth, it will be too late to come up with a new energy strategy. We must adopt a preventive approach and act now.

Renewable energy is the only alternative

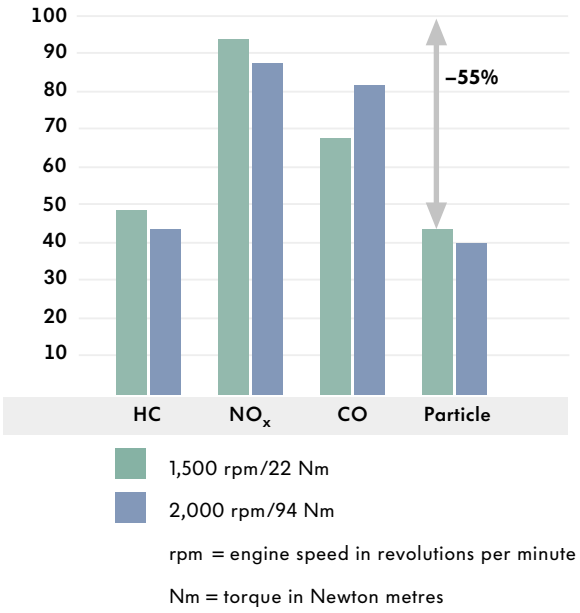
One factor in this context is the energy consumption and pollutant emissions of passenger cars. With 750 million or so cars on the road around the world, it is obvious that alternatives to conventional fuels will need to be available in large quantities very soon. However, we first need to establish the technical prerequisites for meeting global demand and must then ensure that no more energy is consumed than can be renewed. Otherwise, alternative fuels will bring the same problems as conventional fuels and will not be compatible with sustainable development.

In order to secure energy supplies in the long term, not least in view of the political instability of many oil-producing

regions, it will not only be essential to use fossil fuels as sparingly as possible but also – in the medium to long term – to employ alternative sources of energy. The most important role in this respect falls to renewable energy resources which are CO_2-neutral. In the long term, drive systems using hydrogen-powered fuel cells will make a breakthrough if they prove suitable for use in passenger cars and competitive in terms of cost, size and weight. However, until these systems are ready for mass production, which will certainly take at least another 20 years, attention will focus on synthetic liquid fuels. Fuels of this type can be produced from a variety of different feedstocks, feature extremely high quality and purity and – an essential point – can be used in existing internal combustion engines.

Synthetic fuel in diesel engines

Relative pollutant concentration in % (diesel engine: 100 %)



Source: Volkswagen AG

Synthetic fuel is cleaner

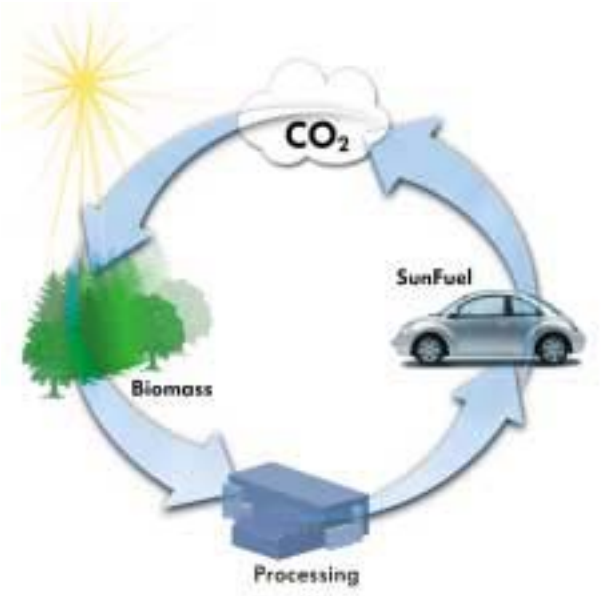
But what exactly is synthetic fuel? Basically, it is a diesel fuel free from aromatics and sulphur which generates significantly lower emissions during combustion. Volkswagen calls such fuels "SynFuel" and they can be produced from a number of different feedstocks, including natural gas. Natural gas is considerably more abundant than oil and contains less carbon, making for a commensurate reduction in CO_2 in exhaust emissions. As road tests show, the concentration of pollutants such as particulates (–55 percent) and NO_x (–10 percent) is also significantly lower with SynFuel than with conventional diesel fuel.

Thanks to the extreme flexibility of the chemical production process (based on Fischer-Tropsch synthesis), tailor-made fuels can be developed. These will also meet the requirements of future types of engine such as the Combined Combustion System (CCS) developed by Volkswagen. The CCS combustion process combines the benefits of petrol and diesel engines. Compared with conventional internal combustion engines, power units with CCS feature lower emissions and higher efficiency.

Fuel from biomass

Where synthetic fuels become really interesting – and sustainable – is when they are produced not from fossil raw materials but from biomass. If "feedstocks" such as wood, straw or compost are used, the fuel produced is CO_2-neutral. That is to say, the amount of carbon dioxide released to the atmosphere during combustion is equivalent to the carbon dioxide originally absorbed by the plants in the process of photosynthesis. That is why Volkswagen calls such fuels "SunFuel". Neither SynFuel nor SunFuel call for a new fuel distribution infrastructure, as drivers can fill up with either at conventional filling stations. In order to obtain an overall view of the environmental costs and benefits involved, Volkswagen is drawing up life cycle assessments covering the production and use of SunFuel.

SunFuel and SynFuel represent an ideal interim stage between the hydrocarbon and hydrogen economies. The two fuels also complement each other to perfec-



tion. The yield of bio-GTL processes can be doubled by adding hydrogen produced with renewable energy. GTL stands for "gas to liquid" – the process by which SynFuel is produced from natural gas. If, in place of the natural gas reformer, a biomass gasification unit is used, we have the process referred to as bio-GTL or, more precisely, BTL (biomass to liquid). And the first step in the bio-GTL process can also be used to produce hydrogen. This technology will give the fuel cell systems of the future and the hydrogen economy the time they need to become competitive with advanced internal combustion engines.

However, Volkswagen could not attain the demanding objectives en route to sustainable mobility in isolation, and so the Group is banking on a number of highly promising partnerships. Rapid progress will call for responsible cooperation between the scientific and political communities, as well as between the automobile industry and fuel producers. Consequently, Volkswagen is working together with many other companies and institutions.

Cooperation with Shell

Volkswagen works very closely with the Royal Dutch/Shell Group, which has been producing high-quality fuels from synthesis gas at its plant at Bintulu, Malaysia, since the early 1990s. The optimum fuel specification was developed during comprehensive testing on the engine test beds operated by Volkswagen Research. Pure, non-blended SynFuel was then tested in 25 Golf TDIs in Berlin over a period of five months. The motto of the trials was "The way to a sustainable future". After being given their first tank of SynFuel by German Federal Chancellor Gerhard Schröder at the project launch ceremony, the standard-production Golfs were made available to charities and welfare organisations including Berliner Tafel, Rheuma-Liga Landesverband Berlin, Naturschutzbund Deutschland (NABU) and Kinder Kunst Museum. The fleet test, carried out with the scientific support of the Technical University of Berlin, demonstrated that the synthetic fuel is perfectly suited to everyday use.

German Chancellor Gerhard Schröder launches the SynFuel fleet test.

Another key focus of research cooperation between Volkswagen and Shell is the development of an optimum fuel for the future CCS combustion process based on the TDI diesel engine. The parallel development of combustion processes and fuel here offers unprecedented potential – a synergy effect derived from the fact that high-quality SynFuels produced from synthesis gas can be "designed" for a specific purpose.

For further information visit

www.sunfuel.de

Cooperation with Choren Industries

Choren Industries of Freiberg, Saxony, a leading coal gasification company in the era of the German Democratic Republic, has developed a biomass gasification process. At the initiative of Volkswagen, Choren has added a synthesis step to the previous gasification stage. The only difference between the SynFuel and SunFuel production processes is the way in which the synthesis gas is generated. Instead of converting methane into H_2 and CO, in the SunFuel process a biomass gasification unit generates the H_2 and CO from a variety of biological materials such as wood, straw or energy crops. The other stages of the process remain unchanged, so that the only difference between SunFuel and SynFuel is the primary energy source. The chemical properties of the two fuels are identical.

The first stage of the new plant was commissioned in October 2003

Currently, the 1-MW pilot plant operated by Choren produces about 100 litres of adequate-quality fuel per hour. A larger plant with a capacity of approximately 40,000 litres a day is under construction. Volkswagen is supporting these activities and also provides advice on the specification for SunFuel. In addition, Volkswagen is promoting the creation of a stable economic environment for the introduction of the new fuel in order to attract additional investors. Thanks to tax exemption, SunFuel production in Freiberg is already economically viable and investments in additional plants are therefore likely.

Cooperation with DaimlerChrysler

In order to lay the necessary political and economic foundations, it is important that the automobile industry should present a united strategic front to stakeholders and politicians alike. Volkswagen and DaimlerChrysler have both realised that fuel cell vehicles and the related hydrogen supply infrastructure are not about to be launched in the foreseeable future and that we will have to make an active contribution to resource conservation before then. Consequently, the two companies are working together on the introduction of SunFuel on the European market. We are supporting the ongoing development of the relevant processes and cooperating with a number of companies and institutes (in Germany unless stated otherwise) including Choren Industries GmbH (Freiberg), Clausthaler Umwelt-Technik-Institut GmbH (Clausthal), Dr. Mühlen GmbH (Herten), the Energy Research Centre of the Netherlands, the Fraunhofer Institute for Environmental, Safety and Energy Technology (Oberhausen), VER GmbH (Reichstädt) and Forschungszentrum Karlsruhe. Our aim is to analyse and optimise the processes in terms of their overall environmental impact, and not just their greenhouse gas potential.

Cooperation for biomass production

The widespread introduction of SunFuel will call for huge quantities of biomass. As SunFuel can be produced from any type of plant, this presents a new challenge for farmers. It is only quantity that matters and not crop yields or quality. This opens up new options for ensuring high yields at the same time as protecting the soil and groundwater. An initial approach has already been developed by the University of Kassel. A trial area near Wolfsburg has been set aside for developing eco-friendly cultivation methods for energy crops.

Another challenge lies in getting the biomass to the production plants. A finely tuned logistics system will be needed to ensure adequate supplies at all times. In

this context, the German states of Brandenburg and Lower Saxony have concluded a contract with Volkswagen with a view to ensuring economically viable production as soon as possible and promoting the technology required. As a first priority, the contract covers studies of the environmental conditions required for the areas concerned, the selection of plants and the development of crop sequences, although harvesting and crop preparation and transportation will also be assessed.

In the long term, it is hoped that SunFuel will not only make a contribution to sustainable mobility but also offer farmers a further opportunity to create added value. In view of the enlargement of the European Union and the vast agricultural areas available in the new Member States, SunFuel represents one way of avoiding agricultural subsidies. SunFuel could meet almost half of the demand for diesel as a passenger car fuel in Germany if subsidised agricultural set-aside areas (totalling about 1.1 million hectares) and the agricultural land made available by eliminating overproduction were used for growing energy crops.

Laying the Foundations for the Future

"Over the past few years, the public debate on environmental protection has become wider ranging, taking in aspects of the sustainability of companies' operations and products. The focus has shifted from a one-sided strategy of avoiding pollution towards a holistic consideration of the environmental, economic and social effects of entrepreneurial activities. It is in this context that we consider the sustainable development of personal mobility, the objective towards which everyone at Volkswagen is working. Against the backdrop of the climate change controversy, further reductions in the carbon dioxide emissions of our products are a prime objective of research and development activities at Volkswagen.

The debate currently in progress concerning alternative drive systems, fuels and sources of energy is still dominated by considerable uncertainty. Volkswagen too sees the fuel cell powered by hydrogen produced using renewable energy resources as a potential long-term response to the challenge of sustainable personal mobility. In the short term, however, there are still technical and economic obstacles preventing the widespread use of this technology.

Our task, then, is to consider the best route to our objective. I am convinced that Volkswagen is building an effective bridge to the hydrogen economy with its fuel strategy based on the SynFuel and SunFuel. Interim stages and building blocks in this transitional strategy which can take effect in the short term include the systematic optimisation and convergence of conventional diesel and petrol engines, the development of innovative drive systems with direct-injection engines, automated transmissions, the intelligent use of the drivetrain and the optimisation of conventional fossil fuels by reducing the sulphur and aromatics content.

One thing above all else is clear: in view of the overall economic situation, it will only be possible to replace existing technologies and energy supply infrastructures in responsible steps. Unilateral action by individual companies or even countries will be doomed to failure. Instead, what we need is a broad consensus among European companies and politicians."

Prof. Wilfried Bockelmann, Member of the Board of Management of the Volkswagen Brand in charge of Technical Development

A Technical Feasibility Demonstration

Breaking new ground with the one-litre car

Although it had been announced for some time, the world looked on in astonishment when Volkswagen's 1-litre car made its debut on 15 April, 2002. The then Chairman of the Volkswagen Board of Management, Dr. Ferdinand Piëch, and his successor Dr. Bernd Pischetsrieder proudly presented the first car in the world that can cover 100 kilometres on only one litre of fuel (see also the Volkswagen Environmental Report 2001/2002). To mark the end of his term of office, Dr. Piëch drove this research vehicle from Wolfsburg to Hamburg, recording an average fuel consumption of 0.89 litres per 100 kilometres. It was yet another impressive demonstration of Volkswagen's technology leadership, because the one-litre car, a two-seater, is a masterpiece of automotive design. The entire car with its streamlined carbon-fibre body (Cd 0.159) weighs in at just 290 kilograms. Other technical highlights include the magnesium space frame chassis, carbon-fibre composite bodywork, brake system, axle design and wheels. This extremely low-slung vehicle (it stands at just 111 cm) is powered by a single-cylinder diesel with an output of 6.3 kW. For further information on the 1-litre car visit

www.mobility-and-sustainability.com

Technical Data

Engine	
Type	One-cylinder naturally aspirated diesel engine with pump injector unit
Displacement	299 cm^3
Bore x stroke	69 x 80 mm
Compression ratio	16.5 : 1
Valves per cylinder	3
Valve gear	Double overhead camshafts
Engine weight (dry)	26 kg
Output	6.3 kW (8.5 PS) at 4,000 rpm
Torque	18.4 Nm at 2,000 rpm
Transmission	6-speed automated manual gearbox
Starter	Impulse starter-alternator
Performance/consumption	
Top speed	120 km/h
Fuel consumption	0.99 l/100 kilometres
Body and wheel/tyre dimensions	
Length x width x height	3,646 x 1,248 x 1,110 mm
Wheelbase	2,205 mm
Front/rear track	1,000 mm/810 mm
Tank capacity	6.5 litres
Kerb weight	290 kg
Luggage compartment capacity	80 litres
Aerodynamic drag Cd/surface	0.159/1.0 m^2
Tyres front/rear	95/80 R 16 115/70 R 16

Keeping Our Sights on the Target

Passenger car emissions still falling

For more than thirty years now, exhaust emissions have ranked alongside output as key factors in car engine design. The first pollution control directive was introduced by the European Community back in 1970. Carbon monoxide (CO) and hydrocarbon (HC) limits for petrol engines were followed by maximum values for emissions of nitrous oxides (NO_x) in 1977. These restrictions have also applied to diesel engines since 1984 with limit values for particulate emissions from diesel engines being added four years later. The next step was the introduction of the Euro 1 exhaust emissions standard in 1992. All petrol-engined vehicles needed three-way catalytic converters to comply with the new limits.

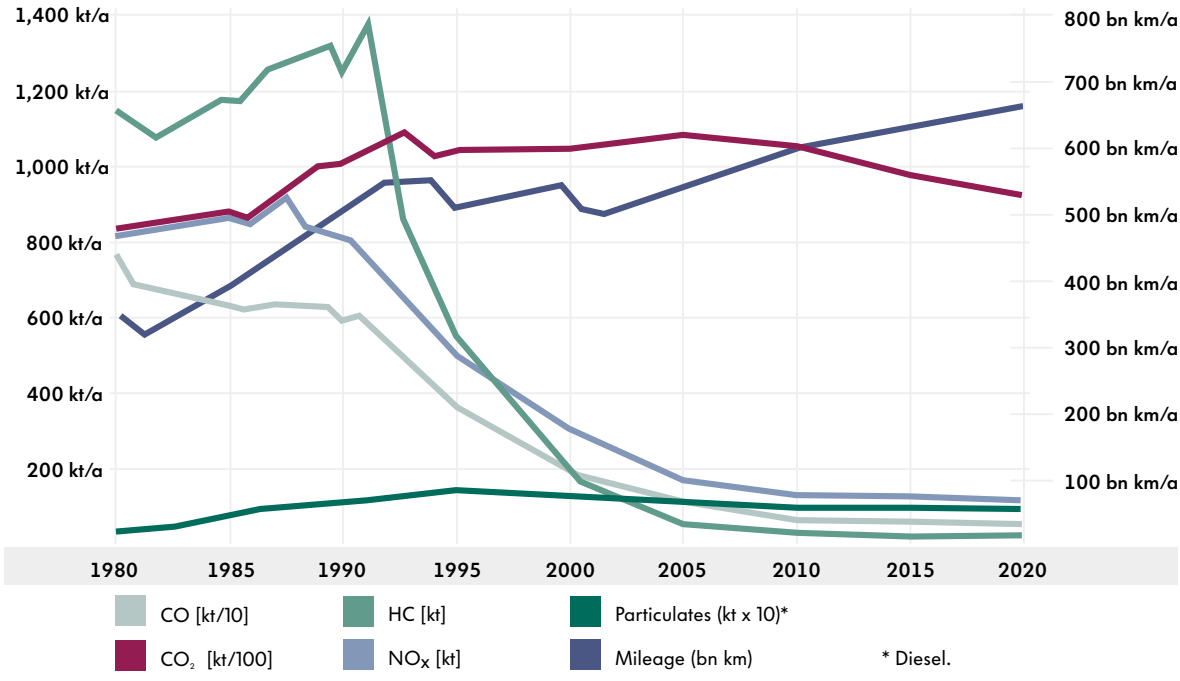
Further significant reductions in emissions were achieved by the progressively more stringent limits imposed by the Euro 2 (1996), Euro 3 (2000) and Euro 4 standards. The maximum emission values laid down in Euro 4, which comes into force in 2005, are about 90 percent lower than those in Euro 1. Some of Volkswagen's petrol and diesel engines already met these stringent limits six years before compliance becomes mandatory. Today, one year before the new standard comes into force, more than 90 percent of all Volkswagen cars sold in Germany are Euro-4-compliant.

Measurements and simulations

The emissions forecast model commissioned by Germany's Federal Environmental Agency (see graph below) shows the development of passenger car emissions in Germany. The model is continuously being updated to reflect the actual and anticipated effects of changes in fleet composition, the introduction of clean fuels and the latest projections concerning volumes of traffic. The graph clearly shows that the introduction of lower-emission engines has led to significant reductions in the output of exhaust components subject to legal limits. And as a result of lower fuel consumption, carbon dioxide emissions have not increased in line with mileage.

Measurements confirm that the impact of motor vehicle emissions on air quality is steadily falling as a result of the use of cleaner engines. Local measurements of particulate concentrations in the atmos-

Car exhaust emissions in Germany up to 2020



Source: IFEU (Institute for Energy and Environmental Research)/UBA (Federal Environmental Agency) (TREMOD 3.0 simulation model)

phere at various roadside monitoring sites in major German and Austrian cities showed typical reductions in the amount of soot. Although any analysis of these values must take into account that the air at these sites is also polluted by emissions from industrial sources and domestic heating systems (see graph below).

Working closely with PTV Planung Transport Verkehr AG and the Technical University of Graz, Austria, Volkswagen has developed a simulation model for exhaust emissions. Using this model, the emissions situation, especially in inner-city areas, can be simulated with reference to individual vehicles. An interface with an emission distribution model means that the air pollution can be computed with high resolution in terms of both space and time. The purpose of the model is to assist in the development of constructive approaches in response to values above the statutory limits. Volkswagen has also taken the initiative in transferring its experience with exhaust emissions to the question of noise. For further information visit

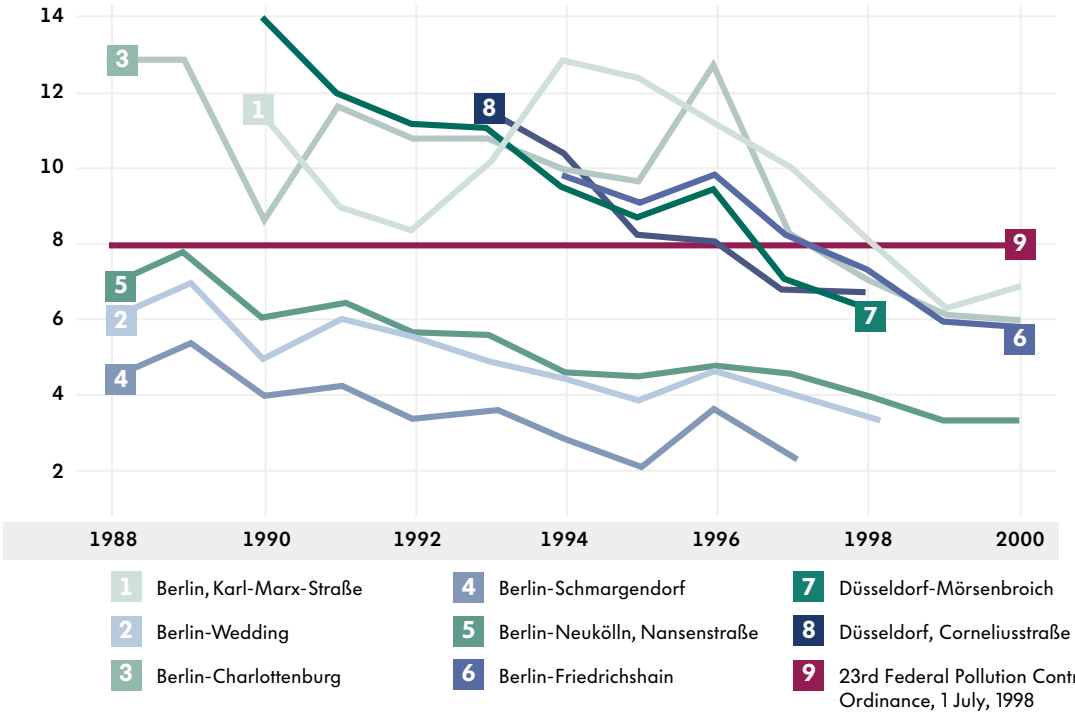
www.mobility-and-sustainability.com

Particulate emissions from diesels

Despite all progress on the engineering front, particulate emissions from diesel engines remain a controversial subject. The key parameters in the debate are the size and quantity of particles. The assumption that the high-pressure injection systems used on modern diesel engines for the more effective atomisation of the fuel produce smaller particles that are more readily respirable has not been clearly confirmed by scientific studies. Our measurements (see graph at top right) show that when the mass of particles falls (to comply with emission limits) so too does the number of particles emitted. An additional limit based on particle quantities of the type called for by some EU Member States would therefore make no sense and would also make mandatory vehicle inspections considerably more expensive.

Annual average particulate concentrations at roadside monitoring sites in Germany

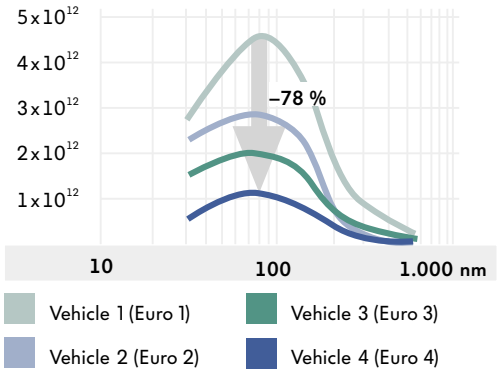
in µg/m³



Source: Technical University of Vienna

Particle size distribution

(with Euro 1 to Euro 4 engines) Number of particles per km



nm = nanometres

Source: Volkswagen AG

Over a hundred years after the diesel engine was invented, it remains the most efficient internal combustion engine. The main focus of Volkswagen's diesel engine development work is on avoiding emissions in the first place rather than on costly and complex end-of-pipe measures to eliminate pollutants. As a result, more than 60 percent of the diesel engines now sold by Volkswagen in Germany already meet the stringent Euro 4 limits even without a particulate filter – and that proportion is still growing.

At the 2003 Frankfurt Motor Show (IAA), Volkswagen had two particulate filter systems on show. Since the autumn of 2003, the Passat 2.0 TDI has been available with an engine-remote particulate filter installed in the floorpan. As regards maintenance intervals and thus convenience for customers, this additive-type system currently represents the best particulate filter on the market.

In 2004, a particulate filter which does not require the use of an additive is due to become available for the Golf 2.0 TDI. The new filter will feature an innovative oxidation coating and be installed close to the engine, so that both the oxidation-type catalytic converter and the fuel additive can be dispensed with. This pioneering system requires no maintenance and is designed to last the lifetime of the car. Reliability and minimised complexity – and thus low cost – are further features of this new technology from Volkswagen.

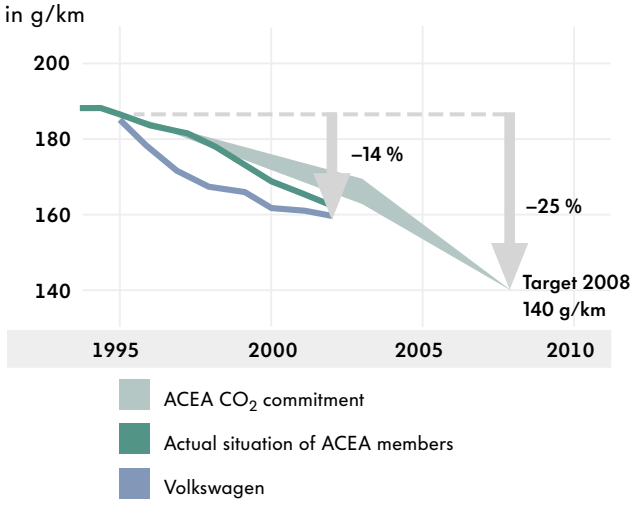
Improved fuels

Better fuels also help in cutting emissions. In this connection, the sulphur content of diesel fuel on sale in countries where the Euro 4 exhaust emissions standard will apply should be limited to 10 ppm (parts per million). New synthetic fuels such as SynFuel and SunFuel (see page 46) represent a clean, future-oriented alternative to conventional fuels. In contrast to new vehicle technologies, which only affect emissions in line with the market penetration they achieve, improved fuels bring immediate benefits in terms of lower emissions and better air quality.

Advanced diesel engines will in any case be essential in optimising fuel economy and reducing CO_2 emissions. The European Automobile Manufacturers Association (ACEA) has entered into a voluntary commitment to reduce average new car fleet emissions by 25 percent to 140 grams of CO_2 per kilometre between 1995 and 2008. Prospects for meeting this commitment are bright (see graph below). Volkswagen too is playing its part; since 1995 we have reduced the CO_2 emissions of our vehicle fleet by 14 percent.

Drop in CO_2 emissions due to falling fleet consumption

in g/km



Source: Volkswagen AG

Giving Free Rein to E-motion

On the road to zero-emission vehicles

Volkswagen's alternative drive system strategy is closely linked to the company's fuel strategy and continuously benchmarked against developments in conventional vehicles and drivetrains. Apart from purely technical factors, market requirements, customer preferences and statutory provisions all play an important part here. For example, the development of (battery-powered) electric vehicles over the past few years has been mainly driven by Californian legislation requiring manufacturers to include ZEVs (zero-emission vehicles) in their range. That said, current developments here are opening the way for the introduction of hybrid and fuel cell drive systems.

Volkswagen's alternative drive system concepts are intended to signpost the potential for cutting fuel consumption and emissions beyond the limits imposed by conventional drivetrains. In the process, in line with our fuel strategy our long-term objective is to ensure the CO_2-neutral use of energy. Volkswagen is currently pursuing three different approaches to alternative drivetrains:

- battery-powered electric vehicles
- single-shaft parallel hybrid drivetrains
- fuel cell drive

Battery-powered electric vehicles

Battery-powered electric vehicles are one way of effectively ensuring zero emissions at the point of use, making them an obvious choice for urban delivery services, for example. Nevertheless, despite the considerable progress that has been made in this area, battery-powered vehicles cannot win a significant market share in open competition with conventional vehicles. This is mainly due to the current state of the art in batteries, which limit range to about 100 kilometres, take about six hours to recharge and are relatively expensive. Electric vehicles are therefore probably destined to remain niche products. Without government intervention, they are simply not competitive. However, concept cars are still being developed to demonstrate the state of the art and test components (especially the batteries).

One example is a Golf equipped with a nickel-metal hydride (NiMH) battery and a peak output of more than 100 kW. Volkswagen is using this car to test the acceptance of electric vehicles. The car's performance is comparable to conventional vehicles and it has been well received. However, tests have shown that further development work on the battery system is still required for use in vehicles of this type.

The Bora Electric is Volkswagen's latest prototype electric vehicle. But despite its attractive performance (range 160 km; acceleration 0–100 km/h in 10 secs.) it will not be going on sale. This is because certain questions related to lithium ion batteries still need to be answered and the production cost of the overall system is high. Consequently, its chances of success in the market would be very limited.

Parallel hybrid drivetrains

Of the various hybrid drivetrain designs that are available (series, mixed and parallel hybrid), Volkswagen favours the single-shaft parallel configuration. The main item in the design brief for systems of this type is cutting consumption and emissions while maintaining adequate performance and comfort and staying within cost targets. The hybrid systems considered incorporate four main features to ensure that these requirements are met.

- **Automatic start-stop function:** the internal combustion engine is stopped when it is not needed for powering the vehicle and started by the electric motor as soon as power is required.
- **Energy recovery (during deceleration):** during deceleration (i.e. on the overrun and when braking), the electric motor is switched to generator mode, using the kinetic energy of the vehicle to charge the battery.
- **Flexible operating mode selection:** for example, the system can be set up so that the electric motor handles the part-load operating range, which is less suited to the internal combustion engine, while the engine alone covers the higher power output range. Alternatively, if the battery charge is

low, the specific load of the engine can be raised until it is working more efficiently, and the additional energy used to recharge the battery.

- **Telematics and route information:** information received by electronic data transmission can be used to stop the engine automatically when the vehicle is approaching red traffic lights or the end of a tailback. Similarly, the battery can be charged to an appropriate level for dynamic, economical operation ahead of an uphill or downhill section.

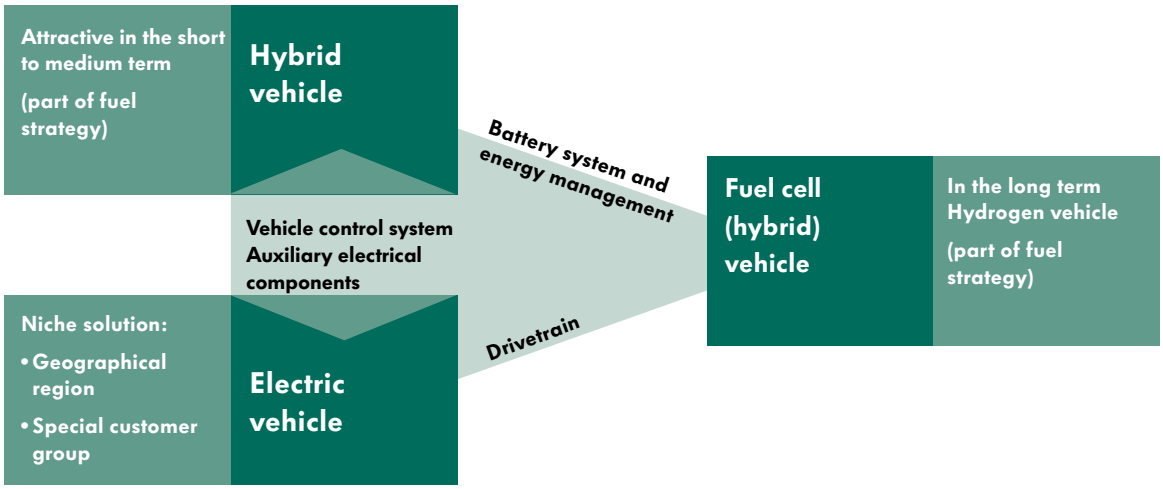
Volkswagen first tested the single-shaft parallel hybrid drive system in a Golf in 1986. Our current system features a higher-performance motor and considerably improved battery systems and mechatronics hard- and software, but the basic principle of single-shaft parallel hybrid drive remains the same. The only change is that the present system is not designed for external battery charging. A road-going prototype has been built and is currently undergoing extensive testing to fine tune the driving and operating strategies. The objective is to make the anticipated benefits of the system visible, especially in terms of consumption and emissions, and to determine the production cost of the vehicle as a whole.

Fuel cell drive systems

Fuel cells are the most promising long-term alternative to the conventional internal combustion engine. The most attractive option is the hydrogen-powered fuel cell. If the hydrogen is produced using renewable energy sources (such as wind power), there will be virtually no overall impact on atmospheric carbon dioxide concentrations. The drivetrain for Volkswagen's concept fuel cell cars is adopted from electric vehicles, while the high-performance battery and the overall energy management system are derived from the parallel hybrid drive concept (see page 54). Synergy effects mean that design work can focus on the development of new components for the fuel cell system. In order to assess the technology, Volkswagen has produced several design studies with fuel cell propulsion systems.

The Bora HyMotion is powered by cryogenic hydrogen (liquid hydrogen at a temperature of –253° C) and is fitted with a fuel cell with an output of 30 kilowatts. With the support of a high-performance NiMH battery, a maximum output of 75 kW is available. Although this design study can reach a maximum speed of 140 km/h (with acceleration from 0 to 100 km/h in 12.6 secs.) there are a num-

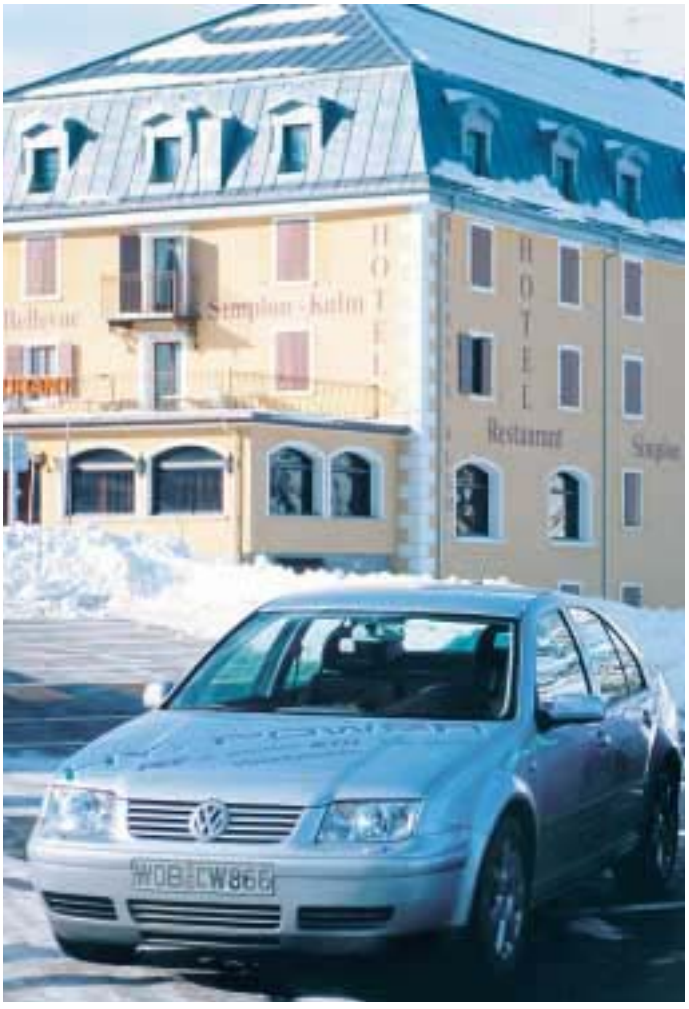
Alternative drive strategy



Source: Volkswagen AG

ber of problems associated with the use of cryogenic hydrogen as a fuel. The evaporation and energy losses in the liquefaction process in particular mean that this concept is unlikely to see widespread use in the short term.

Another fuel cell concept car, the Bora HY.POWER®, was developed by Volkswagen in cooperation with the Paul Scherrer Institute at the Swiss Federal Institute of Technology (ETH) in Zurich. This vehicle is powered by compressed hydrogen (at a pressure of 320 bar) and equipped with a 40 kW fuel cell system. A 60 kW supercap (supercapacitor) system is used for power boosting and energy recovery. As with the Bora HyMotion, the total power output available is 75 kW. Although the Bora HY.POWER® has been tested successfully and has even crossed the Simplon Pass in winter conditions, it is intended solely as a prototype for testing the overall system of fuel cells and supercaps.



The Bora HY.POWER® on the Simplon Pass

Series production still a long way off

Now that the first tests have proved the technical feasibility of the system, we must continue the development process in realistic stages. Before fuel cell vehicles can be launched onto the market on a large scale, we will have to run fleet tests with specially selected customers. The prototypes have shown that fuel cell vehicles still have a number of obstacles to overcome in comparison with their conventional counterparts. These are connected with cost, volume, weight, durability and reliability under the conditions normally faced by cars, such as high and low temperatures and dusty environments. To surmount these obstacles, dramatic technological progress in certain problem areas, dedicated research and development work and the use of new materials and production processes will all be essential.

The development stages associated with the fuel production and supply chain, from the provision of energy for hydrogen production to vehicle refuelling, will also call for constructive cooperation between all the organisations concerned. Before hydrogen can be introduced as a motor fuel in line with Volkswagen's fuel strategy, politicians and society as a whole must first come to recognise the potential of this new fuel.

Further information on topics related to Chapter 2.3 Research and Development

Research funding
Electronics
INVENT

can be found at
www.mobility-and-sustainability.com

Closing the Loop

Eco-friendly recycling of end-of-life vehicles
Vehicles that have reached the end of their useful lives are much too valuable to be simply dumped. Consequently, the European Union (EU) insists that European car manufacturers take back their end-of-life vehicles (see page 88). As the recycling rates to be met when disposing of such vehicles in the future are very high, dismantling studies were initiated at a very early stage with a view to designing recyclability into vehicles.

But that is only part of the story. End-of-life vehicle recycling can only be a sustainable prospect if the processes used are both environmentally compatible and economically viable. Consequently, Volkswagen has drawn up life cycle assessments for two different recycling processes (see page 33) with the outcome that the process developed by Volkswagen in cooperation with SiCon is clearly superior to conventional dismantling and recycling, shredding and landfilling. The Volkswagen/SiCon process makes sense because the materials produced during recycling can be returned to the existing production cycle in place of primary raw materials.

How did we tackle this problem? We focused primarily on the reuse of shredded material. Reusable material fractions can be produced by multi-stage shredding in combination with sorting and segregation on the basis of physical criteria such as density, particle shape, magnetic properties, conductivity and optical characteristics. The process stages required were developed or derived largely on the basis of conventional raw material preparation and waste treatment methods.

The result is a process that allows all the shredded materials, including plastics, rubber and textiles, to be reused. In this way, the statutory reuse and recycling rates required for end-of-life vehicles can be reached in an environmentally compatible way without complex, labour-intensive dismantling. For further information on this subject visit

www.mobility-and-sustainability.com

Another example of successful, constructive cooperation between Volkswagen and its partners can be seen in connection with a new requirement of environmental legislation. Under the EU End-of-Life Vehicle Directive (2000/53/EC), with few exceptions the use of the heavy metals lead, cadmium, mercury and hexavalent chromium in new vehicles registered after 1 July 2003, is banned. At Volkswagen, compliance with this requirement is the responsibility of the Material Controlling Team which was established in addition to the conventional materials management organisation (responsible for testing replacement substances with reference to occupational health and safety and quality assurance). Volkswagen has ensured that all its business partners comply with these requirements by adopting revised standard terms & conditions and product specifications, introducing additional written conformity declarations and continuing with the established seminars and workshops for system developers and suppliers. However, substitute materials were required to replace the banned heavy metals. In cooperation with suppliers, the technical development and quality assurance organisations at Volkswagen started the search for substitute materials in good time and were able to meet the statutory requirements on schedule.

Global Thinking, Local Action

Production and plants

The World Summit on Sustainable Development in Johannesburg in 2002 achieved few tangible results, but it did succeed in highlighting one thing: bringing about positive change to living conditions in the majority of newly industrialising or developing countries cannot be achieved by state intervention alone. Today and in the future, globally active companies will have to shoulder more of the responsibility for economic, environmental and social development – and this can best be achieved at the plants operated by these companies.

What does this mean in practice? It means creating training opportunities and jobs whilst ensuring high standards of industrial health and safety; it means using local resources with care and, in particular, giving increasing priority to safeguarding supplies of drinking water for the future; and it means putting in place long-term environmental management systems with a view to integrating the issue of environmental protection into all planning and implementation processes.

Hartmut Müller

"By sustainability we mean a responsible approach geared to the long term that takes into account the interests of mankind and the environment without losing sight of economic aspects. As multinational companies, Volkswagen and Bosch share in the overall burden of responsibility for sustainable development worldwide. As part of our product-related environmental protection activities, we have together created both the 3-litre car and the 1-litre car. Our common vision is to cut resource consumption still further at every stage of the product life cycle. One major challenge facing us is the high-growth Chinese market in which Volkswagen and Bosch are today already proving good partners – in some cases through joint ventures. By adopting a joint approach, co-operating closely and respecting each other's specific needs, we are making successful progress with our mutual long-term projects such as reducing emissions and resource consumption, while at the same time making motoring safer."

Hartmut Müller (60) is Head of Central Environmental/Fire Protection and Accident Prevention at Robert Bosch GmbH in Stuttgart, Germany. In 1999, Volkswagen presented Bosch with the Volkswagen Environmental Award.

These goals can only be achieved, however, by means of a continuous transfer of knowledge. Crucial to such a partnership, therefore, are the regular exchange of experience, a uniform set of technical environmental standards and systematic communications through global networks.

Group environmental conferences are an important tool in promoting such networks, and it was to this end that two hundred experts representing the Group's brands came together for the first Volkswagen Group Environmental Conference in 1998. Their mutual aim was to develop common guidelines and principles for environmental protection in the twenty-first century and to improve cooperation between the Group's brands and plants. In June 2002, this dialogue was continued at the second Group Environmental Conference in Ingolstadt, Germany. One significant outcome of this conference – and a focus for the immediate future – was recognition of the need to more fully involve Volkswagen's suppliers and partners in the ongoing development of environmental management at the company.

In its global efforts to synchronise environmental activities, Volkswagen is careful to ensure that, in addition to respecting the formal framework provided by its environmental policy and environmental standards, for example, there is also a high degree of inner acceptance and involvement on the part of regional management. To this end, regional con-

ferences were introduced as a means of first establishing the necessary basic information and then leading to the realisation of agreed goals and measures via intensive dialogue. The first regional conference (for the North America region) was successfully staged at the Puebla plant in Mexico in November 2003. In the next few years, further regional conferences are planned in Brazil (South America/South Africa region) and in the Asia-Pacific region.

Right on Target

Volkswagen in dialogue with its suppliers
On 25 June 2003, Volkswagen Coaching organised the 100th environmental workshop for Volkswagen and its business partners in the "Priority A – partners for the environment" programme. The programme was developed so as to enable our suppliers to take on Volkswagen's environmental policy and ecological standards and to provide a forum at which to discuss the appropriate application of policy and standards along the supply chain. The workshops are also a quick and easy way of keeping all our partners up to speed with any factors arising as a result of changes in environmental legislation.

Since the first symposium back in 1997, we have already been able to welcome 1,200 participants from 1,100 supplier facilities. So it was only fitting that, at the 100th workshop, we cast a glance back at the achievements of the past five years, and set our sights on the road ahead. We invited all the speakers from past workshops to come and face any questions or criticism from delegates and listen to their proposals. Also on the agenda were topics as diverse as Volkswagen's "Environmental Radar" newsletter, the Hannover plant's neighbourhood dialogue scheme, the 1-litre car and Volkswagen's fuel strategy. Many of those present said they would like to go into some of these topics in greater depth – something we will be doing at the 2004 workshops.

Larger symposia are held on a regular basis as part of the Priority A programme. Suppliers are kept informed of the latest developments by mail as well as via a dedicated environmental website on the Internet. In addition, Volkswagen informs them immediately when any divergence from our environmental policy is noted. By the same token, suppliers keep Volkswagen abreast of their own environmental activities. Each year, we present an Environment Award to the supplier whose innovative idea has best served the environmental compatibility of our products or production processes. The 2003 award winner was Thyssen Fügetechnik Nord in Wolfsburg, for an ecologically and economically optimised steel application in the body production process that uses tailored blanks to save weight and optimise functionality.

Volkswagen Group Award 2003: Dr. Franz-Josef Paefgen, General Power of Attorney, Volkswagen AG, Dr. Ulrich Jaroni, Member of the Board of Management of ThyssenKrupp Stahl AG, Dr. Bernd Pischetsrieder, Chairman of the Board of Management of Volkswagen AG, Francisco Javier Garcia Sanz, Member of the Board of Management of Volkswagen AG in charge of Procurement (from left)

Dirk Große-Leege, Head of Volkswagen Communications, at the 100th environmental workshop for suppliers

Far Apart but Close Together

The Volkswagen plants

With plants on four different continents, our production facilities have now reached just about every corner of the globe – and no two Volkswagen plants are quite the same. On the next few pages, we present symbolic examples of environmental activities from each production plant. In addition to reading about some of the technical measures introduced, you will also find descriptions of projects and initiatives triggered by the commitment of our employees. A more detailed presentation of all our plants and other projects can be found on the Internet at

www.mobility-and-sustainability.com

But along with environmental protection, another key issue at all our plants is sustainable development. Consequently, in Chapter 3 on "Social Responsibility", we present three examples of social projects (see pages 93, 98 and 99).

Germany

The Braunschweig Plant

At the Braunschweig Plant, all 164 disposal points for waste requiring no documentation have been equipped with a transponder system (see photo below). With the aid of these transponders and a reading device, data specific to each disposal point can now be collected and analysed automatically. So now it is possible to determine how often each individual waste container is removed and replaced with an empty one, and check on how well the waste is segregated. A points system has been set up and now, when a container is replaced, the purity of individual waste fractions can be evaluated on a scale of one (clean) to five (mixed and contaminated with hazardous waste).

The Chemnitz Plant

Like all the other plants, Volkswagen's Chemnitz plant sets great store by continuously improving environmental protection from the planning stage onwards. By way of example, a large number of modifications on the process engineering front have led to tangible successes. One case in point concerns the filter systems, where new and high-performance filters now ensure an improved level of quality, availability and downtimes. The pollutant load from oil and emulsion mist in the central electro-filters has also been cut back significantly. And we have reduced heat consumption and thereby cut costs by EUR 46,700 by using additional heat recovery systems to pre-heat the incoming ambient air.

The Emden Plant

The regional environment centre Ökowerk e. V. in Emden offers schools, playgroups, clubs, associations and anyone with an interest in the natural world a chance to find out more about environmental issues and to experience nature in all its diversity at first hand. Ökowerk is also involved in the environmental training effort at Volkswagen's Emden plant. Familiarisation with the centre is part of supervisor training courses and the plant's Environmental Protection Specialists regularly meet up here to exchange notes. On the practical front, the centre is providing Volkswagen with expert advice on how best to convert light wells at the plant into ecological rest zones for employees. In return, Volkswagen helps Ökowerk to identify and recruit new network partners to keep it financially viable.

The Hannover Plant

The commercial vehicle plant in Hannover showed the way in 2001 with its "Watching the Waterline" campaign. The aim of this employee initiative was to reduce both water consumption and water pollution at the plant. Measures were concentrated on areas with high water consumption, resulting in significant savings – in the foundry, in particular – of approximately 60,000 cubic metres a year. This was backed up by a number of coordinated individual activities designed to involve every employee at the plant, all of which contributed to the success of the initiative.

The overall results were impressive: average water consumption was down 15 percent in 2002 compared with the previous year – with peak savings touching 35 percent. Needless to say, the campaign was picked up again in 2003: under the heading "Holding the Waterline", the best ideas from the campaign two years ago were reintroduced in revised form.

The Kassel Plant

The Volkswagen Kassel plant (located at Baunatal) held its first Environment Day in June 2003. The forum gave staff from the plant's Environment Protection department a chance to tell visitors from the political and business spheres and local authorities, as well as management and staff from other departments, about Volkswagen's activities in a whole range of aspects of environmental protection. There were informative presentations on topics ranging from saving energy, handling water-polluting substances, reducing air pollution, waste management and wastewater treatment. Plans are in place to hold regular Environment Days in future.

The Kassel plant's first Environment Day

The Salzgitter Plant

Volkswagen's smallest employees are tiny – microscopic, in fact. At the Salzgitter plant, microorganisms are currently responsible for cleaning up an area now used by outside companies, a measure which became necessary when waste oil was discovered in the soil during excavation work for a new pipeline. Unfortunately, the pipeline itself (high-voltage power, natural gas and drinking water) severely impeded access to the contaminated soil and only a comprehensive raft of safety measures would have permitted complete excavation. So it was decided to apply an effective and cost-efficient alternative in the form of in situ soil treatment. And that is where the little helpers come in: their job is to break down the oil biologically, generating carbon dioxide, water and biomass in the process. To help them work more efficiently, the air in the soil is regularly replenished and fed with nutrients containing nitrogen. To this end, a specially devised system involving air-injection wells and vacuum lances has been installed. Thanks to these hardworking "employees", up to four tonnes of oil will be disposed of in an eco-friendly way in less than two years.

VW Kraftwerk GmbH

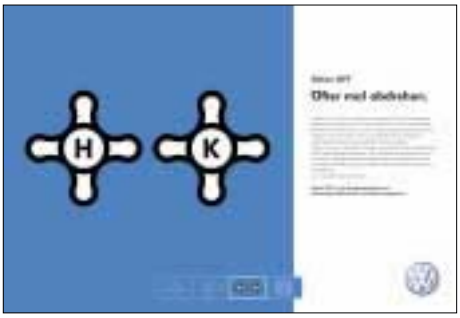
VW Kraftwerk GmbH is the Volkswagen Group's service provider in matters of energy, operating Group-owned power stations at the German production plants in Wolfsburg, Kassel, Hannover and Emden, as well as the in Czech Republic – some as joint ventures. As a rule, these are combined heat and power plants – the CHP process being currently regarded as offering the best technical and ecological fuel efficiency. In addition to supplies of electricity, heat, water, natural gas and compressed air, Volkswagen's

Wolfsburg plant is also provided with refrigeration. To this end, the energy production process is combined with absorption refrigeration facilities. As a result, combined heat and power operation can continue during the summer months, raising the already high fuel-efficiency figure to over 70 percent and making a direct contribution to protecting the environment and conserving natural resources. For further information visit

www.vw-kraftwerk.de

The Wolfsburg Plant

In May 2003, the Wolfsburg plant introduced its OFF campaign. This challenges all employees to show the same responsible attitude to energy at the workplace as they would at home. In this way, Volkswagen not only makes considerable financial savings but also conserves natural resources. Poster campaigns and idea-management competitions encourage every employee to make a contribution – whether by switching off lights and turning off taps when leaving a room, or switching off both computer and monitor before leaving for home in the evening. A simple comparison helps to quantify the scale of the annual energy requirements at the Wolfsburg plant: the heat energy consumed at the plant would be sufficient to supply 24,000 homes for an entire year. By reducing the ambient temperature in offices and production facilities by a single degree Celsius, the plant could make annual savings of EUR 1.3 million. So as the scheme reveals, it doesn't take much to save energy and conserve resources. The OFF campaign is being held up as an exemplary initiative within the company's Model of Sustainable Development and has



now been launched across all Volkswagen plants via a special intranet program.

The Mosel Plant

The region's most advanced wastewater treatment plant is providing exemplary treatment for all industrial and municipal wastewater from the Volkswagen plant and nearby factories and communities. Volkswagen set up this state-of-the-art wastewater treatment facility when the Mosel plant was built in 1992, and – through its cooperation with local communities – is making a considerable contribution to easing the local wastewater situation. As a result of the treatment plant's efficiency of over 95 percent, water quality in a local tributary, the Zwickauer Mulde, has improved appreciably. And ongoing investments are helping to ensure that wastewater treatment here remains at the cutting edge.

Europe

The Bratislava Plant

Volkswagen Slovakia's parent plant in Bratislava now also operates an environmental management system in line with ISO 14001 which underwent successful certification in October 2003. A comprehensive internal audit was carried out in order to test the introduction of the system in-house. Preparation for the audit at the Bratislava plant involved the first-time use of a new system for the definition and evaluation of environmental aspects. The system is compatible with the Group's SEBU system which serves the same purpose. Additional environmental information was made available to employees through the new Environmental Information System (EIS) as well as on the intranet. Bratislava is the first plant outside Germany to introduce the EIS, which is up and running at all of the Group's domestic plants. Now employees can consult the EIS at any time to find out more about

environmental issues. The system also provides access to all environment-related data for the plant, current environmental policy and the environment-management handbook.

The Brussels Plant

Soil tests prior to construction of a new production shop at the Brussels plant revealed evidence of soil and groundwater contamination left behind by previous site owners. Most importantly, the tests revealed the presence of mineral oil, heavy metals and ammonium. A quick and effective response was called for. Having consulted the environmental authorities in Brussels, Volkswagen opted for an immediate and costly clean-up operation, which involved removing 8,000 tonnes of soil for treatment. A further consequence of this inherited pollution, however, was contaminated groundwater, and since a complete groundwater remediation programme is no straightforward operation, a long-term plan had to be drawn up. Beneath the floor of the new production shop are

several pumps which feed the contaminated water to two activated carbon filters for treatment, before channelling it into the drains. The process will continue until the groundwater pollutants no longer pose a hazard.

The Martin Plant

The focus here has been on training, because a certain amount of explanation is necessary before any workforce can get to grips with a new environmental management system (EMS). Consequently, all Volkswagen Slovakia employees at the Martin plant underwent intensive training in how to deal with the new EMS. The plant was duly certified in line with ISO 14001 in September 2002. The external auditors also paid close attention to the national parent plant in Bratislava (see above). Thanks to excellent co-operation by all departments concerned, the Martin plant was recertified in June 2003.

The Palmela Plant

Waste air from the spray booths at the Palmela plant goes through the wet-wash process for cleaning. Until recently, this resulted in an emulsion contaminated with paint and solvents which then had to be distilled and treated. As this process consumed large amounts of energy and transportation to the treatment facility gave rise to emissions, it was decided to put a more ecologically and economically efficient process in place. This involves the use of a special coagulant to ensure that paint particles are precipitated and can be continuously removed from the water cycle. This system can also treat any rinsing-water residues from the cleaning process, which formerly had to be incinerated as hazardous waste. Thanks to this new process, we now save more than 7,000 cubic metres of freshwater a year and have cut the quantity of paint waste by more than half.

The Pamplona Plant

At Volkswagen we have a long tradition of having the environmental management systems at our plants certified by independent auditors – and not just in Germany. A case in point is the Volkswagen plant in Pamplona, in the Spanish province of Navarra. This was the first plant to submit to inspection in line with both the EC Eco-Audit Regulation and ISO 14001. In the meantime, this benefits some 45 suppliers, who have made a voluntary commitment to develop their own environmental management systems in cooperation with Volkswagen Navarra. The result is PROYMA – "Proveedores y Medio Ambiente" (Suppliers and the Environment) – a project jointly initiated by Volkswagen Navarra and the provincial government, which is helping suppliers to introduce an environmental management system certified in line with ISO 14001 by 2005 at the latest.

The Polkowice Plants

Since 2002, all environmentally relevant processes at the Polkowice plant in Poland have been coordinated by an "Energy

Taskforce". The task of this group – made up of employees from all departments – is to find ways of making production processes more eco-friendly, to heighten awareness of environmental issues among employees and to help conserve valuable resources. One topic of particular importance is freshwater. Poland has very little surface water at its disposal. By building a stormwater-retention basin, the plant has been able to cut its uptake of freshwater. Another significant part of the work of the Energy Taskforce is looking into the ideas submitted by employees on the subject of environmental protection. Within the idea-management scheme at the plant, all employees are encouraged to submit proposals on any aspect of environmental protection or resource conservation.

The Poznan Plant

In the car production process, resin is used to seal microscopic fine cracks in cast aluminium parts. The wastewater from this process is heavily contaminated with sulphates and presents a high chemical oxygen demand. At Volkswagen's Poznan plant in Poland, the intro-

duction of an advanced automatic impregnation system now means that all parts are treated in a closed loop. Excess resin is rinsed off the surface and the sulphate-laden wastewater from the rinsing process is treated in an evaporator before being fed back into the rinsing cycle. Process residues can be recycled as harmless additives for building materials.

North America

The Puebla Plant

"Wastewater separation and recycling" is the name the Puebla plant in Mexico has given to its successful ecological programme aimed at conserving precious freshwater. In the same way as other resources are recycled, wastewater from the plant is separated into different streams according to the applications for which it is to be reused. The water recycling system then reconditions the water to exactly the quality required. Thus, for example, bacteria help break down organic materials in sanitary wastewater; a physical-chemical approach is used to treat industrial wastewater; and rainwater is fed directly into a retention basin before being filtered to produce process water and freshwater. Thanks to this water management scheme, the plant has been saving 700 cubic metres of freshwater a day since 1999.

South America

The Anchieta Plant

In the past, paint sludge was incinerated at cement works. Now it is recycled at the Anchieta plant and used in the manufacture of insulating mats for the cars built at the plant. This new process reduces transportation costs and does away completely with the cost of incineration. Not only that, but the insulating mats produced by this method are four percent cheaper than conventional ones. The process was developed by Volkswagen do Brasil employees in collaboration with external partners, and in recognition of the ecological and economic benefits, the project team was selected by Volkswagen do Brasil's internal recognition programme for an environmental award.

The Córdoba Plant

Since January 2002, the Córdoba plant in Argentina has been heat-treating new magnesium gearbox casings in a low-pressure vacuum. The special thing about this innovative process are the electrically heated vacuum ovens. Formerly the ovens were gas (methane) heated, and

no more methane means no more local emissions. Moreover, the short warm-up phases required under vacuum means that the ovens can be more flexibly integrated into the various process stages and switched on and off at short notice as required. An additional benefit is that process gases containing ammonia, previously required for surface hardening, have also been dispensed with – eliminating the potential threat they posed to workforce and environment alike. Washing the gearboxes is also no longer necessary, so there is now no oil-contaminated wastewater to be dealt with.

The Curitiba Plant

A variety of measures introduced at the Curitiba plant in Brazil in 2002 have brought dramatic reductions in the quantity of industrial and hazardous waste produced. Fewer solvents are required, for example, for cleaning processes in the paintshop, and advanced filter presses are now much more efficient at removing

the water from paint sludge, with the result that much less sludge now requires disposal. In addition, a new recycling partner has taken over responsibility for the recycling of waste such as solvents, polystyrene and wood. Compared with figures for 2001, this has led to a 90 percent reduction in the amount of waste which would otherwise have been landfilled.

The Pacheco Plant

The pampas in the east of Argentina is one of the world's largest areas of steppe and grassland – unfortunately it is also one of the most endangered. Volkswagen therefore came

up with a special idea at its Pacheco plant to help preserve the unique landscape and habitat of many endangered species. It was decided – after excavation work for the construction of a new truck plant was complete – to only partially refill the resulting pit and top up the rest with rainwater. The outcome is a pond with a reserve of water which could also be used for fire-fighting. Trees have also been planted along the banks to provide a new and natural habitat for rare flora and fauna.

The Resende plant

Volkswagen employees at the Resende plant in Brazil have been demonstrating not just commitment to environmental issues but also talent on the stage. An Environmental Committee at the plant made up of employees representing all departments has organised a regular series of events on envir-

onmental themes. In 2001 and 2002, for example, the plant staged an Environment Week, the highlight of which on both occasions was an environmental play produced and directed by Volkswagen employees and designed to encourage the audiences in an original and lighthearted way to change their attitudes towards environmental issues. The play was performed in front of employees and their families, as well as for a group of 500 schoolchildren and representatives of local authorities.

The São Carlos plant

Since June 2003, São Carlos in Brazil has been able to boast one of the largest and most advanced aviaries in the whole of Latin America. The new aviary is the outcome of a partnership between the Volkswagen engine plant and the "Dr. Antonio Teixeira Vianna" ecology park. The enclosure, which covers 450 square metres, provides a new habitat for many endan-

gered birds. For lovers of exotic species, the new aviary is just perfect, because visitors can observe the rare birds close-up through darkened glass from a suspended walkway. The São Carlos plant, which was the first Volkswagen production facility outside Europe to be certified in line with ISO 14001, has been supporting the ecology park since 1996. Among other things, Volkswagen has enabled 900 schoolchildren to visit the park as part of their environmental education and financed the construction of further enclosures.

The Taubaté plant

Water is a valuable resource in the automotive industry. Volkswagen's Taubaté plant in Brazil alone uses an average of 100,000 cubic metres a month – 70 percent of which comes from the largest treatment facility for process wastewater in Latin America. That is roughly equivalent to the water consumption of 1,400 households. Commissioned by Volkswagen, Hidrogesp built the wastewater facility and will hand it over to Volkswagen after an initial term of five years. Until then, the plant obtains its recycled water – mainly for use in the paintshop – at far more attractive terms than in the past.

Asia-Pacific

The Changchun plant

Frying and roasting in industrial kitchens and canteens produces considerable volumes of smoky, oil-rich fumes. These are not only responsible for unpleasant odours, but more importantly are also suspected of being hazardous to health. To counter this, waste gas treatment systems have been installed in the canteens at FAW-Volkswagen Automotive Company Ltd. in Changchun, China. These multi-stage electrostatic filters require very little in the way of maintenance and boast efficiency levels of over 90 percent.

The Shanghai plant

The success story behind the environmental management system (EMS) at Shanghai-Volkswagen Automotive Company Ltd. in China dates back to 1997. Volkswagen was the first automotive company in China to achieve EMS certification in line with ISO 14001 from the Huasha audit headquarters of the state environmental agency. And it was not long before the plant was the object of further praise – in June 2002 it received commendation in the city of Shanghai's 2000/2001 Environmental Report which referred to it as a "progressive environmental collective". Later that year, the plant was adjudged to have implemented one of the top one hundred state environmental protection projects. In the meantime, the plant has also been giving regional suppliers the benefit of its experience at a number of workshops. As a result, many suppliers serving Volkswagen in Shanghai have themselves already received ISO 14001 certification for their environmental management systems.

Cape of Good Hope

Volkswagen committed to a modern South Africa

by Ed Richardson

For nearly 20 years during the 1980s and 1990s, sanctions isolated South Africa from global trade and the country's commercial life was forced to focus inward on Johannesburg and the surrounding area. The Eastern Cape, which is home to Volkswagen's Uitenhage plant, is rated as the poorest province in South Africa with an unemployment rate in excess of 40 percent.

Volkswagen of South Africa is the biggest private-sector employer in the Eastern Cape, where it currently employs more than 5,000 workers at the Uitenhage plant and accounts for many thousands more jobs at its suppliers and service providers. Back in the 1970s, Volkswagen took the lead when it was one of the first South African companies to recognise a black trade union. This was followed in the early 1990s by offering the first training courses for black mechanics in the motor industry. Today, Volkswagen has a number of programmes in place to train managers from what are known as "previously disadvantaged groups" in South Africa – blacks, coloureds, Asians and women. "It is no good that we achieved a political transformation if the economy stays in traditional white hands," says Volkswagen South Africa Human Resources Director Brian Smith. But changing that situation, he admits, is "not easy because we have a skills shortage. We can't afford to drop our standards in terms of merit and competence in an internationally competitive business. It is no good us saying that in order to meet equity targets we put just anyone into management."

Education must improve

That explains why Volkswagen is also actively helping to change the culture of schooling in the region. "A good education is the key to success," explains the plant's Community Relations Manager, Weza Moss. Funding for school projects is managed through the Volkswagen Com-

munity Trust, which was formed at the initiative of both the workers and the company. HR Director Smith believes that there is a place for all good people at Volkswagen South Africa, regardless of race and colour. "There is always this difficulty of trying to balance," he says, "but in 2004 we will achieve the target of 25 percent of management being from previously disadvantaged groups, as agreed with the unions."

Volkswagen South Africa Managing Director Hans-Christian Maergner is adamant that "there is no contradiction in running a viable company and taking corporate social responsibility seriously. There is one simple rationale to the Volkswagen Group's investment strategy. If we as a company cannot achieve a 13 percent return on capital investment, we won't invest."

And the company continues to invest in its South African plant. Volkswagen has been the domestic market leader in passenger vehicle sales for the past two years and played a leading part in bringing about South Africa's breakthrough into the global auto market, first with orders to China, then to Western Europe. Now, over 30,000 Golf 4s a year and the new Polo are being shipped to the Asia-Pacific region.

Helping people to help themselves

In addition to its educational projects in schools, the Volkswagen Community Trust is involved a number of other aid projects such as "Khayamandi Women in Development". With the Trust's support, a total of 16 women have bought a brick-making machine. In addition, they grow vegetables which they sell to street traders in Port Elizabeth. "With the income, the mothers can finance school uniforms and fees for their children," says Tembeka Msitshana, who heads the project.

AIDS – the biggest threat

South Africa has the highest incidence of AIDS in the world. As such, the HIV virus poses a threat to the entire country's goals and ambitions. "More than a thousand people a day here are dying from the disease," says Dr. Olive Shisana,

Executive Director of the Human Sciences Research Council. An awareness programme has been devised to highlight the dangers of AIDS for all schoolchildren – from primary schools through to high schools – and advise them on how to protect themselves against the disease. Volkswagen is also supporting AIDS orphans. In South Africa, the aid organisation terre des hommes is distributing funds raised by Volkswagen's "One Hour for the Future" campaign (see page 99).

Ed Richardson (47) owns the Siyathetha agency and lives in Port Elizabeth. He is a freelance journalist and also writes for Automotive Purchasing News.

"We Have to Find Our Own Methods"

Although social commitment undoubtedly takes priority in the troubled Eastern Cape province, Volkswagen has nevertheless set an example in the environmental sector, too. The plant in Uitenhage was the first in South Africa to met the criteria of the international environment protection standard ISO 14001. "Now the idea is that our suppliers will also meet international environmental standards. Our aim is that, by next year, 80 percent of them will achieve certification in line with ISO 14001," says Matt Gennrich from the press department at Volkswagen of South Africa.

Environmental inspections are carried out regularly at the Uitenhage plant by outside organisations. Full-time Plant Environment Officer **Simon Lelaka** (30), is working together with 20 part-time colleagues to secure environment-friendly production methods. In mid-2003, Volkswagen AG took special steps to strengthen the environmental competence of its South African subsidiary: **Hans-Heinrich Pröhl** (41) from

Central Environmental Planning in Wolfsburg, was seconded to Uitenhage for three months to share his experience, whilst Simon Lelaka spent several weeks taking a closer look at practices in Wolfsburg. The two environmental experts talked to Matt Gennrich about the impressions they collected when they exchanged countries and cultures.

Simon Lelaka, you have just come back from your first trip to Germany. What are the main differences you noticed compared to your home country of South Africa?
There are obviously many differences. The first thing which struck me at the Wolfsburg plant was the high degree of discipline. In addition I was surprised to see how clean everything was.

You mean 'clean' in the sense of environmental protection?
That, too. In Wolfsburg there is a very high degree of ecological responsibility from the first production phase to the last. The Wolfsburg plant has, for instance, its own refuse disposal installations. And then I also visited the plant's own water-purification plant. All that impressed me.

Simon Lelaka in front of the Wolfsburg power plant

Hans-Heinrich Pröhl, this was your first time in South Africa. What were your main impressions?
I have seldom been welcomed in such a friendly way in any other foreign country. Here at the Uitenhage plant, I was immediately integrated into all the different processes – I was introduced to all the managers and the auditors with whom I would be working. Obviously many things are different here as compared to Wolfsburg, not least the language. But in that respect you have to sink or swim. I decided to swim.

Apart from the language, what else is different, especially as regards environmental protection?
I knew that I was coming to a country where environmental protection standards are not the same as in Germany. I set myself the goal of promoting environmental protection measures that are relatively easy to implement and affordable. What we need here are solutions that are simple, and quick to take effect.

Simon Lelaka, how would you grade environmental protection at the Uitenhage plant right now – as good, satisfactory or unsatisfactory?
We have already done a lot, so it is definitely satisfactory. Of course there is still room for improvements – and we will be working hard to implement these.

Were there any concrete things that you saw in Germany which you would like to implement here?
Many of the things I saw there are obviously technologically very advanced. It would be difficult to transfer such high-tech solutions to South Africa, if only for financial reasons. So I will have to adapt these to South African conditions. Although we share the fundamentals of environmental protection, here we have to find our own methods.

Hans-Heinrich Pröhl, do you see any danger here of creating different environmental standards for industrialised nations and developing countries?
Certain standards should definitely be applied all over the world – something which is guaranteed in Uitenhage. But I fully agree with Simon that it makes no sense to simply transfer high-tech solutions from Germany to Uitenhage. That won't work. It is pragmatic solutions that are needed here.

What concrete problems were you confronted with in Uitenhage?
Luckily there were not too many. We had a construction-related incident at the tank farm involving a fairly big leak. The damage needed attending to immediately, which we did by removing the leaked substance and replacing the soil. Then we built a draining system to ensure that in future no more damage to the environment would originate from this installation.

Did you learn anything in Uitenhage which could be of importance for the plant in Wolfsburg?
The standard of cooperation between employees. The plant in Uitenhage is very intimate, the information routes to management and between employees are definitely shorter here than in Europe. This allows you to react much faster to certain things.

Simon Lelaka, what is the main resolution that you would like to realise first, now that you are back in South Africa?
I would like to improve the storage and handling of environmentally hazardous materials. And then I would like to compile an action plan with regard to environmental protection and formulate regulations as a guideline for all the employees.

And what is your main resolution on your return to Germany, Hans-Heinrich Pröhl?
I hope to be able to continue cooperation with Uitenhage with regard to plant and equipment and environmental technology.

Are there any concrete plans?
According to my information, South Africa is about to introduce stricter environmental legislation and we will have to react to this. Presumably the specifications for wastewater treatment will be tightened, and we will have to optimise the wastewater plant in Uitenhage.

Hans-Heinrich Pröhl, Matt Gennrich, Simon Lelaka (from left)

You Never Stop Learning

Exchanging notes on the environment

The international audits already carried out by Volkswagen at a number of plants have proved invaluable in preparing for environmental certification in line with the international standard ISO 14001. They served to support the implementation of Group-wide environmental standards and the transfer of specialist knowledge. The key to success – in addition to the experience and multinational make-up of our environmental expert teams – is the high motivation shown by all concerned in wanting to exchange knowledge, learn from others and suggest ways in which individual plants can make environmental improvements.

Duly encouraged, the Volkswagen Board of Management decided to carry out regular international audits in the North America, South America/South Africa and Asia-Pacific regions. One such international audit was conducted at the Puebla plant in Mexico (North America region) between 30 June and 4 July 2003. The goal was to maximise reductions in the consumption of freshwater for production purposes and by employees in order to conserve a declining natural resource. In so doing, Volkswagen de Mexico is making a stand against the general trend of steadily increasing freshwater consumption in Mexico (see page 31).

Environmental experts, chemical and construction engineers and specialists in process engineering from Group head-

quarters in Wolfsburg spent the week with their Mexican colleagues examining every possible way of saving freshwater. In addition to optimising internal processes and raising awareness of the issue among the workforce, it was decided above all to put rainwater to use and to recycle treated wastewater. The outcome of the international team's week of investigations was a plan which will in future cut freshwater consumption per vehicle by 25 percent. Furthermore, wastewater is to be treated more effectively so that recycled water can be put to a greater variety of uses. Depending on specific regional factors, subsequent international audits will focus not just on plant facilities, but also on the products themselves, on the workforce and on issues of public interest – and in this way will support the implementation of Volkswagen's environmental policy.

Safety Matters

Continual improvements in industrial health and safety
Volkswagen attaches the same importance to the safety of its workforce at all its plants. What concerns us first and foremost, of course, is maintaining the health of our employees. But health and safety at work have also become key factors for economic reasons, since they mean fewer hours lost due to absenteeism.

In recent years, Volkswagen has achieved a great deal in terms of industrial health and safety – industrial accidents at the company's German plants have been reduced by 95 percent over the last 30 years. But there is still room for improvement. Two-thirds of all remaining industrial accidents are caused by behavioural factors such as inattentiveness. These, too, can easily be avoided.

"Self-assured" at work
In response, in 2002 we launched the "Self-assured" project which focuses on the way employees go about their work. The self-assurance in the project name is twofold: first, each employee is encouraged to give special thought to any potentially hazardous type of activity and by doing so to raise awareness of his or her own safety. At the same time, it is hoped that all employees will develop sufficient self-assurance to point out potential dangers or errors to their colleagues.

Dr. Folker Weißgerber, Member of the Board of Management of Volkswagen AG in charge of Production, and Uwe Bartels, Chairman of the Health and Safety and Environment Committee, kicked off the "Self-assured" project in May 2002. Launched first at the Palmela plant in Portugal, shortly afterwards it was introduced at all Volkswagen's German plants. Employees were briefed on safety issues by their supervisors with the aid of instructional films, a booklet and overhead projector slides. In addition, twelve different posters served

Dr. Folker Weißgerber (left), Member of the Board of Management of Volkswagen AG responsible for Production, has just presented the 2003 Industrial Health and Safety Cup to Reinhard Kindlein, Industrial Health and Safety, Hannover plant

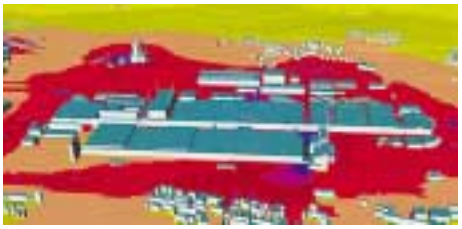
to provide a constant reminder of the campaign to employees at the various plants.

Sound planning
Noise emanating from production facilities situated close to residential areas could easily lead to problems with local residents – possible outcomes being legal disputes, neighbourhood complaints and the threat of operational restrictions. Rigorously applied environmental management has been introduced to counter such risks. As a result of long-term planning for advanced noise abatement technology at our production plants we have been able to:

- assure the legally required standard of noise abatement technology largely without the need for official intervention – and far more effectively – through the acquisition of new low-noise production equipment;
- substantiate adequate noise-emission reference values for future, essential plant extensions to be possible in accordance with planning law;
- engage the authorities, local residents and plant management in a process of dialogue with a view to preventing complaints arising in the first place.

This approach was also sufficient to convince the relevant local authorities, with whom agreements have been reached in the mutual interests of Volkswagen, local residents and the local authorities for the Braunschweig, Emden, Salzgitter and Wolfsburg plants. We now plan to reach similar agreements for other plants.

Volkswagen produces what are called noise maps, showing the noise levels calculated for the entire site at the respective plant. Each map (see illustration above) shows a virtual representation of the plant site and neighbouring residential area (in Wolfsburg) and colour-coded noise levels – in this case for the night-time period.



Reduced oil mist at the stamping plant
The drawing oil used at stamping plants has a negative impact both on employees and the environment. Now, new equipment with integrated separators reduces the concentration of oil mist and oil vapours at the stamping plant by more than 90 percent. Not only that, but this process also helps to reduce the consumption of materials and cut disposal costs.

The Facts of the Matter

Volkswagen's environmental facts and figures
Whenever attention turns to environmental protection and sustainability, the focus is usually on general goals and measures. But how can we tell whether or not a production facility is really environmentally aware and intent on conserving resources? Can sustainability be measured? If so, what are the key parameters?

Even if the actual quality of a company's environmental and sustainability policies cannot ultimately be expressed in bare figures, reliably collated data at least provide important foundations for many stakeholders. Such information gives the authorities, the media, financial institutions, auditors and not least Volkswagen itself the opportunity to assess our performance in the field of sustainability critically and objectively. Furthermore, such data are a key means of communicating with the public. They appear, for example, in the environmental statements of Volkswagen's European plants which have attained certification in line with the EC Eco-Audit Regulation.

But others, too – insurance companies, investor groups and asset managers – base their investment decisions and premiums to a certain extent on environmental data. Given growing worldwide environmental and liability risks, companies need precise knowledge of their consumption, materials flows and emissions if they are to assess and minimise these risks. Such data also make it possible to derive and extrapolate trends and environmental targets for individual plants, countries and regions. Moreover, they help to reveal weak spots and highlight potential for optimisation.

Volkswagen has been publishing selected environmental data for its production plants since 1997 (for the period going back to 1994). At that time, the data concerned only the company's German plants. Environmental data for all Volkswagen's European plants were published for the first time in our Environmental Report 1999/2000. In the present Environmental Report, we have been able for the first time to reproduce substantially consistent and verifiable environmental data for our non-European plants as well, covering 2001 and 2002. So the data situation at the company has gradually improved to the point at which all our production facilities worldwide are now integrated into the data acquisition system.

How are environmental data collected?

How simple life would be if environmental data for the entire company were available at any time at the touch of a button. Unfortunately we are not quite at that stage yet! The environmental data presented here are generally based on a variety of facts and figures submitted on an annual basis by the various plants to a central department responsible for collation. Data acquisition at the plants is handled in accordance with internally defined concepts and methods, set down in the binding Group-wide VW standard 98 000 (Operational Environmental Indicators).

General development

As with almost all statistics, the environmental data which follow are open to misinterpretation. Between 1998 and 2002, for example, production started up at the Palmela, Polkowice and Martin plants one after the other. This meant that not only total consumption of resources but also emissions and waste increased, despite the fact that technical improvements at other plants had led to substantial reductions.

Key indicators

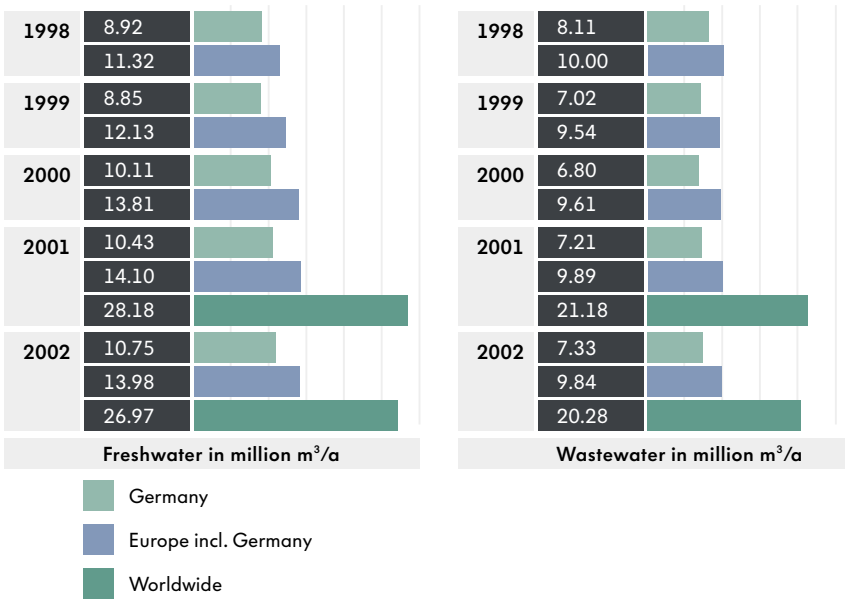
Freshwater and wastewater

Freshwater volumes include public and private water supplies, company-owned spring water, uptake from other open bodies of water, plus rain and surface water. The freshwater graph for Germany and Europe shows the Wolfsburg plant accounting for the largest share – 7.3 million cubic metres in 2002. Irrespective of the intensity of production activities, freshwater volumes here rose, in particular, owing to heavy summer rainfall in 2000, 2001 and 2002.

Effluent flow rates are measured to determine wastewater volumes. Volumes lost through evaporation, leakage or seepage are not metered. The overall decrease in freshwater volumes at plants outside Europe for 2001 and 2002 is attributable to the special water-conservation programmes that we introduced in Brazil.

Freshwater and wastewater

for the Volkswagen brand (cars and commercial vehicles)



Source: Volkswagen AG

Waste

Waste is classified in different ways in different countries according to the national legislation in force. For this reason, Volkswagen decided to introduce definitions with worldwide validity in order to simplify corporate statistics.

To give an accurate reflection of waste arising from production processes, waste resulting from construction work (building rubble, soil excavations, etc.) is not included here. Nor have we included scrap metal in the statistics, since this is classed as a commodity.

Industrial waste

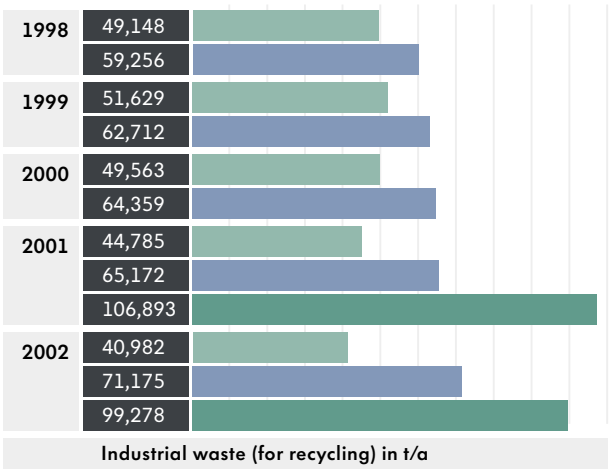
Industrial waste is waste which poses only an insignificant or minimal threat to man and the environment.

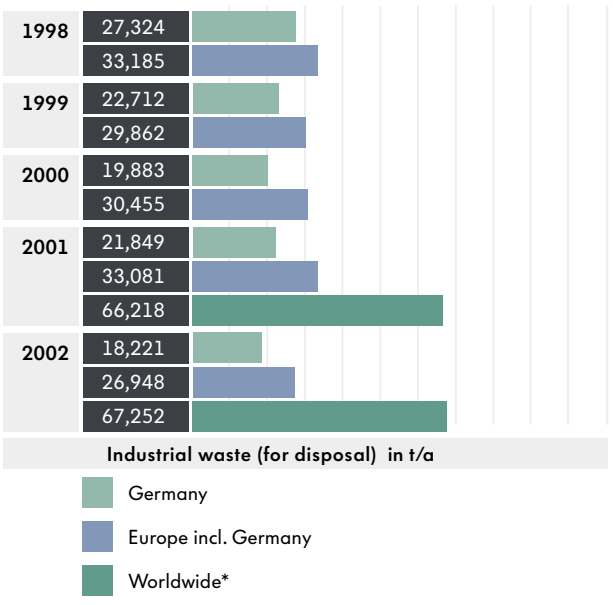
Hazardous waste

Hazardous waste represents a considerable threat to both man and the environment. It must therefore be treated with special care or landfilled in accordance with specific safety regulations.

Industrial waste (Germany)

for the Volkswagen brand (cars and commercial vehicles)



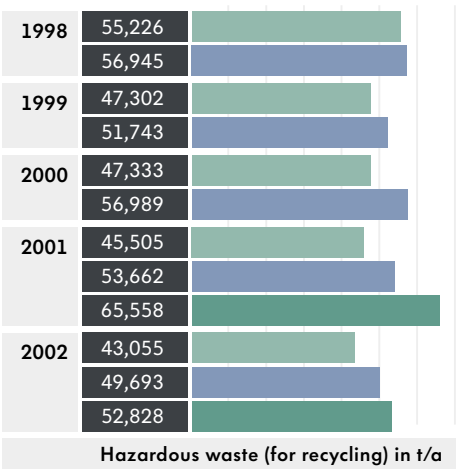


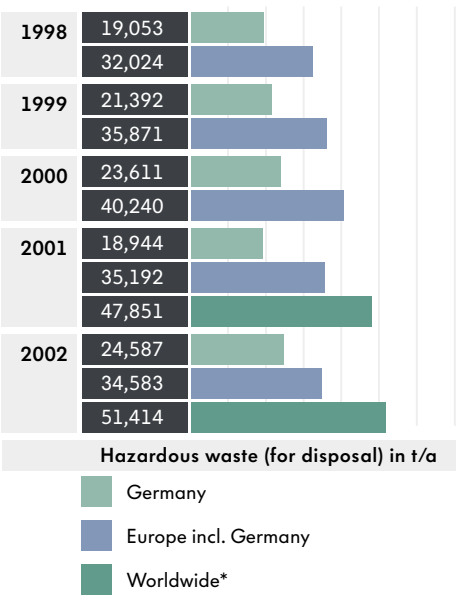
Source: Volkswagen AG

*Waste from Shanghai and Curitiba is not included, since there is still uncertainty about waste classification here.

Hazardous waste

for the Volkswagen brand (cars and commercial vehicles)





Source: Volkswagen AG

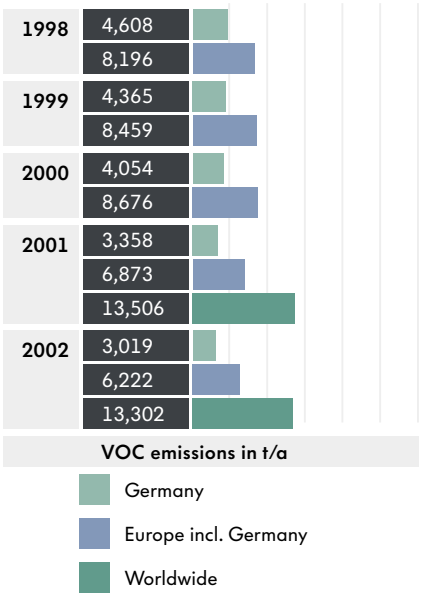
Volatile organic compounds (VOC)

Emissions of volatile organic compounds are environmentally relevant on account of the photochemical activities of these materials in the atmosphere, such as their contribution to the formation of ground-level ozone. The principal source of these emissions are the paintshops.

In Germany, VOC emissions declined steadily from 1998 to 2002. In Europe they increased at first and then went into sharp decline. This welcome development is due to the increasing use of low-solvent paints, improved application methods and advanced waste-air treatment facilities. In 2001, for example, solvent emissions were down largely as a result of the introduction of so-called 'pig systems' at the Wolfsburg and Brussels plants, which force excess paint back into the loop, and the start-up of the new paintshop in Bratislava.

Volatile organic compounds (VOC)

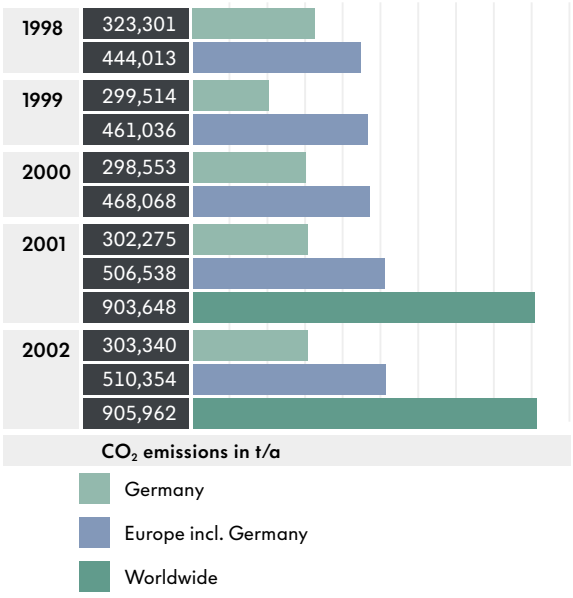
for the Volkswagen brand (cars and commercial vehicles)



Source: Volkswagen AG

Direct CO_2 emissions from in-house heat/power generation

for the Volkswagen brand (cars and commercial vehicles)



Source: Volkswagen AG

Carbon dioxide (CO_2) from in-house energy production

The CO_2 values arising from in-house energy production refer to the carbon dioxide emitted directly at the plants due to the combustion of natural gas or coal, for example. Typical systems in which such combustion processes take place are thermal aftertreatment equipment at the paintshops, heat treatment equipment in the hardening shops and in-house boiler plants for the production of heat.

Carbon dioxide is either produced directly by such combustion processes at our plants or indirectly by the purchase of electricity and district heating. It is the most important of the six greenhouses gases dealt with in the Kyoto Protocol, since emissions remain largely linked to energy consumption. Industrial processes in general are energy intensive, with the result that as capacities and production volumes increase, so do CO_2 emis-

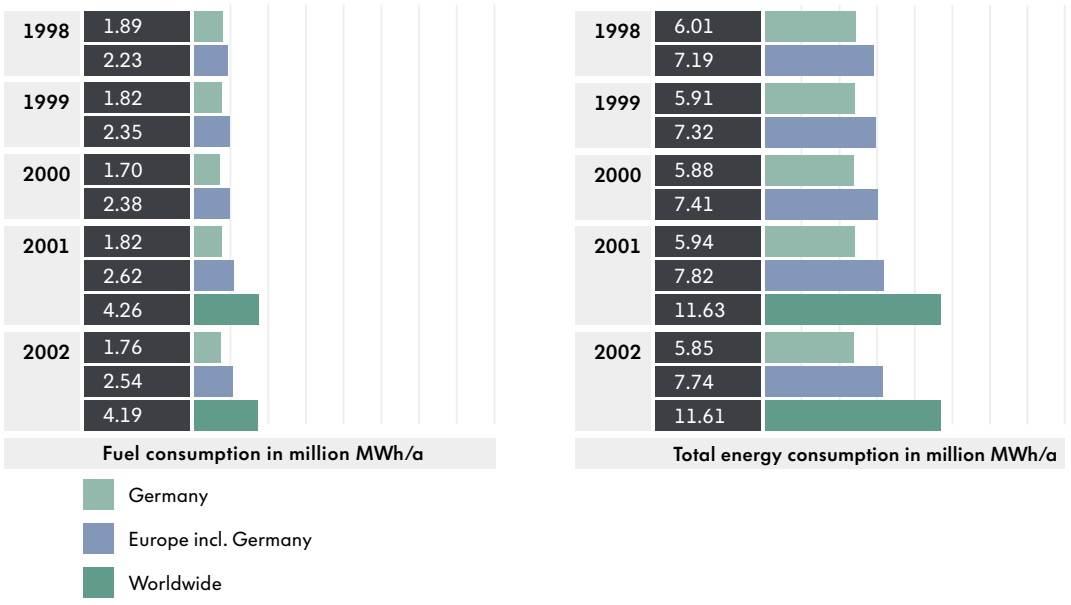
sions. Potential for reducing the output of CO_2 lies in switching to low-carbon primary energy sources (e.g. changing over from coal to natural gas) although renewable energy resources such as solar, hydroelectric and wind power can also contribute to reducing the volume of CO_2 we emit, as can energy conservation through the introduction of advanced energy-efficient technology.

The figures shown do not include indirect CO_2 emissions arising elsewhere in the generation of the electricity and district heating purchased by Volkswagen, since no generally recognised or standardised methods of computation currently exist.

Fuels used at the plants and total energy consumption
The figures for use of fuels at the plants include all – mostly fossil – primary energy sources required for stationary combustion processes. This primarily refers to natural gas used in our own boiler plants to produce process heat and for room heating. Other sources of energy used include coal and propane.

Total energy consumption is calculated from the amount of fuel a plant uses together with the amount of energy (electricity and district heating) purchased from external power stations. Electricity can account for a considerable proportion of total energy consumption (approx. 46 percent at our European plants and approx. 40 percent at the non-European plants).

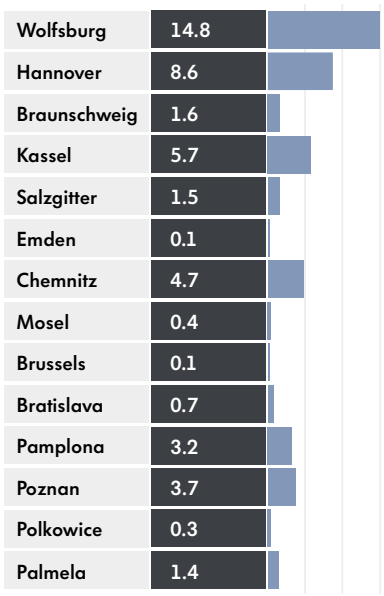
Fuel and total energy consumption
for the Volkswagen brand (cars and commercial vehicles)



Source: Volkswagen AG

Environmental protection investments 2002

for European plants of the Volkswagen brand
in million euros

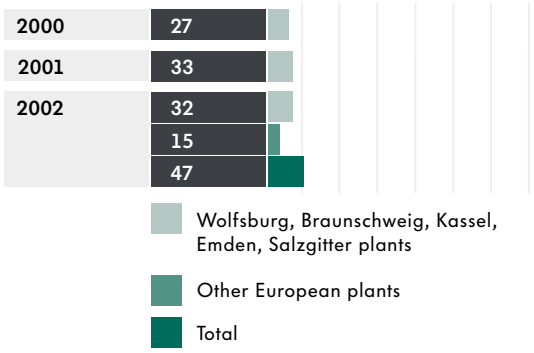


Included in environmental protection investments are all additions to property, plant and equipment which serve exclusively or predominantly to protect against harmful effects resulting from production processes. These may be measures relating either to products or production processes.

Source: Volkswagen AG

Environmental protection investments

in million euros

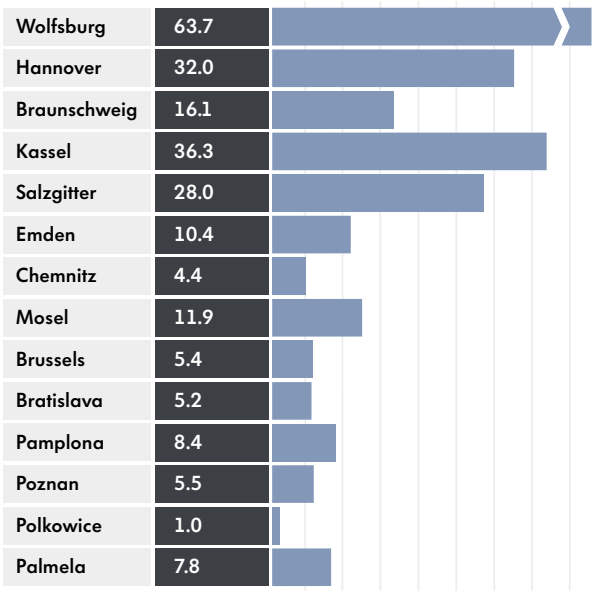


2002 is the first year for which environmental protection investments for the remaining European plants of the Volkswagen brand appear in the Environmental Report.

Source: Volkswagen AG

Environmental protection operational costs 2002

for European plants of the Volkswagen brand
in million euros

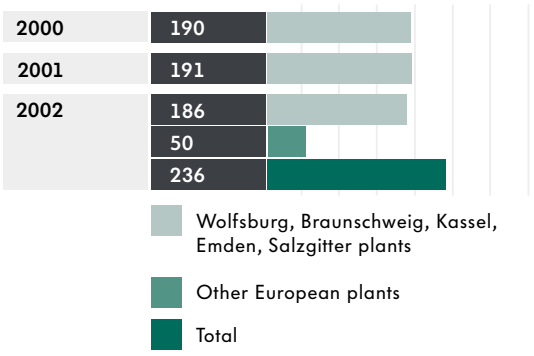


Operational costs for environmental protection include all costs arising from the operation of systems, facilities or measures introduced to protect the environment. These refer exclusively to production-related activities.

Source: Volkswagen AG

Environmental protection operational costs

in million euros



The European plants of the Volkswagen brand calculate their operating costs according to a standardised system of indicators. It is becoming increasingly difficult to show environmental operating costs separately as a result of the much wider use of integrated environmental measures.

Source: Volkswagen AG

Accident indicators 2001/2002

Accident indicators provide a relatively reliable and valid picture of the load and frequency of accidents at any given plant. As these are included for the first time this year, we are only publishing the figures for the Volkswagen brand for 2001 and 2002. As industrial health and safety is integrated into the environmental department at Volkswagen, the accident figures do not appear under the heading of 'Social Indicators'.

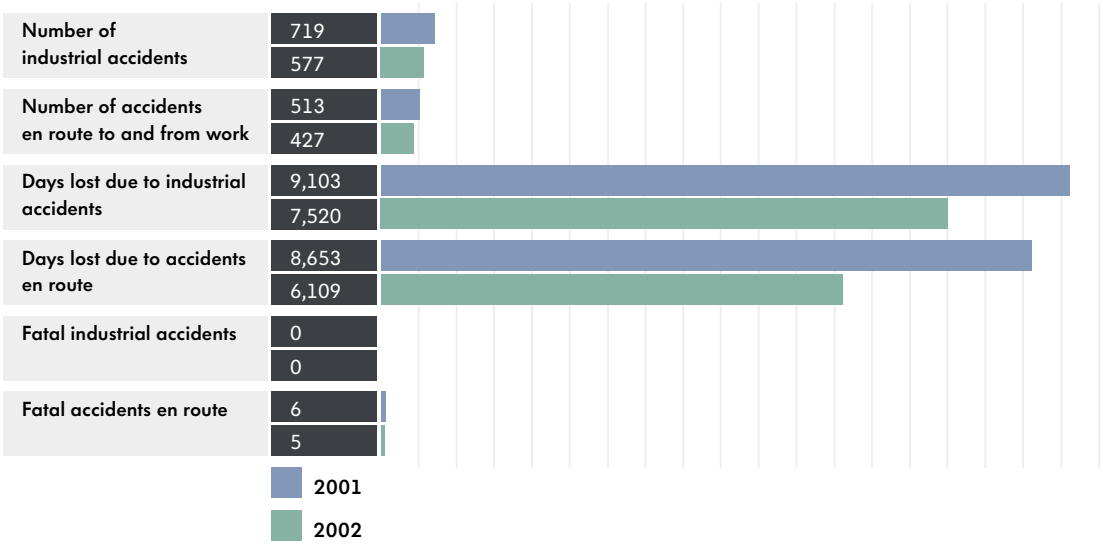
The accident load index at Volkswagen AG for 2002 fell by nearly 18 percent against the previous year from 8.4 to 6.9 percent. These figures are indicative of a long-term positive development. In particular, mention should be made of the Hannover, Braunschweig and Salzgitter plants, where the accident load index saw the sharpest falls.

Most of the Volkswagen brand's European companies likewise report positive figures. Particularly positive data were reported by Autoeuropa at the Palmela plant and Volkswagen Navarra at the Pamplona plant. For Volkswagen as a whole, including our European companies, the accident load index show a fall of 20.4 percent – from 13.7 percent in 2001 to 10.9 percent in 2002.

Two plants are worthy of special mention at this point: for its outstanding achievements in the field of industrial health and safety, the Hannover plant was awarded the Board of Management's Industrial Health and Safety Cup for 2002 – the second time it had received the award. Here the accident load index fell by 31 percent between 2000 and 2002. The cup for the best unit went to the vehicle finishing unit at the Emden plant for its impressive industrial health and safety management.

The cups have been awarded since 1985 for the best performance in the field of industrial health and safety by a German plant and a German organisational unit at Volkswagen AG.

Industrial health and safety at Volkswagen AG



Figures for Volkswagen AG relate to the Wolfsburg, Hannover, Braunschweig, Kassel, Emden and Salzgitter plants.

Source: Volkswagen AG

Accident trends at the European plants of the Volkswagen brand

Accident load index

$$\frac{\text{Total days lost x 1 million}}{\text{Total man-hours x 10}}$$

Accident frequency index

$$\frac{\text{Total number of accidents x 1 million}}{\text{Total man-hours}}$$

Figures for Volkswagen AG relate to the Wolfsburg, Hannover, Braunschweig, Kassel, Emden and Salzgitter plants.

Figures for Volkswagen AG including subsidiaries relate to Volkswagen AG and the Volkswagen Saxony, Volkswagen Brussels, Volkswagen Slovakia, Volkswagen Navarra, Autoeuropa (Palmela), Volkswagen Motor Polska (Polkowice) and Volkswagen Poznan companies.

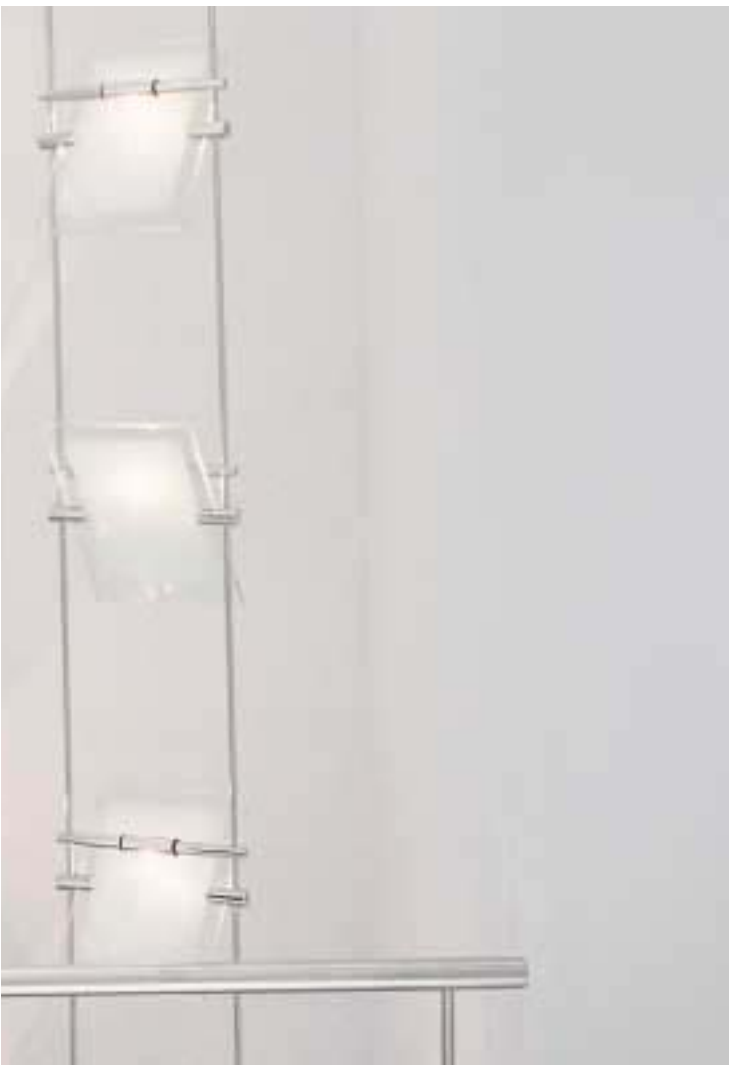
Source: Volkswagen AG

You Can Rely On Us

Volkswagen advises dealers on environmental protection
At Volkswagen, environmental protection is not just about the company's products and production processes but carries on through to the sales sector. To ensure that Volkswagen dealerships can keep up to date with the environmental protection issues that concern them quickly and easily, we have set up an electronic "Environmental Protection – Customer Service" information system as part of the Customer Service division's own service network.

The VW/Audi Environment Advisory Service has been available to dealers since 1992. This is a voluntary advisory and inspection scheme provided on site by our partners DEKRA Umwelt GmbH, LUEG Umweltschutz GmbH and TÜV. On successful completion, the dealer is awarded an environmental protection seal and certificate.

The Customer Service division is also responsible for implementing structural environmental protection measures and for internal waste management at the individual Volkswagen Service Centres. These activities are aligned with legal requirements, economic



Prof. Wilhelm Simson

"Quite how sustainable development is to be brought about is an open issue – it cannot simply be imposed on society by law, but demands innovation. However, innovation only thrives in a environment which is receptive to new results. By encouraging dialogue between politicians, scientists, the business world and the general public, econsense aims to build confidence in the business sector's ability to provide solutions and to enhance the persuasiveness of its commitment to sustainability. Through the skills and resources that drive and implement innovation, business is playing a key role as we move towards sustainable development. Volkswagen is represented on econsense's Board of Trustees. Sustainable development is feasible – as is demonstrated by the business sector in very practical ways in everyday operations. Not every solution needs to be invented from scratch; some successful initiatives have already been put into practice at company level. I am thinking here of training schemes, modern working-hour models or new environmental technologies, for example."

Prof. Wilhelm Simson (65) is Spokesman of the Board of Trustees of econsense, Munich, Germany

viability and customer needs. Waste management at the dealerships is handled as part of the dealership architectural consultancy scheme because the architecture of each Volkswagen Service Centre should in itself ensure efficient waste management.

Internal waste management can be divided into segregation, collection, storage and disposal steps, the first two being carried out in the workshops and parts stores, while storage and disposal are handled by the central waste disposal depot. Environmental protection guidelines for the design and construction of Volkswagen Service Centres and the master plans are available to every dealer whose premises require structural modification.

Volkswagen also commissions testing to ensure that vehicles which are already on the road comply with increasingly stringent emission limits. Such testing reveals the changes in exhaust emissions from higher mileage vehicles owned by our customers. The tests are monitored by two exhaust laboratories, one a fixed installation in Westlake Village, California, and the other a mobile exhaust monitoring centre in Europe. The results of the tests are fed into the development of new exhaust technologies and highlight where modifications are required in existing designs.

Real Winners

Lupo FSI and 3L TDI – Germany's most eco-friendly cars

Following on from the previous year's success, the VW Lupo 1.4 FSI again topped the 2003/2004 "Cars and the Environment" table prepared by the German Association for Transport and the Environment (VCD). The Lupo has a direct-injection petrol engine and presents an average fuel consumption of 4.9 litres per 100 kilometres. A total of 364 vehicles were assessed in Germany, there being categories for compact cars, family cars and MPVs as well as the overall rating. Several other Volkswagen cars appear in these categories. Contenders were awarded 40 percent for fuel consumption (CO_2 emissions), 40 percent for pollutant emissions and 20 percent for noise pollution. The assessment scheme is based on a 1997 report produced by the Institute for Energy and Environmental Research (IFEU). For VCD, the purpose of the table is to provide advice to purchasers, to encourage manufacturers to develop environmentally compatible products and to influence political decision-making (www.vcd.org).

The VW Lupo also came out the winner in the rankings of the German ÖKO-TREND Institute for Environmental Research and Consultancy. However, this time it was not the petrol-engined FSI, but the diesel-engined 3L TDI version (the 3-litre car) which, for the fourth time in succession, was rated Germany's most eco-compatible car. Second place in the overall ratings went to the Volkswagen Group's Audi A2 1.2 TDI, which has the same engine as the Lupo 3L. The Polo 1.4 FSI came fifth, while the Golf 1.6 FSI was ranked eighth (www.oeko-trend.de).

In addition to fuel consumption and pollutant and noise emissions, the ÖKO-TREND table also takes account of resource conservation in the production, purchasing and logistics sectors. Other assessment criteria include recycling and environmental management. ÖKO-TREND's aim in publishing the table is primarily to advise fleet operators on purchasing environmentally compatible vehicles.

The VCD and ÖKO-TREND ratings demonstrate Volkswagen's leading role in the development of environmentally compatible standard production models, be it with diesel or petrol engines. VCD and ÖKO-TREND also rated manufacturers as well as vehicles. In both cases, Volkswagen finished close to the top – coming second in the ÖKO-TREND ranking and third in the VCD table.

Top-ranking cars in the 2003/2004 VCD "Cars and the Environment" table

VW Lupo 1.4 FSI	7.87 points
Daihatsu Cuore 1.0 Plus	7.79 points
Toyota Yaris 1.0 linea eco	7.63 points
Suzuki Alto	7.43 points
Toyota Prius (hybrid drive)	7.40 points
Top-ranking compact cars	
Toyota Prius (hybrid drive)	7.40 points
Audi A2 1.2 TDI 3L	7.07 points
Toyota Yaris Verso 1.3 C	6.76 points
Audi A2 1.4	6.67 points
Ford Focus 1.8 CNG	6.60 points
Top-ranking family cars	
Opel Astra 1.6 CNG Caravan	7.02 points
Ford Focus C-MAX 1.6 TDCI	6.97 points
Ford Focus 1.8 CNG Turnier	6.60 points
VW Golf 2.0 Variant BiFuel	6.54 points
Seat Córdoba 1.2 12V	6.53 points
Top-ranking MPVs	
Opel Zafira 1.6 CNG	6.03 points
Fiat Multipla Bipower	5.56 points
Opel Zafira 1.6 Ecotec	5.16 points
VW Touran 1.6 FSI	5.16 points
Opel Zafira 1.8 Ecotec	4.94 points

Source: VCD

The Lupo FSI: No. 1 in the VCD rankings

Keeping on the Move

Visions of the traffic of the future

If no new passenger and goods transport concepts are developed in the next few years, for some cities the threat of gridlock looms large. What may sound like an attempt to spread doom and gloom is in fact the conclusion of a study by the Massachusetts Institute of Technology (MIT) commissioned by the automotive industry. To get an idea of what this really means, all you need to do is take a look at São Paulo or Mexico City, where the roads are full of traffic but there is precious little mobility to be seen. The consequences are self-evident.

Meanwhile, in so many rural areas especially in poor, emerging countries where the infrastructure is inadequate, the situation could hardly be more different. Large portions of the population there are cut off from access to means of transport and thus from development opportunities.

Major companies work together

In order to find solutions to these problems and achieve sustainable mobility over the long term, some of the world's largest energy companies and car manufacturers, including not only Volkswagen, but also BP, DaimlerChrysler, Ford, General Motors, Honda, Nissan, Michelin, Norsk Hydro, Renault, Shell and Toyota, have joined forces in a joint initiative. They are all working on the assumption that their own long-term survival depends on achieving sustainable mobility. The joint "Sustainable Mobility 2030" initiative is being carried out under the aegis of the World Business Council for Sustainable Development (WBCSD), of which Volkswagen is a founder member. We share the belief that sustainability and corporate success increasingly go hand in hand (see page 105):

- A company's stakeholder value is a determining factor in its continuing existence.
- If creation of added value is to be sustainable, a company must take a long-term view of political and social trends and consistently integrate any conclusions it draws into its business processes.
- Added value, environmental protection and social improvements can all be pursued at the same time.

Consequently, for us sustainable mobility means meeting mankind's need for mobility – the mobility to reach destinations, communicate, trade and establish relationships – without compromising the development opportunities of current or future generations.

Dialogue with stakeholders

The initiative involves stakeholders all over the world in the process of defining strategies. Stakeholders include, for example, environmental associations, scientific institutions and official bodies (see page 8). The ongoing dialogue with these groups has led to identification of the following challenges and measures which lie along the road to sustainable mobility:

- adapting vehicles to regional and personal requirements (in developing and emerging nations)
- reducing emissions
- providing access to mobility, especially in rural regions of emerging countries
- competition between passenger and goods traffic for infrastructure and resources
- congestion problems
- greater coordination between traffic planning and mobility requirements
- development and extension of institutions and networks
- requirement-led transport systems which promote development

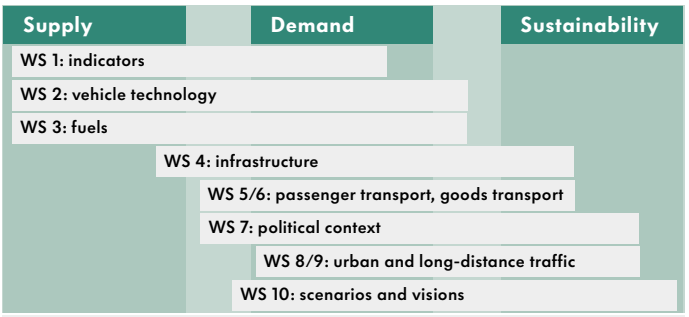
Intercompany working groups addressing various themes on both the supply and demand side have been set up to find sophisticated approaches to solving these problems, some of which are still becoming more severe.

The "Indicators" working group, for example, drew up the following list of parameters that are central to sustainable mobility:

- access to mobility
- user costs

- travel time
- reliability and comfort
- road safety
- personal safety
- greenhouse gas emissions
- influence on environment and well-being
- consumption of resources
- national government transfers
- mobility tailored to minorities
- profitability

Working groups and topics of the initiative



WS: Workstream

Source: Volkswagen AG

Multilateral strategies

The result we are aiming for is to develop a concept of mobility for industrialised and emerging countries which is not only geared to actual needs and environmentally compatible but also affordable. To this end, we are drawing up mutual, cross-sectoral, long-term strategies to reduce traffic-related emissions and greenhouse gases, incorporating transitional strategies (e.g. biofuels) and running all the way to fuel cells. In addition to the necessary technical innovations on the supply side, these strategies also need support from the political sector on the demand side, possibly by introducing incentives. Driver training courses on how to save fuel can also increase customer awareness of consumption and emissions (see page 89). Finally, another approach lies in increased coordination and links with public transport.

All of these approaches, however, demonstrate the complexity of the process and the interdependency of the individual players. No company or even entire sector can implement the proposed solutions without the assistance of policy-makers and society at large.

The "Sustainable Mobility 2030" initiative formally came to an end in December 2003. The final report will be published in early 2004, but the report obviously cannot be the end of the matter. We believe that the findings must be implemented through selected measures and activities in developing and emerging countries(www.sustainablemobility.org).

Welcome Back

Law on taking back end-of-life vehicles

Like all car manufacturers, Volkswagen has been obliged since 1 July, 2002 to take back any new vehicles registered in Germany from this date onwards, pursuant to the EU End-of-Life Vehicle Directive. From 1 January, 2007, this obligation will apply to all end-of-life vehicles. Volkswagen's German take-back network offers the last owner the opportunity to hand over an end-of-life vehicle at a local collection point. The end-of-life vehicles are then processed by recycling companies in accordance with national legislation and additional requirements specified by Volkswagen. Dismantled

parts and recovered materials are returned to the appropriate recycling schemes.

Not only Germany, but all EU Member States and Accession States are required to embody the directive in national law. This means that the car manufacturer's responsibilities in the Member States will be devolved onto the importers. The Volkswagen sales operation considers itself responsible for advising and supporting importers both in implementing and subsequently carrying out their legal responsibilities. Such advice and support is tailored to the particular circumstances of the individual markets and ties in the national automobile associations and organisations.

Smoothly Does It

Safe and sound helps the environment, too

At Volkswagen, we not only build cars, we also show people how to drive them as safely as possible and with due consideration for the environment. To this end, we have recently joined forces with the road-safety association Deutsche Verkehrswacht, Driving-Know-how, and Deutsche BKK, a corporate health insurance scheme, to develop a completely new "safe eco-driving" course. Participants not only learn driving techniques which make them more aware – and safer – drivers in everyday conditions, but can also safely experience emergency situations under the watchful eye of an instructor. The lessons learned not only increase safety but also save fuel, reducing the impact on the environment and on the driver's wallet. This is because simply by switching to a defensive style of driving, it is possible to cut fuel consumption by more than 20 percent, while still maintaining the same average speed.

Working in small groups, participants learn how to improve their driving skills step by step. A basic course is available which presents theoretical principles and trains drivers how to brake and take evasive action correctly. Anyone who really wants to put emphasis on safe driving can follow that with an intensive course which includes an opportunity to try the famous "elk test". All hazardous situations are rehearsed several times over. Both courses include an "eco-driving" element, explaining the most important rules for saving fuel while driving. Each course concludes with a discussion session, summing up the most important features. Courses can be booked at

www.sparsicherheitstraining.de

Disabled drivers can also easily take a training course. The course programme was designed to make it possible for disabled and able-bodied drivers to take part in the same course. By jointly mastering simulated hazardous situations, the aim is not only to improve everyone's driving skills but also to help people overcome any reservations or prejudices they may have in connection with the disabled.

The courses are held by trained driving instructors for all classes of vehicle. One of these instructors is Jörg Hacke. At the Sachsenring circuit, he recently provided tips on safe driving for 19 drivers from the VdK Sachsen disabilities support group. The team of instructors is active throughout Germany. "Safety is just as much an issue in Bavaria in the south as it is on the north coast," emphasises Hacke. And if safety, social integration and environmental protection can be delivered in a single package, so much the better.

A Company Is All About Its People

"Volkswagen has redefined social responsibility. Our definition goes far beyond social sponsoring. To be socially responsible, a company must continuously enhance the employability of its people and then offer them employment prospects for their entire working lives. We also see ourselves as partners to the regions where Volkswagen is active."

Dr. Peter Hartz, Member of the Board of Management of Volkswagen AG responsible for Human Resources

Globalisation has changed the nature of the worldwide exchange of information, goods and services and become a key challenge for politicians, industry and society. Consequently, the situation of companies with international business has changed dramatically. Commercial success is no longer the only aspect that comes under scrutiny. Today these companies are also expected to play a more active role in society and politics. Politicians and society as a whole regard companies as active players in the process of globalisation, and global players are expected to act as ecological and social role models on an international scale.

Dieter Overath

"TransFair is an independent organisation that awards a seal of approval for fairly traded products. Fair trade supports producers in developing countries and helps them to attain a decent standard of living through their own efforts. Through fair trade, they can improve their living and working conditions and protect the environment, at the same time as enhancing the quality of their products. At its company restaurants and self-service outlets at six facilities in Germany, Volkswagen offers coffee, tea, orange juice and biscuits with the TransFair seal, and the service has recently been extended to the Brussels plant. Since January 2001, more than 93,000 packs of coffee and over 31,000 packs of orange juice have been sold. For TransFair, the commitment shown by Volkswagen has been exemplary. It has opened doors for us with other major companies and has helped them to develop a sense of social responsibility for producers."

Dieter Overath (48) is Managing Director of TransFair e. V./RUGMARK, Cologne, Germany

At Volkswagen, there are three main principles of social responsibility:
- safeguarding existing jobs and creating new ones
- enhancing employability
- enabling employee participation

In this connection, Volkswagen has coined the term "workholder value". The value of a job with a company is determined by the employee's prospects of future employment within that company. In the long term, we build workholder value by consistently living up to our social responsibilities.

The attractiveness of Volkswagen as an employer and our success in the marketplace are reflected by developments in employee numbers. At the end of 2002, the Volkswagen Group employed some 325,000 people (including 298,000 at its production plants). This represents an increase of approximately 82,000 people since 1994. The main factor in the growth of the workforce has been the expansion of Volkswagen's international activities, including the establishment of Autoeuropa, Volkswagen Motor Polska and the commercial vehicles plant at Poznan, as well as the creation of new jobs at Bratislava and Györ and at Volkswagen's affiliates in China. In Germany, too, there has been an increase of some 21,000 in the Volkswagen workforce, not least as a result of the creation of new jobs at Audi and Volkswagen Sachsen and the establishment of Auto 5000 and Automobilmanu-

faktur Dresden. Then there was the expansion of the Volkswagen service portfolio, which created 14,000 new jobs at the Group over the same period.

Innovative employment models safeguard and create jobs
Volkswagen has built a number of innovative instruments for safeguarding and creating jobs into its human resources policies. One of the key elements here is the organisation of working hours. The concept of the "breathing factory" is based on the flexible adaptation of personnel capacities to market requirements while avoiding redundancies wherever possible. This allows Volkswagen to adapt to the wishes of its customers at the same time as ensuring secure employment and maintaining the Group's intellectual capital. In much the same way as a living organism takes up more or less oxygen in line with levels of activity, working hours and production output are stepped up at Volkswagen when there are plenty of orders on the books and reduced when the company has fewer orders in hand.

It was the introduction of the four-day working week in 1993 that laid the foundations for the breathing factory. As a result of the crisis that hit the automobile industry at the time, Volkswagen found itself with 30,000 employees more than it actually needed. Redundancies were avoided by reducing working hours and adjusting pay accordingly. This approach to safeguarding jobs, which was pioneered by Volkswagen in Germany, has since been successfully adopted at other plants within the Volkswagen Group. Jobs were saved in this way in 1998 in Brazil and in 2003 at our Spanish plant in Pamplona. Only recently, a reduction in working hours was also agreed at our subsidiary in Mexico with a view to avoiding 2,000 job losses.

On the basis of shorter working hours, the company has developed other flexibility measures such as working-time accounts. This way, Volkswagen can produce cars on four to six days a week. People who work more than the hours laid down in collective bargaining agreements build up working-time assets. If they then have to work shorter hours as a result of the economic situation, these assets are reduced again. Volkswagen has now introduced working-time accounts at most of its plants where such arrangements are compatible with national legislation.

Auto 5000: building the Touran

The Volkswagen time-asset bond scheme is a special tool that allows employees to plan their working lives more flexibly. In addition to working-time assets, employees can also contribute part of their gross income to the scheme. Time assets are invested in special interest-bearing funds on the capital market and employees only pay income tax and social security contributions when they actually withdraw the assets invested. The time assts saved can be used by employees wishing to take early retirement. For further information on the subject of human resources at Volkswagen, visit

www.vw-personal.de

Employment models in Germany
Volkswagen has also demonstrated that it is indeed possible to create new jobs in a high-wage country like Germany. A classic example is the Auto 5000 company, a new start-up based on the Volkswagen 5000x5000 project. The aim of the original project was to offer 5,000 unemployed people a job with a monthly salary of (at the time) DM 5,000 – now EUR 2,556.

The innovative pay agreement for Auto 5000 also broke new ground in terms of working-hour models. The flexible working hours agreed are based on the achievement of daily production targets. In addition, the agreement provides for three

hours' training per week for each employee – as an average over the year as a whole (see page 96). Today, some 3,500 employees covered by the scheme are currently building the Touran compact van in Wolfsburg and plans call for recruitment of further 1,500 to build the Microbus in Hannover. Further information is available on the Internet at

www.auto5000.de

Responsibility for the local region

AutoVision is a concept developed by Volkswagen together with the city of Wolfsburg in 1998 with a view to halving unemployment in the region. The concept was based on the principle of empowering the region to improve its own economic performance. In order to implement these plans, Wolfsburg AG (a public-private partnership) was established in 1999, with the following divisions:

- **SupplierLocationServices** – this division assists Volkswagen suppliers wishing to relocate to the region.
- **InnovationsCampus** – this division provides support for business start-ups by providing tailor-made business premises and customised consulting.
- **ErlebnisWelt** – the objective of ErlebnisWelt is to develop attractive leisure and entertainment activities with a view to making Wolfsburg a desirable destination for short breaks.
- **PersonalServiceAgency** – a direct link to the regional labour market.

Waste Recycling Project (Córdoba Plant)

At Volkswagen's Córdoba plant, waste materials are collected, sorted and recycled just like at other Volkswagen sites. The special thing about recycling at Córdoba is that, since 2003, proceeds from the sale of recyclable waste have been donated to the municipal children's hospital. The hospital has been especially hard-hit by the national economic crisis. The project was suggested by workers at the plant, who have since taken responsibility for purchasing and handing over medicines and other materials to the hospital. They also make contact with the young patients and their families.

AutoVision, Wolfsburg

By December 2002, AutoVision alone had created over 4,800 new jobs. In addition to achieving its original objective of halving unemployment, AutoVision has made a significant contribution to the regional labour market. More than 90 suppliers have now relocated to the region and 160 start-ups have been founded. For further information visit

www.wolfsburg-ag.com

Volkswagen has launched similar initiatives at its plants in Kassel (1999) and Emden (2000). In the meantime, the concept has also been successfully transferred to other countries, with appropriate adaptation to local conditions. A regional development concept at Uitenhage, South Africa, was launched in 2001, followed by an initial competition for business start-ups a year later. For further information on AutoVision, visit

Employability and Job Family development – the key to success

The knowledge and competence of a company's workforce reflect its problem-solving capabilities and adaptability. By fostering the employability of our workforce, we ensure that the company remains competitive and can provide secure employment in the long term. Employability is therefore the key to safeguarding our corporate future.

Given the growing pace of change in work and business processes, lifelong learning is indispensable if people's employability is to be maintained and enhanced over the long term. Nowadays, vocational or professional qualifications earned in the past provide no guarantee of secure long-term employment.

This is one of the reasons why Volkswagen has developed the concept of Job Families. The main focus here is on the development of key skills from comparable fields of work. Job Families constitute not only a training scheme but also a framework for career planning. They are geared to the value-added chain that runs from product creation to production and marketing.

But it is not only the acquisition of knowledge that Volkswagen supports. Knowledge only becomes valuable when it is actually used and made available. This is why Volkswagen has introduced an innovative knowledge-management system, with a view to making local knowledge available throughout the Group. With knowledge databases, networks and signposts, we are out to ensure that our expertise is effectively made available throughout the world.

Vocational training at Volkswagen

With a view to ensuring a sustainable flow of young, qualified staff, Volkswagen supports the "dual" system of training by vocational schools and employers that is customary in Germany. The system ensures a steady supply of qualified personnel and guarantees the high quality of the workforce in the long term. The Volkswagen GAB trainee programme is based on process-oriented training in selected industrial vocations with the option of completing an educational qualification at the same time. This programme ensures process-oriented training in practical workplace-related tasks from an early stage.

At the end of 2002, Volkswagen had 4,163 trainees working for qualifications in 27 occupations. In addition to specialist capabilities, the main emphasis of training is on building social skills and initiative.

The importance of social skills and initiative for our corporate culture is demonstrated by the fact that the internal agreement on "Partnership-Based Conduct at Work" which was concluded in July 1996, is now firmly anchored in Volkswagen's training schemes. In addition, Volkswagen has also introduced a number of training programmes specifically for instructors. Following the successful completion of their final vocational examinations, trainees are normally offered employment with Volkswagen.

New ways of creating training opportunities

Unemployment leaves its mark on people; young unemployed people are often marked for life. So it is especially important to ensure that young people are offered training and then given a job.

This is the objective of the "ready4work" pilot project initiated by Volkswagen in Wolfsburg. The project helps young people without vocational qualifications to find a training vacancy. The additional openings required are located by a regional training network. The success of such networks in combating youth unemployment confirms that this project is on the right road. Experience has shown that a large number of young people stay with the companies where they were trained when they have obtained their qualifications. The project also features a new funding concept for training activities. Along with local authorities and employment offices, both companies and private individuals can contribute.

Human resource development – investing in the future

Any company wishing to improve its competitive position in world markets must develop its junior staff. Ongoing training is a key factor in human resource development because the training market is becoming increasingly global and competition for top-calibre specialists is getting tougher all the time.

In response, Volkswagen provides systematic ongoing training for the workforce at all its production plants. In Germany, Volkswagen Coaching is responsible for training activities and maintains a presence at all six Volkswagen production plants. In 2002 alone, Volkswagen Coaching organised some 4,100 development courses, with a total of around 36,000 participants.

Volkswagen Coaching is also responsible for the Group's international management trainee programme, which is designed to recruit and develop young high-potential candidates. During the 15-month programme, trainees are familiarised with the entire company and also gain international experience on assignments in other countries. Volkswagen Coaching is on the Internet at

www.vw-coaching.de

Level 5 – the Internet for everyone

International experience is not the only key factor. A good command of modern communication and information technology is another essential qualification for the future. The Volkswagen "Level 5" campaign ensures that the workforce is thoroughly conversant with Internet and e-mail. Under this scheme, employees can earn a Level 5 Internet passport that not only confirms successful participation in the scheme but also entitles them to surf the Internet from home for up to ten hours a month free of charge. More than 65,000 Volkswagen employees have already taken up this offer.

New qualifications mean new jobs

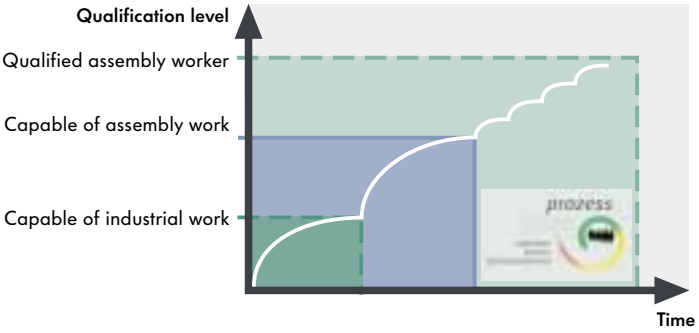
The long-term unemployed in particular face the risk of impaired employability as their qualifications go out of date and no additional skills are acquired. Volkswagen combats this trend through the PersonnelServiceAgency (PSA), a division of AutoVision. The objective of this modern service agency is to bring the long-term unemployed back into the mainstream labour market by offering them temporary employment or finding them a permanent position. The main focus is on retraining and acquiring new qualifications in courses organised together with external partners.

Companies too benefit from the PSA, which can provide qualified personnel rapidly and cost-effectively during peak periods. The temporary employees secured in this way may later be offered permanent employment.

Training time – part of the deal at Auto 5000

The Auto 5000 training scheme is based on process-oriented learning. Employees benefit not only from an innovative remuneration system but also from extraordinary training opportunities. Under their employment contracts, each employee is entitled to an average of three hours' training per week and receives payment for half of this training time. Using the slogan "from candidate to carmaker", Volkswagen recruited unemployed personnel specifically for Auto 5000, also giving people with no experience or formal qualifications related to car production a chance. What candidates did need, though, was the will and ability to acquire the required knowledge. These were also the crucial factors in the three-stage selection procedure introduced especially for Auto 5000. Some 47,500 candidates completed the first test for applicants on the Internet.

Initial training and process-oriented learning



Source: Volkswagen AG

In the end, more than 3,500 candidates were recruited for Auto 5000 in Wolfsburg. The preliminary training stage for the newcomers, financed by the employment authorities, takes three months, after which the trainees are generally equipped for employment in industry. The aim is to provide them with the general technical qualifications they need for their work, so at this stage the training is not related to specific work processes. This is followed by a basic training stage with Auto 5000, lasting six months. During this stage, the trainees work at their workplaces in the production sector, acquiring the qualifications they need in the car production process. Following these two training phases with a total duration of nine months, the trainees are offered permanent employment and integrated into the newly designed work processes. After working for two years with Auto 5000, they

Auto 5000: Touran assembly

can obtain a formal qualification as automobile assembly workers from the Chamber of Commerce and Industry.

AutoUni – Knowledge is the key

The AutoUni was set up in 2002 as another building block in Volkswagen's human resources policy. The aim of the AutoUni is to reach high academic standards at the same time as maintaining a close practical relationship with the company. The motto of the new institution is "knowledge is the key". The general intention is that the AutoUni should make a significant contribution to human-resource development and knowledge acquisition at Volkswagen.

In the curriculum of the AutoUni, the main emphasis is on international and interdisciplinary aspects. Networked global thinking is a key skill which forms an indispensable factor in a training strategy based on a thorough understanding of sustainability.

Teaching at the AutoUni has already started, with initial programmes on Economic Value Added and vehicle electronics and a number of internal events. The first summer school was held in Prague

Model of the AutoUni

in cooperation with Škoda in September 2003. In terms of the subjects covered, the summer school was a pilot event for the master's course in sustainable mobility which is due to start when regular teaching commences in the winter semester of 2004/2005. The "students" at the AutoUni include Volkswagen employees from all over the world and from different divisions of the Group.

"Sustainable mobility", the subject of the new post-graduate course, is closely related to the strategic orientation of Volkswagen. The master's course is intended to develop an in-depth understanding of mobility as a service, in the context of sustainability as a future-oriented goal that is of prime importance to society. For further information, visit

www.autouni.de

From employee to entrepreneur

Volkswagen employees should be able to identify with their company, which is why Volkswagen has adopted a number of measures to encourage active participation in the development of the company on the part of the workforce.

At Volkswagen Group facilities throughout the world, we have adopted an idea-management system to foster creativity and knowledge among our employees. So far this programme has been a resounding success. In 2002 alone, Volkswagen saved almost EUR 126 million as a result of improvements suggested by members of the workforce. These improvements brought perceptible benefits both for the company and for the employees concerned – the bonuses which the company paid for these suggestions totalled more than EUR 23 million.

Another way to enable employees to participate in the success of the company is the Volkswagen share option plan. Since 1999, all Volkswagen employees have been entitled to acquire shares in the company, allowing them to participate directly in any rise in shareholder value. After all, the employees themselves make a significant contribution to such rises. In addition, Volkswagen pays a profit-related bonus each year.

Volkswagen's social responsibility for its employees does not end when they reach the end of their working lives. In addition to benefits under the state pension scheme that is mandatory in Germany, Volkswagen has also set up a pension scheme of its own, so that employees at many Volkswagen plants around the world receive a company pension. In addition, Volkswagen employees can boost their company pension by making voluntary contributions to the company pension scheme from their gross salary. They then receive a higher company pension when they retire.

Shaping present and future in cooperation with the workforce

Traditionally, relations between management, employee-representative bodies and trade unions at Volkswagen have been based on a spirit of cooperation. We have now expanded this approach from cooperative conflict resolution to the joint shaping of the present and the future. This approach forms a cornerstone of the future development of the company, because innovative concepts can only be implemented through cooperation. Potential conflicts are avoided before they arise by involving employee-representative bodies in the planning process from a very early stage. Strategies for shaping the future are developed jointly. In view of the positive results achieved with this approach in Germany, it has now been extended to international industrial relations within the Volkswagen Group. Following a two-year pilot phase, an agreement concerning a European Works Council was signed in 1992, long before the European Commission issued a directive on the subject in 1996.

Global Works Council meeting at Emden, July 2003

In May 1999, Volkswagen became the first company in the automotive industry to establish a Group Global Works Council. This body meets the Board of Management and human resources managers at least once a year to discuss important questions related to the Group. The Group Global Works Council consists of employee representatives and trade unionists from Volkswagen Group facilities around the world.

The FORMARE Project (Resende Plant)

FORMARE (derived from the Portuguese for "training") is the name of a project in Resende, Brazil, in which the Volkswagen truck and bus plant is playing an active part. The project aims to help children and young people from socially deprived families to gain a foothold in the world of work. Each year, as part of the project, Volkswagen employees train fourteen 17-year-olds for twelve months. The Volkswagen volunteers each provide one and a half hours of tuition every week, covering the fields of environmental protection, automation, communication, English, technical drawing and assembly techniques. The trainees are provided with meals, a monthly salary, transportation services, dental treatment, uniforms, social security cover and training materials by the "Consórcio Modular Volkswagen Resende". More than 80 percent of the young people who have taken part in the project to date found a job immediately after they completed their training and in fact most of them were recruited by Volkswagen.

Minimum social standards at Volkswagen sites

In an agreement between the Board of Management, the Group Global Works Council and the International Metalworkers' Federation (IMF) finalised in June 2002, what was in fact already normal practice at the Volkswagen Group was formally set down in writing. The "Declaration on Social Rights and Industrial Relationships" guarantees certain minimum social standards and equal treatment in all the countries and regions represented by the Group Global Works Council. The declaration guarantees freedom of association and protection against discrimination as well as banning child labour and forced labour of all kinds. In addition, the declaration contains provisions on compensation, working hours, and industrial health and safety. These are based on the core labour standards of the International Labour Organization (ILO).

The declaration is a fixed item on the agenda of the annual meetings of the Group Global Works Council. Volkswagen is therefore one of the few multinational companies with a committee documenting and monitoring the social responsibility shouldered by Volkswagen around the world.

Volkswagen – a partner of the Global Compact

In January 1999, UN Secretary-General Kofi A. Annan called on multinational companies to make a stronger commitment than in the past to ecologically and socially compatible globalisation – and the UN Global Compact was born.

Kofi Annan's initiative is an attempt to involve companies in the implementation of international standards on a voluntary basis.

"Tu Salario Solidario" (Pamplona Plant)

A campaign launched by the Volkswagen Navarra workforce shows that even small gestures can have a dramatic impact. The association "Tu salario solidario" (Your Solidarity Salary) was established in 1998. The basic idea is quite simple. Each member of the Volkswagen Navarra workforce joining the association (membership is voluntary) donates an amount corresponding to one day's pay. The amounts collected are used for charitable purposes such as flying in two children from Mauritania for treatment in a Pamplona hospital. It may not sound like much, but the donations received certainly add up. By mid-2003, including some additional donations, the workforce had given a total of EUR 116,000, which had been used for 15 charitable projects around the world. The number of employees joining the campaign has risen from 271 in 1998 to 589 in 2003. This corresponds to more than twelve percent of the workforce.

The standards concerned are set out in:
- the Universal Declaration of Human Rights (1948)
- the Declaration on Fundamental Principles and Rights at Work of the International Labour Organisation (1998)
- the Rio de Janeiro Declaration on Environment and Development, including Agenda 21 (1992)

The Global Compact is based on nine principles in the area of human rights, labour standards and environmental protection (see page 13). Volkswagen supports the principles of the Global Compact. As one of the world's major automobile manufacturers, we are working to ensure compliance with the respective standards. Further information is contained in Volkswagen's Global Compact brochure, which is available on the Internet at www.unglobalcompact.org and at

www.mobility-and-sustainability.com

One hour for the future

The "One hour for the future" initiative was launched by the Group Works Council at the end of 1999. Volkswagen employees donate at least one hour's wages to help street children at Volkswagen sites throughout the world. To date, roughly EUR 3.8 million has been donated and special mention should be made of the fact that Volkswagen employees in Mexico and Brazil are also taking part in the initiative. In another voluntary initiative, since July 2003, Volkswagen managers and staff have been donating the "odd cents", i.e. the cents after the decimal point on their pay statements, to help children in need. The donations are mainly used for the long-term financing of six projects selected in cooperation with our partner organisation in this venture, "terre des homes". The main principle adopted at the Puebla, São Paulo and Uitenhage sites is to help children to help themselves. Apart from board and lodging, the children and young people concerned receive education to give them a better chance for the future.

Integrating people with disabilities

Like street children, disabled people often suffer from social disadvantages. But people with disabilities can play a valuable part in the value-added chain if appropriate employment is made available.

Volkswagen has a long tradition of integrating disabled people into work processes. At the end of 2002, people with disabilities accounted for some 6 percent of the workforce at Volkswagen. The company also helps to ensure employment for people with special needs by awarding contracts to workshops for the disabled. In 2002 alone, these contracts had a total value of over EUR 12 million.

In 2003, the General Works Council and the Board of Management signed an agreement concerning improvements in the integration of people with disabilities at Volkswagen. The objective of the integration agreement is to ensure that disabled persons secure appropriate employment and create added value. As a result, they are treated the same as other employees with respect to benefits and requirements, although we of course take account of the special needs of each individual person. Close cooperation between organisations and units within and outside the company ensures that workplaces are adapted to the specific capabilities and impairments of employees with disabilities.

In addition, Volkswagen has been taking part in the "European Year of People with Disabilities" (EYPD) as a corporate partner to the European Commission. The aims of this initiative are to sensitise society to the needs of disabled people and to promote equal treatment. These aims were also propagated by the "People's March" campaign in which an EYPD bus toured all the European Union Member States, informing people about the initiative. Volkswagen took part in this campaign and invited the bus to visit Wolfsburg in the autumn of 2003.

Work2Work

Volkswagen provides an employment guarantee for members of the workforce who are no longer able to perform their previous work as a result of a disability. "Work2Work" is the programme that gives disabled employees in Wolfsburg a chance to remain part of the value-added chain.

Work2work functions as an internal employment agency, providing employees with a job which is adapted to their specific disability and ensuring that they can create added value. Some 600 employees are currently involved in the programme in Wolfsburg, about half of whom are severely disabled.

An employee on the Work2Work programme

Promotion of women

Women have put their skills to the test and proved successful in almost all walks of life, which makes the relatively small number of women among top management at most multinational companies all the more surprising. Ensuring equal opportunities for women is a priority objective and a key tenet of human resources policy at Volkswagen.

Together with the Group Works Council, a central officer for women's interests and the women's representatives at the individual sites, Volkswagen has set up a commission to increase the proportion

of women in management positions. In practice, this means organising mentoring programmes, advancement seminars and re-induction programmes following maternity leave.

Volkswagen is also making efforts to arouse interest in technical vocations on the part of girls and young women by holding regular information events. “Girls’ Day” gives schoolgirls a chance to take a look at occupations that have traditionally been male preserves and widen their perspectives. In 2003, more than six thousand schoolchildren in the 11–16 age group took up this offer from Volkswagen.

Health management

At Volkswagen, health protection and promotion are considered part of the company’s social responsibility and an economic necessity. The underlying principle is that you can only expect high performance from your employees if you are prepared to protect and improve their health. Consequently, the measures that form part of the Volkswagen health-management system aim to enhance employee motivation and performance.

So health management at Volkswagen means more than simply preventing accidents and occupational diseases. Ensuring a sense of well-being and acquiring new knowledge are other key elements.

The Volkswagen health-management system has a modular structure. Apart from the key modules of “Medical Advice and Support”, “Workplace Design” and “Information & Communication”, personal responsibility is a key concern. The basic principle here is that everyone shares in the responsibility for his or her own health.

The objectives of health management are:

- to protect and promote health
- to use and build knowledge
- to raise and stabilise attendance rates
- to improve quality
- to optimise customer relations
- to improve economic performance

Volkswagen also faces up to its international responsibilities. For example, programmes to combat AIDS have been launched in Brazil and South Africa, countries hard hit by the disease. Infected employees and family members at Uitenhage in South Africa benefit from medical support, outpatient home care and the assistance of social workers, psychologists and dieticians (see page 69).

A Look Behind the Curtain

Transparency and the enterprise

During 2002, transparency became a corporate watchword. Financial and accounting crises have rocked companies, corporate bankers and company auditors alike, with a devastating impact on investor confidence. Making corporate activities more transparent has become an essential prerequisite for sustainable corporate development. Where there is transparency in the dialogue between business partners, quality can flourish. At the same time, the role of the financial markets in promoting sustainable development has also come under the microscope, with "socially responsible investment" steadily growing in significance.

Corporate governance

The term "corporate governance" embodies a responsible approach to the management and supervision of a company, aimed at long-term enhancement of shareholder value. Because issues of good corporate governance are steadily gaining in importance in the capital markets, the German government's "German Corporate Governance Code" commission has draw up and published an

Dr. Astrid Zwick

"For Allianz, sustainability means contributing to a worthwhile future while remaining competitive. That is why we maintain a strong sense of our ecological and social responsibilities while pursuing our long-term commercial objectives. We are working with Volkswagen on a research project set up by the European Business School on the subject of 'Transparency in the financial markets'. Our mutual objective is to improve our ability to assess sustainability performance and to make the process more transparent. As our dialogue evolves, we are exploring our respective roles and responsibilities in relation to sustainable development in the hope that, together, we can determine the constraints and opportunities confronting the various players involved."

Dr. Astrid Zwick (40) is Head of the Allianz Group's Sustainability Office in Ismaning near Munich, Germany

appropriate code of practice. This addresses all the key aspects of German corporate governance that have been most heavily criticised:

- inadequate focus on shareholder interests
- two-tier corporate legal structure (board of management and supervisory board)
- insufficient transparency of German management culture;
- lack of independence of supervisory boards
- limited autonomy of auditors

The code lays down key legal requirements for the management and supervision of German publicly listed companies. It also sets out, primarily in the form of recommendations and/or suggestions, a large number of nationally and internationally recognised standards for good and responsible corporate management. In 2002, listed companies were for the first time obliged – under § 161 of the German Stock Corporation Act – to disclose the extent of their compliance with the code's recommendations, and to list any recommendations which they have not yet implemented. The aim of this measure is to boost the confidence of investors in Germany and abroad – not to mention customers, employees and the general public – in the management and supervision of German listed companies.

The Volkswagen Board of Management has taken the new code of corporate governance very seriously. As it happens, practices previously implemented at the company already conform for the most part to the recommendations and suggestions set out in the code. For example, there has long been a comprehensive flow of information between the Board of Management and the Supervisory Board, far exceeding the legal requirements. Similarly, codes of practice governing the Board of Management and Supervisory Board have been in place for many years. Indeed, the code of practice applying to Volkswagen's Board of Management has long included a detailed list of transactions requiring mandatory approval by the Supervisory Board.


The Volkswagen Annual General Meeting was held in Hamburg in 2003

As part of our implementation of the code, we will be further intensifying our efforts to publish corporate information via the Internet. The key financial publications and information concerning Annual General Meetings can already be called up on the company's Investor Relations website. We also already provide our shareholders with a proxy voting facility for Annual General Meetings. More details can be found at

www.volkswagen-ir.com

On 15 November, 2002, the Board of Management and Supervisory Board of Volkswagen issued a declaration of compliance with the recommendations of the German government commission's "German Corporate Governance Code". Furthermore, on 24 April, 2003, the Annual General Meeting resolved that the articles of association of Volkswagen AG should be supplemented by a remuneration clause pertaining to the chairmanship and membership of Supervisory Board committees.

Adding value

The value-added statement indicates the additional value generated by our Group companies in the year under review as their contribution to their host nations' gross domestic products. For years, our annual report has shown the contribution, in terms of goods and services, that we have made to the national economy by our own efforts. A detailed breakdown of the value added by the Volkswagen Group can be found in Chapter 5 of this report.

Leading the field in sustainability indices

The Volkswagen share has featured in the Dow Jones Sustainability Index World (DJSI World) ever since the index was first established. Furthermore, the Swiss rating agency SAM continues to rate Volkswagen as the front runner in the automotive industry. The DJSI is the first global index to reflect the performance of companies that meet the criteria laid down by the SAM Group. Factors assessed include, among others, technology leadership, social and environmental compatibility and productivity. Aspects highlighted by the analysts included Volkswagen's fuel strategy and innovative labour market concepts in particular. On the basis of this comprehensive analysis and a comparison of the DJSI with the conventional Dow Jones index, it is clear that managing for sustainability is a successful strategy.

In addition, Volkswagen has been quoted in the UK's FTSE4 Good index since the index was set up, and has achieved above-average ratings from independent agencies such as Munich-based oekom and CSR Europe. Volkswagen's shares are also represented in many socially responsible and sustainability-oriented funds, which, although they still have a modest profile in the marketplace, are steadily growing in popularity.

Volkswagen does not just feature in international sustainability analyses, however. The Group is also involved in research projects which investigate the relationship between a company's sustainability performance and its share price; projects such as "Transparency in the Financial Markets", which is organised by the Sustainable Business Institute at the European Business School (for details see www.sustainable-investment.org). A recent survey carried out by the Institute in collaboration with Deutsches Aktieninstitut showed that over 75 percent of respondents had identified a long-term relationship between these variables. At Volkswagen, we were already aware of the positive relationship between our corporate strategy with its long-term orientation and the sustainability objectives of the financial markets. The well-above-average ratings of our sustainability are a clear indicator that shareholder value is not diametrically opposed to the notion of stakeholder value, but that these aspects of a company's performance actually complement each other. We continue to add to our shareholder value while systematically taking account of the interests of all our various stakeholder groups worldwide.

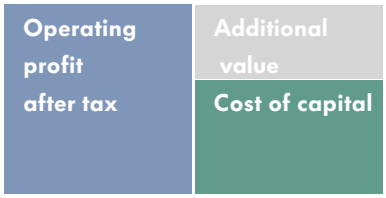
Not just a Question of Money

Economic Value Added

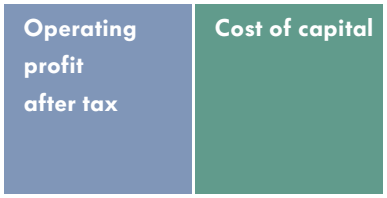
Once upon a time, environmental protection was generally regarded as a cost-intensive indulgence. For the most part, companies rarely pursued environmental initiatives on their own account, but only under pressure from environmental activists or politicians. At best, such initiatives were undertaken on preventive grounds, in order to limit legal liability or to avoid the problems associated with long-term contamination.

The early 'nineties saw a profound change in attitudes. Companies came to realise that environmental protection does not necessarily have to be a cost factor. Eco-efficiency – the sustainable use of resources – is the term used to describe the realisation by major enterprises that ecological efficiency can in fact represent a source of economic profitability.

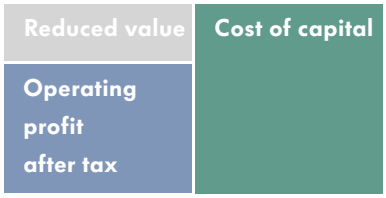
Calculating EVA®*



Adding value
The company generates a profit that exceeds the cost of all equity capital and borrowing requirements, as well as all other expenses



Preserving value
Minimum interest requirements are satisfied; the cost of capital is covered



Eroding value
The company fails to earn enough to cover the cost of capital

* Registered trademark of Stern Stewart & Co.

Economic Value Added

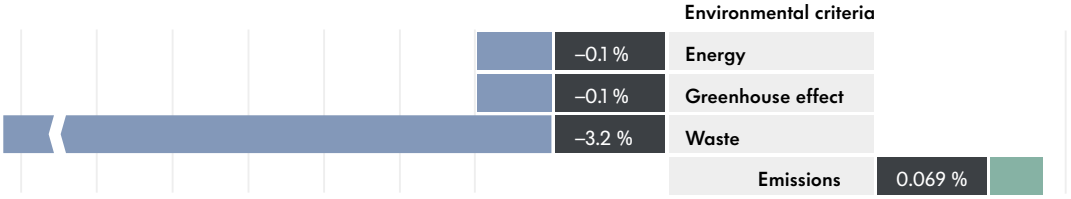
At Volkswagen, commercial success is assessed by applying the value-based indicator Economic Value Added (EVA®). We use this indicator to measure the performance of the subgroups and companies in the Automotive division as a whole, as well as the performance of individual products and projects, by seeking to achieve a balance between targeted earnings and capital employed. Prior to and during implementation, processes, projects and products are monitored to ensure that they are preserving or (better still) enhancing shareholder value in a manner that is sustainable over the long term. Shareholder value will only increase if the improved profits achieved through capital investment or process enhancement exceed the cost of the capital employed to bring about such improvements.

Materials flow analysis has made a key contribution to eco-efficiency, and is used at Volkswagen to provide an end-to-end overview of production technologies used within the Group. The process of analysing the flow of materials helps to clarify complex networks of cause and effect and highlight opportunities for optimising these interactions. This provides the basis for evaluating ecological issues in the automotive production chain.

By combining these two approaches – EVA® and materials flow analysis – we are successfully incorporating economic and ecological benchmarks into our decision-making processes. As soon as product planning generates new initiatives for reducing environmental impact, we are – for the first time – now also able to assess their likely commercial impact.

Thus materials flow analysis and EVA® formed the first stage prior to developing a new, integrated painting system. This led to the elimination of cost-intensive PVC undersealing by fitting polypropylene (PP) panelling instead. The outcome was a significant reduction in emissions and energy consumption (see diagram top right), coupled with more environmentally acceptable end-of-life disposal, as required under ELV legislation. The shift in work processes – i.e. the elimination of the PVC undersealing stage in the paintshop and the integration of the PP panelling – has also cut down both environmental impact and production time. Consequently, personnel costs are lower and paintshop robots have been liberated for use elsewhere. From a commercial perspective, fewer capital assets are tied up in processes, which means that capital costs are reduced. An economic analysis of the initiative based on the EVA® principle takes both the cost impact and use of capital into account. The value leverage tree (see chart bottom right) helps to clarify the economic impact of using PP panelling.

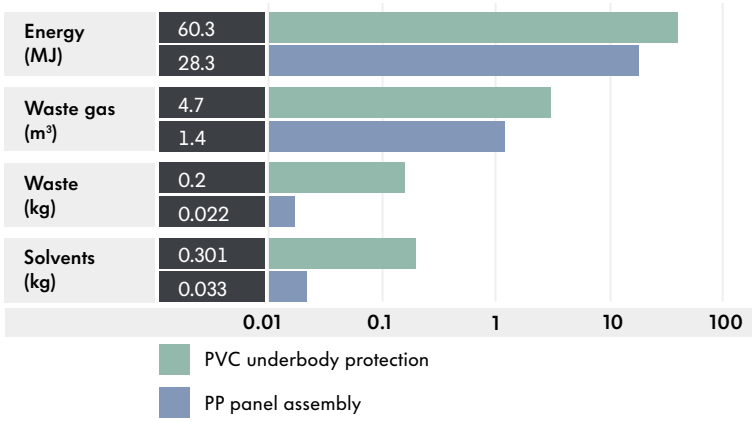
Variations over full life cycle due to use of PP panel (per-component differentiation)
Percentage change in standardised environmental impact



Source: Volkswagen AG

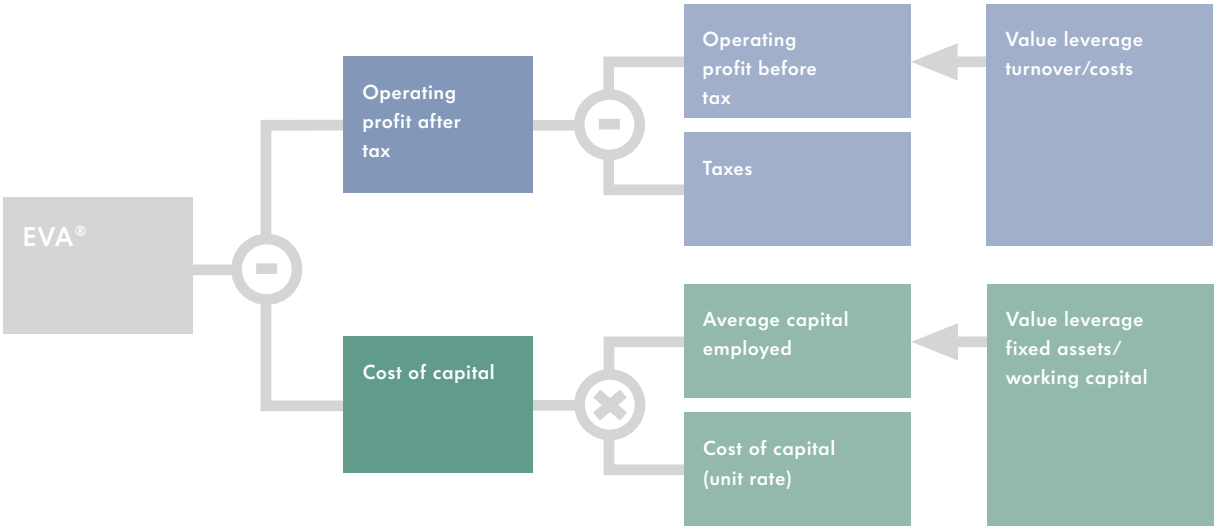
The overall outcome of the individual measures comprised in the integrated underbody painting concept must justify the investments involved, in order to safeguard Volkswagen's future in the marketplace while at the same time helping to protect the environment. This form of analysis gives just as much weight to the introduction of new, low-impact technologies as it does to the effectiveness of the capital investment.

Reduction in resource utilisation and emissions through use of PP panel



Source: Volkswagen AG

Analysis of economic impact using value leverage tree



Source: Volkswagen AG

The Volkswagen Group

The Volkswagen Group's activities focus on its Automotive and Financial Services divisions. The Group is thus able to offer a broad range of services to complement the automobile business along the entire length of the value-added chain.

	Volkswagen Group					
Division/ segment	Automotive division				Financial Services division	
Business line	**Volkswagen brand group**	**Audi brand group**	**Commercial vehicles**	**Remaining companies**	**Financial Services**	**EuropCar**
Product line/ business field	VW Passenger Cars Škoda Bentley Bugatti	Audi Seat Lamborghini		Financing Services	Dealer and customer financing Leasing Insurance Fleet business	Rental business

In reporting on Group divisions, vehicle sales, sales revenue and operating profit are presented along with the figures for the previous year. For additional transparency, sales revenue and operating profit are also broken down by market into Europe/Rest of the World, North America, South America/South Africa and Asia-Pacific, based on a geographical analysis of unit sales.

Key figures by business line

'000 units/million euros

	Vehicle sales*		Sales revenue		Operating profit	
	2001	**2002**	**2001**	**2002**	**2001**	**2002**
Volkswagen brand group	3,606	3,539	49,370	46,711	3,004	2,463
Audi brand group	1,205	1,191	25,044	25,439	1,456	1,359
Commercial vehicles	296	267	5,029	4,884	340	156
Financial Services/EuropCar			8,574	9,459	552	721
Remaining companies**			523	455	72	62
Volkswagen Group	**5,107**	**4,996**	**88,540**	**86,948**	**5,424**	**4,761**

*Each individual figure is rounded, so that minor discrepancies may occur through the addition of these amounts.

**Primarily Coordination Center Volkswagen S.A., Volkswagen International Finance N. V., Volkswagen Investments Ltd., Volkswagen Transport GmbH & Co. OHG, VW Kraftwerk GmbH, VOTEX GmbH, Volkswagen Immobilien, gedas-Gruppe, VW Versicherungsvermittlungs-GmbH, Volkswagen Beteiligungs-Gesellschaft mbH.

Source: Volkswagen AG

Key figures by market

million euros

	Sales revenue		Operating profit	
	2001	**2002**	**2001**	**2002**
Europe/Rest of the World	60,346	60,239	3,398	3,365
North America	17,832	17,277	1,664	1,287
South America/South Africa	5,626	4,284	–45	–359
Asia-Pacific*	4,736	5,148	407	469
Volkswagen Group*	**88,540**	**86,948**	**5,424**	**4,761**

*The sales revenues and operating results of the joint venture companies in China are not included in the figures for the Group and the Asia-Pacific region, as these companies are consolidated at equity. The Chinese companies achieved a (pro rata) operating profit of EUR 550 (521) million.

Source: Volkswagen AG

Further information on the Volkswagen Group and its brand groups can be found in our current annual report and at

www.volkswagen-ir.com

Environmental Strategy

The Volkswagen Group is out to set new automotive benchmarks, not least in terms of the environment. The "3-litre" and "1-litre" cars are the most high-profile examples of this commitment. To ensure that Volkswagen continues to play a leading role in the future, we are guided in our efforts by a number of key strategic considerations.

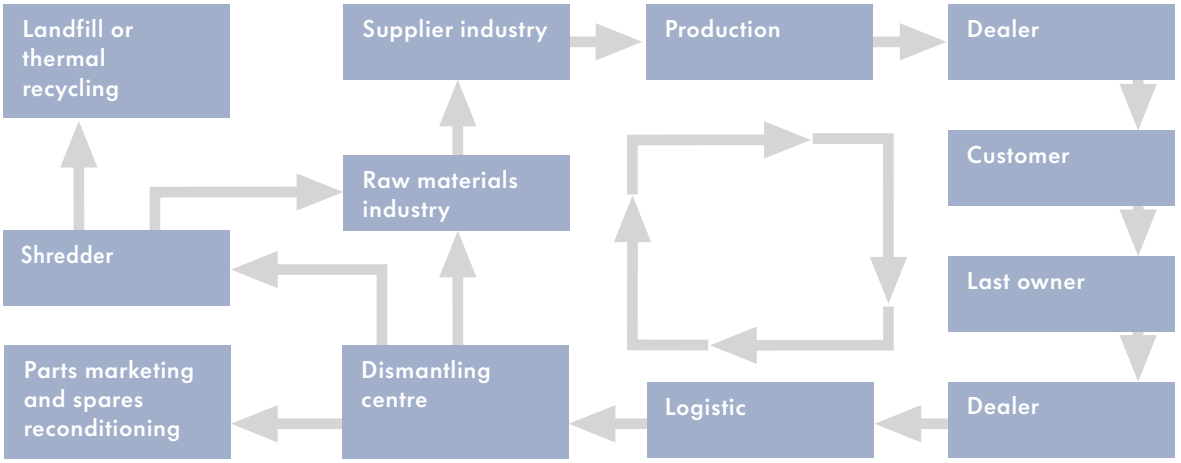
Integration

New standards call for new approaches. "End-of-pipe" environmental protection has its limits. Of course we will still need wastewater treatment facilities and catalytic converters in the years to come, but our goal is to prevent environmental impacts from occurring in the first place. That calls for intelligent solutions from the outset. At Volkswagen, it is not just the environmental department that has applied itself to the challenge: every division, every department and every employee is part of the team.

Taking account of the full life cycle

Volkswagen is concerned with every phase of a car's life. Seeking solutions for a specific period of a vehicle's life cycle makes little sense. Such an approach runs the risk of advances being made in one area whilst retarding progress in another. What is of prime importance is that any environmental impact is minimised at every stage. This applies from the extraction of raw materials through the production process and the product's service life all the way to disposal. That is why, for some years now, the Group has been drawing up life cycle assessments (see page 33). These consider not just the vehicle or specific components, but take fuel into account as well. The Volkswagen Group's commitment to its products begins before the materials reach our plants and continues long after the vehicles have left the works. By way of example, we offer our customers information and courses that can help to cut their fuel consumption by up to 20 percent

Product life cycle – automobiles



Source: Volkswagen AG

(see page 89). And we expect the same holistic approach from politicians and society as a whole. It is not sufficient, for example, to judge new fuels and suitably modified drive systems solely by the amount of CO_2 they emit (see page 44).

Market-oriented solutions

The customer is at the heart of our environmental strategy because "eco-cars" which fail to find buyers are of no use to us or the environment. In the meantime, the general public too has realised that society's environmental demands or declarations of environmental awareness alone will not create a market – a fact borne out, sadly, by our cautious projected sales figures for our "3-litre" models (the Lupo 3L TDI and Audi A2 1.2 TDI). But we are facing up to the challenge and working towards incorporating environmental requirements into attractive products in the best way possible. In the process, the Volkswagen Group is putting a great deal of faith in its technological expertise, and not least in TDI and FSI engines. Nor do we forget that protecting the environment can be fun. The negative associations – in the automotive industry and elsewhere – which in the past have linked environmental protection with self-sacrifice or scaremongering have already put off far too many customers.

Global differentiation

Any globally active company like the Volkswagen Group must tailor its environmental commitment to a variety of conditions. Environmental protection involves very different tasks and responsibilities at international and regional levels. What proves successful in one community is not automatically the right solution for another. The situation facing a rural area of Western Europe, for example, will be very different to that in a major city in a newly industrialising country.

Taking the long view

Environmental protection is no short-term affair. On the contrary, it demands sustained commitment. Environmental topics may have faded from the front page headlines in recent years, but despite success stories like the reduction of vehicle-related emissions in industrialised countries, a great many tasks still need to be tackled.

Sustainability in context

One-off environmental solutions are doomed to fail if they do not take adequate account of economic and social aspects. That is why Volkswagen is actively engaged in the many different sectors of sustainability (see page 6). On the mobility and sustainability front, as part of the WBCSD Sustainable Mobility project, our Group is already concerned with how the world will look in the year 2030 (see page 87).

The Škoda plant in Mladá Boleslav with the new paintshop on the right

Integrated production network

Volkswagen is keen on the one hand to exploit synergies across the Group in the interests of environmental protection, and on the other to develop brand-specific solutions in keeping with our corporate vision.

A good example of our plant-related activities can be found at the Group's Czech brand, Škoda. Long before the Czech Republic's accession to the European Union, licensing procedures for the new paintshops in Kvasiny und Mladá Boleslav were already aligned with the latest and most advanced EU standards. One specific feature of these standards is the stringent upper limit set for solvent emissions from the painting process, a target nevertheless easily achieved by the process employed by Škoda. In addition, in the course of the licensing procedures it was ensured that not only atmospheric emissions but the overall environmental impact was minimised. This integrated approach helps to achieve optimum environmental protection in all areas.

We use a variety of tools to control and monitor our Group-wide activities. The Group Task Force – Environment (GTFE) provides a forum for the cross-functional exchange of information and for coordinating the various measures. In addition, international audits are carried out and solutions developed at regional conferences which take into account both local circumstances and the Group's high standards.

The strategic debate on sustainability

Our Group's strategic direction receives important stimuli from external initiatives and organisations, as well as from guidelines originating outside the company. In addition, we aim to contribute our own experience to the strategic debate. Given the complexity of the problems in the field of sustainability and the global economy as a whole, this debate provides an important means of setting landmarks that will keep companies on course towards sustainable development. At the same time, the debate serves to document the growing demands on an international level that globally active companies are expected to meet.

In the past, we have joined forces with various initiatives and today we take account of several key codes of practice in our strategic planning. The most important of these are the OECD's Guidelines for Multinational Enterprises (2000), the UN Global Compact (2002), the ICC's Charta of Sustainable Development (1992), the UNEP Mobility Forum (2002), Volkswagen's Environmental Policy (1995) and our Declaration on Social Rights and Industrial Relationships (2002) (see Chapter 1). Ensuring the meaningful integration of the sustainability process is the task of various cross-brand and cross-divisional steering groups, such as the Environmental Brand Committee and the Group Task Force – Environment (see page 30).

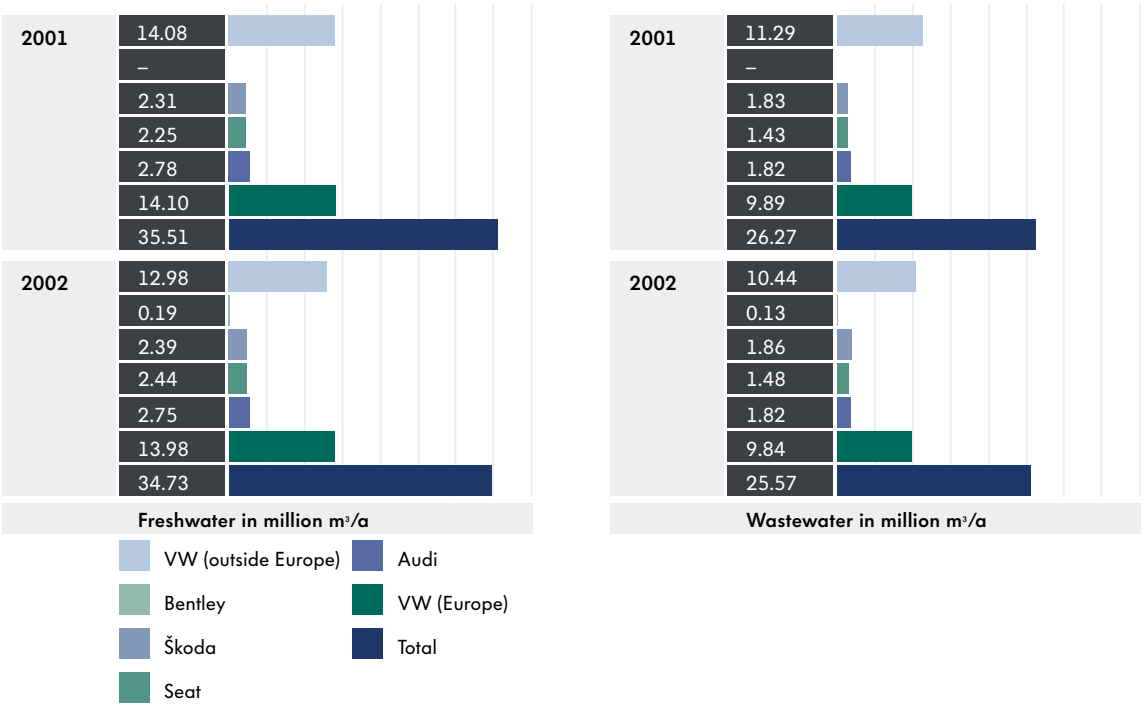
Faced with so many different ecological challenges, each of our brands has its own approach to finding solutions. Volkswagen, Audi, Seat and Škoda regularly provide details in their own publications.

Sustainability Indicators

Environmental data for Group plants

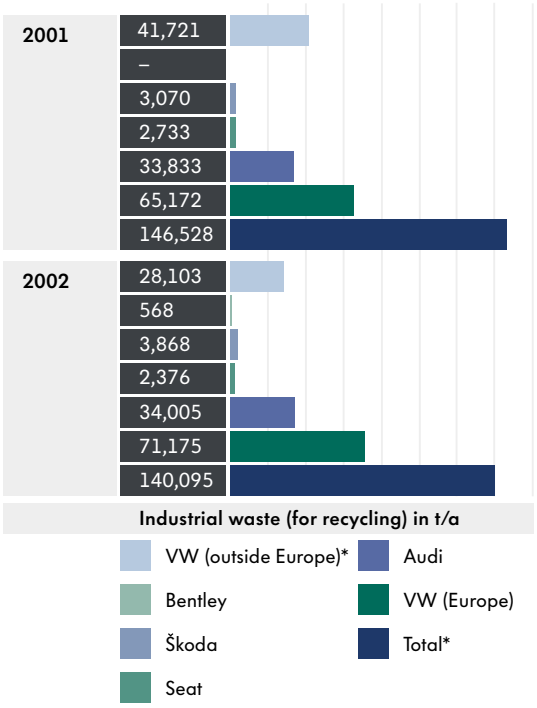
For the first time, we are also able to present selected environmental data for the Group. Each brand is responsible for collecting its own data. Thanks to the rise in the number of international audits and the intensification of personal contacts within our networks, not least as a result of environmental protection courses for employees and reciprocal plant visits, we have been able to boost awareness of the need to collect environmental data. Basically, responsibility for the collection and quality of data at plant level lies with the Plant Environmental Officers and their teams at each production facility. The Plant Environmental Officers send their environmental data to the relevant brand representative, who in turn forwards them to the appropriate central office. Many of the Group's European plants have had an environmental data acquisition system in line with VW standard 98 000 in place for some years now. However, valid data for all production plants worldwide have only been available since 2001. The figures presented reveal that, on account of its high production volumes, the Volkswagen brand is responsible for the lion's share of resource consumption, emissions, waste, etc.

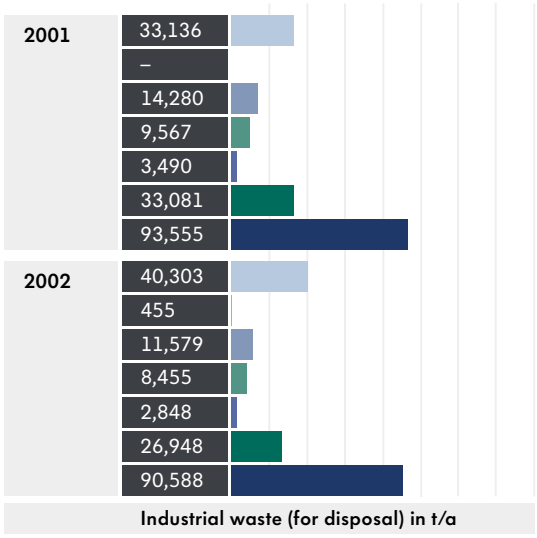
Freshwater and wastewater



Source: Volkswagen AG

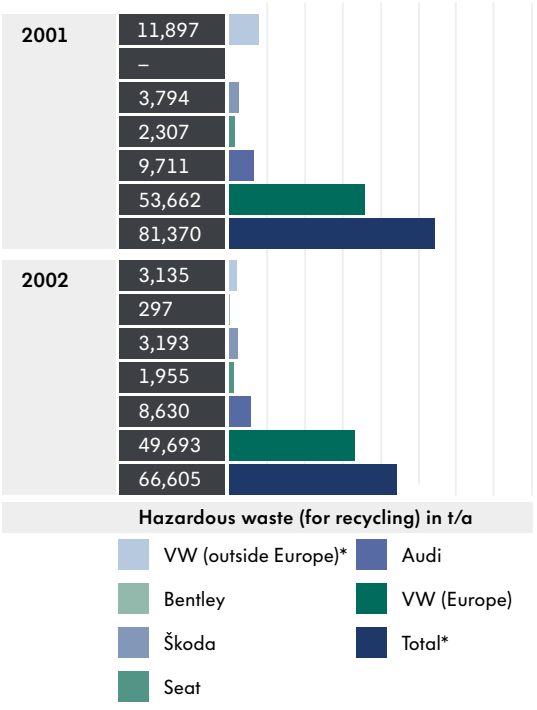
Industrial waste





Source: Volkswagen AG

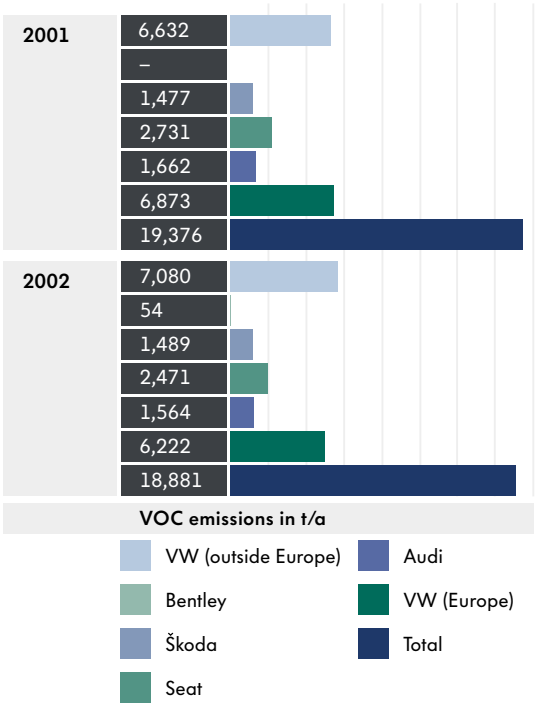
Hazardous waste



*Waste from Shanghai and Curitiba is not included, since there is still uncertainty about waste classification here.

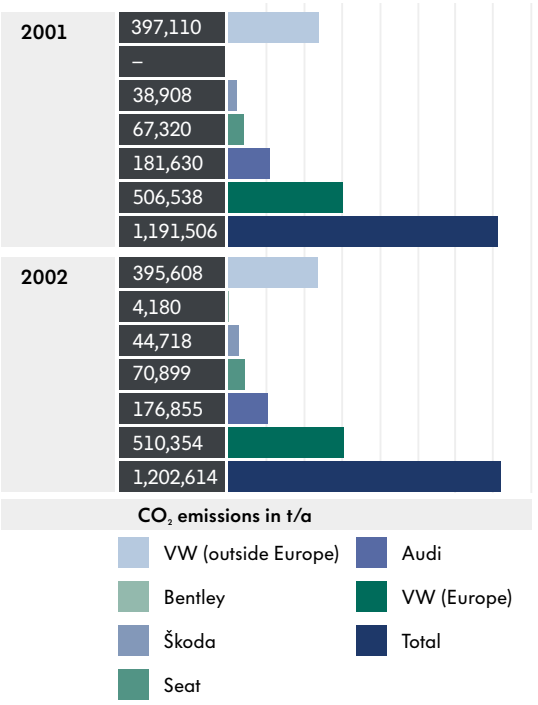
Source: Volkswagen AG

Volatile organic compounds (VOC)



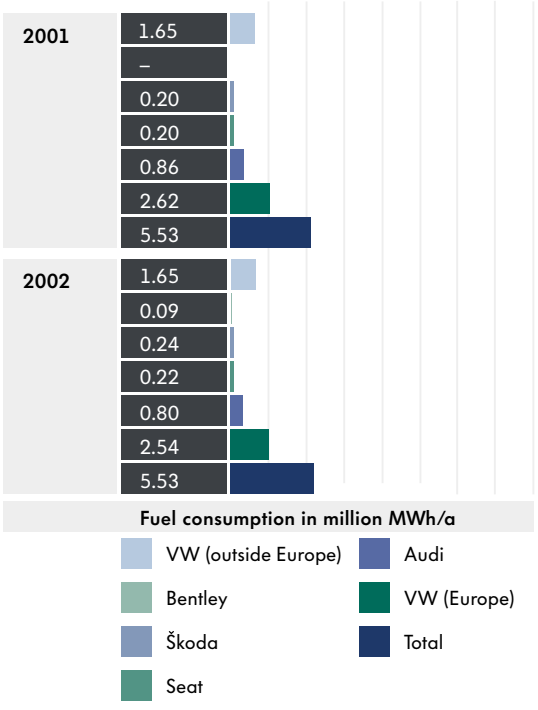
Source: Volkswagen AG

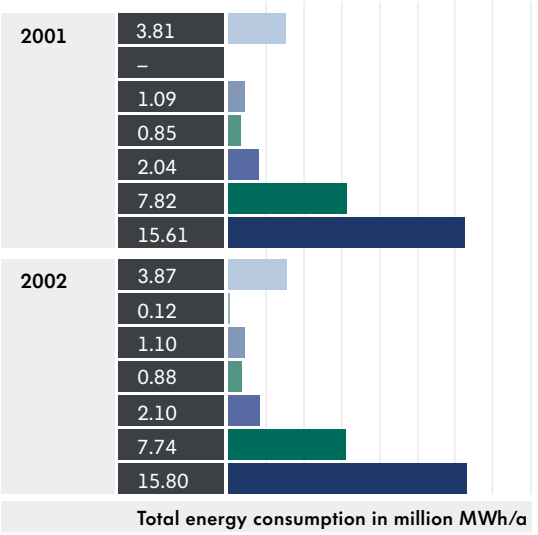
Direct CO_2 emissions from in-house heat/power generation



Source: Volkswagen AG

Fuel and total energy consumption





Source: Volkswagen AG

Certified plants

The main aim of an eco-audit is to ensure continuous improvement in all environmental indicators at our plants. Standards reached are inspected by an independent auditor/validator at least once every three years. In particular, the audits provide an indication of the degree to which the targets set out in the environmental programme have been met.

Volkswagen plant	EMAS	ISO 14001	Since
Braunschweig	x		1996
Emden	x		1995
Kassel	x		1998
Salzgitter	x		1996
Wolfsburg	x		1997
Hannover	x		2000
Kassel (VWK)*	x		1998
Wolfsburg (VWK)*	x		1996
Zwickau/Mosel	x		1996
Chemnitz	x		1999
Dresden	Planned in medium term		
Brussels	x		2002
Poznan	Planned for 2004		
Polkowice		x	2000
Martin		x	2001
Bratislava		x	2003
Pamplona	x	x	1997
Palmela		x	1998
Puebla		x	2000
São Carlos		x	1997
Resende		x	2001
Taubaté		x	2001
Anchieta	In preparation		
Curitiba	In preparation		
Pacheco	In preparation		
Córdoba		x	2000
Changchun		x	2002
Shanghai		x	1997
Uitenhage		x	2000

Škoda	EMAS	ISO 14001	Since
Kvasiny		x	2001
Mladá Boleslav		x	2001
Vrchlabi		x	2001
Bentley			
Crewe		x	1999
Audi			
Ingolstadt	x	x	1997
Neckarsulm	x		1995
Györ	x	x	2002
Cosworth			
Northampton	x	x	2001
Wellingborough	x	x	2001
Worcester	x	x	2001
Novi	In preparation		
Seat			
Martorell		x	2003
Gearbox del Prat			
Prat		x	2001

*VWK = VW Kraftwerk GmbH.

Source: Volkswagen AG

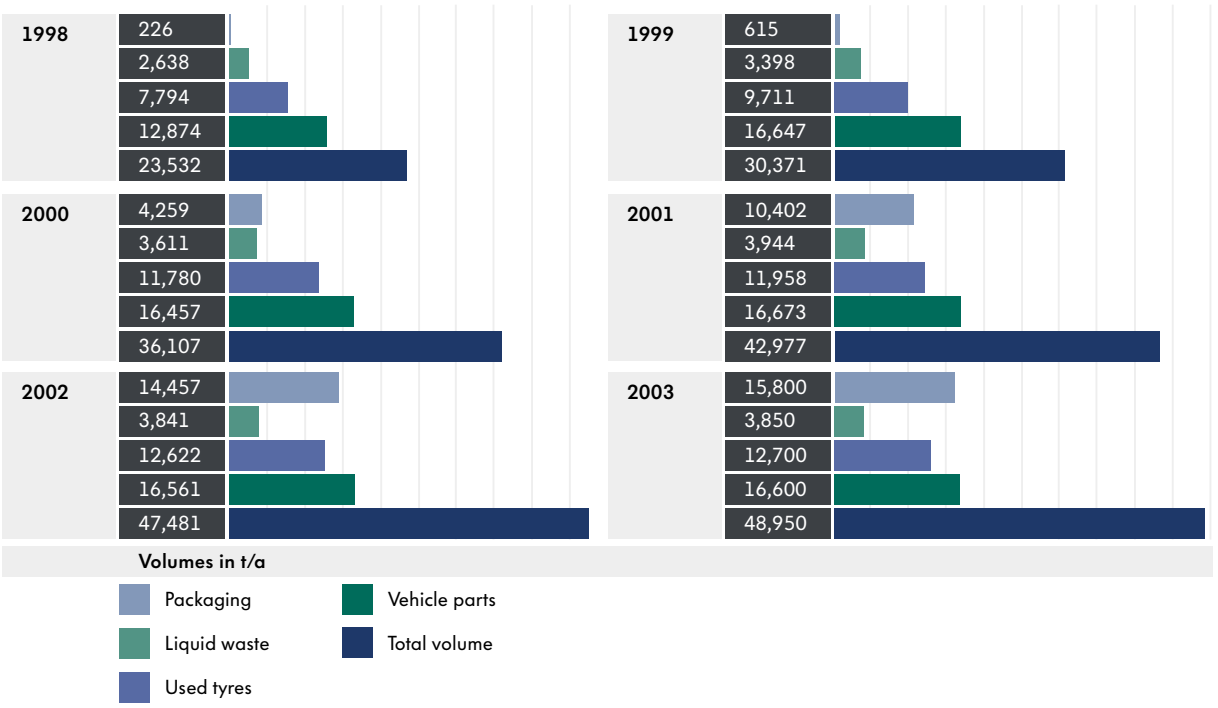
Workshop waste management

Germany's Materials Recycling and Waste Management Act of 1996 lays the responsibility for products firmly at the door of manufacturers and distributors. Volkswagen considers it a challenge to assure its customers and dealers of environmentally compatible waste disposal from the time its products reach the dealerships to the end of their service lives.

To this end, Volkswagen launched its "workshop waste management" project in 1998. Today, over 99 percent of our German workshops make use of this offer, which has now become a permanent feature of our dealerships. The system now handles more than 47,000 tonnes of waste a year, roughly equivalent to the amount of domestic waste produced by a small town.

Volumes of waste at workshops in Germany (Group)

Volkswagen, Audi, Seat, Škoda; including forecast for 2003



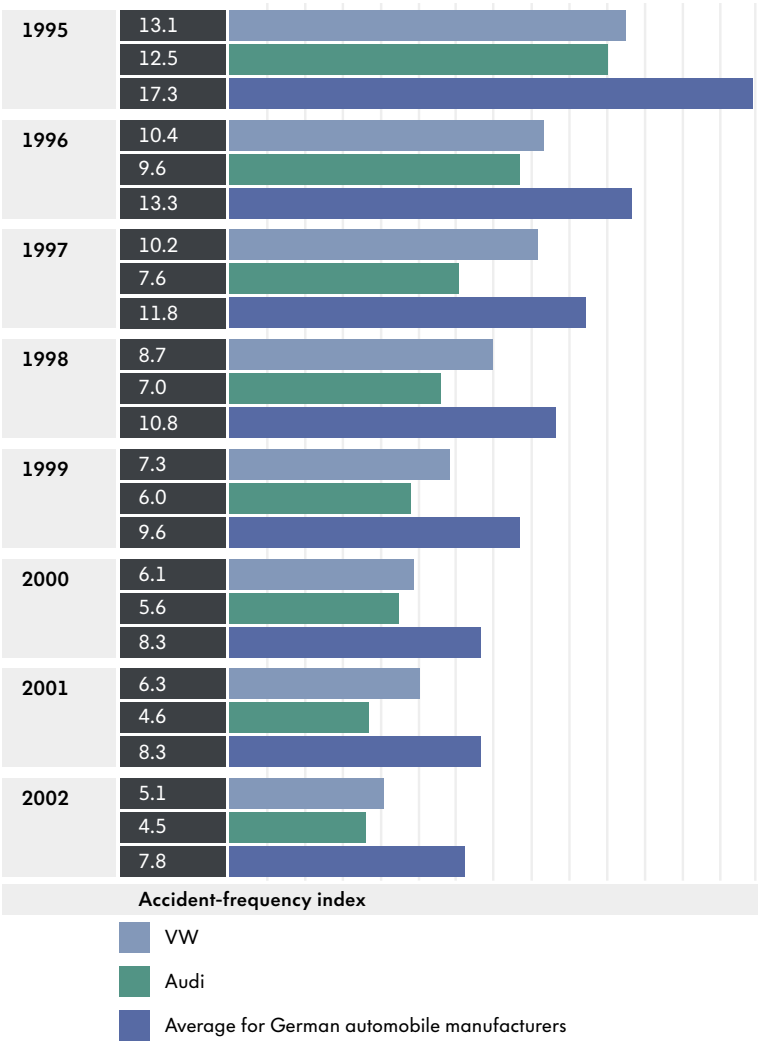
Source: Volkswagen AG

Industrial safety

In June 2002, the Chairman of the Board of Management of Volkswagen AG, Dr. Bernd Pischetsrieder, and the President of the Group Global Works Council, Klaus Volkert, signed the "Declaration on Social Rights and Industrial Relationships". The declaration pushes the topic of industrial safety even higher up the agenda at the Volkswagen Group's plants around the world. In conjunction with the health & safety units at the plants, industrial safety will be continuously driven forward through a large number of activities and projects. One example here is the "Self assured" programme, which has attracted international attention following its successful introduction at Volkswagen's German plants (see page 75).

Industrial safety is also the subject of an ongoing exchange of experience among German car manufacturers, where in addition to discussing specialist topics, companies also benchmark their accident-frequency index on the basis of industrial accidents subject to reporting requirements. Over the years, our efforts to improve industrial safety have repeatedly been assessed as above average. Our aim is to achieve a similarly high level of safety at all plants belonging to the Volkswagen Group and our efforts are supported by knowledge transfer measures at technological and personal levels.

Comparison of accident frequency at Volkswagen AG* and Audi AG with the average for German automobile manufacturers**



$$\text{Accident-frequency index} = \frac{\text{No. of accidents requiring reporting x 1 million}}{\text{No. of hours worked}}$$

*Volkswagen AG (Wolfsburg, Hannover, Braunschweig, Kassel, Emden and Salzgitter plants).

**Audi AG (Ingolstadt and Neckarsulm plants).

Source: Volkswagen AG

Value added

Value-added accounting forms an important component of any commercial accounting process. It provides a means of identifying and depicting the value generated by a company as well as its distribution over a given period.

The "Sources of funds" column shows the sum of sales revenue plus other income less expenditures. The resulting value added is appropriated by the stakeholders in the company – its employees, shareholders, creditors and the state.

By breaking the figures down in this way, we achieve a significantly improved transparency in regard to the various dimensions of sustainability, in particular social responsibility and finances. In 2002, the Volkswagen Group generated value totalling EUR 19,757 million, or EUR 66,000 per employee.

Value added of the Volkswagen Group

Sources of funds in million euros	2001		2002	
Sales revenue	88,540		86,948	
Other income	8,568		8,605	
Expenditures	–76,774		–75,796	
Value added	**20,334**		**19,757**	
Appropriation of funds in million euros	**2001**	**%**	**2002**	**%**
To shareholders (dividends)	496	2.4	505	2.5
To employees (wages, salaries, fringe benefits)	13,213	65.0	13,313	67.4
To the state (taxes, levies)	1,505	7.4	1,573	8.0
To creditors (interest)	2,690	13.2	2,275	11.5
To the company (reserves)	2,430	12.0	2,091	10.6
Value added	**20,334**	**100.0**	**19,757**	**100.0**

Source: Volkswagen AG

Volkswagen Group employees (total)

1994*	2001	2002
242,200	322,000	324,900

Year-end figures
*Four-day week introduced.

Source: Volkswagen AG

Volkswagen Group employees by country (production plants)

in '000 employees

	1994*	2001	2002
Germany	140.2	156.6	157.0
Brazil	23.9	25.6	24.6
Spain	19.8	21.3	22.6
Czech Republic	16.0	22.5	22.3
China		16.8	18.8
Mexico	14.0	16.0	14.1
Slovak Republic	0.8	7.4	8.9
Belgium	5.8	6.0	5.8
South Africa	7.3	5.3	5.0
Hungary	0.2	4.8	4.8
Poland		3.8	4.2
Portugal		3.5	3.3
United Kingdom		3.4	3.3
Argentina	3.9	3.2	2.5
Italy		0.5	0.6
Total	**231.9**	**296.7**	**297.8**

Year-end figures
*Four-day week introduced.

Source: Volkswagen AG

Information on Volkswagen Group employees (production plants)

in %

	2000	2001	2002
Proportion of female employees*	11.0	11.1	11.4
Proportion of trainees**	3.9	4.0	4.1
Turnover	2.4	2.3	2.6
Health index	96.7	96.7	96.7

*Worldwide, not incl. China.
**In Germany.

Source: Volkswagen AG

General questions on environmental protection and the Environmental Report should be addressed to:

Volkswagen AG
Environmental Strategy, Business Processes
Dr. Ulrich Menzel
P. O. Box 011/17743
38436 Wolfsburg, Germany
Tel.: +49 (0)5361 972804
Fax: +49 (0)5361 972960
E-mail: ulrich.menzel@volkswagen.de

Specialist questions should be addressed to the relevant department below:

Volkswagen AG
Group Research
Matthias Rabe
P. O. Box 011/17750
38436 Wolfsburg, Germany
Tel.: +49 (0)5361 926670

Volkswagen AG
Environment and Industrial Safety
Günter Sager
P. O. Box 011/18960
38436 Wolfsburg, Germany
Tel.: +49 (0)5361 923248

Volkswagen AG
Environmental Strategy, Business Processes
Dr. Horst Minte
P. O. Box 011/17743
38436 Wolfsburg, Germany
Tel.: +49 (0)5361 978428

Volkswagen AG
Environmental Planning, Production/Plants
Ulrich Sollmann
P. O. Box 011/18970
38436 Wolfsburg, Germany
Tel.: +49 (0)5361 928066

Volkswagen AG
Industrial Safety (Work Environment)
Jörg Nothdurft
P. O. Box 011/14260
38436 Wolfsburg, Germany
Tel.: +49 (0)5361 925991

Volkswagen AG
Life Cycle Assessments and Recycling
Axel Riemann
P. O. Box 011/17741
38436 Wolfsburg, Germany
Tel.: +49 (0)5361 926314

Volkswagen AG
Mobility
Klaus Rieck
P. O. Box 011/17741
38436 Wolfsburg, Germany
Tel.: +49 (0)5361 972801

Volkswagen AG
Energy Conversion
Dr. Wolfgang Steiger
P. O. Box 011/17780
38436 Wolfsburg, Germany
Tel.: +49 (0)5361 928592

Volkswagen AG
Environmental Protection – Procurement
Wolfgang Gädicke
P. O. Box 011/17743
38436 Wolfsburg, Germany
Tel.: +49 (0)5361 923807

Volkswagen AG
Environmental Management Officer – Product
Dieter Pundt
P. O. Box 011/17680
38436 Wolfsburg, Germany
Tel.: +49 (0)5361 978300

Volkswagen AG
Service Engineering
Manfred Fischer
P. O. Box 011/19470
38436 Wolfsburg, Germany
Tel.: +49 (0)5361 928063

Volkswagen AG
Corporate Government Relations
Reinhold Kopp
Plenipotentiary of Volkswagen AG
P. O. Box 011/18820
38436 Wolfsburg, Germany
Tel.: +49 (0)5361 978622

Volkswagen AG
Government Relations, Science and Technology
Dr. Hans-Jürgen Schäfer
P. O. Box 011/18820
38436 Wolfsburg, Germany
Tel.: +49 (0)5361 972859

Volkswagen AG
Central Personnel Dept.
Dr. Josef-Fidelis Senn
P. O. Box 011/18990
38436 Wolfsburg, Germany
Tel.: +49 (0)5361 973310

Volkswagen AG
Investor Relations
Gillian-Ruth Karran
P. O. Box 011/18490
38436 Wolfsburg, Germany
Tel.: +49 (0)5361 949843

Volkswagen AG
Communications
Thomas Mickeleit
P. O. Box 011/19720
38436 Wolfsburg, Germany
Tel.: +49 (0)5361 987604

Volkswagen of South Africa
Communications
Matt Gennrich
P. O. Box 80
Uitenhage, 6230
South Africa
Tel.: +27 41 9944607

Glossary

A glossary with definitions of key words in the report, together with comprehensive explanations and additional terms, which are constantly being updated, can be found on the Internet at

www.mobility-and-sustainability.com

Questions on environmental protection at individual Volkswagen plants should be directed to the relevant Plant Environment Officer (see plant environmental statements).

Further information and an order form for copies of the Environmental Report can be found on the Internet at **www.mobility-and-sustainability.com**
E-mail: info@mobility-and-sustainability.com

Always Going the Extra Mile

Environment-Online Award
The Internet portal www.volkswagen-environment.de was awarded the gold Environment-Online Award as the website of the month in April 2002. Under the patronage of the Federal Minister of the Environment, the German Environmental Management Association, B.A.U.M., gives out a monthly award for the best environmental website. B.A.U.M. is Europe's largest business environmental initiative with a membership of over 500 companies.

The Global Reporters 2002
Volkswagen is Number 1 in the automotive industry – such is the result of the second international comparative study on sustainability reporting presented in November 2002 by the London-based consultancy SustainAbility Ltd. on behalf of the United Nations Environmental Programme (UNEP). This study, "The Global Reporters 2002", is a worldwide comparison of companies which publish sustainability reports documenting their achievements, management qualities and aims in this respect. The study assessed the "Volkswagen Environmental Report 2001/2002 – Mobility and Sustainability", which not only reports on environmental performance, but also provides information about corporate social and financial affairs. Volkswagen achieved twelfth place in the overall top 100 ranking of all the sectors examined and came first, with 94 points, in the overall evaluation of the automotive industry.

Best German environmental report 2002
Volkswagen's environmental reporting team and the German Chamber of Statutory Auditors (WPK) in Berlin have become well acquainted in recent years, Volkswagen having now been awarded its third German Environmental Reporting Award (DURA) by WPK, each time with a better ranking. In 2002, Volkswagen made it to the top, coming first in the "Best Environmental Reporting" category for its outstanding documentation of its commitment to environmental issues and clear explanation to the general public of the significance of environmental policy within the company. The jury praised the report's approach of focusing on specific issues, all centred on the topic of mobility. The DURA award was initiated in 1998 with the aim of supporting corporate environmental and sustainability reporting and drawing attention to exceptional reports.

The DURA award ceremony: Dr. Ulrich Menzel, project manager Volkswagen Environmental Report, Count Hubert von Treuberg, Chairman of the German Chamber of Statutory Auditors, Günter Sager, Head of Environment and Industrial Safety at Volkswagen (from left to right)

First edition 2/2004

Environment and Industrial Safety

Concept/editing:
Volkswagen AG, Wolfsburg
crossrelations, Düsseldorf

Layout/graphic design:
crossrelations, Düsseldorf

English translation:
Bauer-Boothroyd Übersetzungen, Schorndorf

Photos:
Wolfgang Kaehler (corbis, Düsseldorf)
China Tourism Press (Getty Images Deutschland, Munich)
Tim Wegner (Frankfurt am Main)
Mark Lewis (Scarborough, South Africa)
dpa/AFP
Volkswagen AG (Wolfsburg)

Lithography:
O/R/T Medienverbund, Krefeld

Printed by:
Druckhaus Friedrich Schmücker GmbH, Löningen
certified to DIN EN ISO 9001 : 2000 (quality management)
validated to EC Eco-Audit Regulation 761/2001 (environmental management)

Ordering the Environmental Report:
If you would like a copy of our Environmental Report, please place an order at www.mobility-and-sustainability.com or with Volkswagen-Distributionsservice, P. O. Box 1450, 33762 Versmold, Germany.

At Volkswagen AG, development work on all our models never ceases, so please allow for the fact that changes in design, equipment and technical specifications may be made at any time. Consequently, the data, images and descriptions in this report cannot give rise to claims of any kind.

Article No.: 415.1240.01.18

VOLKSWAGEN AG
Environment and Industrial Safety
P. O. Box 011/17743
38436 Wolfsburg
Germany

December 2003
Printed on paper bleached without chlorine (TCF)

Art. No.: 415.1240.01.18