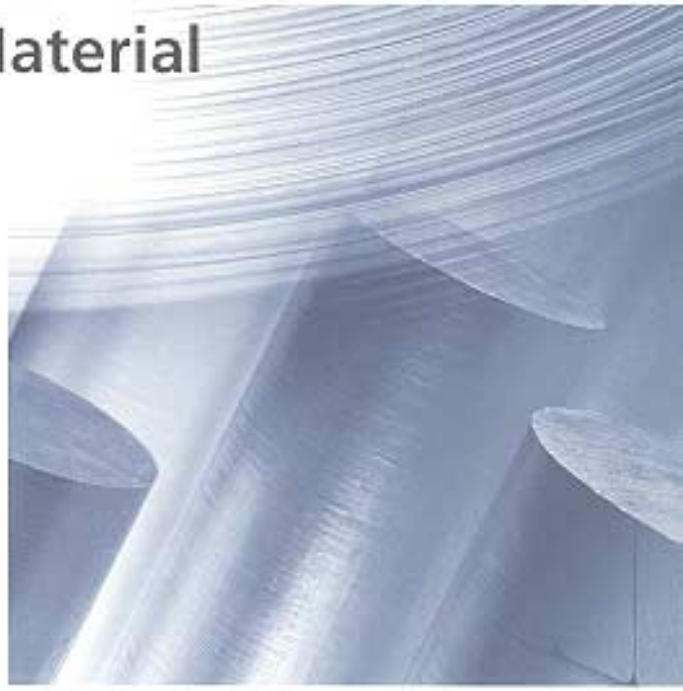
Aluminium

A Sustainable Material



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ALUMINIUMINDUSTRIE e.V.

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Summary

The blueprint for future-orientated and sustainable development that evolved from the Rio Conference in 1992 assumes that ecological, economic and social objectives are of equal importance. The German aluminium industry identifies itself with the basic principles of sustainability and makes an important contribution to putting them into practice.

The industry is an important economic factor and shows a high degree of social responsibility and environmental awareness. As a key branch of the economy, it works together closely with nearly all other branches of industry, thus providing the foundation for technical progress and contributing to improvements in living standards.

It creates jobs and income for a large number of people involved directly or indirectly with the industry, as well as offering young people the chance to obtain a qualification and giving them job prospects. The branch of industry has intensified its contacts with schools and developed numerous training opportunities for teachers and pupils in order to make it easier for young people when they start work.

The industry makes considerable investments in research and development to make production even more efficient and environmentally friendly.

The aluminium industry regards environmental protection as a mission to be actively pursued. Its member companies are continually striving to optimise processes and products with the aid of eco-audits and environmental management tools. The conservation and careful use of energy and raw materials play a key role in this respect. This manifests itself in numerous ways: the extraction of raw materials in an environmentally acceptable manner, a voluntary self-commitment to protect the climate, the extension of a recycling network that traditionally has had very high recycling rates, to make it ever more closely knit, and the reduction of waste and emissions.

It helps further the development of structurally weak areas of the globe as an employer, foreign investor and through its trade in raw materials and products worldwide, and thus gradually helps narrow the wealth gap between the poorer and the industrialised nations.

The aluminium industry practices an open information policy both internally and externally in order to establish confidence in the way it behaves. It relies

on maintaining a dialogue with all relevant groups of society and carries out this dialogue intensively at company and trade association level. It will continue to strive resolutely to achieve future-orientated and sustainable development.

The specific properties of aluminium make it a sustainable material par excellence. It makes a significant contribution to fulfilling basic needs, such as mobility, living, safety, healthy eating and medical treatment, and does so in a manner that is acceptable economically and ecologically.

SUSTAINABLE DEVELOPMENT

Ten years after the Rio Conference in 1992, the blueprint for sustainable development has become well established internationally. It is well known that the guiding principle of sustainability, which goes back to the Brundtland Commission, is development that satisfies the needs of the present generation without robbing future generations of the freedom and opportunities to satisfy their own needs.

However, a lot has happened in the intervening ten years. There are a lot of national and international organisations and institutions involved in trying to put the blueprint - which was expressed in general terms - into practice as part of a strategy of sustainability. To the fore are questions related to achieving the objectives that were formulated in the Agenda 21 and which have been further developed at numerous subsequent meetings. It is no longer a matter of promoting the blueprint for sustainability as the accepted guiding principle but more a case of formulating practical concepts that will serve as the maxim for carrying out trade. The summit in Johannesburg in 2002, a successor of the one held in Rio, was again concerned with this objective.

More and more companies and organisations are integrating the blueprint for sustainability into their company policy and are supporting the development of such concepts at company and association level. They co-operate with scientific institutes to establish branch-specific criteria, such as quantifiable indicators, which make sustainability more tangible and give the firms greater confidence that they are moving in the right direction when it comes to business decisions.

The German and the international aluminium industries are also participating in this process of formulating sustainability. The guiding framework remains the combination of economic, ecological and social objectives. The aim of sustainable development is to balance people's economic and social living conditions with the needs of their natural environment.

One thing has become increasingly clear. Focussing one-sidedly on ecological aspects, which was a common feature of public discussion in the early days, has had its day. Current concepts regarding sustainability are more concerned with determining the economic and social dimensions of sustainability and linking these with the ecological dimension. This approach is often referred to as "corporate social responsibility".

The extent to which the sustainability debate has progressed can also be illustrated by the fact that it has even reached the financial markets. The Dow Jones Sustainability Index includes firms whose company policy places particular importance on sustainability. Companies engaged in the aluminium industry are also included in this index. The number of environment, ethic or sustainability funds is growing – an indication that in future investors will be paying more and more attention to companies that feel committed to the principles of sustainable development.

The prime aim of sustainable development is improve people's economic and social living conditions in harmony with their natural surroundings. Economic, social and environmental aspects are closely interrelated and of equal importance.

THE THREE PILLARS OF SUSTAINABILITY

The ultimate aim of any commercial activity is to satisfy people's needs - this applies equally to third-world countries and industrial nations. A sustainable economy means achieving prosperity via efficient production, which uses limited goods and resources thriftily. It also means encouraging technological progress that will make it easier for present and future generations to shape their lives and help solve human problems on a global scale by way of innovations. Open and deregulated markets are important here because they

create the important framework that allows fair competition between companies.

On top of this is the social dimension of sustainability. It aims to maintain and improve living conditions locally and in other parts of the world. It is of prime importance to ensure that society remains innovative and adaptable to change. This will maintain in the long term the standard of living that has already been achieved, and improve it further, reduce the high levels of unemployment that have existed for years and fulfil the new demands currently being made on education and training. These are all matters, however, that are not dependent for their realisation on the goodwill of companies and employers but on the ability of all relevant forces in society to undergo reform.

It is a case of maintaining people's natural life-support systems. The key demands of environmentally friendly production and living are protecting the environment and people's health, conserving available resources by using them sparingly, recycling that is linked to the reduction of emissions and waste, and environmentally acceptable products.

All three pillars of sustainability – economic viability, social responsibility and protection of the environment – are ultimately very closely interrelated. A method of production or a way of living that is carried out at the expense of the environment will, in the end, undermine living standards that have already been achieved. Anyone who sacrifices the social market economy for the sake of a primacy of environmental policy undermines the economic basis that makes such environmental improvements possible. With its plants and products, the aluminium industry in Germany makes an important contribution towards satisfying the above-mentioned objectives. In presenting these efforts, it also becomes apparent that it is not always possible to assign them clearly to a specific category – economic, social or ecological aspects – because the categories are so closely interlinked.

Economic viability, social responsibility and environmental protection are the three pillars of sustainable development. With its production plants and products, the aluminium industry in Germany makes an important contribution towards fulfilling these objectives.

THE ECONOMIC IMPORTANCE OF THE ALUMINIUM INDUSTRY

The aluminium industry is an important economic factor in Germany with a turnover of about 13 billion euros and about 73.000 employees. It includes metal production in primary aluminium smelters as well as in remelting and recycling plants, the manufacture of semi-fabricated products and castings, and subsequent processing to foil, tubes and cans.

About 600 plants produce or process aluminium. Although they include concerns that are active globally, they are mainly small and medium sized companies. Moreover, the economic activities of the aluminium industry spread extensively into other branches and supply companies.

The aluminium industry is a growth segment that thanks to its investments in modern, resource-conserving production technologies safeguards the future of areas where it is located, not least in regions of Germany with a weak infrastructure. At the same time, it is a key politico-economic branch that because of its close co-operation with almost all other branches of the economy provides the foundation for technological progress and improvements in living standards.

The companies in the aluminium industry are important taxpayers. The tax income they provide helps finance important politico-economic and social activities of the government and its institutions.

In addition, the branch is strongly globally orientated – with a high level of international trade. Over 40 percent of the production is intended for export and in some product groups the export share is over 60 percent. When one considers all products, the level of imports in Germany is 40 percent. As an investor abroad and as a consequence of its trade in raw materials and aluminium products worldwide, the German aluminium companies contribute to the development of structurally weak areas of the world.

The companies invest considerable sums in application-related research and development in order to further improve the material properties of aluminium, develop new products and optimise processes. An example here is the development work for the so-called inert anodes (see the section on ecology for details).

The properties of aluminium – its light weight, its high electrical and thermal conductivity, its corrosion resistance, its strength and its non-toxicity from a health point of view – allow it to be used in a wide range of applications with

high product benefits. It is thus not surprising that the demand for aluminium in Germany is continually increasing and is now about 2.9 million tonnes a year. The main markets for aluminium products are the fields of transport, building and construction, engineering, and packaging.

The aluminium industry is an important economic factor in Germany. It is a key politico-economic branch for technological progress and improvements in living standards.

THE SOCIAL RESPONSIBILITY OF THE ALUMINIUM INDUSTRY

The German aluminium industry provides work and income directly for about 73,000 employees, and provides their families with a living standard and social security that are high by global standards. In addition, many people who are employed in the plants of customers, equipment suppliers, as well as trading and service industries outside the aluminium industry also benefit from its economic strength.

Human resources management at plant level offers employees and apprentices wide-ranging possibilities in the areas of training and further education, staff promotion, personal development and future staffing. The companies give young people the opportunity to obtain qualifications in technical, commercial or academic fields and thus provide them with long-term career prospects.

Training courses and seminars offer dedicated employees and trainees opportunities for further education and qualifications and thus serve the career development of the employees. Many companies have a formal training policy that enables them to recruit managers from within the company.

In addition, medium-sized aluminium companies in particular strive to utilise the expert knowledge of their employees. In the past they have arranged “bourses” for exchanging ideas, initiated “creativity offensives”, which serve to continually improve technical processes and work procedures, but which are also extended to cover occupational safety and environmental protection in the plant.

In the 90s, aluminium companies introduced a range of measures to make working hours more flexible. These measures improve the plant economics on the one hand and take the interests of the employees into account on the other, e.g. by use of so-called “savings accounts” for working hours throughout an employee’s working life. In this way, employees gain a certain degree of sovereignty over the time they have to work in that they can arrange their working lives more individually.

Year after year, the aluminium industry invests millions in safety at work, the prevention of accidents and health protection at the workplace. This is reflected in accident figures in this branch, which have fallen significantly in recent years. Besides technical improvements, it is primarily practice-oriented training and qualification measures aimed at identifying risks that have contributed to this positive development. In the plants, occupational safety is an integral part of the management system and is subjected to systematic audits, clearly defined standards and binding guidelines.

The aluminium industry and the people working there are involved in numerous activities and contribute money and other items to supporting projects from neighbourhood schemes to ventures in developing countries.[1]

The aluminium industry also provides work and income for many located way outside the industry. It offers young people qualified training and career prospects.

Social Responsibility at an International Level

The globalisation of trade means that a company‘s social responsibility does not cease once the company is operating across the border. This is particularly true for a business like the aluminium industry, which is characterised by its internationality. As a result of trade in raw materials and products as well as being an employer and investor abroad, aluminium companies make a significant contribution to the development of other countries. They thus make a valuable contribution to tackling poverty and gradually closing the wealth gap.

[1] GDA brochure “Aluminium – Social Aspects”

THE ENVIRONMENTAL CHALLENGE FACING THE ALUMINIUM INDUSTRY

Climate protection and conservation of resources are the two most important environmental policy objectives of our age. They lead to a range of concrete demands – such as the efficient utilisation of energy, reduction of emissions and waste, recycling and the development of new, environmentally friendly and recyclable materials, products and production processes. After all, one is concerned with the protection of eco-systems and people's health, as well as with a future-orientated development that safeguards the interests of future generations.

The aluminium industry orientates itself towards these ecological aspects without losing sight of the economic and social dimensions of its actions.

Climate protection

The reduction of greenhouse gases is one of the prime objectives of an environmental policy aimed at protecting the climate and the Earth's atmosphere. Improvements in energy efficiency and a reduction in the amounts of climate-relevant gases are of central importance. The German aluminium industry has made great efforts in this respect for a good number of years. For example, in recent decades energy consumption in the production of primary aluminium has fallen from an average of 21 kilowatt hours per kilogram to its current level of 15 kWh/kg – a saving of almost 30 percent. There are now electrolysis units operating with extremely low levels of less than 13 kWh/kg.

Where greenhouse gases are formed during the production of primary aluminium, one is dealing not only with carbon dioxide but also above all with the trace gases CF_4 and C_2F_6. Here, too, the industry has achieved marked successes. Within the scope of a voluntary self-commitment, the five German primary aluminium smelters have reduced emissions of these trace gases by 85 percent since 1990. Expressed in carbon dioxide equivalents, this represents a reduction of about two million tonnes compared with 1990 in the year 2000 alone. In this way, ecological progress is achieved using instruments that the market accepts, without the state telling companies how they should achieve the targets it has set them. Such an approach avoids wasting politico-economic resources and at the same time encourages innovation and technological progress,

Evidence of this is the development work the aluminium producers have carried out on so-called inert anodes, which aim to use carbon-free and non-consumable materials. According to studies, 60 to 80 percent of the greenhouse gas emissions caused by the process could be eliminated by the use of inert anodes, and the formation of CF_4 and C_2F_6 could be prevented completely. The inert anodes also make it possible to reduce fluoride and dust emissions even further. It is not possible to say when this technology will be available on a commercial scale but the research projects of today are often tomorrow's state-of-the-art.

ENVIRONMENTAL MANAGEMENT

In the aluminium industry today, there is a well-organised process at plant level for considering the environmental effects of any actions taken, with clearly defined responsibilities all the way up to top management. A well-developed environment-management system ensures that environmental requirements are considered systematically at all stages of planning, execution and monitoring, and that any weaknesses are rectified at an early stage.

An important aspect is production-oriented environmental protection resulting from the need to comply with any restrictions associated with planning permission and to keep emissions within legal limits. The last few years have witnessed the growing emergence of plant environmental policies - in addition to legal requirements - that regard environmental protection as a mission with self-imposed objectives. Using eco-audits, for example, one can define targets, tools and measures to reduce the environmental impact of production further. Medium-sized plants in the aluminium industry are also increasingly using these eco-audits. This shows that the environmental awareness of this branch of industry is broadly based and not limited to a few companies.

Conservation of resources and recycling

The aim of sustainability in dealing with resources is to increase the efficiency of the utilisation of resources so as to preserve non-renewable resources for future generations too. One talks here of conservation of raw materials, the use of renewable energies and increased energy efficiency, recycling and reduction of waste and emissions.

The raw material bauxite: Even when viewed from today's perspective, the known, commercially viable bauxite reserves will last for more than 200 years.[2] In keeping with the aims of sustainable and environmentally friendly development, top soil and overburden is removed prior to bauxite mining and stored temporarily. Once mining ceases, it is used to re-cultivate the area. About 70 percent of the land used for bauxite mining is returned to its native state and 20 percent is used for forestry and agriculture. The remaining ten percent is used for recreational areas, housing and industrial development, and thus contributes to the social and economic development of the area. [3]

Energy: The aluminium industry makes particularly extensive use of CO_2-free sources of energy. Worldwide, more than 50 percent of the energy used in primary aluminium smelters is obtained from renewable hydroelectric power.

The amount of recycled material in circulation is continually increasing. This conserves valuable resources and at the same time saves energy because up to 95 percent less energy is required for recycling than for primary aluminium production.

A district heating project at the world's largest aluminium rolling mill, Alunorf, in North Rhine Westphalia provides a good example of the efficient utilisation of energy. The waste heat from the waste-gas cleaning system on 13 melting furnaces is used for heating by 6,500 people on a new housing estate a few kilometres away. It replaces up to 3.9 million cubic metres of natural gas and thus avoids about 10,000 tonnes of carbon dioxide being released to the atmosphere every year.

Recycling: Aluminium's intrinsic material value means that it has always been worthwhile returning the material to the loop that comprises metal extraction, processing, use and recovery. Unlike many other materials, there is no deterioration in quality when aluminium is recycled. New profiles or other high-value products can be made from extrusion scrap and new rolled products can be made from used aluminium sheet and foil. The amount of secondary aluminium in circulation is therefore growing continually. The aluminium industry can thus be regarded as a high-order recycling system and aluminium

[2] Special reports issued by the *Bundesanstalt für Geowissenschaften und Rohstoffe* (German Federal Institution for Geosciences and Raw Materials) and the *Staatlichen Geologischen Diensten in der Bundesrepublik Deutschland* (Government Geological Services in the Federal Republic of Germany), Hannover 1998 [in German]. "Material Flows and Energy Requirements in the Extraction of Selected Raw Materials – Aluminium, 1998".

[3] International Aluminium Institute, "Second Bauxite Mine Rehabilitation Survey", London, July 2000

itself, which is “a raw material that can be used again and again”, can be considered on a par with “renewable raw materials”. After all, aluminium is used and not consumed.

The industry is continually developing its products further. This ensures that in many cases today less material is used for a given application than in the past (downgauging), but without imposing any restrictions on the functionality. Besides conserving resources and reducing emissions, this has also increased the competitiveness of the products.

Further ecological optimisation is achieved by recycling other materials used in the plant. Thus, for example, used rolling mill lubricants are treated and recycled. This, too, is a contribution to conservation of resources and sustainability.

The conservation of resources begins with closed internal recycling loops. Process scrap, which arises from the processing of aluminium, is completely recycled and returned to the production process. Internal production cycles in the aluminium industry also include operating and auxiliary materials. Materials recycled thus include, for example, the core sand needed in sand casting processes to make the moulds used for casting engine blocks and cylinder heads, the lubricants used to roll semi-fabricated products, and the solvent residues from foil-lacquering processes. The plants even recover the salts that are used in the recycling process to tie up impurities in the scrap. Internal recycling loops thus enable resources to be used in a sustainable manner. In doing so, they reduce the impact on the natural surroundings and the pressure on waste disposal sites.

On top of this, there is a well-functioning recycling industry that has existed for decades and recovers aluminium, for example from the transport, building and construction and packaging sectors. The German secondary aluminium industry is one of the leaders in Europe, with a production of about 620,000 tonnes a year, which is 49 percent of the total production. The recycling rate is about 95 percent in the transport sector and is 85 percent in the building and construction sector.

The recycling of packaging moved onto a new plane with the setting up of the so-called Duales System recycling system. The comprehensive system of collecting, sorting and recycling of used packaging has led to about 80 percent of aluminium packaging now being recycled.[4] Thanks to the use of mod-

[4] Source: GVM - Gesellschaft für Verpackungsmarktforschung

modern sorting technologies, it is now possible to also recover aluminium from laminates right through to coffee packs. However, despite all the efforts and successes in this sector, one does not have to have 100 percent recycling to satisfy the principles of sustainable development. The energy required to collect the very last item of packaging bears no relation to the benefit it would achieve.

Reduction of emissions and waste

Numerous measures have contributed to a drastic reduction in the emission of pollutants. The most important ones include:

The further development of cell technology for fused-salt electrolysis, the optimisation of process control and quality control of charge and raw materials.

Modern filter technologies in production and processing plants. This has led to 99 percent of the gaseous and particulate fluoride emissions in the primary aluminium industry being collected.

Closed loops for operating and auxiliary materials, such as the recycling of the oil-mist lubrication in rolling mills or the recovery of solvents by converters, who apply a coating, printing or a lacquer to aluminium.

The collection of filter dust when recycling aluminium scrap.

The high-tech treatment of waste gases from recycling plants, in order to avoid the formation of dioxins and furanes resulting from organic deposits attached to the scrap.

Waste-water treatment plants that prevent any waste water that cannot be recycled from being discharged to the environment without filtering.

All of this and lots more means that the impact of aluminium plants has now been reduced to a minimum.

In order to achieve the improvements outlined above, the German aluminium industry has made large financial commitments. About ten percent of all investment goes towards plant-related environmental protection. On average, about three times this amount is spent every year operating the environmental protection equipment. The technical and economic limits have thus been reached, particularly as the potential for further reductions is now so small that the costs involved in achieving the reductions would be out of all justifiable proportion to the benefits obtained.

Where material loops cannot be closed and waste is generated, the aim of a sustainable method of production and consumption is to keep waste to a minimum, make as little use as possible of waste-disposal sites, and, if possible, find secondary uses for the unwanted materials. Electrolysis cells in primary smelters are a good example of how one can reduce the amount of mineral waste produced. In Germany's largest aluminium smelter, cell life has been improved by 150 percent since 1975 – with the result that significantly less spent pot-linings have to be disposed of than in earlier years.

Environmentally friendly development also demands that there is a reduction in the emission of pollutants that are a risk to the health of employees and the ability of the natural environment to adapt. The optimisation of production processes and the installation of equipment to protect the environment has now reached such a level in Germany that it has become an example for the rest of the world. This also applies to the environmental protection in the aluminium industry at plant level.

Climate protection and the conservation of resources are the two main aims of current environmental policy. The aluminium industry is adopting numerous measures to support these aims. They include the efficient utilisation of energy, the reduction of emissions and waste, recycling, the development of new, recyclable and energy-saving materials, products and manufacturing processes.

THE SUSTAINABILITY OF ALUMINIUM PRODUCTS

The development of sustainable consumer habits is a key factor in checking excessive demands on natural resources. Consumer behaviour means the individual has an important role to play and can possibly influence matters by encouraging the use of sustainable products. Aluminium products are particularly well suited to support this process, not least because of their specific material properties. Aluminium makes a significant contribution to fulfilling basic needs, such as mobility, living, safety, healthy eating and medical treatment, and in a manner that is economically and ecologically acceptable. Examples from the three large market segments, transport, building and packaging, will make this clear.

Packaging: Unlike other consumer goods, packaging products[5] have a relatively short life-span. Packaging materials have acquired a reputation for being superfluous and are quickly cited as an example for a non-sustainable lifestyle because their product benefits are transferred exclusively to the product that is packaged. However, it is precisely from a sustainable development viewpoint that packaging is indispensable. Without it, it would not be possible to ensure proper food supply or to care for human health in certain parts of the world. Food has to be transported, distributed and stored; it needs packaging to protect it from mechanical damage and prevent it from perishing, in other words to prevent food from being wasted.

Aluminium always plays a major role when one is looking to put intelligent packaging solutions into practice. Its strengths here can also be attributed to its lightness, together with superior barrier properties, which afford food and pharmaceuticals protection against light, gases, vapours and bacteria. Used as a laminate with other materials, aluminium is indispensable as a "super thin" partner when the highest level of product protection and long shelf-life are required. This is obvious when one looks at a litre carton of long-life milk. Thanks to a thin layer of aluminium, just six thousandths of a millimetre thick, one can store 650 litres of milk for several months without cooling using a kilo of aluminium. Aluminium packaging fulfils important criteria for sustainability thanks to its high functionality and economy. From an economic point of view, it saves more resources than it consumes and benefits mankind more than the demands it makes on the environment. Moreover, socio-demographic developments indicate there will be increased use of aluminium as a packaging material. The number of single-person and small households is increasing and with it the need for small, individual-portion packaging; there is little time for shopping when both partners work and these are increasingly turning to ready meals; the elderly are increasingly using services such as "meals on wheels". The corresponding packaging is frequently aluminium.

Even from a purely ecological point of view, aluminium packaging would also satisfy the requirements for sustainable development. This applies likewise to the "conservation of resources" and "closed loops" criteria. Aluminium packaging is getting lighter year by year. The weight of aluminium beverage cans has been reduced by about 39 percent since the beginning of the 80s. During the same period, the thickness of yoghurt pot tops has been reduced by 15

[5] GDA brochure "Aluminium in Packaging – maximum performance, minimum use of material"

percent, that of processed foil for flexible packaging by 28 percent and that of foil for confectionery by 30 percent. These developments coupled with the high recycling rate for aluminium, which has now reached 80 percent, speak for aluminium packaging.

Transport: The transport of goods, journeys to work and people's leisure activities are associated with large amounts of traffic. The light metal aluminium is an important component of modern mobility. Lightweight aluminium products help cut fuel consumption and reduce emissions. The voluntary self-commitment of the car industry to reduce the fuel consumption of new vehicles by 25 percent up by the year 2005 will also be supported by the increased use of lightweight aluminium.

Scientific investigations have shown that energy consumption for primary aluminium production, which is higher than that needed for other materials, is more than compensated for by the energy savings during the useful life of the vehicle - with cars this is usually after driving 60,000 kilometres.[6] A car's useful life is thus the critical ecological parameter when assessing its environmental relevance as far as energy consumption and emission of greenhouse gases are concerned. When considering the complete life cycle of a car, less than 10 percent of the emissions associated with the greenhouse effect occur during production (including the production of the starting materials), but more than 90 percent during the useful life.

The potential reductions offered by aluminium and a largely closed-loop system speak for the light metal as an environmentally friendly material that conserves energy and resources. The aluminium industry thus also contributes to a system of mobility that conserves the environment, which was one of the key actions that the German Federal Government wrote in its report to the Special General Assembly of the United Nations.[7]

Lightweight construction with aluminium does not, however, only contribute to a reduction of emissions of pollutants. The material also offers a degree of

[6] German Federal Parliament: Report of the Commission of Enquiry "Protection of Man and the Environment – Evaluation Criteria and Prospects for Environmentally Acceptable Material Loops", Drucksache 12/8260 [in German].

[7] *Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit* (Federal Ministry for Environment, Nature Protection and Environment): "Sustainable Development in Germany – Draft Environmental Policy Programme", April 1998 [in German]

active and passive safety – the lighter a car, the shorter is its braking distance too. After all, a few metres can decide whether or not an accident occurs and people are injured. New materials like foamed aluminium, which is lighter than water but nevertheless has an extremely high stiffness, offer a combination of properties that make it possible to improve the design of the collapsible zone still further to ensure even greater protection if a collision does occur.

Building and Construction: The ecological benefits of aluminium in the building sector[8] are its long life and its low maintenance requirement. Aluminium windows, doors, roofing or façades still look good and are fully functional after decades in service. The most obvious example of this is the San Gioacchino Church in Rome, whose dome is covered with aluminium sheet and has now shone silvery white for over a hundred years.

Living means more than just having a roof over one's head. The demands placed on accommodation change with increasing prosperity. In addition to physical wellbeing resulting from comfortable sanitary facilities, heated rooms or running hot water, one also has to consider a person's mental wellbeing within his four walls. Quality of life, aesthetics and design are gaining in importance. People do not just want to live comfortably; they also want a pleasant ambience.

The long service life of aluminium building products and the minimum amount of effort required to maintain them also contributes to the conservation of resources. Used window profiles or sheet made from aluminium are much in demand when it comes to recycling. The so-called A/U/F recycling initiative (A/U/F = Aluminium Windows and Facades and the Environment) was set up as long ago as 1994 by building-system suppliers and aluminium companies and ensures that these products, too, are increasingly being recycled.

Further applications: The usefulness of aluminium products can also be illustrated using numerous other examples, including such mundane items as aluminium stepladders, which are light and stable, aluminium wheels or rowing machines used for keeping fit and aluminium snap-links can be life-saving for mountaineers. The same also applies incidentally to aluminium blankets that every driver has to carry in his first-aid kit.

[8] GDA brochure "Aluminium in Building – Ecological and Sustainable"

Aluminium makes a significant contribution to ensuring that basic needs, such as mobility, living, safety, healthy eating and medical care, can be fulfilled economically and in an environmentally-friendly manner.[9] Aluminium means products that have a long shelf-life, and are reliable, environmentally friendly, safe and harmless.

Product ecology

At product level, the systematic collection of data of relevance to the environment is becoming more and more important. Companies can thus determine what effects they are having on the environment and continually optimise their products and processes. In this way, they contribute to changing what is often a short-sighted way of looking at things by considering the environmental relevance of products over their whole life.

On the other hand, it is not objective when legislators or public authorities become involved in the design of products or impose restrictions on the use of certain products, for example based on life-cycle assessments, and thus control markets. This strongly restricts or even removes the incentives for further development and the ecological optimisation of products and material applications. The consequence is techno-ecological stagnation instead of continual improvement.

The aluminium industry has supported life-cycle assessment projects carried out by scientific institutions as well as customers and thus contributed to de-emotionalising what is often an emotional and politically controversial environmental debate. In all of this, and in the interests of complete sustainable development, one should not lose sight of the fact that life-cycle assessments, material flow analyses and eco-audits are only a part of the story. The identification of possible ways of increasing or decreasing environmental impact has to be viewed with socio-economic aspects in mind.

[9] German Federal Parliament: "Aluminium – Economic, Ecological and Social Consequences". Drucksache 13/6833 [in German].

EDUCATION AND TRAINING

A branch such as the aluminium industry creates a wide range of jobs and training opportunities for young people at the start of their careers. It therefore has an inherent interest in maintaining good contacts with schools and co-operating with them to provide detailed information on the world of industry and economic processes. The aluminium industry sees this involvement as a long-term investment in the future. It is a component of corporate social responsibility that makes it easier for young people to start their careers.

Particularly important from a social point of view is the fact that the companies offer young people apprenticeships, and with it the chance to make something of their lives.

With this in mind, the Gesamtverband der Aluminiumindustrie (GDA) and its member companies organise an exchange for young people seeking practical job experience so that they can get an insight into the everyday aspects of working in the industry. In addition, many companies arrange works visits and some sign co-operation agreements with local schools. These agreements envisage, for example, that pupils can use a plant's laboratory facilities for carrying out projects. There have been projects in which companies from the industry have helped schoolchildren make parabolic solar mirrors from aluminium. There have also been partnerships in which both sides jointly develop projects to be covered in the classroom that look at aluminium from various viewpoints.[10] The range of topics covered ranged from "Location factors and deposits of raw materials" in geography, through "Electricity and magnetism" in physics and "Environmental protection in the production of aluminium in biology", to "Creative approach to aluminium" in arts and craft.

Since 2001, the GDA has exhibited at Bildungsmesse, an international trade fair for education and training. Here, visitors have the opportunity to discuss matters relating to aluminium with GDA's specialists face-to-face, exchange ideas and find out more about the information currently available to teachers from all types of school. The key feature of the GDA's teaching material is a folder that gives teachers plenty of ideas for class work: exercises in the form of project sheets for the children, including solutions, background information and overhead foils. The contents are suitable for use by schoolchildren and include information on bauxite mining and the production of aluminium, fields

[10] "Natural Sciences in the Classroom. Special Edition: Aluminium" *Chemie* No. 68, 2/2002 [in German]

of application and environmental aspects. In addition, the GDA offers a teaching case full of illustrative material on the subject of aluminium and samples of applications – from bauxite, via aluminium hydroxide and an aluminium ingot through to end products such as an aluminium can, a tray and an extruded section.

The aluminium industry fosters close contacts with schools and offers wide-ranging training opportunities for teachers and pupils. It regards this involvement as a long-term investment in the future.

NEW APPROACHES

The blueprint for sustainable development is not only aimed at governments and political parties, but also at all institutions and groups in society, right down to individuals. The message from Agenda 21 for industry is: “Free enterprise, including cross-border companies, and trade associations which represent them, should be equal partners when it comes to putting measures into practice and assessing them.”

Such a partnership raises the question of the collaboration between politics and industry. It is not compatible with a policy that is based on state control, with orders and bans issued in the name of ecology and a limitation of world trade. Instead of ever more regulatory influence in business matters, it is necessary to establish an operating framework that will activate the innovative and growth forces of the marketplace, encourage companies to act on their own initiative and enhance the creative potential that man inherently possesses.

At the same time, the blueprint of Agenda 21 imposes high demands on free enterprise - from economical, social and ecological points of view. The aluminium industry accepts this responsibility. In the past few years, it has adopted many new approaches in order to fulfil this responsibility. One can mention the development of new materials and products, continual improvement of processes, operating steps and occupational safety, the social involvement of companies and their employees over and above their daily business, improved environmental protection as well as co-operation with

scientific projects related to product ecology and material flow analyses. The GDA, for example, supported the Technical University of Aachen (RWTH) in its long-term project "A Resource-orientated Analysis of the Material Flow of Metallic Raw Materials", in which aluminium played the main role.

Dialogue targeted internally and externally

Striving to achieve sustainable development is an ongoing process. Maintaining a dialogue with all relevant groups of society about the right steps to be taken to achieve sustainable development has an important role to play here. The aluminium industry conducts this dialogue at both company and trade association level. An example is the European initiative "Aluminium for Tomorrow's World", which leading aluminium companies launched at the end of 1998. Meetings to conduct a dialogue with representatives from the fields of business, the media, the environment, education, the church and science are at the heart of this initiative.

The latest example of such dialogue is the "Towards a Sustainable Aluminium Industry: Stakeholder Expectations and Core Indicators" project. The GDA was responsible for overseeing the project, which developed sustainability indicators for aluminium and the aluminium industry and was carried out on behalf of the European aluminium industry by the Wuppertal-based Institut für Klima, Umwelt und Energie (Institute for Climate, Environment and Energy). A Europe-wide analysis of stakeholder expectations served as the basis. The first results were presented at national, European and UN level. The stakeholder interest was in keeping with the pioneering character of the research work initiated by the aluminium industry. In a follow-up project, it is now planned to discuss the results in detail and, if necessary, develop them further.[11]

The aluminium industry is also conducting this dialogue within the industry. For example, it is holding internal branch workshops, at which people can exchange experiences and which stimulate dialogue processes at a local level.

[11] "Final Report: Towards a Sustainable Aluminium Industry: Stakeholder Expectations and Core Indicators" downloadable from http://www.eco-efficiency.de, publications

The German aluminium industry will continue its approach to achieving sustainable development through its member companies, its trade association and dialogue with all stakeholders in a purposeful manner.

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