Environmental Declaration 2011 for the Audi Plant in Ingolstadt

Responsibility and Commitment for Ecology and Sustainable Mobility
Foreword  04

Integrated Audi environmental management – Transparency and efficiency  06

The environmental policy of AUDI AG – globally uniform standards  07

Audi takes responsibility: Consideration of environmental aspects in the case of products and production facilities, as well as the environmentally compatible use of resources.

Ingolstadt plant – Audi relies on Germany as a location for industry and business  08

The plant is the headquarters as well as the largest and most important production facility of the Audi Group.

The protection of the environment is a top priority  09

The Ecology Steering Committee and the coordination of plant environmental protection.

Research and development  10

Audi engineers rely on efficient technology, environmentally compatible materials and lightweight construction.

Information and communication  12

Knowledge is crucial to success: Audi employees are regularly trained with regard to environmental protection and energy efficiency.

Integrated product policy  14

Environmental standards are maintained throughout the entire Audi supply chain.

Efficiency can be experienced – ecological awareness in automotive construction  16

At Audi the logistics chain is planned with the objective of protecting resources.

Ecology equates to economy  18

Audi recycles 95% of waste materials. Resources such as water and wax are reused multiple times in a cyclical process.

Intelligent, sustainable solutions  20

Vorsprung durch Technik: TDI engines with ultra-low emissions system, assistance systems, recuperation system, start-stop system.

Corporate social responsibility  22

Harmony between ecology, economy and social responsibility: Audi is intensively involved in the area surrounding its plant in Ingolstadt.

Data and facts  24

“Assuming ecological responsibility is a precondition for our commercial success.”

Dr. Dagobert Achatz, Head of Environmental Protection at the Ingolstadt Plant, AUDI AG
Foreword

“Efficiency” has long been the dictum when dealing with resources, energy production and consumption. This also applies to the environmental policy of AUDI AG. All phases of the product lifecycle of our cars, from development and production through vehicle usage to end-of-life disposal, are considered from this perspective. This particularly applies to all the resources that are used in the manufacturing of our Audi models.

This environmental declaration provides you with detailed information about the work undertaken to protect the environment at the Ingolstadt plant.

The European Union’s demanding environmental management system, EMAS (Eco-Management and Audit Scheme) was introduced as early as 1997 at the Ingolstadt plant and is optimised on an ongoing basis in the interest of continuous improvement. A worthwhile commitment, because by passing the monitoring audit for the Audi plant in Ingolstadt in April 2011, the environmental assessors of DEKRA Certification GmbH confirmed the environmental management systems established at Audi according to the EC Eco-Management and Audit Scheme (EMAS) and ISO 14001:2004. The plant has thus been the proud bearer of the EMAS seal of approval for more than 14 years! These certifications are proof of the continuous enhancement of our environmental achievements.

In 2010 the new European standard for energy management was integrated into the existing environmental management system. That makes Audi the first company to be awarded the DEKRA certificate for the new standard in a car plant. The DIN EN 16001 standard places particularly stringent demands on the continuous and systematic reduction of energy consumption. To do justice to the growing significance of the array of energy-related issues, Audi’s environmental policy was supplemented with a passage on the “sparring and efficient use of resources”.

A properly functioning environmental management system requires that employees from every department are included and informed, that new developments are initiated and followed up, and that there is an exchange of ideas and experience with other companies. Environmental protection is an important component of the Audi Production System (APS). In the context of the APS “Environmental Protection” module, employees are made aware of environmental issues and qualified in them – from trainees to group leaders. Climate protection plays a special role in this philosophy. In order to reduce CO₂ emissions even further, the sparing use of resources and the reduction of energy consumption serve as the benchmark for every step in production. After accounting for the planned production increase up to 2020, AUDI AG has set itself the goal of lowering the specific plant and company-related CO₂ emissions by 30 percent compared to 1990.

This can be achieved, on the one hand, only by means of continuous process optimisation and, on the other hand, by taking energy-saving measures into account in the planning stage for plants and buildings as well as in logistics processes. The Audi Group has relied on resource-conserving logistics for many years. For example, up to 70 percent of all cars are delivered to their destinations by rail. Sophisticated systems help to ensure that packaging and transport capacity are used to optimum effect. Audi is the first company in Germany to use trains powered by means of regenerative electricity to transport its cars from the Group’s headquarters in Ingolstadt to the North Sea port of loading in Emden.

As an early adopter of “green” electricity in rail freight transport and a development partner of DB Schenker, the logistics branch of the Deutsche Bahn Group, the Audi brand is once again a pioneer in the automotive industry.

Efficient solutions such as the use of district heating, heat recovery systems and the use of modern combined power, heating and cooling plants have proven their worth at the Ingolstadt plant for many years. With the signing of the latest district heating contract, Audi will considerably extend the quantity of the waste heat used from neighbouring industrial enterprises. Audi considers the sustainable and responsible handling of the resources used, such as water, to be extremely important. Recycling and water-saving processes such as dry processing in mechanical production and cascade rinsing in the paint shop continuously reduce water consumption and the volume of wastewater. Audi is also increasingly using rainwater at the Ingolstadt plant.

The pursuit of continuous improvement is also evident in studies on the use of forward-looking regeneration forms of energy and the practical testing of innovative technologies. For example, in collaboration with Green City Energy, several roofs with a total area of 11,600 square metres were made available for photovoltaic modules at the plant grounds in Ingolstadt two years ago. In 2010 Audi installed photovoltaic modules on a further 7,500 square metres on the roof of the new body shop, meaning that there are now around 19,000 square metres available for this technology. With this addition the total yield from all the installations at the Ingolstadt plant has increased to approx. 1,500 MWh per year, around a third of which is used directly on site. In addition to new charging stations for electric cars, various production facilities will also use the eco-friendly electricity. The use of this power on-site reduces transmission losses and thus makes an important contribution to climate-friendly energy generation.

Of course Audi also places particular importance on efficiency in its cars. Fuel consumption and harmful emissions are being systematically reduced: by 2012, Audi will reduce the CO₂-emissions of its models by around 20 percent. In addition, Audi is decisively promoting electric mobility, but is also concentrating on further improving the efficiency of current power trains. Worldwide, Audi already markets 54 engine and transmission options in its models with emissions figures below 140 g CO₂ per kilometre.

Audi’s renewed participation in the fourth Bavarian Environmental Pact underscores its commitment to the environment. The motto of the Bavarian Environment Pact IV is “Sustainable Growth with Environmental and Climate Protection”. As usual, Audi will be involved in such activities as the working forums. At the end of 2009 AUDI AG reinforced its commitment to environmental protection issues: The company established the Audi Stiftung für Umwelt GmbH (Audi Foundation for the Environment) with a nominal capital of five million euros devoted exclusively and directly to charitable causes in the ecological domain.

One of the foundation’s projects is a unique research initiative dealing with important questions related to topics such as biodiversity and carbon sequestration. The basis of the project is the establishment of forest trial areas according to a special design under various climatic conditions. In this context the project can rely on a commitment from Audi that provides for the creation of such forest areas at international locations. As a first step, 36,000 oak trees have been planted in the vicinity of the Ingolstadt plant. The project is currently being expanded to include other Audi plants.

Last year the stops on our visitor route in the production facilities were revamped. Insights into the production processes at the Ingolstadt plant as part of special environmental-related visitor tours are part of our comprehensive information policy.

I hope you find this to be an interesting and enlightening read.

Peter Kößler
Plant Manager, Ingolstadt
Environmental Management Representative

Peter Kößler, Plant Manager, Audi Ingolstadt

Conservation of resources and climate protection are key components of the Audi corporate philosophy.
The environmental policy of AUDI AG – globally uniform standards

Preamble
AUDI AG develops, produces, and sells cars worldwide. The goal is to guarantee individual mobility. It also bears responsibility for the continuous improvement of the environmental compatibility of the products and production facilities, as well as for the environmentally compatible use of natural resources. The development status of advanced technologies is taken into account for this purpose, from both ecological and economical viewpoints. AUDI AG makes these technologies available worldwide, enabling their application throughout the entire process chain. At all of its locations, it is a partner for the community and the political establishment, thus contributing to positive social and ecological development in a sustainable manner.

1. AUDI AG offers high-quality cars, which meet their customer’s expectations in terms of environmental compatibility, economy, safety, quality and comfort in equal measure.

2. Research and development are components of Audi’s environmental policy. AUDI AG develops ecologically efficient processes and concepts for its products, thus increasing their international competitiveness.

3. It is the declared goal of AUDI AG to foresee and avoid any harmful effects on the environment in all of its activities. The focus here is particularly on the sparing and efficient use of resources and energy. Compliance with environmental regulations is a matter of course.

4. The environmental management of AUDI AG, together with supplier companies, service providers, trading partners and recycling companies, ensures that the environmental compatibility of the cars and production plants is continuously improved.

5. The Executive Board of AUDI AG is responsible for adherence to the environmental policy as well as the functionality of the environmental management system. There are regular checks of the environmental policy with regard to its suitability and fitness for purpose, and – insofar as necessary – updates.

6. An open and clear dialogue with customers, dealers and the public is a matter of course for AUDI AG. Cooperation with politicians and local authorities is on a basis of trust. It also includes emergency precautions and emergency maintenance at the individual production sites.

7. All employees of AUDI AG are informed, qualified and motivated in environmental protection as appropriate to their function, so that their sense of responsibility for the environment is encouraged. They are committed to these principles.

8. This environmental policy is binding for all AUDI AG plants and is supplemented or substantiated by the formulation of plant-related primary areas of activity.
Ingolstadt plant – Audi relies on Germany as a location for industry and business

The Ingolstadt plant has existed since 1949. Auto Union GmbH, the predecessor to AUDI AG, set up its company headquarters here and produced motorcycles, light vans and spare parts. Today the Audi plant in Ingolstadt houses not only the headquarters but also the largest and most important production facility in the Audi Group. Around 32,000 employees work on the 210 hectare premises – in research and development, production, logistics and administration. Audi produces the A3, A4, A5 and Q5 model series as well as components of the Audi TT in Ingolstadt. Numerous suppliers have set up plants in the area.

The company premises
Around 914,500 square metres of the company premises in Ingolstadt are covered by buildings. In the south and southeast, the company premises are adjoined by a general residential area and to the north and east there is an industrial area. Along the southwest border of the Audi plant there is a general residential area. A stream flows through the company premises, in part above ground.

Development, Production and Logistics
The plant premises house the production facility with the pressing shop, the body shop, the assembly shop, component production and the paint shop. Technical Development is located in the northwest. The Audi Museum, the Customer Center and the glass “Market and Customer” building are arranged around the Audi Piazza. The latter houses workstations for more than 600 employees in the Sales, Marketing and Public Relations departments, as well as service facilities for customers and visitors, such as Audi Bank direct, a travel agency, the Employee Vehicle Centre and Audi Personnel Service. The Piazza associated with this forum offers space for open-air events, while the Piazzetta with its pools and lawns, trees and shrubs, is the perfect place to relax. The heating requirements of the site are covered by two heating plants, one combined power, heating and cooling plant, and connection to a district heating system. Audi treats its wastewater in two decentralised wastewater plants. Other important facilities include the buildings of the works fire brigade, car washes, filling stations, a waste materials facility and a recycling collection point. The site has its own rail connection and is adjacent to the freight transport centre, which was established in 1995 and where numerous suppliers have set up shop.

The protection of the environment is a top priority
Overall responsibility for environmental protection lies with the Executive Board, which entrusts the member of the Production division with the execution of the environmental protection tasks. The Director of Production is thus responsible for compliance with the environmental policy. According to § 52a of the Federal Emission Protection Act he is also obligated, among other things, to monitor compliance with the legal environmental provisions for systems requiring approval. However, as he is entitled to delegate these tasks, the Director of Production passes them on accordingly to the operators of environmentally relevant systems. The “Plant Environmental Protection” department is responsible for company and plant-related environmental protection. The head of the “Plant Environmental Protection” department in Ingolstadt also conducts the coordination between plants on Plant Environmental Protection topics at AUDI AG. For each location the Executive Board nominates the Head of Plant Environmental Protection as the Plant Environmental Protection Representative and assigns him or her the task of ensuring that each plant satisfies the legal provisions. In addition to this, all plants each have their own environmental management representative, who is responsible for the successful implementation of the environmental management system. In Ingolstadt this role is assumed by the Plant Manager. At the same time, he/she also performs the function of the energy management representative.

Organisation of Environmental Protection

The Ingolstadt plant – Audi relies on Germany as a location for industry and business

The Ecology Steering Committee
Bodies coordinate environmental protection on two levels within the company. The Environmental Protection Coordination Group, headed by the Director of Production, is comprised of the respective environmental management representatives of the Group companies Audi Ingolstadt, Audi Hungaria Motor Kft., Audi Brussels S.A./N.V. and Automobili Lamborghini Holding S.p.A. It deals with strategic environmental protection topics and commissions the environmental bodies to develop proposals in that regard. A key role is played at the level of AUDI AG by the Ecology Steering Committee, which implements the instructions from the superior Environmental Protection Coordination Group and works out appropriate environmental protection strategies. It has the task of enhancing employees’ ecological awareness and of employing task forces made up of members of different departments and from different plants to develop and implement environmental protection topics. As necessary, several task forces on topics such as Sustainability, Environmental Audit, Environmental Management and Integrated Product Policy are subordinated to the Ecology Steering Committee. They develop environmental protection programmes, generate a communication concept, make proposals for strategic environmental protection topics and present them to the Ecology Steering Committee.

Organisation

Director: Peter Kisslak / Management: Dr. Dagobert Achetz

Sustainability Working Group
Environmental Report Working Group
Environmental Management Working Group
IJP Working Group

*Bundes-Immissionsschutzgesetz [Federal Emission Protection Act]
Audi is a company that stands for innovation. In that respect, the employees who work in Technical Development, Planning and Production in Ingolstadt assume a key role. Preventing environmental pollution by means of foresight is considered to be the number-one principle at Audi. When developing new models, the engineers rely on efficient technology, environmentally compatible materials and lightweight construction.

**Lighter and safer**
Intelligent lightweight construction means greater safety and lower fuel consumption – groundbreaking solutions are developed in Ingolstadt. In what is known as lightweight construction quality, the relationship between weight, torsional rigidity and size, Audi is making a decisive impression on modern body manufacturing. Form-hardened steel makes the body extremely impact-resistant and saves almost a third in weight compared to conventional components. On the road that means lower fuel consumption.

LED technology reduces CO₂
Efficient, reliable, striking – Audi was the first car manufacturer to recognise the potential of the revolutionary LED lighting technology and incorporate it into vehicle development. Audi holds a technological lead of several years and is driving development forward. LEDs reduce fuel consumption. Classic dipped headlights, tail lights and number plate lights demand continuous power from the alternator. LED technology, on the other hand, gets by on less than 10% of this power output. In effect that means considerably less CO₂-emission per kilometre. And additional safety too: visibility to other road users is considerably enhanced by means of LED lighting technology.

**Neustadt Test Site**
On an extensive test site in Neustadt on the Danube, Audi engineers test their latest developments for performance, fuel consumption, wear and noise emissions. In the adjoining corrosion protection centre, vehicles are subjected to accelerated ageing processes. Audi naturally compensates for the sealed surfaces: half a million trees and shrubs have been planted around the facilities. Flora and fauna find new habitats, including various native species of animals and plants that are threatened with extinction. An expert report provides evidence of the success of the measures taken. A biotope has been created on the area formerly used for intensive farming.

**Wind Tunnel Centre**
The Ingolstadt plant has a modern wind tunnel centre with three test rigs. The heart of the 10,000 square metre area is a fan, which delivers the air into the measurement zone through a six square-metre duct. As the first facility of this type, it is possible to generate speeds of up to 300 km/h in the Audi climatic wind tunnel in Ingolstadt. In addition to heat and cold, it is also possible to simulate sunlight with up to 1,200 watts per square metre, as well as rain. It is even possible to create snow. It is thus possible to carry out trials on the cooling performance of the oil and water circuits, the engine or the interior at extremely high or low temperatures. With the climatic wind tunnel a tool has been created that will make a sustainable contribution to the reduction of CO₂ emissions. As a result of the findings made on the test rigs, it will be possible to develop improved and more fuel-efficient cooling systems for cars.

**Pre-Series Centre**
The new building for the Audi Pre-Series Centre (“Vorsieren-Center” – VSC) was completed in 2008 at the Ingolstadt plant. The interests of Technical Development and Production are combined in one area of responsibility in the VSC. This form of organisation ensures that product characteristics and production techniques are sorted out early in the development phase. For example, in what is known as the “Cave” it is possible to guarantee the buildability of the prototypes in virtual terms in the initial concept phase of a product, and systematically simulate construction of the car long before the initial hardware is created. In this way it is possible to detect and remedy any problems at an early stage, and the sequence of actions in introduction can be configured even more efficiently, for example in terms of energy saving or the avoidance of waste. The five-storey building houses office space, workshops for car production and commissioning, as well as testing facilities and a logistics area.

**Research: aerodynamics and LEDs reduce consumption**
The climatic wind tunnel at the Audi plant in Ingolstadt provides findings for the development of fuel-efficient cooling systems.
Knowledge is the key to successful environmental management. Audi is fully committed to the appropriate training and education of its employees and engages in an ongoing exchange with well-known universities and research institutions.

Multipliers in environmental protection
Expertise and commitment on the part of Audi employees are crucial to the success of environmental management. The environmental protection method module is an important component of the Audi production system. Here environmental protection is actively encouraged by promoting awareness of those topics that employees can locally influence themselves. Plant environmental protection representatives, especially trained by the environment department, impart necessary knowledge to their colleagues, instruct them in environmentally compatible behaviour and inform them about the latest developments. In order to be able to optimally carry out their roles, the environmental representatives attend further training events several times a year, organised by the Environmental Protection department. These training sessions cover current events such as changes in environmental legislation or construction activities, but also more elevated topics such as CO₂ emissions trading. In order to identify energy saving potential, a “team of energy delegates” examines possible ways of using energy even more efficiently, together with the local workforce. Prospective production team leaders receive detailed information about plant environmental protection at Audi in the course of their internal further training. Furthermore, Audi makes its environmental protection transparent by means of numerous publications, for example in the annual environmental declarations and in the Audi environmental magazine.

The topic of the environment in vocational training
Audi offers apprenticeships in 22 occupations. Environmental protection is regularly featured on the timetable. The teaching covers topics such as heat recovery, water pollution prevention, emissions protection, waste prevention, noise pollution prevention, environmental law and environmental management. There is a training day once a year on a particular environmental topic for each of the occupational groups.

Guided tours of the plant
Plant tours are regularly organised in Ingolstadt on the topics of “The ecological side of production” and “A plant tour with the environmental bus”. These focus on providing information about modern environmental protection measures, in particular about emissions protection. The basic principles of combined power, heating and cooling plants, water cycles and the elaborate technology of industrial wastewater treatment in the Ingolstadt plant are explained in detail.

Cooperation with Universities and Research Institutes
Audi has cooperated in projects with several universities and research institutes in recent years. A strategic partnership exists with the University for Applied Sciences FH Ingolstadt: The competency area of “Production and Automation Technology” was created at the Institute for Applied Research with the support of AUDI AG. Projects from the topic areas of mobile robotics, body manufacturing, automation technology, resistance spot welding, paint mixing processes and logistics are brought together here.

In one study, Audi specialists have already investigated how butyl glycol/water mixtures from the paint shops can be recycled in alternative ways in order to reduce non-recyclable waste. Further environmental lifecycle assessments in the context of vehicle exterior corrosion protection have been produced by Audi in collaboration with the Bavarian Institute for Applied Environmental Research and Technology (Bayerisches Institut für Angewandte Umweltforschung und -technik GmbH).
Environmental protection covers the entire lifecycle of the car at Audi. From the extraction and preparation of raw materials through manufacturing, transport, marketing and usage to end-of-life disposal, all of the phases are optimised from an ecological point of view. This principle is called Integrated Product Policy (IPP) and stands as a synonym for the environmentally compatible development of processes and products.

Integrated approach
Audi considers the product lifecycle as a whole: from the extraction of raw materials through manufacturing, sales and usage right up to waste disposal. In order to reduce the environmental pollution produced by a car, it is necessary to take into account the environmental effects at every stage in its production and usage. Integrated Product Policy includes protection of the environmental media of ground, water and air, as well as global resources. Production paths are viewed in their context in order to prevent the mere displacement of pollution.

Throughout the value-added chain
Key elements of the Integrated Product Policy are cooperation and communication between the players throughout the value-added chain. On the one hand, each of the suppliers that have a direct or indirect influence on the product characteristics must exercise its design options. At the same time, the suppliers must be aware of the consequences of their actions with regard to other phases in the product lifecycle. In this way, sustainability is created in the supply chain.

Simultaneous engineering
At Audi, environmental protection starts where the greatest effect can be achieved: in product design and development. Audi employs simultaneous engineering from the initial planning phase onwards. This takes the form of the parallel processing of tasks in technical development. All those involved in the creation of a vehicle, including the suppliers, strive to integrate environmentally relevant aspects into all processes. One such measure, for example, means that subsequent recycling and ease of repair are already taken into account in the selection of materials. All of the production phases are also optimised from an ecological point of view by means of simultaneous engineering.

Audi environmental standards
In the context of its integrated approach to vehicle and component manufacturing, usage, maintenance, repair and end-of-life vehicle disposal, Audi communicates clear requirements to the supplier industry. In their development activities, all production partners focus on the avoidance of harmful substances, the conservation of resources and the recycling of materials. Audi must be notified of all environmentally relevant components by type and quantity, as well as any treatment and disposal information. All Audi production partners can verify current specifications with an online database via an electronic supplier link. In the system they will find a list of all the directives and standards that Audi demands in its "Specifications for Environmental and Human Compatibility" (Lastenheft Umwelt- und Humanverträglichkeit) and its "Group Environmental Standard, Vehicles" (Konzern-Umweltnorm Fahrzeuge). A further, similarly Internet-based database provides details relating to material description, which Audi has produced in collaboration with the other car manufacturers and with the support of the VDA, the German Association of the Automotive Industry.
With this “International Material Data System” (IMDS), the partners in the supply chain communicate the material content of their products to each of their customers. Finally this information arrives at the end of the chain, in the Ingolstadt plant. Audi then checks whether the material content corresponds with their own specifications and with the legal requirements.

Dual-Victory Strategy
The integrated consideration of the entire product lifecycle opens up new ecological potential, both in product-related environmental protection and in the design of processes. Integrated product policy is a concrete problem-solving approach at Audi Ingolstadt. In doing so, Audi aims not only for ecological improvements but also for sustainable concepts that deal with economic as well as social aspects. Consideration of the entire lifecycle in the development phase of the car enables product design to take environmental aspects into account, with technical innovations. Less energy and materials are needed. Recycling and disposal are simpler and less polluting. Occasionally this also has a positive effect on production costs. At any rate, there is a bonus in terms of resource and climate protection as a consequence. A win-win situation for everyone!
Efficiency can be experienced – ecological awareness in automotive construction

Audi consumes energy, water and raw materials in vehicle production. Waste materials, wastewater and emissions are created in the process. Both input and output are reduced to the absolute necessary minimum by the Ingolstadt plant. The “closed loop principle” has a particularly positive effect. Resources such as water or wax are reused several times in the production process. It is a primary principle at Audi to foresee and prevent environmental pollution.

Pressing shop

The pressing shop in Ingolstadt produces sheet metal components for the bodies of the A1, A3, A4, A5, Q5, Q7 and TT models. An average of 1,700 tonnes of sheet steel and aluminium in the form of coils are processed there every day. Rolls of sheet metal weighing up to 30 tonnes each are cut into blanks and pressed into the required shape. The material that is not needed is cut off in the process and completely recycled. After the finished sheet metal components have been stacked in special containers, the body shop can access them.

Ingolstadt has what is currently one of the most modern presses for large body components. As a result of its power – total pressing force of 7,700 tonnes at a maximum speed of 16 strokes per minute – it replaces three hydraulic pressing lines of an older design. The compact cube form guarantees a minimum transportation volume. At the same time, experts minimise the amount of sheet metal waste in the product planning phase.

Shocks and vibrations

Every meeting of the two halves of the die, weighing up to 22 tonnes, causes noise and vibrations. The shocks and vibrations from up to 500,000 strokes a day are virtually eliminated by positioning the presses not directly onto the concrete foundation but onto coil springs, which absorb the vibrations to a large extent.

Body shop

Robots weld together individual components of steel and aluminium into subassemblies to create a vehicle skeleton. Various jointing techniques are used. Innovative spot-welding, laser-welding and adhesive techniques reduce the consumption of operating materials.

Use of compressed air in the laser cutting of form-hardened components

After the forming process in the hot forming lines, high-strength sheet metal components are further processed using a laser. This cuts out the necessary holes in the sheet metal component. To do this, Audi has replaced the customary cutting gas nitrogen with conventional compressed air. The annual consumption of 600 tonnes of nitrogen has been completely eliminated, leading to an avoidance of 300 tonnes of CO₂.

Use of drawing compounds and hydraulic oils

In the pressing shop, oils are used for the presses and for sheet metal forming. The changeover from hydraulic to mechanical press drive systems means that it is possible to reduce the consumption of hydraulic oils and electrical energy. The basic oiling of the metal performed by the sheet metal manufacturer makes the addition of drawing compound virtually superfluous. As a result of the delivery quality, it is possible to dispense with the otherwise normal washing procedures before forming.

Recycling of residual metals

There is a recycling loop for unused sheet metal: during the manufacturing process, offcuts fall through chutes onto a conveyor belt in the press shop cell. The residual metal is conveyed to a packing press, which compresses every 300 kg of loose sheet metal offcuts into a compact cube. These cubes are returned by rail to the manufacturer and are melted down again there. To the extent possible, the metal offcuts accumulated in the pressing shop are used for the manufacturing of small components. The compact cube form guarantees a minimum transportation volume. At the same time, experts minimise the amount of sheet metal waste in the product planning phase.

Phosphatising

The surface of the body must be pre-treated at the start of the painting process. Phosphatising baths protect against corrosion and result in better adhesion of the paint. This process generates rinsing water, which is polluted with nickel, manganese, zinc and zirconium. Using a split flow treatment method, it is possible to precipitate out a high proportion of these heavy metals. As a result of this process, the legal limits for discharge into the sewer system are met by a large margin.

Paint shop

Painting is the part of the process with the greatest environmental relevance. Solvent emissions have been drastically reduced since the changeover to water-based paints. All of the paints used in Ingolstadt are lead-free. The degree of automation is continually being developed in order to minimise spray losses when painting. This includes such processes as electrostatic application. Flushing systems in the spray booths reduce the release of paint particles. The extracted air from the filler and clear lacquer dryers is taken to a thermal post-combustion unit and the resulting heat is used again to heat the dryer. Closed water loops ensure a significant reduction in water consumption in the painting process.

Water: Recycling and water-saving processes contribute to the conservation of resources.
Ecology equates to economy – Audi recycles more than 95% of waste materials.

Sustainable production includes the efficient use of resources and taking into account the interests of employees. The logistics chain at Audi is efficiently planned and hence sparing in the use of resources – from the transportation of parts to the Ingolstadt plant up to the delivery of finished cars by rail. The use of energy is also efficient: The plant’s own power station supplies parts of the plant with electricity, heat and cooling.

Component production
In the Component Production department at the Ingolstadt plant, around 800 employees process engine components and running gear parts, prepare assemblies, mount and balance wheels. The most important production processes are turning, drilling, milling, clearing, grinding, honing, hardening, roller burnishing and laser notching. In this way, various unprocessed parts are turned into suspension and engine components, such as wheel carriers, brake discs, swivel bearings, connecting rods and cylinder heads. The disposal of waste, including used oil, cooling lubricant emulsions and filter elements, is strictly monitored and the accumulating metal shavings are collected as recyclable materials. Consumption has been reduced by means of systematic tracking of oil and cooling lubricants or manage entirely without them. On the material processed, these procedures require only very low quantities of cooling lubricants or manage entirely without them.

Logistics
A modern, environmentally conscious logistics system is characterised by short information and transportation paths. Systems and modules are assembled outside the factory gates and are delivered to the assembly line precisely in sequence. This concept is also based on the freight transport centre at the Ingolstadt plant of AUDI AG. In five assembly centres, module suppliers produce their subassemblies “just in time” and use their own staff and means of transport to deliver them to the assembly lines of their own accord.

Vehicle assembly
The vehicles are assembled on three multi-storey assembly lines. The individual parts assembled into subassemblies are transported by means of conveyor systems to the assembly lines. There the vehicles – attached to slides or to suspension conveyors – are moved along the line. The mounts are adjustable in height and can be adapted to suit each of the employees involved. All components are delivered in reusable packaging or recyclable non-reusable packaging. In the final production stage the engine, gearbox and vehicle electrics are installed in the body. Then it is time for the fuel tank and the pre-assembled drive train, the exhaust system, bumpers, wheels and seats. One special feature in terms of ergonomics is the design of the floor: all of the walkways are made of vibration-absorbing material. The vehicles are filled with fuel before they come off the production line and the escaping fuel fumes are immediately extracted.

Ingolstadt Cooperative Heating Network
The Ingolstadt plant has been supplied with waste heat from the Ingolstadt waste recycling facility since the beginning of 2004. By signing a new district heating agreement in September 2009 between Audi, the Ingolstadt city utilities department and Petroplus refinery, the currently contractually assured minimum quantity of 60,000 megawatt hours per year will increase to 120,000 megawatt hours per year from 2011. Audi’s long-term goal is to expand the use of district heating to 200,000 megawatt hours.

Energy supply
The savings measures of recent years, such as more energy-efficient installations and energy-optimised plant operating procedures, are having a visible effect: The energy consumption per vehicle produced is falling, even in the case of the primary consumers in the paint shop and in the body shop. Heat recovery systems, such as rotating heat exchangers, are also improving environmental performance at the Ingolstadt plant. Heating oil plays a subordinate role. Heat requirements are covered by means of a district heating connection to the municipal waste recycling facility in Ingolstadt as well as two heating plants running predominantly on natural gas and a combined power, heating and cooling plant.

Waste balance sheet
Almost no non-recyclable waste is now accumulated at the Ingolstadt plant: over 95 percent of waste is recycled. Individual materials such as scrap steel are virtually entirely reused in the context of a recycling management system.

Alternative energies
Potential studies are considering the feasibility of further energy-saving projects. Among other things, this includes the “use of forward-looking regenerative forms of energy”. For example, Audi has produced a study on the use of groundwater for cooling purposes. But it also covers the testing of innovative technologies in practice. For this purpose, Audi will provide the Munich company Green City Energy with several roofs on the plant grounds in Ingolstadt, with a total area of 11,600 square metres. The ultra-modern photovoltaic modules were installed at the end of 2009. Apart from questions concerning statics, the characteristics and outline of the roof, innovative strength, the efficiency and the energy balance of the modules played a decisive role in selecting the investor. In 2010 Audi installed photovoltaic modules on a further 7,500 square metres on the roof of the new body shop, meaning that there are now around 19,000 square metres available for this technology. The total yield from all the installations at the Ingolstadt plant has thus increased to approx. 1,500 MWh per year, around a third of which is used directly on site.

End-of-life vehicle recycling
As a result of the high proportion of recyclable materials, old cars are a significant secondary source of raw materials. All of the vehicles developed by Audi can be up to 95 percent recycled. As a manufacturer, Audi satisfies the directive about the recovery of end-of-life vehicles in Germany for all of its models. Functional electrical units such as starters and alternators are reconditioned at the Ingolstadt plant. Audi customers can decide for themselves in the event of a repair whether their car is to receive a new component or an equally functional reconditioned unit.
Intelligent, groundbreaking solutions – Vorsprung durch Technik

For decades Audi has been building highly efficient internal combustion engines, which are being continuously improved. This applies not only to TDI* diesel engines, which with the ultra-low emission system already beat the strictest pollution limits announced in Europe and the USA, but also to the current TFSI** petrol engines. But the engine is only half the story when it comes to fuel consumption. For that reason, Audi examines every single vehicle component for its fuel-saving potential.

Assistance systems
Intelligent technical details enable a more efficient use of fuel. Gearshift displays in the driver’s line of vision show in which gear the least emissions will be released, depending on the current engine load and engine speed. Another innovative approach is the recommendation of the route that promises the lowest fuel consumption. The fuel consumption factor is added to the computational logic of the navigation system for that purpose.

Recuperation system
A recuperation system recovers energy during braking and coasting, and stores it temporarily in a battery. When a conventional vehicle slows down, part of its kinetic energy is converted into heat by the brakes. It is thus released into the environment unused, as a loss. Audi’s recuperation system converts the kinetic energy into usable electrical energy.

Start-stop system
Start-stop functions have a similarly positive effect on energy management. They avoid the inefficient idling phases when the vehicle is stationary. The internal combustion engine is switched off after the vehicle has stopped. The energy requirements of the electrical system are covered by a battery.

Modular Efficiency Platform
The start-stop system and recuperation are only two of the technology modules that Audi combines under the term “Modular Efficiency Platform”. This platform includes many other innovations – even more efficient engines, an even wider range of high-tech gearboxes, as well as new mechanical and hydraulic ancillary units such as power assisted steering pumps and alternators with low energy consumption.

Sophisticated exhaust emission cleaning already beats future limits.

*TDI: Turbocharged Diesel Injection
**TFSI: Turbo Fuel Stratified Injection

TDI
TDI evolution: Audi develops efficient diesel technology
Corporate Social Responsibility – Harmony between ecology, economy and social responsibility

Basic principle: responsible action.

Bavarian Environmental Pact
Audi’s renewed participation in the fourth Bavarian Environmental Pact underscores its commitment to the environment. The motto of the Bavarian Environment Pact IV is “Sustainable Growth with Environmental and Climate Protection”, Audi is involved in such matters as the installed working forums “Integrated Product Policy (IPP) and Resource Efficiency” and “Management Systems”. The goal of both working forums is to ensure that the experience acquired by Audi and other big companies in the subject area of Integrated Product Policy (IPP) and in the field of environmental management systems is made available to small and medium-sized enterprises. This is the only way to achieve the aim of enhancing the power of innovation and bringing about sustainable growth.

Creating attractive working conditions
Motivated and committed employees secure the success of the company. Employee identification with the brand is very high at Audi. In the Universum “Ideal Employer” ranking, the Ingolstadt car company has repeatedly been voted into first place by engineering graduates. Audi is also in the top five among economics and business students. When choosing an employer, a good working atmosphere plays a key role, but so do factors such as fascinating products, market success, interesting work, as well as secure employment and personal development possibilities.

Enhancing the quality of life
Audi makes an active contribution to enhancing the attractiveness and quality of life of the Ingolstadt location. This involves such fundamental things as secure jobs and employee profit-sharing. Audi is intensively involved in the immediate, regional area surrounding its plant in Ingolstadt. This is also demonstrated by the establishment of an association for the development of the Ingolstadt region, together with the city, administrative districts and other companies. Its objectives include a high level of innovation in research and development in the region, as well as enhancement of the attractiveness of the region for visitors, future residents and employers.

AUDI AG has been acknowledged for its exemplary integration of people with disabilities. For that the car manufacturer will be receiving the 2011 “ComToAct” award, which is endowed by the Evangelical Reformed Church of the Swiss canton of St. Gallen and awarded by the University of St. Gallen.

Audi Stiftung für Umwelt GmbH
At the end of 2009 AUDI AG reinforced its commitment to environmental protection issues. For example, Audi established a foundation with a nominal capital of five million euros devoted exclusively and directly to charitable causes in the ecological domain.

Environmental Protection
But environmental protection at Audi does not stop at the factory gate. For that reason the car manufacturer from Ingolstadt, in cooperation with the Bavarian State Forests and the Technical University of Munich, established the “Oak Forest CO2 Reservoir” research project in the Kösching Forest. This project investigates such factors as the interactions between stand density on the one hand and CO2 capture potential and biological diversity on the other hand. The foundations for the project were laid in 2008 with the planting of around 36,000 common oaks near the Group headquarters in Ingolstadt. A second trial area with over 13,000 common oaks has already been created at the Hungarian Audi plant in Győr. An additional 10,000 trees were planted near the Audi plant in Neckarsulm at the end of November 2010. Further areas at international plants of the Audi Group are currently in the planning stage.
Data and facts

26 Environmental management system
27 Environmental performance assessment
28 Data and facts about environmental protection
31 Energy and water
32 Wastewater
34 Waste
36 Emissions
37 Noise
38 Contaminated Sites
39 Environmentally relevant systems
40 Environmental programme – Implementation status 2011
The environmental management system – continuous improvement

The Ingolstadt plant was re-examined according to EMAS II in April 2009, and at the same time re-certified according to ISO 14001. The comprehensive 2009 environmental declaration for the Ingolstadt plant was checked by DEKRA Certification GmbH in this context and declared to be valid. In addition to evaluation by external auditors, internal environmental checks and management audits were also conducted. Despite the high quality of the environmental management system, internal checks repeatedly result in improvement potential across all business processes and procedures. The certain compliance with legal provisions and Audi standards is of primary importance in this context. The environmental management representative is regularly informed about the essential results of the internal checks and the trends displayed by the figures, data and facts in environmental protection. Once a year, in the management review, there is an assessment of the system by top management. The results of the system assessment form a key basis for the derivation of the environmental targets in the next cycle. In the internal audits in 2009 the focus was on the production process. In 2010 and in the first quarter of 2011, environmental management audits and technical environmental audits were carried out across all core business processes as well as the support and control processes, taking into account direct and indirect environmental aspects. Here the focus was on the product development process. The essential basis for this is the environmental policy of AUDI AG. Overall, proof was provided that the environmental management system at the Ingolstadt plant is suitable for continuously improving the environmental protection performance at the plant and achieving the environmental targets. As a component of the Audi Production System (APS), the environmental protection module core module remains an integral part of the environmental management system. In 2009 the environmental protection module core module was supplemented by environmental protection issues in the office area that employees can influence. The Group project “Sustainability in the supply chain” will be continued on an ongoing basis for Audi suppliers in the future. The objective is for all suppliers along the entire supplier chain to adhere to the environmental standards prescribed by Audi. Audi engages in an open dialogue on the subject of environmental protection in a number of ways. The public and interested groups such as customers, neighbours and non-governmental organisations (NGOs), government and official body delegations, and suppliers are included in communication in the context of the environmental management system. Furthermore, Audi is committed to the environment at all of its plants and facilities and pursues a comprehensive information policy, e.g. through “Dialogues – The Audi Environmental Magazine”, which was published in March 2009. In the next few years, Audi will be even more committed to the further development of eco-friendly production processes and technologies. The early integration of environmental protection aspects into all environmentally related planning processes is guaranteed by the environmental management system.

Environmental performance assessment

Environmental performance assessment: Rise in absolute pollution in 2010

Audi uses an environmental performance assessment system based on the methodology of the Swiss Federal Office for the Environment, Forestry and Agriculture (BUWAL) in order to record the environmental effects resulting from the activities at the plant. Audi uses an environmental performance assessment system based on the methodology of the Swiss Federal Office for the Environment, Forestry and Agriculture (BUWAL) in order to record the environmental effects resulting from the activities at the plant. This process has been adapted to the circumstances at the Ingolstadt plant by the application of appropriate ecological factors. The scientific system according to BUWAL is based on the aspect of the ecological shortage of a resource, calculated from the current and critical flow. Subsequently an eco-factor is calculated, which is multiplied by the emissions or the consumption of a resource. This produces environmental pollution points, which are used for absolute and percentage-based evaluations of the environmental effects. The major environmental effects at the plant in 2010 are again attributable to energy consumption as well as solvent emissions and traffic or noise (see chart). When compared with the “Wastewater” section).

The increase in environmental pollution points for solvent emissions is predominantly attributable to a legally required change in the recording method and scope. Noise emissions changed only minimally from 2009 to 2010, such that there is no change in the environmental pollution points in this context.
The input-output balance sheet provides information about the incoming and outgoing material and energy flows at the Ingolstadt plant in 2010, as well as about the changes in them compared to the previous year. For example, aluminium consumption increased as a result of the increased use of aluminium components in new models, among other things. Steel consumption has risen only slightly due to the vehicle programme and increase in the degree of material use. On the other hand, the steel scrap percentage rose in comparison with the previous year as a result of the increasing proportion of parts deliveries to China (CKD*-production). Products that have been delivered from the Ingolstadt plant to other Audi plants are also included. Furthermore, products and manufacturing depth differ between the individual plants and also within the industry. So it is only possible to make a qualified direct comparison of input/output data. For this reason, Audi Ingolstadt usually presents its environmentally relevant material and energy flows in absolute quantities.

Changes according to EMAS III

The input-output balance was also supplemented by indicators called for in EMAS III Annex IV. The key performance indicator for the total consumption of renewable energy consists of the quantity of electricity from regenerative energy and the district heating supplied to Audi (waste heat from the Ingolstadt waste recycling plant). The product output corresponds to the total output quantity of all vehicles produced and parts delivered to other sites (spare parts, CKD volumes, painted bodies and parts of the pressing shop). The total emissions of greenhouse gases in t CO₂ equivalent consist of the greenhouse gases SF₆, CO₂ and refrigerant from stationary plants that were emitted at the Ingolstadt plant.

To determine the SO₂, NOX and PM emissions, the major emission sources at the plant were considered. The area consumption refers to the sealed area of the plant grounds. In addition, EMAS III demands publication of the core indicators, which refer to the total output quantity. Audi meets this requirement by means of the tables shown on the right, however, for the sake of greater clarity the core indicators refer to the total output quantity in kilotonnes (≈ 1000 tonnes) (see output table, page 30). In the area of material efficiency at the Ingolstadt plant Audi refers to the most important environmental impacts, which are directly related to the use of steel and aluminium materials and the use of paints and fillers.

Both indicators are supplemented in each case by the standard industry indicator for the pressing shop (degree of materials usage %) and for the paint shop (specific solvent emissions in g/m²). For the key area of waste, indicators are generated for the major hazardous and other wastes respectively. A higher indicator, relating to the total waste volume at the plant, rounds off the picture. By means of the new core indicators, Audi ensures that the environmental performance of major environmentally relevant processes at the plant are presented in an undistorted and comprehensible manner. However, a direct comparison of the core indicators with other sites is not possible due to the different manufacturing processes.

Significant changes compared with 2009 – Data and facts about environmental protection

<table>
<thead>
<tr>
<th>Core indicators 2009/2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Period</td>
</tr>
<tr>
<td>General Information</td>
</tr>
<tr>
<td>Energy: Total direct energy consumption (MWh) / Total output (kt)</td>
</tr>
<tr>
<td>Water: Water consumption (m³) / Total output (kt)</td>
</tr>
<tr>
<td>Biological diversity: Area consumption (sealed area in m²) / Total output (kt)</td>
</tr>
<tr>
<td>Emissions: Total emissions of greenhouse gases (t-CO₂ equivalent) / Total output (kt)</td>
</tr>
<tr>
<td>Material efficiency</td>
</tr>
<tr>
<td>Material use (steel and aluminium) / Total output (t/kt)</td>
</tr>
<tr>
<td>Degree of material usage in %</td>
</tr>
<tr>
<td>Paints and fillers / Total output (t/kt)</td>
</tr>
<tr>
<td>Waste</td>
</tr>
<tr>
<td>Total waste / Total output</td>
</tr>
<tr>
<td>Major hazardous waste types</td>
</tr>
<tr>
<td>Emulsions / Total output (t/kt)</td>
</tr>
<tr>
<td>Butylglycol water mixture / Total output (t/kt)</td>
</tr>
<tr>
<td>Paint sludge / Total output (t/kt)</td>
</tr>
<tr>
<td>Moulding sand / Total output (t/kt)</td>
</tr>
<tr>
<td>Neutralisation sludge / Total output (t/kt)</td>
</tr>
<tr>
<td>Other important waste</td>
</tr>
<tr>
<td>Metal waste / Total output (t/kt)</td>
</tr>
<tr>
<td>AEV* with sorting / Total output (t/kt)</td>
</tr>
<tr>
<td>AEV* without sorting / Total output (t/kt)</td>
</tr>
</tbody>
</table>

*CKD production (CKD-Stand for “well completely knocked down”); i.e. completely dismantled, and this means that a vehicle is packed in its individual components, dispatched and assembled locally.

*AEV: Waste for use as energy
<table>
<thead>
<tr>
<th><strong>Energy</strong></th>
<th><strong>In GWh</strong></th>
<th><strong>%</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Heat</td>
<td>1.150</td>
<td></td>
</tr>
<tr>
<td>District</td>
<td>0.120</td>
<td>10,5</td>
</tr>
<tr>
<td>Natural</td>
<td>0.274</td>
<td>23,9</td>
</tr>
<tr>
<td>Electric</td>
<td>0.553</td>
<td>47,7</td>
</tr>
</tbody>
</table>

**Water**

More widespread use of rainwater

The increased usage of rainwater at the plant contributes to the conservation of natural water reserves. Rainwater is collected in underground cisterns for this purpose, from an area of almost 450,000 square metres. With the completion of an additional rainwater reservoir with a capacity of 2,900 cubic metres in 2006, there are now a total of five rainwater reservoirs available with a total capacity of over 14,000 cubic metres. The volume of rainwater used in 2010 at the Ingolstadt plant amounted to a new record figure of 264,553 cubic metres. For every cubic metre of wastewater that is discharged into the sewer system, AUDI AG has to pay a wastewater fee. As considerable quantities of the water used during production either evaporate, are disposed of externally or are passed onto the product, AUDI ensures that the actual water flows in the system in 2008, 2009 and 2010. The slight reduction in the quantities of water discharged is primarily attributable to the cost savings in 2009 and 2010. As a result of this, less water evaporated in the area of the cooling towers. The increase in the consumption of drinking water is attributable in part to the insourcing activities in the black parts paint shop.

**Unit and output**

<table>
<thead>
<tr>
<th><strong>Input</strong></th>
<th><strong>2009</strong></th>
<th><strong>2010</strong></th>
<th><strong>Unit</strong></th>
<th><strong>Delta%</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw materials</td>
<td>338,016</td>
<td>334,432</td>
<td>t</td>
<td>-1,1</td>
</tr>
<tr>
<td>Aluminium</td>
<td>9,249</td>
<td>10,573</td>
<td>t</td>
<td>14,3</td>
</tr>
<tr>
<td>Process agents and additives</td>
<td>6,179</td>
<td>6,583</td>
<td>t</td>
<td>6,5</td>
</tr>
<tr>
<td>Oils</td>
<td>374</td>
<td>411</td>
<td>t</td>
<td>9,9</td>
</tr>
<tr>
<td>Bonding agents and pigment paste</td>
<td>3,029</td>
<td>3,395</td>
<td>t</td>
<td>12,0</td>
</tr>
<tr>
<td>Antifreeze agents</td>
<td>1,951</td>
<td>2,304</td>
<td>t</td>
<td>17,1</td>
</tr>
<tr>
<td>Metal processing fluid</td>
<td>167</td>
<td>169</td>
<td>t</td>
<td>1,2</td>
</tr>
<tr>
<td>Oxygen and nitrogen</td>
<td>9,328</td>
<td>7,900</td>
<td>m³</td>
<td>-19,6</td>
</tr>
<tr>
<td>Antifreeze agents</td>
<td>1,951</td>
<td>2,304</td>
<td>t</td>
<td>17,1</td>
</tr>
<tr>
<td>Oils</td>
<td>374</td>
<td>411</td>
<td>t</td>
<td>9,9</td>
</tr>
<tr>
<td>Bonding agents and pigment paste</td>
<td>3,029</td>
<td>3,395</td>
<td>t</td>
<td>12,0</td>
</tr>
<tr>
<td>Antifreeze agents</td>
<td>1,951</td>
<td>2,304</td>
<td>t</td>
<td>17,1</td>
</tr>
<tr>
<td>Metal processing fluid</td>
<td>167</td>
<td>169</td>
<td>t</td>
<td>1,2</td>
</tr>
<tr>
<td>Oxygen and nitrogen</td>
<td>9,328</td>
<td>7,900</td>
<td>m³</td>
<td>-19,6</td>
</tr>
</tbody>
</table>

**Output**

Products* | 598,761 | 553,533 | Items | -7,7 |

**Carboxylic acids, Ingolstadt** | 566,158 | 533,010 | Items | -5,8 |

In cooperation with Glyd* | 32,603 | 38,541 | Items | 18,2 |

Product output, total output quantity of all products | 933,679 | 1,032,899 | t | 10,1 |

**Waste**

Waste | 24,898 | 27,624 | t | 10,9 |

Waste for recycling | 17,560 | 20,192 | t | 14,7 |

Waste, hazardous waste | 6,986 | 8,508 | t | 23,4 |

Residual waste | 10,574 | 11,684 | t | 10,9 |

Waste for disposal | 7,338 | 7,432 | t | 1,3 |

Hazardous waste | 6,845 | 6,937 | t | 1,4 |

Residual waste | 493 | 495 | t | 0,4 |

Scrap | 186,359 | 251,079 | t | 39,3 |

Wastewater | 885,900 | 1,097,281 | m³ | 23,9 |

**Extracted air**

CO₂ | 140,819 | 148,134 | t | 5,2 |

Organic solvents*** | 964 | 1,154 | t | 19,2 |

Solvent emissions*** | 21 | 23,2 | g/m³ | -10,9 |

Total emissions of greenhouse gases (t-CO₂ equivalent) | 147,662 | 152,518 | t-CO₂ equivalent | -3,5 |

SO₂ | 0,91 | 1,00 | t | 9,9 |

NOₓ | 183,68 | 180,18 | t | -1,9 |

PM₁₀ | 23,17 | 19,25 | t | -17,3 |

**Biological diversity**

Area consumption (sealed area) | 187,51 | 187,51 | Hectares | 0,0 |

* OECD production from 2010 (EIO) stands for “overall systemic production”, i.e. completely dismantled and this means that a vehicle is packed in its individual components, dispatched and assembled locally, e.g. in India.

** CO₂ emissions emitted directly at the plant.

***Modified basis for calculation: Solvent balance acc. to 31st German Federal Emission Protection Ordinance (BImSchV) from 2010.
Regular wastewater analyses
This wastewater is analysed every day in order to check compliance with the prescribed limits. Thanks to a reliable and effective cleaning process, the limits for harmful substances are met by a large margin, as is confirmed by the results of the investigations. Wastewater that might possibly contain oil residues is passed by Audi through what are known as oil separators (volatile liquid separators). These separate such substances as grease, oil and petroleum from the watery phase so that they can be disposed of separately. The wastewater quantity per vehicle has increased in line with the total water consumption, to 1.9 cubic metres. In the reporting year a concept study was prepared on recycling, and hence on the reduction of water consumption. This is primarily intended to counter the increasing consumption in production. In 2010 there was increased demand for water resulting from the insourcing of paint jobs in the area of black part painting and the associated changeover from 2-shift to 3-shift operation primarily in this area as well as in the area of body painting.

Calculation of the water volumes demonstrably not discharged into the sewer system
The total sum of the wastewater demonstrably not discharged is calculated from the following areas:

Cooling towers
The evaporation in the cooling towers is calculated from the difference between the make-up feed (metered) and blowdown (metered).

Paint shops
There are many processes involving evaporation in the paint shops. In the case of dip-painting processes, water evaporates directly out of the baths and the dryer stages. Along with direct evaporation from the paints and washing out, air humidification also plays an important role in the area of paint shop N56. The water content in the separately disposed paint sludge from the coagulation process and in the separately disposed butyl glycol/water mixtures is to be considered of lesser importance.

Most water flows can be recorded in terms of volume with flow meters. There are, however, also some split flows that cannot be detected, or water volumes in paint sludge and separately decontaminated waste that can only be estimated. In these cases, the choice of system limits for the individual areas is of crucial importance. This is because all of the aforementioned individual items can be worked out by means of a difference calculation (inflow into the system minus outflow from the system). In the case of inflows, the inputs of Kösching water as well as process water and drinking water into the processes involving intensive evaporation are all taken into account. The outflows from these processes are recorded accordingly. The difference between the metered inflows and outflows corresponds to the demonstrably non-discharged wastewater volumes.

Separately disposed of oil/water mixtures
Some oil/water mixtures used to be disposed of externally, so the proportion of water (90 percent) did not get into the sewer system. With the commissioning of an emulsion vaporisation plant on the plant premises, used emulsions and washing water have been separated at the plant since 2006. The proportion of non-discharged water is reduced as a result.

Passed on to the product
The cars produced must be filled with coolant water and the windscreen washing system must be topped up. Audi estimates around 5.5 litres of coolant water per vehicle, and around 2.25 litres for the windscreen washing system.

Use of rainwater (precipitation in m³)

<table>
<thead>
<tr>
<th>Period</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Precipitation</td>
<td>174,600</td>
<td>181,069</td>
<td>213,891</td>
<td>184,577</td>
<td>141,953</td>
<td>238,799</td>
<td>211,495</td>
<td>236,226</td>
<td>264,553</td>
</tr>
</tbody>
</table>
The total amount of waste accumulated at the Ingolstadt plant in 2010 was 27,624 tonnes, which represents an increase of 10.9 percent compared to 2009. At the same time the quantities of hazardous waste per vehicle increased by 3.0 kilograms. What is striking when analysing the individual waste types is the increase in emulsions. There were 869 tonnes more in 2010 than in 2009. This is due to increased washing and rinsing procedures.

Due to the decrease in moulding in the experimental foundry of the Technical Development facility, the moulding sand quantities fell by 159 tonnes. At around 3,367 tonnes, the rinsing liquid from paint shop N56 accounts for the largest amount of hazardous waste to be disposed of externally. In order to reduce the associated high costs, experiments were carried out in 2007 with a vacuum vaporisation disposal process (AUDI AG, transporters, disposal companies) the new proof process could be applied on time on 1 April 2010. This will apply for all waste producers, transporters, recyclers and the responsible authorities. The central point is the electronic signature in place of the previous signature on paper.

The crucial factor here was an extended recording system for these types of waste. In accordance with the amended Ordinance on Waste Recovery and Disposals Records, the electronic proof procedure for all parties involved in the disposal process for hazardous wastes became compulsory on 1 April 2010. This represents an increase of 12.2 percent. The increase is above all attributable to the quantities of waste for energy recycling (+359 tonnes), paper, cardboard, cardboard boxes (+796 tonnes) and the quantity of polyethylene film (+425 tonnes). Crucial factors in this regard include a greater variety of models and parts as well as an extended treatment system. Such a system is already being employed with extraordinary success for the separation of emulsions.

Due to increased washing and rinsing procedures, the rinsing water from the filler and final paint coat facility will not be disposed of externally. In order to reduce the associated high costs, experiments were carried out in 2007 with a vacuum vaporisation system. Such a system is already being employed with extraordinary success for the separation of emulsions. A biological treatment system for rinsing water, which went into operation in 2008, has already delivered good results as a trial system. The system for plant for rinsing water, which went into operation in 2008, has already delivered good results as a trial system. The system for rinsing water from the filler and final paint coat facility will not be disposed of externally. In order to reduce the associated high costs, experiments were carried out in 2007 with a vacuum vaporisation system. Such a system is already being employed with extraordinary success for the separation of emulsions.
Emissions

CO₂ emissions
The emissions of the greenhouse gas CO₂ are of key importance for the Audi plant in Ingolstadt. In 2010 there was a rise in CO₂ emissions. For example, the directly emitted CO₂ emissions amounted to 148.134 tonnes at the plant. In 2009 this figure was 140.819 tonnes. The rise in CO₂ emissions is in part attributable to the increase in enclosed space at the Ingolstadt plant and to meteorological influences.

CO₂ emissions trading
In accordance with the Greenhouse Gas Emissions Trading Act, Audi is obligated to participate in the European-wide CO₂ emissions trading system. There are two plants involved in emissions trading at the Ingolstadt site: the "heating plant east/west" and the "combined power, heating and cooling plant". Emissions certificates for the Ingolstadt site: the "heating plant east/west" and the "combined power, heating and cooling plant". Audi employs the latest environmental protection technologies and is currently preparing for the requirements of the 3rd trading period, which will start in 2013.

Organic solvents
Audi employs the latest environmental protection technologies and is currently preparing for the requirements of the 3rd trading period, which will start in 2013.

The emissions certificates were promptly applied for and allocated. The plant received rights amounting to 135,360 tonnes of CO₂ emissions per year. The CO₂ emissions of the installations at the plant that fall below the emissions trading umbrella amounted to 108.216 tonnes in 2010. Thanks to the action taken in recent years, there are currently no charges to be expected for the plant from emissions trading in the second trading period. Audi is currently preparing for the requirements of the 3rd trading period, which will start in 2013.

Organic solvent emissions are primarily produced when painting and coating surfaces, as well as through the operation of engine test rigs. Water based paints are used for the cataphoretic dip priming coating processes. The total emissions of organic solvents (VOC) amounted to around 1.154 tonnes in 2010. As a result of the change in the method of demonstrating compliance with legally prescribed limits, there has been a considerable increase in the VOC emissions to be reported. This results in a figure of 1.95 kilograms per vehicle produced.

Organic solvent emissions are primarily produced when painting and coating surfaces, as well as through the operation of engine test rigs. Water based paints are used for the cataphoretic dip priming coating processes. The total emissions of organic solvents (VOC) amounted to around 1.154 tonnes in 2010. As a result of the change in the method of demonstrating compliance with legally prescribed limits, there has been a considerable increase in the VOC emissions to be reported. This results in a figure of 1.95 kilograms per vehicle produced. Organic solvent emissions are primarily produced when painting and coating surfaces, as well as through the operation of engine test rigs. Water based paints are used for the cataphoretic dip priming coating processes. The total emissions of organic solvents (VOC) amounted to around 1.154 tonnes in 2010. As a result of the change in the method of demonstrating compliance with legally prescribed limits, there has been a considerable increase in the VOC emissions to be reported. This results in a figure of 1.95 kilograms per vehicle produced.

Noise

Adherence to benchmarks
The system known as the industrial noise information system (BLIS) forms the basis for all noise level observations at the Ingolstadt plant. With the aid of this sonic model it is possible to produce precise noise emission forecasts for all of the measures carried out on the plant premises. The data can thus be taken into account early in the planning phase for installations or construction projects, helping to prevent or minimise the effects of noise. In 2010 Audi had to create noise quotas for a new building at the Ingolstadt plant. This was only possible by thoroughly assessing each new source of noise to be installed and identifying existing significant noise sources. As a result of a multitude of individual measures, the emissions could be kept constant or in some cases even reduced at the relevant emission locations of Audi. Refinement of the system is a focus in the daily work in this subject area. Because of the demolition of the building in need of protection at the Audi emissions location in Carl-Zeiss-Strasse, and a change of use for the site, the relevant emissions location has to be relocated. Relevant discussions are currently taking place with the responsible approval authority.

Noise emissions figures
The noise information system (BLIS) provides precise noise emission forecasts.
Contaminated Sites

Preliminary investigations and clean-up
The topic of site contamination plays an important role in all construction projects at the Ingolstadt plant. As early as in the planning phase, the Plant Environmental Protection department assesses whether pollutant contamination is to be expected, and commissions suitable preliminary investigations. In the case of changes to old installations and buildings, the focus is on tests of the building structure for asbestos, PCBs (polychlorinated biphenyls) or materials containing tar. In this way it is possible to ensure selective dismantling and the appropriate disposal of environmentally hazardous building materials. Water pollution control has top priority when planning new buildings. Above all, areas that have already been used as industrial sites before being acquired by Audi are intensively examined for groundwater pollutants. All results of these preliminary investigations will be made available to the planning departments and included in the tender documents. In this way any existing soil contamination can be removed before construction begins. Furthermore, investigations into construction water and groundwater are carried out for all building activities. This prevents surface and groundwater from being put at risk. The Plant Environmental Protection department also takes action in the area of environmentally relevant production facilities if there is a suspicion of pollution with hazardous substances. For example, Audi had already begun to clean up the subsoil in the area of the paint shop in the south of the plant premises in 1997. Following an interruption caused by comprehensive dismantling work, the clean-up was resumed in mid-2001. In the meantime 3,427 kg of solvents have been removed from soil air and groundwater within twelve years. As a result of these successful measures, it has been possible to modify the operation of the clean-up system: soil air extraction has now ceased and groundwater is now only removed and cleaned by means of a wellhead.

Environmentally relevant installations at the Ingolstadt plant

Requiring approval according to the Federal Emission Protection Act (BImSchG)

Environmental effects
Car plant
– Paint shop
– Body shop
– Assembly
– Ancillary installations (such as large-scale incinerators, waste and recycling treatment systems)

Additional plants requiring authorisation
Test rig groups (engine and transmission test rigs), storage area for crash vehicles, wind tunnel centre, emulsion evaporation plant, scrap presses

Emissions in the form of organic solvents, CO₂, SO₂, CO and NOₓ, smells, noise, water pollutants and waste, noise

In the period under review:
Federal emissions protection law approvals
– Expansion of the scrap baling press by an additional unit (2010)
– Approval process for the conversion of boiler house A12 including integration of Petroplus district heating

Federal emission control legislation related notices
– Approval of existing materials area
– Storage Facility for hazardous waste

Miscellaneous
Approval support for the Audi driving and presentation site in Neuberg. Development of the future Münchsmünster plant

Extraction of solvents (BTEX)
(from soil air and ground water in kg (since 2001) in the area of the former paint shop south)
### Environmental Programme – Implementation status 2011

#### Environmental targets, Audi Ingolstadt 2010–2017

<table>
<thead>
<tr>
<th>Individual measures</th>
<th>Environmental protection target</th>
<th>Date</th>
<th>Degree of fulfilment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Replacement of solid state laser by diode laser in body shop A5</td>
<td>Approx 95% energy savings compared to the solid-state laser, reduced CO₂ emissions</td>
<td>2010</td>
<td>Achieved saving 88%</td>
</tr>
<tr>
<td>Detailed planning of district heating usage in the context of &quot;Ingolstadt Cooperative Energy Network&quot;</td>
<td>Savings in energy/CO₂, NB emissions</td>
<td>2010</td>
<td>Completed</td>
</tr>
<tr>
<td>INI/TUM project quality control in the pressing shop</td>
<td>Reduction of reject materials and energy consumption</td>
<td>IV/2011</td>
<td>40%</td>
</tr>
<tr>
<td>Emission of the PVD dryer in the UBS</td>
<td>Energy saving</td>
<td>IV/2012</td>
<td>Completed</td>
</tr>
<tr>
<td>Introduction of a &quot;Power Management&quot; scheme</td>
<td>Optimisation of energy flows in assembly</td>
<td>IV/2013</td>
<td>50%</td>
</tr>
<tr>
<td>Equipment of new multi-storied car parks with LED lighting</td>
<td>Energy savings in multi-storied car parks</td>
<td>2015</td>
<td>20%</td>
</tr>
<tr>
<td>Expansion of the photovoltaic receptor areas to the parking decks</td>
<td>Expansion of &quot;regenerative power generation&quot;</td>
<td>2015</td>
<td>30%</td>
</tr>
<tr>
<td>Modernisation of a central boiler house by installing an energy-saving boiler and setting up a combined heat and power plant</td>
<td>Reduction of emissions and energy consumption</td>
<td>2017</td>
<td>Completed</td>
</tr>
<tr>
<td>Checking of relevant environmental aspects: sustainability in construction, energy supply and water usage</td>
<td>Development of an overall ecological concept for the newly planned driving and presentation site in Neuburg</td>
<td>III/2012</td>
<td>10%</td>
</tr>
<tr>
<td>Establishment of a system of targets for energy saving</td>
<td>Increased energy efficiency in the TE operation</td>
<td>III/2011</td>
<td>Completed</td>
</tr>
</tbody>
</table>

#### Use of mobile and stationary energy storage units on the Audi plant premises
- Conservation of resources and prevention of emissions
- Date: IV/2009
- Degree of fulfilment: Completed

#### Installation of a heat recovery system in the paint shop in the brake disc production unit
- Energy saving
- Date: IV/2009
- Degree of fulfilment: Completed

#### Set-up disruption reduction project Reducing set-up disruption times in the pressing shop by 50% on the basis of the figures from 2007
- Energy saving
- Date: I/2009
- Degree of fulfilment: Completed

#### Optimisation of the hall lighting and its control via a central control programme for ventilation in the body assembly area
- Energy saving
- Date: III/2009
- Degree of fulfilment: Completed

#### Installation of a high-speed door and optimisation of the opening and closing control of hall doors N4Z/N24
- Energy saving
- Date: III/2009
- Degree of fulfilment: Completed

#### The solvents of the paint shop are recorded with the aid of the tool. This leads to greater transparency in solvent emissions
- Production of an electronic tool for the qualification of the solvent emissions of the paint shop
- Date: II/2010
- Degree of fulfilment: Completed

#### Production of a detailed plan for the use of groundwater for cooling purposes in building A 50
- Energy saving
- Date: IV/2009
- Degree of fulfilment: Completed

#### Contaminated Sites
- Establishing the horizontal and vertical spread of lightly volatile halogenated hydrocarbons, naphtalene and toxic nuclear contamination in the subsoli
- Ground probes and groundwater analyses in the area of hall N1
- Date: III/2009 new date II/2010
- Degree of fulfilment: Completed

- Establishing the horizontal and vertical spread of lightly volatile halogenated hydrocarbons, naphtalene and toxic nuclear contamination in the subsoli
- Ground probes and groundwater analyses in the area of hall N1
- Date: II/2012
- Degree of fulfilment: 90 %

#### Organisation
- Taking into account the current plans with regard to vehicle numbers by 2015, the plan and company-related CO₂ emissions at Audi are to be reduced by 30% to means of various measures by 2020, based on 1990 figures
- Reduction of overall energy consumption by 2% in relation to annual consumption in 2008, by means of specific measures in the hall. Reduction in packaging materials by more than 25%
- Conservation of resources and prevention of emissions
- Continuation from the Environmental Programme 2006–2009
- Long-term target: IV/2020
- Degree of fulfilment: 81 %

#### Preparation of a training course on the subject of energy efficiency
- Increased efforts to raise the awareness of employees and managers on the subject of energy efficiency and conservation of resources
- Date: II/2010
- Degree of fulfilment: Completed

#### Integration of green space development into the structural planning for the plant
- Expansion of the green areas at the plant
- 20 %

#### Products
- Improved involvement of indirect employees in environmental protection procedures
- Integration of the CIP concept into the indirect area
- Date: II/2010
- Degree of fulfilment: Completed

#### 25% reduction in CO₂ emissions of the Audi models, on the basis of 2006–2012
- Conservation of resources and prevention of emissions
- Continuation from the Environmental Programme 2006–2009
- Date: IV/2012
- Degree of fulfilment: 70 %

#### Deployment of driver assistance systems to help the driver to develop an efficient driving style
- Up to 15% CO₂ savings when driving
- 2011
- Degree of fulfilment: 95 %

#### Offering more than 50 model variations with emissions figures of <= 120 g/km CO₂
- Expansion to the model range of the model series B6 and A6
- Date: 2015
- Degree of fulfilment: 30 %

#### Introduction of hybrid versions in the model series B6 and A6
- Up to 20% reduction in CO₂ emissions with the relevant products
- Date: 2012
- Degree of fulfilment: 20 %

#### Introduction of Audi models powered by CNG
- 25% reduction in CO₂ for the relevant products, compared to the equivalent petrol-driven model
- Date: 2017
- Degree of fulfilment: New target

#### Establishment of the "e-Performance Research Project"
- Pursuit of an integrated development approach to "Electric Mobility"
- Date: IV/2012
- Degree of fulfilment: 30 %

*CNG = Compressed Natural Gas

---

**Environmental protection target**

**Date**

**Degree of aspects:** sustainability in construction, concept for the newly planned driving and presentation site in Neuburg by installing an energy-saving boiler and energy consumption receptor areas to the parking decks power generation.

Expansion of the photovoltaic "regenerative power generation" scheme in assembly

Introduction of a "Power Management" scheme for optimisation of energy flows in the pressing shop

INI.TUM project quality control in the pressing shop

Precautionary Water Pollution Control

Replacement of separation installations at the plant

Optimisation of KTL/VBH processes (paint shop)

Achievement of water recycling using a membrane bioreactor

Increase in service life of welding electrodes in the platform unit in body shop A5

Increase in the level of material usage sheet metal by approx. 7% in relation to 2010, on model changeover in the pressing shop

Implementation of biological wastewater treatment for fiber and topcoat painting

Replacement of three hydraulic pressing lines by mechanical large-scale suction presses

Introduction of standardised individual bonnet packaging

Introduction of standardised external belt packaging

Extension of the service life of the cooling lubricants in cylinder head production (aluminium) from 2 to 3 years

Pilot trial in cooperation with the Technical University of Munich relating to heavy metal recycling in painting pre-treatment as a replacement for nickel precipitation

Establishing the horizontal and vertical spread of lightly volatile halogenated hydrocarbons, naphtalene and toxic nuclear contamination in the subsoli

Establishing the horizontal and vertical spread of lightly volatile halogenated hydrocarbons, naphtalene and toxic nuclear contamination in the subsoli

Conservation of resources and prevention of emissions

Conservation of energy and CO₂ reduction

Target is adjusted annually

Increased efforts to raise the awareness of employees and managers on the subject of energy efficiency and conservation of resources

Expansion of the green areas at the plant

Integration of green space development into the structural planning for the plant

Conservation of resources and prevention of emissions

Conservation of energy and CO₂ reduction

Completed

Completed

Completed

Completed

Completed

Completed

Completed

Completed

Completed
The signatories, Manuela Held, Dr Hans-Josef Dünnwald and Dr Gerhard Nagel, EMAS environmental assessors with the registration numbers DE-V-0190, DE-V-0257 and DE-V-0172, accredited or licensed for the area of the manufacturing of motor vehicles and motor vehicle components, hereby confirm their assessment that the plant and/or entire organisation, as stated in the updated environmental declaration 2011 of the AUDI AG organisation at the Ingolstadt plant with the registration number DE-155-00040 meets/meet all the requirements of the Regulation (EC) No. 1221/2009 of the European Parliament and of the Council of 25 November 2009 on the voluntary participation by organisations in a joint eco-management and audit scheme (EMAS).

By signing this declaration it is confirmed that
– the assessment and validation was carried out in full compliance with the requirements of Regulation (EC) No. 1221/2009,
– the result of the assessment and validation confirms that no evidence for non-compliance with the prevailing environmental regulations exists,
– the data and information of the updated environmental declaration of the organisation provide a reliable, credible and truthful picture of all activities of the organisation within the area stated in the environmental declaration.

This declaration cannot be equated with an EMAS registration. The EMAS registration can only be carried out by a party with jurisdiction in accordance with Regulation (EC) No. 1221/2009. This declaration may not be used as an independent basis for informing the public.

Ingolstadt, 07.04.2011

Manuela Held
Environmental expert
Im Gressental 13
D-71120 Grafenau
Licence No. DE-V-0190

Dr. Hans-Josef Dünnwald
Environmental expert
Herbert-Lewin-Strasse 4
D-50931 Cologne
Licence No. DE-V-0257

Dr. Gerhard Nagel
Environmental expert
Fleckenweinberg 9
D-70192 Stuttgart
Licence No. DE-V-0172

Fuel consumption and CO₂-emissions*

<table>
<thead>
<tr>
<th>Model</th>
<th>Power output (kW)</th>
<th>Gearboxes</th>
<th>Urban</th>
<th>Non-urban</th>
<th>Combined</th>
<th>Combined</th>
</tr>
</thead>
<tbody>
<tr>
<td>Audi Q5 hybrid quattro</td>
<td>180</td>
<td>Tiptronic, 8-speed</td>
<td>--</td>
<td>--</td>
<td>6.9</td>
<td>159</td>
</tr>
</tbody>
</table>

*Figures for the model shown on the front page

This report is printed in a climate-neutral manner and on 100% recycled paper (Recy Star Polar / Papyrus). The paper was produced in a climate-neutral manner, without additional bleaching, optical brighteners and coating applications, and meets the strict requirements of the Blue Angel. Recycled paper conserves resources, reduces emissions of greenhouse gases associated with paper manufacturing, and lowers water consumption and wastewater pollution.