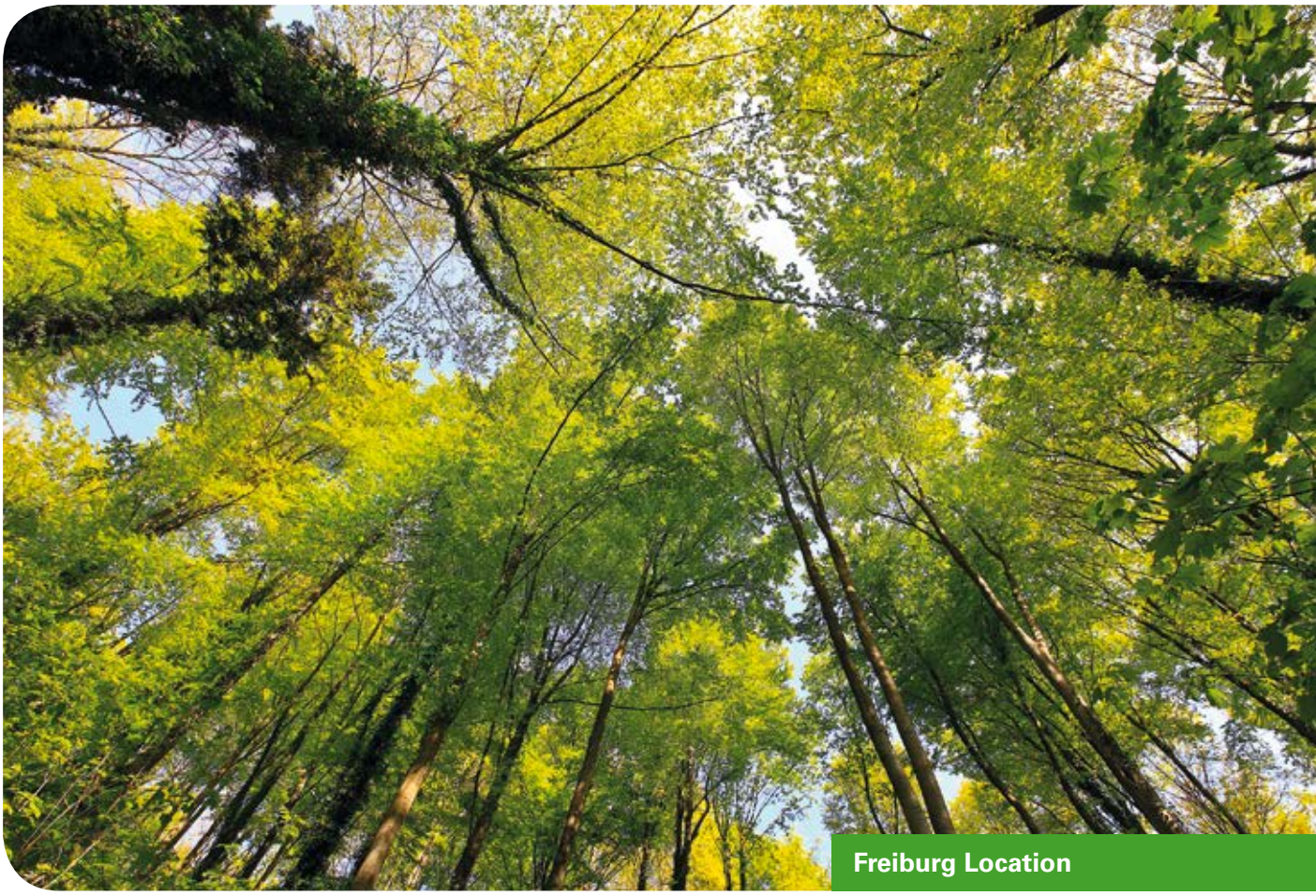
MICRONAS



Freiburg Location

„Preserving what we value“

Micronas

Environmental*Statement* 2013

to EMAS/ISO 14001

Climate protection, Conservation of resources, Production safety

Foreword by Corporate Management

2013 was a year full of challenges for Micronas. Despite the constant weakness of the Yen and the still unstable automotive industry, we were able to assert ourselves on the market and even strengthen our position.

A key focus at the Freiburg site was the drive to change over from the 150mm to the 200mm wafer production line. Apart from achieving a considerable increase in production efficiency, we were able to significantly expand our capacity for the present cleanroom area. For this, we invested specifically in new manufacturing equipment, especially in Backend (assembly & testing).

Large-scale production of the first members of our Hall-effect sensor families based on the 3D HAL technology (HAL 36xy/HAL 38xy) has already started up successfully. Our Hall sensors are, without question, at the heart of our product portfolio, but we also market a second innovative product line: the so-called "embedded controllers" for smart actuators. These products, launched in 2012, are already being successfully used in customer applications, for example in automated grill modules. This application also contributes to engine cooling through the specific fresh air control. Furthermore, it helps to reduce CO_2 emissions and lower the vehicle's fuel consumption. We are currently working on the next generation, which will allow even more accurate engine control and thus ensure more efficient engines and minimum engine noise.

All Micronas products have so far been developed at the Freiburg and Munich sites in Germany and in Villach in Austria. In order to further consolidate our R&D activities, we decided to close the Villach Technology Center at the end of 2013, and to distribute the research work done there between the Freiburg and Munich sites.

To maintain our leading position in the Hall sensor market for automotive electronics, we are focusing our attention on the growing number of applications that address the mega-trends of environmental protection and safety. With all our activities – from development to production – we put our trust in innovative technologies and the expertise of our employees, while taking full account of our ecological responsibility.

Because of the quantity of very toxic substances in our production area, Micronas has, since 2001, been subject to the 12th Bundesimmissionsschutzverordnung (Federal Immission Control Act), with the result that Micronas has to have a concept ready and available at all times to prevent hazardous incidents. As part of this concept, the risks that can emanate from the production area – e.g. fire, gas and chemical leaks – are determined and evaluated. The hazardous incident concept was updated in 2013 with the drawing up of a risk assessment of power cuts, earthquakes, and heavy precipitation/flooding, together with a plan for the safe coordination of hazardous incident-related matters between Micronas and the tenants of the Micronas Technology Park.

We have since obtained the necessary emission and water control legislation approvals of the regulatory authority, but we want to go a step further than merely complying with the legal requirements. In 2013, we pushed on with our environmental projects, a summary of which can be found on page 9.

Considering the various environmental aspects, we focused on energy consumption in recent years and derived saving projects by analyzing and evaluating energy flows. Therefore, we expanded our principles of action to environmental protection, industrial safety, and fire protection also regarding our commitment to improve the energy-related performance. They therefore meet the requirements of environmental and energy policy in accordance with the international standards ISO 14001 environmental management systems, ISO 50001 energy management systems, and the EMAS. The principles of action can be found on page 8.

In December, we installed a cogeneration unit for combined heating, cooling and power generation to supply the energy for our manufacturing plants. Through the new facility, we anticipate a significant improvement in the reliability of energy supply and thus eliminate the power cuts, grid fluctuations and voltage drops that repeatedly led to damage to our production machines. Furthermore, we expect an optimization of the heating and cooling supply system, and thus a reduction in energy consumption and costs. You can find more details on the project on pages 10 and 11.

Climate protection and the conservation of resources not only affect private buildings and households. Industry and commerce are equally important when it comes to reducing CO_2 emissions. After the installation of a large photovoltaic unit at the end of 2011, we at Micronas are proud to be taking another step in the direction of a "Green Industry Park" through the building of the combined heat and power plant at the Freiburg site.

Matthias Bopp
Chief Executive Officer

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CORPORATE PRINCIPLES

Micronas is a leading provider of innovative sensor and IC based system solutions for the automotive and industrial electronics market. In order to meet the demanding challenges of these industries, we act according to the following principles:

Customer satisfaction

We want to be among the best. Our customers' success and satisfaction are our benchmarks. We strive to deliver zero-defect products at good value for money and a high level of service. Our customers' assessment of the quality and benefits of our products and the service we deliver is an indication to us of how well we are meeting their demands and expectations and how we can further improve.

Products

We set high standards. Our product and service quality is the basis for our business success. We work in close cooperation with our customers to develop and manufacture products tailored to their specific needs and give them a technological lead.

Employees

We are Micronas. By means of open communication between management and employees, we create a working atmosphere marked by trust, openness, and creativity. Regular training enhances the motivation of our employees and enables them to meet constantly changing challenges. Every member of the workforce, irrespective of her or his position, is accountable for the quality of his or her individual performance. The managerial staff serves as a role-model function and, through dialogue and communication, insures that quality is a basic principle embraced by everyone on a day-to-day basis. Quality is a corporate obligation and thus an ongoing duty for all departments, hierarchical levels and employees.

Processes

We are focused on cooperation. Customers are recipients of process outputs. We regard our company as a network of service relationships in which every employee is both a customer and a supplier of work results. Through the consistent implementation of this concept, we consolidate customer/supplier relationships. For core and key processes, appropriate and proportionate performance criteria are defined that act as controlling indicators for a performance assessment at each stage of the process. These Key Performance Indicators (KPIs) form the basis of our continuous improvement process.

Results

We think and act with a business-focused approach. All corporate activities are aimed at safeguarding and consistently improving our financial results. The effectiveness of these activities is verified through the constant monitoring of key parameters.

Social responsibility

We assume responsibility. Our activities, which are geared to economic success, must also comply with social, ethical and ecological standards. We aim to avoid safety risks and prevent any adverse impact on the environment from the very beginning rather than try to limit the effects or eliminate the damage afterwards. All measures are aligned not only to short-term targets but also to long-term process improvements and changes of behavior. This necessitates not only the optimum handling of resources, but also an accurate forward-looking evaluation of potential environmental influences.

Quality policy zero ppm

We embrace quality. The zero ppm target (zero defect strategy) can only be achieved through consistent prioritization and alignment of all activities to quality and reliability. Immediate response to quality risks has maximum priority for each and every employee. All members of the workforce are obliged to inform their supervisor immediately if they identify quality weaknesses they cannot eliminate themselves. Here again, our principle is: Avoid faults rather than having to correct them. Our quality management system is aligned to the international automotive standard ISO/TS 16949. To monitor its effectiveness, KPIs are regularly defined and then assessed and improved by means of audits. The quality policy and the fundamental procedures and interactions within our company are documented in our quality management manual. These can be accessed by anyone – customers, suppliers, employees – at any time. The use of this manual ensures that all commercial, technical and organizational activities are uniformly aligned to the prime goal – quality.

“Using energy intelligently”

Company and Products

As a globally operating developer and producer of semiconductors, Micronas is one of the leading suppliers of innovative sensor and IC system solutions for the field of automotive and industrial electronics. Micronas is headquartered in Zurich (Switzerland), while its operational management and production are in Freiburg in Germany. Here, the company develops and manufactures Hall-effect sensors, embedded controllers for smart actuators, and innovative gas sensors for automotive and industrial applications.

The Micronas Group currently has around 900 employees, of which about 800 are located in Freiburg, where the company’s research and development, marketing, production and sales departments are based. Micronas is one of the few companies worldwide to both develop and manufacture its semiconductor solutions at the same site. Future-oriented ideas from our skilled engineers are turned into products in the nearby production plant, which is only a few meters away. This covers wafer manufacture and testing as well as assembly and final quality control. Micronas operates worldwide and has branches around the globe.

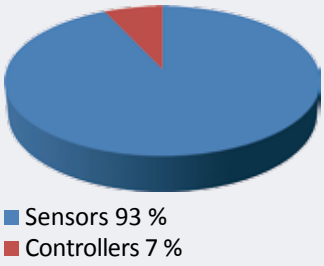
Integrated into the chain of suppliers to the automotive industry, Micronas must naturally also comply with the demands of car manufacturers. The increasing electrification of vehicles may mean greater comfort for the driver, but it also brings a number of major technical challenges. In this respect, compliance with the mega-trends of environmental protection and safety still enjoys maximum priority. Micronas has successfully tackled these challenges and has become a leading supplier of magnetic field sensors for electronic throttle controls (ETC). In this application, our sensor solutions reduce fuel consumption and cut CO_2 emissions. Innovative, intelligent and redundant system solutions make the Micronas Hall-Sensors even more resistant to magnetic interference fields and offer a variety of safety functions. At the same time, the Micronas products comply with the constantly rising quality specifications of the automotive industry – for example by means of the zero error strategy (zero ppm) – and thus guarantee outstanding reliability. They satisfy customer demands for low space requirement and minimal system costs, as have to be guaranteed for new comfort and lifestyle applications. Micronas system solutions are noted above all for their high functionality, low consumption and small form factor.

One area of application for Micronas products in the field of industrial electronics is that of production automation. In joystick applications, for example, Hall sensors measure angles or linear motions of the handgrip compared with its rest position, and are gradually replacing contact-based potentiometers in this application. With their excellent reliability and resistance to mechanical wear, they thus guarantee a long service life with several million cycles. Contactless joysticks are used in reliable and safety-critical applications as occur, for example, in off-highway vehicles and generally in all man/machine interfaces.

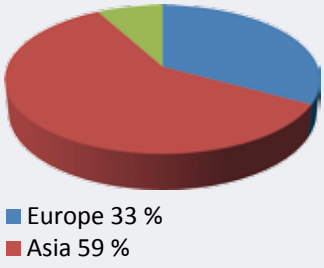
FACTS AND FIGURES

Micronas in 2013:

- Headquarters of holding company in Zurich, Switzerland (SIX Swiss Exchange: MASN)
- Operational management and production in Freiburg, Germany
- Test center in Glenrothes, Scotland
- 912 employees worldwide, of which 806 are based at the operational headquarters in Freiburg
- Sales of CHF 152 million/ EUR 123 million
- Sales by product group:



- Sales by market:



- Investment and ongoing expenditures of EUR 1.4 million in corporate environmental protection.

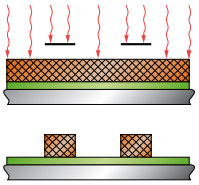
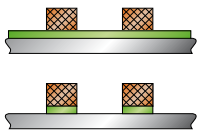
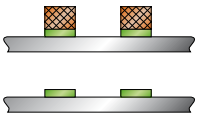
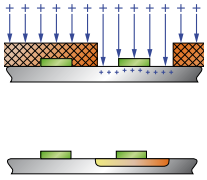
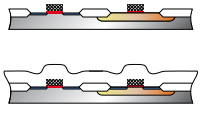
„Hundreds of single processes“

Production and Environment

Just as complicated as the products themselves is the production process: Several hundred individual physical and chemical processes are required to produce the electronic circuits – or silicon chips – on an ultrapure, monocrystalline silicon wafer. The tiny structures measure less than 0.5 µm and are thus less than 1/100th of the diameter of a human hair. They can just about be detected in an optical microscope.

Frontend processes

During the production process at Frontend, several thousand Hall sensors are formed on each wafer. In turn, every Hall sensor contains many thousands of electronic devices, mainly transistors, resistors, capacitors, and diodes. The physical and chemical Frontend processes take place in a class 1 cleanroom environment (max. 35 particles >0.5 µm are allowed in a cubic meter of clean air). The first step involves scribing of the wafers with a laser and subsequent cleaning. In a recurring sequence of coating, lithography, etching, implantation, cleaning and high-temperature treatment to create the structures and adjust the electronic properties of the active elements, the silicon chips are produced on the wafer.

Frontend processes	Main environmental impact	Remedial measures
 **Lithographic processes: For the structuring of layers by photolithography, i.e. the transfer of structures from a photo mask to the photo resist on the wafer**	Use of solvent-based photo resists and developers, plus the formation of coating residues and spent solvent mixtures	Environmentally relevant photo chemicals have been replaced by safer ones. Photochemical residues and spent solvent mixtures are sent for thermal recycling. Solvent vapors are conveyed to a waste air treatment plant.
 **Dry etching processes: To transfer photo resist structures to the oxide and metal layers beneath by etching**	Use of combustible, corrosive, toxic and environmentally hazardous process gases, emissions of gases with high greenhouse gas potential and formation of waste gases	The volume of process gas has been reduced by making improvements to the process control. Exhaust gases are conveyed to a waste air treatment plant.
 **Cleaning processes: For wet-chemical cleaning of the wafer surface and to remove the resist** **Wet chemical etching processes: To transfer photo resist structures to the layers beneath**	Use of hazardous substances, i.e. acids, alkalis, special chemicals, solvents and the formation of spent chemical and solvent mixtures	The use of chemicals has been reduced by making improvements to the process control and by introducing an automatic, accurately controlled dosage system. Hazardous chemicals have been replaced by safer ones. Spent chemicals are sent for internal and external recycling. Chemical vapors are conveyed to a waste air treatment plant.
 **Ion implantation processes: For doping certain areas with foreign atoms such as boron** **High-temperature processes: For the production of extremely pure oxide and dope layers to adjust the electronic properties of the transistors**	Use of flammable gases and small quantities of toxic gases, plus formation of waste gases	Flammable gases are subsequently incinerated. Safety gas cylinders are used for toxic gases. Exhaust gases are conveyed to a waste air treatment plant.
 **Coating processes: For the deposition of insulating oxide and conductive metal layers**	Use of flammable, corrosive, toxic and environmentally hazardous process gases, emissions of gases with high greenhouse gas potential and formation of waste gases	The volume of process gas has been reduced by making improvements to the process control. Exhaust gases are conveyed to a waste air treatment plant.

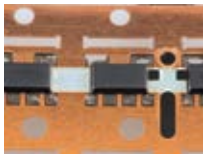
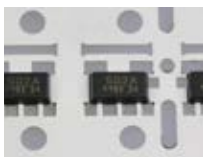
„Processes, environmental impact, action"

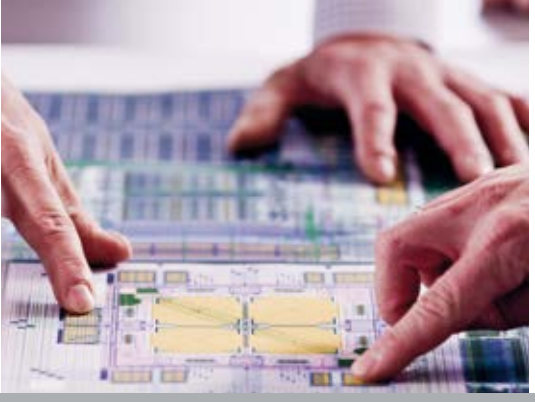
Production and Environment

Backend processes

From the waferfab, the wafers are delivered to Backend and tested. At the chip assembly stage, the wafers are first sawn into individual chips. These are bonded to a copper leadframe, and the electrical contacts of the chip are connected to the leadframe by means of a 20 – 25 µm thick gold wire. Subsequently, the chips are encapsulated by a compression molding compound and the copper leadframes tinplated in a galvanizing process. Finally, the outer electrical copper contacts coated with tin are shaped in line with the standard specifications. After checking the electrical functions during final measurement, the products are packed ready for dispatch.

One Micronas chip typically weighs between 10 mg and 140 mg and is several square millimeters in size.

Backend processes		Main environmental impact	Remedial measures
	**Parameter test and probe test of the chips: All chips on the wafer are tested for their proper functioning.**	Electricity consumption	Implementation of various electricity saving projects,
	**Grinding / sawing of the wafers: The wafers are ground to a final thickness and then sawn up into individual chips in fully automatic precision units.**	Use of water and formation of waste water	General water efficiency measures to reduce water consumption and effluent generation by using reclaimed water and effective steering of the waste water flows into the ultra-pure water treatment facility.
	**Contacting (bonding): The individual chips are bonded to a copper leadframe (die bonding), the electrical contacts of the chip are contacted to the copper leadframe by means of a thin gold wire (wire bonding).**	Electricity consumption, use of gold wire	Use is made of the latest bonding technology with lower electricity consumption per chip. Implementation of various electricity saving projects.
	**Molding: The chips are encapsulated on the copper leadframe with a molding compound to protect them from environmental influences**	Use of molding compounds plus generation of dust and plastic scrap	Molding compounds are fed to the compression molding tools free of dust. Filtered dust is conveyed for special external waste treatment. Use of "green" molding compounds is being continuously increased. Plastic scrap is conveyed externally for thermal recycling.
	**Galvanizing: The copper leadframe with the chips is coated with tin so that the products can be soldered by the customer.**	Use of hazardous substances and production of galvanic waste water, production of waste metal	In the galvanizing units, metals are deposited electrolytically from the working solutions. Metals from the galvanic rinse water are precipitated in the central waste water treatment unit. Metal waste from working solutions and rinse water is recycled. Galvanic solutions are either treated in the central waste water treatment plant or disposed of externally.
	**Forming, final testing, packaging: The external electrical contacts are formed, the products measured and packed.**	Production of plastic scrap, electricity consumption	Trays are cleaned and reused. Plastic scrap is recycled. Implementation of various electricity saving projects



„All demands met“

Trained officers at Micronas

Micronas has for many years had environmental and safety standards in place that go well beyond those required to comply with the relevant legislation. In the year 2000, an environmental management system was introduced at the central Micronas development and production site in Freiburg. As well as corporate environmental protection, the system also covers the fields of industrial safety and fire protection and is referred to in short as the "ESF System".

The key aspects of the system are compliance with statutory requirements, a process of continuous improvement, preventive and defensive fire protection, and the implementation of risk analyses and hazard assessments in all sectors of the Freiburg production site. Since 2002, the Micronas test center in Glenrothes, Scotland (Micronas Ltd., 70 employees) has also had its own system for corporate environmental protection, based on the ESF. Both systems are certified to the international ISO 14001 standard, while the ESF Management System in Freiburg also meets the approval of the European EMAS regulation[1)] (Eco-Management and Audit Scheme). The main elements of the ESF Management System to ISO 14001 / EMAS are described below in more detail. The management has defined the Micronas environmental policy in its Principles of Action.The ESF organization currently comprises

- 4 full-time ESF staff, including the Environmental Management Officer,
- 25 trained officers from different areas of the company,
- 24 members of the internal emergency response team,
- 22 safety officers,
- 52 company paramedics, and
- 58 duty officers responsible for safety in all areas of production.

The staff are given regular training, internally or externally, according to their respective function in the ESF system. In Glenrothes in Scotland, the Quality and Environmental Management Officer, backed by a team of 18 colleagues, is responsible for the „Integrated Management System for Environmental Protection, Health, Safety and Quality“. The elements of the ESF Management System are described in the ESF handbook and also in the relevant process instructions and standard operating procedures, and can be referred to on the Intranet by all the employees. They constitute the rules for compliance with the company's environmental policy. Micronas operates a process that ensures that all legal obligations and customer requirements are adhered to. Foreseeable developments in environmental protection and in legislation are channeled into planning at an early stage. All trained officers, managerial staff and plant managers are actively involved in this process. Micronas cooperates in full with the regulatory authorities.

The necessary legal permits for immission control and water for operating the waste air treatment facility for wafer production and waste water treatment plants have been obtained. For production processes at the Micronas Technology Park, chemicals are needed that have to be stored safely. For this reason, at the end of 2013, we applied for a permit from the regulatory authority according to §19 of the Bundesimmissionsschutzgesetz (Federal Immission Control Act) to establish intermediate storage facilities for large quantities of hazardous substances – also for our tenants. At the same time, we applied for permission to store up to 50 t of hazardous waste in the suitably provided waste storage facilities. This permit became necessary as a result of the adoption of the European Directive on Industrial Emissions into German law.

With a full knowledge of the latest laws and regulations together with details of the required permits, we have the necessary legal security.This also brings advantages in economic terms, as it not only avoids extra costs caused by late reactions, it also enhances the trust and confidence of Micronas stakeholders, in other words, the employees, customers, investors, suppliers, risk insurers, site neighbors and the general public. As part of the annual process of setting its environmental targets, Micronas first evaluates the relative importance of the direct and indirect environmental aspects, which are explained in more detail on pages 12 and 14. After this, an assessment is carried out of the extent to which the main environmental aspects can be influenced through the execution of environmental projects to reduce consumption and/or emissions. A list of the environmental projects can be found on page 9.

One of the most important ways to ensure transparent internal and external communications is the regular publication of the Environmental Statement and Environmental News, in which we document the company's environmental performance. Environmental management is not a one-off effort, but a continuous objective, because the conformity of the system is monitored every year by an independent auditor. Apart from that, regular internal audits are also carried out to ensure that the procedures defined in the ESF System are being adhered to.

[1)] Regulation (EC) No 1221/2009 on the voluntary participation by organizations in a Community eco-management and audit scheme

„All demands met“

Environmental Management

PRINCIPLES OF ACTION

Relating to Environmental Protection, Industrial Safety, Fire protection (ESF) and Energy

Statutory Basic Conditions

We are committed to compliance with all applicable environmental energy and industrial safety legislation. In order to achieve this commitment, an effective internal and external system of approval management, risk analysis, and emergency precautions is implemented and developed. Our primary goal is to prevent and avoid environmental impacts and safety risks during normal operation, and in the event of an emergency, rather than limiting effects and/ or damage.

Motivated, Responsible and Competent Personnel

For efficient environmental protection, we need motivated and environmentally aware employees, with management providing a good example. By encouraging open communication, our employees are informed about all projects and activities in relation to both our local environmental management system and corporate environmental protection. Moreover, extensive training for our employees in environmental protection, industrial safety and fire protection is performed regularly.

Clear Structures

With clearly defined responsibilities and processes for all activities related to the environment, and the health and safety of employees, we have created the infrastructure for efficient and effective environmental protection, industrial safety and fire protection and development. In this context, we attach special value to interdisciplinary teamwork.

Availability of Information and Resources

We ensure that the information and resources of the environmental, safety and energy management, which are necessary to achieve the strategic and operative targets, are available.

Principle of “Sustainability”

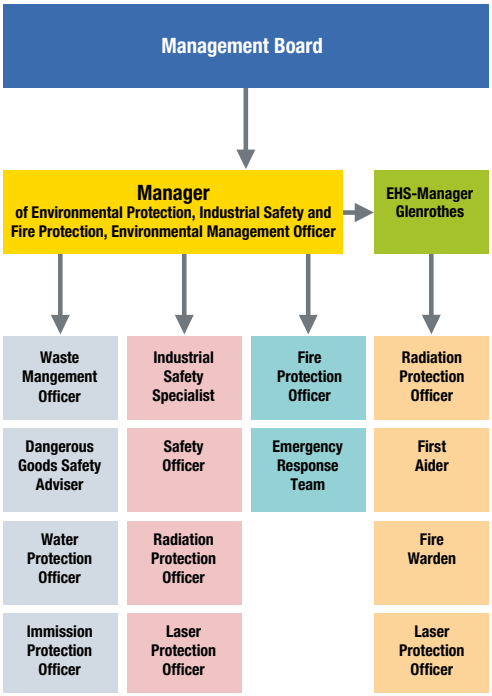
In assuming its responsibility for future generations, Micronas regards avoidance or minimization of environmental pollution as the top priority. This requires making optimum use of the resources we consume, such as materials and energy. This applies to all the phases of our product lifecycles we are able to influence, including processes within the company, and requires a forward-looking assessment of potential environmental impacts in all cases.

Cooperative Dealings with our Interest Groups

We take precautions to ensure that all contractors working on our factory site comply with our environmental and safety standards. In cooperation with our suppliers, we explicitly encourage them to implement the same environmental standards as Micronas. Furthermore, we advise our customers regarding all the environmentally relevant characteristics of our products. As a matter of course, we also promote close cooperation with authorities, and conduct a dialog with interested members of the public. We communicate openly our environmental and energy policy, the environmental impacts from our company and the environmental and energy performance.

Continuous Monitoring and Effectiveness Control

We regularly perform system audits to ensure the continued development and monitor the effectiveness of our ESF and energy management system. Any deviation from these principles or goals results in the immediate application and monitoring of appropriate corrective action. We regularly collect, record and evaluate environmental and energy-related indicators, in order to monitor our environmental and energy performance to achieve our set targets through measures for continuous improvement. We make sure we acquire efficient products and services that contribute to the conservation of resources and the improvement of our energy-related performance.



EMAS Freiburg

ISO 14001 Freiburg

AEO Freiburg

ISO 14001 Glenrothes

Since 2010 Micronas is Authorized Economic Operator (AEO), since 2012 “Known Consignor” according to the Regulation (EC) No 300/2008, and is regarded as particularly reliable and trustworthy. The aim is to safeguard the continuous international supply chain from the manufacture of a product to the end-user.

Overview of current and planned environmental projects

Location Freiburg

Environmental Projects

Subject	Goal	Measure	Dept. respons	2013	2014
Energy management	Electricity savings of approx. 200,000 kWh/year (43 t CO_2/year)	Electricity savings through introduction of Thin Clients	IT Operations	●	●
	Electricity savings of approx. 320,000 kWh/year (69 t CO_2/year)	Energy savings in the computer center through virtualization		●	
	Electricity savings of approx. 10,000 kWh/year (2 t CO_2/year)	Electricity saving by relocation of hazardous substances in the warehouse and optimization of the electric power consumption of the fan	Plant Engineering and Facilities	●	●
	Increase in the availability of electricity, heating and cooling, plus reduction of approx. 6,000 t CO_2 /year (calculated with the CO_2 emission factor of the German power mix)	Installation of a cogeneration unit for combined heating, cooling and power generation		●	●
	Electricity savings of approx. 280,000 kWh/year (60 t CO_2/year)	More efficient cooling generation with turbo refrigeration machines and cooling network between buildings 1,2,3 and building 4		●	●
	Electricity savings of approx. 228,000 kWh/year (49 t CO_2/year)	Installation of frequency converters of osmotic pumps in the water treatment plant for regulated pump operation		●	●
	Avoidance of approx. 68 t CO_2/year by avoiding liquid nitrogen production at the supplier and liquid nitrogen transport to Micronas	Replacement of the liquid nitrogen supplied by truck with the less pure liquid nitrogen generated during nitrogen production at the on-site facility		●	
	Electricity savings of approx. 69,000 kWh/year (15 t CO_2/year)	Introduction of dual-core controllers in probing/final testing of linear Hall sensors	Backend Engineering	●	
Resource management	Reduction of raw materials and waste, in both cases by approx. 10 t/year through new treatment reagents in the galvanic waste water treatment	Use of bentonites and Fe-III chloride	Plant Engineering and Facilities	●	
	Reduction of water consumption of approx. 100 m^3/day in ultra-pure water production	Efficient guiding of the water / waste water streams in the 5-stage treatment facility		●	
	Savings of approx. 150 l/year of substances hazardous to aquatic environment (tin concentrate, additives, acids)	Chemical savings through low-flow filtration	Backend Assembly	●	
	Savings of approx. 250 kg copper-leadframes, 220 kg molding compounds, 7,900 kWh electricity per year. Substitution of hazardous cleaning chemicals	Application of new cleaning materials for compression molds			●
Immission control	Use of refrigerants with low to zero depletion potential	Refrigerant plants to be switched from R22 to alternative refrigerants	Plant Engineering and Facilities	○	○
Occupational safety	Improve occupational safety, savings of tin and cleaning chemicals, waste reduction in galvanic process	Substitution of mechanical/chemical processes through a melting process during cleaning of the tin cathode and recovery of tin	Backend Assembly	●	
	Intensify occupational safety, reduction of use of chemicals and of waste	Cleaning of small parts in a self-enclosed small-parts cleaning box		●	
Health protection	Improved health protection	Health campaigns: Herb exhibition, campaign for healthy feet, Qi Gong for beginners. New offers: JobRad, first-aid course, consulting in difficult times of life, overcoming stress.	Working group on health protection	●	
		Health campaigns: Power bags with bio fruit, Smoothie vitamin kick, Food tips with nutrient theory. New offers: Advice on early identification of skin and bowel cancer, prevention of drug dependency, glaucoma. Project „How good is canteen food?“, fully automatic machine for producing fresh orange juice.	Working group on health protection		●

● Implementation ● Completed, goal achieved ○ Extension

Cogeneration unit for combined heating, cooling and power generation

Energy efficiency

Mounting cost pressure and rising operating costs in semiconductor production require ever stricter measures to cut costs.

In this respect, the efficient management of energy brings not only financial gains. Reduced consumption of fossil fuels and thus lower emissions of carbon dioxide (CO_2) and other climate-relevant air pollutants is making an effective contribution to environmental protection and helps to conserve the already short resources.

In the particularly energy-intensive production of semiconductors, energy is needed for different fields of application in the form of heat, cold and electricity. In this environment, the use of a cogeneration unit is especially attractive because, in addition to the electricity, the resultant waste heat can also be utilized and the deployed primary energy (natural gas) can thus be optimally used.

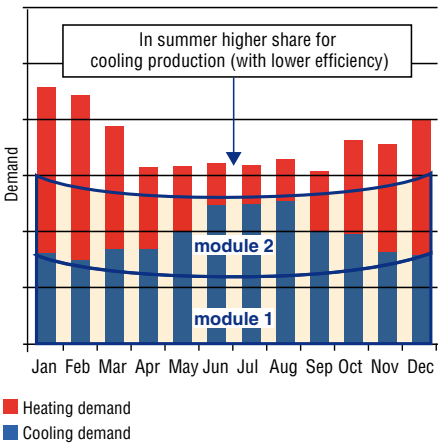
Heating and cooling demand

The very complex networking is significantly determined by the production conditions and production plants.

The main heat consumers are the room heating systems and the air-conditioning units. Another heat consumer is that of ultra-pure water production. Whereas the heat consumption for room heating systems and air conditioners is dependent on outside temperatures, it is important for ultra-pure water supply to have constant heat consumption throughout the year. The highest heat demand is thus in the winter months.

Air conditioners and production cooling systems are the biggest cooling consumers. The amount of cooling needed for the air-conditioning plants is also dependent on the outside temperatures, whereas for cooling the production plants, a supply of cooling media is required throughout the year. The highest cooling requirements are thus in the summer months. Around 70 % of the energy needed at the site is required in the waferfab, which is why the cogeneration unit was installed directly next to these buildings. The extremely short supply distances reduce transfer losses to a minimum. By combining the heating and cooling systems of several consumers on the operating site into a single-supply grid, an all-year power generation is guaranteed with the use of the waste heat at the site. The basis for the dimensioning was the annual load duration curve of the heating and cooling requirements (see diagram) and the corresponding daily curves.

Annual load duration curve: Heating/cooling demand



Design of the cogeneration unit

For the cogeneration unit, a modular design with redundant units was chosen. This system gives, among other things, higher availability of the electrical and thermal output in the event of failure of one unit or during maintenance work. Daytime-dependent consumption fluctuations are balanced out by the heating and cooling storage system. To cover the heat demand peaks, the existing heating boilers are used. The cooling demand peaks are covered by the refrigeration machines. In the winter months, the re-cooling plants are used for the free cooling of the cooling demand for the production machines and the circulating air cooling units. At outside temperatures of below approx. 0 °C, the cooling requirement is covered directly via the re-coolers.

The room in which the units are installed is cooled by means of a heat pump and kept at constant temperature. Constant room temperature guarantees an optimum operation of the combustion engines all the year round. The heat is used to heat up the municipal water for the water treatment unit.

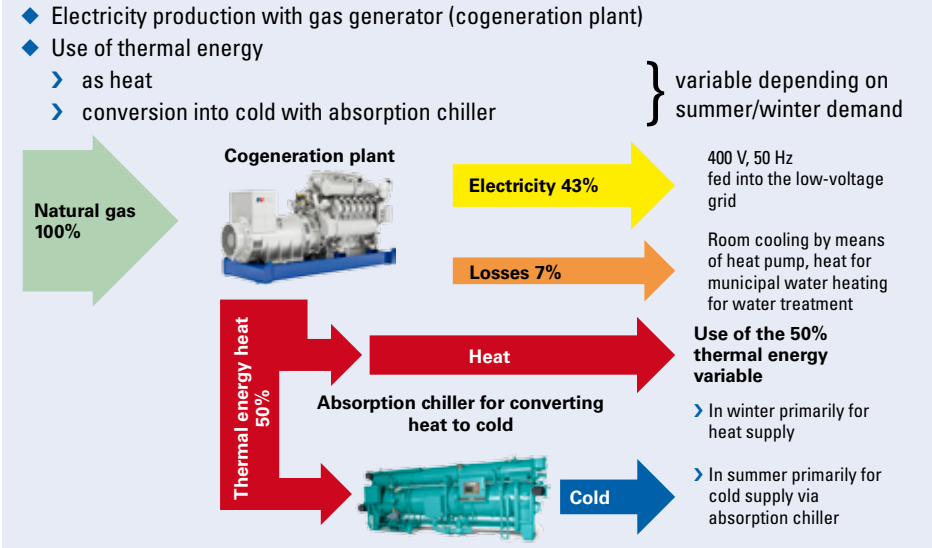
The cogeneration plant is operated in parallel, and, with prolonged power cuts in the public grid, in insular operation as a grid replacement unit. Through this mode of operation, critical production plants and the clean-room facilities can also be operated should the external supply break down.

Combustion engine with generator

At the heart of the cogeneration unit are two gas-fueled combustion engines that produce electricity via a generator. The generator converts the mechanical energy created on the engine shaft into electrical energy. The engine heat formed during electricity production is utilized for the heating supply. The engine cooling water and combustion waste gases serve as the heat sources. The heat can be conveyed to the heating circuit via heat exchangers. Two modules are switched in parallel. The heat is conveyed to a storage tank with a water capacity of approx. 40 m^3.

Two units, each with an output of 1,287 kW, are used electrically with heat extraction from engine cooling water, lubricating oil, mixture cooler and a waste gas heat exchanger.

The synchronous generator for producing three-phase current (400V, 50 Hz) is realized via a gas-Otto engine for lean-burn operation.



Energy flow diagram: electricity production with gas generator

Functional description

The heat generated in electricity production is used for heating or cooling, as required. In winter, the waste heat from the engines is used directly for heating. In the transition periods and in summer, the excess heat is conveyed to the absorbers for cooling production

Heat generation

The waste heat from the generators is conveyed to the heating circuit via a heat module, where it heats the water from 75 °C to approx. 90 °C. In the second step, the water is heated to approx. 105 °C via a exhaust gas heat exchanger, whereby the exhaust gases from the combustion engine unit are cooled to approx. 120 °C. The heat can be stored in a water tank with a capacity of 40 m³.

Cooling production

Two absorption chillers, each with a hybrid cooling tower, are adapted to the performance of the generators.

Absorption describes the solving or dissolving of gases or vapors by liquids. Solving or dissolving occurs under different pressure and temperature conditions.

The absorption chiller is responsible for the thermal conversion of the driven cooling production. Unlike mechanical compression, this thermal compression is carried out in the absorber and extractor.

Fluctuations in the cooling requirements are balanced out via the cooling storage unit with a volume of around 40 m³.

Hybrid cooling towers with closed water circuit

The hybrid cooling tower has the form of a cooling tower combining the advantages of wet and dry cooling towers. The condensation heat from the absorption chillers is dissipated via a water-glycol circuit through the cooling tower to the ambient air.

In winter, the re-cooling unit is used for free cooling. At low outdoor temperatures, the cooling storage unit is supplied directly from the two cooling towers.

Exhaust gases from the combustion engines

The waste gas is first conveyed via an oxidation catalytic converter to reduce the pollutant level before being cooled in the downstream waste gas heat exchanger to approx. 120 °C. The downstream exhaust silencer guarantees compliance with the noise emission thresholds. The waste gases are conveyed via a stainless steel chimney unit on the roof to the outside. The relevant emission-measuring points are installed after the silencer.

Energy data

Meeting the energy requirements	
Electricity demand approx.	30 %
Heating demand approx	60 %
Cooling demand approx.	40 %

Total energy balance	
Operating time approx.	8.300 h/y
Energy input (natural gas) approx.	46 GWh/y
Electricity generation approx.	20 GWh/y
Thermal energy approx.	24 GWh/y

Use of the thermal energy	
For heating approx.	13 GWh/y
For cooling approx.	11 GWh/y

Savings through the cogeneration unit	
Electricity generation through cogeneration unit approx.	20 GWh/y
Electricity generation in cooling production approx.	3 GWh/y
Electricity savings through free cooling approx.	0,6 GWh/y
Natural gas for heating approx.	13 GWh/y

CO_2 emissions

Reduction in CO_2 emissions approx. (calculated with the CO_2 emission factor for the German power mix)	6.000 t/y

Environmental Data 2013

Environmental Data 2013

As part of the process of defining environmental targets, Micronas has evaluated the relative importance of possible direct and indirect environmental impacts / influences.

Direct environmental impacts

Important direct environmental influences are

- CO_2 emissions from the consumption of electricity, fossil energy sources and PFC gases[1],
- the consumption of process chemicals and, connected with this, the resultant production of hazardous spent acids.

Micronas strives, as part of its continuous improvement process, to reduce the impact of these environmental effects. The environmental data for 2013 for the Freiburg site are given below. With these key figures, we comply with the requirements of the EMAS regulation. This report covers both the absolute consumption figures and the consumption figures standardized to the total gross value added. These core indicators are related to the year 2013. Standardization to the total gross value added over the last four years provides the required comparability of the consumption data.

Energy efficiency
The consumption of electricity and fossil energy resources – almost exclusively natural gas – together represent the core indicator "energy efficiency". The proportion of renewable energies in the energy consumption in the last few years was just under 50% (see p.13).

In the period from 2010 to 2013, energy efficiency projects were carried out that led to savings of approx. 2.9 m kWh of electricity or 660 t of CO_2 a year. The projects planned for 2014 will result in annual savings of approx. 720,000 kWh.

The photovoltaic unit installed in 2011 supplied some 282,000 kWh in 2013, saving 159 t of CO_2.

Material efficiency
The consumption of chemicals and process gases constitutes the core indicator "material efficiency". Chemical consumption is made up of process chemicals for production and chemicals for water treatment and waste water treatment. In the period from 2010 to 2013, the projects carried out to reduce chemical consumption in production, cooling water treatment and waste water treatment led to savings of approx. 28 t/year.

Water efficiency
Municipal water is used for the production of ultra-pure water for production, for sanitary and cooling purposes, and in waste air scrubbers. To reduce water consumption and use the water more efficiently, increasing use has been made in recent years of reclaimed water. Reclaimed water is very slightly contaminated rinse water from process plants and waste water from the ultra-pure water treatment plants. The rinse water is collected and reused in process cycles where less stringent demands are made on water quality. Water can also be reclaimed and recycled via optimized steering of the water/waste water flows in the ultra-pure water treatment systems.

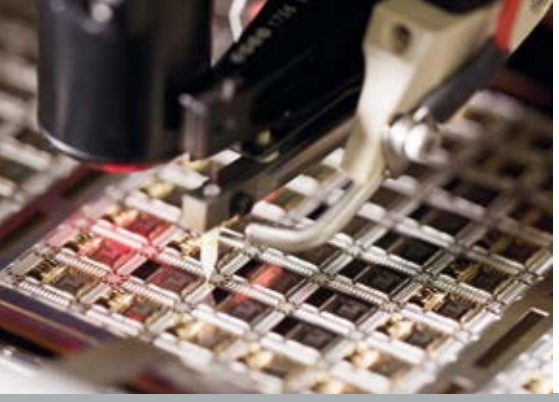
Emissions
The core indicator "emissions" is, according to EMAS, made up to two parts. Total annual "emissions into the air" – calculated from the natural gas consumption[2] – from 2010 to 2013 amounted to 35-42 kg sulfur dioxide (SO_2), 1,900-2,300 kg nitrogen oxides (NO_x), and 24-29 kg dust. Because of the low quantities involved, standardization to the total gross value added was dispensed with. Total annual "emissions of greenhouse gases" is calculated from the consumption of electricity, fossil energy sources and the emission of PFC gases[1]. The proportion of CO_2 emissions caused by electricity consumption varies heavily with the relevant CO_2 factor of the purchased electricity. In recent years this has fluctuated between 160 and 250 g/kWh and was thus well below the German average of over 500 g CO_2 / kWh. Greenhouse gas emissions of methane (CH_4) and dinitrogen monoxide (N_2O) are negligible.

Waste
In terms of waste legislation, the core indicator "waste" consists of both hazardous and non-hazardous waste. More than 90% of the hazardous waste is made up of acids and solvents, of which a large proportion is recycled. For this reason, the savings in chemical consumption also leads to a similar reduction in hazardous waste. The recycling rate for the entire waste volume in the years from 2011 to 2013 has been consistently high, namely around 83%.

Biodiversity
The core indicator "biodiversity" refers to the land use, expressed in square meters of built area. In 2013, the figure was approx. 12,300 m^2. It has not changed since 2007.

[1] Perfluorinated carbon compounds with a high greenhouse gas potential used in semiconductor manufacture as process and cleaning gases.

[2] ProBas database of the Federal Environment Agency (Umweltbundesamt)



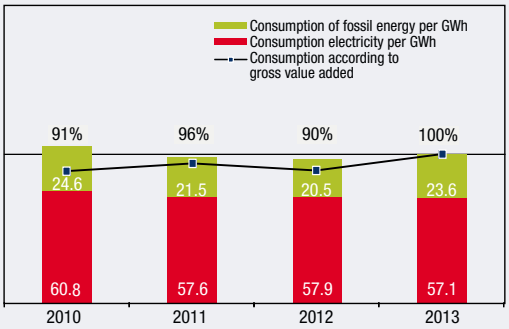
Environmental Data 2013

MICRONAS FREIBURG

Absolute consumption resp. CO_2 emissions

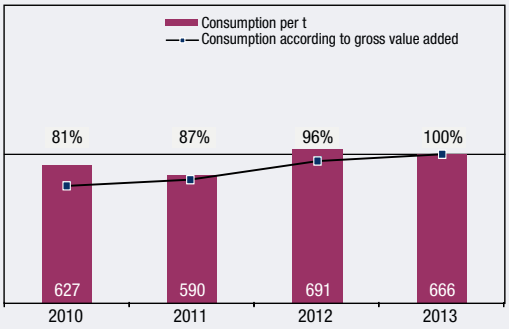
Consumption resp. CO_2 emissions referring to the gross value added in %, normalized to the year 2013

Electricity and fossil energy

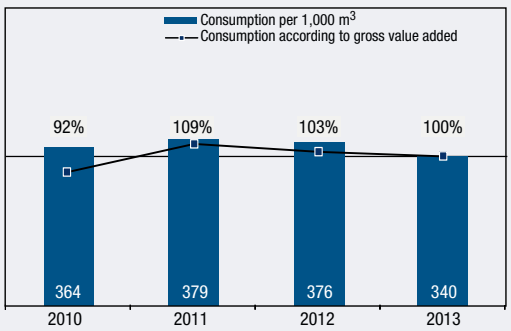


	Total energy consumption from renewable resources (GWh)	Proportion of the renewable energy sources to the annual total consumption (electricity and heat)
2010	42.5	50%
2011	35.2	45%
2012	38.2	49%
2013	Value not yet available	

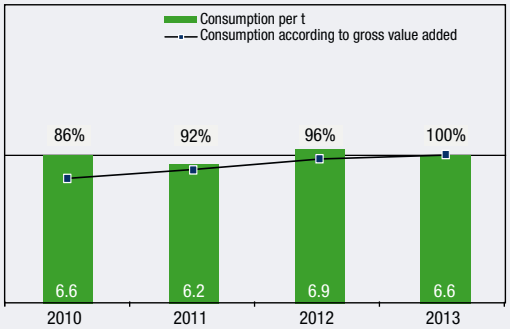
Chemicals



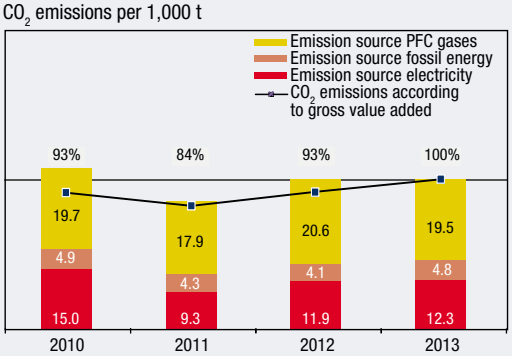
Water



Process gases



CO_2 emissions per 1,000 t



Direct Environmental Impacts at Glenrothes

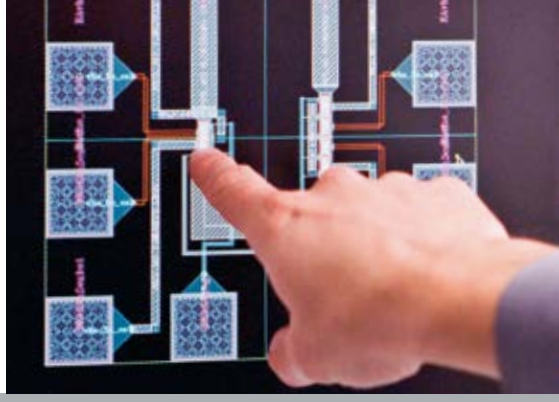
Before delivery, a functional test is run on the finished chips – a large proportion in the Test Center in Glenrothes. The test equipment uses electricity, i.e. the most significant direct environmental impact is energy consumption and the associated CO_2 emissions.

Keyfigures 2013:

- Energy consumption: 2.9 GWh electricity (corresponding to 1.431 t CO_2)
- Main waste fractions: 4 t paper, cardboard, and 3 t plastic waste and 7 t metal scrap for recycling; 2 t plastic waste for disposal
- Notifiable accidents: none

Investment and current expenses in corporate environmental protection (waste management, water protection, soil decontamination, noise reduction, air pollution control, climate protection, nature protection, landscape conservation) in Freiburg

	Million Euro
2010	1.2
2011	2.2
2012	1.4
2013	1.4



Environmental Data 2013

Environmental Data 2013

Production yield
Another important contribution to improving all core indicators is made by raising the production yield. The yield is an important performance figure in the semiconductor industry. The fewer chips on a wafer that subsequently fail due to defects, the fewer wafers have to be started in the Waferfab, and the less electricity, media, materials etc. must be used in total. In turn, less waste has to be disposed of. This applies to the same extent to the production yields in Assembly and Test. Projects put in place with the aim of raising yields are at the same time environmental projects for improving the core indicators.

Indirect environmental impacts

The main indirect environmental factor is the application of our products by our customers. Sensors from Micronas enable reduced fuel consumption e.g. in electric power steering (EPS), electronic throttle control (ETC), the automatic grille module (AGM) and the electricity sensor in vehicle start/stop systems.

Another indirect environmental impact involves the environmental performance of our suppliers. We endeavor to ensure that the suppliers of materials that are used in our products or exert an influence on the quality, such as process gases and chemicals, have an environmental management system in place. At Micronas, 90% of all material suppliers have a certified environmental management system installed.

The following section describes achievements in the fields of industrial safety and fire protection.

Industrial safety

The approval process for new plants and reconstruction projects guarantees that the trained officers and staff of the Plant Engineering and Facilities department are also involved in the planning at an early stage. Following installation and before final approval, hazard assessments are performed at the various workplaces. At workplaces with hazardous substances operating procedures are drawn up in accordance with the regulations on hazardous substances. These provide the supervisor with an instruction document for the employees. Trained staff and officers regularly carry out inspections to ensure that the legal regulations are being adhered to, and, if necessary, derive corrective measures to be implemented by the persons responsible. Hazardous substances at Micronas are divided into various storage classes according to their physical and chemical properties, and stored separately. All store rooms and chemical supply plant rooms are equipped with modern water-safety devices to avoid chemical release – e.g. with twin-wall pipes, bunds, and leakage sensors. At Micronas in Freiburg, the accident figures are well below the comparable index of the Employers' Liability Insurance Association. In 2013, there were four minor reportable accidents, without any particularly frequent occurrence in any one area.

Fire protection

Because the fire protection officer is a member of the approval management team, he must be informed early of any new facilities and rebuilding measures. He defines the protective targets after previous analysis of the buildings and surrounding area in agreement with the risk insurer and, if necessary, with the regulatory authority. He adapts the organization of the fire protection facilities and escape routes, and monitors the implementation of the fire protection systems as far as the equipment and construction work is concerned. Finally, he updates the technical documentation and the regular testing schedules.

Emergency protection

Despite all the previously described preventative measures, emergencies can still arise, the effects of which have to be kept to a minimum. In an emergency – e.g. smoke or fumes – a smoke detector automatically sends an alarm to the emergency call center, where two watchmen are on duty, 24/7. They immediately alert the investigation team in line with the alarm plan and, if necessary, notify the emergency task force, which then puts the required emergency measures into place. Part of the task force is the internal emergency response team, which also includes trained firefighters. The head of the emergency response team regularly organizes exercises in realistic scenarios (e.g. smoke, leakage of hazardous gases and liquids). The safety officer on duty then takes charge of the operation and deals with the emergency together with members of the emergency response team and the company paramedics. In 2013, in a full exercise, a major incident (scenario: heavy smoke in the hazardous material store combined with clearance of the building and treatment an injured person) was simulated with the participation of all the above-mentioned task force and the management. As a result of the findings from this exercise, several procedures were further improved.

The fire protection concept and the emergency plans also include notifying the Freiburg fire department in critical emergency situations. Once the fire department has received an alarm, it can be on the Micronas factory site within a few minutes. As in the past, further detailed tours of the site will be arranged with members of the Freiburg fire department so that they can obtain a better picture of the main hazard areas and the type of incidents that could occur.

As a matter of course, all alarm exercise and alarm incidents are subsequently evaluated to identify any weak points, take corrective measures and continuously improve.

Training measures

In addition to the legally prescribed training, such as training at the workplace, instruction of external employees and the handling of hazardous substances, regular training is also carried out on the hazardous properties, toxicology and handling of chemicals and gases as well as suitable protective measures. Every year, as part of the emergency planning, training is given to the safety officers on duty in all production areas. Delegated trained officers take part regularly in courses to update their knowledge and to obtain qualifications relating to industrial safety, fire protection, immission protection and water protection.

Micronas Technology Park

In the last few years, the Micronas site has developed into a technology park with eight external companies renting facilities to perform research, development and production in various fields. There are a number of synergies here because all firms require similar infrastructures – infrastructures that Micronas maintains and offers to outside companies. Micronas has signed an agreement with all these companies on aspects of environmental protection, industrial safety and fire protection. This so-called ESF agreement defines the responsibilities of both Micronas and the external companies in matters of e.g. personal and building protection, receipt of hazardous substances, and waste disposal, and defines the interfaces of processing plants with incoming and outgoing products and materials. The outside companies are integrated into the Micronas fire protection concept and emergency plan.

Health protection

The working group on health protection, which comprises members of the company's medical service, the works council, the HR department and industrial safety, carries out projects to encourage health care.

Consultation services are offered on vaccination, giving up smoking, diet, hygiene, skin care and skin protection, difficult situations, health days, and health insurance schemes.

Support for sport and social activities include running groups, mountain biking, regular health activities such as massage, yoga, shiatsu, muscle development, and a portal for leisure activities.

Travel to work has also been tackled with environmentally friendly solutions:

- The rail/bus network timetables have been regularly made available to company employees since 1991 in a campaign to promote environmentally friendly travel.
- The "Regiocard" is an annual ticket for use on all public transport in the region, subsidized by the employer.
- Car-share / ride-share system.
- JobRad – leasing system for bikes, pedelecs and e-bikes, subsidized by the employer.

The company's health-care service is available on working days and Saturdays. Other projects organized by the working group are described on page 9.

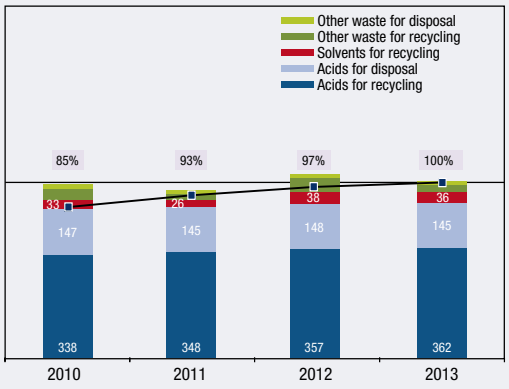
Environmental Data 2013

WASTE

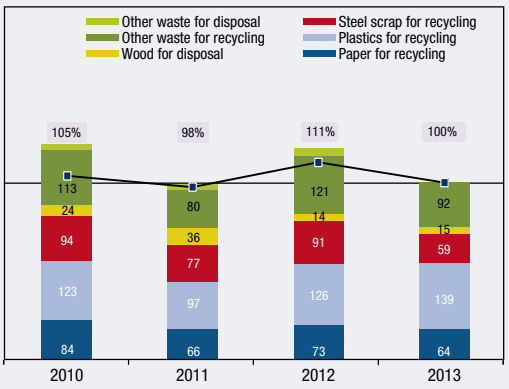
Waste in t

Waste referring to gross value added in %, normalized to the year 2013

Hazardous waste (t)

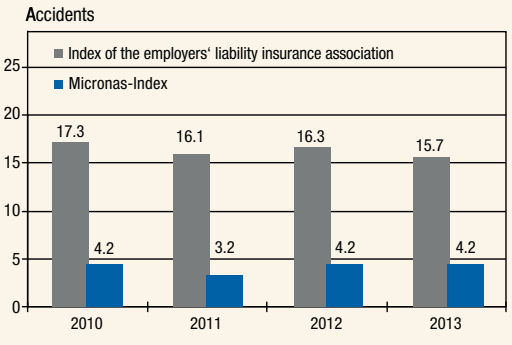


Non-hazardous waste (t)



ACCIDENTS

Notifiable accidents per 1,000 employees



MICRONAS

EMAS
GEPRÜFTES
UMWELTMANAGEMENT
DE-126-00053

Environmental Statement

The next consolidated Environmental Statement will be submitted for validation at the latest in July 2017. The next updated Environmental News will be submitted for validation in July 2015.

Environmental Verifier

Dr.-Ing. R. Beer (Permit no. DE-V-0007)
Intechnica Cert GmbH (Permit no. DE-V-0279)
Ostendstr. 181
90482 Nuremberg, Germany

Validation

Dr. Reiner Beer, with EMAS environmental verifi er registration number DE-V-0007, accredited or licensed for the scope 26.1 (NACE Code Rev. 2), Manufacture of electronic components and boards, declares to have verified whether the site as indicated in the consolidated environmental statement with registration number D-126-00053 meets all requirements of Regulation (EC) No 1221/2009 of the European Parliament and of the Council of 25 November 2009 on the voluntary participation by organizations in a Community eco-management and audit scheme (EMAS).

By signing this declaration, I declare that:

- the verification and validation has been carried out in full compliance with the requirements of Regulation (EC) No 1221/2009,
- the outcome of the verification and validation confirms that there is no evidence of non-compliance with applicable legal requirements relating to the environment,
- the data and information of the consolidated environmental statement of the site reflect a reliable, credible and correct image of the site activities, within the scope mentioned in the environmental statement.

Nuremberg, Juli 2014

Dr. Reiner Beer, Environmental Expert

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