MICRONAS

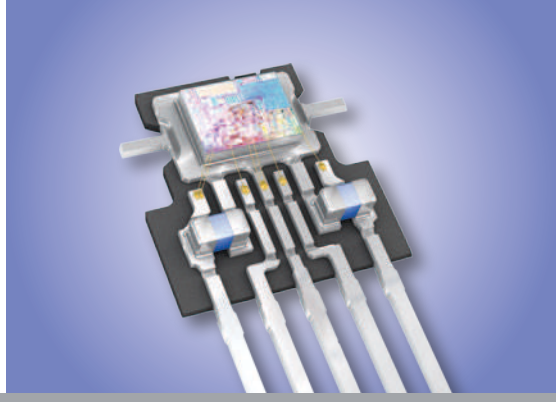
**“Preserving what we value”**

Micronas

# Environmental*News* 2015

to EMAS/ISO 14001

# "Sustainable environmental protection – also under a new roof"



## Editorial

Energy-saving, environment-friendly measures are just as important for the world we live in as they are for the profitability of our company. Micronas is not alone in pursuing the megatrends of the semiconductor industry, namely economic efficiency and environmental protection. The challenge is to be able to combine these two targets. Micronas does this both at the design stage and during production. At present, the focus when developing new magnetic field sensors is on the integration of additional components or functions alongside the actual sensor into the package. Through integrated capacitors, sensors become particularly insensitive to electro-magnetic interference fields. The new HAC 37xy direct-angle sensor was developed for multi-dimensional magnetic field measurements and combines the Micronas 3D HAL® technology with integrated blocking capacitors. In the automotive segment, for example, this sensor is particularly suitable for modular solutions for turbochargers without a printed-circuit board as well as for AGR valves and throttle flaps.

Lower fuel consumption and reduced $CO_2/NO_x$ emissions with unchanged engine performance are the main drivers for the increased use of turbochargers. The declared target of max. 95 g of $CO_2$ emissions per km can be achieved by "downsizing" the engines. This basically means reducing the cubic capacity when using a turbocharger in combustion engines, while maintaining the same drive comfort and engine performance. Smaller engines suffer less friction losses and are also lighter. In the case of turbochargers with variable turbine geometry, the angle of attack of the guide vanes is changeable and the flow cross section can thus be adjusted to the load state. To set the blades, an electric actuator is used. The position of the guide vanes can then be communicated to the engine control unit via an angular sensor or a position sensor like the HAC 37xy. Particularly in partial load operation when driving in urban areas, the turbocharger pushes more air into the cylinders at low engine speeds, raising the performance and torque while simultaneously reducing consumption.

In 2015, alongside the general indirect environmental aspects of our products that help to reduce fuel consumption and emissions, we also pushed forward with a number of environmental projects that had a direct influence on the environment. At the end of last year, we successfully concluded our soil and groundwater decontamination project. Because we have been pursuing this decontamination project for more than 15 years, we would like to tell you more about in this issue of Environmental*News*. You can find the details on page 3, followed by an overview of our environmental projects on page 4.

At the end of 2015, the Japanese group, TDK Corporation, announced a public offer to purchase all the publicly held Micronas shares. TDK is one of the market leaders in the field of read/write heads for magnetic hard disks. In the field of TMR technology, which is based on the effect of tunnel magnetoresistance, TDK is in fact the world leader. TMR sensors are used for magnetic field measurement, for example as an electronic compass, a distance/angle measuring system, or as small, potential-free current sensors. TDK wants to grow further in the business with magnetic field sensors. We are convinced that the transaction between Micronas and TDK will have considerable strategic, operative and financial benefits for us. The Board of Directors of Micronas has therefore decided unanimously to support the offer from TDK and to recommend Micronas shareholders to accept it. Since the beginning of March 2016, TDK has held over 90 percent of the shares, and since then, Micronas has been an official subsidiary of the TDK Group.

Micronas is specialized above all in Hall-effect based sensor systems and their integration, whereas TDK has special expertise in the previously mentioned TMR sensor technology. If we combine this technological know-how, it will be possible to develop new products, creative solutions and innovative technologies. In this way, we can make optimum use of the growth opportunities in the sensor business, especially in the automotive market. Micronas will serve as a sensor competence center to drive the global strategy for magnetic field sensors within the combined company.

At Micronas, economic efficiency and environmental protection will continue to go hand in hand. The necessary emission controls and water regulatory approvals are available, and an application in line with the 4th Bundesimmissionsschutzverordnung (Federal German Immission Control Act) on the storage of substances and waste is currently in the process of approval. We are therefore setting a clear sign of sustainable environmental protection under our new roof.

Matthias Bopp
Chief Executive Officer



# "The soil under our feet"

Environmental Projects

## The soil: One of the basics of life

Although we spend our whole lives walking about on soil, we don't really notice it[1]. Yet together with air, sunlight and water, it is one of the four essential requirements for life on our planet Earth.

There are more living organisms in a handful of soil than there are people on the Earth[2] – more than 7.4 billion. But the soil can also claim other astonishing records: Both the largest-known living organism (approx. 9 km², mycelium of the honey fungus species, Armillaria Ostoyae, in the Malheur National Forest, Oregon, USA) and the oldest such organism (approx. 80,000 years old, the roots of the trembling poplar species, Populus Tremuloides, in the Fishlake National Forest, Utah, USA) live in the soil. Alongside the oceans and fossil deposits of coal, gas and oil, the soils represent the third-largest carbon pool in Nature, and are thus an important factor in today's ever more important climate protection[3].

## Soils and their importance

Soil is to terrestrial life what water is to aquatic life. In the dark, animals, plants, fungi, bacteria and viruses ensure, almost unnoticed, the perfect cycle of life: nothing is lost, everything is used.[4]

The cultural importance of the soils for humankind and its development can be seen from the world "culture": It stems from the Latin "colere", which means "to till the soil". In economic terms, the soils are, alongside labor and capital, the third key production factor, which is presumably why nobody wants to lose the proverbial "ground under their feet"[5].

## Soil contamination – fast reaction, consistent decontamination, remarkable success

We are therefore particularly pleased today, in this United Nations "International Year of Soils"[6, 7, 8], to announce the successful completion after more than fifteen years of our soil/groundwater decontamination project.

*Fig. 1: Infiltration basin*

At the beginning of the 1980s, there was a leak of solvent from a collecting tank. After immediate extensive investigation and the subsequent publication of an expert report, the authorities at that time ordered a ground excavation, with which the majority of the contaminated soil was removed and duly disposed of. Difficult conditions and the then still young technology of soil rehabilitation led, up to the end of the nineties, to the use of several different soil decontamination techniques.

The beginning of the new Millennium saw the launch of the soil/groundwater decontamination project, during which a total of 800,000 m³ of groundwater was, up until the end of 2015, removed, cleaned with more than 10 tons of activated carbon, and then infiltrated in our newly built infiltration basin (Fig. 1) with a layer of activated soil. The infiltrated water was transported on top of an impermeable layer of soil back to the decontamination well in the groundwater flow direction, where it was removed and returned to the activated carbon cleaning unit. With this closed loop system, any remaining solvent residues were mobilized and effectively removed.

## Long-term soil monitoring to check the state of the soil and the success of the decontamination measures

The expert report and extensive long-term monitoring with over 800 samplings and more than 8,000 individual parameter measurements are evidence of the success achieved to date. Regular reports to and talks with the authorities rounded off the extensive monitoring of the project.

*Fig. 2: Team: (l. to r.) Konrad Slowik, Christian Blechschmidt, Ewald Stoeckl, Ralf Schäfer, Wolfgang Molnar and Dr. Christian Mueller.*

As part of our ongoing soil protection measures, samples will continue to be taken for analysis even after conclusion of the decontamination work. The aim is to make the project a sustainable success.

Dr. Christian Mueller,
Head of Facilities

[1] State of the soil in Germany – to mark the International Year of Soils; Federal Environment Agency 2015, Dessau-Roßlau 2015.
[2] The soils of Germany – Federal Environment Agency, 2010, Dessau-Roßlau 2010.
[3] Third soil conservation report of the German Government; Federal Ministry of the Environment, Nature Conservation and Reactor Safety, Paper WA III 2, Bonn 2013.
[4] Reise in den Untergrund, Teil I, Die Haut der Erde; ARTE G.E.I.E., Kehl, May 2015.
[5] Boden, Böden, Bodenschutz; Ministerium für Umwelt, Klima und Energiewirtschaft BadenWürttemberg, Stuttgart 2015.
[6] Resolution adopted by the General Assembly on 20 December 2013, 68/232; World Soil Day and International Year of Soils; United Nations, NewYork 2014.
[7] Status of the World's Soil Resources – Main Report; Food and Agriculture Organization of the United Nations and Intergovernmental Technical Panel on Soils, Rome 2015.
[8] http://www.fao.org/soils2015/en

# Overview of current and planned projects

## Freiburg Location

### Environmental Projects

| Subject | Goal | Measure | Dept. responsible | 2015 | 2016 |
|---|---|---|---|---|---|
| **Waste management** | Increase in recycling quota for waste products | Send spent hydrofluoric acid for material recycling | Environment, Safety and Fire Protection | ● | |
| | Waste reduction | Send silicon wafers for recycling | | ● | |
| **Energy management** | Electricity savings of 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 | ○ | ○ |
| | 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. 2,500 kWh/year (0.5 t $CO_2$ / year) | Installation of LED lamps on a carpark and at various workplaces | | ● | |
| | Electricity savings of approx. 10,000 kWh/year (2 t $CO_2$ / year) | Conversion to LED technology in buildings | | | ● |
| | Electricity savings of 118,000 kWh / year (25 t $CO_2$ / year) | Electricity savings through introduction of "thin clients" | IT Operations | ● | |
| | Electricity savings in Front Assembly of 41,000 kWh (7.1 t $CO_2$ / year) | Capacity extension with faster die-bonders | Backend Assembly | ● | |
| **Water resource management** | Water savings | Removal, utilization and infiltration of ground-water for cooling purposes | Plant Engineering and Facilities | | ● |
| **Fire prevention** | Attainment of fire protection certificate of the damage insurer for the high quality of the safety measures regarding insurance requirements | Continuous improvement in preventive and organizational fire protection, regular fire prevention audits by damage insurer | Plant Engineering and Facilities, Environment, Safety and Fire Protection | ● | |
| **Legal certainty** | Implementation of a legally secure and standardized archive of documents (e.g. operating permits) | Configuration of a filing system in the archives of the production area; subsequent archiving of valid documents | IT Operations, Environment, Safety and Fire Protection | | ● |
| | Adherence to legal thresholds from 4$^{th}$ and 12$^{th}$ Bundesimmissions-schutzverordnung (Federal Immission Control Acts) | Use of SAP booking data, definition of static hazardous substance volumes in warehouses, provision area and production areas in SAP and up-to-date compilation and overview in the Micronas Business Intelligence software | | | ● |
| **Health protection** | Encourage healthcare among the workforce | Health campaigns: Campaign on burn-out prevention, testing of new inner and outer shoes for waferfab employees, information on fitness with free training, tips on wellbeing and healthy diet | Working group on health protection | ○ | |
| | | New offers: Extra Shiatsu chair for faster easing of back tension, creation of a rest zone (low-noise relaxation room in building 7), power bags with regional and fair-trade fruit | | ○ | |
| | | Health campaigns: Optional measurements on various functional diagnostics (e.g. balance check, heart coach, vascular changes, vein function) on a campaign day | | | ● |
| | | New offer: Conflict mediation | | | ● |

Legend: ● Implementation ○ Extension ● Completed, goal achieved ○ Completed, goal nearly achieved

# Micronas at a glance



## FACTS AND FIGURES

### Micronas in 2015

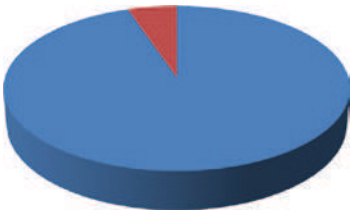
- Headquarters of holding companies in Zurich, Switzerland (SIX Swiss Exchange: MASN)
- Operational management and production in Freiburg, Germany
- 919 employees worldwide, of which 810 at the operational headquarters in Freiburg
- Test center in Glenrothes (Scotland)
- Sales of CHF 134.4 million / EUR 127.1 million
- Takeover offer by TDK Corporation – Micronas will, within the combined company, assume responsibility for magnetic field sensors, serving as the sensor competence center
- Investment and ongoing expenditures in corporate environmental protection (waste management, water protection, soil decontamination, noise reduction, air pollution control, climate protection, nature protection, nature protection, landscape conservation) in Freiburg

| | EUR million |
|---|---|
| **2012** | 1.4 |
| **2013** | 1.4 |
| **2014** | 5.8 |
| **2015** | 1.6 |

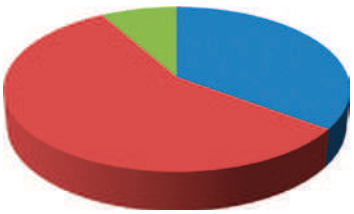
### Test center in Glenrothes (Scotland)

- 76 employees
- Energy consumption: 2.6 GWh equivalent to 1,263 t $CO_2$
- The chief environmental aspect is electricity consumption and the related $CO_2$ emissions.
- Main waste fractions: 4.3 t paper and board, 3 t plastics and 9.5 t metal into recycling; 5.5 t of domestic-like waste for disposal
- Notifiable accidents: none

### Sales distribution according to production lines




### Sales distribution by region




### Micronas Certificates


ISO 14001 Freiburg


ISO 14001 Glenrothes


EMAS Freiburg


Fire Prevention Certificate (SISTA) Freiburg

# Environmental Data 2015

## Environmental Data 2015

The following charts show the 2015 environmental data for the Freiburg site, which is the Micronas headquarters and its largest production site. By publishing these figures, we comply with the requirements of Regulation (EC) No. 1221/2009, the so-called EMAS regulation.

The bar charts show the absolute consumption figures, while the linear diagrams show the consumption normalized to the total gross value added – the so-called "core indicators". The core indicators themselves are then related to the year 2015. Normalization to the total gross value added over the last four years ensures the required comparability of the consumption data.

| Year | Total energy consumption in GWh | of which from renewable energy sources in GWh (proportion of total energy consumption) | Total energy consumption normalized to the total gross value added, related to the year 2015 | PEF electricity [1] | PEF gas [2] | PEF heating oil [2] |
|---|---|---|---|---|---|---|
| **2012** | 78.3 | 38.2 (49%) | 74% | 1.27 | 1.1 | 1.1 |
| **2013** | 80.7 | 42.0 (52%) | 82% | 1.21 | 1.1 | 1.1 |
| **2014** | 90.6 [4] | 36.3 (40%) | 87% | 1.21 | 1.1 | 1.1 |
| **2015** | 95.6 | figure not yet available | 100% | 1.3 [3] | 1.1 | 1.1 |

### Energy consumption

The core indicators specified by EMAS and the primary energy factors (PEF) are shown in the table above.

Primary energy factors indicate what quantity of primary energy is needed to provide a certain amount of final energy (e.g. electricity). These are taken into account in the diagram on electricity and fossil energy sources.

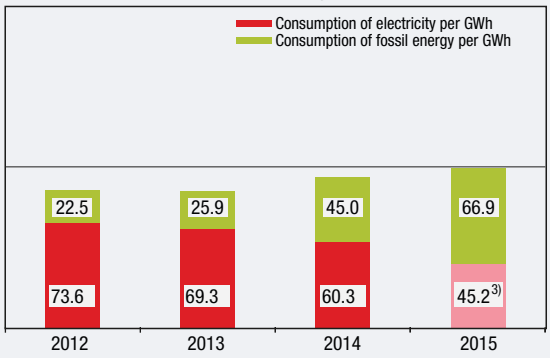
The photovoltaic unit generated around 112,200 kWh in 2015. The facility had to

MICRONAS FREIBURG

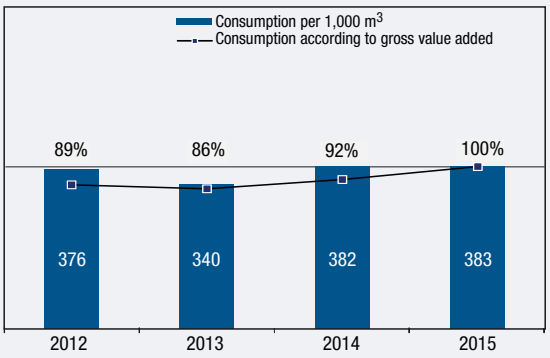
Absolute consumption

Consumption related to the total annual gross value added in %, normalized to the year 2015

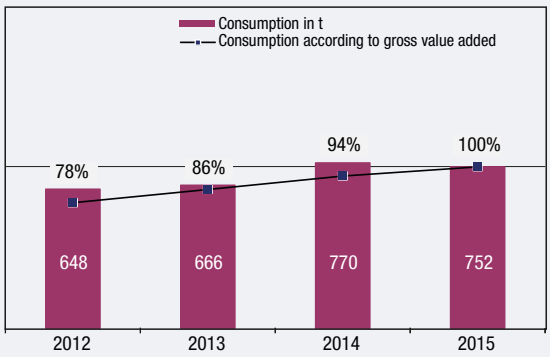
Consumption of electricity and fossil energy sources, taking into account the respective primary energy factor. For total energy consumption and normalization to the total gross value added, see Table



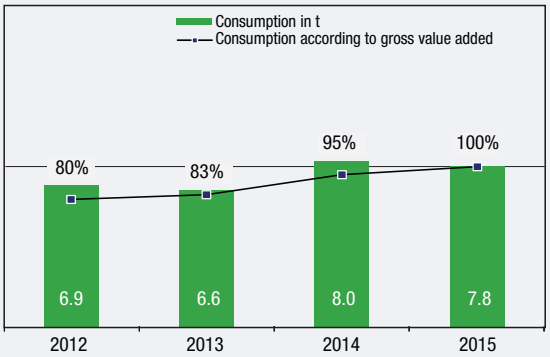

Water




Chemicals




Process Gases





be taken off stream for a large part of the year to follow up a product warning from the supplier and initiate corrective measures.

## Other environmental data for 2015

- The natural gas consumption (for heating purposes and for electricity and heat generation in the cogeneration unit) in 2015 of approx. 61 GWh according to GEMIS[5] corresponds to equivalent emissions of 89 kg of $SO_2$, 4,900 kg of $NO_x$, and 61 kg of dust, which are regarded as insignificant environmental aspects.
- The sealed area (core indicator biological diversity) is 39,200 $m^2$, the unsealed area is 12,300 $m^2$.
- The recycling quota for the entire waste produced rose from 82% to 83% in recent years to 95% in 2015 due to the recently introduced material recycling of the spent hydrofluoric acid.
- The pattern taken by the amount of hazardous waste produced over the course of the year basically correlates with the processed wafer area. The marked decline in 2015 is based on the one hand on the fact that a specific wafer technology was discontinued and, with it, the time-corresponding acid change. On the other hand, there was a one-off trial to increase the concentration of acid to be disposed of, combined with the reduction in the acid volume.

## Fire Prevention

The damage insurer has awarded the fire prevention certificate 2015 (SISTA, SIcherheitsSTAndard) to the Freiburg production area. This certifies the high quality of the Micronas safety measures, which meet the insurance requirements of the fire and fire business interruption insurance.

[1] Primary Energy Factors for electricity from electricity supplier

[2] Primary Energy Factors for gas and heating oil from DIN V 18599-1:2011-12

[3] PEF (electricity) for 2015 is a conservative assumption by the electricity supplier

[4] The total energy consumption (electricity and fossil energy) of 81 GWh reported in Environmental*News* 2014 does not take account of the additional primary energy input following the introduction of the BHKW in 2014.

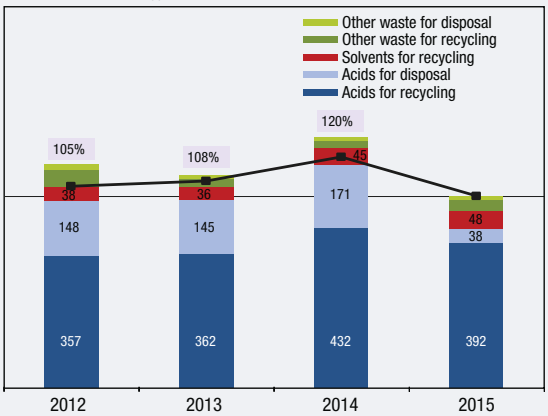
5) Global Emission Model for Integrated Systems

## WASTE

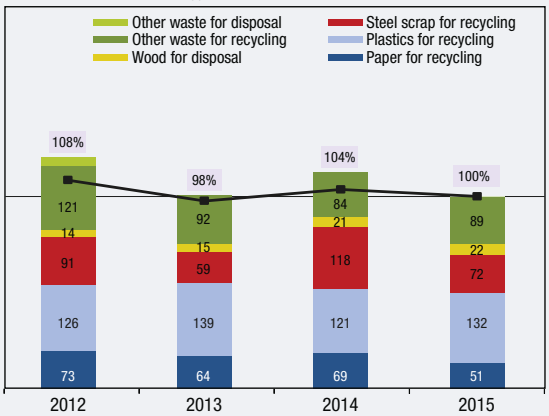
Waste in t

Waste referring to gross value added in %, normalized to the year 2015

Hazardous waste (t)




Non-hazardous waste (t)

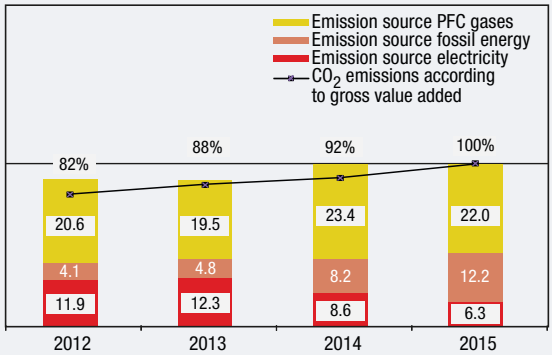



## $CO_2$ EQUIVALENTS

$CO_2$ equivalents

$CO_2$ equivalents related to the total annual gross value added in %, normalized to the year 2015

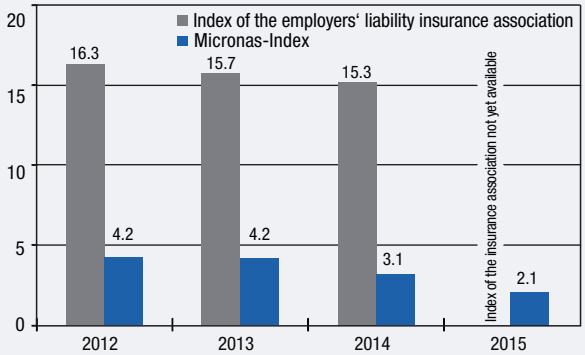
$CO_2$ emissions per 1,000 t




## ACCIDENTS

Notifiable accidents per 1,000 employees

Accidents



MICRONAS

EMAS
Verified environmental management
DE-126-00053

## Environmental Statement

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

## Environmental Verifier / Environmental Verifier Organization

The authorized environmental verifier / environmental verifier organization are as follows:

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

## Validation

Dr. Reiner Beer, with EMAS environmental verifier 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 updated 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, July 2016

Dr. Reiner Beer, Environmental Expert

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