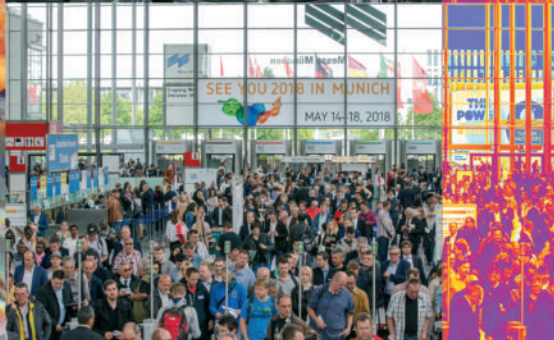
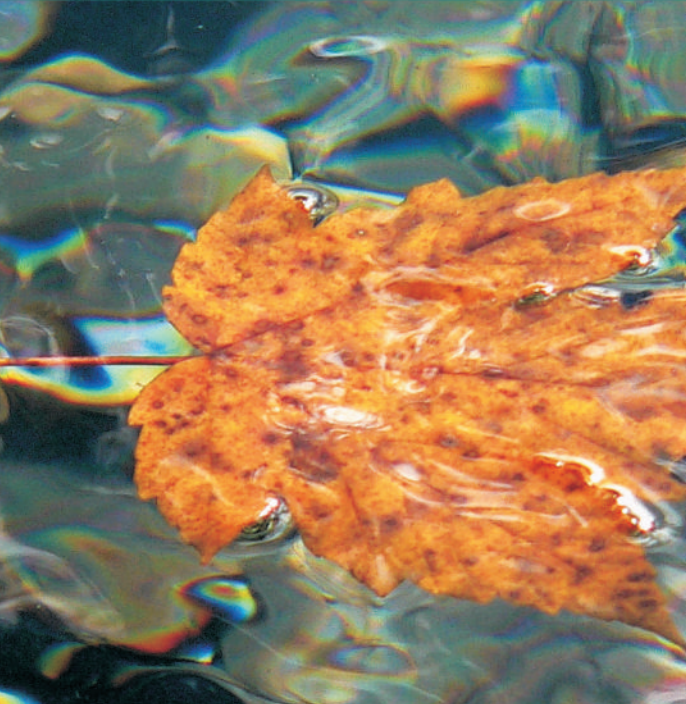
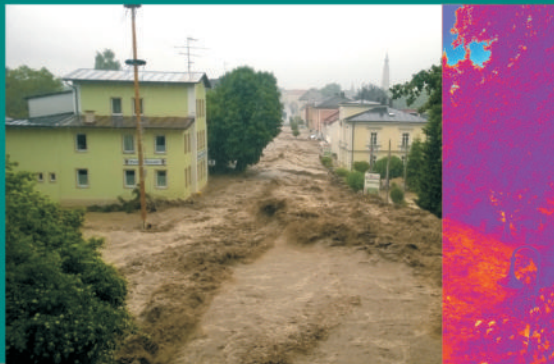


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Editorial

Innovative and future-oriented solutions for a future worth living in

Climate change and an extremely fast-growing demand for energy are the challenges of our time. The top priority is to generate sustainable growth while at the same time reducing greenhouse gas emissions. The aim of all efforts must therefore be to increase the share of renewable energies and at the same time improve energy efficiency. How this can be achieved is shown by proposals and examples from local authorities, industry, associations, organisations, and university institutions:

- Who offers environmental expertise at the highest level?
- What role do local authorities play in environmental protection and efficient energy supply?
- How are sources of noise visualised by an acoustic camera?
- Where can young entrepreneurs have recourse to extensive infrastructure and a wide range of services?
- What is the consensus on whether sustainable and efficient energy supply is possible?
- Where is the meeting point for forward-looking innovations?

- Which new approaches to energy management and energy efficiency can be implemented?

"Environmental technology and energy in Bavaria" focuses on sustainable quality of life.

Walter Fürst, Managing Director

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Saving resources – boosting circular economy Securing the future with a raw material shift



The annual UN Climate Conference took place in November 2017, this time in Bonn. Like no other topic, the discussion on climate change has made people aware of their limits, not only with regard to the impact of greenhouse gases on the Earth, but also to the worldwide consumption of natural resources – two issues that are completely inseparable.

Because one fact is certain: our current lifestyle demands more and more resources. The worldwide use of raw materials – whether oil, gas, coal or mineral resources – has increased by more than 50 percent over the past 30 years. Our consumption today amounts to 78 billion tons. The „Earth Over-shoot Day,, – this being the date when the world population has used up its ‚annual budget‘ of natural resources – moves a little bit forward in the calendar every year. In 2017 this date was reached on August 2nd – four months earlier than 30 years ago. Booming economies and growth in the global population are forever escalating the demand for raw materials. What makes the situation even worse is that the extraction of raw materials is becoming more and more difficult and more expensive.

Deposits are frequently found in politically instable regions. There is also increased mining of raw materials in areas where concentrations are low, and this often has a negative impact on the environment due to intensive input of materials and energy. We just cannot afford to go

on this way if we want to preserve our prosperity.

In the consumption of raw materials there is also a moral-ethical factor to be observed. Our responsibility towards future generations means that we must commit ourselves to a more sustainable use of the Earth's natural resources. If today's generation continues to openly plunder resources, we will not only be leaving the next generations a planet that has been depleted of raw materials, but also one with irreparable environmental damage. In line with the „polluter pays,, principle, we need to manage a turnaround in the consumption of raw materials. On a permanent basis!

The protection of resources is a key issue in Bavaria. Our top priority is to decouple economic growth from the consumption of resources. To achieve this goal we need a functioning circular economy. A major step along this path is resource efficiency enhancement. The efficient use of resources can limit the impact on the environment and still maintain Bavaria's competitive edge as a business location. To this end, the State of Bavaria set up the Resource Efficiency Centre of Bavaria as a hub for networking and for creating synergies that ensure better and efficient use of resources. The funding of the ForCYCLE network was another milestone in building up resource competence in Bavaria. By developing innovative recycling processes and enabling business enterprises to

make simultaneous use of the acquired secondary raw materials, we are laying the foundation for a successful circular economy. A follow-up for ForCYCLE is already being planned. The topic of resources and recycling is also addressed at the IFAT 2018 in Munich. As part of the world's leading trade-fair for water, sewage, waste and raw materials management the Bavarian State Ministry of the Environment and Consumer Protection is again organising a Conference on Resource Protection and Recycling. A major focus of IFAT 2018 will be on sustainability and the recycling of construction materials, with particular emphasis on increasing the acceptance of recycled construction materials. The recycling of mineral debris and broken-up road surface materials, as well as their re-use in the construction industry as secondary raw material, helps save primary resources and also contributes towards climate protection. The benefits achieved as a result will be threefold – lower raw material costs for companies, affordable prices for customers and responsible use of natural resources for the environment.

A stylized blue ink signature of Ulrike Scharf.

Ulrike Scharf MdB

Bavarian State Minister of the
Environment and Consumer Protection



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Sharing our passion for energy and service

MVV Industriepark Gersthofen GmbH manages Industriepark Gersthofen (Gersthofen Industrial Park), which is currently occupied by ten companies with a total workforce of around 1,200 people. The core competencies of MVV include the supply of energy and utilities, services connected with the site infrastructure and security/environmental management.



Economic and ecological factors go hand in hand in Gersthofen: by using refuse-derived fuels (RDFs) as a source of energy for a high-efficiency power plant, MVV reduces CO₂ emissions and therefore makes a significant contribution to environmental protection and, consequently, to sustainable waste management in Bavaria.

MVV Industriepark Gersthofen GmbH is a subsidiary of the MVV Group, which is a listed company headquartered in Mannheim.

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Monitoring of

Stormwater overflow tanks

The proper servicing of the approx. 25,000 stormwater overflow tanks in Germany is an essential requirement for successful water pollution control. The hydraulic loads are especially high in occurrences of heavy rainfall, and this frequently results in extreme discharges into the water, combined with high loads from chemical oxygen demand (COD), nitrogen compounds, heavy metals and anthropogenic micropollutants. Owing to their pollution load discharges, which can sometimes be significant, stormwater overflow tanks therefore play a central role in the treatment of stormwater. Those responsible for stormwater treatment therefore face a great challenge in bringing their partially obsolete facilities up to today's standards in construction and technology. Fitting the tanks with electronics as part of this also presents a challenge for these operators.

Detailed explanations on the structural design and fitting of stormwater overflow tanks with electronics or measurement instruments can be found in the regulations of the DWA (German Association for Water, Wastewater and Waste) (DWA-A 16 worksheet, DWA-M 176 information sheet and DWA-M 181 information sheet). ■

Remote monitoring and remote control

For example, the self-monitoring regulation (EKVO, German regulation for monitoring wastewater systems) of Baden-Württemberg demands that stormwater overflow tanks undergo visual and functional checks „particularly after stress on

the facilities through rainfall“ – i.e. after every inundation event of the tank.

This includes visual checks for deposits at the inlet, overflows and outlet, as well as a functional check on the technical equipment, measuring devices and throttling devices. As a result, any malfunctions must be rectified immediately. If the operator of such a facility demonstrably does not fulfill their duties, this can lead to criminal charges.

In its justification, the Baden-Württemberg EKVO grants the possibility of carrying out partial checks via remote monitoring systems. This can considerably reduce personnel costs and save a great deal of time. Furthermore, the remote monitoring system should also have automated standard analyses of measured data (e.g. inundation and discharge activity in monthly and annual reports), since the water authorities of the States demand these reports repeatedly. ■

What might an example solution for this be? (example here from Endress+Hauser)

- Measuring components for fill level (ultrasonic, radar and hydrostatics) and flow rate (EFM)
- Electronic recorder for the logging and archiving of the overflow events („stormwater overflow tank record“)
- Mobile router for the transmission of measured values
- Web server with web dashboard for rendering and analysis of the measured data via Internet access
- Complete data hosting

Description of solution:

The measured values are recorded and saved on site in a memograph-type electronic recorder. This provides maximum security. The necessary data is transferred securely via a mobile router to a central server at Endress+Hauser and stored safely there. The standardized stormwater overflow tank records can be retrieved anywhere at any time over the Internet using a secure web dashboard. No on-site software installation is necessary. Up-to-date security standards (VPN, HTTPS) are used for this purpose. ■

Advantages/benefits for customers:

- Curve profiles and stormwater overflow tank records can be retrieved anywhere at any time via the Internet
- No on-site IT infrastructure necessary
- No on-site software installation necessary
- Events are promptly recognized and relayed
- Secure connections via VPN and HTTPS

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Saving energy across a network



At Gersthofen Industrialpark Park, a network of eight companies helps boost energy efficiency.

An energy-saving initiative was set up at the industrial park almost two years ago, the main focus of which is the efficient use of primary forms of energy. Eight companies now successfully participate in GEENI – the ‚Gersthofer Energieeffizienz-Netzwerk Industrie‘ (‚Gersthofen Energy-Efficiency Network for Industry‘). It not only includes companies based at the industrial park such as chemicals manufacturers CABB, Clariant and Kraton Chemical, but also service providers such as Bilfinger Maintenance, MVV and IGS Netze. Two external companies are also part of the network: the SGL Group from Meitingen and the building materials manufacturer Johns Manville from Bobingen. Responsibility for the network lies with the site operator MVV Industriepark Gersthofen GmbH, which also provides the moderator.

Gersthofen Industrial Park

Ever since GEENI was established, the participating companies have been looking closely at ways of saving energy, combining and analysing their projects and consolidating their lessons learnt in a shared list of actions. The principal aim of the network is to exchange ideas and experiences across companies in order to achieve a new level of efficiency together and to reduce CO₂ emissions. The initiative is set to run for a three-year period, with the initial findings already available.

The ideas include two exemplary projects that illustrate the effectiveness of an energy-saving network. The examples are designed to show that working together closely beyond company barriers can pay dividends: ‚Look closely at issues and talk about them,‘ is the

motto of Dr Herbert Rauscher, network moderator and the man responsible for the energy supply at Gersthofen Industrial Park. Where necessary, the network can also draw on the support of an energy consultant; in the case of GEENI, this role is occupied by BFE Institut für Energie und Umwelt GmbH in Mühlhausen. ■

Optimum compressed air supply saves energy

The Clariant wax-grinding plant in Gersthofen produces more than 10,000 tonnes of wax powder and ultra fine wax particles a year. Four compressors were used to generate the necessary compressed air. Due to their age, some of these compressors needed considerable maintenance. Despite a combined approach involving adjustments to loads, idle periods and rotational speed, it was only

possible to achieve limited energy efficiency. The existing compressed air system was subjected to a detailed analysis using special sensors. First and foremost, this meant examining mass flow rates and pressure gradients in order to lay the foundation for a new system concept.

The solution: an outdated rotary-screw compressor was replaced with a modern turbo compressor that serves the base load and boasts a high level of energy efficiency. The central control unit was replaced and optimised, enabling a significant reduction in the idling rates of individual compressors. In turn, this enabled a considerable lowering of specific power input. When coupled with the decreased repair costs, the new compressed air solution delivered a pleasing saving at the production facility. ■



The poster features a blue background with a hexagonal pattern. At the top left is the logo for 'INITIATIVE ENERGIEEFFIZIENZ NETZWERKE' and at the top right is the logo for 'GEENI GERSTHOFER Energieeffizienz-Netzwerk INDUSTRIE'. The main title 'GERSTHOFER ENERGIEEFFIZIENZ-NETZWERK INDUSTRIE' is prominently displayed. Below it, a list of four bullet points outlines the network's goals: connecting companies, sharing knowledge, saving energy, and reducing CO2 emissions. At the bottom, a circular area contains logos for member companies: IGS NETZE, CLARIANT, JM Johns Manville, BILFINGER, MVV, CABB, KRATON, and SGL GROUP.

INITIATIVE
ENERGIEEFFIZIENZ
NETZWERKE

GEENI
GERSTHOFER
Energieeffizienz-Netzwerk
INDUSTRIE

GERSTHOFER ENERGIEEFFIZIENZ- NETZWERK INDUSTRIE

- Unternehmen vernetzen
- Wissen teilen
- Energie sparen
- CO₂ reduzieren

IGS NETZE
Ein Unternehmen der MVV

CLARIANT

JM
Johns Manville

BILFINGER

MVV

CABB

KRATON

SGL GROUP
THE CARBON COMPANY

Energy efficiency thanks to a lighting management system

Alongside efforts to optimise the costs of its energy-intensive production processes, specialist chemicals manufacturer CABB is also focusing on its infrastructure. An analysis conducted as part of a specific project came to the conclusion that significant savings in overheads could be achieved by installing LED lighting and introducing a

lighting management system. The production facilities at CABB operate 24 hours a day, 365 days a year. Almost 2,000 fluorescent lamps had been installed to light up the production facilities and administration buildings (34 buildings in total); their average operating time was estimated at 7,000 hours a year. A study focusing on the lighting in all production and infrastructure areas resulted in the development

of a completely new lighting concept. A minimum level of illuminance has been retained, ensuring safety by means of a backup generator in the event of a power cut. The lights are on permanently and have been converted to energy-saving LED technology. The lighting is now maintenance-free.

A lighting management system has been developed for all other lights. In certain areas, it is only possible to switch lights on – as practised on staircases. Automation with the existing process management system offers many opportunities, with costs kept to a minimum. The result is a 'lighting philosophy' at the company that meets all requirements and makes both ecological and economic sense. The new concept saves energy and maintenance costs whilst ensuring a high degree of workplace safety. The two measures at CABB lead to an annual CO₂ saving of around 120 tonnes. ■

Conclusion: *it's worth taking a closer look*

These examples make it abundantly clear that it is worth scrutinising energy costs very closely and, most importantly, sharing insights. The energy-saving measures can be applied at little cost and can therefore benefit many companies. ■

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Network moderator

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Growing environmental expertise creates competitive edge

The administrative district Landkreis Aichach-Friedberg has been an active member of the KUMAS Kompetenzzentrum Umwelt e. V. since its foundation in 1998. We actively participate and benefit from the network activities, e. g. from business contacts or science cooperation. The businesses in our region are able to augment their environmental competences and therefore strengthen their competitive advantage and overall sustainability. The Landkreis Aichach-Friedberg further enhances this through complementary activities regarding energy and resource efficiency such as an evening event for local businesses, which was held in cooperation with KUMAS and other regional partners. The department for promotion of economic development and the department for climate protection have been acting as pilots in matters of energy efficiency, renewable energies as well as grants and subsidies for businesses, municipalities and pri-



The Umweltpreis is an award for outstanding contributions to environmental and climate protection which is handed out by the Landrat (district administrator) once a year. Companies are welcome to apply. ■

vate households for many years. Professional, independent and free of charge consultation hours which are open to businesses are offered on a monthly basis. Together with the City Augsburg and the Landkreis Augsburg, the Landkreis Aichach-Friedberg supports companies in the implementation of environmental management systems through the project ÖKOPROFIT A 3. Having completed this process, the businesses are offered the opportunity to join the ÖKOPROFIT Klub Augsburg, a network of companies that

work together to continually improve their environmental performance.

Our latest offer is a tool to analyse the power consumption in companies. This energy meter measures and analyses specific electrical loads in the working processes of businesses. A qualified energy consultant monitors the process, interprets the results and directly points out potentials for energy-saving measures on site in the respective company.



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AICHACH-FRIEDBERG

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The district of Augsburg builds on environmental expertise

The district of Augsburg is strongly committed to environmental and climate protection and aims to halve the greenhouse gas emissions until 2030 by promoting efficient energy consumption and supporting the use of renewable energies.

Environmental and climate protection initiatives underline the districts awareness of being a role model. The schools in sponsorship of the district are currently in the process of being systematically renovated with a focus on efficient energy use. Consequently, high energy efficiency standards are being implemented and climate-friendly options for the energy supply chosen, such as woodchip, district heating systems or cogeneration plants.

A recent highlight in terms of energy-efficient development is



Photovoltaic plant of grammar school „Schmuttertal“, Diedorf ■

the grammar school „Schmuttertal“ in Diedorf: it was built in plus-energy-standard and is the only school in Germany, which over its entire lifecycle produces more energy than it consumes, from being built, through operation to theoretical demolition. Furthermore, it is the only grammar school in Germany which was built on a CO₂-neutral wooden construction. Numerous well-known national prizes prove the success of the „Eco-School“ concept.

Energy savings and the reduction of CO₂ can also be achieved by optimizing user behaviour. Because

every single person has to contribute in order to accomplish a successful energy transition, the district of Augsburg has created a long term educational energy saving project („PEP“) in order to raise and sustain awareness for this topic within the school communities. This long-term project was implemented in 2012.



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The missing part for SME - energy consulting in Augsburg business parks

The Augsburg area has set itself the target of reducing annual CO₂ emissions by 55% compared to 2009 by 2030. An ambitious goal, considering the economic power gathered in the districts of Aichach-Friedberg and Augsburg and especially in the city of Augsburg. At the same time, many companies have already set out towards energy and resource efficiency in order to reduce costs, optimize processes, gain competitive advantages and distinguish themselves as a sustainable company. They are supported by a comprehensive range of information and advice services – from brief telephone advice to opportunities to benefit from the latest findings in research projects.

The city of Augsburg, a KUMAS founder member since 1998, also contributes to this range: most notably, the ÖKOPROFIT® club (since 2016 also acting as an energy efficiency network) and the ÖKOPROFIT® entry rounds should be mentioned here. There are eleven companies currently active in the club, many of them for several years. Since its launch in 2002, the ÖKOPROFIT® project has already introduced 57 Augsburg companies to corporate environmental management.

In 2018, this offer will be supplemented by the broad-based „energy consulting in Augsburg business parks“. The campaign is aimed specifically at small and

medium-sized companies and comprises two elements:

- During an up to three-hour on-site consultation, an independent efficiency expert conducts a compact inventory, highlights optimization opportunities, and suggests next steps and funding opportunities.
- Second element are further offers within the respective business park, with the aim of enabling companies to start an improvement process.

The new offer focuses on energy efficiency and renewable energies. Depending on the cost structure, starting position and interest of a company, the advice may also cover other aspects related to resource efficiency.

This flexibility in terms of content not only reflects the qualifications of the consulting experts, but also the experience of numerous companies: The systematic recording and optimization of energy use opens up initial savings potential – „easier saved than earned“. Moreover, the company is provided with the basis for further steps towards comprehensive resource efficiency and sustainability. Examples are flow of materials, process quality, logistics up to digitization and innovation processes.

Contact point for interested companies is the environmental office of the city of Augsburg.

Launch in the business area Lechhausen Nord 2017:

- on-site-consulting at the respective company
- vendor- and product neutral advice
- consultants with long-term experience in the SME sector and dena/BAFA qualification
- topics ranging from cross-sectional technologies to specific topics
- up to 3 hours duration, including:
 - compact, comprehensive first inventory
 - site inspection to specify optimization proposals
 - individual suggestions for next steps and funding opportunities
- consulting report (optionally with a final explanatory meeting)
- profitable: energy cost savings of 10-20% in many SMEs already possible through non- or low-investment measures
- funding granted by the environmental office of the city of Augsburg for up to ten companies

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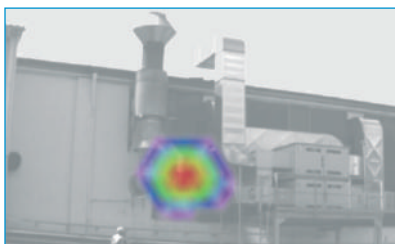
Compliance with legally required noise control standards can be challenging, particularly for managers of industrial plants and large construction sites. At these sites, the causes of excessive noise are frequently difficult to identify as there are numerous sources of noise, some even inaccessible. The case study of a production company located at the edge of a town shows how TÜV SÜD experts use acoustic cameras for localising and visualising sources of noise.

Near a residential area, a company produces electrical insulation for transformers, electric motors and generators. Production runs in several shifts. However, at night the factory slightly exceeded the noise limits defined by law time and again. The company had no comprehensive noise inventory. Given this, it was unclear whether isolated improvement measures would be effective and if so, where they should be introduced. In addition to providing answers to these questions, TÜV SÜD's experts were commissioned to assess the existing noise control concept and identify weaknesses, if any.

The acoustic camera they used for this purpose comes with wide-area arrays of individual microphones. The time difference between the incoming signals is used to calculate the origin of the signals. Digital filters are incorporated to improve signal quality. As in thermography, the different levels of noise intensity are presented in different colour graduations – from red to green and blue/purple. This colour pattern is then superimposed over the camera image. This method allows noise sources to be identified beyond all doubt and even presented in the form of a video. ■

Surprising result on site

The four production halls and the boiler house were home to several hundred possible noise sources. However, contrary to expectations,



Localisation and visualisation of a noise source in an industrial plant with the help of an acoustic camera ■

the cause of the violation of statutory noise limits was localised not in the boiler house or the production halls, but in an auxiliary building. During conversion work in the factory, the plant manager had installed an additional production system there. While on-site measurement proved the noise level of the actual production system was within legal limits, the sound waves it emitted were causing the extensive glass façade of the auxiliary building to vibrate. The noise generated by the large surface was masked by other sounds in the vicinity of the production hall, and was only audible in the residential area nearby.

Once the source of the sound had been narrowed down, the company was able to take targeted and cost-

effective measures to minimise sound emissions. In this case, the glass façade was unnecessary and could therefore be replaced by a solid brick wall. As the company now reliably complied with the maximum acceptable noise limits and the sounds perceived as disturbing by local residents were eliminated, the factory's acceptance in the area improved, providing better planning certainty for future projects. Further images taken by the acoustic camera in the near field of the production company also identified other acoustic weaknesses, including a loose pipe clamp and corroded air vent. Repairing these sources of noise involved very little effort and expense and significantly improved the company's image. ■

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From a safe distance

Health and safety play a pivotal role at BUCHEN – which is why the company places such importance on developing its own technology to further improve safety standards. Thanks to its latest innovation, a robot with an automated high pressure jet washer, the company has once again improved the working conditions for their industrial cleaning specialists.

No matter whether it be oil refineries, chemical businesses or heavy industry: if their machines need cleaning, then high pressure water jet systems with handheld lances are often deployed to perform the work. This carries a number of risks for the industrial cleaning experts – firstly because the water jet is so powerful and secondly because the spray generated obscures their vision. What's more, there is the added uncertainty of the potential risks of the product residue and hazardous substances dislodged by the process.

These were, therefore, all good reasons for BUCHEN UmweltService to look at and improve the technology being used. The company's own technology department develops a robot that enabled high pressure jet cleaning work to be automated. The result: its automated industrial cleaner (AIC). ■

Customer benefit from safe work and excellent results

There are a whole host of advantages to deploying this robot. First and foremost, it further improves safety levels. All the potential risks operatives may face in the danger zone sim-



BUCHEN's automated industrial cleaner is controlled with a joystick – by an operator sitting in the control centre (container) well away from the danger zone ■

ply no longer apply as they do not need to enter the area. At the same time, the ongoing physical strain of manual cleaning work is reduced. This is especially true when it comes to the powerful recoil caused by the high pressure jet. Industrial cleaning specialists working with handheld high pressure lances have to cope with a recoil of maximum 25 kilogrammes. In contrast, the AIC system is effectively a back-friendly “desk job” in an air-conditioned container where they can carry out their work safely either sitting or standing. Also the AIC uses a ratio of pressure and water volume that produces particularly effective cleaning results. Moreover, the same high quality cleaning results are reached as the distance between the jet and the part being cleaned remains the same throughout. The mobility of the robot creates further advantages – especially for cleaning work which

operatives would have to do overhead or from an elevated position.

With around 2,700 employees in more than 70 locations, BUCHEN is one of the leading service providers in Europe in the areas of industrial services, power plant services, tank services, catalyst handling and sludge dewatering. ■

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European funding instruments for research on Environment and Energy



For decades, the European Union has been committed to the protection of the environment and focuses particularly on the close interaction of environmental and energy policies.

Whilst the European Union stands for remarkable unity and a strong ability to negotiate on the world stage, for instance through the conclusion of international climate agreements, it shows its dedication for a sustainable climate policy above all within Europe itself.

The Europe 2020 strategy for a smart, sustainable and inclusive growth substantiates the goal of the European environmental policy to reduce greenhouse gas emissions, to increase the proportion of renewable energies and to enhance energy efficiency. Following this strategy, the European Commission prioritises the creation of a European Energy Union, which shall lead to secure, affordable and sustainable energy for Europe (including the implementation of an internal energy market). The development of renewable energies will contribute to European and globally agreed climate targets, and increase Europe's independence of resource and energy imports, thus guaranteeing the energy security of about 500 million Europeans. The mentioned elements of the

European environmental policy aim at achieving a decarbonised and sustainable economy, protecting natural resources as well as safeguarding health and quality of life of all Europeans. Simultaneously, the competitiveness of the EU on an international level shall be increased.

How can the political willingness to adjust the European economy to sustainability and to implement the Energy Union based on renewable energies to combat climate change be realised, while ensuring the living standards for all Europeans and the competitiveness of Europe?

The EU invites all societal stakeholders to work together and across borders towards innovative, creative and forward-thinking solutions for a future worth living in. The needs of the ambitious European climate and energy policy will be met by exploring and developing new technologies and instruments.

To realise its environmental and energy policy, the European Union has consequently invested for years in research and innovation, whilst increasing Europe's competitiveness through innovative project results. One instrument of this investment is the EU Framework Programme Horizon 2020, which represents the largest

funding programme for research and innovation worldwide. From 2014 to 2020, Horizon 2020 provides nearly 80 billion Euros, of which 10 billion are available for energy and environmental research.

The European Union pursues a holistic approach with its research and innovation policy, which focuses on the development of disruptive innovations and in particular on the involvement of different societal stakeholders. Scientists from universities and research institutes cooperate in interdisciplinary projects with researchers from industry and representatives from communities and political authorities. Moreover, the participation of private persons as citizen scientists becomes increasingly relevant. The participating partners benefit from the knowledge and research culture of other countries, while increasing their international visibility through transnational cooperation.

Horizon 2020 follows the principle of the three "Os". Open Science allows the unhindered knowledge transfer in all areas of society. Open Innovation opens the innovation process and hence promotes knowledge exchange as well as the cross-linking of know-how. The principle open to the world acts in this spirit as well, as Horizon 2020 explicitly welcomes the cooperation with partners from around the world, thereby

widening the European research area by a global perspective and creating a value added for Europe.

The Horizon 2020 work programme for 2018 to 2020 funds projects in the environment and energy sectors, which contribute to a low-carbon and climate-resilient future, to the implementation of the Paris Agreement and to the greening of the economy in line with the UN Sustainable Development Goals (SDGs).

In tangible terms, this implies creating cost-effective and more efficient production technologies that are integrated better into a smart, flexible and robust energy system. Energy efficiency shall be amplified in industrial processes and the EU building stock (new and existing buildings). By granting an citizens and consumers active role in the energy transition, the understanding of the socio-economic context shall be improved and the market acceptance of environment and energy innovations will be increased.

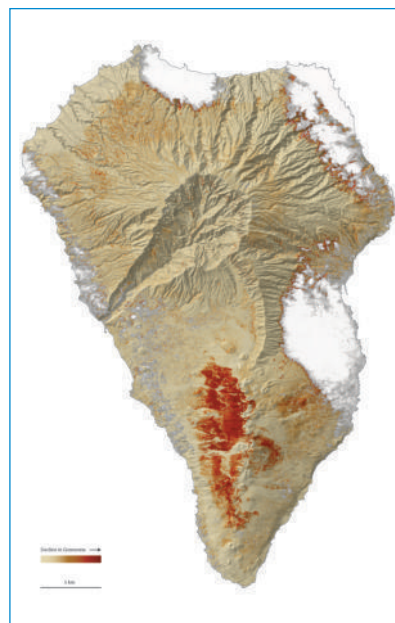
Regarding the transition to a circular economy, resources need to be used more effectively and efficiently, thereby contributing to sustainable economic and societal models. EU funded projects shall enhance the development of innovations that allow access to non-energetic, non-agricultural resources for industrial purposes. Funding measures in the environmental sector with an emphasis on water aim at supporting and accelerating the implementation of European water-, resource efficiency and water-dependent industry policies. In this context, the protection and further development of natural and cultural assets, biodiversity, ecosystems and material cultural heritage play an important role to use their value for economy and society. Earth observation data and informa-

tion will be used to support the goals for sustainable development.



This is already pursued in **ECO-POTENTIAL** (Improving Future Ecosystem Benefits through Earth Observations). In this EU funded project, 47 universities and research institutes from 11 EU countries and seven non-EU states (i.a. Israel, South Africa, Australia, and Kenya) cooperate to investigate and conserve ecosystems and nature reserves by using data from continuous earth observation via weather and radar stations, airplanes and satellites.

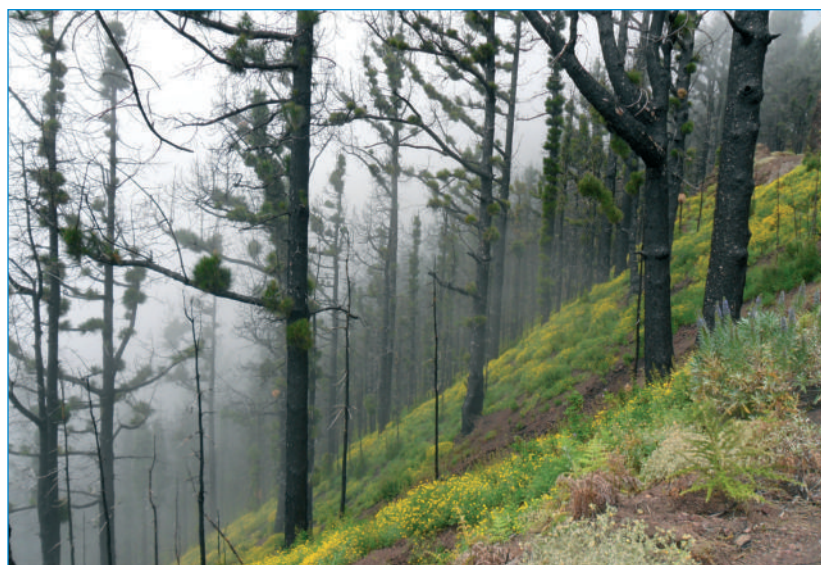
The research area of the greatest European nature reserve project, which has ever been financed, covers a variety of climatic zones throughout Europe. The consortium also deals with legal and political framework conditions of environmental management in the EU member states and participating third countries in order to use concepts and guidelines for the management and



Satellite imagery show what happens in nature – in this case, the loss of leaves between July and August 2016 on the Canarian island La Palma. A huge human-induced forest fire happened in a large area in the South of the island. Clouds formed by the trade wind, cover the white spots on the map. ■

conservation of natural reserves and systems.

Another priority in the Horizon 2020 working programme is sustainable urban development, for example in Smart City Projects. Therein, funded cities and municipalities (so-called lighthouse cities) work together for a safe, adaptive and sustainable urban development.



The Canarian pine is adapted to forest fires: the trees survive and sprout again after the fire has destroyed their needles. Researchers can understand such dynamics better due to the conjunction of earth observation and field data.

Copyright: Severin D.H. Irl ■



The City of Munich is one of these lighthouse cities and develops solutions for a liveable city of the future together with its partner cities Vienna and Lyon as well as various local stakeholders from the academic and economic sector. The EU project **Smarter Together** aims to improve the quality of life of residents, increase the energy efficiency and create integrated mobility offers. One of the major district development areas in Germany, Neuaubing-Westkreuz/Freiham, serves as a real-time laboratory to experiment in the areas of energy, mobility and technology, to develop i.a. intelligent light poles, multimodal mobility

offers as well as multifunctional “Shared District Boxes”, and to apply those technologies in the research area. Additionally, a SmartCity App connects all offers and services in the district smartly, thus creating a real benefit for the inhabitants. The local citizens are actively engaged in this process by co-creating the activities. Ideas and solutions that have proven to be successful and are well received by citizens shall be further developed and implemented in the long term in other districts of Munich and European cities.

Besides Horizon 2020, there are various other programmes in the environment and energy sector, promoting research and innovation for a liveable future.

Due to its natural beauty, variety of landscapes, rich biodiversity and cul-

tural heritage, the Alpine region plays a crucial economic and ecological role. This was emphasised in the EU strategy for the Alpine Region (EUSALP). Simultaneously, the Alpine Region is faced with considerable challenges due to economic globalisation trends, demographic change, climate change, energy problems and its role as transit region.

The INTERREG-Programme Alpine Space provides 116 million Euro in total to transnational projects that target cross-border challenges and develop new visions for an intelligent, sustainable and integrated growth in the Alpine Region. The topics “Innovative Alpine Space”, “Low Carbon Alpine Space”, “Liveable Alpine Space” and “Well-governed Alpine Space” tackle most urgent tasks in the field of innovation and public services, low-carbon transport and mobility options, sustainable valorisation of the natural and cultural heritage of the Alpine Space as well as the protection and ecological connectivity of alpine ecosystems.



The Alpine Space financed project **GRETA** (Near-Surface Geothermal Resources in the Territory of the Alpine Space) fosters the use of near-surface geothermal energy for covering the increasing heating and cooling energy demand in the Alpine Region. Geothermal energy serves as a renewable energy source, which is climate-friendly, sustainable and independent of weather conditions. GRETA also addresses innovative use cases, like the heating of swimming pools and train stations as well as the cooling of supermarkets, hotels or office buildings.

In consequence of the manifold opportunities for European funding for research and innovation, nu-



Project area/subject street lamps. Copyright: Dominik Parzinger ■



Geothermally heated railway tracks. Copyright: GRETA Project ■

merous service points at national and regional level support potential applicants.

The Bavarian Research Alliance (BayFOR) offers interested parties a comprehensive advisory service regarding European funding instruments and an active support in all phases of the proposal writing process. Thanks to its offices in Munich, Nuremberg and Brussels, BayFOR is widely connected on a regional and European level. Additionally, BayFOR is a partner institution in

the Bavarian Research and Innovation Agency. BayFOR supports project consortia with at least one Bavarian project partner. BayFOR's scientific officers support and advise potential applicants throughout the application process. This includes consultation on European funding instruments, specialisation on certain calls, assistance for national and international partner search, and the hands-on support during the entire process of proposal writing as well as the grant preparation phase with the funding body.

Alongside universities and research institutes, European projects focus especially on small- and medium-sized enterprises (SMEs) as well as municipalities. BayFOR has further established an advisory unit for SMEs and is a partner organisation in the Enterprise Europe Network, the biggest consultation network for SMEs. Since BayFOR's entire range of services is pre-financed by the Land of Bavaria, there are no additional costs for consortia during the application phase.

The benefit of European projects becomes obvious when projects are actually funded and consortium partners profit from grants, knowledge exchange and increased visibility due to international cooperation. Above all, the real value added of the projects evolves, when partners present successful solutions for a liveable future and experience by way of collaboration the meaning of being unified in diversity. ■



Installation of a borehole heat exchanger in the Aosta Valley, Italy. Copyright: GRETA project. ■

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The Nuremberg Metropolitan Area – Energy and Environmental Technology for the Global Market

With a population of 3.5 million and a gross domestic product of more than 100 billion euros, the Nuremberg metropolitan area is one of Germany's ten largest economic regions. It offers great potential for business and science in "Information and Communications", "Automotive", "Transportation and Logistics", "Medicine and Healthcare", "Automation and Production Engineering", and particularly in "Energy and Environment".

Nuremberg Metropolitan Area

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The power industry has long been one of the biggest employers in the core of the Nuremberg metropolitan area and occupies a top position in Europe, with approximately 500 companies and over 50,000 jobs. With a long tradition of technologies for thermal power plants, this region covers the entire value chain, ranging from planning and development to engineering and manufacturing, all the way down to commissioning, monitoring, maintenance, modernization and dismantling. The equipment manufactured in the region includes steam-raising



Under the motto "Future Solar Factory" in the framework of the Energy Campus Nuremberg (EnCN) ZAE Bayern and partners are currently developing a worldwide unique research platform for printed solar cells which are suitable for mass production. The research tasks spans over the development of new technologies for photovoltaic cells with the objective of efficiency increase, over printable photovoltaic and over solvent-free production technologies. (Photo: fuchs-foto.de) ■

units, turbines, generators and waste gas purification systems. The Siemens site in Erlangen, with roughly 5,500 employees, acts as the global headquarters of the sector Siemens Energy where all decisions are made and where projects around the globe are managed. Erlangen is also the location of the German headquar-

ters of Areva NP, a global market leader in nuclear power utilization.

Companies based in the Nuremberg metropolitan area equip the energy industry worldwide with state-of-the-art technologies for efficient network infrastructures. Examples include high-voltage direct-current transmission sys-

tems as well as “smart grid” and “smart metering” systems. The world’s largest high-power transformers are also manufactured in Nuremberg by Siemens.

In the wind power industry, companies in the region supply key components for plant engineering and construction. The metropolitan area employs several thousand people in the production of large gearboxes, large rolling bearings, azimuth and pitch drives and power inverters. Expertise in the utilization of biomass is concentrated in the rural areas of our region, such as the Upper Palatinate and Western Central Franconia, which has Germany’s greatest density of biogas facilities. Experts in this field include leading technology suppliers, such as Schmack Biogas AG, as well as the Weihenstephan-Triesdorf University of Applied Sciences and the Renewable Energies Network of Western Central Franconia. In the near-surface geothermal energy field, the heat pumps and related equipment manufactured in Upper Franconia have a European market share of around 30 per cent. In June 2009, Germany’s largest geothermal power plant, with systems engineering supplied by Siemens (Erlangen/ Nuremberg) went into operation in Unterhaching near Munich.

Printable photovoltaic are among those future-oriented technologies for solar energy supply, that will lead to radical cost savings. Under the motto “Future Solar Factory”, in the framework of the Energy Campus Nuremberg (EnCN) ZAE Bayern and partners are currently developing a worldwide unique research platform for printed solar cells which are suitable for mass production. The portfolio include both organic and inorganic printing technologies.

The Nuremberg metropolitan area is a European leader in the development and manufacture of

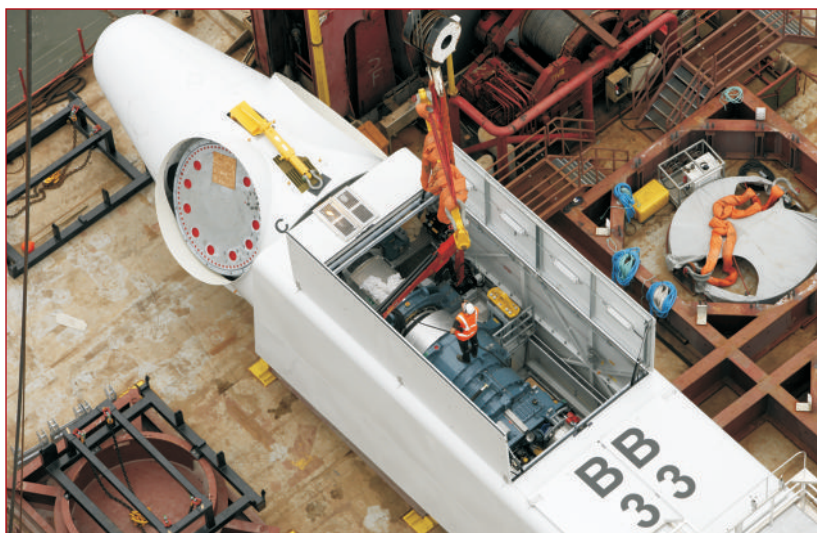


Following a successful final inspection at the Siemens transformer plant in Nuremberg, the world’s first 800-kilovolt ultra-high-voltage power converter transformer is ready for delivery. The transformer will be used in the Yunnan-Guangdong high-voltage DC transmission system in China, currently one of the two HVDC systems with the highest rated capacity in the world. (Siemens press photo) ■

power electronic systems. Examples include power inverters for photovoltaic or wind power plants, frequency converters to regulate electric drives in industrial applications or in electric vehicles, as well as efficient power supply units. Siemens AG, Semikron GmbH and Baumüller GmbH are important companies in this field. Fraunhofer IISB, with its Centre for Vehicle Power Electronics and Mechatronics (ZLKM), is a world leader in application-based research. The Nuremberg Energy Campus is currently being developed as a new R&D beacon to help meet the challenges posed by the change in Germany’s energy policy. Important higher education insti-

tutions include the Institute for Electronic Systems (ELSYS) and the engineering faculty (EFI) of the Georg Simon Ohm University of Applied Sciences in Nuremberg. With its European Centre for Power Electronics (ECPE e.V.) and the Bavarian Power Electronics Cluster, the metropolitan area has some excellent networks linking companies and research institutions that work in this field.

The technologies and markets for the energy and environmental sectors are closely linked. More than 1,000 companies and institutions in the Nuremberg metropolitan area provide approximately 25,000 jobs, primarily in water technology, air pollution control and recycling, as well as in product and production-integrated environmental protection. Examples include Siemens AG in Erlangen as a world leading provider of automation solutions for the water industry and Huber SE, an important international system supplier for water technology, in Berching. Energie Campus Nürnberg is committed to putting into practice the vision of a sustainable power society based on renewable energy. To this end, expertise within the regional industry and science sectors will systematically develop with the objective of putting



A large number of key components for wind turbines are manufactured in the Nuremberg metropolitan area. (Siemens press photo) ■

Bavaria and Germany in a noticeable leadership position in selected fields of energy research.

Most of the research on energy and the environment is conducted at the universities of Erlangen-Nuremberg, Bayreuth and Würzburg, the universities of applied sciences of Ansbach, Amberg-Weiden, Coburg, Hof, Nuremberg and Weihenstephan-Triesdorf and the Fraunhofer Institutes IIS (Integrated Circuits), IISB (Integrated Systems and Device Technology), both located in Erlangen, and ISC (Silicates Research) in Würzburg. In addition, there are numerous other technology-oriented institutions, such as ZAE Bayern whose sites in Würzburg and Erlangen focus on thermal insulation, photovoltaics and thermal sensor systems, the Institute Branch Sulzbach-Rosenberg of the Fraunhofer Institute for Environmental, Safety, and Energy Technology UMSICHT, EBA in Triesdorf (with a focus on biomass energy utilization), the plastics institute SKZ in Würzburg (energy efficiency in plastics processing), the energy technology centre "etz" in Nuremberg, the Georg Simon Ohm University of Applied Sciences' environmental institute in Neumarkt and its energy and environmental technology centre in Schwabach and the Northern Bavarian Energy Agency.

In view of the double-digit growth rates in the renewable energy sector in particular, it is important to secure a supply of specialists for the region. The Nuremberg metropolitan area offers a unique density of relevant university degree programmes and vocational training courses. The university degree programmes include "Energy and Environmental Systems Engineering" (Ansbach), "Environmental Engineering", "Hydro Engineering" and "Renewable Energy Engineering" (Weihenstephan-Triesdorf) and



The combustion technology lab at the Institute Branch Sulzbach-Rosenberg of the Fraunhofer Institute for Environmental, Safety, and Energy Technology UMSICHT for examining the combustion and emission behaviour of different biomass fuels (<http://www.umsicht-suro.fraunhofer.de>) ■

"Mechanical Engineering / Environmental Engineering" (Amberg-Weiden). The Nuremberg Chamber of Commerce and Industry for Central Franconia has developed the "European Energy Manager" qualification programme that provides practical training and networking opportunities in a total of 13 countries of the European Union and is now also used in China, Mercosur, Moldova and Egypt.

The city of Nuremberg provides effective platforms for international marketing activities, such as Chillventa, an international trade fair for refrigeration, air conditioning, ventilation and heat pumps, BioFach, an international organic food products fair, as well as the world's leading power electronics fair PCIM.

The process of innovation in energy and environmental technologies is often based on interdisciplinary cooperation between manufacturers, users and research institutions. This is reflected in an unrivalled density of regional networks, some of which work very closely together. Examples include the Bavarian Environmental Cluster (www.umweltcluster.net), the Bavarian Energy Technology Cluster and the Bavarian Power Electronics Cluster (both based in Nuremberg), the energy industry network "ENERGIEregion Nürnberg", the Northern Bavarian environment sector initiative (www.umweltkompetenz.net), the

European Center for Power Electronics (ECPE), the user clubs and energy and environmental committees of Northern Bavaria's CCIs, the international Energy Manager Network of the Nuremberg CCI for Central Franconia as well as the Renewable Energy Network for Western Central Franconia. ■



**Umweltkompetenz
Nordbayern**



metropolregion nürnberg
KOMMEN. STAUNEN. BLEIBEN.



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Energie-Atlas Bayern – Energy turnaround, just one click away

An environmentally-sustainable, efficient energy supply is possible now and in the future – companies, municipalities and citizens can all make a contribution. As an Energy Turnaround portal for the state government of Bavaria, the Energie-Atlas Bayern delivers all the essential information on this subject: interactive maps and tools, figures, facts, tips and much more.

The energy turnaround is moving forward in Bavaria: in the year 2016, for the first time renewable energies were the most important power providers, with a share of 43.3 percent of gross electricity generation. But how much do wind and solar energy contribute to this? And what is the situation in the region where I live like? The Energie-Atlas Bayern shows this, as well as supporting anyone interested in a sustainable, efficient energy future.

Companies have a great energy-saving potential. This gives them greater independence from power prices and increases their competitiveness. With the “Abwärmerechner” for example, individual companies can calculate whether waste-heat utilisation is worth its while. Anyone who wishes to use the potential waste-heat of others or offer their own can find suitable partners in the “Abwärmebörse”.

Municipalities play a vital role in the design of the energy future – whether it be as planners, consumers, motivators, role models and often also as providers. For local planning, the Energie-Atlas Bayern offers maps and data on deployed technology and potential that can be assembled by anyone. A digital “Werkzeugkasten” with printed materials and the possibility of borrowing an Energy Turnaround exhibition provides local public relations with support. Prac-



Home page of Energie-Atlas Bayern: all the information on energy and installations, in detail and up-to-date. Source: Energie-Atlas Bayern ■

tical examples show what measures other municipalities are implementing.

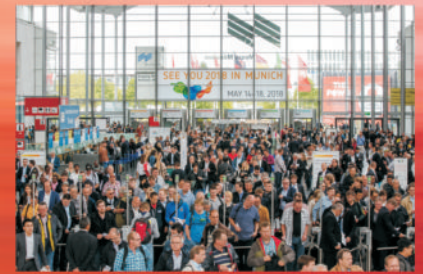
Citizens can save a great deal of energy in their homes – and without sacrificing their TV! The Energie-Atlas Bayern offers plenty of suggestions: anyone who wants to know if it is more efficient to replace their old washing machine with a new one can find out with the “Haushaltsgeräte-Check” – and also whether a photovoltaic installation on their own roof is worthwhile, or what the best heating system is. Some of the offers and services of the Energie-Atlas Bayern:

- Information on everyday energy saving, energy efficiency and climate protection
- Local contact people, development programmes and ideas that can be copied

- Background knowledge of the individual energy carriers and their environmental credentials, and assistance with building installations
 - Map display of all renewable energy installations
 - 3D visualisation of wind energy installations
 - Tool for testing of energy mix scenarios for municipalities and regions (“Mischpult”)
- Overall control of the portal is exercised by the Bavarian State Ministry of Economic Affairs. ■

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IFAT 2018 – two new halls

Every two years the greentech sector converges on Munich, the capital of Bavaria. Between May 14 and 18, 2018, IFAT, the 'World's Leading Trade Fair for Water, Sewage, Waste and Raw Materials Management' will be taking place at the Messe München exhibition center. What visitors can expect and which themes will be in focus at this upcoming IFAT is revealed by Stefan Rummel, Managing Director of Messe München.

Mr. Rummel, what new things can we look forward to at IFAT 2018?

The biggest change at IFAT 2018 is of course the expanded exhibition site. Two new halls have been built at the venue, and now, for the first time, the event will be taking up 18 halls to showcase our exhibitors' innovations and visions for the future. As part of this expansion, we also took the opportunity to optimize the layout of the sections.

In what way? What will the new layout look like?

We have taken the two core themes at IFAT and arranged them so that it is even easier for the visitors to quickly find the companies of interest to them. The section on waste and secondary raw materials is located in the eastern part of the exhibition center. Water and sewage technologies are in the halls at the western end. Each area is adjacent to an open-air exhibition site which provides additional exhibition space and can be used for live demonstrations.

Which themes will dominate at IFAT 2018?

There are a number. New legislation and directives will play a central role. This includes directives on commer-



Stefan Rummel, Managing Director of Messe München: "Those who wish to remain competitive for the long term have to go for environmentally-friendly technologies." ■

cial waste and packaging laws in Germany, as well as the "Circular Economy Package" at EU level. How can the new regulations be put into practice and what technologies will be needed for this? In May IFAT will be providing answers to these questions.

Are there any other trends?

For the first time IFAT will be tackling the theme of sustainability

in road construction – that is interesting in particular for local authorities and the building sector. In a special display, visitors can find out about long-lasting, recycled building materials and resource-saving machinery and equipment. The question of how digitalization is influencing road-building will also be tackled in an accompanying lecture program.

Is IFAT targeted primarily at local authorities?

Local authorities make up a large proportion of our visitors, that is correct. But IFAT is just as important to industry. Because innovative, green technologies are the key to designing sustainable production processes and to saving both resources and costs. Those who wish to remain competitive for the long term have to go for environmentally-friendly technologies. For this reason IFAT is presenting solutions for a wide range of different segments of industry, for example the automotive sector, the building materials industry, the food industry, chemicals and pharmaceuticals.

In the environmental sector in particular it is important to attract new talent and to promote ideas. How is IFAT catering to this need?

Under the title of *experience.science.future* we are putting on a new platform in 2018. Here start-ups and

universities can present their ideas and projects from science and research. In this way we are providing a valuable opportunity for pioneers in particular to get their messages across. Young people will also find *experience.science.future* to be a very useful resource. Because this is where opportunities in exciting “green” careers will be presented: there will also be tips on how to submit successful applications, a jobs portal and a networking zone. That is a unique concept and one that we are sure will provide real added value for exhibitors and visitors.

Many thanks for the interview!

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What visitors can expect at IFAT 2018:

Over 3,100 exhibitors

...present solutions for efficient resource management.

18 exhibition halls plus outdoor exhibition space

...means a total of 260,000 m² of presentation space.

Exciting live demonstrations

...offer a chance to gather up-to-date practical know-how.

An extensive supporting program

...dedicated to topical themes in the sector.

experience.science.future

...is the new future platform for start-ups and young talent. ■



Thanks to the new layout of sections in the halls, it's now even easier for visitors to quickly find the companies of relevance to them. ■

Transferring know-how and technology from Bavaria

Bavaria's contribution to globally sustainable water management

For more than 19 years, the Technology Transfer Water (TTW) initiative has been active and can look back on a track record of success. Set up by the Bavarian State Ministry of the Environment and Consumer Protection and located at the Bavarian Environment Agency's Hof site, TTW shall underpin international cooperation in water management issues. Work focus is the impartial consultancy assistance of colleagues from Central and Eastern European countries to whom partnership agreements exist.



Visiting the wastewater treatment plant Monheim as part of an expert seminar with participants from Slovakia ■

As a state-run non-commercial entity, TTW is used to channel the comprehensive experience of the Bavarian water resource management administration, as well as to provide support in building up functioning eco-management systems and setting appropriate environmental standards. TTW sees itself as a cornerstone of Germany's efforts to transfer technology in the water resources sector and to



Visualization of water social function with participants from TTW summer academy ■

achieve implementation of the goals set out in the Agenda 21.

The difficulties inherent in implementing environmental and infrastructural programmes are complex and tend to have their roots in the overall institutional field, with legal frameworks, administrative organisations, and management structures as the specific causes of most issues.

It is in this area that TTW measures are applied. In order to pass on the principles of integrated water resource management (IWRM) and good governance, TTW organises a broad range of activities to promote exchanges and educational measures to accompany projects being implemented. Within the framework of our IWRM seminars, for example, we try to offer insights into how different players in various parts of the water management sector work, removing

mutual prejudices, showing the advantages of a modern services administration, and encouraging the growth of interdisciplinary networks abroad.

TTW is currently in contact with water management professionals in many countries in Southern and Eastern Europe, Asia- and Latin America. ■

Further information is available (in German) at:

<http://www.lfu.bayern.de/wasser/ttw/index.htm>

Contact:

**Bayerisches Landesamt für Umwelt
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Identification of demand side management potentials within the sector of domestic living

The continuous availability of electrical energy is the basis for the economic benefits in Germany and contributes significantly to the prosperity of this country [1, 2]. The need to guarantee security of supply in order to maintain this standard is of central importance. Due to the objectives of the European Union and the nuclear catastrophe in Fukushima in March 2011, the Federal Government adopted a change in the electrical energy supply [3], away from nuclear and fossil based power plants to locally distributed, regenerative energy generation plants. This is accompanied by a paradigm shift in energy supply. Whereas the regulation of power plants has always been demand-driven in the past, generation-oriented consumption will be necessary in the future, since the feed-in power of these technologies is subject to strong fluctuations as the expansion of renewable energies increases. This change necessitates the need to flexibilize the demand side, for example by integrating storage technologies. Insufficient flexibility is at present leading to a shutdown of renewable generation power plants for system-related reasons in the case of local generation surpluses. However, the operators of these power plants receive compensation payments for energy quantities that are not fed into the grid due to the legal situation of the Renewable Energy Act.

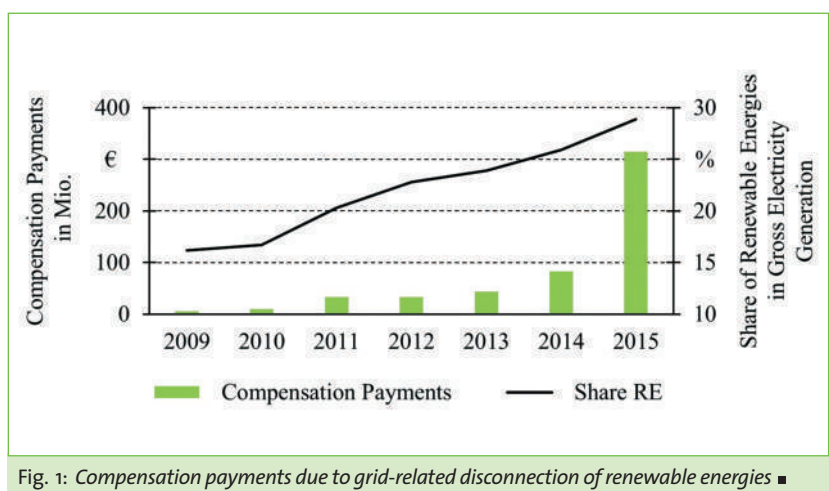


Fig. 1: Compensation payments due to grid-related disconnection of renewable energies ■

As seen in *Fig. 1*, there has been a significant increase in spendings over the past few years, so that more than 300 million euros had to be reimbursed in 2015. The further progress of the energy transition will create even more frequent periods of surpluses in electric power in the future, so that further flexibility options are becoming necessary.

In particular, the sector of domestic living, with a 26 % share of total energy consumption in Germany [4], offers a great potential for load management. However, the suitability of electrical consumers requires the possibility of decoupling the time between the user interaction and the actual function fulfilment or maintenance of condition. Thus electrical consumers can be subdivided according to these criteria into those of demand-related or independent operation (*see Fig. 2*). Electrical consumers with demand-related opera-

tion behavior are further subdivided into the immediate demand and the time-variable demand. Due to the expectation of immediate function fulfilment after user interaction, the first-mentioned group does not have any potential within the scope of load-influencing actions, whereas programmable or program-controlled electrical consumers are able to realize the necessary temporal shift. In particular, this category includes goods in the „Washing, drying and rinsing“ appliance grouping.

The highest potential for load management functionality is boasted by automatically switching devices in periodic or continuous operation, which operate largely without direct user interaction. Electrical devices, which are assigned to this group, usually contain a kind of storage or make use of thermal inertia, such as refrigerators and freezers, thus enabling them to be temporarily

switched off. Fig. 3 summarizes the results of a potential analysis of different electrical consumers, which shows in particular the high potential of electrical storage heaters. In Germany 1.6 million households [5] are still using this technology, with an installed power of 17.6 GW and a maximum storage capacity of 140 GWh. This means that electric storage heaters have a four times higher potential than all German pumped-storage power plants. Due to this fact, the Institute of Factory Automation and Production Systems at the FAU Erlangen-Nuremberg is developing a possibility for individually controlling of already existing electric storage heaters for the use as decentralised energy storage facilities for the energy supply company, in collaboration with several Bavarian industrial companies. [6–9] ■

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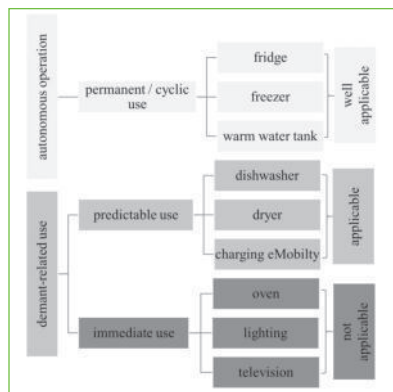
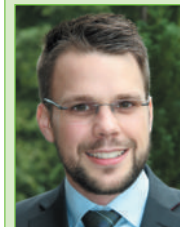


Fig. 2: Classification of electrical consumers according to their suitability for DSM ■

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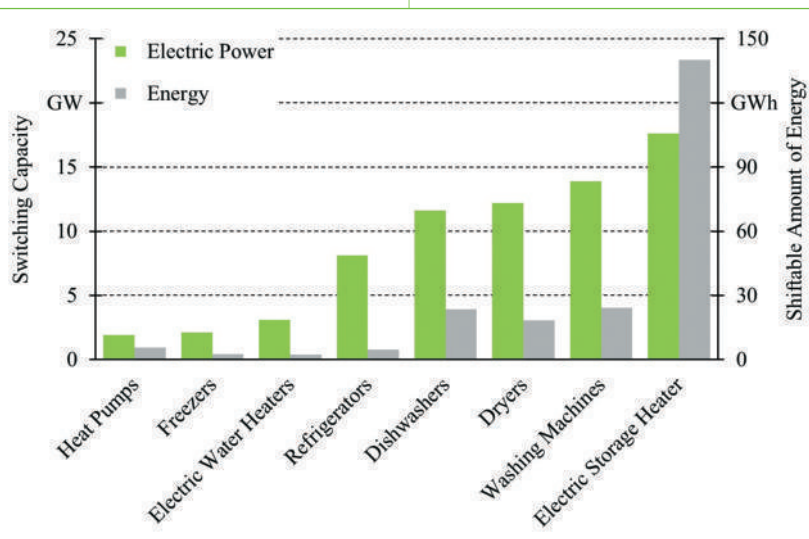


Fig. 3: Load shifting potential of different electrical consumers ■

Special progressing cavity pump conveys spa water from a Glauber's salt spring in Saxony



In September 2015 a salt water thermal baths opened in Saxony. They are fed from a highly-saturated Glauber's salt spring. The spring water is conveyed with a brine content of 22 per cent at a temperature of 42°C. In a long-term pumping trial, a system provided by NETZSCH Pumpen & Systeme GmbH in Waldkraiburg was installed. The key element of the special solution for spa water conveyance is an NTZ type NEMO® progressing cavity pump, which is particularly well suited, thanks to its special conveying principle.

In 2007 the bath carried out exploratory drilling and an initial pumping trial. At a depth of around 1,200 m, they came across highly mineralized water with a particularly high sodium sulphate and chloride content which smells aromatic, sweet and to some extent pungent. This highly saturated Glauber's salt spring also contains calcium, magnesium, hydrogen carbonate, silicates, rare soils and many trace elements which are important for the human body. Due to the composition and concentration being so unusual, managers decided to use the spa water in thermal baths. ■

Specially-tailored pumping system to reliably convey of multi-phase medium

A NETZSCH downhole progressing cavity pump was installed and a longterm trial conducted. The aim of this test phase was to confirm the long-term behaviour of the well and to assess the operating conditions for the conveying technology.

The NTZ progressing cavity pump is comparatively slim and can be operated within a bore shaft. The



The spring water was initially conveyed in the context of a long-term pumping trial, using a system provided by NETZSCH Pumpen & Systeme GmbH in Waldkraiburg, which was designed in close consultation with the project partners. Head of Business Field Jörg Eitler from NETZSCH Pumps & Systems at the commissioning ■



Thanks to the rotor-stator principle, the NEMO® progressing cavity pump is also suitable for the extremely saline, multi-phase medium in the Elster Valley ■

aggregate is based on a rotor that turns in an oscillating motion within a fixed stator that is geometrically adapted to it. The precise geometrical mating forms conveying chambers during rotation which transport the medium smoothly from the inlet to the discharge side. As the chambers are self-sealing, this ensures stable volume and pressure, so there is effect from no

shear forces and hardly any pulsation occurs.

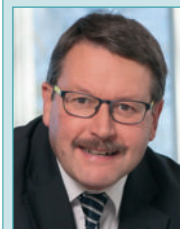
The consistency and viscosity of the medium are insignificant in terms of product flow with this displacement technology, which means that the pump is particularly well suited to difficult, multi-phase liquids like the brine in the Elster Valley: the water has an extremely

high salt content of 97 percent, with a small percentage in crystalline form. In this context, the delivery rate is determined by the size and speed of the pump, which means it can be extremely accurately regulated. It is for this reason this pumping technology is used particularly for test phases.

Since September 2015, visitors to the thermal baths environment where diluted brine is used to enable weightless floating in water, have been benefitted from the data which it was possible to collect in the long-term pumping trial with NETZSCH technology. ■

For more than 60 years, NETZSCH Pumpen & Systeme has served markets worldwide with NEMO® progressing cavity pumps, TORNADO® rotary lobe pumps, NOTOS® multi screw pumps, grinding machines, barrel emptying systems, dosing systems and accessories, providing customised, sophisticated solutions for applications in every type of industry. With a workforce of over 2,000 and a turnover of more than 245 million euros (2016 financial year), NETZSCH Pumps & Systems is the largest business unit with the highest turnover in the NETZSCH Group, alongside NETZSCH Analysing & Testing and NETZSCH Grinding & Dispersing.

Author:



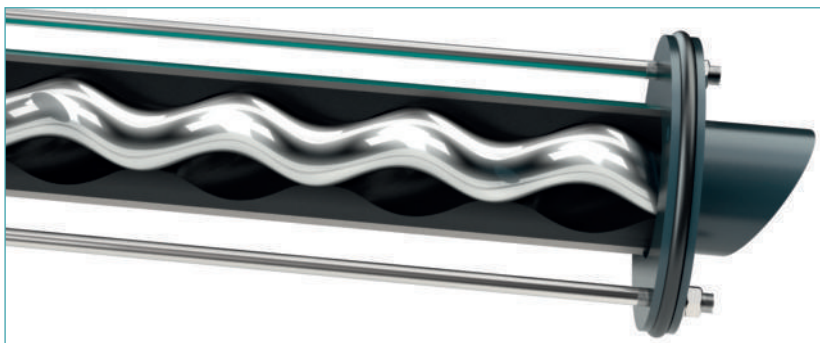
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The NTZ was installed by NETZSCH engineers at the well site in the Elster Valley in 2009, together with the drive head and sucker rod ■

Energy-efficient room ventilation with heat recovery using a novel concept



The German regulation for energy savings (Energieeinsparverordnung – EnEV 2016) provides for continuously rising standards of thermal insulation during the construction and renovation of residential buildings. However, the insulation required for this reduces not only transmission heat losses but also natural air exchange. In order to ensure the necessary supply of fresh air while at the same time guaranteeing high energy efficiency, ventilation systems with heat recovery are increasingly being used in buildings.

There are centralised and decentralised ventilation systems on the market, whereby centralised systems are mostly used for new buildings, as these have a higher overall efficiency, but also need for a defined air ducting throughout the entire building. The air-conducting elements required for this can be taken directly into account when planning a new building, but in the case of energy-efficient modernisation and renovation of old buildings, this concept cannot be implemented without great effort. For this reason, decentralised systems are usually used here. These systems typically consist of three main elements, two axial or centrifugal fans for the inlet and outlet duct and one heat recovery element. One fan conveys air from inside the building to the outside, while the other fan transports fresh air into the building. Both flows pass through a heat exchanger, which usually operates according to

the countercurrent or crossflow principle. The incoming air is heated with the outgoing air by extracting thermal energy from the exhaust fluid due to the temperature difference between the two air flows and passing it to the supply flow. This operating principle ensures the necessary air exchange with high energy efficiency at the same time, since the room heat does not escape unhindered as with conventional airing.

The fans installed in these systems generate a characteristic noise due to the periodic pressure change caused by the circulation of the impeller blades, which can, for example, lead to disturbances of the people present when using such a system in quiet rooms. For this reason, appropriate efforts must be made to isolate the systems acoustically, as the noise is caused by the physical operating principle of the fans and the noise source cannot be eliminated. For this reason, a new type of room ventilation system with heat recovery is being developed at the Institute for Factory Automation and Production Systematics (FAPS) at the Friedrich-Alexander-University Erlangen-Nuremberg as well as at the Institute of Process Machinery and Systems Engineering (iPAT), where the two fans and the heat exchanger are bundled in one functional element [1-7]. It consists of a package of circular, smooth discs which are mounted concentrically on a shaft. When this shaft is set in rotation,

the discs also cause air to rotate which is in contact with the surface of the disc. Centrifugal acceleration conveys the air to the edge of the discs. The flow profile arising from a freely rotating disc is shown in Fig. 1.

The disc package is mounted in a housing which forms two structurally separated channels for fresh air and exhaust air delivery. Due to the alternating contact of the discs

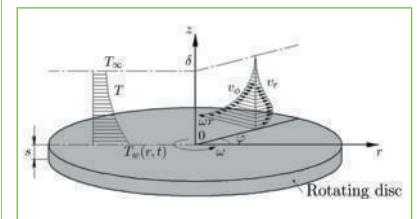


Fig. 1: Resulting flow profile around a free rotating disc [8] ■

with the fluid of the corresponding channels, a heat transfer takes place in addition to the fluid transport. This operating principle is illustrated in Fig. 2.

Since this concept does not use bladed impellers, this flow sound source is not present, which makes the system less noisy during operation and reduces the need for acoustic insulation. In addition, the reduction of components and size leads to savings potential when manufacturing such a device. The resulting reduced complexity of the system also promises low-maintenance operation.

Fig. 3 shows the result of a flow simulation of the resulting temperature transfer from the heated discs to the cold fresh air. For the simulation, only two discs of the

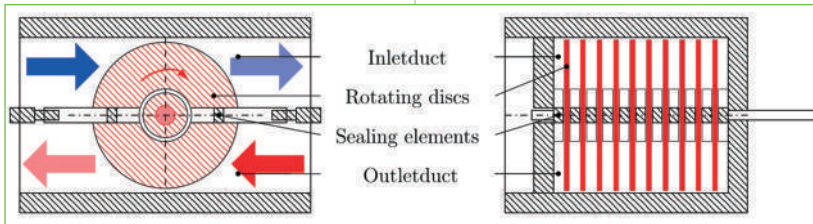


Fig. 2: Functional principle of a new type of room ventilation system with heat recovery ■

disc package were used. It has been shown that this system can achieve heat recovery rates of up to 40%. ■

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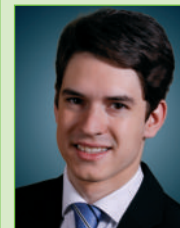
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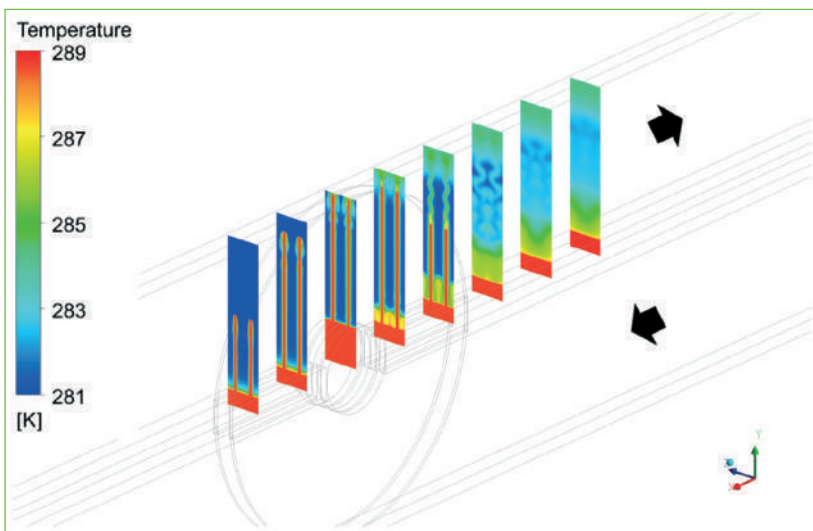


Fig. 3: Resulting heat transfer of discs which have a higher temperature than the cold fresh air due to contact with the warm exhaust air ■



Protection against urban flash floods

2016 will go down in Bavarian history as the year of flash floods. The engineering company COPLAN shows how to minimize the risk of flash floods in the future and which measures can help to extend early warning periods and reaction time.

The death of seven people and material damage running into millions: On 1 June 2016 the Lower Bavarian towns Simbach and Polling were hit by an urban flash flood as a consequence of previously unknown heavy torrential rain. Simbach and Polling only form a partial amount to a far greater extent of total damage, which mainly affected buildings and Bavarian infrastructure.

Flash floods in the future

The State Office for Environment published an analysis for the period from May to June and came up with following diagnosis: "2016 will go down in history as the flood year in Bavaria." An exceptional persistent depression over middle Europe is rated as main trigger for a row of heavy storms. How likely are flash flood events of such an extent in the future? It cannot be predicted when and how often similar events will take place in the future, only a statistical statement about the magnitude of urban flash floods can be made. It is certain that also very rare torrential rains like in 2016 can occur several times and at any time. Therefore risk management containing preventive aspects and technical flood protection becomes even more important ■



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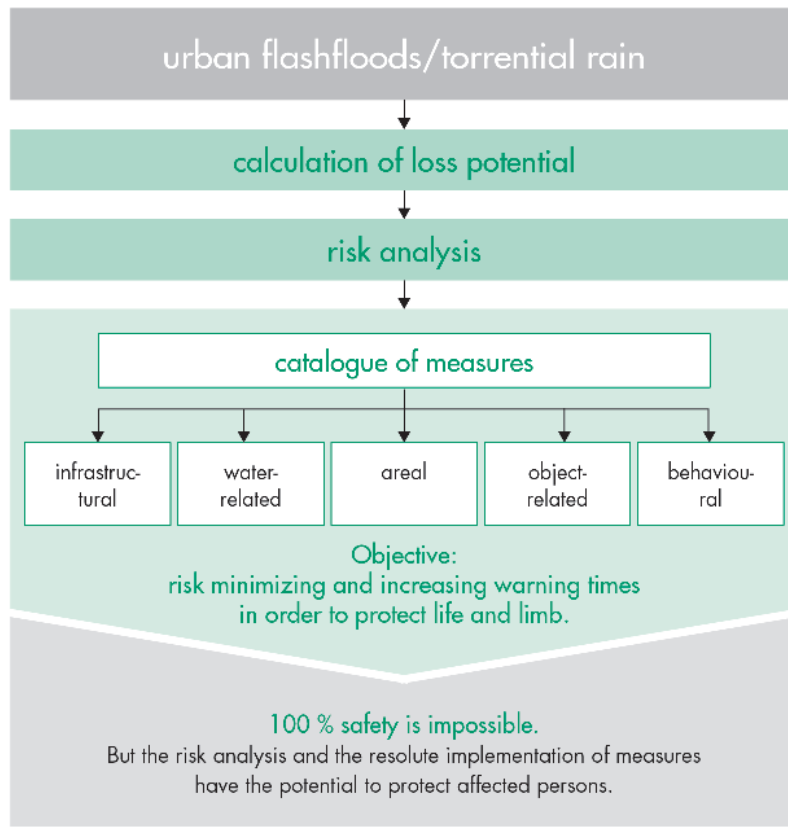
Special Support Program for measures of risk management

Thus politicians draw necessary consequences from weather disaster in June 2016. The present Bavarian Environment Minister, Ulrike Scharf announced a Special Support Program in September 2017. The Program supports Bavarian communities with three million Euros to implement a concept of risk management: "The year 2016 showed us that the protection against urban flash floods poses a new and important pillar of flood protection. Regional flood protection is the central component to reach our objective of a climate-proof Bavaria." The funding rate for local concepts is 75 %; the maximum grant amounts to 150.000 Euros. ■

„Flood protection in St. Salvator" – a concept made by COPLAN AG

In the course of elaborating a concept of flood protection for St. Salvator, Bastjan Kebinger, employee of COPLAN AG, presented how risk management can concretely look like. During torrential rain in May and June 2016, St. Salvator was flooded caused by favorable discharge conditions in sub-basins. How does the construction of the concept look like? First the analysis focuses on possible damage which can be caused by urban flash floods in the targeted regions: Which objects on the site are worth protecting? How are areas and buildings used and are there structural specifics? The Calculation of loss potential is followed by a risk a-

Risk analysis to protect the population



analysis of floods in specific areas and surfaces. Two elements, topographic terrain analysis and runoff-simulation form the basis of risk assessment. Based on this, COPLAN AG developed a catalogue of measures which contains preventive aspects regarding flood protection in St. Salvator. ■

Categories of preventative activities

Due to economic aspects, COPLAN AG refrains from expensive measures or solutions which

would be difficult to implement. Therefore the solution concept focuses on immediate catchment areas to stop possible inflows towards the centre a priori, to minimize peak flows and to reduce flow rates. COPLAN AG recommends some agricultural activities in order to improve natural water retention. In this context the use of mulch seeding, transverse cultivation and suitable crop rotations should be intensified. Further green bands strengthen water retention and prevent

fertile surface from washing away. COPLAN AG also developed individual measures regarding concrete subsections in the affected area including flood channels and drainage gutters to slow down effluent concentrations. Furthermore some smaller dams and earth walls should be built. ■

Increased warning time as lifesaver

“Full protection is impossible. We strive for the goal to increase warning times for local residents by developing some individual measures,” says Kebinger. A functional risk management can gain valuable minutes, which can be lifesaving for local residents. Furthermore residents can get important documents or essential belongings in safety. Further protective measures are already in discussion: the establishment of early warning systems or the use of specific apps could minimize the risk to be surprised by urban floods. ■

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Situation during flood disaster in 2016
(source: Bad Griesbach)



Situation during dry weather
(source: COPLAN AG)

Sustainable Supply Chains in the Automotive Industry



Continental Promotes the Transfer of Knowledge and Technology with Suppliers in Mexico

Sustainability in value chains is an increasingly important issue in the automotive industry. Continental and selected suppliers in Mexico have joined together in a network to take specific measures for the promotion of corporate sustainability and environmental management in the local automotive industry.

Suppliers have a major influence on sustainability performance

One important aspect for the implementation of Continental's environmental strategy 2020 „Creating sustainable solutions“ is improving the sustainability performance of its global supply chain. Together with Arqum GmbH, an international consultancy for sustainability, the project “Sustainability Network in the Mexican Supply Chain” was launched in 2016. The key idea of this network is to jointly identify and tackle challenges for practical implementation of environmental protection and energy efficiency on the basis of an integrated approach to knowledge and best-practice sharing, onsite consultancy and tailor-made training.

Going beyond current practice of customer-supplier cooperation, the network hence not only provides a communication forum but also allows concrete solutions to be jointly discussed, identified and operationalized and for them to

be implemented into their operations. For this reason, the project is supported by DEG, the German Investment and Development Corporation, member of the state-owned KfW Banking Group, as part of its “develoPPP.de” support program.

“Closer networking and a more intensive exchange of experiences between our suppliers in Mexico are aimed at improving the environmental performance of all project partners, including Continental itself. In the end, it is primarily about making a joint contribution to sustainable development.

Jim Egner, Environmental Manager for NAFTA ■

Capacity development as a basis for self-controlled improvement processes

The overall aim of the network is to foster sustainability in the Mexican automotive industry through an improved environmental and energy performance. Following achievements are therefore targeted:

- Exchanging experiences, know-how and best-practices
- Developing capacities for sustainability and environmental management
- Implementing concrete improvement actions
- Facilitation of continuous improvement processes
- Establishing foundations for systematic environmental and energy management
- Demonstrating the benefits of investments into green technology and solutions

The results help all participating companies to not only improve their environmental and energy performance - but also reduce their operating costs, while at the same time increasing productivity, employee retention, and competitiveness. ■

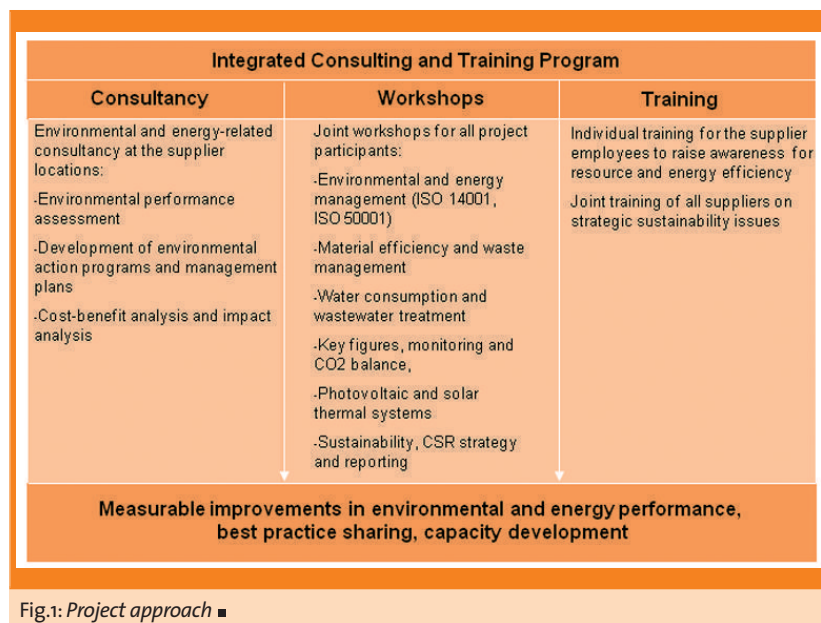


Fig.1: Project approach ■

Specific improvement from an integrated training and consulting program

During the 18-month project period, the following related work packages were implemented (see Figure 1):

- Workshops to promote the transfer of knowledge, solutions and technology
- On-site consultations at the suppliers' production sites
- Individual as well as company-wide training

In a series of 6 professionally moderated workshops, the energy and environmental managers of the participating supplier companies and the Continental sites

exchanged experiences and know-how on proven methods as well as technological and organizational solutions for a more efficient operational use of resources and energy. Both strategic issues of sustainability management as well as operational and technical aspects of the company's environmental and energy management were discussed in this context. The aim here was to promote the exchange of expertise of the participants and provide them with concrete suggestions and implementation examples.

At the same time, a comprehensive individual environmental and energy consultation was conducted at



Fig. 2: Works tour with an environmental and energy expert from Arqum from Munich as part of the environmental and energy technical consultancy at one of the participating suppliers in San Luis Potosi ■

the location of each participating company. The consultancy undertaken has aimed at developing and implementing concrete and measurable action programs for improving energy efficiency and environmental management. The starting point for this were the topics that had been jointly developed in the workshop.

As a third pillar of the project, tailor-made training was conducted in the participating companies in order to further raise environmental awareness and cross-company training on the topic of environmental management. The idea behind this was to promote the development of capacities for a permanent follow-up procedure for those steps established during the project. ■

Measurable efficiency gains, well-trained and motivated staff as a starting point for a long-term commitment

On the basis of the site-specific consultancy of the suppliers, a total of 45 representative actions were selected for the analysis of the project results. The respective environmental field determined the extent to which the saving potential varied between the environmental aspects and the companies. But on the whole, all of the central environmental aspects were tackled by the participating companies. Within the framework of the cost/benefit analysis and the bottom-up monitoring applied in this context, it was established that each participating company had benefited from substantial efficiency gains.

To finance those measures, the companies have invested in total the equivalent of approx. 664.000 EUR. The measures lead to a yearly saving of approx. 787.000 EUR, which means that the average return-on-invest is approx. 0.8 years. Almost two thirds (62%) of the measures had a return-on-invest of under three years.

	Savings bottom up		Average efficiency gain
Electricity	923,497	kWh	7.12%
Petrol	3,749	kWh	1.33%
Total energy	927,246	kWh	4.77%
Hazardous waste	178,883	kg	34.43%
Non-hazardous waste	32,650	kg	8.09%
Freshwater	4,581	m ³	8.88%
Wastewater	205	m ³	1.59%
Chemicals	6,232	kg	1.33%
CO ₂	775,276	kg	20.24%

Table 1: Savings and efficiency improvements for the relevant environmental issues ■

Over the project period, the network – i.e. all ten participating companies are considered as one entity – achieved substantial savings and efficiency gains (see table 1). Almost one gigawatt hour of energy was saved marking, as it does, an efficiency gain of almost 5%. Fresh water consumption was down by almost 9%, which in view of the scarcity of fresh water in the relevant regions of Mexico represents a considerable achievement. The generation of hazardous waste was reduced by almost 35%.

The project shows that investing in energy and resource efficiency not only results in ecological savings and economic benefits but also reduces emissions of greenhouse gases. Through the efforts of the network, the ten companies

have saved approx. 775,000 kg of CO₂ emissions.

Considerable total savings, low payback periods and a large potential for CO₂ reduction clearly show that this project has paid off for the participating companies – both in ecological and economic terms. Continental aims to build on this success and extend the cooperation within the network to other companies in order to multiply the achieved results and thus scale the positive effects to environment and resources. ■

A detailed description of the project and the actual results can be downloaded as a brochure on www.arqum.de/mediendownload/projektbroschueren/ or the project website www.sustainabilitynetwork.net.

Arqum stands for occupational safety, quality and environmental management. We advise companies, municipalities and districts as well as government agencies and NGOs at home and abroad on their way to achieving a sustainable economy. To this end, we develop practice-oriented concepts and innovative solutions in environmental and climate protection, sustainability, resource and energy efficiency (e.g. ECOPROFIT, ECOfit, LEEN), work safety, quality and international co-operation. We are a leader in the development of operational management systems according to ISO 14001, EMAS, ISO 50001, OHSAS 18001 or ISO 9001.

'The bottom-up monitoring takes into account all actions carried out in the company during a determined period of time. The sum of the effective actions then results in savings for the respective year. This enables the increase in efficiency and the CO₂ reduction in the company in relation to a hypothetical year without implementation of measures to be calculated.'



Fig. 3: Environmental and energy managers exchange knowledge during a workshop at Continental's Tijera Plant in Guadalajara ■

Author:

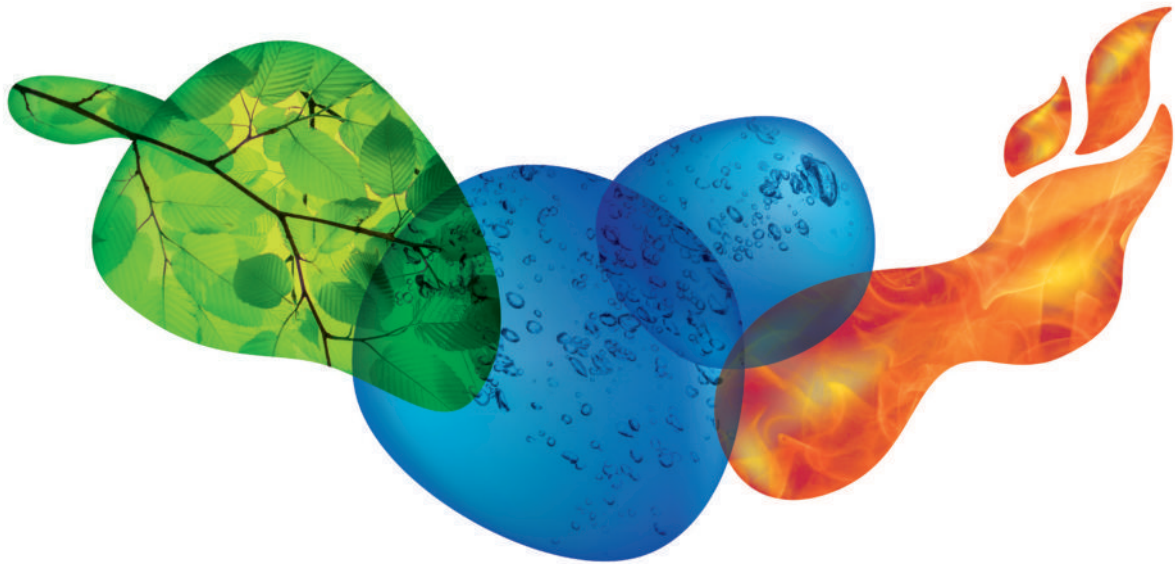


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