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RESEARCH NEWS

12 | 2012 ||

1 Tasty and gluten-free

Cereals are good for you, supplying the body with carbohydrates, proteins and vitamins. Yet some people are intolerant to the gluten protein they contain. Now, researchers are developing new recipes for tasty, gluten-free pasta and pastries.

2 Wireless communication's crystal ball

By now, wireless connections like Wi-Fi and Bluetooth are just as commonplace in industry. Yet systems often interfere with one another as data is being exchanged. Now, "Awair" will not only detect available frequencies but will predict them, too.

3 Keeping ship hulls free of marine organisms

Special underwater coatings prevent shells and other organisms from growing on the hull of ships – but biocide paints are ecologically harmful. Together with the industry, researchers have developed more environmentally-friendly alternatives.

4 Copper, gold and tin for efficient chips

With gold, copper or tin and special galvanizing processes, scientists are improving the function of semi-conductors and making the manufacture of microelectronic systems a child's play. Especially the LED industry could profit from this.

5 Putting electronic cigarettes to the test

Are e-cigarettes harmful to users? An unresolved question. It's harder still to judge the danger to bystanders. How many different substances do e-smokers exhale – and what are they? A new study brings light to the shadows.

6 Composites for large-scale manufacturing

Continuous fiber-reinforced composites with thermoplastic matrix resins are very well suited for use in automotive manufacturing. However, to manufacture them is complicated. A new approach now makes it possible to use the injection molding process.

7 Machines with built-in copy protection

Pirated goods cost German industry billions, and expensive industrial goods like machining systems are becoming a growing target. Scientists are turning the tables on the forgers by studying their methods and developing anti-counterfeit solutions.

8 Newsflash

The Fraunhofer-Gesellschaft is the leading organization for applied research in Europe. Its research activities are conducted by 60 Fraunhofer Institutes at over 40 different locations throughout Germany. The Fraunhofer-Gesellschaft employs a staff of around 20,000, who work with an annual research budget totaling 1,8 billion euros. Roughly two thirds of this sum is generated through contract research on behalf of industry and publicly funded research projects. Branches in the USA and Asia serve to promote international cooperation.

Editorial Notes:

RESEARCH NEWS l Frequency: monthly l ISSN 09 48 - 83 83 | Published by Fraunhofer-Gesellschaft l Press Office l Hansastraße 27 l 80686 München l Phone +49 89 1205-1333 l presse@zv.fraunhofer.de | Editorial Staff: Franz Miller, Tina Möbius, Tobias Steinhäußer, Britta Widmann l Reprints free of charge.We encourage you to favor the online version and newsletter via www.fraunhofer.de/fhg/EN/press This bulletin is also available in German as FORSCHUNG KOMPAKT.

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Tasty and gluten-free

Not every person can eat what they like; far from it, one in every 250 people in Germany is intolerant to the protein gluten, which is chiefly found in the cereals wheat, spelt, barley and rye. Experts call this intolerance coeliac disease. For those affected, this means giving up bread, pizza, pasta and cakes, while ice cream wafers, dumplings and pretzels also pass onto the list of banned foods. Those suffering from coeliac disease, a chronic bowel disorder, must keep to a strict diet if they are to avoid diarrhea, stomach ache, vomiting and other symptoms. Accordingly, only gluten-free products make it onto the menu.

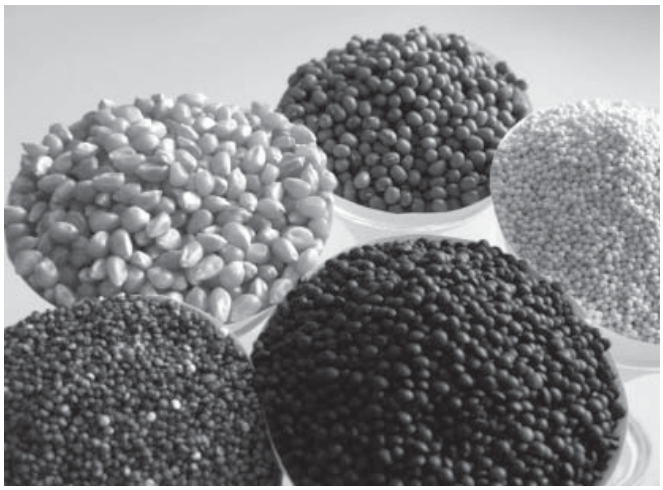
Indeed, demand for these food products, mainly offered by small and medium-sized enterprises (SMEs), has risen steadily over the past years. Nevertheless, many consumers dislike gluten-free pasta and bakery products because they are unappetizing, lacking in texture and leave a disagreeable sensation in the mouth. This is a view confirmed in consumer tests involving coeliac disease sufferers and healthy volunteers. The tests form a key part of the EU project GlutenFree (www.glutenfree-project.eu), which is being coordinated by the Fraunhofer Institute for Process Engineering and Packaging IVV in Freising. Partners include ingredient providers and food producers as well as research institutes from Germany, Ireland, Italy and Sweden. The aim of the project is to enable SMEs to develop premium, tasty gluten-free products that the consumer will eat with real enjoyment and satisfaction. The focus is primarily on bread and pasta, and on improving their taste, smell, appearance, texture and sensation in the mouth.

Gluten is good for baking because it holds the dough together. "Gluten contains two protein fractions, the gliadins and the glutenins. These form a network-like structure – the dough matrix, if you like – giving the dough good porosity and a viscoelasticity that allows it to keep its shape and remain elastic in the baking process", says Dipl-Ing. Jürgen Bez, scientist at IVV. Gluten-free bakery products dry out more quickly, crumble more easily and have a shorter shelf-life. Pasta without gluten overcooks more quickly, and is sticky and less elastic. "As a result, finding ingredients to compensate for gluten's positive properties is a challenge", says Bez. The process begins as early as the selection of raw materials: quinoa, for instance, often produces a bitter taste. Nevertheless, researchers have been successful in finding ingredients such as plant proteins, which lend pasta and bakery products the same structuring effect as the protein gluten. Hydrocolloids like xanthan gum, HPMC and dextran have all been examined carefully, as well as seeds taken from cereals and pseudocereals like amaranth, quinoa and buckwheat. In addition, scientists analyzed protein isolates taken from potatoes and pulses like lupins, broad beans and peas, as well as investigating the interaction of a variety of recipe ingredients during the production process, and the ways in which this affected texture, sensory properties and aroma profile. A whole range of recipes were tested; for example, researchers combined proteins with soluble fibers like xanthan gum and HPMC or with insoluble citrus fibers.

It's the combination that counts

"Adding the hydrocolloid xanthan gum succeeds in giving dough a particular elasticity, though here the end result is heavily dependent on the concentration, the proportion of water, the type of flour and the other ingredients. Getting the right combination is crucial", summarizes Bez. "As a rule, hydrocolloids alone are not enough to offset the lack of gluten, and proteins need to be added to recipes." Thanks to a special production technique, scientists are able to extract a protein isolate containing viscoelastic properties from the seeds of lupins and broad beans. This was another technique developed by Bez and his team at Fraunhofer IVV. "By adding lupin proteins, we were able to improve the volume of baked goods", says the researcher. Scientists also established that adding sourdough helps prevent loaves from going moldy so quickly, observing that dough becomes more elastic and that loaves stay fresh for longer. What's more, some gluten-free flours are more nutritious than wheat flour. Test subjects rated oatmeal, rice flour and teff flour particularly flavorsome.

Bez considers the project a success, pointing to project partners' success in producing a range of new and improved gluten-free breads, including toast bread, leavened bread and oat wholemeal bread, ciabatta, baguettes and pizza dough. Four of the baked goods producers involved in the project are already using the recipes for ciabatta, wholemeal bread and pizza dough. Furthermore, researchers were able to produce tasty, gluten-free spaghetti with a high fiber and protein content. Bez is confident that it won't be long now before we see some of the new products lining bakery and supermarket shelves.



People suffering from coeliac disease are only allowed to eat pasta and bakery products made with gluten-free types of grain. (© Fraunhofer IVV) | Picture in color and printing quality: www.fraunhofer.de/press

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Wireless communication's crystal ball

Wireless communication technologies have become an indispensable part of industrial operations. Within the logistics sector, for instance, Wi-Fi and Bluetooth are used not only to identify and track goods but also to control forklift trucks or high-rack storage systems. In this, the various wireless systems are obliged to share a single frequency band. To ensure that all runs smoothly, coexistence planners monitor both the wireless systems and potential intruders, since any interruption to the transmission of data could cripple production. In "Awair", researchers at the Fraunhofer Institute for Communication Systems ESK in Munich have developed a piece of software whereby coexistence planners will be able not only to detect available radio frequencies but to predict them, too.

"Awair" draws up a digital map of available wireless channels, displaying channel usage in the form of a 3-D image. As on a physical map, the visual representations form hills and troughs; bulges in the 3-D image signify that a frequency is in use, while unaltered areas indicate an available one. Using recorded data to construct time series, it is also possible to forecast which channels will be used when, and for how long. This gaze into the future is the product of neural networks. This refers to a series of technologies that approximate the way the human nervous system processes information. These technologies analyze time series data, allowing them to predict which frequencies are available with unerring accuracy, all correct to the nearest second.

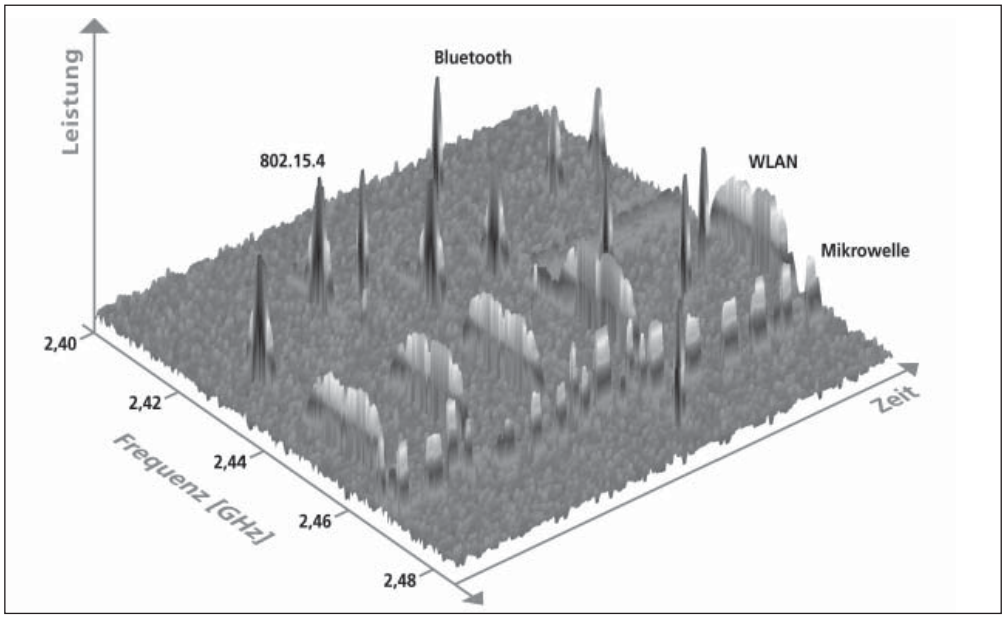
Tighter rules in coexistence management

"Companies can use "Awair" to ensure they comply with increasingly strict industry standards. Just recently, the European Telecommunications Standards Institute (ETSI) published a new, amended standard dealing with the fair use of wireless communication channels. The standard brings with it greater challenges in the area of coexistence management. In particular, it restricts the choice of frequency bands available to automated manufacturing systems that need to communicate with one another in real time", outlines Dipl.-Ing. Günter Hildebrandt of Fraunhofer ESK.

To ensure that all unlicensed radio frequency bands can be monitored, Fraunhofer ESK researchers decided on flexible, software-based technologies like software-defined radio (SDR) and neural networks, tailoring them to the needs of industry. In contrast to the standard radio chip, which uses hardware to process radio signals, SDR systems use software instead. As a result, SDR is more flexible – simple adjustments in the software allow a single wireless device to use multiple radio frequency bands.

Across the world, radio frequencies are divided up into licensed and unlicensed bands. In Germany, this is the responsibility of the Federal Network Agency, while the International Telecommunication Union (ITU) forms the corresponding international body. In

Europe, considerations of cost mean that companies in the industrial sector mainly use the popular and unlicensed 868 MHz, 2.4 and 5 GHz ISM radio frequency bands. But it's not only industry competing for use of these radio bands, but private households too. As a result, bottlenecks and overloaded frequency bands are a daily occurrence.



"Awair" displays when signals are being transmitted and on which frequencies. (© Fraunhofer ESK) | Picture in color and printing quality: www.fraunhofer.de/press

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Keeping ship hulls free of marine organisms

If a ship is at anchor for longer periods algae, shells and barnacles will colonize it. Every year, this so-called biofouling causes economic losses of billions of Dollar. Biological growth on the underwater surface promotes corrosion. The deposits increase the roughness of the hull below the waterline which has a braking effect as the ship travels. Depending on the roughness of the basified bio layer, the consumption of fuel can increase by up to 40 percent. In the case of a large container ship this can result in additional annual costs of several millions.

All the countermeasures used to date have considerable drawbacks: Cleaning the hull by sandblasting in a dry dock removes also the painted coating and can only be used every three to five years. There are effective hull coatings preventing the growing of adhering bio layers, but in most cases by ecotoxic biocides. Both copper ions and synthetic biocides accumulate in the coastal water and in the sediments. For this reason the particularly toxic tributyltin (TBT) is banned since 2008 and the currently preferred and still permitted copper oxide containing coatings are to be replaced by non-toxic alternatives in the foreseeable future.

As part of the BMWi-supported project consortium "Controlled Antifouling System based on Nanocomposits for Shipping" (GANaS) researchers at the Fraunhofer Institute for Mechanics of Materials (IWM) in Halle have developed a more ecologically-friendly alternative. "The electrochemically active coating system produces regularly changing pH values on the surface of the hull. This effectively prevents colonization without having to use any biocides", explains Professor Manfred Füting of the IWM in Halle who is coordinating the project.

Painted coatings as electrodes

Large area electrodes were painted on an isolating primer coating. The electrochemical active layer based on a sol-gel paint of NTC (nano tech coating gmbH), which was modified by electrically conductive particles. To achieve an adequate distribution of the electrolysis current a highly conductive interlayer was applied. In a preprogrammed and optimized electrochemical process the electrolysis current is periodically commutated and interrupted. A current density of lower than 0,2 mAcm-2 generates enough pH stress near the surface of the hull to prevent the growing on of any barnacles, shells and algae The electric current is supplied by a photovoltaic module or by the land based power grid.

The electrochemical antifouling by alternating pH values was developed and patented by the project partner bioplan GmbH. This principle is working effectively and independently of marine flora and the kind of sea water. "With the coating development in the GANaS project we are on the way to a practical solution", says Füting.

With their development Füting and colleagues are primarily looking at official ships, such as oil spill ships or fireboats: These are in port most of the time, but must be ready for deployment as soon as they are required. "A ship with a heavy amount of growth will no longer be able to attain the speed it requires to quickly reach the location where it is needed", says Füting as food for thought.

Tests with the first prototypes at the Barth shipyard were promising: differently coated and electrochemically active and passive large areas are currently tested to prove their long-term stability against hydrodynamic stress and efficiency to prevent adherence and growth of bio layers. To achieve the real applicability of an economically competitive and ecofriendly antifouling system follow-up projects are planned: "They will mainly involve improving the technical applicability and optimization of our electrochemical antifouling system, which then could be applied on ship hulls for at least 3 to 5 years", states Füting.

Underside of the boot with the test surfaces. Persons (from left to right): Sebastian Kunsch – MD Barth shipyard; Manfred Füting – Fraunhofer IWMH; Stefan Sandrock – MD bioplan GmbH, Baltic Sea resort Nienhagen (© Fraunhofer IWM) | Picture in color and printing quality: www.fraunhofer.de/press

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Copper, gold and tin for efficient chips

They are particularly small, durable and economical: LEDs have conquered the automotive industry; it is already possible today to recognize the make of a car by the design of the LED headlights. Whether in the interior, displays, infotainment system or brake lights, parking lights or fog lights – a modern car offers many possibilities for LED technology to be used for lighting. Unlike the traditional halogen or xenon lights, light emitting diodes need LED drivers. Their most important task: they must continuously supply the light diodes with power. In addition, they are to carry out complex tasks and to control, for example, several LEDs in series, or switch individual ones on in multiple stages if the interior lighting is to be dimmable.

The requirements relating to the drivers are enormous: they must be immune to the high temperature and voltage differences in a car or be resistant to aggressive chemicals. In order to guarantee reliable luminosity, a higher voltage must flow through the circuits of the LED drivers. Researchers from the Fraunhofer Institute for Microelectronic Circuits and Systems IMS offer manufacturers a process to manufacture the chips that suit these applications: it is based on galvanization, a process in the semiconductor industry, in which special metals are deposited on the semiconductors.

Copper for increased current flow

However, Prof. Holger Vogt's department at the IMS, is backing copper, in particular. "This way, we can have more current flow through the chips", explains Vogt. That is important, because for most applications the chips must become smaller and smaller – the current that flows through them, however, stays the same. However, integrating new materials, such as a layer of copper, is not always without problems, since there are limits to the regular processes for manufacturing chips. It is for this reason that the scientists at the IMS specifically constructed a manufacturing line for "post processing" – the MST Lab & Fab – to be able to subsequently improve the chips on the substrate wafers, depending on the requirements of the application.

In addition to copper, the engineers are also able to deposit other metals or compounds such as copper-tin or gold-tin onto the chips. "These layers can be soldered", explains Vogt. That offers a substantial advantage: the cover can be soldered onto the chip, right there on the wafer. "The result is the smallest housing for a chip that can be had", says Vogt. It can be used to surround and protect sensitive sensors without negatively affecting their functionality. One example is bolometers, sensors that are used to measure temperature. Because the housings for bolometers must additionally also be put into a vacuum environment to provide accurate measurements, their manufacture to date has been very complex and thus expensive. However, with the help of the MST Lab & Fab, housings that are cost-effective and therefore suitable for mass production can be manufactured.

In addition, the researchers in the MST Lab & Fab have been able to construct complex components within a single housing. The are able to solder two chips, such as an opto-chip with highly sensitive photo sensors with a CMOS-Chip (Complementary Metal Oxide Semiconductor) which can measure individual photons, to each other, using the copper galvanization process. Such microelectronic components are suitable for night-vision devices or for low-light microscope applications.

An employee at the MST Lab & Fab, where the post processing of chips takes place. (© Fraunhofer IMS) | Picture in color and printing quality: www.fraunhofer.de/press

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Putting electronic cigarettes to the test

Electronic cigarettes are experiencing somewhat of a boom at the moment. An estimated two million people in Germany have already turned to the vapor cigarette, which many view as a healthy alternative to conventional smoking. However, a number of voices, primarily from the political sphere, are warning of possible health risks, claiming that the long-term consequences cannot yet be foreseen. Studies to date have come to mixed conclusions. There is a general lack of substantiated facts, fuelling an ongoing battle between supporters and opponents. By carrying out a new, independent study, researchers at the Fraunhofer Institute for Wood Research WKI in Braunschweig hope to introduce a degree of objectivity into this emotional topic of debate. The scientists' goal was to find out whether e-cigarettes pollute the surrounding air, thus affecting bystanders of an e-cigarette user.

An e-cigarette consists of a battery, an atomizer, a heating coil and a reservoir for the liquids used for producing vapor. These liquids are heated up in the atomizer and vaporized at between 65 and 120 degrees Celsius. The user activates the mechanism either by pressing a button or by suction, depending on the design. Liquids come with or without nicotine, and also contain aromas and flavors like amaretto, almond, vanilla or apple. Propylene glycol is the most usual solvent; it produces the atomized mist that resembles smoke when exhaling. In contrast to conventional cigarettes, which constantly emit smoke as the tobacco burns, the electronic equivalent only releases volatile substances when it is turned on. But that is not the only difference between the two stimulants, as the WKI researchers observed. "In the e-cigarette, vaporized substances create an aerosol of ultrafine particles which become even finer when inhaled into the lungs. These tiny nanodroplets disperse over time. In contrast, the combustion process discharges solid particles that can remain in the surrounding air for a considerable time", says Dr. Tobias Schripp, scientist at Fraunhofer WKI and co-author of the study.

No formaldehyde emissions detected

The Fraunhofer experts conducted a series of test chamber measurements to analyze emissions of volatile organic compounds (VOCs), ultrafine particles and formaldehyde, with particular emphasis on the quantity, concentration and distribution of particles. Tests were conducted using volunteers in an 8-cubic-meter test chamber, where conventional cigarettes were compared with e-cigarettes containing a variety of liquids. To ascertain how the distribution of particles develops over a number of minutes, and the amount of propylene glycol released in the longer term, the vapor was in addition pumped directly into a 10-liter glass chamber. This test was performed on different types of e-cigarette, all containing the same liquid. "In general, the emissions of VOCs and ultrafine particles when smoking an e-cigarette were lower than the equivalent emissions from a standard cigarette", says Schripp. Furthermore, the researcher and his team were not able to detect any formaldehyde emissions from the e-cigarette.

Conventional cigarettes, on the other hand, exceeded the guideline value of 0.1 ppm (parts per million) for indoor air quality under the given test conditions. Vaporized propylene glycol was released into the air from both electronic and tobacco cigarettes, as it is also often used as an additive in tobacco. Pulmonologists fear that this solubilizing agent can irritate the airways when inhaled in large quantities. "While it is true that the electronic cigarette contributes less to indoor air pollution than tobacco cigarettes, it is not entirely emission-free. Consequently, it seems reasonable to assume that bystanders are exposed to the released vapor and thus 'passive vaping' is possible", says Schripp, summing up the results of his measurements. He also criticizes the product labeling strategy, which in many cases provides inexact or inadequate information on the liquids used. As a result, e-smokers often have no reliable way of knowing what potentially harmful substances they are inhaling and exhaling.

The scientists' aim in carrying out this study is to provide measurement data suitable for use as the basis for future investigations. "However, the study does not claim to provide any kind of toxicological assessment", stresses Schripp. A summary of the results was published in the Indoor Air journal (http://onlinelibrary.wiley.com/doi/10.1111/j.1600-0668.2012.00792.x/pdf). The researchers intend to present the study on December 6, 2012 at the 10th German Conference for Tobacco Control.

E-cigarettes come in many different guises, yet they all have one thing in common: they only emit vapor when switched on. (© Fraunhofer WKI) | Picture in color and printing quality: www.fraunhofer.de/press

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Composites for large-scale manufacturing

To date, it has been very laborious to manufacture fiber-reinforced composites with a thermoplastic matrix in large quantities. On the one hand, the textile-like dense continuous fiber-reinforced structures are difficult to shape, on the other, joining the continuous fibers with a highly viscous thermoplastic matrix material is a highly complex process. To date, there is no economically profitable production technology for large-volume component series.

Adapted injection molding process

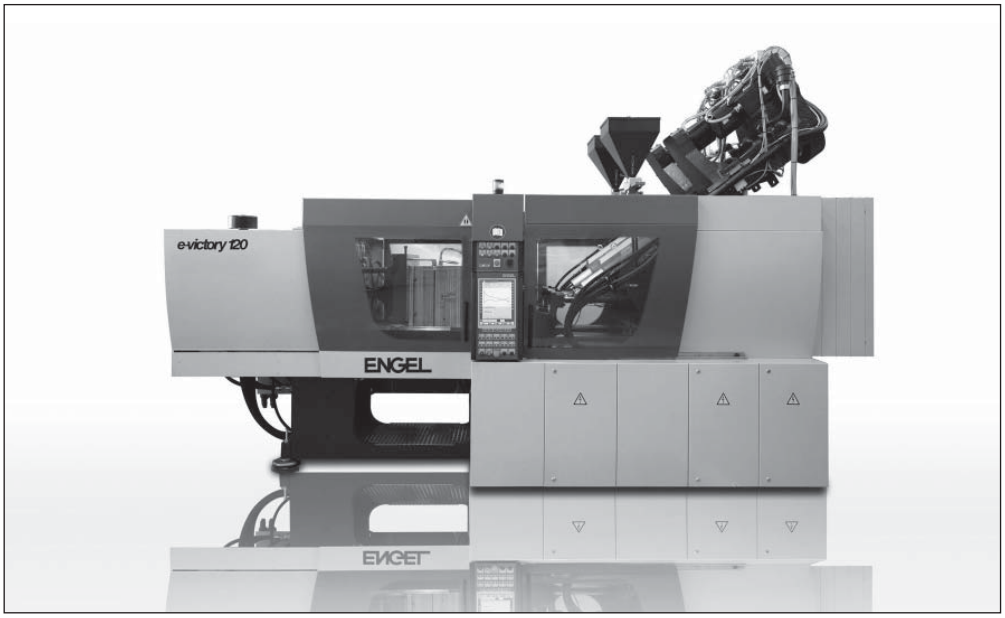
Together with the injection molding machine manufacturer ENGEL Austria GmbH, the scientists of the Fraunhofer Institute for Chemical Technology ICT in Pfinztal (Germany) have, for the first time, brought a technology to production readiness that allows the series production of such continuous fiber-reinforced thermoplastic composites with an injection molding process. So far, it has only been possible to use the injection molding process for fiber-reinforced composites made of short fibers or long fibers. "Continuous fiber-reinforced composite structures with a thermoplastic matrix are becoming increasingly popular, and will be used increasingly in the automotive industry", states Dr.-Ing. Lars Fredrik Berg, scientist and project manager at the ICT. "With the injection molding process, components that have high fiber contents by volume and therefore outstanding mechanical characteristics can be produced efficiently in high volume series".

Based on the results of their own research, the scientists of the ICT developed, together with ENGEL, a prototype machine for injection molding. The ENGEL e-victory 120 can handle all the necessary working steps in a single machine. The reactive components are prepared and mixed, and the material is injected into the molding die. The in-situ polymerization also takes place in it, after the textile reinforcement structures have been introduced. "The ICT and ENGEL have developed a robust, compact and fully automated technological system to series readiness that is flexible and quick at the same time. It is exactly this technology that the automotive industry has been lacking for continuous fiber-reinforced thermoplastic composite structures. The process, which to date had been distributed across several machines, can now be carried out on a single one", says Dipl.-Ing. Peter Egger, Head of the Technology Center for Lightweight Composites at ENGEL. e-victory has already passed its first crucial test: Engel produced, as an example, a brake pedal insert made of fiber glass-reinforced polyamide for the automotive supplier ZF Friedrichshafen.

Endless fiber structures wetted out ideally

In contrast to the injection molding processes for fiber composite materials to date, where only short fibers could be processed, continuous fiber-reinforced composite

structures can be fed into the e-victory and be impregnated with a very low viscosity plastics matrix. "We have developed a process in which the in-situ polymerization of thermoplastic matrix materials works. We allow monomers, which are highly reactive molecules, to polymerize directly in the machine. The monomers have a shorter molecule chain than polymers, and therefore a lower viscosity. When being processed, the viscosity of the reactive plastics matrix is similar to that of water. This means that the fiber structures can be wetted down in an ideal manner, without displacing the structures in the form", explains Berg. In October the Reinforced Plastics Industrial Association AVK awarded the ICT and ENGEL an AVK Innovation Prize in the "Processes" category for this new technology.



Using the ENGEL e-victory 120, thermoplastic composite structures can be mass-produced using the injection molding process. (© ENGEL) | Picture in color and printing quality: www.fraunhofer.de/press

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Machines with built-in copy protection

The annual cost to industry of illegal copies of branded products is estimated at a staggering 650 billion U.S. dollars worldwide, and German machine tool manufacturers are becoming an increasingly popular target for pirating operations. Around one third of all companies have seen their business eroded by cheap imitations of their products, especially manufacturers of textile machines, compressors and plastics processing equipment. "Most companies have absolutely no idea just how easily their products can be copied," says Bartol Filipovic, head of the Product Protection department at the Fraunhofer Research Institution for Applied and Integrated Security AISEC in Garching near Munich. The AISEC advises companies on how best to protect their products and IT services from unlawful attacks on their proprietary rights (overview of product protection: http://ais.ec/psinfo).

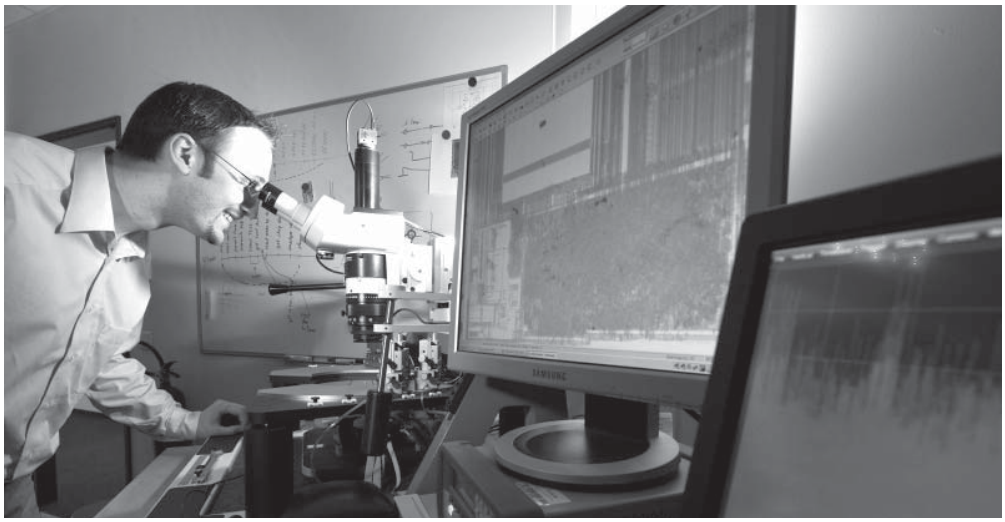
In the world of industrial machines, there are forgeries of almost everything that can be copied, from housing design to instruction manuals. The most critical elements are those that give a product its "intrinsic value": electronic circuits and software that constitute its distinctive characteristics. This makes embedded systems with measurement, control, or signal processing functions prime targets for forgers. Product pirates tend to steer clear of getting their own hands dirty, preferring to engage the services of those offering "reverse engineering". This involves performing the same development process only in the opposite direction, which begins by analyzing exactly how the hardware is put together and creating circuit diagrams of the original product. Reverse engineers can then rip the software and reconstruct the machine's control system and functions, thereby gaining access to the manufacturer's key know-how.

In addition to conducting research, AISEC's most important role is instructive. Many companies react only once counterfeits of their own products have surfaced on the market. Although it is then too late to prevent fake copies, it is possible to tag the original so that it can be distinguished from imitations. The aviation industry marks safety-critical spare parts with copy-resistant holograms; it is also possible to build a kind of indelible electronic fingerprint into the circuit. But taking any number of safety precautions is not going to be enough to deter manufacturers of fake products, and trade in them can only be stopped when customs officers, distributors and customers are all equipped with the devices needed to read and decode the markings. As this is often not the case, companies should see to it that suitable protection mechanisms are placed deep within the hardware when developing each new product range. The optimum scenario is for clients to consult AISEC before completing this phase, and have their developers share the proposed hardware setup, circuit diagrams and software with AISEC's product protection team – in strictest confidence, of course. AISEC's researchers analyze this information to identify any weaknesses and offer suggestions for making the product more secure.

Targeted technical methods guard against forgery

One option is to install cryptographic devices that encrypt the data stored within the machine. These devices generate the corresponding decryption key based on the duration of electrical signals on the microchip. The signals emitted by other chips, even those from the same production batch, will be of a slightly different duration, rendering the key unusable. Another option is to use hardwired control units. These purpose-built chips make it extremely difficult for offenders to rip the software and run it using standard chips built into product imitations. However, it is possible for companies to safeguard computer programs without the need for special hardware; for instance by adopting obfuscation techniques. It is definitely worthwhile for companies to analyze and develop suitable technical safeguards, says Bartol Filipovic. "The service we provide is less costly than the damages inflicted by product piracy." The cost of such services varies according to the scope of analysis and the extent of the protection required.

Through its advice, AISEC aims to buy companies as much time as possible. Companies that have implemented AISEC recommendations enjoy at least five to ten years relief from attacks by product counterfeiters. This time lead is crucial for companies to protect their expensive investments. The technological know-how required to manufacture industrial goods does not go out of date as quickly as that for consumer goods, making it thoroughly worthwhile for forgers to copy a machine even if it has already been on the market for five years. Equipping goods with the latest protection methods means that forgers would simply be wasting their time. "I'm not aware of a single case where someone has successfully broken through our safeguards," says Filipovic.



Researchers are developing technical safeguards. (© Volker Steger) | Picture in color and printing quality: www.fraunhofer.de/press

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Trapping malware with honeypots

Hackers systematically scan the Internet for vulnerable systems with the help of self-spreading malware. On average, accessible systems are the target of an attack every three minutes whereby security loopholes are often exploited. In order to protect systems better, cyber experts study their opponents' work. One possibility is the use of "Honeypots". These are computers integrated into the Internet and are only there to record attempted attacks.

Researchers at the Fraunhofer Institute for Communication, Information Processing and Ergonomics FKIE evaluate these attacks and collect valuable information about the hackers' current methods and the malware they use.

In the "HoneypotMe" project they have developed this approach further. For example, they redirect attacks on regular systems to an external analysis computer. As the attacking system is unaware of this forwarding, attacks on monitored systems can actively be made more difficult.

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Measuring jet blast of aircraft

While aircraft are travelling across an airfield their jets produce strong airflows. Jet blasts from aircraft that are taking off can be strong enough to blow over cars. On behalf of Fraport AG researchers at the Fraunhofer Institute for Material Flow and Logistics are measuring how powerful the jet blast of new aircrafts is. Differentiated evaluations of the airflows occurring on the ground help airport operators improve traffic planning in the areas close to the terminals.

At the core of the measuring system developed for this is an ultrasonic anemometer. The portable wind measuring system allows more flexible configuration of the aircraft positions, thereby ensuring better utilization of airport capacity.

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Robot tests parking deck

The automatically driven BetoScan® scanner system inspects the concrete surfaces of parking garages, bridges and industrial floors. The comprehensive diagnosis helps architects, business owners and building companies to detect damage early and to come up with a realistic renovation plan. Researchers at the Fraunhofer Institute for Non-Destructive Testing IZFP have developed these robot platforms together with partners.

The system, which is fitted with non-destructive test sensors, rapid and cost-effectively examines several hundred square meters of parking surfaces per day. One person operates the BetoScan®. The result of the examination can be supplemented with other data, plans and images. Vivid graphics provide building experts with a good basis for renovation decisions. The project has been sponsored by the Federal Ministry of Economics and Technology BMWi. BetoScan® will be shown from January 14 to 19 at the fair trade BAU 2013 in Munich (Hall C2, Stand 135).

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