



## RESEARCH NEWS

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### 1 Healthy seeds - treated environmentally friendly

Farmers treat seeds chemically in order to rid them of pest infestation. Now researchers have developed a method that kills pathogens without harming the environment. Pioneering seed suppliers are already implementing the procedure commercially.

### 2 The armchair as a fitness trainer

Each of us would like to pursue our personal hobbies and interests into old age. However, this depends on us staying fit and healthy. Researchers are now presenting an armchair that brings the gym right into your living room at the push of a button.

### 3 Aldi Süd Supermarkets – Energy-Optimized

Running a supermarket requires a lot of electricity. Long rows of refrigerators have to be kept cool and large areas have to be lit. A new concept enables supermarket operators to cut their energy use by around 25 per cent.

### 4 Optimized custom-made ski sledges

At the 2014 Winter Paralympics, competitors will line up wearing optimized sit skis that are adapted to their individual needs. This is made possible by a new manufacturing method which Fraunhofer researchers helped to develop.

### 5 Faster video streaming

In the smartphones and tablet era, more and more users are watching videos on the move – with a resulting strain on mobile networks. The combination of the HEVC video compression standard with LTE brings networks welcome relief.

### 6 Safe glass facades

Glass facades are attractive, but they also have to be safe. Say if a bomb were to go off nearby, would they withstand the blast? Researchers are using a shock tube to find out, and one of their projects is a new building complex in San Francisco.

### 7 Awakening the dormant potential of e-government

E-government holds the promise of gains in efficiency and satisfaction for case workers. In Denmark, seven government ministries have already undergone a full digital changeover. Now researchers have adapted the model for German government agencies.

### 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.

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## Healthy seeds - treated environmentally friendly

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Seeds are home to molds and fungi, bacteria and viruses. To kill them off and to thereby prevent plant diseases from spreading, the seeds are, as a rule, treated chemically. However, recently this method has been discredited. The permits for some chemical treating agents have been withdrawn, but the granting of new permits has declined markedly as well. And lastly, a severe case of E-coli infection which was caused by beansprout seeds and which made headlines in summer 2011, also resulted in calls for alternatives. The scientists of the Fraunhofer Institute for Electron Beam and Plasma Technology FEP in Dresden, Germany have developed an environmentally friendly method for removing germs from seeds. They treat the seeds with electrons, which within milliseconds destroy the DNA of the harmful organisms. Due to a special device setup, the elementary particles only act on the surface and in seed coat. The embryo in the interior of the seed is not affected so that the ability of the seeds to germinate is not impaired.

"In cereal seed you will find almost exclusively fungal pathogens but due to climate change it has been affected increasingly by bacteria from the south, against which there are no chemical agents as yet. Our treatment with low-energy accelerated electrons on the other hand is effective against bacterial and fungal pathogens. Also, the pathogens cannot build up a resistance against this process," says Frank-Holm Rögner, holder of a master's degree in physics and department head at the FEP. Since the scientist and his team do not use any chemical additives, they destroy the pathogens in an environmentally friendly fashion with their method. Any leftover seed can be used as feed without any concerns.

Experts have long been able to prove that the germination ability of seeds treated in this manner is equal to that of chemically treated seeds. For two decades they have been attempting to establish and further develop their method. In 2002, they built a mobile demonstration unit which they use to provide test treatments all across Germany. However, even though the EPPO (European and Mediterranean Plant Protection Organization) recommends the process for conventional as well as for ecological farming, the technology has been unable to significantly penetrate the market and has not progressed beyond demonstration status. According to Rögner, one of the reasons, among others, for the lack of economic success is said to be the farmers, who can be convinced only if good results have occurred over many years, in conjunction with the recommendations of the supplier of their seeds or specialist advisor, but who rarely would take new ideas by scientists, who are not working in their field, seriously.

Now the researchers are working with the company Nordkorn Saaten GmbH. In 2010, Nordkorn had them demonstrate the process for the first time using the mobile demonstrator – a truck on which the unit is mounted – directly on site at their headquarters in Güstrow, Germany. The seed producer was impressed as the prototype ran

for hundreds of hours with a throughput of up to 30 tonnes per hour – the durability of the technology had inspired his confidence. In the meantime Nordkorn has bought the pilot plant, together with the long-standing seed partner company of the FEP, BayWa AG, and has commissioned the FEP with the building a second, custom-fit unit. This unique system is to start operations in Güstrow in late June 2013. Together with BayWa and Nordkorn as well as a plant manufacturer, the further development of the unit has also been planned. Among other things, the technology should become more affordable and more compact. The scientists and their partners are currently looking for project sponsors.

The scientists from the FEP are confident that, in the long term, the treatment with electrons will prove to be a success story. There is some support for this: Starting in 2015, farmers must prove that they are trying to reduce their CO<sub>2</sub> footprint and lower the use of chemical pesticides. "With our unit, we are able to contribute significantly to this," says Rögner. Should the treatment with electrons gain greater acceptance, the scientists from FEP could license their process to plant construction companies.

The scientists are currently promoting their activities abroad. The FEP is endeavoring to introduce the electron treatment process into the Chinese and Indian markets. "Due to the large amounts of seed produced, we see good opportunities there," says Rögner.



**Manufacturing inspection of a special electron source for the new seed treatment facility at the Fraunhofer FEP. (© Fraunhofer FEP) | Picture in color and printing quality: [www.fraunhofer.de/press](http://www.fraunhofer.de/press)**

## The armchair as a fitness trainer

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For years the trends have been clear: not only are we getting older all the time, but we are also increasingly left to take care of ourselves in our old age. This is why researchers are already working on technologies that will assist us in everyday situations later in life. One of these technologies is will be presented by the Fraunhofer Institute for Integrated Circuits IIS in Erlangen (Germany) at the CeBIT trade fair in Hanover, March 5-9, 2013 (Hall 9, stand E08): an intelligent armchair we can not only comfortably sink into in front of the television but one that also motivates us to keep ourselves healthy and fit.

On the outside, GEWOS looks like a conventional armchair. Even when you sit down you don't notice any difference. But first glances can be deceiving. A glimpse inside the armchair reveals sensors, circuit boards and all kinds of wiring. The microsystem technology built into the seat cushions, backrest and armrest constantly measures the state of health of the seated person. "GEWOS measures the key bodily functions and determines the correct sitting posture. If the acquired values deviate from specifications, the system shows the user how he or she can practice improving endurance or sitting in a healthier position," explains Sven Feilner of the Image Processing and Medical Technology Department at IIS.

### A very different way to watch TV

A tablet PC applied to the armchair transmits the data to the TV via Bluetooth and WLAN. Feilner describes the system: "At a glance the user can view trends in pulse rate, blood oxygen saturation, blood pressure or weight over a certain period of time. A virtual health assistant uses the recorded data to come up with exercise plans tailored to the user and updates these plans based on the progress made". If the values fall outside a prescribed range the health assistant may recommend more exercise. Then, the armchair is transformed into a rowing machine of the kind seen in fitness studios. The armrests become the oars, and a support for the rower's feet pops out below the seat. Individual exercises are easy to call up through the television. "Here too the sensors record all of the values and the health assistant lets the user know if any exercises are not being executed correctly," Feilner continues.

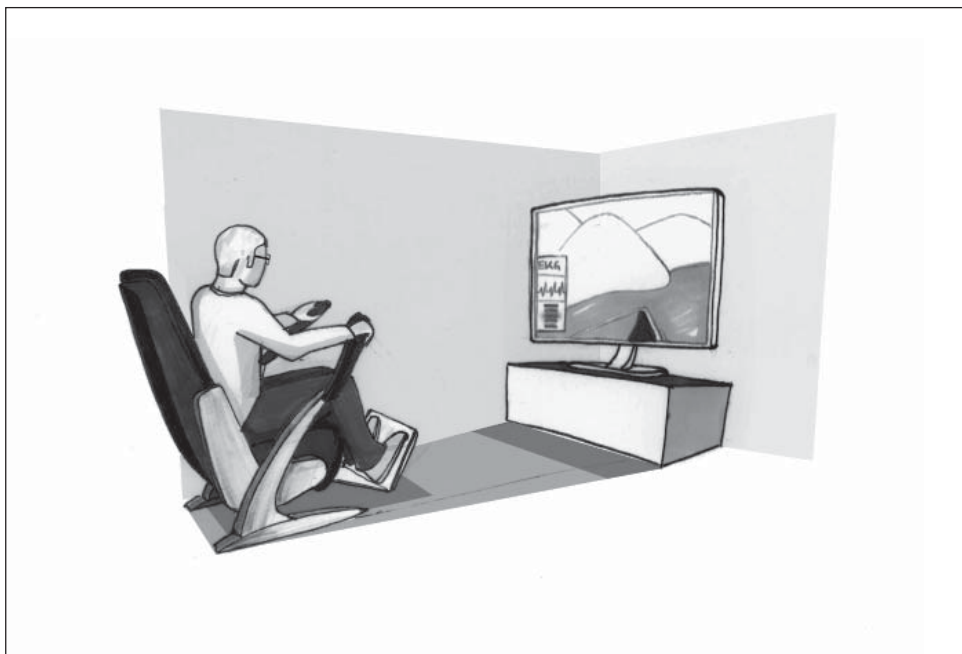
The armchair has already passed its first test with flying colors. Last year, at the AAL Conference (Ambient Assisted Living) 2012, 100 senior citizens tested GEWOS and ranked it in first place among 14 different assistance products. Feilner looks ahead to the future: "The next steps involve a comprehensive evaluation for the finishing touches. We're very confident that we'll be able to market the armchair together with our partners in the foreseeable future". The scientists in Erlangen want to use people's natural play instincts to help them add cognitive games to the system's capabilities. Senior citizens should not just row against imaginary competitors; memory games should also encourage them to participate. By making a mental note of individual

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segments of the armchair, for instance, and then placing weight on them using the corresponding part of their body. Visitors to the Fraunhofer stand at CeBIT in March will have an opportunity to test the armchair for themselves in a live setting.

### **Six partners, one goal**

The project, dubbed "GEWOS" (an abbreviation for the German "Gesund wohnen mit Stil" [Healthy Living in Style]), is funded by the German Federal Ministry of Education and Research (BMBF) and is being carried out by six partners in business and research in addition to IIS. The goal is to create an assistance system that is easy to operate and will be accepted by senior citizens. In addition to the exercise armchair, GEWOS also includes a web platform as a central interface for information management. The platform can be used to call up health-relevant data and to integrate physicians and health experts. "Senior citizens should be able to get around independently in their own four walls as long as possible. For that to succeed they have to stay healthy. The exercise armchair gives them an easy and motivating way to stay fit," Feilner concludes.



**Off to the rowing regatta: The Armchair keeps senior citizens fit, even in their own four walls. (© Fraunhofer IIS) | Picture in color and printing quality: [www.fraunhofer.de/press](http://www.fraunhofer.de/press)**

## Aldi Süd Supermarkets – Energy-Optimized

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Cold air flows out of the long rows of shelves filled with sausages, dairy products and fish. Numerous lamps light up the space where daylight barely penetrates. Supermarkets use nearly ten times the energy of a normal household. Researchers at the Fraunhofer Institute for Solar Energy Systems ISE in Freiburg, Germany have now created alternatives. “We have developed an integrated concept in collaboration with property developers, the planning team and manufacturers and as a result, we aim to reduce energy consumption by 25% in comparison to regular supermarkets”, says Nicolas Réhault, Group Leader at ISE.

The main focus of the concept lies in the area of cooling. This is because at approximately 40 to 50%, it represents the largest share of the electricity bill. The freezer-systems have to reliably store pizza, cake, fish, etc. at -25° Celsius, otherwise the goods will spoil. Sausages and cheese must be stored at a maximum of four degrees Celsius. Normally, plug-in freezers are used for this purpose. They generate the required level of refrigeration themselves and pump the produced heat directly into the store – a practical but inefficient method. ISE researchers have now developed a combined central refrigeration system in collaboration with property developers and the planning team. Now, all cooling points are connected to a combined central refrigeration system. The heat is not dissipated into the store but channeled via a three-stage recooling system. During the winter the system recovers the heat via a heat exchanger and uses it to heat the store. Residual heat is channeled via a gas chiller and geothermal heat pump in the surrounding area. In doing so heated water is pumped through probes into the ground where the heat is dissipated and the water is fed back cold. The result of this is that freezers and chiller cabinets only require half the electricity of comparable standalone units. Gas and oil-fired boilers are superfluous as heating is provided by the waste heat from the cooling systems. The heating system also has an effect on the ventilation system. The system is no longer required for heating; rather, it is used exclusively for introducing fresh air into the store, and is therefore a third smaller in size.

### Carbon dioxide as coolant

The scientists have also optimized the choice of refrigerant, the agent which serves to absorb heat and transport it to the chilled areas. However between 5 and 15% of the refrigerant leaks out of any system annually. Conventional refrigerants have a high global warming potential, in other words, they contribute to heating the atmosphere. For this reason, the scientists utilized carbon dioxide, which has a global warming potential 3000 to 4000 times less than conventional refrigerants. Up until now, carbon dioxide has rarely been used as a refrigerant as the system must withstand high pressures. Moreover, the efficiency of the system is reduced during hot summer days. In order to compensate for losses at high ambient air temperatures, the experts integrated

a third cooling stage in collaboration with their colleagues from Hafner-Muschler. When the sun beats down from the sky, the refrigerant is sub-cooled via a geothermal heat exchanger.

Lighting makes up the second largest share of the electricity bill. For this reason the scientists employ daylight to illuminate large stores. Light enters the store via triple-glazed skylights. A microscreen is fitted between the individual panes of glass to reflect direct sunlight which allows only indirect light to pass through. Artificial light in the form of lamps is additionally switched on and controlled in relation to the available daylight.

“Part of our concept has already been implemented by Aldi Süd in their new buildings. This enabled 20% energy savings to be achieved during the first year of operation”, explains Réhault. “New control strategies have now enabled us to optimize these concept components so that energy savings of 25% will be saved in the second year of operation, compared to a standard branch. This is already very close to our goal of 30%.”



Skylights in the roof reduce power requirements for lighting. (© Ralph Kensmann, StartDesign GmbH) | Picture in color and printing quality: [www.fraunhofer.de/press](http://www.fraunhofer.de/press)



## Optimized custom-made ski sledges

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The athlete speeds along the cross-country ski run. Things are looking good for him. Up until now he has been in line for a new personal best time. However, whether or not he finishes first is often decided by just a few seconds. With such tight timings everything must be right, including the conditions on the cross-country ski run, the condition of the athlete on the day and the optimally adapted custom-fit skis. In contrast to Olympic skiing stars who are wooed by sponsors, up until now this has not been a matter of course for elite athletes with disabilities. The development of sports equipment especially adapted to the requirements of physically challenged competitive athletes is still in its infancy. This is partly due to the relative lack of interest on the part of sponsors and partly because many paralympic disciplines are still fairly new.

However, this is to change, at the latest in time for the Winter Paralympics 2014 in Sochi. Researchers at the Fraunhofer Institute for Mechanics of Materials IWM are working with research and industry partners to create optimized skis sledges for handicapped cross-country and biathlon skiers. "Our aim is to construct optimized ski sledges for all competitors based on bio-mechanical relationships", says Prof. Matthias Scherge, head of the tribology business area at IWM and coordinator of the project consortium. The challenge in relation to this is that the degree and nature of the physical disability is different for each athlete – and the athlete can only optimally utilize his strength in a very specific seated position. "For this reason, every athlete essentially requires a unique solution", explains Scherge.

### Detailed design through three-dimensional scanning

The athlete's customized seat shape is determined in a simulation model. For this the athlete sits in a cross-country ski sledge and supports himself with ski poles. Partners from the Institute of Sport and Sport Science at the University of Freiburg, Germany attach markers to various parts of the athlete's body to map the sequence of movements. Sensors in the poles measure the transmission of energy while the athlete pushes off. The results are fed directly into a simulation program which then creates a bio-mechanical model. This model then allows the rough geometry of the seat to be derived. For the detailed design, the athlete is scanned in three dimensions under exertion. An additional simulation enables the experts to analyze areas where excess weight can be saved without affecting the stability of the material. This optimized lightweight prototype is then manufactured in a generative manufacturing process – in other words, directly from the design data – which means the cost of the sports equipment is kept within reasonable limits.

Normal racing skis can be attached to the sledge. "However, the skis move differently under the sledge than they would do during normal skiing. They are only being moved in a straight line", adds Scherge. "This must be taken into consideration during the

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grinding process". For this reason, the IWM researchers have developed special ski grindings for use under ski sledges in collaboration with Montana. In this case, at the end it is still necessary to carry out a fine tuning process which is specially adapted to the individual athlete. For example, the weight of the athlete affects the surface in contact with the snow. In terms of ski coatings, Prof. Scherge and his team have many years of experience in international elite sports at their disposal. Coatings developed by IWM ensure that the skis are able to glide through the snow with minimal friction.

The project planners intend to use the time until 2014 to optimize their developments. In doing so, the consortium is open to additional co-operation with interested parties. Prof. Scherge also hopes that the paralympics will also create an impetus in terms of recreational sports. "It would be nice if the paralympics could provide disabled people with new sport-related perspectives when it becomes clear that everything is possible with the right technical support."



Professional athlete and wheelchair user Martin Fleig trains with a ski sledge. (© Ruben Elstner, MikroTribologie Centrum  $\mu$ TC) | Picture in color and printing quality: [www.fraunhofer.de/press](http://www.fraunhofer.de/press)

## Faster video streaming

Whether on a long train journey, sitting in a café or lounging at home on the sofa, smartphones and tablet computers allow us to watch videos anywhere and at any time. As convenient as this development is for users, it also throws up some problems. Because the downloaded video files are usually very large, they are increasingly putting too much strain on mobile phone networks. There is a reduction in image quality and videos take a long time to load. Sometimes users are even forced to take breaks while watching videos, because data cannot be downloaded fast enough.

New types of data transfer are needed if networks are going to be able to cope with this onslaught. And this is exactly what researchers at the Fraunhofer Institute for Telecommunications, Heinrich Hertz Institute, HHI in Berlin are working on. "We are combining the new LTE mobile communication standard with the HEVC video compression standard, taking the best parts from both technologies," says Dr. Thomas Schierl, group manager at the HHI. But what exactly lies behind these shiny new acronyms?

### LTE mobile communication standard

Cell phone calls, websites, and videos are currently transmitted using the UMTS standard. However, LTE, which stands for long-term evolution, is now replacing UMTS. If for instance an iPhone is displaying a "3G" connection, this means it is using UMTS. In future, connections are set to become faster: then 4G or LTE – depending on the provider – will be displayed. Initially, LTE achieves speeds of 100 megabits a second. Future rollouts will see speeds rise all the way up to 300 megabits a second. By comparison, the maximum UMTS speed is 28 megabits a second. As a result, tablet computers using LTE can load content about three to four times faster. This is particularly interesting for rural areas, where the cells of networks are so large that data rates are often scarcely sufficient to download videos or other large files to mobile devices.

Not only do LTE networks transfer videos and other volumes of data faster, they also have shorter time lags. This is particularly important for video conferencing, where participants do not want to sit waiting for the response of their dialogue partner to be transmitted. "LTE allows resources to be distributed to users of mobile services in a very flexible manner," says Thomas Wirth, group manager at the HHI. "In addition, new protocols carry information about the application being used, which makes it possible to further optimize transmission."

To deliver videos to mobile devices at even greater speed, researchers are integrating LTE technology, which is fast in its own right, with the High Efficiency Video Coding (HEVC) video compression standard. Researchers at the HHI have developed important technologies for HEVC together with well-known electronics manufacturers.

The advantage of HEVC is that the standard requires only half the bandwidth for high-quality video transmission, which means it can serve twice the number of devices as the previous H.264/MPEG-4 AVC standard. But how does it manage this? "A lot of concepts have been taken over from H.264 and systematically improved," says Schierl, group manager for multimedia communication at the HHI. "One example is block size: whereas H.264 breaks up the image to be transmitted into blocks with a maximum size of 16 x 16 pixels, HEVC has much greater flexibility as regards choosing the maximum block size – from 16 x 16 all the way up to 64 x 64 pixels. Larger blocks enable significantly greater coding efficiency, especially for videos in high definition (HD)." For instance, if an object within a video moves, this movement can be described. Video compression standards calculate motion information for each block. This information is typically transmitted once per block. On account of the significantly greater block size capacity and flexibility with HEVC compared to H.264, there is a corresponding decrease in the amount of motion data required.

"The combination of the two standards will transform user behavior," says Schierl with conviction. "Today's mobile Internet is faster than the typical DSL connection people have in their homes, which means a lot of users will choose to go online via LTE even when at home." The researchers will be presenting their innovation, which should be operational in a few months' time, at the Mobile World Congress in Barcelona from February 25 to 28 (Hall 7, Booth D60).



Combined with LTE functionalities HEVC enables faster video streaming. (© Fraunhofer HHI) |  
Picture in color and printing quality: [www.fraunhofer.de/press](http://www.fraunhofer.de/press)

## Safe glass facades

Metropolises like San Francisco are in a state of constant flux. Excavators and wrecking balls tear down dilapidated old factories and houses that are beyond renovation, freeing up space for new structures. Entirely in this spirit of dynamism, a huge building complex will soon go up on a site where until recently a train station stood: the Transbay Transit Center, a five-story structure with glass facades, over 20,000 square meters of floor area, and a glass-covered park on the roof. A second phase will see the construction of an additional high-rise building. The budget is 4 billion US dollars.

The glass facades and glass roof add greatly to the building's esthetic appeal. But what about the safety of the huge areas of glass? What happens if a bomb detonates in the vicinity of the complex? This is precisely what a New York engineering office has commissioned researchers at the Fraunhofer Institute for High-Speed Dynamics, Ernst-Mach Institute, EMI in Efringen-Kirchen in southwest Germany to investigate. "We are using the 'Blast-STAR' shock tube to test different glazing structures of glass facades for their resistance to the pressures produced by explosions at various distances," says the EMI researcher Oliver Millon.

### Testing safety glazing, windows, and doors

The principle behind it is this: the shock tube consists of a driver (high-pressure) section and a driven (low-pressure) section, which are separated by a steel diaphragm. Researchers can compress the air in the driver section to a pressure of up to 30 bar, i.e. to approximately 30 times atmospheric pressure on Earth at sea level. This permits the component to be subjected to a load pressure of 2.3 bar. When researchers set the appropriate amount of pressure, the steel diaphragm is ruptured: the air rushes out into and through the driven section and hits the glass section being tested, which is attached to the end of the shock tube, as a planar shock front. First the glass is forcefully pushed backward, before the pressure relents and the glass is sucked forward. Depending on the pressure the researchers set in the driver section, they can simulate detonations of different amounts of explosive at different distances from the building – from 100 to 2,500 kilograms of TNT at distances from 35 to 50 meters from the building. Does the glass come through the procedure undamaged? Or does it crack or even shatter into tiny pieces? There are various DIN and ISO standards specifying the different pressures that windows and glass facades must withstand without cracking, and EMI researchers are testing different manufacturers' safety glazing, windows, and doors against the specifications laid down in these standards.

"Although shock tube technology is well known in principle, there are only a handful of shock tubes in existence worldwide," explains Millon. "The fact that extremely high stresses arise in the tubes makes them very complex to manufacture and operate." For example, the apparatus must be able to withstand abrupt changes in pressure across a

large area; the glass sections being tested can be up to nine square meters in size. "In addition, we must ensure that we achieve a planar shock front at the glass section being tested, in other words that the shock wave reaches each part of the glass section at the same time," says Millon. To this end, the researchers carried out computer simulations prior to construction of the shock tube and subsequently confirmed the results by taking measurements in the finished apparatus.

The preliminary investigations into selecting suitable glass structures for the Transbay Transit Center have already been completed. Further investigations are planned for certified demonstration of the blast resistance of the pane types selected during the construction phase.



Researchers use this apparatus to identify the stresses at which windows and glass facades crack and shatter. (© Fraunhofer EMI) | Picture in color and printing quality: [www.fraunhofer.de/press](http://www.fraunhofer.de/press)

## Awakening the dormant potential of e-government

Electronic communication has long been an everyday reality in offices across the German public sector. However, case workers often only use modern document management systems for recording digitized files, while going about their own “natural” work processes as if the new technology did not exist. This is a real shame when we consider that the concept of e-government promises not only large gains in efficiency but also greater employee satisfaction. The Fraunhofer Institute for Open Communication Systems FOKUS in Berlin has now drawn up a scenario which shows how an ICT solution that was successfully implemented in Denmark can be swiftly adapted for German government agencies. The researchers are presenting the proposed approach at their eGovernment Laboratory in Berlin and also from March 5 to 9 at the CeBIT trade show in Hannover (Hall 9, Booth E08).

### German government recommendations exceeded

“We have been investigating interoperable and cost-effective ICT solutions for German government agencies since way back in 2004,” explains Dr. Michael Tschichholz from FOKUS. “One of our partners is cBrain, whose integrated solution is already being very successfully implemented in seven Danish government ministries. We took a close look at the technology and discovered that it would suit the needs of German government agencies very well.” The German government set out its recommendations for such an ICT platform in its “Organizational Concept for Electronic Administration”. Alongside electronic records management, the recommendations specify that the platform should be capable of modeling electronic workflows and electronic collaboration and integrating the various software applications for specialist processes that have grown up over the years. “These building blocks of e-government are supported by the Danish solution. As an option, managers can also be included in digital processes via mobile devices,” says Tschichholz.

In Denmark, the Ministries of Social Affairs and Integration, of Transport, of Climate, Energy and Building, of the Environment, of Employment, of Housing, Urban and Rural Affairs, and the Prime Minister’s Office have already fully digitized their records management, administration work, and casework. All written material – whether formal or informal – is managed in a standardized ICT environment. The core component is integrated knowledge management. Employees have immediate access to relevant information via a digital archive. Social media technologies such as chat forums are integrated into formal work processes and support informal communication.

“Users’ experiences have been positive across the board,” reports Tschichholz. “At the Ministry of Social Affairs and Integration, every employee saves 30 to 45 minutes a day. 81 per cent of employees at the Ministry of Transport are either satisfied or very satisfied. The most recent changeovers took only a few weeks in each case. Meanwhile,

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the time needed for training is kept within reasonable limits, as employees have recourse to user interfaces they are familiar with and receive individual support from "runners" who move from office to office during the brief introduction phase."

### **Accessing ministerial briefings on a tablet computer**

Tschichholz and his team have developed specific application scenarios, and these are currently undergoing a field test in German ministries. In the FOKUS eGovernment Laboratory, the research scientists recreated sample workflows from the Federal Ministry of the Interior and analyzed how the Danish solution can be adapted to the ministry's work. "We showed, for example, how the solution can be used to draft briefing documents, which the permanent secretary or minister can then conveniently access on the move from a tablet PC," says Tschichholz, who also uses the ICT platform at FOKUS for internal processes.

Last year, the team successfully presented the laboratory scenario to Cornelia Rogall-Grothe, Federal Government Commissioner for Information Technology, and the Danish Ambassador Per Poulsen-Hansen. At the CeBIT trade show, FOKUS will demonstrate how mobile devices can be securely used for administration work with the aid of the Danish ICT platform.



**New software enables secretaries or ministers to check briefing documents on the move from a tablet PC. (© Fraunhofer FOKUS) | Picture in color and printing quality: [www.fraunhofer.de/press](http://www.fraunhofer.de/press)**



## Exemplary civic participation in large-scale projects

The days when big infrastructure projects were planned over citizens' heads are well and truly over, especially since the controversy surrounding the Stuttgart 21 rail project. However, a blueprint has so far been lacking for an efficient process that allows citizens to have a say in and shape projects. The "Schwäbisch Gmünd Tunnel Dialog" project has now shown what such a process might look like. Under the guidance of the Fraunhofer Institute for Environmental, Safety, and Energy Technology UMSICHT, a dispute that had been smoldering for several years was resolved in just six months.

The nub of the dispute concerned the installation of a dust and exhaust filter in the 2.2 kilometer long Einhorn Tunnel, which is designed to relieve road traffic in Schwäbisch Gmünd and is currently under construction. Representatives from campaign groups, government authorities, and the local companies involved in the project met up with the evaluator team a total of four times to discuss the issues. In the end, there was a high level of participation and a clear result: a filter is not required. Instead, other ways of improving air quality were identified. The test case, which was sponsored by the German Federal Ministry of Education and Research, was unique in its depth and complexity. UMSICHT carried out detailed evaluations of the available filter technologies, including a life cycle assessment. The researchers also investigated the market potential of tunnel filters as well as the economic effects on Schwäbisch Gmünd of installing and not installing a filter.

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## Mobile high-tech measuring instrument determines particulate emissions

Demand for wood-burning stoves has been booming for several years now. However, burning biomass such as wooden pellets, logs, and briquettes releases particulates that are damaging to people's health. As a consequence, new particulate emission limits for freestanding fireplaces came into force in March 2010. Researchers from the Fraunhofer Institute for Toxicology and Experimental Medicine ITEM in Hannover in collaboration with Vereta GmbH and the Institute of Particle Technology at Clausthal University of Technology have developed a handy system which measures particulate emissions exactly. The particulate measurement kit including measuring rod is the first mobile equipment to carry out measurements directly in the flue pipe and display and document measurement values during operation. Following a two-year trial phase in the field with chimney sweeps, the system passed the German Technical Inspection Association test in accordance with DIN 4206, thereby fulfilling the legal requirements laid down in the German Federal Immission Protection Ordinance (Bundesimmissions-

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schutzverordnung). To measure the concentration of particulates, the technician merely has to insert the sampling probe or measuring rod into the flue pipe. The probe draws off some of the flue gases, which are diluted with pre-treated air at the tip of the probe and then cooled in a conditioning unit. The flue gases are then fed through two optoelectronic sensors which use different measuring techniques: the aerosol light-scattering photometry method devised by the ITEM, and the aerosol photoemission method developed by Clausthal University of Technology. An algorithm combines the electrical signals from both these sensors to produce a definitive reading. The kit weighs 14 kilograms and is operational in less than three minutes.

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**Instrument handle with built-in electronics makes surgery easier**

Surgeons have to operate with the utmost precision, and manipulating surgical instruments requires acute sensitivity. Now a new vulcanized handle, which can be fitted to surgical tools such as screwdrivers and retractors, has been designed to help surgeons during operations. Researchers at the Fraunhofer Institute for Manufacturing Engineering and Automation IPA in Stuttgart have developed the device in cooperation with the surgical instrument specialist Weber Instrumente GmbH & Co. KG. Thanks to integrated electronic components, surgeons receive feedback during operations as to whether they can insert the instrument any further. When a surgeon tightens a screw, for example, sensors measure the amount of force expended. LEDs indicate by means of an optical signal when the optimum torque has been reached. The energy required is supplied and stored via an inductive charging method. Young, less experienced surgeons stand to gain the most from this technology.

The entire electronics including sensors, evaluation technology, and LEDs is cast inside the handle. This means there is no gap in which germs could settle. Another special feature is that the instrument handle can be sterilized at 134 degrees Celsius. As the electronics is switched off during the sterilization process, it comes through the high temperatures unscathed. The researchers also want to expand the system to include a wireless interface for transmitting the sensor data to a PC, permitting the operation to be documented in detail. A first prototype will be presented at the MEDTEC trade show in Stuttgart from February 26 to 28 (Hall 3, Booth B04).

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