Earthquake-proof

Earthquake-proof construction is a matter of life and death in many countries of the world. "The disaster in Japan really brought home the importance of research and development in this field," says Prof. Bohumil Kasal, Director of the Fraunhofer Institute for Wood Research, Wilhelm-Klauditz-Institut, WKI in Braunschweig. Since 2008, he has been in charge of an EU research project to develop new timber buildings reinforced with fiber composites. In addition to researchers from the Czech Republic, Poland and Great Britain, the project also includes the participation of numerous industry partners who have agreed to provide the materials to be tested.

Simulations have shown that wood is a good material for constructing buildings in areas that are prone to earthquakes. The key is the strength-to-mass ratio, which is relatively low in concrete and steel, but high in wood: in order to construct buildings which are stable, you need to cut the amount of mass that could be accelerated and cause damage in the event of an earthquake. But the stability of a timber building depends on the joints between the structural elements. The EU project included a comparison between different forms of construction – steel and wood joints and joints reinforced with a cement epoxy matrix – as well as the testing of various frame structures.

Logistics lab down under

Australia poses great challenges on the logistics front. It is a huge country, and the distances between towns are enormous. At the same time, traffic is constantly increasing here too. So anyone looking to carry out just-in-time deliveries there needs cleverly devised concepts and reliable planning tools. These are currently being developed by an international and interdisciplinary team of scientists in the new Future Logistics Living Lab. The laboratory was opened in February at the Sydney Technology Park. A dozen universities, research institutes, IT and logistics companies are involved – including the Australian research organization NICTA, the Fraunhofer Institute for Experimental Software Engineering IESE and the German software group SAP.

The Future Logistics Living Lab's research scientists are seeking to identify the challenges of the future and work out solutions with the aid of information technologies. For example, they aim to develop concepts which will enable transport and logistics companies to increase safety, reduce carbon dioxide emissions and deliver on time despite traffic jams, and all without incurring high additional costs.

Communication of the future

Companies looking to provide telecommunications services in Indonesia are faced with a daunting prospect: the country stretches over thousands of kilometers, with 239.9 million inhabitants spread over 6,044 islands. "Just like all network operators in emerging countries, Telkom Indonesia has to perform a balancing act: many regions don't even have the infrastructure for fixed-line connections, yet users in the regions that are already hooked up are clamoring to use the innovative multimedia communication services offered by cutting-edge communication technologies, such as IP-based Next Generation Network (NGN) technologies," says Prof. Thomas Magedanz from the Fraunhofer Institute for Open Communication Systems FOKUS.

To help providers tailor the services they offer to their customers' needs, Magedanz and his team have developed a high-tech solution: "Universities and companies such as Telkom Indonesia can use our 'Open NGN Service Platform' to train their employees, develop innovative services and test out business models before taking the decision to buy an expensive, fully-fledged commercial platform." The new pilot platform has the advantage of being manufacturer-independent and compatible with all commercial systems.

Telkom Indonesia has now gathered enough experience to tackle the next step, which is to implement a commercial NGN system with support from the Fraunhofer researchers.

Innovations on tour

China is building, and demand for new housing and office space continues to grow particularly in urban areas. This presents a unique opportunity to employ state-of-the-art energy-saving construction techniques. Fraunhofer research scientists recently demonstrated how urban development can be planned with sustainable and resource-saving effect and how buildings can be constructed and air-conditioned using innovative insulating materials and solar technology to save energy at the Traveling Conference on Building Innovation. During a week-long tour of the cities of Shenyang, Qingdao and Hangzhou, five experts from the Fraunhofer Institutes for Building Physics IBP and for Solar Energy Systems ISE as well as the Fraunhofer Building Innovation Alliance BAU gathered information about local construction projects, presented new technologies and answered questions about town and building planning.

Giant pump

Weighing in at a colossal 35 tons and capable of shifting 10,000 liters of water a second, the biggest pump in Asia posed a huge engineering challenge for its Indian manufacturer. Despite its huge dimensions, there was a real risk that the structure would vibrate like a guitar string during operation – and those kinds of vibrations could easily have fatigued and cracked the pump's welded and screwed joints.

The engineers were keen to predict and prevent vibrations right from the design phase by using prototypes, so they turned to researchers from the Fraunhofer Institute for Structural Durability and System Reliability LBF in Darmstadt for help. To obtain the data their Indian colleagues needed to optimize their simulations, the team from the LBF used an extremely sensitive measuring system designed to document tiny accelerations and rotations. The 17-meter-high pump is now up and running and supplying water to a power plant in New Delhi.

On the right track

Finding the right way to a destination is no longer a problem, as long as the navigation system can receive GPS signals – but this can be problematic in narrow streets, buildings and tunnels. In the future, motion sensors incorporated in satellite navigation devices will supplement the measurements taken by the GPS receivers. The idea is simple: from a known starting point, the motion sensors are able to determine the route taken. They do this by measuring how long the device has been traveling and in what direction. A software system can then calculate the exact position from the data. Up to now the cost of the solution has been prohibitive, because motion sensors are too expensive.

The EU project Milepost saw research scientists at the Fraunhofer Institute for Silicon Technology ISIT in Itzehoe working in cooperation with Italian colleagues at Consorzio Pisa Ricerche and with various companies to develop new types of motion sensor which are cheaper and more precise than the technology previously available. These inertial sensors are produced using techniques from silicon microsystem technology.

Virtually underwater

Leisure pool complexes have traditionally offered water slides, warm pools and wave machines, with some of the more exclusive water parks throwing in palm-fringed beaches and exotic cocktails for good measure. But a German-Korean consortium led by the Fraunhofer Institute for Applied Information Technology FIT in Sankt Augustin has set a considerably more ambitious goal for its AREEF project: it aims to provide a virtual underwater world for people to explore. Visitors to the pool, in particular children, will get the chance to learn more about underwater fauna and flora.

This new entertainment technology is based around mobile devices such as tablets and smart phones. The virtual underwater world will be superimposed on the camera image of the real pool environment displayed on the device's screen – a technique known as augmented reality, or AR. This will enable users of the application to experience forests of underwater plants, colorful coral reefs and fish. The AREEF project marks the continuation of the FIT's work in the field of underwater augmented reality which began in 2009 with the development of the world's first prototype of a mobile underwater AR system. The focus now is on developing a fully-fledged system that is economically viable. The project is funded by the Korea Institute for Advancement of Technology KIAT. Fraunhofer FIT is the first European research institute to lead a project of this kind.

Working with Western Cape

Since many years the South African province of Western Cape is focusing on research and education. The four major Universities Cape Peninsula University of Technology, University of Cape Town, Stellenbosch University and University of Western Cape are attracting scientist from all over the world. When Helen Zille the President Provincial Government visited Bavaria recently she signed a Memorandum of Understanding with Fraunhofer.

The goal of the agreement between the universities in the Western Cape region and Fraunhofer is an intensified cooperation in the fields of environment and climate protection. Teams of specialists intend to join their efforts to improve the way we consume our natural resources like raw-materials, water and energy.

The Cooperation seeks the support of the program "International partnerships for sustainable Technologies and Services for Climate Protection and Environment ", CLIENT, of the German Federal Ministry of Education and Research BMBF.