Nature conservation

Rothenthurm: The endless lure of the mire

Architecture

A place where trainee talent is forged

Frutigen Tropic House

Caviar made in Switzerland

Interview with Prof. Hansjürg Leibundgut

Heat pumps, solar cells, probes: «It’s a revolution in building services technology.»
REHAU moves people and people drive REHAU.

Rainer Schulz, CEO, REHAU Group
Dear Readers,

Everyone is talking about sustainability. And so are we. In fact it has been a corporate practice of ours for the past 60 years. By pursuing a far-sighted corporate policy aligned to the long term, we have always endeavoured to fulfil our responsibility both as an employer and as an industrial enterprise. Since the founding of the company in 1948 by Helmut Wagner, innovation and the ongoing development of materials and products have been the focus of all our aspirations. To begin with, our main goal was to replace expensive and scarce materials with polymers. Today we are proud that our intelligent system solutions in the area of infrastructure, building technology or mobility make a contribution to the responsible use of energy and raw materials.

What our systems and products achieve is shown by the articles in this new magazine that we have named Unlimited. This is right in line with our guiding principle “REHAU moves people and people drive REHAU”. Unlimited is all about the people who manufacture our products, install them or plan their use. We reveal how REHAU systems can make a contribution to conserving our environment. We all want to preserve our planet for coming generations.

This first issue of Unlimited is devoted to the topic of water. It is well known that life cannot exist without water, which is why we must do everything in our power to safeguard this vital but diminishing resource. Wastewater has to be collected and treated, precious drinking water transported safely over long distances, rainwater returned to the water cycle in a controlled way. By supporting all these processes, REHAU contributes to the responsible and sustainable use of this precious element.

I sincerely hope that our magazine Unlimited will help you get to know REHAU as a company like never before.

And now, enjoy your read!

Nils Wagner, Project Manager
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Daimler has set itself a development budget of no less than four billion Euros. As the company’s head of Group Research & Development, Thomas Weber, confirmed in a recent interview, half of this is earmarked for green technologies and products. In Stuttgart, this is seen as an investment in the future in the light of ever scarcer and ever more expensive fuel. The corporation is upping the pace: it already produces a Smart with an electric engine and it aims to roll out the first hybrid engines in its larger Mercedes B-Class mid-range and executive vehicles by the end of the year. Weber believes it will be possible for models in the S-Class to achieve fuel consumption levels of 3.2 litres per hundred kilometres in the future. In line with this, the Board member is calling upon the suppliers to exploit this period of upheaval in the automotive industry creatively, pointing out that this is a ‘tremendous opportunity’ for them, since the carmakers are not able to do everything themselves. A truly attractive proportion: The rate of vendor parts currently used by Daimler amounts to 70 percent.

Safe and clean drinking water is a basic human right. This is the key message of a declaration made by the UN General Assembly in New York in July. The concept represents a major step in the right direction, given the fact that 1.5 billion people around the world do not have direct access to the life-giving liquid. To help resolve the problem, considerable research is being performed into the safe, sustainable and affordable sterilization of water. A group of researchers at the Ferdinand-Braun-Institute Leibniz and Berlin Institute of Technology (TU Berlin) that has been looking into this problem for some time has now reported a success. The possible solution involves illuminating the water with ultra-violet light-emitting diodes (UV-LEDs). With the right dosage and wavelength, the UV light is ideally suited for disarming micro-organisms like bacteria, viruses and spores. The illumination destroys the genetic material, thus preventing the organisms from reproducing. This finding is not new. What is new, though, is the method of obtaining the UV light. Up until now, this was created using environmentally harmful low-pressure mercury vapour lamps. The alternative method is based on semiconductor-based InAlGaN LEDs, and the researchers are now working on improving their performance and efficiency. If they were to succeed, a promising, inexpensive alternative to traditional mercury lamps could be used in the future, thus also providing an opportunity to permanently sanitize water in poor countries.

www.wgl.de
The white runabout, as mall Citroën Berlingo, is the pride of REHAU’s new vehicle fleet. The company has set an example by adding the electric version of the VW T5, a Berlingo and an electric scooter to its collection. The electric vehicles will be deployed internally at the various facilities, using their own refueling points. «Energy efficiency drives us» is the slogan under which the new vehicles were unveiled to the workforce. In going over to electric vehicles to some extent, the company is responding to the appeal from the German government for companies to gradually switch to renewables. The polymer specialist aims to set a good example by building its business and development strategies around the megatrends of energy efficiency and electromobility. The words are backed by actions: not just by deploying the new electric cars but also by reducing carbon emissions by means of energy-efficient construction, among other things. So the new white fleet featuring the green car and plug is also more than just a means of transport; it is also a commitment to ecology, sustainability and research.
> Eco-ships

It is well known that ageing oil tankers can cause environmental disasters. A less well-known fact, though, is that shipping as a whole is responsible for three percent of global greenhouse gas emissions, and the figure is rising. Consequently, pressure has been increasing on the international shipping industry for some time now to build environmentally friendly vessels.

Japan is taking the first step. Several companies over there are currently drawing up plans to develop the first eco-ships in the world. As with the car, hybrid and electric motors together with fuel cells will play a leading role in the eco-freighters, albeit on a much larger scale. A subsidiary of IHI, a manufacturer of heavy machinery, aims to equip a 30-metre passenger ferry with a lithium-ion battery that is up to 300 times the size of an equivalent car battery. The company states that this first plug-in ferry in the world for 800 passengers will be able to cover up to 80 kilometres without having to recharge. One of its competitors, Mitsui Engineering & Shipbuilding, is currently developing a diesel-electric hybrid system for long-distance container ships. And last but not least, NYK is looking to the alternative of wind and solar energy. The shipping firm aims to have the NYK Super Eco Ship 2020 equipped with at least 8 sails and 31,000sqm of solar cells ready for use by 2030. We can only hope that the researchers continue to enjoy a fair wind.

> Solar energy

And the research is continuing. The Fraunhofer Institute for Solar Energy Systems (ISE) working in conjunction with the Freiburg Materials Research Centre (FMF) has reported success in their efforts to generate solar energy using organic solar cells. The research team has succeeded in achieving the best fill factor in the world for flexible organic solar cells. The fill factor defines the quality of the solar cell, measuring how well the cell is capable of collecting the charge carriers generated by light. The goal was to develop the lightest possible, flexible solar cells. The FMF carried out research into conductive plastics for use in organic photovoltaic systems. Compared with established silicon photovoltaics, this is a young area of research that has evolved rapidly over recent years. Unlike traditional solar cells made from inorganic semiconductors that are already established on the market, organic solar cells employ organic materials like polymers to convert sunlight into electrical energy.
Paradise saved

The Rothenthurm mire landscape nearly became a Swiss army training ground by a hair’s breadth. Today no effort is spared to protect and preserve this unique landscape.
Of national significance:
Rothenthurm raised bog.

Rare birds:
Fragile ecosystem.

Biodiversity: rough pasture.

Nutrient-poor soil:
Hardy vegetation.
It’s raining. It’s cold. Wafts of mist are suspended in the air.
Perfect weather, in other words. Not necessarily for long walks – but most definitely for the vegetation of a raised bog. After all, this biotope can only exist with plenty of water and moisture. The weather at the Rothenthurm raised bog in the Canton of Schwyz appears very willing to oblige in this respect. Rambling meadows spotted with purple and white flowers, occasionally interrupted by small groups of trees, greedily soak up the water that pours from the sky by the bucketful to saturate the earth. The ground feels springy underfoot, almost like walking on a mattress.

«That’s the peat moss, sphagnum, that the raised bog is made of,» explains Annemarie Sandor, «it soaks up the rainwater like a sponge.» The result is a permanently moist, non-decomposing subsurface that builds up continuously until it rises several metres above the landscape. Hence the name: raised bog. The biologist who works for the Canton of Schwyz, in her capacity as project manager she has drawn up a plan to protect the Rothenthurm mire landscape. The 1138 hectare area between Rothenthurm and Biberbrugg is home to the largest contiguous raised bog area in Switzerland.

Since 1996 it has been recognised as one of the Swiss mire landscapes of particular beauty and national importance. And how this came about is part of Swiss lore.

In the early 1980s the Swiss army was wanting to set up a military training ground right in the middle of the large mire area, on the raised bog plateau of Biberbrugg-Rothenthurm. Conservationists, farmers and the population rose up in arms, organised resistance and collected signatures. Ultimately a referendum was held in 1987. What happened next, no one would have believed possible: 58 percent of the electorate voted in favour of the initiative. With the result that today the protection of Swiss wetlands is now written into the constitution: «Mires and mire landscapes of outstanding beauty and of national importance are protected.»

Annemarie Sandor knows what that means. She knows every grass, every butterfly, every bird, that lives in the dry meadows. Whinchats, Marsh Warblers or Meadow Pipits: «Ground nesters», she says, «that is why you’re not allowed to mow the fields until late in the year, to not destroy their eggs for instance.» Then there are the rare dragonflies and butterflies, such as the Cranberry Fritillary, that can only reproduce where there are cranberries. «The ecosystem is fragile, the nutrient-poor soil does not have much to give, which is why only a few highly specialised plants and animals can live there.»

It was not only the victory over the army, but also a declaration of a commitment by the Swiss to biodiversity and the treasures of nature.

On the wet meadow stand grasses with a white tuft of hair at its tip: Single-Headed Cottongrass. A typical wetland dweller that signals a raised bog. The hardy vegetation has acquired survival strategies to be able to exist at all in this acidic soil. Such as the Sundew, for example, an arnivorous species that gets the nutrients it needs by catching flies.

Up to as recently as the middle of the last century, peat bogs were pretty much plundered for their peat. Dried peat was seen as the poor man’s heating fuel and was systematically mined. The peat business was also put an end to by the Rothenthurm Initiative. But even today there are still very visible drainage ditches

Mires and mire landscapes of outstanding beauty and of national importance are protected.

ABC of wetlands

Wetlands are habitats dominated by water, in which there is a permanent excess of water because the water cannot drain away easily into the ground. We distinguish essentially two different types of wetlands: fens and raised bogs.

RAISED BOGS
are formed from an accumulation of peat moss. Because the lack of oxygen in the ground prevents the plants from decomposing, it typically grows above the level of the groundwater: in Switzerland about 1 millimetre per year. Hence it takes thousands of years for the moss to build up, over the centuries forming layers of water-saturated peat moss sponges several metres high. The plants in the upper peat layers live on nothing but nutrient-poor rainwater and nutrients obtained from the air. The soils in raised bogs are not only wet, but also very poor in nutrients and acidic. Which is why raised bogs are colonised by special plants that can survive under such harsh conditions.

FENS
are fed not by the rain alone but also by other water sources: streams, surface runoff or flooding, for example. The roots of the plants of the fens reach down into the ground or surface water, meaning they are better supplied with nutrients. As a result the vegetation of the fens is more prolific and diverse than that of raised bogs.
criss-crossing the landscape. Wherever possible, however, the raised bog is regenerated – restored to its original condition. For the small Canton of Schwyz this represents a major undertaking, as it is home not only to Rothenthurm but also the wetlands of Schwantenu, Breitriet/Unteriberg, Lauerzersee, Frauenwinkel and Ibergeregg with a total of 19 raised bogs and 104 fens. Every one of these is a nature reserve, watched with eagle eyes. Hardly surprising, then, that the upgrading of a road through the area can quickly become a political issue.

This was the case in 2007, for instance, when the ageing H8 main road between the hamlets of Second and Third Altmatt near Rothenthurm had to be rebuilt and upgraded. And because in the first phase this stretch of road does not go directly through the mire, but through a groundwater protection zone, no expense was spared to channel the dirty water from the road and clean it. Annemarie Sandor was also involved in the planning, representing the interests of the mire. Guido Schuler from the Department of Civil Engineering of the Canton of Schwyz was likewise involved. «A road refurbishment through a bog was a first for me too,» he says.

In a case like this, the preliminary investigations have to be extremely thorough. As far as possible, damage to nature of any kind is avoided. Thus the new H8 was built in such a way that the dirty rainwater now no longer flows off down the embankment but is channelled straight into the drains. From there the water is fed into a flood detention basin, a kind of natural collecting basin with an ecological filter system, through which it drains. Only then it is fed back into a stream. «Peat moss in particular reacts extremely sensitively to dirty water,» says Michiel Hartman of Pöyry, the specialist environmental consultancy company that advised the project.

And thus no effort was spared to keep the rainwater from the road surface from coming into contact with the soil, as far as possible. Thick protective plastic sheeting was placed beneath the gravel bed on which the road is built, to prevent the water from seeping away. Instead of simple water pipes, double-walled pipes that are built to be absolutely watertight were used. And during the construction phase, the construction site was subject to particularly strict rules as regards the environmental compatibility of the materials used. All in all the upgrade took 18 months and cost 3.2 million Swiss Francs.

But Annemarie Sandor is already thinking about the next section, a stretch of road on the far side of Third Altmatt roughly a kilometre long, which is scheduled for upgrading in 2012 or 2013. What the biologist is particularly concerned about: not only does this section pass straight through the bog and directly affect the bog land, but the road bed would present a threat to the groundwater flow. So this stretch of road will have to be built on stilts. A major challenge, and one that is causing the planners quite a headache. Annemarie Sandor is well aware of the enormous effort required, but: «We have been commissioned by the Government to protect the bogs,» she says. And, road or no road, that’s the bottom line. <
When the main road between Second and Third Altmat near Rothenthurm in the Canton of Schwyz needed refurbishing in 2007, the 70-year-old road drainage system had to be renewed at the same time. Because the roundabout 600 meter section passes through two groundwater protection zones, the construction materials used had to satisfy especially high standards. The requirement was for an absolutely watertight double-walled pipe system consisting of shafts and pipes. A total of 1,900 metres of pipes were laid and 43 inspection and drainage shafts installed.

The following REHAU system solutions were used:

**AWASCHACHT DN 1000/625 made of polypropylene (PP)**

These shafts fulfill the highest requirements in terms of strength, lifespan and material quality. Compelling features are their low weight and ease of handling on installation (modular system). Also their light colour makes them very inspection-friendly and facilitates maintenance.

**AWADUKT sewer pipes made of polypropylene (PP) Sn10 in the NW160 – NW400**

The heavy-duty sewage pipe system PP Sn10 comprises two connected systems: the inner, sealed carrier pipe made of PP Sn10 is protected by an outer containment pipe with security sealing system connections.

**Fauna and flora of the mire landscape:**

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<th>Animals</th>
<th>Dragonflies</th>
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<td>Whinchat</td>
<td>White-faced Darter</td>
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<td>Quail</td>
<td>Golden-ringed Dragonfly</td>
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<td>Lapwing</td>
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<td>Cuckoo</td>
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<td>Tree Pipit</td>
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<td>Dusky Large Blue</td>
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<td>Large Red Damselhy</td>
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<td>Peat Mosses (sphagnmum)</td>
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<td>Cranberry</td>
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<td>Hare’s-Tail and Common Cottongrass</td>
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<td>Bottle Sedge</td>
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<td>Bog Rosemary</td>
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**AWASCHACHT DN 1000/625:**

**AWADUKT sewage pipe:**
Award-winning architecture from Berlin-based WeberWürschinger: Best architects 2011
Learning factory with a view

Prolin – the REHAU training centre stands for sustainable architecture and education. It represents an investment in young people.

What is the most important part of a new apprentice training centre? It doesn’t take long for Christian Uhl to give his answer: «the new soccer table», beams the 21-year-old in the grey overalls. Standing next to him in the huge, well-lit room full of workbenches, his colleague Jessica Wittmann smiles in amusement. Fighting the background noise of milling machines and welding equipment in use two workbenches down, she adds: «What I really like here is all the light – everything is so welcoming.»

Together with over 70 colleagues, the two apprentices took up residence in Prolin, REHAU’s new training centre, in June. The red-brick edifice in the middle of the company premises has housed more than 170 young apprentices since September 2010. The restored industrial building from the 19th century has become a real eye-catcher with its modern extension. A striking gable now towers up into the sky, giving Prolin an unmistakable profile.

The training centre is more than just a prestige building for REHAU. As Nils Wagner, head of Corporate Architecture, puts it: «This is an expression of our corporate values and a contribution to the Rehau area and its local culture.» The fact of the matter is that, in line with a corporate philosophy that has fostering and educating its workforce top of the priority list, in 2007 REHAU wanted and needed to invest in training its apprentices. It was also true that a new purpose needed to be found for the old colour-weaving mill that REHAU had bought over thirty years previously and had been used for storage ever since. It was clear from the outset that the company would again want to work with the Berlin-based architect’s office WeberWürschinger, with whom two further projects had already been completed.

At meeting upon meeting over the weeks and months, the plans were fine-tuned and details agreed – the expectations for the building to be designed were high. The idea was to provide a new home for all the apprentices, no matter whether their training was on the technical or commercial side. Light and space was what the trainers wanted, led by Michael von Hertell, who invested a lot of blood, sweat and tears in the project as project manager and the man with overall responsibility for technical training at REHAU. «We had no real home for our commercial apprentices in the past,» he says in his office. «We simply needed much more space.» The outcome was a good 1300 square metres spread over three floors, and von Hertell can now keep a constant eye on his

Training courses at REHAU:

- APPRENTICESHIPS > Laboratory assistant > Industrial clerk
- > Electronics technician > IT specialist > Industrial mechanic
- > Mechatronics engineer > Tool mechanic > Plastics process mechanic > Media designer > Technical draughtsman

COMBINED COURSES (apprenticeship and university studies in combination) System materials/industrial mechanic > IT/IT specialist
- > System materials/plastics process mechanic > Industrial engineering/mechatronics engineer > Business administration/
industrial clerk > Industrial engineering/industrial clerk
- > International management/industrial clerk
- > Commercial law/industrial clerk
Majestic: modern architecture for inquisitive apprentices.
Cool styling: recreation room in Prolin.

Welding, milling, sawing: modern workshop.

Relaxing at lunchtime: without the stress.

Flooded with light: transparent architecture.
protégées from his meeting room, which is separated from the work room by a pane of glass.

By dividing the functions across three floors, the architects have also symbolically created three different usage levels. The 600sqm workshop for technical trades like mechatronics engineer, plastics process mechanic and tool mechanic is on the ground floor, while the recreation area complete with kitchen and changing rooms is on the middle floor and the seminar rooms and IT suites are on the third floor. The floors are distinguished by a clear colour concept: the workshops are blue, the recreation area red and pink, the «thinking floor» green. Another special feature of Prolin is that the whole range of REHAU system solutions featuring the use of renewables were installed, including heat pumps and geothermal probes.

Malte Klindt, head of HR Central Europe, is convinced that REHAU’s decision to persist with the €3 million Prolin project even during the crisis years of 2008 and 2009 once again underlines how «training plays a major role for the polymer specialist» and «Prolin is a highlight in this regard.» Since REHAU started training its first apprentices in 1953, times may well have changed but not the commitment that the company makes to training up young workers. Highly skilled and generally loyal to the company, these young employees are the future, adds Klindt. So it is no great surprise that REHAU offers apprenticeships at all its facilities. An attractive place to learn, as all the apprentices who achieve a good or satisfactory mark are taken on permanently at the end of their course. Word gets around and demand for the training places is huge. Klindt comments: «We have more apprentices than ever before right now.»

And like all those that went before them, these young people will end their course knowing what prolin actually is. It is the name of an amino acid, which is found in protein, and has the formula C5H9NO2. <

These young, well-trained employees are the company’s future.

REHAU’s contribution:

The former colour-weaving mill had to be completely gutted before it could be converted into the training centre. While it has been made as modern and functional as possible in architectural terms, the building has also been equipped with energy-efficient system solutions from REHAU, with renewables playing a major role.

> The following REHAU system solutions were used:

**REHAU Thermo Design 70 window system with aluminium insulation panels**
This system achieves outstanding heat insulation, thus reducing the energy required for heating and cooling.

**RAUGEO probes to tap geothermal energy used to heat and cool the building**
The geothermal energy probes reach deep underground to obtain the energy required to run a heat pump.

**REHAU heat pumps used to heat and cool the building and to heat water**
The energy drawn from the ground is piped into the building with the aid of the heat pump.

**REHAU underfloor heating/cooling**
The underfloor heating spreads the heat perfectly around the room at a low energy level. The systems can be used to both heat and cool.

**Training at REHAU:**

REHAU has been training apprentices since 1949. As of 2010, there are 573 in each year group. That’s 16 percent more than in 2000. The most popular courses are for industrial clerks and plastics process mechanics. Over the last ten years, the GKV industry association has awarded prizes to 25 former REHAU apprentices, with five of them taking the top award!
Christoph Riedmüller

(22) APPRENTICE

Lives: Burgoberbach
Started training: 9/2006
Job: process mechanic for plastics and rubber technologies
REHAU site: Plant 15, Feuchtwangen
Hobby: riding motorbikes

«I was really surprised to become Germany’s best apprentice in process engineering in 2009. It’s a bit weird at the start, as you don’t believe it. It was a great feeling when I then discovered that most of it was right. I no longer know how many points I had. I think it was 97 or 98 out of 100. We were a group of five apprentices who took the final exam six months earlier than planned. The examination material was continuously repeated at work, both in theory and in practice, over the last three months. I also repeated it at home, but never for more than half-an-hour a day.

It helped me to have a secondary school certificate. The things we had to learn in physics and maths I already knew from secondary school – it was just a bit different. I never used to be top of the class at school. My teacher from back then would barely believe that I did so well in the training qualification. I think it is because at school I often didn’t know what the many theories were good for. This is different at vocational school because you understand how you can apply physics and maths and then learning suddenly makes sense. I therefore think it’s better when you are a bit older when you train.

I live at home with my parents and have two older brothers. On weekends in summer, I like to go out and about on my motorbike, a Naked Bike. I also go on holiday on my bike, together with my brothers and a few friends. I have seen a few places already, for example the Dolomites, the Pyrenees, Sardinia and Corsica.

As I passed the examination earlier than planned, I was ahead of my year group and could choose where I wanted to go at REHAU. I work at Plant 15 in Feuchtwangen where we use injection moulding to produce bumpers for well-known German car manufacturers. It is not typical for REHAU to take on all the trainees, but it happened with us. Working for REHAU means you have the opportunity to work abroad. I can easily see myself doing that for a few weeks or months.»
Primeval fish: sturgeon in the pond.

Breeding ponds: home to 30,000 sturgeon.

Flagship project: the Tropic House Frutigen.

Warm water from the Lötschberg: ideal for fish farming.

Young sturgeon: four barbels for dabbling.
All the same, the Tropic House Frutigen produces 45 tonnes a year. According to tentative estimations, we will be able to sell our first notable caviar production in two to three years," says Moser, gazing lovingly at his «kids» as they swim past the viewing window. The fish will have reached sexual maturity and will be producing the highly coveted roe by then. For this purpose, we will need 60,000 fish, while in the existing ponds we have about half that number – 30,000 young, predominantly Siberian sturgeon. This species produces tasty caviar and only requires six years to reach sexual maturity. Fully-grown, they are barely two metres long and weigh about 100 kilograms. Siberian sturgeon are ideal for farming purposes because they are not complicated and achieve yield in a reasonable time frame. In comparison, the Beluga
sturgeon, which is the largest species of sturgeon, only reaches sexual maturity at the age of 20, measures up to five metres in length and can weigh several hundred kilograms.

But why are sturgeon farmed in Frutigen? And what is the immense hothouse beside the ponds all about, where banana trees, papayas and star fruit, to name but a few, flourish in the jungle atmosphere? This adventure story was born from the imagination of Peter Hufschmied who, almost 10 years ago, was racking his brains about what could be done with the 20°C warm water which was, to all intents and purposes, a waste product from the Lütschberg tunnel. «As it passes through the rock strata of the Lütschberg,» explains Moser, standing in front of a giant map showing a cross section of the mountain, «the water heats up to 35°C in numerous places». It is collected outside the tunnel and finally escapes from the mountain at a temperature of 20°C and a rate of some 100 litres per second. The temperature is too high to be released directly into the Kander as it would have a huge negative impact on ecological balance of the small river. In 2002 Hufschmied, who was Chief Construction Manager of the Lütschberg Base Tunnel North at the time, presented his idea of how the warm water could be put to good use: the creation of a «Centre for tropical plantations and aquaculture». The compelling underlying idea was to use the energy from the warm water in a closed loop to support fish farming and the cultivation of tropical fruit in a hothouse - cultivating thermophilic fish and tropical plants while at the same time avoiding the costly cooling of the tunnel water. In 2004 it was already at the pre-project stage and a business plan was drawn up. Then in May 2008, after six years’ planning, the groundbreaking ceremony was held. Only one and a half years later, in November 2009, the Tropic House and the sturgeon farm were put into operation.

The project is impressive for its well thought out energy concept. Nothing is left to chance. Most of the energy needed in the Tropic House is provided by the warm water from the tunnel. If the warmth of the water is not enough to heat the Tropic House in winter, other renewable energies are used including biomass and solar energy. By means of complex technical water treatment plants, the water is channeled through the sturgeon ponds several times. A dense network totaling 15 kilometres of pipes connects the waterways to each other underground. Wherever possible, solar panels are installed in exposed areas. To quote the Berner Zeitung newspaper, the construction, which cost 30 million Swiss francs to build, is «the biggest energy park in Switzerland» – a technologically unique feat which has won numerous awards, including the «Idee Suisse Award» in 2009. Moser points to the ponds with the fish swimming around and the glass construction behind in which mangos, kiwis, litchis and papayas are waiting to be harvested. «Of course, we have pushed technical possibilities to the very limit» he says, «not to mention the fact that consumption of all our products is absolutely sustainable.» <
Mr von Urbanowicz, what is stormwater management?

Mr von Urbanowicz, you’ve been dealing with water management for 15 years. Has your attitude towards water changed in that time?

Yes and no. To be honest, my job has completely sensitized me to the topic as water is ever-present in both my day-to-day work and special events. But I’m no guru outside the office either. There are still things I could do to make better use of water.

Do we Central Europeans have too little appreciation for the water coming out of our taps?

This is probably the case. You don’t notice how important water is until it becomes harder to obtain. Things can soon look very different in other climate zones where water is rare. So rare, it’s quite conceivable that wars will be fought over it one day.

No one would want that. And yet water is the elixir of life — without water, nothing works in the world.

That’s perfectly true — but it can also bring death. In floods, for instance, or the Asian tsunami. Or just think of contaminated drinking water. This is one of the reasons why it’s so
crucial for water to be managed professionally, most importantly to preserve the precious «good» water for posterity.

> **In other words, ways have to be found of sustainably handling water?**
In the trade, we call this water management. That is our core business. We divide this into three areas: drinking water supply, stormwater management, and wastewater disposal.

> **In other words, you have to separate the good water from the bad?**
Precisely. Drinking water absolutely has to be protected. That is the top priority. But that has worked pretty well for some time now… in the West, at least. In the case of waste water and above all stormwater, things are more complicated. Stormwater management, for instance, is a more recent discipline.

> **How long has it been around?**
I reckon people have been talking about it for around 15 years. The concept emerged primarily in industrialized nations, where the natural water cycle is massively disrupted in the cities with their concreted areas. Stormwater cannot drain away, get into the sewers and then the rivers. This means that the water table falls over time, if it is not constantly replenished.

> **And how are we now trying to prevent disruption of the natural water cycle?**
In various different ways. You can collect, use and allow stormwater to drain away. This includes everything from simply collecting it in a water butt or tank to water the garden through to flushing the toilet or doing the laundry. It is far more complicated to install underground box systems that can be used on a larger scale for storage and drainage. More and more local councils are stipulating this method of sustainably handling stormwater with a view to cutting costs and protecting the environment.

> **So smart water management is the key for water-poor countries.**
Yes. If global water management doesn’t improve, the water-rich and the water-poor continents – just think of Asia or Africa – will keep drifting further apart. Water management is both an ecological and economic challenge at one and the same time.
Water for India

REHAU systems are helping to prevent floods and store valuable stormwater in India.

H₂O. Water for drinking, doing the laundry or dishes, stormwater or wastewater. In the Western World, people turn on the tap and clean water flows out of it. The dirty water is collected, treated and returned to the water cycle. Things are different in India, one of the most populous countries in the world after China, with its 1.1 billion inhabitants. At the same time, though, it is also water-poor. An unholy alliance, especially so as the amount of water available per person has been falling constantly; whereas the total was around 5.2 cubic metres per person in 1951, only 1.7 cubic metres remained in 2005. So much for the statistics. And because the population is growing constantly, the demand for water is growing as well, while the water supply situation has massive deficiencies in terms of both drinking water and the systematic cleaning of waste water, the country is running headfirst into a water emergency.

India

Form of government: federal republic
Head of state: President Pratibha Patil
Size: 3,287,240 sq km
Capital city: New Delhi
Population density: 349 inhabitants/sq km
Population: 1.18 billion
Economic growth to 2050: approx. 5-6 percent
Water demand by 2050: 1.4 billion cubic metres
Daily volume of waste water: 30 billion cubic metres
Mr Leibundgut, you say that humans need no oil, gas or uranium. How did you come to that conclusion?
Humans cannot take in these substances physically, i.e. they can’t eat them. They are dangerous and non-renewable. Throughout the entire of the species, homo sapiens have been looking for energy they can use. They are not interested in the system itself, only in what it can generate, for example the light from a bulb, the processing power of a computer or the warmth given off by a heating system.

What is bad in that?
It isn’t just about the energy system, it is also about the apparatus, the instruments and the entire supply chain needed to obtain a desired energy source from a relatively primitive chemical element. It doesn’t matter whether this energy originates from the formation of the planetary system, for example in the case of uranium, or in the fusion process of the sun. If everything was simple, then we wouldn’t have to think about how to move away from coal and crude oil, which are fossil fuels, produce CO\textsubscript{2}, and are only limited sources of energy in their natural state. As things stand at the moment, we have to ask ourselves what would happen if we stopped obtaining energy this way?

The history of humanity has been a history of waste.
You’re right. The problem was only that mankind wasted limited resources, and this always had dramatic consequences: at one time, massive forest areas used to be cut down irretrievably in order to build ships; steam ships used to eat up massive amounts of coal; the disaster at the Chernobyl nuclear power plant revealed the dangers involved with atomic energy in a very dramatic way; and we have still made absolutely no progress in terms of how to dispose of radioactive waste. And do you also remember forest dieback?

Of course. There are people today who claim it never took place.
It did happen. It has its roots in technology, namely in catalysts or the desulphurisation of fuel oil. This shows us that the world wants energy whatever the cost. But gas is a very volatile fuel and, as far as oil is concerned, the recent catastrophe at the oil platform in the Gulf of Mexico shows us what can happen if technology is increasingly used to obtain fossil energy sources. And the key problem has still not been solved. Fuel combustion gives off CO\textsubscript{2} and people are now trying to catch the CO\textsubcript{2} and bury it deep into the earth. This is nonsense. The fact is we have a fundamental energy crisis.

Prof. Hansjürg Leibundgut (61):
Hansjürg Leibundgut has been Professor of Building Systems at the Institute of Technology in Architecture in the Faculty of Architecture at the ETH Zurich since 2005. In his Mechanical Engineering course at the ETH, Leibundgut specialized in reactor technology and hydrodynamics. He completed his studies with a dissertation on solar energy and absorption cooling technology. He then went into industry and later became the director of the Office for Energy and Air Hygiene in Zurich. He has been co-owner of Amstein+Walthert AG since 1989.
Humans have developed an energy system that requires ever more technology. The system itself is damaging. Correct. But today there are technologies that can make fossil energy sources a thing of the past. We have had windmills for many centuries, for example. They were not initially built to save energy but to grind corn. However, over the last few years it has been technologically possible to build 70-metre long wings that can be attached at a height of 120 m to a gear mechanism. Wing technology from aviation is applied in the construction. It is wonderful, a major breakthrough. The other technology is the photovoltaic effect, which was discovered, at least in theory, in 1857. Photovoltaics were forgotten about because no-one knew the materials that were needed for widespread exploration into the subject. However, we know today that silicon and some copper are needed. There is plenty of both available and disposing of them is easy. In silicon’s case, you only need to make a hole in the desert and the material is already returned to nature.

So the energy issue is resolved at least in theory? We are at the start of a technological revolution. In terms of output, solar radiation is 10,000 times higher than the energy needed by human beings. We only need to fill up one percent of the surface area of Europe with wind machines and solar equipment in order to supply the continent with energy. There are no limits in terms of energy, land or the machines and equipment.

Which is why you have been calling for sustainable building systems for many years now. What can be expected from this branch? The construction of a house essentially means putting together the most varied materials, such as bricks, wood or glass. And the principle is the same: the selected materials must remain available, must not corrode and must not damage the environment when they are returned to it. And then there is the key question of the energy supply.

What do you suggest? It is a question of what we need. We need heat so that we don’t freeze in winter. We need warm water and we need electricity. All this can be achieved without generating CO₂. It is interesting that heating is always at the centre of these discussions, while warm water and electricity are more difficult issues to resolve. Building systems in the 20th century were based on the assumption that there was no problem with energy, and so there were no isolating building materials. This situation has now changed, as we all know. Today there is a powerful Minergie lobby that propagates with ideological zeal that freedom from CO₂ emissions can only be achieved by improving the exterior shells of houses.

What do you have against Minergie? I supported Minergie strongly at the beginning, but it has turned into a religion and today you only get financial support when you adhere to Minergie values and wrap insulation 16 cm thick around your house. I can only laugh at that. I can achieve better CO₂ emission values with 4 cm thick insulation and with an energy supply that comes from renewable sources. If I can have a very simple, cheap and environmentally neutral inflow of energy, then why should I use thick, expensive and ugly insulation?

That makes sense. But how can it work? I have more solar energy in summer than in winter, so I have to save excess energy for the cold season. In former times, this energy used to be stored in wood in front of huts; today, it is handled by geothermal probes reaching 300 meters underground where the temperature of the earth is around 17 degrees. I need solar panels on the roof, an underground heat storage system and a heat pump. That is all.

What is the energy budget for such a house? Put simply, we transfer the heat that falls on the roof to underneath the earth and then bring it back into the house in winter. The excess solar energy from the summer can heat the soil three or four degrees above the natural temperature of the earth, which is around 16 degrees. Solar panels, which have so far only been used to supply electricity, are now also being used to supply heat. Nine tenths of the energy budget of the house can be covered this way. The rest can be supplied from outside in the form of electricity generated from wind and solar power. This means that the building can be run CO₂-free and with low investment and maintenance costs. One important aspect in this is the pipe that links the geothermal probe and the hybrid collector on the roof. It must be able to withstand high pressure, as we want to store the heat deep in the earth. The height difference is more than 300 meters.

Are you expecting high demand for these systems? We are at the start of a technological revolution in building systems. Interest among the public is increasing and industry is interested. R&D departments have been knocking at the door and jumping on board. It is now industry's task to open the market.
Heating systems with geothermal probes are today still more expensive to buy as is the special pipe that is needed. But that will change. The system comprising an underground heat storage system, hybrid collector and heat pump is rapidly becoming more attractive than all other variations. The interesting thing here is that the system can be run using little electricity.

> **When will the prices be affordable?**

They are already affordable. Whoever wants to build a house today should seriously think about what oil and gas will cost in ten years’ time and opt for the system whose costs can be calculated today. It is clear that mass production of heat pumps and heat collectors will lower the prices by one-third within ten years. But no-one is going to wait ten years. Clever house-builders will choose the heat pump and thereby increase the production figures as well as reduce production costs. There will still be house-builders that believe in miracles and build houses with oil and gas burners in them, but these aren’t the clever ones.

**REHAU's contribution:**

The soil in central Switzerland has an average temperature of 16 degrees Celsius at a depth of 230 meters. Solar panels will catch the heat of the sun in summertime and transport it via a probe into the earth. The earth warms and returns the heat stored in the summer in winter. The deeper a probe can be placed in the earth, the more heat can be stored in the earth. REHAU allows the management of this underground heat storage system thanks to the two-zone probe, which is being used for the first time, as well as the special piping that belongs to it.

> The following REHAU system solutions were used:

**RAUGEO PE-Xa geothermal probe**

The geothermal probe made from high-density crosslinked polyethylene is especially robust and suitable for tough installation situations. The probe’s high temperature resistance also makes it possible to collect excess heat in summer without reducing the lifespan of the probe.

**RAUSO PE-Xa**

The pre-insulated pipes from high-density crosslinked polyethylene guarantee that no heat is lost when it is transported around the building. These pipes are attached to the upper section of the geothermal probe so that the energy is only stored in the underground heat storage system at depths of more than 150 m.
13,000 km of REHAU AWADUKT PP SN10/16 RAUSISTO pipes have been laid since 1999.*

* That’s equivalent to the distance from Berlin to Sao Paulo.