FOOD 2.0
How to satisfy nine billion people safely in the future

CORROSION
Which methods help minimize the underestimated risk

HEART HACKERS
Why medical devices need protection against attacks
"Let your food be your medicine," said the Greek physician Hippocrates of Kos 2,500 years ago. His advice could not be any more up to date. Nutritionists are head over heels in warnings against... and recommendations for... At the same time, and in light of numerous food scandals, there is growing skepticism in many parts of the world about foods of unknown origin. Consumer organizations are promoting organic foods and "buying local".

But let’s be honest: The local farmer alone will hardly be able to solve problems involved in feeding the world in the future. What the world needs is new, even completely new, forms of producing food, be it vertical farming or aquaponics (pages 6-9).

However: the skepticism of many consumers when it comes to these processes and products will be enormous.

TÜV Rheinland has developed a new test mark for food in order to combat these prejudices and guarantee quality in this, literally, existential field of food. With the FoodCert Alliance (page 11), we are, in cooperation with specialized testing laboratories, able to check the quality of all kinds of foodstuffs, specifically from production and cultivation to processing all the way to packaging, transport and storage – our integrated contribution in the sense of Hippocrates' advice.

Enjoy your contact with the subject of nutrition.

Ulrich Fietz
Spokesman of the Executive Board of TÜV Rheinland AG
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Innovative cultivation options should help to provide more people with foodstuffs.
Soon, around nine billion people will live on our planet. To feed them properly, we need to handle foods more intelligently. Agriculture is currently experiencing a technical revolution of a kind it hasn’t seen in a long time: Smart technology is making growing, packaging and sales channels more efficient and more sustainable. But it is not just the quantity that matters. With the increasing wealth, there is also a growing desire for safe, high-quality foods around the world. Consumers want to know where their bread is coming from, how it was made and what’s inside. This is a challenge that food producers and distributors will have to meet.
The farmer of the future will not wear gumboots. He will also no longer need a wheelbarrow, a tractor or a plow. The farmer of the future will wear a white lab coat, surgical mask and sterile rubber gloves. His tool will be the laptop rather than the manure fork. He will do his daily work not in open fields, but in a vertical farm, housed in a skyscraper made of glass. In it, strawberries, lettuce and cabbages – all neatly arranged on shelves – will extend their roots not into Mother Earth, but they will sprout into the air, into a mist made up of a well-calculated and finely sprayed nutrient solution. Natural fertilizer is provided by the waste water from the connected fish farm. The plants can grow around the clock, protected from drought, strong winds and frost: during the day, the sun shines on them, and at night, it’s LED light. The wavelength is perfectly matched to the growth requirement. Crops are picked multiple times per year. No need for plant protection products, as the plants thrive in a virtually sterile environment. The vertical farms are located in the middle of mega cities, in skyscrapers, on roofs and in old warehouses. There are no more long transport routes to the consumer – this is good for the climate.

**THE WORLD NEEDS SMART FARMERS**

Clinically clean, effective, sustainable – this is what the future of agriculture looks like. At least, this is what researchers such as Dickson Despommier, ecologist and pioneer in vertical farming from the United States, believe. According to Despommier, without smarter farming, it will not be possible to produce enough
In the year 2050, the **food needs** will exceed those of today by 70 percent. One reason for this is the growing wealth in emerging nations.

In 2013, the biggest **exporter** of agricultural products was the United States, followed by the Netherlands and Germany. The biggest **importers** are China, the USA and Germany, according to the World Trade Organization WTO.

The worldwide **crop yields** of basic food stuffs like wheat, corn and rice are increasing by a mere 1.5 percent – not enough.

Today, around 42 million tons of fish originate from **aquacultures**. In 15 years, it could be 80 million tons. 90 million tons can be fished sustainably from the seas per year.

The revolution in agriculture focuses on robots and innovative cultivation methods: Unmanned aerial vehicles scan the fields and calculate the amount of fertilizer needed (below); in aquaponics, lettuces and fish grow in symbiosis (right); and autonomous robots ensure cleanliness in the cow barn (far right).
A product you find in the supermarket is only as good as the raw materials from which it was made. For this reason, it is crucial that soil samples, seeds and fodders are analyzed repeatedly. The tests in independent, accredited laboratories provide reliable results.

Harvesters, tractors, milking machines: An efficient farming operation requires properly functioning equipment. Every day, it is subject to high mechanical stresses. It is essential for the vehicles to undergo a technical inspection regularly and the machinery to be maintained by trained personnel — unexpected downtimes can jeopardize crops, cause accidents and endanger people.

Scandals involving contaminated food happen again and again. This is also one of the reasons why meat, vegetables, fruit and the like are among the products subjected to the strictest inspections out there. And legal requirements regarding hygiene continue to increase as well. Hygiene audits, carried out by independent bodies, are therefore mandatory for food-processing companies.

Foodstuff is a sensitive load. No matter if silo truck, milk tanker or cooling truck — all special vehicles and the transported goods themselves have to comply with the regulations applicable for traffic safety and hygiene. In case of animal transports, animal protection requirements must also be observed.

In food production, dangers can arise, for example, from dust related to coffee, dry fruit, flour and sugar, as sparks and hot machine parts can ignite the dust. Automated extinguishing systems reliably protect humans and production.
Working in the agricultural field is not only diverse, but sometimes also dangerous. The handling of sharp, rotating and heavy machinery parts is just as much part of the daily work as dealing with animals. Farmers and helpers attend training classes where they learn how to operate their equipment safely, take care of the livestock confidently and provide first aid.

### Occupational Safety

By the time they get to our table, many foods have already gone through quite a process. Trouble-free logistics are required to achieve efficiency for the food industry and quality for the consumer. From growing to processing to transport and retail all the way to our tables: Transparent, standardized processes increase food safety and ensures consumer confidence.

### Systems

The company Sky Greens proves that vertical farming can be a solution. Their high-rise greenhouse made of glass is situated in the middle of Singapore. Sky Greens has been producing spinach, lettuce and Chinese cabbage for the domestic market since 2012. Around 500 kilograms are supplied to the mega city’s supermarkets every day. That’s not a whole lot. In addition, the greens grown in the up to nine-meter-high shelves are roughly 40 percent more expensive than imported goods. Still, Sky Greens is growing. Because the vegetables are proven to be free of harmful substances, the customers, which include hospitals and retirement homes, gladly choose the products from the vertical farm. The government of Singapore also supports Sky Greens. In future, half of the 5.3 million people living in the densely populated city state are to be fed through vertical farming. Vertical farms are already in operation in Japan, South Korea and the USA, and the world’s largest one is currently being built in Scranton/Pennsylvania. There, about 17 million pepper and tomato plants are expected to grow in many layers stacked above one another in a former warehouse on an area of just under 30,000 square meters.

### AN ALTERNATIVE: TOMATO FISH

Aquaponics goes one step further: For instance, researchers from Berlin breed tomatoes and perches in a closed water and nutrient cycle. This saves drinking water, fertilizer and feed and is gentle on the seas. Unlike in conventional aquaculture, the so-called tomato fish also develop under hygienic conditions that can be easily controlled – an important aspect in food production. After repeated scandals, people everywhere are increasingly concerned about contaminated foods. From the seeds to the finished food – everything is traded globally, explains...
Melanie Bauermann: "Food safety can only be ensured through controlled processes, verifiable international standards, independent analyses and transparency. Producers and consumers want to know where the ingredients come from and what is contained in the food."

Vertical farming and aquaponics will not be able to completely replace conventional farming. But high-tech is also arriving on fields and in cow barns. Unmanned aerial vehicles take photos of cornfields, for example. A connected app then tells the farmer not only where to fertilize, but also how much. This way, he increases the yield while saving diesel, fertilizer and pesticides. In many cow barns, robots have begun to take over feeding and milking the livestock: a man-high bucket moves autonomically through the barn and drags the feed into piles at the feeding troughs. Based on the height of the pile, the machine knows whether fresh feed is needed or not. Guided on magnetic rails in the ground, the robot then rolls across the farmyard into another barn and reports the requirement to the fodder silo. After it has been automatically loaded, the smart helper returns into the barn and distributes the meal. Because the amount of feed provided is adapted to the amount of feed eaten, less winds up on the manure pile. Moreover, the constantly fresh fodder increases the cows’ appetite. They eat more, grow faster and give about a third more milk than their peers in robot-free barns. For milking, the cows voluntarily trot into the fully automated milking parlour – but only when the udder is full, following their own biorhythm. As a result, not only the cows are less stressed on a smart farm; the farmer, too, can take his time and does not have to put on his gumboots as often.

THE WORLD CHAMPIONS IN EXPORTING

When it comes to trading with food, the world turned into somewhat of a village market place long ago. Many countries have specialized in growing certain products and supply them to the rest of the world. New Zealand, for example – though relatively small – produces more than one third of all milk traded globally. While China is the largest producer in many classes of goods, the agricultural products primarily wind up in the domestic market. At the same time, China imports larger quantities of foods than any other country. Particularly popular products include milk powder and pork meat. After several scandals involving contaminated food, many Chinese people prefer to choose products that have been certified by independent bodies with regard to safety.
Food scandals cost producers a lot of money and consumer confidence. What are ways to increase food safety?

There is a high demand for independent and efficient inspections from the raw material to the finished product. This is why we initiated the FoodCert Alliance® (FCA) – a cooperation between TÜV Rheinland and accredited test laboratories. This is a network that is unique in the world in this form and that guarantees our expertise in the food sector.

What is special about this laboratory network?
The client receives everything from one source. Each of the FCA laboratories is specialized in the analysis of a certain class of goods, allowing us to cover the entire range of products and analyses without gaps and in a competent manner. TÜV Rheinland controls the test process and is the sole point of contact for the client. Our responsibility is to take care of the correspondence with the laboratories, ensure that all deadlines are met and assess the test results for the customer.

One thing that is certified is "tested quality", for example. How does the consumer find out about this? Through the new TÜV Rheinland food test mark. Placed on the product, it enables consumers to see at a glance that this is a safe quality item. They can find out more about it by using the QR code and a smartphone: What are the product's quality features? What was tested and how? What are the ingredients? In addition, information is provided on the producer and other products and processes – this transparency creates trust.
In Japan, Sweden or Germany, single households form the biggest group of all residential and living communities, and in developing countries, the number of people per household is decreasing as well. This change is also reflected in the buying behavior: Foods have to be offered and packaged in ever smaller portions. However, the quantity itself is the least of all challenges for modern packaging. "Foods are supposed to have the maximum possible shelf life and still be full of nutrients, look appealing and entice people to buy them," says Matthias Pavlik, responsible for testing food packaging at TÜV Rheinland. On top of that, the packaging should be as convenient to handle as possible. When the glass bottle was substituted by the lighter PET bottle, this was only a first step. Resealable cheese packages, zippers on bags, screw caps on beverage containers and, finally, multiple layers of cold-cuts in one package were the development stages that followed.

More and more consumers also base their buying decision on the sustainability of the packaging.

Easy to open, safe to close, compostable without any problems and, of course, non-hazardous to health: food packaging is truly multi-talented.

Two more aspects are the non-hazardousness to health and the recyclability of the raw materials. TÜV Rheinland supports customers predominantly in connection with the health aspect, as modern chemical and microbiological analysis methods even trace substances that previously remained undetected. So far, the compatibility issue largely prevented nanotechnology from accessing the food market. While it is true that the minute particles could prevent oxygen-related processes and even show on the packaging whether the contents are fresh or already spoiled, it has not yet been sufficiently clarified how nanoparticles could affect the human organism. "Until it has been proven that their use is absolutely non-hazardous to health, no food producer will get their fingers burnt on this," believes Matthias Pavlik.
More and more consumers also base their buying decision on the sustainability of the packaging. DIN CERTCO offers the certification of packaging made of such bioplastics that are compostable and/or manufactured from renewable raw materials. This type of packaging, for example, for fruits or vegetables, has been available for several years already and is becoming increasingly popular. Due to their high production costs, though, these innovative packagings are still a niche product. However, according to a recent study, it can be expected that the profits in this area will triple within the next three years in Europe. Biological barrier layers that keep moisture and oxygen away from the food and that might be able to substitute the previously used raw materials are still in the early stages of development.

Easy to handle, strong and flexible at the same time: These basic requirements of modern packaging are just as important as the inner values. The so-called barrier layers, which keep moisture and oxygen away from the packaged food and which aim to ensure a longer shelf life, play a key role in this context. They also protect the original flavorings for a longer period of time. The disadvantages: The composites made of fossil materials or chemical substances require enormous amounts of energy in the production process, devour important resources and can cause problems with regard to recycling. Biological barrier layers, such as films made of whey, present an alternative, but they are still in the early stages of development. As far as the look goes, the trend is clearly towards transparent packaging, because the consumer wants to be able to see through it and primarily trusts their own visual impression.

On 13 December 2014, the new EU regulation on the provision of food information to consumers will come into effect and will be compulsory. As of 13 December 2016, a table with nutrition information will be mandatory on every label – until then, the nutrition labeling is voluntary. The food information regulation will bring new reading material to supermarket shelves across Europe. Allergens must be identified more clearly than was previously the case. This also applies to unpackaged goods such as bread, meat and cheese sold at a counter. Furthermore, consumers should be able to trace more accurately where the piece of meat on the plate in front of them came from and what path it took to get there: In future, the towns where an animal was born, raised and slaughtered must be printed on the label. Clear hints about fake food, such as imitation cheese or ham formed of pieces of meat, must not be omitted either. Even the font size is prescribed. “The scope for product labeling is decreasing. Those who don’t comply will feel the effects – from retailers, from authorities, from consumer advocates,” says Melanie Bauermann, head of the Food business segment at TÜV Rheinland. At various seminars, the food engineer familiarizes responsible people from industry and trade with the new regulations and gives recommendations for legally compliant labeling.
Portable mini computers in the form of data glasses or watches are all the rage. The first worldwide standard for certification has now been released – so that trend and quality can step out on the growing market as a pair.

People in the scene talk of “wearable devices”, and certainly do not mean portable radios or the good old Walkman. Instead, they are referring to intelligent watches, data glasses and other mini computers with Internet capability that are shaping the trend in consumer electronics. But what about their product safety, performance, compatibility and lifespan? To answer this question, TÜV Rheinland has issued the world’s first wearables certification. To gain certification, devices must be safe, easy to use and comfortable to wear. They should integrate seamlessly into the life of the user, allowing data to be gathered over a longer period of time. Users are mostly worried about the devices’ safety. This is why TÜV Rheinland tests the safety of the devices, the battery, the power adapter, the WLAN connectivity, the electromagnetic compatibility (EMC) and the use of hazardous materials. In addition, the inspectors take the lifespan, environmental friendliness, skin contact and electromagnetic interference into account. The certification process also assesses the responsiveness of the embedded sensors and the information security, connectivity, verifiability and data analysis capacity of their processors.

Technology as it should be!

Wind turbines, elevators, cloud services, cars, doctors offices – everything needs to be safe and have working technology. How can TÜV Rheinland inspect all this? What does “TÜV approved” even mean when it comes to a toy, an elevator or a website? Who is behind TÜV Rheinland and who checks up on the inspectors? The new german book “Inspecting inspectors. How does TÜV Rheinland work?” offers a look behind the scenes, helping to answer questions like these, and describes the unbelievably diverse world of TÜV Rheinland on 96 pages. The book costs EUR 19.90. More information and order options at www.tuv.com/pruefer-pruefen-buch.
TÜVtel gets gold

TÜVtel, the TÜV Rheinland technology magazine for children, has received the gold Fox Award from the CPWissen portal. Made up of corporate publishing experts from science, agencies, companies and editorial offices, the jury rewarded TÜVtel for its "efficient performance and efficacy which are well above average" and considers the magazine an "inspiring and model example". TÜVtel gained points for quality and dialog competence. It contributes to the TÜV brand and promotes interest in technology among prospective academics, they continued.

Tess and Roby from TÜVtel go on lots of adventures, answering many children’s questions as they go.

Active Break Assist – the lifesaver

Picture the scene: A 40-ton truck is racing towards the end of the traffic jam at 90 km/h. The driver is distracted, but the vehicle comes to a halt just in time before the imminent impact. That is what the emergency braking system Active Break Assist, ABA for short, does. Mercedes-Benz has offered the radar-guided assistant system, now in its third generation, for the heavy truck Actros since 2006. If there is a standing or slowing obstacle in front, ABA 3 automatically initiates graduated full braking and, depending on the speed, can even prevent a collision. Since the very start of ABA’s development, TÜV Rheinland experts have held responsibility for the EU-wide type approval of the entire braking system including all its driver assistance systems. This inspection is required for road traffic approval. As of 1 November 2015, the installation of an emergency brake and lane control warning system will be compulsory in the European Union for all newly approved trucks with a total weight of more than 3.5 tons and for all buses with more than nine seats. New vehicle models have had to be equipped with this electronic lifesaver since 1 November 2013. So far, Mercedes-Benz has sold more than 47,000 heavy trucks with ABA 2 or ABA 3 in the Actros, Arocs and Antos series.
products are tested for electromagnetic compatibility each year in the Nuremberg lab.

ABOUT radio waves AND absorbers

The EMC laboratory in Nuremberg examines electronic devices with respect to their electromagnetic compatibility (EMC) – from medical equipment to the on-board electronics in motor vehicles.
Before a diesel engine, X-ray device or range hood is launched onto the market, it is tested for its EMC in accordance with legal provisions. A special focus is placed on the radiation received and emitted by the products from industry, medicine, household or wireless technology. The laboratory, which was modernized in 2010, is equipped with the latest hybrid absorber technology. The pyramid-shaped tips of the absorbers pick up the electromagnetic waves. The goal of the tests is to find out whether a device is susceptible to radio interference from other devices or emits disturbing signals itself. If it exceeds a certain limit value, it will not be approved.

The laboratory in Nuremberg reached a milestone in August of this year: The Federal Motor Transport Authority in Germany accredited the lab as engineering center of the technical service, type test center for vehicles/vehicle parts. All inquiries concerning EMC in the automotive sector are handled by the experts in southern Germany. Manufacturers can have their vehicles and components tested in the lab according to internationally uniform standards and regulations (UN/ECE). Sophisticated on-board electronics must not be susceptible to radio waves or emit interference signals themselves, as otherwise the manufacturers do not receive the type approval.
The big cyber-armament

Attacks on computer systems occur more often and are more sophisticated than ever before – conventional anti-virus software hardly offers any protection anymore. Businesses and authorities need to fight back with new methods.

When commuters in Haifa wanted to drive through the Carmel Tunnels, everything came to a halt. One of the most important roads in the northern Israeli town was paralyzed for a whole day. The reason: A cyber attack on the surveillance cameras in the tunnels. Until today, nobody knows who was behind all of this. Authorities refuse to comment. But the incident made it clear once more that there is no perfect protection against cyber attacks. After all, hardly anyone has more experience in attacks carried out through the web – Israel is said to be the most frequently attacked country in the world.

LIKE A WAR

"It’s like in a real war: If you want to fight back, you need to practice – using a scenario as realistic as possible," Oded Ilan is convinced. Oded works for CyberGym, a recently founded training center for computer experts in Israel. There, in the tranquil coastal town of Hadera, CyberGym employees lean over their keyboards and attack IT specialists from organizations. Although, it’s only a simulation, "it sometimes happens that someone who is at the end of their tether simply pulls the plug," reports Oded Ilan from the cyber training exercises. A disastrous reaction, for if the control system were to be switched off in a power plant, soon the lights would go out in the entire city.

Such cyber maneuvers are only one of the new answers companies and authorities are looking for in order to fight attacks from the Internet. The degree of sophistication the IT attacks now exhibit became clear during the TÜV Rheinland IT Security Congress of at the end of May 2014. But the "good guys" are arming themselves as well. Take FireEye, for example: The California-based company has developed virtual computer systems which analyze the entire data flow of businesses and thus are able to detect suspicious movements – unlike virus scanners, which only recognize viruses that are already known and therefore are only able to fend off a fraction of the dangerous computer attacks.
TÜV Rheinland’s mobile SIRT Team helps companies limit any damage and prevent new attacks.

FLYING UNDER THE RADAR

“Today, most of the attackers fly more or less under the security radar,” explains Frank Melber, IT security expert at TÜV Rheinland. This enables cyber spies to intercept sensitive information over a period of several months. It is only with systems like the one from FireEye that data leaks can be found quickly. To support the IT departments in their effort to fix the leaks, TÜV Rheinland has devised the concept of an IT intervention team: As soon as the systems trigger an alarm, the experts of the Security Incident Response Team (SIRT) are on hand to limit the damage within the company as quickly as possible and to prevent further damage. Melber states that “at least 95 percent of the companies have long been compromised – and they don’t even know it.” It is no surprise that not only large corporations, but also small and medium-sized businesses invest more and more in their IT security. For only this way are they able to protect their most valuable asset: their expertise.

Questions on this topic?
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PIONEER OF ENCRYPTION

How dangerous can software be? Pretty dangerous. This was the assessment of US authorities long before the majority of us even got into contact with the Internet. For this reason, they banned the export of Pretty Good Privacy (PGP), a software for encrypting emails, in the early 1990s. The program had been developed by US cryptologist Phil Zimmermann. To evade the export restriction, Zimmermann published the complete source code as a book, thus being able to legally take the software abroad. In Europe, the book was then recorded again, and finally there was an international version of PGP. Even today, PGP is still the most widely used software for email encryption. For Phil Zimmermann, however, the topic has become “kind of boring” by now, as he stated at TÜV Rheinland’s IT Security Congress. He now prefers to figure out ways to properly encrypt telephone conversations with his company “Silent Circle”. What hasn’t changed is Zimmermann’s warning about surveillance by government institutions. As technological development progresses, computer-aided surveillance of all of us will become easier all the time. “We will not be able to solve this problem simply by using more technology,” believes Phil Zimmermann. “We also need to fight for laws that really protect our privacy.”

“Privacy is a right just like any other. You have to make use of it, or you run the risk of losing it.”
Phil Zimmermann
Rust never sleeps

Rock star Neil Young knew that rust never sleeps as far back as 1979. But although it appears as a fun motto in the concert film "Rust never sleeps", rust in industry causes damages, amounting to billions of euros. TÜV Rheinland encounters corrosion every day – and their box of tricks now includes most advanced x-rays.

Grangemouth refinery, United Kingdom, 2000: Over eleven tons of hydrocarbons escape from a tank. The ultra-light flammable liquid is heated to a high temperature. Although a huge fire does not break out, the costs amount to GBP 74 million. Lemont refinery, USA, same year: The entire crude oil distillation process is put on hold for six months. The plant is closed down: too dangerous. Outage costs: USD 300 million. And there are just two examples from the countless cases every year. As an example from 2000 to 2010 corrosion accidents in EU refineries have cost at least 1.6 billion euro in property damage. Corrosion does “eat” the base material of safety-related components, completely destroying its integrity. “Corrosion is a risk factor that causes immense damages around the world,” says Ivan Winkler, Senior Manager Field Operations at TÜV Rheinland USA. According to an American study, the direct costs resulting from metallic corrosion amount to USD 276 billion – each year in the United States alone. That corresponds to four per cent of America’s gross national product. Compared to this, the costs caused by hurricanes, tornadoes and other environmental disasters in the USA – USD 17 billion per year – are vanishingly small. Corrosion causes pipelines to leak, bridges to collapse and automotive manufacturers to recall vehicles. "The list of damages is endless, and is not limited to large-scale public constructions: think of the rusty bike in your basement or the reddish brown patches in the mesh of your garden fence," says Ivan Winkler. In industry, of
course, the damage has more serious consequences. As well as the financial losses, corrosion also endangers people and the environment. In contrast to environmental disasters, however, corrosion damage has a crucial advantage: it can be controlled. Even better: experts have developed methods for detecting corrosion even in the most hidden of corners – such as inside a pipeline, on an oil platform or in the welding seam of a pressure vessel. With the right instruments and the necessary expertise, weak points can be identified in good time and damage can consequently be prevented.

**SOUND AND X-RAYS**

But what does corrosion actually mean? The word derives from the Latin "corrodere", meaning "to gnaw with force". Essentially, corrosion means that a material reacts with its surroundings," explains the TÜV Rheinland expert. Chemical or electrochemical processes cause measurable changes. As a corrosion product, rust is formed when iron oxidizes. It reacts with oxygen in the presence of water. The color and surface change; the iron becomes porous and eventually disintegrates. As well as rust, there are other types of corrosion that occur as a result of various factors. A single rule of thumb applies to all of them, especially in an industrial context: there is no good form of corrosion – every type is dangerous in its own way and can cause devastating damage.

TÜV Rheinland experts around the world use engineering assessment methods and technologies to find, identify, monitor and characterize corrosion. For instance, non-destructive testing (NDT) methods are used to detect corrosion early. One of the latest and most advanced NDT means is Digital X-Ray, which TÜV Rheinland USA is offering to its clients (see Page 23). The tool is battery-operated and has a wireless connection to the Internet. It delivers razor-sharp images of what is happening inside a material.

New types of non-destructive testing, such as radiation-free ultrasound or acoustic emission testing, are seeing increasing use in the oil industry, too. You can find a video on the topic at www.tuv.com/dpec.
component,” explains Ivan Winkler. If a tank displays hidden material defects that aids corrosion and in turn leaks, the our Advanced Digital X-ray tool makes them visible.

Another testing method takes advantage of the echo effect using ultrasound. “Here, a measuring device sends high frequency sound waves into the interior of a pipe in a power station, for example. If the sound meets corroded welding seams, it is reflected by the uneven surface and reflected back to the measuring device,” says Ivan Winkler. Finding the precise location of the corrosion later is then child’s play for the TÜV Rheinland experts.

As well as x-ray and ultrasound, acoustic emission testing is also a volume-oriented testing method – in brief, this means that it analyzes a material component holistically. Active corrosion spots and/or cracks emit naturally typical acoustic signals. The inspectors use specialized sensors in fixed positions to listen to these acoustic signals. If anomalies like corrosion and/or cracks become active then the sensors detect and allocate them.

OUTWITTING SURFACES
The TÜV Rheinland inspectors are certified in accordance with ISO standard 9712, without which they would be unable to conduct non-destructive testing. The experts have to assess and evaluate which methods are best suited to each object being tested.

Depending on the type of corrosion, a surface-oriented test might be more appropriate. For example, the inspectors make use of magnetic effects with eddy currents. When a coil with an alternating voltage is put near to a metal and therefore conductive surface, tiny cracks and other hidden corrosion damages are revealed as if by magic. At these points, eddy currents and magnetic fields are weakened because material defects conduct the electrical current differently from the rest of the surface.

“A similar thing happens when we apply the finest magnetic particles to part of the object under investigation, as long as we have magnetized the item beforehand,” says Ivan Winkler. This results in field lines that run parallel to the surface. In contrast, cracks in the material that run perpendicular to the field lines generate a stray field, where powder particles build up because they are magnetically attracted. It is clear that something is not right with the material at these points.

The aim of this non-destructive testing is to increase the safety and economic efficiency of industrial plants and to prevent damage. In other words, the experts try to act faster than the corrosion – because they know that rust never sleeps.

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Questions on this topic?

“Every type of corrosion is dangerous and causes damage.”

Ivan Winkler
TÜV Rheinland has been using the portable x-ray detector for non-destructive testing in the USA for a few months now. This gives the experts a new, state-of-the-art x-ray machine that they can use to examine safety-related components in industrial plants for corrosion and other material damage. The device is easy to use even in places that are difficult to access, thus improving the inspector’s safety and productivity. Wireless and battery-operated, the x-ray detector transmits its results directly to a laptop and, as a sideline, is revolutionizing traditional x-ray technology.

While, in the past, expensive film material and a range of chemicals were required to capture x-ray images and make them visible, the new device delivers high-resolution x-ray images without any loss of quality. The results can be immediately saved, analyzed and processed in digital form on the computer, saving not only time, but also money. The portable x-ray detector will soon be put to use in other regions, too, so that customers all over the world can benefit from the new technology.

TÜV Rheinland’s portfolio also includes the inspection of spherical tanks (below). The experts inspect all the tanks’ welding seams and metal plates using a radiation-free ultrasound method and acoustic emission, which allows them to “hear” whether a material has any weaknesses. The image on the left is involved in the power piping and process piping sectors in both the gas and chemical industries.
Healthy thanks to software: Regular IT security tests ensure that heart pacemakers, patient monitoring devices and other medical equipment does what it should.
Melbourne 2012: At a security conference, a cyber expert gives a heart pacemaker an electric shock of 830 volts from a distance of ten meters. For a pacemaker wearer, this attack would be fatal. Although this was only a physical test, it shows the risks facing computer-based medical equipment such as heart pacemakers, implants, insulin pumps and much more today. They are not appropriately safeguarded. It is still unknown whether people are affected by cyber attacks, such as on heart pacemakers or ventilation devices. USA 2013: Dick Cheney, former US Vice President, says in an interview that he has had the remote control function of his heart pacemaker deactivated due to fears of an attack. But is this actually possible? "Many implants allow a remote connection. This is protected by a user name and password, but often not encrypted, so that doctors can act quickly in an emergency," explains Dr. Michael Berensmann, expert in medical products. The physicist works on the software security of active medical equipment at TÜV Rheinland. In the case of patient monitoring devices, which display and oversee patient data, the security risk is mainly in internal communication. After all, many devices within a hospital are connected to one another: Doctors quickly upload test results to their tablets for ward rounds; radiology sends images to doctors; patient monitoring devices deliver vital parameters such as heart frequencies to nurses; programmed injection pumps feed medication to patients; doctors use their work tablet to surf social networks from the sofa in the evening. "The more devices with Internet interfaces are connected to the hospital network, the greater the security risk," says Dr. Berensmann. If the devices are connected to the Internet, they are at risk of attacks that could hold up or even entirely paralyze work at the hospital. Switzerland, June 2014: Parts of the medical records of Formula 1 driver Michael Schumacher are offered to the media following his skiing accident. Digital data theft?

HOW TO: MINIMIZE RISKS

To stop the situation getting this far, European companies who want to launch medical products in particular classifications must first be audited and have their technical documentation examined, including with regard to IT security. The aspects examined by Dr. Michael Berensmann and his colleagues as part of an order include whether the software in question has been developed in line with defined processes and which measures the company has planned in case of emergency. If the audit is successful, the manufacturer receives a certificate and is reaudited once a year. This provides quality assurance that protects customers and patients in the long term and that more and more companies are using – including those abroad. Washington, 1 October 2014: The American regulation authority, the Food and Drug Administration (FDA), publishes its guidelines for the security of medical devices, which have been under discussion for more than a year. The guidelines mean that manufacturers must agree to take information security into account even during the development phase of the devices and as part of risk management. Put simply, they need to name possible threats and weak points and evaluate the probability of these security gaps being exploited. In addition, manufacturers must undertake to define defense strategies. "In the USA, there is immense

IN-EAR-SOFTWARE

A cochlear implant recreates some hearing in people who are profoundly or completely deaf. It sits behind the ear and is connected to implanted electronics and electrodes through the scalp, thus bypassing the damaged parts of the ear. Audio signals are transmitted to the brain via the auditory nerve in coded form as electrical signals. However, cochlear implants use wireless data transmission methods and need to be protected against hacker attacks, for example, to prevent them being manipulated from outside.
pressure to make medical technology more secure,” says Dr. Daniel Hamburg, information security expert at TÜV Rheinland. Together with its American subsidiary Open-Sky, TÜV Rheinland is launching exactly this service on the market, helping manufacturers of medical devices to determine the technical risks behind their products. This is one building block that will allow implementation of the new, stricter FDA requirements. "It is becoming increasingly important to take IT security into account throughout the entire life cycle of products, systems and software and to establish the appropriate security architecture. The financial cost of this is usually many times lower than the potential damage caused by a real attack, which may occur sooner or later," explains Dr. Hamburg.

**ONLINE RESCUE ABOVE THE CLOUDS**

Alongside the many risks and side effects that medical devices bring, they also offer many opportunities. The current audit, on which Dr. Berensmann is working, is proof of this: "If someone has a heart attack on a long-haul flight, it is possible to use a special device to create an ECG, measure the oxygen saturation, and forward the data to a doctor on the ground via video conferencing. He can then provide further instructions.” In addition, the world of apps and smartphones is expected to encroach further into the medical market in future. Apple has already showcased the first watch with heart rate sensor and speech function. If such medical and recreational apps are to have value for more than just leisure activities, important questions of data security and protection against hacker attacks need to be answered here, too.

Questions on this topic?
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Ward rounds with tablets: More and more devices in hospitals are connected to the Internet via Bluetooth, WLAN or USB and are an integral part of modern treatment.
Fall 2014: IT security professionals Dr. Daniel Hamburg and his colleague are sitting in the meeting room of a hospital in southern Germany. They connect their specially prepared laptops to the hospital network. Their task: to test the IT security using a penetration test. They quickly find the IT workspaces connected to the hospital information system (HIS) – the core of hospital operations containing all patient data. A combination of user name and password is needed to log in – no problem for TÜV Rheinland's specialist team. They do not have to search for long: the hospital has not changed the pre-configured default combination. Bingo – unimpeded access to all patient records. But HIS users have different authorizations. By exploiting further weak points, the testers obtain all authorizations and climb the hierarchy up to administrator. They can now delete, manipulate or add patient data. But that is not all. Via the network, the two men gain access to the medical technology equipment and would be able to manipulate results in the radiology system (RIS). "The HIS and RIS are not usually connected directly to the Internet, but the hospital network often is, for example, so that external maintenance staff have access to internal systems," explains Dr. Hamburg. If they connect via insecure lines, unauthorized users can penetrate the system. The penetration test is concluded the next day. "The level of security in the networks we find varies widely. Sometimes we manage to gain unauthorized access within just one or two days," explains the IT expert. But his work does not stop there: solutions need to be found. "There are often problems with the structures and processes, which we then discuss with those responsible for IT," he says. This means not simply changing the preset passwords in the individual case, but also ensuring that the problems do not arise again when new components such as tablets or medical equipment are added to the network. Penetration tests are also a proven method for companies and public administration to increase their security level.
What makes the "Made in Germany" label so special: www.certipedia.com identifies what's behind a certificate – anytime and anywhere. Greater transparency is not available anywhere.

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Darn, no more toner. Purchases like this are simply a nuisance, regardless of whether you have to go to an electronics store or buy them online. Products completely void of emotional attachment, such as toner cartridges, have a difficult time in swaying consumer favor their way. To distinguish themselves from the tremendous mass of similar products and particularly win over major customers that want to equip thousands of workplaces with safe equipment, Samsung, as a manufacturer of toner cartridges, now has its toner powder tested for substances that are carcinogenic, mutagenic and toxic to reproduction. If they pass the test, they may carry the TÜV Rheinland test marks with the keywords “Tested for harmful substances” and “Emission tested”. The test mark primarily becomes a powerful sales argument in that consumers, dealers, purchasers and manufacturers can at all times and everywhere identify what the test mark represents. Access to certipedia.com can be obtained by scanning with a smartphone or by entering the ID number. The database provides relevant information on products, services and systems which are tested, certified and monitored by TÜV Rheinland around the world. Languages already include German and English, and many more will be available in the future. Greater transparency is currently not available anywhere. “The TÜV Rheinland test mark lets you know within seconds whether a product is authentic and what is really behind the seal,” explains Markus Klein, marketing expert at TÜV Rheinland. He points out a trend developing in German case law: “Whoever includes a seal or test mark in their advertising must make essential information available in such a manner that consumers can access that information without major difficulties.” A manufacturer of dog food uses the test mark to distinguish itself from its competitors: If the pet owner scans the QR code on the bag containing “BEWI DOG® puppy” food, he/she sees in an instant: What did TÜV Rheinland test, and what are the product’s properties and features? How can it be used ... and much more.

Questions on this topic?
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Certipedia is TÜV Rheinland’s certification database with over 350,000 certificates. Customers can visualize quality at all times thanks to test marks and Certipedia. Worldwide, systematic and compelling.

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TÜV Rheinland also tested the barbed wire that once separated East and West. Result: weather-resistant—but not history-resistant.
25 years of TÜV Rheinland in Hungary. With its first branch in the socialist Eastern Block, TÜV Rheinland was caught up in the momentous events of 1989.

It is one of those dates that almost everyone can remember: 9 November 1989, the fall of the Berlin Wall. Exactly a quarter of a century has passed since then. Just a few months before, TÜV Rheinland – under the critical eye of the state authorities – had opened its first office in the socialist Eastern Block, in Budapest. Hungary was seen as comparatively liberal; many German firms used production companies there, but demanded adherence to Western standards for certain activities such as welding – verified by a certificate from a TÜV company. That is why, in late 1988, TÜV Rheinland decided to offer its customers in the city on the Danube a local point of contact.

"NOBODY KNEW WHAT WOULD HAPPEN NEXT."

However, when the one-man office opened on April 5, 1989, there were many people who did not believe there would be business opportunities for a company like TÜV Rheinland. "I was constantly asked: Who could possibly do this work better than us, the state-run test institutions?" remembers Professor Gábor Czitán, whom TÜV Rheinland employed as the first branch manager. But history ran a different course. In September 1989, the Hungarian government opened the country’s borders to citizens from the then GDR – and they did not hesitate, fleeing via Austria to West Germany in huge numbers. Czitán remembers the turbulent weeks well: "Coaches were organized to carry the people from the West German embassy in Budapest to the border, but at the same time, the secret service was everywhere. Nobody knew exactly what would happen next." Looking back, this first gap in the barbed wire of the Iron Curtain turned out to be a crucial step towards opening the Wall. In the weeks and months that followed, the old order collapsed at an unprecedented speed all over Central and Eastern Europe. State monopolies were dissolved, companies privatized, and the free market economy modeled on the West asserted itself, albeit to varying degrees.

ISO 9000 AT THE BARRACKS

It was a time of improvisation. As early as 1990, the TÜV Rheinland office in Budapest was tasked with organizing courses on ISO 9000 – the international standard for quality management. "Because in socialist times, people..."
were happy to be able to get hold of certain products at all, quality expectations were an almost unknown concept," says Gabór Czitán. The first seminars on ISO 9000, funded by the German government, were held not in smart seminar rooms, but on military premises run by the Hungarian army. The participants had to arrive right on time and leave the base together at the end. "You were only allowed to leave in the middle if there was a birth or death in the family," explains Czitán, describing this very special type of course, in which over 500 Hungarian companies and institutions took part. While back then the little office was like an exotic creature surrounded by state-run monopolistic structures, economic life in Hungary is now unimaginable without TÜV Rheinland. Appointed in Brussels as a notified body according to multiple EU directives, it is is one of the country's most important testing and certification institutions. Now with 250 local staff, the company has played a crucial role in shaping the market for testing services, driving expansion into further countries in Central and Eastern Europe from its Hungarian base, and promoting awareness of the importance of independent inspections in the region. In addition, the provider of testing services offers practical training in engineering, with a focus on inspection and certification, via the TÜV Rheinland Knowledge Center, founded in 2013 at Óbuda University, a technical university of applied sciences. The era of socialism now seems like an age that has all but disappeared, its end heralded by the year 1989.

When the border with Hungary was opened 25 years ago, there was no holding people back. In the summer of 1989, hundreds of citizens fled across the border to Austria to gain freedom.