SOLUTIONS | ERA

NEWSLETTER
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FIMA

For those who follow the trends in intelligent engineering solutions

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NEWSFEED

- **TAXES.** The Latvian State Revenue Service has praised the Latvian subsidiary of FIMA for the integrity of its business operations, timely payment of taxes and the major contribution it makes to the national budget. FIMA is currently implementing rail upgrade projects and data centres and is a participant in ITS projects.

- **SOLUTION.** FIMA has started supplying electronic tracking systems to the Lithuanian Police Department. The systems are to be used to monitor and control suspects who have come to the attention of law enforcement authorities but have not been detained. The company has won a tender by the Police Department and has provided 100 electronic tracking systems consisting of radio frequency ankle monitors, pocket GPS transmitters and fixed home devices. FIMA has also supplied software and ensures mobile communications and the uninterrupted operation of the systems.

- **MEMBERSHIP.** FIMA has joined Vilnius Chamber of Commerce, Industry and Crafts (Vilnius CCIC), and Vytautas Zinkevičius, Development director of the company, has become its vice-president. The chamber brings together more than 450 members including companies, institutions and organisations. It represents businesses before national and local authorities and provides a raft of services to businesses. Vilnius CCIC brings together businesses from Vilnius and Alytus counties.

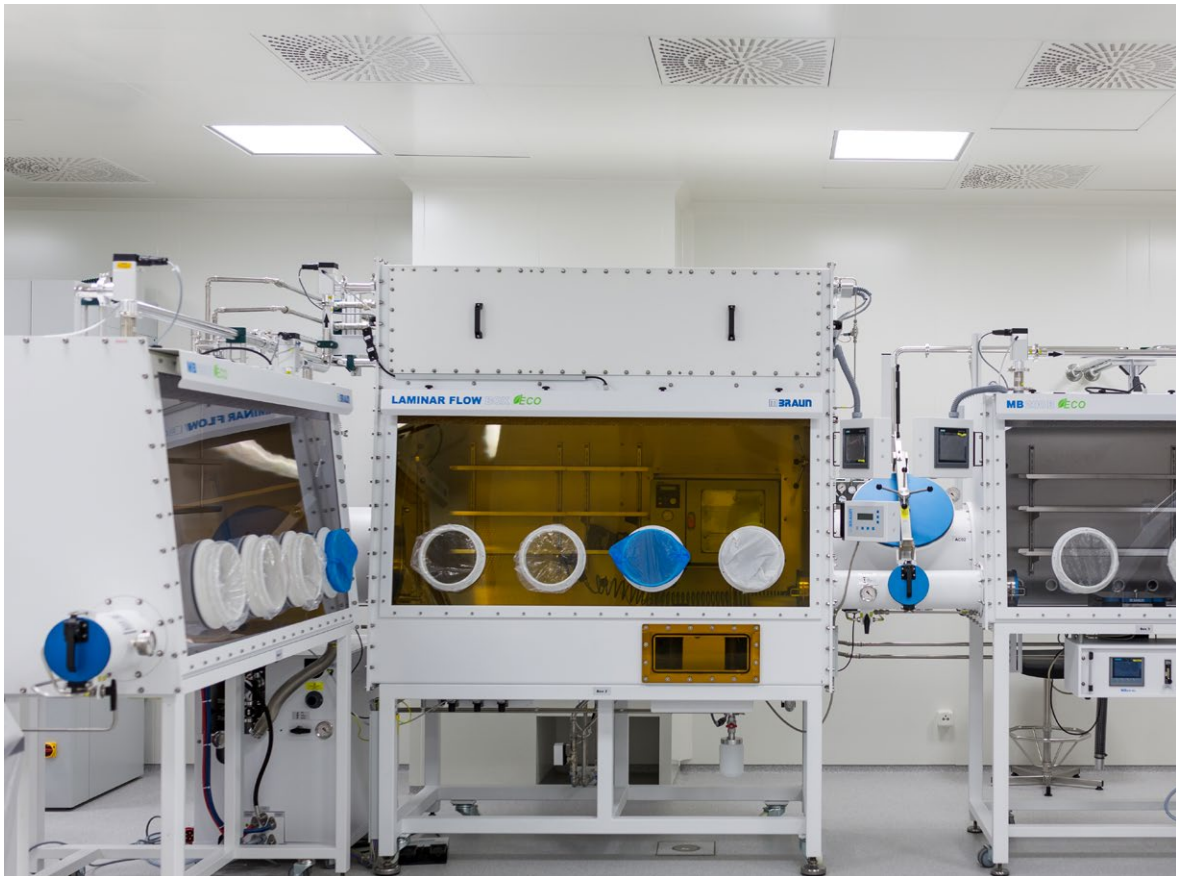
- **RECOGNITION.** FIMA's subsidiary in Latvia, which, working with its partners has upgraded the alarm systems and railway tracks at Liepaja Station, has received an award for the best reconstruction of an infrastructure site in Latvia. FIMA's project received the prestigious Latvian construction industry award 2015 which is given to major, high-quality projects. SIA FIMA has upgraded the alarm, centralisation, locking and power supply systems, mounted new transformers, reconstructed the illumination and video surveillance systems on platforms and level-crossings and provided points heating and automation systems.

TOPIC OF THE ISSUE

Research for businesses

Lithuanian researchers **are celebrating the inauguration of the most advanced research centre in the Baltic States**. The National Centre of Physical and Technological Sciences (NFTMC) will boost cooperation between researchers and businesses and attract new talent to Lithuania. **FIMA was behind the construction of the laboratories and installation of engineering equipment at the new research centre.**

Jonas Jablonskis, the Head of Construction Solutions Department at FIMA



RESEARCHERS AND STUDENTS WILL BE ABLE TO USE THE NFTMC'S CUTTING-EDGE FACILITIES:

- FIMA has provided a chemical vapour deposition (CVD) reactor to synthesise silicon and carbon-based films and nanoformations. This device produces a high pressure vacuum atmosphere and allows the synthesis of, for example, silicon, graphene and diamond layers in various gas mixture environments.
- The NFTMC is fitted out with a mass spectrometer, which is currently one of the four spectrometers in Europe and the first spectrometer in the Baltic States. The device is used to determine the age of fossils including those of dinosaurs.
- The research centre is equipped with an inert gas chamber system, which is the world's third largest system of this type installed at a university. The inert gas chamber system will enable researchers to test new organic substances and new device prototypes. This will allow engineers to develop advanced devices such as organic light emitting diodes.

The NFTMC has brought together the Vilnius University-based Faculty of Physics, a part of the Faculty of Chemistry, Institute of Applied Sciences, Institute of Theoretical Physics and Astronomy, and Centre of Physical and Technological Sciences. Researchers at Vilnius Gediminas Technical University have also joined the centre. According to estimates, one third of the country's researchers will be concentrated here and in the Joint Centre of Life Sciences being established nearby.

Unique conditions

The four-storey National Centre of Physical and Technological Sciences occupies an area of more than 27,000 square metres and hosts the largest and most modern facilities for conducting physical, chemical and technological research in Lithuania and the Baltics.

Forty-six research laboratories and laboratory groups will offer their research and technological infrastructure both to researchers and businesses. More than 700 researchers and students will be able to simultaneously engage in SR&ED.

Lithuanian researchers will now be able to work in unique conditions to undertake work on SR&ED in fields such as laser and light technology, materials science, nanotechnology, semiconductor physics and electronic engineering.

"Contributing to the establishment of Lithuania's most modern research centre was a real challenge for us. This centre has unique equipment which is not available anywhere else in Lithuania. In addition, highly stringent quality, cleanliness and reliability requirements were set for the centre and we were able to meet all of these.

"The project required us to use complex solutions to achieve success. We had to keep in mind that the laboratories are likely to expand in the future and that new equipment will almost certainly become available; furthermore, we will have to service the equipment that we have

CLEANROOMS AT THE RESEARCH CENTRE

- Lithuania's largest research and technology building is provided with nine special laboratories in which very stringent cleanliness, microclimate, noise and vibration requirements have been applied.
- These cleanrooms have an area of approximately 500 sq m and have been fitted out by FIMA. They the only laboratories in the centre which have been certified according to the very stringent ISO 5, ISO 6 and ISO 7 cleanroom requirements.
- Cleanliness requirements are grouped based on the maximum allowable particle concentration in the air, particle size, and air changes in the room per hour. To comply with these requirements, air is supplied to the room via a special system equipped with HEPA or higher class ULPA filters to ensure clean air circulation.
- These rooms must be provided with equipment, furniture and materials that ensure the minimum possible air pollution and are free from static load that would attract solid particles produced in the laboratory.
- Modular cleanrooms are rapidly gaining popularity as a result of innovation and technological advancements. This solution enables the rapid establishment of laboratories which comply with the most stringent requirements while not requiring the building's general engineering systems to be altered.
- Modular cleanrooms function according to the air pressure principle. A modular cleanroom can be a hermetic room inside a room, assembled from modules of different shapes and sizes. Air to such modular cleanrooms is supplied by circulatory air filtration modules. Filtered air from the surrounding room is supplied to the laboratory and is subsequently returned to it. Air in a modular cleanroom can be changed up to 250 times per hour. In a regular office, the air can only be changed three times an hour.
- ISO 14644-1 provides for nine cleanrooms classes. ISO 1 is the highest class and the people using this type of room must wear special suits. ISO class 9 describes a sterile hospital room. The higher the cleanliness class, the more stringent the applicable requirements. The cleanest cleanrooms available in Lithuania are ISO class 5 cleanrooms.
- FIMA engineers proposed to the NFTMC that is used highly effective modular cleanrooms. This solution has enabled the centre to adapt the laboratories to customer needs while still allowing further expansion in the future.
- The company has supplied and mounted all the equipment necessary for the cleanrooms: wall-mounted modules, circulation air filtration modules.

"This centre has unique equipment which is not available anywhere else in Lithuania. In addition, highly stringent quality, cleanliness and reliability requirements were set for the centre and we were able to meet all of these.

installed. In terms of engineering solutions, this building is also one of the most advanced structures in Lithuania," said Jonas Jablonskis, the Head of Construction Solutions Department at FIMA.

Hope to retain talent

The NFTMC should become a connecting link in the innovation chain that starts from studies, research and technology and culminates in product prototypes and, finally, new business. The centre has united university researcher capacities and the different fields of study in a single technological infrastructure.

The centre is expected to boost the frequency of innovation and hi-tech breakthroughs and Lithuania will provide new technology services to both domestic and foreign businesses.

The NFTMC is probably the first large-scale investment in research, knowledge and young people in Lithuania after the regained its independence. The project's creators hope that this modern research centre will help return scientific talent to Lithuania and to halt the brain drain because it will be possible to develop promising technology at home.

LABORATORY PROJECTS COMPLETED BY FIMA:

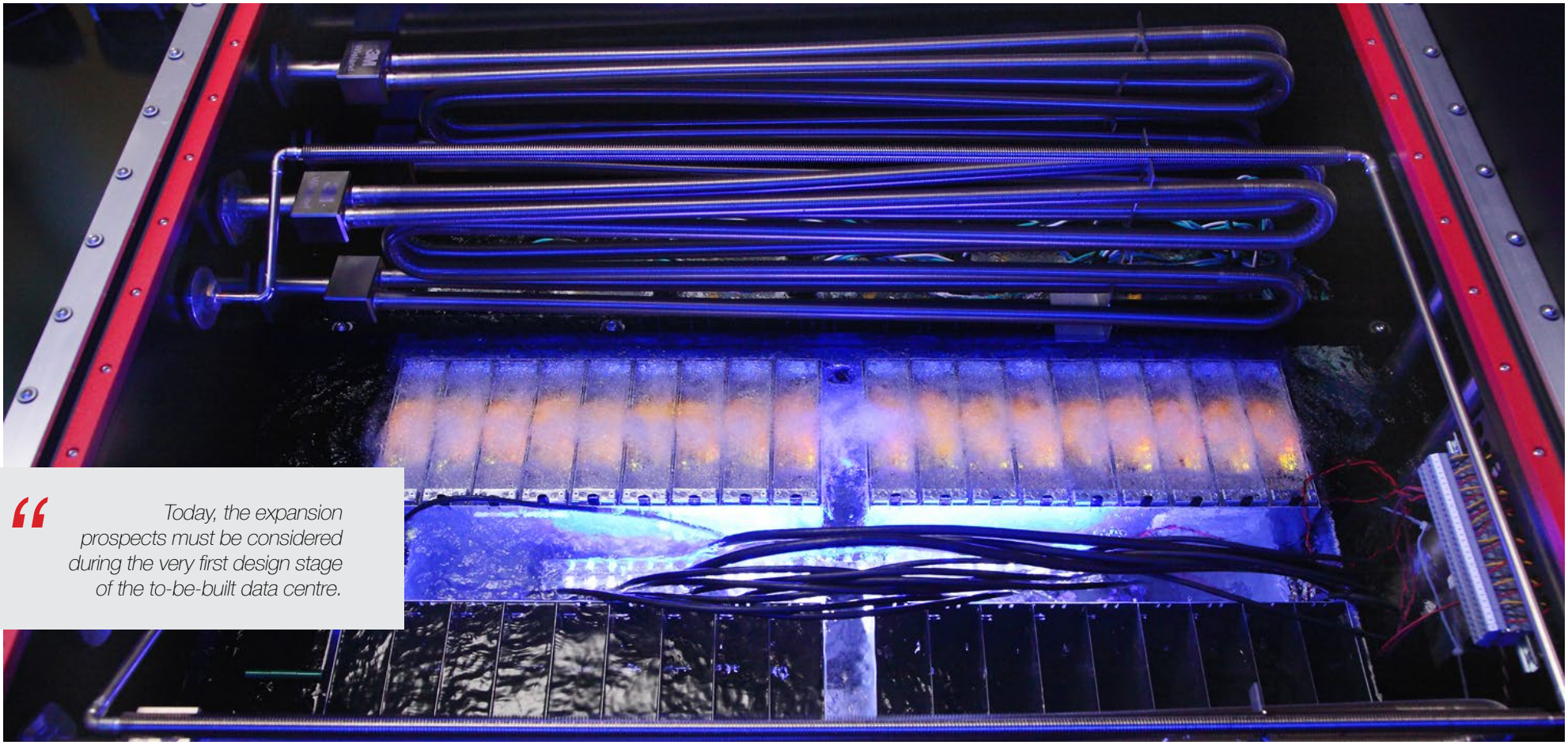
- FIMA has built and fitted out a three-storey laboratory building, which is an extension of the facilities of the National Public Health Surveillance Laboratory. The laboratory is engaged in molecular diagnostics of infectious diseases, epidemiological typing and the study of resistance to antimicrobial drugs.
- FIMA specialists, based on order of the National Public Health Surveillance Laboratory, have implemented several technological solutions that are unique to Lithuania: they have provided a laboratory of biological safety level III. It is the first laboratory within the Lithuanian healthcare system that is able to study rare microorganisms associated with human diseases. Employees at the laboratory are guaranteed a safe working environment while the leak of contaminants outside the laboratory is prevented.

FIMA WORK AT THE NFTMC:

- Nine cleanrooms compliant with ISO 5, ISO 6 and ISO 7 cleanroom requirements;
- Cleanliness level II deionised water supply and purification system;
- 150 fume hoods to be used in lab research;
- A low current system;
- A process control and automation system;
- A gaseous fire suppression system;
- Customised laboratory furniture and equipment.

Data centres: five trends

The development of data centres is as now as fast as the growth of the amount of data being transmitted and processed. **What should data centre administrators bear in mind so that they can continue to operate effectively in this fast-growing area?**



> *Today, the expansion prospects must be considered during the very first design stage of the to-be-built data centre.*

LOCATION

When we talk about data centres, we usually think of large buildings containing server cabinets with capacities measured in megawatts. These kinds of data centres are secure, have effective cooling systems and are flexible but they also have some disadvantages. They are, for instance, sometimes a long way away from their end users. Or, despite the high speed of data transmission over fibre, these centres do not satisfy the needs of a user playing an online game or watching a live football match.

"The popularity of cloud storage is on the rise, and data is stored at data centres that can be located anywhere in the world. People are increasingly opting to watch television online and don't want constant interruptions or data delays lasting even a fraction of a second, so the need for edge data centres in the vicinity of end users is growing.

"Imagine a business district with a small data centre embedded within it to ensure immediate data transmission to its users," said Arūnas Jurkša, Head of the Data Centre Projects at FIMA.

Arūnas Jurkša, Head of Data Centre Solutions Department at FIMA

IMMERSIVE DATA

- In the future, data centres will be different from those we see today. You'll need nerves of steel to watch servers connected to power and data networks immersed in a container full of liquid unless this liquid is dielectric and has good heat conducting properties.
- 3M, a global leader in innovation and a partner of FIMA, has developed the Novec fluid which provides effective cooling of immersed data centre equipment and there are some data centres using this technology already.
- "For instance, the generation of bitcoins requires huge computing resources and the processors must run at full speed, which means that the traditional cooling with air may be insufficient. This is why the idea of establishing cryptocurrency data centres in the north, beyond the Arctic Circle, was considered.
- "One of the most recent bitcoin generation centres was built in Georgia. The climate in the country is fairly warm, and fluid is used for cooling the data centre equipment," said Gintaras Maldutis, sales manager in the Baltics at 3M.

MODULARITY

We can now use solutions that don't need the construction of a large data centre. These are standardised containers with server cabinets and cooling systems already installed which are delivered to a site ready to use. All you need to do is connect them to existing power and communications networks.

"It is a good solution for companies that need a local data centre but do not have the required technical facilities for one: for instance, their buildings don't have the right amount of ventilation or sufficient security. In addition, these kinds of systems can be moved to different locations whenever need arises. They are used by giants such as Google when they need to be able to rapidly scale up their computing power. However, if we want a large data centre, then we need to have an efficient building or complex of buildings," said Mr Jurkša.

DEVELOPMENT STRATEGY

According to Mr Jurkša, Lithuania does not have any large data centres with a capacity of 30–40 MW at the moment. The capacity of our current data centres is below 1 MW.

The country's data centres are located in former industrial sites with well-developed power supply systems and spacious premises suitable for DC infrastructure and which do not require large construction investment. Yet these data centres do not offer any expansion opportunities. In other countries, priority is given to data centre parks established on green field sites.

"Expansion comes with opportunities and risks. A company will not build a large data centre if it does not have sufficient clients. On the other hand, everyone wants to land the big fish! Large-scale clients are out there but their first question to a potential service provider is always: "How quickly will we be able to double our resources?"

"The needs of leading companies are growing rapidly and data centre administrators who are competing to attract these clients must be ready to expand their services as soon as required," said Mr Jurkša.

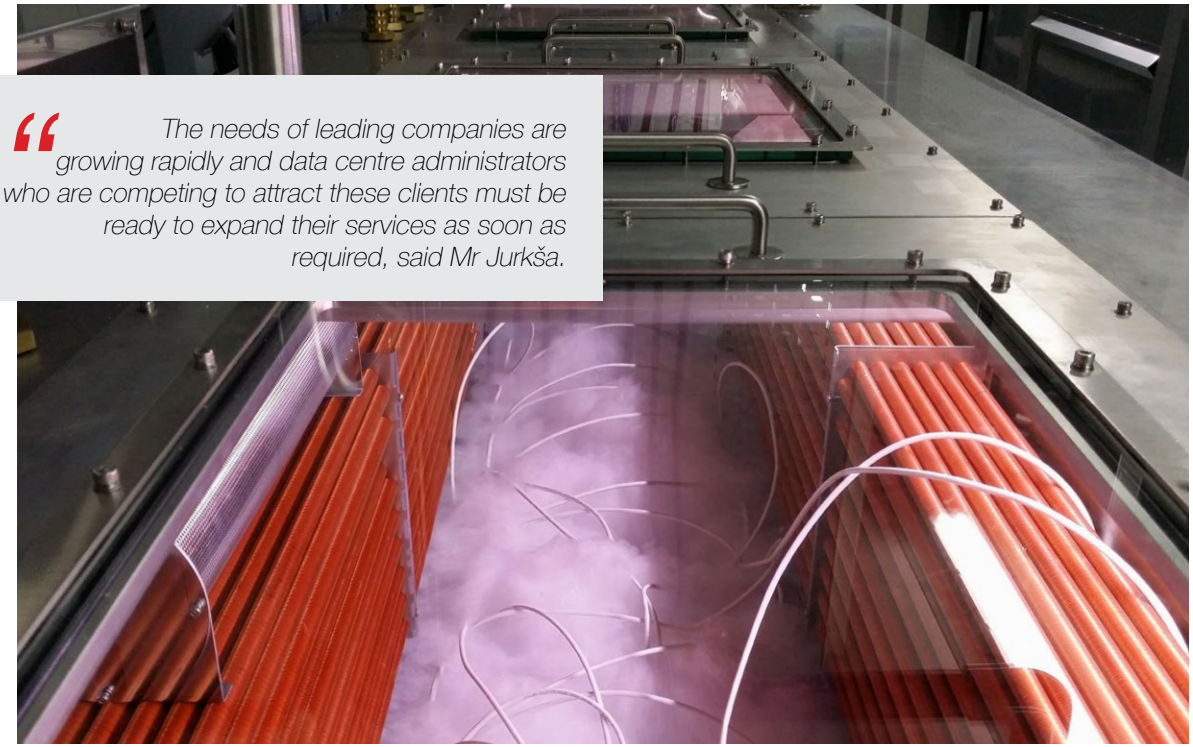
A clear and well thought out data centre expansion strategy is a must. A coherent strategy starts with a green field and includes site and infrastructure planning. Expansion must be planned in such a manner as to be implemented promptly and effectively; furthermore, expansion must not throw the entire data centre infrastructure out of balance. Today, the expansion prospects must be considered during the very first design stage of the to-be-built data centre.

ENERGY EFFICIENCY

Data centre costs will always be a priority and, in this area, Lithuania is one of the leaders because its major data centres are very up-to-date and efficient. They use premium cooling systems and their energy costs are low.

The PUE coefficient shows how efficiently a data centre uses energy.

"It may seem strange but four out of five data centres in the



> *"The needs of leading companies are growing rapidly and data centre administrators who are competing to attract these clients must be ready to expand their services as soon as required, said Mr Jurkša.*

world are, in our opinion, very energy inefficient. We attend the Data Centre World event in London on an annual basis and we find only a small number of technological solutions of interest to us, as participants mostly offer solutions intended for improving inefficient DC cooling systems.

"There are several reasons for this. First of all, the technology provided at data centres that have been built in recent years is still in operation and replacing it before its service period has expired is expensive.

"Attitude is another reason. Lithuanian data centre administrators don't need to be told that low costs increase their competitive advantage. But in Poland, for example, where we are also developing data centres, we have to tell clients that the investment in energy-saving solutions is worth it. We have to explain that it will result in lower prices for clients and, therefore, a competitive advantage," said Mr Jurkša.

SMART DATA CENTRE INFRASTRUCTURE MANAGEMENT (DCIM)

Data centre infrastructure is highly specialised and requires specific maintenance and process management. The more efficient the management of these processes, the lower the costs and the better the use of resources. This is of particular relevance to large data centres.

Imagine a huge business centre provided with lighting, ventilation, heating, power supply and security systems. It is much easier to control all the systems from a single platform that is able to analyse data, send out maintenance reminders, etc.

A data centre also includes a number of systems that require scheduled maintenance and has large quantities of engineering information that must be analysed and used to inform decisions that ensure everything functions properly.

"Here is a simple example: there is some vacant space at a date centre and several powerful server cabinets must be installed there. The centre's smart management system highlights which line has sufficient power for this equipment, where the equipment should be placed so that it doesn't disrupt the cooling balance and notifies staff whether the DC power input capacity needs to be increased. These systems help administrators use data centres efficiently. For the time, however, we lack integrated and comprehensive solutions and this issue must be tackled," said Mr Jurkša.

IMMERSIVE DATA

- How does this work? At this kind of data centre, the server equipment is vertically immersed in a container with Novec. The fluid is highly penetrating and a good heat transferring agent, and its boiling temperature, depending on the specification, can be as low as 34 degrees. This means that after the fluid has reached the required temperature it starts to evaporate vigorously. The steam is condensed on the heat exchanger, which can be used to transfer regular water that then vents the heat to outdoor cooling systems.
- Novec is non-electrically conductive and environmentally-friendly. It boils in the hermetic containers, evaporates, condenses, and falls back down, whereupon the cycle is repeated. Furthermore, these containers mean that broken equipment can be replaced without interrupting the entire process.
- "Since liquids are better heat transmitters than air, highly capable servers can occupy a smaller area and be cooled reliably. For instance, in this case a room with an area of up to 10 sq m can host many servers with the total capacity of 1 MW, whereas if air is used to cool such a set up, then the data centre will have to occupy an area of several hundred square metres. Furthermore, the PUE of a fluid-cooled data centre can be as low as 1.02.
- Because the capacities of data centres will continue to grow and increasing attention will be given to energy efficiency, we believe that cooling with liquids will become a common technology," said Mr Maldutis.

New building management solutions at FIMA

FIMA, the intelligent engineering solutions company, is strengthening its building management system capabilities. The new Information and Communications Technology (ICT) Solutions Department has been established following merger of the Telecommunications Solutions Department and the Automation and Data Centre Solutions Department. Building automation has been made one of the new unit's priorities.

Šarūnas Liktoravičius, Sales manager of the ICT Solutions Department

According to Šarūnas Liktoravičius, who is responsible for building management and automation in the new department, this merger was inspired by the business's changing needs.

Why did FIMA decide to put a greater emphasis on building management systems?

We live in a smart world. At home, we are surrounded by smart TV sets, telephones and computers. These devices are connected to the web and perform not only their core functions but also provide additional services, interact and help us to access and benefit from the huge amount of data in the cloud. The internet, Gmail, Facebook and LinkedIn have become parts of our everyday lives.

Changes in the world of business may be less rapid as they require bigger investment, better security and measurable results.

But it is evident that manual adjustment of temperature or manual operation of light switches in a huge office or hiring more staff to deal with power, heating or security failures is inefficient.

This is why we see an increasing need to integrate the various engineering systems installed within buildings and to have a single and easy-to-use management platform that monitors the operation of all the systems and notifies the building administrator of the need for maintenance, the status of the systems, energy costs and consumption.

In addition, we don't need a special workstation to do this: those involved can access all the necessary information on their mobile devices. This efficiency has an effect on the bottom line and FIMA is leading efforts to do all of it in a simpler and faster way.

We are strengthening this area at FIMA because we want to offer our clients a better, integrated and customised product at an affordable price.

How will FIMA's structure change?

We have merged the two departments in order to make better use of the available internal potential and facilitate the development of comprehensive solutions. My colleagues are excited because we are starting down a new road which will open up new opportunities.

We will expand technology supplier base so that we have more choices and opportunities because our strength is built upon careful consideration of our clients' needs and then developing custom-built integrated systems instead of offering specific systems or controllers. Our partner base will therefore include companies supplying data-collecting detectors and companies offering automation equipment for large facilities.

Please tell us something about your professional experience and career at FIMA.

I have been with FIMA for more than 15 years. It is my first and only employer. I started as a computer network specialist. I have been able to grow and develop just as my company has grown and developed and I have become a complex solutions expert. Over the past three years, I have been responsible for the provision of low current systems at the multi-use leisure complex, Sokol in Minks which includes a Marriott hotel.

I value stability and long-term collaboration. We have retained some of the clients and suppliers who were with us back when I started working at FIMA.

I developed an interest in STEM when I was at school and, at heart, I am an engineer. "It's impossible" is the phrase that motivates me more than anything else: everything is possible and I strive to prove this.

In my free time, I like trying out new things and I have a number of hobbies. I was one of the first people in Lithuania to use an AquaSkipper a decade ago. Today, most people are still surprised when they see somebody using one.

Smart systems: the best defence against undisciplined drivers

Vilnius City Municipal Government working hard to resolve traffic problems.

The building of new roads, the introduction of box junctions at intersections, better conditions for cyclists and a more efficient public transport network – all of these will improve the lives of our city's population but they do not go far enough.

We must evaluate measures introduced in cities abroad which have even higher levels of traffic. These measures include bypasses, the latest intersection designs, bridges, tunnels and smart traffic management systems.

System upgrade ongoing

Work on a centralised traffic management system in Vilnius started a decade ago. Some of the city's intersections have been equipped with video cameras and traffic flow meters for several years. But, when we consider the advances made by other cities, it is clear that Vilnius continues to be far behind.

The latest traffic management systems receive information in real time, process that information instantaneously and, every few seconds, decide which traffic light to change to green to ensure an optimal traffic flow.

System operators can set additional restrictions or priorities, for example ensuring that ambulances, fire engines and buses always get priority.

"Vilnius does have a traffic management system and some of the main roads have green corridors, but we must also think about upgrading the system. We can develop an open system that can be integrated with the latest equipment from different manufacturers.

"A single system can ensure that priority is given to public transport at intersections, measure traffic flows, and inform drivers about the road conditions ahead," said Rokas Šlekys, director of the Solutions Department of intelligent engineering solutions company FIMA.

All-seeing video cameras

However, management of traffic lights alone is not sufficient. If we don't also have high capacity streets and drivers continue to act irresponsibly, traffic conditions in the city will not improve and the number of accidents will continue to rise. We must make traffic safety a priority.

Vilnius mayor Remigijus Šimašius has already said that the better use of video cameras at city intersections should be a priority because cameras can register traffic violations and enable the authorities to penalise the drivers responsible. Modern systems offer even more.

Smart cameras can not only

Rokas Šlekys, Head of the Solutions Department

take recordings but also register violations, for instance, when a car uses a bus lane, stops at an intersection, doesn't stop at a red light or makes a left turn on a street where it is not permitted.

When a number plate recognition system is introduced, algorithms which assess and document traffic violations can be added. Speed sensors can also offer this functionality.

Furthermore, these systems can be used to identify and record vehicles which have not undergone a mandatory inspection or are not insured as well as drivers who have not paid fines they have been issued with. The result is a reduction in the number of vehicles using a particular street.

"In recent years, number plate recognition technologies have been implemented in numerous cities around the world. The British have even calculated the number of offences that these cameras have helped to identify, and the Swedes use these systems to inform drivers of the time required to travel between two places. At the moment, these types of system are only being used in Vilnius's car parks but they actually offer almost unlimited potential," said Mr Šlekys.

The Lithuanian Traffic Police has recently installed a system to monitor average speed on one of Lithuania's most accident-prone roads, Via Baltica. This system records vehicle number plates and the time it takes any particular vehicle to cover a certain distance.

Speed meters are a must

"We believe that the number of these average speed enforcement systems in Lithuania is likely to increase because they help to enforce safer speeds on certain road sections. These speed cameras can also be useful in cities, in particular in the vicinity of schools and other places where speeding drivers pose a particular risk.

But the speed enforcement system in Vilnius has been discredited. In order to save money, only a few of the large number of boxes installed were actually equipped with speed cameras. Some of the boxes look like they have been abandoned, making it obvious to drivers that they are empty.

Vilnius needs to upgrade its speed enforcement system to make it effective and to provide average speed metering at certain sections," said Mr Šlekys.

He also added that most of the city's attention is focused on traffic jams with the issue of road safety rarely given priority. As a result, many pedestrians are injured and are frequently knocked down at night when not using a pedestrian crossing.

"There should be a greater focus on pedestrian safety in the city. The latest traffic management systems allow authorities to set parameters which reflect the time it takes for pedestrians to cross an intersection.

Furthermore, other countries are already installing systems which can determine whether there are any people near pedestrian crossings. When drivers are approaching a pedestrian crossing, they are notified of the presence of pedestrians by red indicators highlighting the contours of the crossing," said Mr Šlekys.

DATA IS THE FUTURE

- The future belongs to driverless cars. But these are still some way off so using smart devices in current vehicles will help us to save time, reduce traffic jams and give advance notice of potential traffic hazards.
- Many of today's drivers set their itineraries based on recommendations made by Google Maps which shows them traffic jams and give them an estimated time for the journey.
- This data is very important for drivers, but it is of little use to the system. In order to manage traffic successfully, we need comprehensive data about the movement of every single vehicle.
- "Recent trends show that in the future, data from vehicles and drivers' mobile devices will enhance the capability of city traffic management systems. Firstly, they will enable us to monitor the habits of drivers or groups of drivers and offer them the best routes: a driver will choose an intersection proposed by the system rather than an intersection of his or her own choice. This will enable the traffic management system to forecast traffic flows and manage traffic even more effectively.
- "Furthermore, drivers will be notified of the recommended speed to ensure smooth flows through traffic lights and they will also be warned about any obstructions. This information will be gathered by the system from the vehicles that are already using the road," said Mr Šlekys.

An advantageous view

24/7 on-site security officers will soon be just a memory. **There are better ways to ensure building security and the latest video surveillance systems are already able to distinguish whether a person walking nearby is merely an innocent passer-by or a potential offender.**

Šarūnas Pavilionis, the expert engineer at FIMA

A testing polygon

The room where FIMA expert engineer Šarūnas Pavilionis works is filled not only with barely audible computers. It is also full of switchers, detectors, cameras, controllers and wiring. Green and red lights flash and every now and then you can hear a loud beep or squeak.

There are many faces appearing on Šarūnas's computer screen: half of the images are of the engineer himself showing different facial expressions. The other photos are of his colleagues. The faces of all employees passing in the vicinity of the room are recorded by a camera which recognises them and then stores these photos in the database.

"All the equipment that we plan to provide at a client's site is tested here with FIMA employees first," said Mr Pavilionis.

As well as the smart equipment and computers, the room contains vehicle number plates from different countries: these are used to test cameras and software able to recognise number plates and even specify their country of origin.

"The latest surveillance and security systems can do a lot. Pretty soon, they will replace on-site security officers, although screens at management centres will continue to be monitored and decisions will have to be taken by human beings.

"But, thanks to the advance of technology, people will no longer have to provide physical security but will rather provide data analysis and crisis management skills, while the images and information they receive will become powerful tools enabling them to predict threats and obtain comprehensive information

> *Intelligent motion detection is one of the fastest developing features of today's video surveillance systems.*

about any violations," said Mr Pavilionis.

High resolution is not enough

There are several rapidly developing areas in the video surveillance sector. Firstly, the resolution of video surveillance cameras is increasing thanks to signal digitalisation.

Currently, most manufacturers offer Full HD video cameras. The 4K Ultra HD standard with a resolution of 3,840 x 2,160 is also gaining popularity. This means that the images recorded by the cameras are of greatly improved quality and allow an individual to be identified at a considerable distance.

Some niche video surveillance system manufacturers merge images from several cameras into one HD image or offer systems that obtain high-quality focused images from any section of a long street. The equipment also employs video matrixes and optics that are normally used in professional still cameras.

Special cameras transmitting light signals can even determine the precise distance to an object and display 3D images.

But this is just the start. The most interesting things happen when this information is processed and analysed both in real time and post-facto.

"The opportunities offered by video cameras are similar to those we see in Hollywood movies: we can even zoom in on a distant object. The system can recognise people on a watch list and we can pinpoint individuals in stadiums containing 50,000 people. None of this is science fiction," said Mr Pavilionis.

Intelligent motion detection

Security systems consist not only of video cameras but also of a number of detectors and sensors. Images contain information which must be considered and then acted upon or disregarded. This is where technology provides the greatest assistance.

"The latest video processing software can understand whether a person is just a passer-by or a potential offender. This type of software can distinguish humans from animals and can even record certain patterns, for instance, a person loitering in the same place for some time.

A security officer therefore not only sees images but also receives warning signals which he or she has to respond to. For instance, if a dog enters an area this image will be displayed but no warning will be given; if a person is detected, the system will send a warning signal," explained Mr Pavilionis.

"These systems are custom-built. We can define the parameters which, if exceeded, result in a warning being generated although the camera itself will cover a much wider area. The system can also display the trajectory of a person or another object. Finally, it can compare faces with images in the database. No warning will be sent if an employee of the company enters the company's premises.

"Intelligent motion detection is one of the fastest developing features of today's video surveillance systems. Studies show that in under half an hour, one operator can miss up to 95% of the incidents in the area within his responsibility. Systems offering intelligent motion detection and analysis are a must – otherwise images, regardless of the quality of cameras used, will only serve as a means for analysing incidents after they have happened," said Mr Pavilionis.

What will we see in the future?

Mr Pavilionis has identified several trends. With video surveillance systems becoming cheaper and information now being transmitted in real time, do-it-yourself devices are becoming increasingly popular. Families install small, easy-to-integrate security and video surveillance sets and use their mobile phones to monitor what is going on at home. Video recordings are saved in the cloud.

The security systems used in the business sector are becoming increasingly integrated and smart. Video cameras with intelligent motion detection functionality can replace other detectors, ensure access control, and detect motion even in a poorly lit or dark environment. The costs of these systems are dropping, while their effectiveness is increasing.

Intelligent video surveillance systems are indispensable when it comes to assuring public order and safety. For instance, video surveillance systems in use at sports stadiums hosting important international matches and large crowds must be able to identify every single individual present.

The British use cameras able to recognise vehicle number plates to investigate serious crimes and monitor the movement of suspects.

With intelligent systems and the technical capabilities of cameras improving further, it is now possible to forecast the likelihood of an incident and take measures to prevent it.

A gateway to Europe

"Good afternoon. Your passport, please." We hear this phrase every time we leave or enter the EU. **The passport control officer and the border control post are probably the first things that you notice when you visit a new country.**

The Tverečius–Vidzy border post

How does Lithuania meet travellers and businessmen? Is the gateway to Lithuania and, therefore, the EU both modern and safe? What kind of impression does it make on foreigners visiting the country?

Complies with Schengen requirements

The Tverečius–Vidzy border post inaugurated in early 2016 will be the first international point along the northern part of the Lithuanian-Belarusian border when our neighbours complete the upgrade of their infrastructure.

In Lithuania, the intelligent engineering solutions company FIMA has provided a border control post in compliance with all the applicable Schengen requirements. It is also efficient and convenient for both for travellers and border officials.

"What we had here previously could not be described as a proper border control post or a gateway to Europe. There were several provisional structures standing in a bare field, there was no water supply or sewerage and there was no equipment to ensure border security. Today, it is a post that in terms of equipment, appearance, se-

> *One of the innovations introduced at Tverečius is the traffic flow management system and this is to be implemented at Rambynas.*

The Rambynas-Dubki border post will be completed in 2017

curity and convenience is as good as anything in any Western country," said Jonas Jablonskis, Head of the Construction Solutions Department at FIMA.

A two-storey administrative building covering an area of more than 500 sq m and a waiting room and an enclosed car park were built near Tverečius.

The building is equipped with rooms for comprehensive security screening, a temporary detention room, toilets, showers for employees, computer workstations, modern screens connected to video surveillance cameras and a workstation for the security officer on duty.

This border post can handle both cars and buses. It has six outdoor screening spots where officers will be able to screen vehicles arriving from either direction. The capacity of the border post is 480 cars and 20 buses per day.

Trucks to bypass Panemunė

The benefits of the new border post in Pagėgiai District will be most appreciated by the residents of the town of Panemunė which lies close to the Russian border. Trucks transporting goods to and from the Kaliningrad Oblast will no longer have to go through the town.

The new border post will be built just before Panemunė. Trucks will then be directed to the new four-kilometre Panemunė Bypass which leads to a new bridge being built on the Russian side.

FIMA's team of design engineers have excelled themselves and won the tender run by the Directorate of Border Crossing Infrastructure. The company has signed a contract for the construction and fitting-out of the border post.

The work includes the reconstruction of a 2,500 sq m building and the erection of new buildings with a total area of 850 sq m. FIMA will also build power and communications networks and provide alarm, video surveillance, number plate recognition, sound detection, signalling and electronic communications systems.

This border post will be called Ramybas–Dubki and will become a critical point of entry to and from the Kaliningrad Oblast. The work is expected to be complete in early 2018.

Major challenges ahead

"We see some major challenges ahead: the border post will cover about eight hectares and will be built on unstable ground. We will only be able to put the new buildings up after we have reinforced the ground with more than 1,800 12-metre long and 0.8-metre diameter poles. The basement will be used to equip 14 control points, several passenger screening buildings and six awnings. This border post is more significant than, say, the facilities at Tverečius. Up to 900 vehicles will cross this post in a single direction," said Mr Jablonskis.

As with the Tverečius post, FIMA will provide the most up-to-date technology to ensure efficient vehicle flow management and security.

One of the innovations introduced at Tverečius is the traffic flow management system and this is to be implemented at Rambynas. Incoming and outgoing vehicles will be directed to specific outdoor screening points by electronic displays.

If the vehicle flow from one direction outweighs that from the opposite direction, the vehicle numbers can be equalised as they can be screened in both directions.

Additionally, the interactive displays specify the origins and types of vehicle (EU or third country vehicles, trucks, cars, etc.) allowed in specific lanes and this information can be changed quickly and easily.

To ensure maximum security, FIMA will provide an ionising radiation detection system – this is done at all international border posts. Rambynas (and Tverečius, too) will be provided with equipment that can force the halt of a vehicle including buses and trucks.

"Border posts are equipped with latest equipment: the high quality video cameras with motion detection software enable the monitoring of the area around the clock. Number plate recording cameras are integrated with number plate recognition and container code recognition systems. If the system detects a suspicious number or code, a warning will be sent to customs officers. Furthermore, buildings' systems are interconnected and can be managed from a single location," said Mr Jablonskis.

He added that FIMA is well aware of the importance of the tasks it has been assigned to carry out: border posts are important both for the country's image and security and require the most up-to-date solutions.

Five stars

One of the most impressive projects built in the Belarusian capital Minsk in recent years is the 65,000 sq m Sokol sports and entertainment complex including a 5-star Marriott Hotel. This complex, which resembles a bird with open wings, has become FIMA's visiting card in Belarus.

FIMA IN BELARUS

- Fima BR implemented 17 engineering systems at the Sokol complex and Marriott Hotel. To date, it is the company's biggest project in Belarus.
- FIMA also implemented engineering systems at Minsk Aquapark, which is one of the largest aquaparks in Europe.
- Projects of this type help the company maintain its top-level expertise and serve as the company's visiting card for potential investors.
- FIMA BR currently employs more than 50 specialists, most of them Belarusian. Lithuanian managers help the Belarusians gain relevant expertise as FIMA BR specialists attend qualification development training in Lithuania on a regular basis.
- FIMA is looking for major sites in Belarus, such as business centres, public buildings and factories, to implement its complex innovative solutions.
- There are many competing service providers in Belarus specialising in individual areas, e.g. implementation of video surveillance or access control systems. FIMA's advantage is that it can offer integrated solutions.

The buildings, which cost approximately USD 100 million, were designed by Belarusian architects and financed by a Qatari investment fund. Marriott had presented its terms of reference, and FIMA BR was one of the contractors responsible for implementation.

A joint team of FIMA BR specialists and Lithuanian engineers provided the buildings with most of its intelligent engineering solutions. The design of these systems alone required six months.

A new star in Minsk

The nine-storey complex has 217 hotel rooms, 2 restaurants, a bar, and a function hall. Part of the building is occupied by a 2,000 sq m sports arena that can be used for mini football, volleyball, handball, basketball and tennis. Over 2,000 people can simultaneously watch sports games or concerts.

There are eight cinema screens with VIP lounges of up to ten seats in each. The complex is also has a beauty and wellness centre and a conference centre.

The building boasts modern architectural and interior solutions and the latest in infrastructure systems.

The hotel is equipped with automated heating, air conditioning, lighting and other engineering systems of the new generation.

For instance, every hotel room has an autonomous heating and ventilation system that is activated automatically on receipt of a signal from the monitoring system. Heating in the room is turned on shortly before the guests are due to arrive, which both ensures comfort and saves energy.

Hotel guests can use their room access cards to go to the car park and the sports and leisure entertainment centre. Fast wi-fi, a security surveillance system and metal detectors are also installed.

SYSTEMS IMPLEMENTED BY FIMA BR AT THE SOKOL COMPLEX AND MARRIOTT HOTEL:

- Structured cabling
- Telephony
- Wireless communications network
- Video surveillance system
- Access control system
- Audio and video system for conference halls
- Audio and video system for restaurants
- Audio and video system at SPA centre
- Intercom system
- TV system
- Audio system at beauty and wellness centre
- Audio system at the gyms
- Background audio system at the sports centre
- Radio speakers
- Clock network
- Parking system
- Metal detectors
- Automation (building management system)
- Parking management system

An international team

"For the time being, we do not have any projects of this scale in Lithuania. This project involved large numbers of consultants and experts from different countries. All of them are qualified professionals in their respective fields, and we easily found a common language," said Dmitry Shadchenev, Development Director for Belarus at FIMA.

Approximately 40 FIMA employees – a joint Lithuanian and Belarusian team of project managers, supervisors and installers – worked in the project.

"The greatest challenge was to take into account all of the adjustments and improvements to the project. Since the customers continued to come up with new ideas, we had to implement them on the go. Furthermore, implementation of our automated building management solutions had to be coordinated with the work of suppliers of the other systems (heating, ventilation, etc.).

Engineering systems are normally implemented after construction works are completed. The deadlines were very stringent, and in cases where builders failed to adhere to their deadlines we had to operate on very tight schedules in order to implement and testing our systems," said Mr Shadchenev.

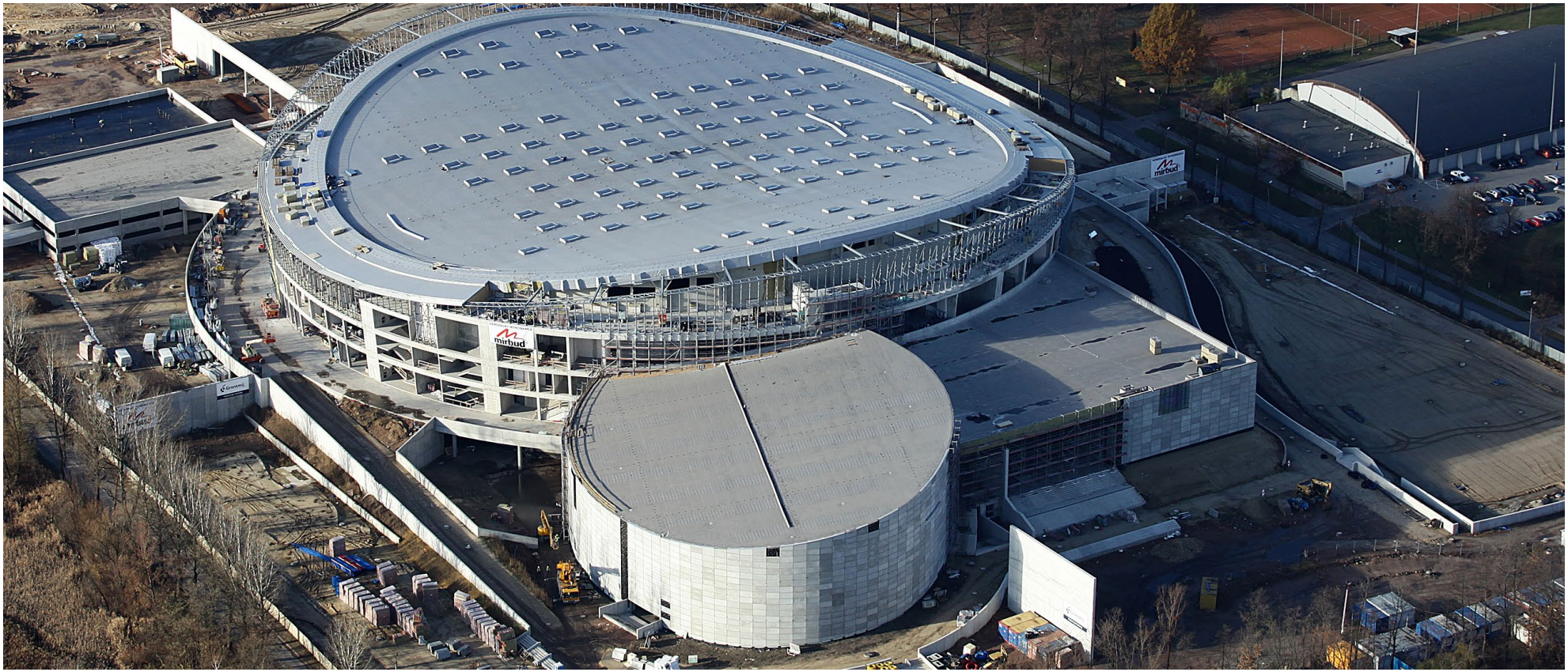
Professional recognition

The sports and entertainment complex and the hotel are provided with premium-class equipment from leading manufacturers. Most of these systems are also used in the other hotels of the chain, so Marriott management gave clear specifications which equipment and functionalities were required.

"Engineers prefer dealing with high-quality systems. For us it was favourable because most of these manufacturers are FIMA's long-time partners. Many other customers are already enjoying similar complex engineering systems. We help customers save energy, reduce maintenance costs and ease the administration workload," Mr Shadchenev said.

Polish arena chooses FIMA

From 2017, the residents of the town of Gliwice in southern Poland will be able to enjoy sporting and cultural events in one of the country's most modern arenas. The Podium Arena covers an area of nearly **70,000 sq m with up to 15,000 seats and is being built on the site of an old stadium**. The Poland-based subsidiary of FIMA will take care of the safety of arena visitors to the arena and facilities management.



FIMA Polska and the Podium Arena's general contractor, Mirbud S.A., signed a contract on the implementation of intelligent engineering systems.

The company is providing fire, break-in and burglary alarm systems and is installing access control and video surveillance equipment.

FIMA Polska also undertook to provide carbon monoxide and gas leak detectors, a voice evacuation and messaging system, other related equipment and cabling.

All the building's engineering systems will be integrated with the BMS, which will also be provided by FIMA.

The Podium Arena in Gliwice consists of the main arena, training facilities, a gym and a multi-storey car park. The facilities will be used for track and field events, tennis, volleyball, handball, indoor football and boxing. Exhibitions, conferences, fairs and concerts will also be held. The façade of the building is already in place, the roofing has been installed and the site landscaping is underway.

Catenary network modernisation

FIMA, which is electrifying the section of railway from Naujoji Vilnia to the Belarus border, is using modern equipment to install catenary lines. The equipment, manufactured by Austria's Palfinger and Italy's SVI S.p.A., means that wiring and the messenger strand can be installed simultaneously while retaining the required tensile load. The work is being carried out rapidly and to exacting standards.

"It is one of the most advanced machines of this type available on the market. It is used to electrify railways in developed countries such as Germany, Italy and the UK. This catenary network mounting equipment ensures the required contact line tension and directs cable to lugs with precision, which means that the workers only need to attach it," said Kęstas Gylys, director of Palfinger Lithuania.

The modern equipment can install lines on both European and Russian gauges.

Contact lines are installed over approximately one-kilometre long sections. When a section is started the work cannot be suspended until the installation of the wires has been completed. Ten to fifteen workers are involved in the work with the equipment.

To date, FIMA has installed nearly 50 kilometres of contact lines on the section. All the supports with lugs have been built and the contact lines have been installed in the way stations between Naujoji Vilnia, Kyviškės, Kena and the Belarusian border. Work is currently underway at stations: the transverses to which the lugs holding overhead lines will be attached are being mounted.

"This equipment is one of FIMA's major investments in this project. We are also planning to use it on other sections, as we electrify other railways both in Lithuania and in the neighbouring countries. Neither Latvia, where we are actively involved in the implementation of railway infrastructure projects, nor Estonia or Poland have such equipment," said FIMA CEO Gintaras Juknevičius.

New speed variable message signs

Traffic safety technology in Lithuania is rapidly catching up with other European countries. **New variable message traffic signs have been provided in Kaunas, on the Islandijos Highway next to the bridge over the Neris River, and on the Kaunas Western Bypass before the bridge over the Nemunas River close to Marvelė.** These signs automatically instruct drivers to slow down when traffic conditions deteriorate.

Drivers can also be warned about other hazards like high winds, slippery road surfaces or traffic congestion. This information is fed to the system by meteorological stations, road condition status and traffic intensity detectors and video cameras. All this equipment is integrated into a single management and warning system.

Based on the data provided, the smart system determines which warnings to display. The new traffic signs resemble large video screens.

The traffic signs were designed and provided by the intelligent engineering solutions company, FIMA, following an order by the Lithuanian Road Administration (LAKD). The company also provided road condition status and wind speed detectors, vehicle speed and flow analysis devices, video cameras, communications and a power supply network.

"Smart traffic management systems are being implemented in many developed countries and we are delighted that Lithuania is now catching up. Variable message signs are perfect for providing useful safety information to motorists including real-time warnings about road hazards and recommendations about safe speeds.

"The experience of other countries shows that smart traffic management systems help to reduce the number of traffic accidents," said Rokas Šlekys, director of the Solutions Department at FIMA.

The Lithuanian Road Administration is implementing smart traffic management systems with a view to improving traffic safety, raising the efficiency of road supervision and providing useful information to drivers.

A ticket to Belgrade with your old printer

Automate your home using an old office printer. This was the assignment given to a team of students from Kaunas University of Technology (KTU). They were given 12 hours to develop a device that starts cooking breakfast as soon as its owner gets out of bed. **Their work won them a ticket to the Serbian capital, Belgrade, where the European BEST Engineering Competition (EBEC) finals will be held this year.**

The KTU team – the "Combat Hedgehogs" – overcome six other teams from Latvia, Estonia and Russia during the regional EBEC competition held at KTU Santaka Valley. FIMA is one of the competition's partners.

A practical assignment

The EBEC is held throughout Europe on an annual basis. In the initial heats, the teams compete in local competitions. This year's local competitions were held at 88 universities in 32 countries. Later, regional competitions were held in 15 countries. Finally, in August about 120 of the strongest teams from all over Europe will meet in Belgrade for an event that will last for more than a week.

The Combat Hedgehogs team, which consists of KTU MSc students Dainius Stankevičius, Marius Gailius, Lukas Venčkauskas and Naglis Ausmanas, began their journey at their home university where they had been challenged by FIMA, which presented the Team Design assignment for the seventh successive year. During the first local stage, the team was pro-

vided with a music player and had to create a smart lock with a key.

FIMA's challenge during the regional stage involved the creation of an automated home and required not only theoretical knowledge but also practical and creative skills.

Do you ever wonder how many times per day or per month you do the same things? Things like turning off your alarm clock, making your morning coffee, brushing your teeth, turning on a tap or a light or locking the door?

If all these tasks were performed automatically, we would have more time to enjoy life and concentrate on our happiness.

For sure, we have plenty of electronic 'assistants' but these tend to break or become obsolete. Our goal is to ensure that they continue to be used and not simply thrown away because taking care of the environment is not a fashion but a necessity.

Let's imagine that you have some broken office printers, which EMP Recycling collected from FIMA, and that you need to create a device or a system that will change your daily routine.

Team spirit

The Combat Hedgehogs was the only team which created a network of devices. In their world, when you wake up in the morning, turn off the alarm clock and raise your head from your pillow, the machine which makes your breakfast is activated. When you arrive in the kitchen, a cup of delicious coffee and fresh pancakes are waiting for you.

"We have developed a system that can sense whether the person is lying in bed or not. If the person is still sleeping and the alarm clock goes off, the alarm clock stops as soon as the person gets out of bed. Moreover, when the person gets out of bed, the breakfast-cooking machine is also activated automatically: water for coffee is boiled and food is cooked on the stove, to be subsequently placed on a plate. The process continues until the plate is taken off the table – the system is then turned off automatically," said the designers behind the winning project.

They won thanks to their experience in earlier competitions, their excellent teamwork and their outstanding stress management skills. Every member of the team was responsible for a particular area. The guys have also worked together in the past and know each other well, which ensured they coordinated their efforts and were highly effective.

Second place went to the Latvian team, Good Question. They developed a device suitable both for drying wet shoes and warming food. The third place went to the Russian team, RadioCrew. The works of the other teams also received a lot of attention.

For instance, romantic people will certainly like the idea presented by one of the teams: they proposed surprising your girlfriend by filling a room with falling flower petals – all you would need to do is press a button.

The winner in the EBEC Case Study nomination was the Four of a K team from Riga. This team will also go to Belgrade in August. The second place went to the KTU team, STATIUS Men and Mantas.

A new generation of engineers

"Despite the assignments being serious and demanding and requiring knowledge and good technical and creative skills, students always think on their feet - their ideas are far from traditional and often make you smile. And on top of all of this, they come up with complex technical solutions to underpin their creations. Engineers are not only practical but also creative people. And sometimes, they can be romantic!" said Sigitas Kazlauskas, director of the Kaunas Unit of FIMA, who represented the company and presented the assignment to students.

The entire FIMA team present at the EBEC event – Donata Dvarionaitė, Jelena Kirilovė, Deividas Zimblys, Simonas Šidlauskas, Šarūnas Pavilionis, Darius Nemeikšis, Vytautas Visminas and Sigitas Kazlauskas –presented the assignments and tools, provided consultancy expertise to the teams and evaluated performance and also demonstrated outstanding creativity and dedication.

"Most of us remember the times when we walked the corridors of this university and looked for solutions to engineering assignments. We are therefore delighted to see the new generation of engineers who will certainly contribute to the growth and development of both our company and other innovators in the future," said Mr Kazlauskas, who is also a KTU graduate.

Solutions Era is a quarterly publication covering intelligent engineering news. It has been published by FIMA since 2006 and is available in Lithuanian, English, Russian and Latvian. Back issues can be downloaded at www.fima.lt.

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About FIMA companies

FIMA is the leading electronic engineering systems integrators in Baltic countries, offering telecommunications, security, automation and data center solutions as well as individually tailored solutions for transport and energy sectors.

The company implements intelligent engineering solutions for businesses and governmental organisations in the Baltic states and Belarus and is continuously involved in projects of technological innovation. In two decades of operation, FIMA has carried out several thousand projects of a various scale and degree of complexity.

FIMA's headquarters are based in Vilnius, Lithuania. The company has subsidiaries in Latvia, Poland, Belarus.

Do you have ideas, suggestions or comments? Email us at **solutions.era@fima.lt.**