

FOCUS



OCTOBER 2015

RESEARCH & INNOVATION IN LUXEMBOURG

FUTURE MANUFACTURING TECHNOLOGIES

N°10

KEYNOTE INTERVIEW

A driver for the innovation economy

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EDITORIAL



“We welcome and provide the highest level of assistance to international actors interested in setting up innovation and research-based activities in Luxembourg.”

 Jean-Paul Schuler

Over the past 30 years, Luxinnovation has built up the knowledge, expertise and networks that enable us to provide enterprises in Luxembourg with solid practical support. This is our mission; to act as a strong and trusted partner for companies aiming to drive forward their research, innovation and business development.

Our goal is to put Luxembourg on the international map as a recognised centre for the highest quality research and innovation, underpinned by the firm backing of a committed and responsive governmental structure. It is increasingly important to establish relationships between our companies and their counterparts abroad, and we welcome and provide the highest level of assistance to international actors interested in setting up innovation and research-based activities in Luxembourg.

FOCUS – Research and Innovation in Luxembourg, which we first published in 2008, is the perfect showcase for our country's research and innovation capabilities. It gives a regular snapshot of important developments here and enables us to draw the attention of readers worldwide to the potential for new R&D, innovation and business partnerships with Luxembourg companies and research organisations.

This 10th edition of *FOCUS* has as its main theme the production technologies of the future. Luxembourg has a proud manufacturing tradition, centred around the production and processing of materials. Materials manufacturing accounts for a large proportion of the R&D activities of the country as a whole, and the sector is constantly searching for and investing in new production technologies aimed at enhancing competitiveness and productivity.

The following pages cover cutting-edge activities related to the production of composite materials, lean manufacturing, robotics, high-tech laser applications and many others. We also take a look at the issues that will come under the spotlight at Manufuture 2015, where policy makers, business leaders, innovators and academics from all over Europe will converge to discuss the future of manufacturing. The conference, organised by Luxinnovation, takes place on 23-24 November in Luxembourg City.

Would you like to know more about research and innovation in Luxembourg or set up a meeting with our specialists? Please contact us; our teams are there to help you.

Jean-Paul Schuler

Managing Director, Luxinnovation
National Agency for Research and Innovation

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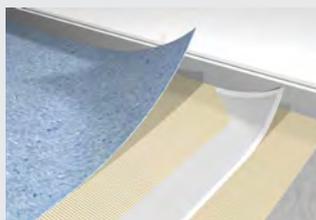
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Focus on
Leading global
innovation strategies

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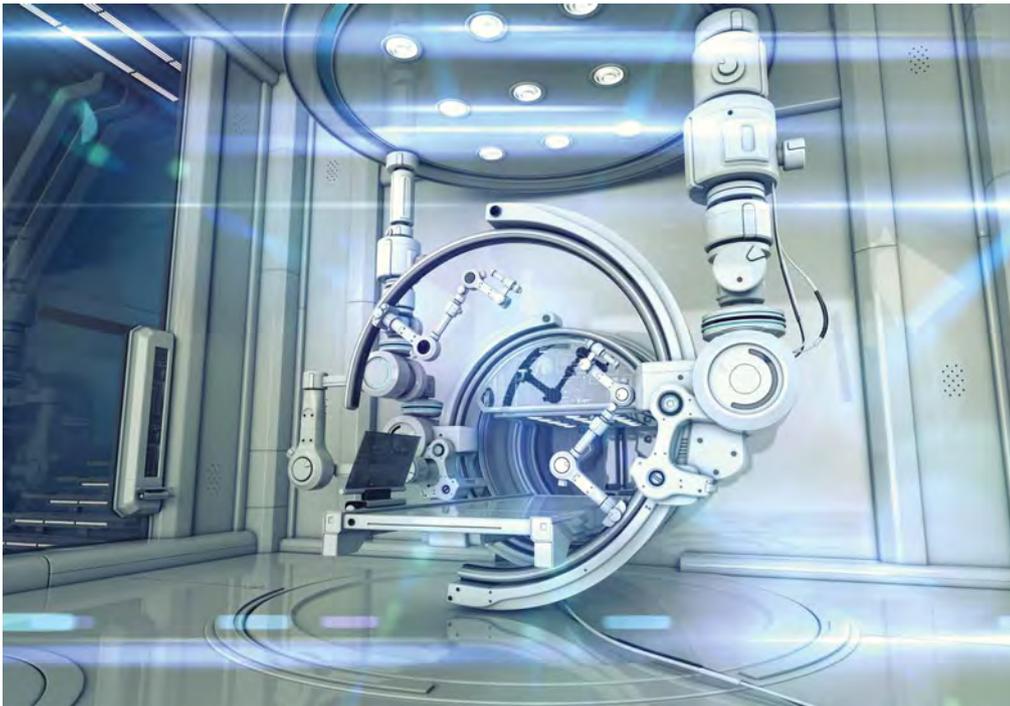


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NEWS

FROM INNOVATIVE LUXEMBOURG



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A CENTRE OF EXCELLENCE IN PARKINSON'S RESEARCH

The Luxembourg National Research Fund (FNR) has launched an 8-year programme with estimated financing of €20 million to establish Luxembourg as an international centre of excellence in research into Parkinson's disease. Building on the country's already consid-

erable expertise in this area, the programme will focus on the two most urgent challenges in the field; improving early-stage diagnosis and gaining a deeper understanding of disease stratification (the differences in the ways patients are affected).

In the first stage of the programme, the new National Centre for Excellence in Research on Parkinson's disease will recruit a cohort of Parkinson's disease patients from

Luxembourg and the neighbouring regions for the purpose of identifying predictive and progressive disease biomarkers. The Centre also plans to work with the US National Institute of Health to develop a platform to host and analyse whole genome sequencing data from Parkinson's disease cohorts drawn from countries worldwide.

www.fnr.lu

HIGHEST PROPORTIONS OF INNOVATIVE ENTERPRISES IN GERMANY AND LUXEMBOURG

According to the latest Community Innovation Survey from the EU statistical office Eurostat, 66.1% of Luxembourg companies reported innovation activity in the period 2010-2012. This ranks Luxembourg second in the EU only to Germany, and compares extremely well to the reported 48.9% average across the EU as a whole.

Luxembourg also reported the highest proportion – 53.5% – of enterprises engaged in organisational and/or marketing innovation. For share of companies conducting product and/or process innovation, Germany ranked first with 55% and Luxembourg second with 48.5%.



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TRANSNATIONAL PARTNERSHIP FOR FUNCTIONAL COATING

World-leading Swedish tooling and tooling systems company Sandvik Machining Solutions has set up a research partnership with the Luxembourg Institute of Science and Technology (LIST). The company, part of a 47,000-strong global group, aims to harness the expertise in advanced materials and nanotechnology offered by LIST's Materials Research and Technology department to develop new types of innovative functional coating for tooling systems. LIST is currently extending its network of partnerships with industry, both at home and abroad.

www.list.lu
www.sandvik.com

POTENTIAL BIOMARKERS FOR EARLY STAGE COLON CANCER IDENTIFIED

A joint research project between the University of Luxembourg, IBBL (Integrated BioBank of Luxembourg), the Luxembourg Institute of Health and the National Health Laboratory has identified two molecules that may indicate the presence of early-stage colorectal cancer. This is potentially a vital turning point; this type of cancer is often undiagnosed before symptoms appear, while early screening is not very effective.

The research team, set up to analyse whether certain proteins could serve as disease biomarkers, found reduced levels of proteins SOCS2 and SOCS6 in the colon in cases where colorectal

cancer was present. Should these findings be confirmed, they could form the basis for a new and much more accurate early detection test.

www.ibbl.lu
www.uni.lu

TESTING THE CIRCULAR ECONOMY

A circular economy describes an economy that actively aims for a positive ecological and economic impact, as opposed to a simple reduction of harmful effects. Luxembourg is already a testing ground for circular solutions and knowledge, mainly in the steel and construction industries but also in sectors such as primary manufacturing, logistics, ICT, robotics and 3D manufacturing.

A recent study initiated by a joint committee of the Luxembourg EcoInnovation Cluster, Ministry of the Economy and Ministry for Sustainable Development and Infrastructure concluded that Luxembourg has significant potential for further development in this direction. Citing the country's economic stability, responsive government, manageable size and in particular, the efficiency, drive and commitment of its local players, the study recommended the implementation of a much wider-scale testing programme. As a result, new pilot projects are to be implemented in a variety of economic sectors.

www.ecoinnovationcluster.lu

INTERNATIONAL CONFERENCE TO FUEL RESEARCHERS' CAREERS

As president of the EU, Luxembourg will host the annual Marie Skłodowska-Curie Actions (MSCA) conference on 10-11 December 2015.

MSCA, which has a budget of €6 billion, is a major plank of the Horizon 2020 programme to recreate the European research community as a vital international force. MSCA funds research training, fellowships and career opportunities for researchers of all ages and in all disciplines, with an emphasis on innovation skills and cross-border/cross-sector mobility. It is expected to finance around 65,000 researchers between 2014 and 2020, including 25,000 doctoral candidates.

This year's event, "COFUND: Synergies to Fuel Researchers'

Careers", will focus on the MSCA COFUND action, which co-finances high-quality cross-border fellowship or doctoral programmes. The conference is organised by the Luxembourg National Research Fund.

www.msca2015.lu

HIGH RANKING FOR HORIZON 2020 FUNDING

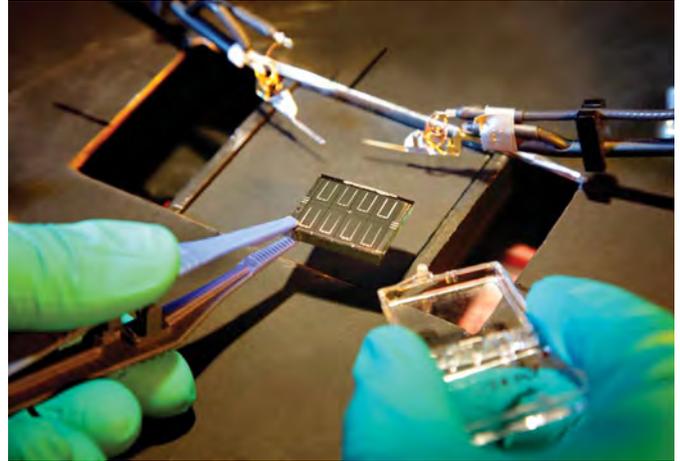
Luxembourg is currently among Europe's top performers in terms of successful applications to Horizon 2020, the EU's highly competitive framework programme for research and innovation. In the first 14 months of the current programme, 19.71% of the proposals submitted by private and public Luxembourg-based entities were successful.

Even more encouragingly for the country's evolving public research sector, both the number of projects and the amount of funding obtained were higher than in the full first three years of the previous Seventh Framework Programme.

The still-young University of Luxembourg scored a particularly notable success with the award of its first-ever European Research Council (ERC) grant.

IMPROVING THE EFFICIENCY OF SOLAR CELLS

A team of University of Luxembourg researchers and visiting scientists from Japanese electronics company TDK have made a vital modification that could radically enhance the efficiency of solar cells.



© Luc Deflorenne

In a solar cell, light passes through a conductive oxide film to the active material beneath. Ideally, the film would be 100% transparent to allow maximum light to pass through, but in practice, some of the light is absorbed by the impurities added to the film to make it conductive. The team modified the film by substituting the impurities with a gas plasma, rendering the film as conductive as before but considerably more transparent.

Similar attempts have been made in the past, but this is the first time the film has been prepared in a one-step process and proven to be stable in air. "This is a fantastic result, not only for solar cells, but also for a range of other technologies," says Professor Susanne Siebentritt, head of the University's laboratory for photovoltaics.

www.uni.lu



A DRIVER FOR THE INNOVATION ECONOMY



The creation of the Luxembourg Institute of Technology (LIST) in January 2015 marks a significant next phase for the country's ambitious and to date very successful research strategy. New CEO Professor Gabriel Crean has a clear vision for LIST as an engine for innovation and reindustrialisation, using to the full its scientific and technological excellence and international profile to provide the strongest support for innovative businesses in Luxembourg and beyond.

"If the 2008 financial crisis taught us anything, it was that Europe's economies need to be more resilient," says Professor Crean. "There is only one way to do this – recognise the value in new ideas, do the cutting-edge technological

research, create real products and services and send them out into the world. This is how I see LIST – as an innovation engine, giving companies the support they need to realise their innovative R&D projects and speed their prototype products and services into the global market."

Professor Crean describes LIST as a Research and Technology Organisation (RTO) with an international reach and standing. "We have 630 research development and innovation staff from 42 countries," he says. "We aim to achieve deep critical mass and a strong impact in our target research areas. LIST has the potential to make a big difference."

More than the sum of its parts

LIST was established in early 2015 through the merger of the Public Research Centres Gabriel Lippmann and Henri Tudor, both established in 1987 and each with strong reputations for the quality of their research and their staff. The merger provided Luxembourg with a unique dual opportunity, not only to streamline and harmonise the work of

the two centres, but also to target the strategy of the new organisation even more firmly at providing support for an innovation-driven Luxembourg economy. LIST therefore places a very strong emphasis on working with the private sector via strategic research partnerships.

To achieve this, LIST focuses on the research fields that make the most significant contribution to economic diversification in Luxembourg. The new LIST is structured into three main areas: Materials, including advanced materials and nanotechnology; IT, with a particular emphasis on innovation in services; and Environment, with a brief to focus on ways of monitoring and safeguarding natural and renewable resources. "I am particularly excited about our new premises in Belval," says Professor Crean. "It's ideal – we will be in the same district as the University, Luxinnova and the Technoport business incubator."

From plant fibre to bio-bricks

Professor Crean uses a practical example to describe the process from applied research to commercial product. In the case of "Bio-bricks" – materials created from plant fibre and used in sustainable construction – researchers first develop a means to enhance the crop yields of the plants providing the fibre. Next, they conduct a full analysis of the fibre's properties, behaviour and suitability for intended use. Third, they produce prototypes of the final product and subject them to a series of tests. With this process complete, the bio-brick process technology can be handed over to Luxembourg's industrial sector; in this case, to concrete products manufacturer Chau de Contern.

A test lab for the world

"The fact that Luxembourg is small is actually one of its biggest strengths," says Professor Crean. "And the government is very accessible and responsive. The way I see it, Luxembourg can be a European test lab for innovative products and services. We can develop and test them here in Europe and rest of the world."

As a further example, Professor Crean points to LIST's collaboration with local start-up Airboxlab on its air quality predictor Foobot. This system, designed to help users reduce their exposure to pollution, uses smart devices to measure the levels of humidity, temperature, volatile organic compounds and fine particles in indoor air. The e-Science unit at LIST is working on the analysis and visualisation of the data and developing algorithms to produce the air quality reports.

"This is how I see LIST – as an innovation engine, giving companies the support they need to realise their innovative R&D projects and speed their prototype products and services into the global market."

 Gabriel Crean

7 Multinational experience

Professor Crean has a degree in Electrical Engineering from Trinity College, Dublin and a PhD in Physics and Material Science from the Université Scientifique, Technologique et Médicale de Grenoble. In Ireland, he served as Director of the Tyndall National Institute, the country's leading ICT research centre, as Professor of Microelectronics at University College Cork and as Vice President for Research and Innovation at the Athlone Institute of Technology. In France, he joined the CEA as Scientific Director, later becoming Vice President for Technology and Director for Europe, and he is a visiting professor and research policy adviser to the President of the Institut National Polytechnique de Grenoble. He holds an honorary doctorate from the University of Technology of Wroclaw, Poland.

Professor Crean chaired the Sherpa Group on the European Commission's Key Enabling Technologies (KET) initiative and is on the board of the European Commission Mirror Group on Smart Specialisation. He also has experience as an entrepreneur and has launched several start-up companies.

Luxembourg Institute of Science and Technology (LIST)

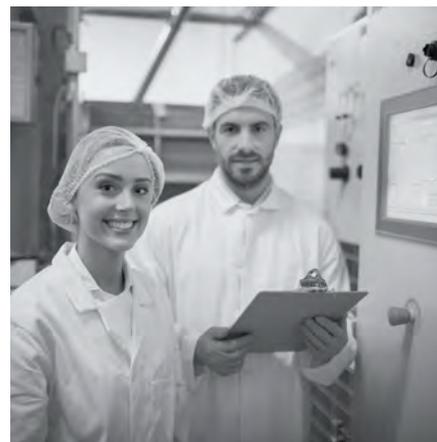


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FUTURE MANUFACTURING TECHNOLOGIES

Luxembourg's manufacturing sector was established over a century ago during the heyday of the nation's steel industry. Over subsequent decades, the focus shifted from traditional materials to high added value niche products, many of which have become the market leaders of today. The materials and production technologies sector, which currently accounts for 8.3% of total national employment and 4.6% of GDP, focuses on highly-automated production lines, robotics, additive manufacturing and the reduction of energy consumption and waste production. Global names active in the sector include ArcelorMittal, DuPont de Nemours, Goodyear, IEE, EURO-COMPOSITES, Tarkett and CERATIZIT.



HOW TO GROW THE MANUFACTURING SECTOR

Determined to “reindustrialise for the 21st century” to reverse the current downward trend, the EU aims to raise industry’s share of EU GDP to 20% by 2020. Luxembourg, which over the course of the last few decades has succeeded in creating a high skill, high value-adding manufacturing sector, will host the bi-annual Manufacture conference in November this year. FOCUS spoke to three of the principal movers behind the event.

The chairman of the European Manufacture platform, Professor Heinrich Flegel of Daimler AG, describes Europe’s mission as “to encourage research and development in order to speed up industrial transformation.” The EU’s strategy is to create a smart, sustainable and inclusive economy delivering high levels of employment, productivity and social cohesion. To do that, says Professor Flegel, “We need to secure high value-adding employment and win global market share.”

Knowledge and industry together

The EU’s target is to raise industry’s share of EU GDP from the present 16% to 20% by the year 2020. “The economic importance of industrial activities is much more significant than these figures suggest, because industry accounts for over 80% of Europe’s exports,” says Professor Flegel. According to Andrea Gentili, Deputy Head of Unit with the Directorate General for Research & Innovation at the European Commission, this will be no easy task: “We have a knowledge advantage in Europe, but we have difficulties translating that into new products and services. The financial crisis made those difficulties more acute.”

“Manufacturing companies need to invest in replacement, rationalisation – to stay competitive – and expansion. About the same amount needs to go into each one,” says Professor Flegel. He emphasises that Europe cannot simply rely on strong R&D performance: “We have to bring our innovative ideas to market before anyone else, and we cannot do that without an equally high-performing manufacturing base.”

Encouraging long term innovation

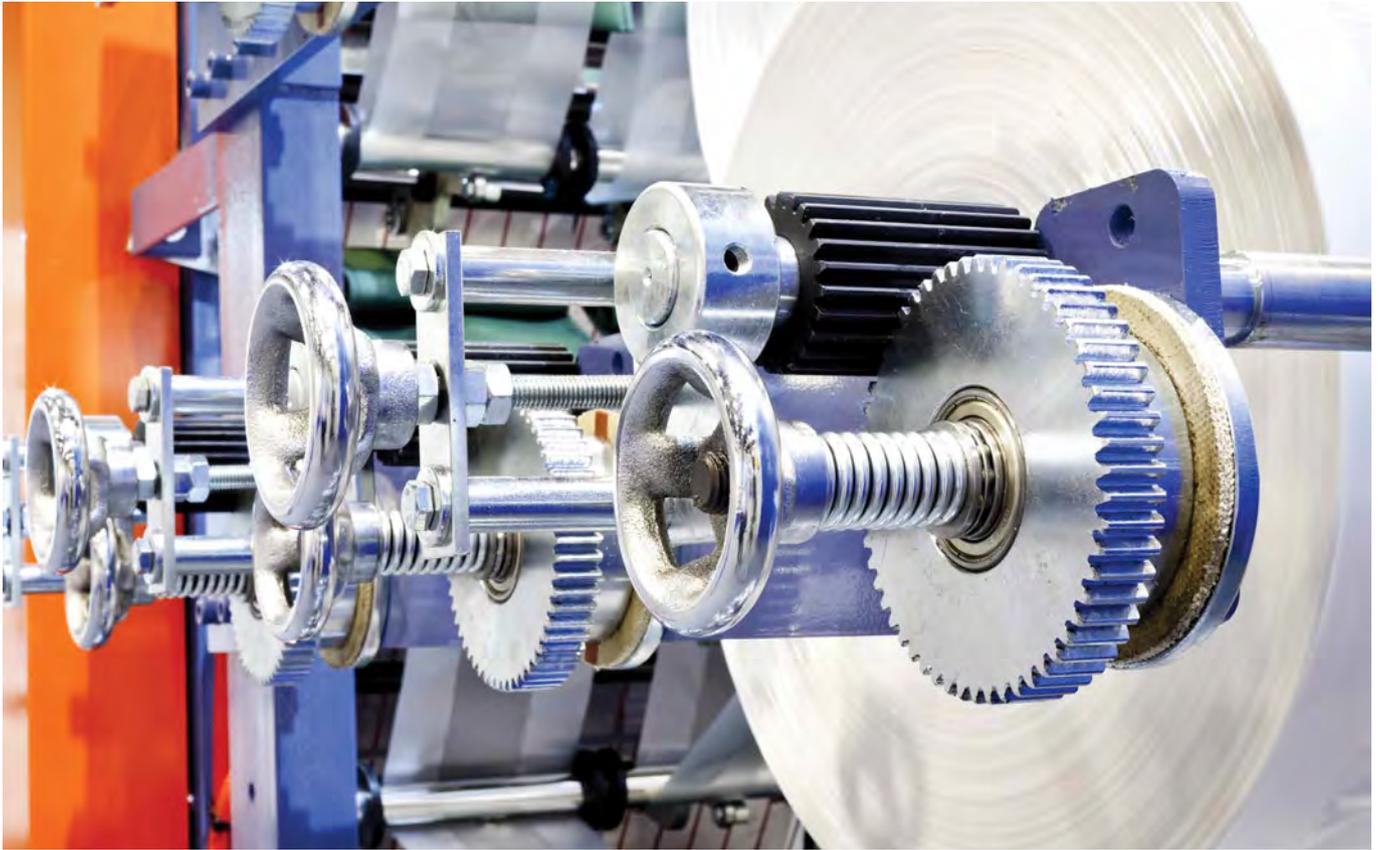
As part of its reindustrialisation drive, the EU is making nearly €80 billion available for research and innovation via its 7-year Horizon 2020 programme. One of the aims of the Manufacture platform is to publicise Horizon 2020 and so encourage European industry to think strategically about the longer-term benefits of investing in product and process development.

The EU expects the Horizon 2020 funding to encourage private companies to invest in R&D, especially as it is hoped that the programme will stimulate targeted support and initiatives on a national level. Similarly, companies – in particular small and medium-sized enterprises – may feel more confident about pursuing a potentially groundbreaking idea if there is a prospect of securing public co-finance. As an example, Mr Gentili cites eight public-private partnerships set up by the European Commission within the framework of Horizon 2020: “For each euro of public funding invested in this particular programme, we expect the private sector to invest a further three to ten euros in developing new technologies, products and services.” This and similar projects will be looked at in detail at the Manufacture 2015 conference.

Showcasing Luxembourg

Michel Wurth is chair of the Manufacture 2015 programming committee and a board member of Luxembourg-based world leading steel manufacturer ArcelorMittal. “This event offers Luxembourg a unique opportunity to showcase its manufacturing sector and potential for innovation,” he says. “Sectors such as steel, ICT, plastics, logistics, automotive components and a network of small and medium-sized industries in different fields are very well developed in Luxembourg. The numerous start-up initiatives taken may also have a long-term influence on the structures of industry.”

Luxembourg is a logical choice for this year’s conference. As Mr Wurth says, “Given that Luxembourg is the largest investment fund centre in Europe, special attention will be paid to EU financial tools that may be used to stimulate industry.” Moreover, the country’s current presidency of the EU Council of Ministers is expected to generate an extra level of interest on the part of national and European decision makers.



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On top of that, Mr Wurth sees Luxembourg as an interesting example of what a country can do: “The Grand Duchy has achieved international standing for its high quality manufactured products and cutting-edge R&D competencies in the manufacturing industry. Today, about 820 companies are fuelling this still highly promising economic pillar whose production output has remained stable and even increased over the past decade. The manufacturing industry has thus proven capable of reinventing itself continuously, which I consider an auspicious feature to compete on a European and global scale in the future.”

“Europe’s mission is to encourage research and development in order to speed up industrial transformation.”



Heinrich Flegel

7 MANUFACTURE 2015 23 & 24 November in Luxembourg

“The conference is a forum for all stakeholders in the manufacturing sector,” says Michel Wurth, chair of the programming committee. “Participants will discuss future project cooperation and determine an approach that allows actors to better exploit the opportunities offered by Horizon 2020.”

Manufacture 2015 will:

- Assess the progress of European manufacturing research and development
- Define the conditions needed for successful reindustrialisation in Europe
- Identify and endorse new policy instruments, business models, support mechanisms and technologies
- Develop recommendations for policy makers.

Manufacture is a pan-European network of business leaders, researchers, innovators, representatives of key technologies and European and national policy makers. Up to 800 senior manufacturing industry players will attend the event, to be held at the European Convention Center Luxembourg in Luxembourg City.

www.manufacture2015.eu

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CONSTANTLY REINVENTING MANUFACTURING



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“With more than 800 satisfied manufacturing companies based here, our best ambassadors by far are their senior managers.”

↳ Patrick Nickels

Manufacturing is in Luxembourg’s soul. Although fundamentally a services economy — particularly in finance — it is committed to positioning itself as a world class location for high-tech industrial production. Luxembourg offers a unique blend of benefits for capital intensive, high value-adding businesses — once they come here, they rarely leave.

Supported by a tight network of international investment offices, government ministers and business representatives travel the world in the drive to attract and retain more high-tech manufacturing firms to Luxembourg. Once here, even the smallest companies have easy access to the government’s decision makers. As a small country, Luxembourg has to respond fast to changes in the business environment, and no-one understands the market better than business leaders facing tough international competition.

Knowing the market

“We have a good understanding of the types of firm that gain the most benefit from investing in Luxembourg,” says Patrick Nickels, Director for Industry at the Ministry of the Economy. “What we look for are high value-adding, usually capital-intensive businesses.”

In many ways, Luxembourg is seeking investment partners in its own image: internationally connected, highly experienced, skilled and ambitious. One such company is International CAN SA, part of the German cosmetics group Maxim, which set up in Luxembourg in 2001 via its acquisition of manufacturing and services firm Cosmolux. In May this year, the company invested €35 million in a new aluminium spray-can production plant in the eastern town of Echternach, a move that will lead to the creation of 200 new jobs in the next two years, almost tripling the Maxim group’s headcount in the Grand Duchy.

Our businesses, our ambassadors

The fact is, companies like working in Luxembourg. However, it can be hard to convey that message above the clamour of the competition, and particularly tough to reach senior executives from Asia and the Americas. “We work hard to take this message to the world, and with more than 800 satisfied manufacturing companies based here, our best ambassadors by far are their senior managers,” says Mr Nickels.

Decades of reinvention

Luxembourg’s experience has been hard won. By the 1970s, the country had been primarily dependent on steel for over a century, with half its national income generated from exports. When the 1970s steel crisis hit, this tiny country was in no position to even consider subsidies to keep businesses afloat. “As an export economy with a very small domestic market, it took us no time at all to grasp the implications,” says Nicolas Soisson, director of Fedil – Business Federation Luxembourg, the group which represents the manufacturing sector. “We began a controlled restructuring of the steel industry, and embarked on a national mission to create economic diversification.”



“Industry was always central to our plans,” he adds, “but we knew we needed innovative ways to develop other specialisations and we cast our net very wide.” Today, of course, Luxembourg’s main export earner is its diverse, world-class financial sector, but the country is also very active in other, perhaps more surprising fields. “Many people thought a satellite project was crazily ambitious,” says Mr Nickels, “but now, SES is not only a world leader but one of the cornerstones of our growing space industry.”

Diversification past and future

Manufacturing diversification has been a central plank of government policy since the late 1940s, when the focus was very much on attracting US companies into Europe.

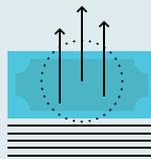
Early investment came from tyre manufacturer Goodyear, which set up in Luxembourg in 1949, materials group DuPont de Nemours (1962) and General Motors – now Delphi Automotive – which began operations in 1979. “Much of this early investment was mainly about US industry seeking a foothold in the European market,” explains Mario Grotz, director general for research, intellectual property and new technologies at the Ministry of the Economy. “For us, however, it was more about looking for new directions in the wake of the steel crisis.”

“In the 1980s, we began to invest much more heavily in research and development, primarily by supporting the private sector and setting up public research centres,” adds Mr Grotz. In response, companies across all sectors started to ramp up their research and the country began to attract a wide range of high-tech businesses. One of the earliest arrivals was Canadian firm Husky Injection Molding Systems, which opened a Luxembourg branch in 1984; another, in 1986, was US firm Guardian, one of the world’s largest manufacturers of float glass and fabricated glass products. Both companies maintain their Luxembourg bases today.

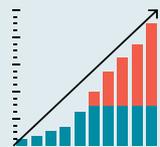
Manufacturing industry in Luxembourg



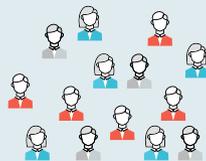
4.6%
GDP



€8.4
billion turnover



3.2%
annual growth rate



32,000
employees

Largest manufacturing companies

ArcelorMittal

4,260



Goodyear/Dunlop Tires

3,250



CERATIZIT

1,300



DuPont de Nemours

1,150



Husky Injection Moulding Systems

890



EURO-COMPOSITES

740



Source: STATEC

“By the time of the upturn, many of our companies had actually made massive improvements to their product ranges.”

 Mario Grotz

From adversity to opportunity

“The competition in Europe for foreign investment increased radically after the fall of the Iron Curtain,” says Mr Soisson. “It became clear that we had to up our game even further and focus our industrial strategy even more tightly on high technology, high skills and high capital intensity.” During the post-1990 period, Luxembourg increased its support for R&D and innovation tenfold, founded its research-focused University and introduced tax breaks on capital investment to help boost the productivity of the manufacturing sector.

The government also provided intelligent practical support in the period after the 2008 crash. “The state provided employment subsidies so that firms affected by the slowdown could hang on to valued employees,” says Mr Soisson. “With output down, staff could concentrate on innovation; by the time of the upturn, many of our companies had actually made massive improvements to their product ranges,” adds Mr Grotz. “Anyone with an ambitious business really ought to come and talk to us; they’ll be very pleasantly surprised.”

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➤ WHY IS LUXEMBOURG THE PLACE FOR KNOWLEDGE BASED, CAPITAL INTENSIVE MANUFACTURING?



MULTINATIONAL, SKILLED WORKFORCE:

We can talk to global clients in their own language.



CENTRE OF WESTERN EUROPE:

Luxembourg is culturally and geographically close to Europe’s main business capitals, all of which can be reached easily by plane, train or road. As a small country, it is commercially neutral.



KNOWLEDGE ECONOMY:

Earnings are high because the economy is driven by clever people working in a high-tech environment.



ENGAGED DECISION MAKERS:

Politicians and civil servants are ready to listen and respond to requests from even the smallest firms.



FOCUSED ON INNOVATION:

Our public research infrastructure is shaped in partnership with the private sector.

Financial and practical support is available from the government, public bodies and partners in private industry.



NEW ROOM FOR GROWTH

CERATIZIT, a long-time pioneer in the development of hard material products for cutting tools and wear protection, has significantly expanded its R&D capabilities with the establishment of a 2,000 m² dedicated research facility at its group HQ in Luxembourg. This will create a fertile environment for new ideas with the space and facilities to bring them to life.

“In some ways, this is a new strategy for us,” says CERATIZIT’s Executive Board Co-Chairman Jacques Lanners. “We have significantly upgraded our laboratory equipment and now have 100 research staff.”

Time, tools and brainpower

The group will engage in fundamental as well as applied research, investigating the basic physical and chemical properties of the hard materials and coatings it uses in its prod-

ucts. “Great things have come out of our R&D work over the years,” explains Dr Ralph Useldinger, Manager Group Analytics and Fundamental R&D. “Our researchers will have the time and the tools they need to follow up properly on their ideas and develop ground-breaking new products, techniques and production methods.”

“Luxembourg is a high-tech manufacturing location and the perfect environment in which to make the most of our people’s high value-adding skills and push back technological boundaries,” adds Mr Lanners. “We are building up our brainpower and ensuring there are no practical or physical limits to what our teams can achieve.”

The client, the partner

CERATIZIT believes in treating its clients as partners rather than simply as customers. “They don’t just give us one of their finished items and ask us to make improvements,” says Mr Lanners. “We work together from the design phase onward to ensure the final product is precisely what they need. With the knowledge we have built up over the years, we can look critically at the design, materials and shape of the product, while our ongoing research helps us bring to the table a fresh, innovative approach.”

“We don’t seek to reinvent the wheel,” adds Mr Useldinger. “However, we can work at the nano-technological level to alter the composition of our bulk materials and coatings.” The company is a firm believer in the benefits of tech-

“Luxembourg is a high-tech manufacturing location and the perfect environment in which to make the most of our people’s high value-adding skills and push back technological boundaries.”

7 Jacques Lanners

niques such as computer simulations, used to analyse and improve the performance of a material or product. This knowledge is also applied to improve the efficiency and effectiveness of the production process.

The innovation HQ

The group spends around 3% of its annual turnover on R&D. Luxembourg acts as Innovation HQ, supporting other research units in Austria, Germany and Italy and at the group’s affiliated companies. Being in the Grand Duchy helps: “We would invest in R&D anyway,” says Mr Lanners, “but with the financial assistance we receive from the state, we can do a great deal more.” Practical support is also available from the University and the public research centres, which over the last decade have significantly ramped up their direct collaborations with industry. As a knock-on effect, these bodies also attract talent to the country.

Rethinking the new

In addition, Luxembourg is an excellent base for high quality manufacturing operations. Its central European location and skilled multilingual workforce make it easy for companies to communicate with clients across the continent, and low employer social charges help to keep costs under control.

As part of the extension to its Mamer headquarters, CERATIZIT has added a further 5,000 m² of industrial capacity. According to Mr Lanners, the simple fact of having a major production facility on-site promotes new thinking, new products and new processes. “Innovation is embedded in our culture,” he says. “Even though we have over 100 people dedicated solely to research, all our professionals have the innovative, entrepreneurial attitudes that enable us to find fresh solutions.”



7 Invention for growth

Owing to its firm commitment to innovation, the CERATIZIT GROUP has been a trailblazer in the hard metal industry for over 90 years. A family-owned firm, it develops and produces unique hard material solutions for cutting tools and wear protection, supplying clients in industries including automotive, energy and stone working. The group is a market leader in numerous sectors and holds over 600 patents that are used in thousands of their products.

The group employs 5,800 people at 23 production sites and over 50 sales offices worldwide. About half of its turnover comes from Europe, with Asia accounting for 35% and the Americas 15%. The signs indicate that sales in Asia will play an increasingly important contribution over the coming period.

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**„CREATIVITY AND INNOVATION
ARE KEY TO FUTURE SUCCESS“**

Dr. Marc Elsen, Project Manager R&D Department

CERATIZIT – A passionate pioneer in the hard metal industry

For over 90 years, CERATIZIT has been a pioneer developing exceptional hard material products for cutting tools and wear protection. The family owned company, headquartered in Mamer, Luxembourg, develops and manufactures highly specialized tungsten carbide cutting tools, inserts and rods. The CERATIZIT GROUP is the market leader in several wear part application areas and develops successful new types of hard metal, cermet and ceramic grades used for instance in the wood and stone working industry.

The leader in material technology is continuously investing in research and development and holds over 600 patents. Innovative hard metal solutions from CERATIZIT are used in machine and tool manufacturing and many other applications including automotive, aerospace and oil and gas.

LEADING INNOVATION IN A NICHE MARKET



Lighter, more efficient and better-performing, composites are rapidly replacing metals as the material of choice in the air transport, wind energy, marine, motor and sports equipment industries. California-based Airtech, the world's leading manufacturer of vacuum bagging and tooling materials used to make composite parts, spoke to *FOCUS* from its European HQ in Luxembourg.

"Airtech does not manufacture products using composites, nor does it supply resin or carbon fibres. It supplies the processing materials required in the composite production process," says Airtech Europe's General Manager Carl Christiaens.

Airtech Europe, set up in Luxembourg in 1991, is a division of California-based Airtech Advanced Materials Group, founded in 1973. Airtech, which also has facilities in Tennessee, England and China, supplies industries including aerospace, wind energy, maritime, printed circuit board, solar energy, sports and leisure equipment and high-performance automotive and motorsport.

A one-stop-shop

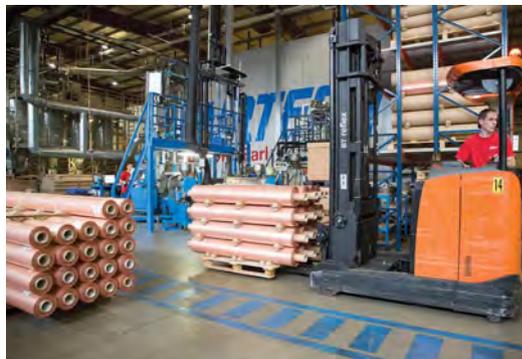
Airtech supplies not only individual components such as bagging film and pressure-sensitive tape, but the complete portfolio for making composite parts. The materials supplied vary depending on the size of the part, the process used and the temperature at which the materials are combined.

"Composite production is a labour-intensive process, so we also offer customised kits – film cut to the exact final size,



“We’ve found that Luxembourg is easy. It’s easy to do business, easy to network and easy to get access to key people.”

 Carl Christiaens



for instance – and collaborate with the client to come up with the best bespoke solution. We can also train our customers in how to use our materials,” says Mr Christiaens.

Continuous improvement

“To stay competitive, we need to be extremely efficient and keep our people highly motivated,” Mr Christiaens explains, adding that the company uses the Japanese “Kai-zen” continuous improvement method. Airtech’s customers have high expectations: “We have to keep on being proactive and finding solutions. Even though composites cost more than, say, aluminium, there is increasing demand for them in many sectors because they offer greater energy efficiency.”

Doing business the easy way

“Airtech had initially been thinking about England for a European base, but chose Luxembourg because of its central location, the approachability of its government and its multicultural, multilingual workforce,” says Mr Christiaens. “We’ve found that Luxembourg is easy. It’s easy to do business, easy to network and easy to get access to key people.”

Airtech has worked with Public Research Centre Henri Tudor, now LIST, and is a member of Luxinnovation’s Materials and Production Technologies Cluster. “We have certainly seen benefits from the government’s programmes to fund innovation,” says Mr Christiaens. “We’re also very much behind the idea of setting up a composite competence centre in Luxembourg, which we think is a tremendous initiative.”

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Composites

A composite combines two or more materials with different physical or chemical characteristics to form a new material that can be lighter and stronger than the individual constituents.



MODELLING THE FUTURE

e-Xstream engineering's award-winning Digimat software has virtually eliminated the painstaking trial-and-error method of creating new composite materials in the laboratory. Digimat is now used by leading international manufacturers to model the advanced composite materials needed to produce lighter, more energy-efficient cars and aircraft, thereby shortening development time and significantly reducing costs.

"e-Xstream Digimat software is for state-of-the-art modelling of composite materials and structures," says co-founder and CEO Dr Roger Assaker. "It allows our clients to analyse and predict the behaviour of composite materials and to design and manufacture high-performance, innovative composite parts. This means

shorter timescales for development, prototyping and testing, decreased time-to-market and a significant reduction in development costs."

Of the world's top 20 OEMs – original equipment manufacturers – 17 use Digimat. "Our clients include automotive and aerospace companies, consumer electronics manufacturers, materials suppliers and medical device manufacturers," says Dr Assaker. "Digimat is also widely used in the world's top universities and research institutes."

A truly international company

Dr Assaker, who has a PhD in aerospace engineering and an MBA in international business, set up e-Xstream engineering in 2003 as a spin-off of Belgian Université catholique de Louvain. The company decided to set up a second HQ in Luxembourg in 2004, attracted by the facilities on offer at the Ecostart business incubator in Foetz (now Technoport 2). "We have received a lot of support from the Ministry of the Economy," says Dr Assaker.



e-Xstream draws its employees from the Belgian, French and German regions surrounding Luxembourg. “43 of our current 46 employees are engineers – 26 have PhDs – and at the moment, we’re taking on around 10-13 new staff a year. Our engineers develop our software, of course, and also provide composite engineering consultancy, either for analytical projects on our company premises or for full-time assignments on our clients’ sites.”

Dr Assaker rates Luxembourg highly as a business location and is an active member of Luxinnovation’s Materials and Production Technologies Cluster. “With 95% of our business coming from outside Luxembourg, we are a truly international company. We have clients in America and Asia as well as in Europe, and have even done a project in New Zealand.”

Partnership, synergy, growth

In September 2012, e-Xstream was acquired by MSC Software of Newport Beach, California. MSC develops proto-

typing simulation software for the aerospace, automotive, electronics, and medical sectors, among others. “Our companies fit together well,” says Dr Assaker. “Our increased capital base makes us a better partner for our larger customers and has enabled us to grow faster. I am MSC’s Chief Materials Strategist as well as e-Xstream’s CEO.”

Award for enhancement

In line with the rapid development of the composite sector and the ongoing pressure for weight reduction in planes and motor vehicles, e-Xstream has been operating a six-monthly schedule for new Digimat software releases. Meanwhile, in 2015, Digimat-VA (Virtual Allowables) was awarded the JEC “Top Innovation” award for composite manufacturing. JEC, the world’s largest composites industry group, launched this award 14 years ago to recognise the leading contributors to “improving composites technology and enhancing value for end-users”. “We are proud to be included in this distinguished group,” concludes Dr Assaker.

“Our clients include aerospace companies, consumer electronics manufacturers, materials suppliers and medical device manufacturers.”

 Roger Assaker

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DELPHI

Innovation for the Real World



99.99% RELIABLE: ROBOTICS FOR TOTAL QUALITY CONTROL



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When most people hear the word “robot” they think of R2-D2 and C-3PO from Star Wars or the more menacing Terminator. Friendly or frightening, the robots of popular culture are usually portrayed as having personalities and qualities that make them seem as much human as machine. The robots at Fanuc Robotics in Luxembourg, however, are not anthropomorphic, but powerful industrial machines that lighten the tasks of workers and significantly improve production efficiency.

“Fanuc is a world leader in robotics and unusual in that we are completely vertically integrated,” says Nigel Ramsden, Engineering Manager at Fanuc Robotics Europe. “Everything we use, we make ourselves, down to our circuit boards. It gives us total quality control.” Fanuc also produces robotic injection moulding, wire electro-discharge cutting and high speed milling machines.

From its home campus in Oshino, Japan, Fanuc has developed a significant European presence. “We have around 200 staff here in Echternach and a further 1,000 in 16 sites throughout Europe,” adds Mr Ramsden. “Our largest and longest-established offices are in Western Europe, and we have a network of new and rapidly-growing Eastern European offices stretching as far as Russia and Ukraine.”

Versatility and strength

Articulated robots are used mainly for factory-floor tasks such as assembly, bin picking, loading and unloading, painting, palletising, packing, testing, measuring and welding. The corporation supplies a wide variety of robot types to industries including aerospace, automotive, electronics, food stuffs, plastics, metal casting, medical and pharmaceutical.

The European automotive industry – one of Fanuc’s major clients – imposes stringent performance criteria on its vendors. While Fanuc robots are produced in Japan, testing against client specifications is conducted at the corporation’s Echternach site. “Fanuc robots are 99.99% reliable, which is why there are over 360,000 Fanuc robots at work worldwide,” says Mr Ramsden. “We are proud of our customer-centric culture and of taking the long-term view in our client relationships.”

Fanuc also produces Delta robots, which have hand-like dexterity and are used for high-speed, small part handling that requires great versatility. Their compact size allows them to be easily integrated into a production line for use in electronics, food, medical and pharmaceutical production.

Collaborative robots: safety at work

In most production lines, people need to be protected from robots. The machines work behind barriers and workers are careful to keep out of their way.

Collaborative robots are a game-changer. A single glance at Fanuc’s CR-35iA indicates that here is a different kind of robot. Fanuc robots are traditionally yellow. “Welcome to the Yellow world!” Fanuc’s website announces. But this robot is green. “We wanted the CR-35iA to be distinct from our other robots,” says Mr Ramsden.



© Fanuc Europe

Touch the pliant rubber covering of this robot and the machine immediately stops, which means it can work safely side by side with a human collaborator. It can lift up to 35 kilos, significantly more than the 23 kilo safe limit for a human worker. It can be fitted with a vision sensor, which means that if a robot is, say, moving wheels from one location to another and one of the wheels is out of alignment, it will automatically readjust to the different position and continue with its task. The human/robot team is ideal for the heavy repetitive jobs common in the automotive, packaging and distribution industries. “And they have Fanuc’s ultra-reliability,” adds Mr Ramsden.

“We are proud of our customer-centric culture and of taking the long-term view in our client relationships.”

 Nigel Ramsden

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THE REWARDS OF PERFECTION

Perfection is crucial in the aerospace and medical industries, where even the tiniest fault in a part can literally put lives at risk. A leading aeronautics client recently gave high-tech components provider Saturne Technology an award for supplying 300,000 ultra-high precision parts a year, each one 100% flawless. The company's founder and CEO Walter Grzymlas spoke to *FOCUS* about the revolution in production and technology, and Luxembourg as a location for high-tech manufacturing.

Saturne specialises in the design and manufacture of high-tech laser applications for cutting, drilling, welding, re-surfacing and laser sintering. "Our laser machines give us precision at less than one-hundredth of a millimetre on a wide range of materials, including metals, ceramics and silicon," says Mr Grzymlas, adding that with the current pace of technological development, investing in innovation is key to staying ahead of the market. The firm mainly supplies the aeronautic, space and medical industries, but also works with a diverse range of other businesses.

Shaping the future

Saturne leads in configuring a new generation of systems along similar lines to 3D printing, in that they add material during the production process as opposed to taking it

away. Techniques such as additive manufacturing and laser fusion work on the principle of gradually building up microscopic layers of metal or ceramic powder material to create three-dimensional parts and components in sizes ranging from 2-600 cubic millimetres.

“This is truly revolutionary technology – it can create any shape, no matter how complex,” says Mr Grzymlas. “You can’t mould a shape like a hollow form, or make one on a machine. Or if you did, it would be prohibitively expensive and nowhere near accurate enough.”

Infinite possibilities

Processes of this type open up possibilities far beyond the reach of traditional manufacturing. Products are of the highest quality, reasonably priced and supplied on time, while the flexibility of the process allows for speedy modification and customisation. There are no nasty surprises for the client – each part is scanned, verified and thoroughly tested, and performs exactly as it is supposed to.

Saturne recently configured and commissioned the world’s largest additive manufacturing machine, unveiled at this year’s Paris Air Show. “We have embarked on a five-year investment and development programme,” says Mr Grzymlas. “As part of that, we will launch a new additive manufacturing machine every year.”

A very good choice

Mr Grzymlas was born in Maizières les Metz in France and was working for a local company when he took the decision to set up on his own. “I looked at Luxembourg as a possible location and was pleasantly surprised by how attractive it was,” he says. “I started in 2000 with a team of three. We’ve got 11 staff now, which we’ll double by the end of the decade, and our annual turnover is €3 million.” The company predicts around 30% annual sales growth and is currently setting up international offices in Canada and Dubai.

“Luxembourg was a very good choice for us,” he adds. “Even though we are relatively small, we have received significant personal and practical support. In particular, the financial assistance we have received from the government has enabled us to maintain a very high-quality research and development programme, essential in this industry. We have also collaborated with the public research centres on a number of projects, and we are setting up something similar with the university. All in all, we are very happy indeed to be in Luxembourg.”

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“This is truly revolutionary technology – it can create any shape, no matter how complex.”

Walter Grzymlas



LEAN TECHNIQUES, HIGH PERFORMANCE

People who associate Luxembourg purely with financial services are often surprised to learn it has a thriving automotive components sector. Raval, which produces fuel tank valves, and Cebi, which provides temperature and oil level sensors, share a commitment to “lean” manufacturing and continuous product innovation, disproving the notion that industrial production can only succeed in a low-cost economy.

The first thing a visitor sees on walking into Raval’s premises in Bascharage is a board listing Raval’s customers. From Volkswagen, Audi, Skoda and Seat to Land Rover, Mini and even Ferrari, it reads like a “Who’s Who” of European car manufacturing.

Raval, founded in Israel in 2000 as a spin-off of Israeli parent company Raviv, took the decision to expand into Europe after securing a contract with Volkswagen to supply valves for its Polo, and later Golf, models. The company chose Luxembourg on the basis of its central location, multilingual workforce and, in the words of Raval Europe’s Managing Director Julian Proffitt, its “mindset of quality awareness.” In 2002, Raval moved into the Ecostart

(now Technoport 2) business incubator in Foetz, and five years later relocated to Bascharage, where it currently employs a workforce of 108.

Raval offers three families of products: the roll-over valve, or ROV, vents the fuel tank during normal operation and seals off the venting openings to prevent fuel leaks if the vehicle rolls over; the fill limit venting valve, or FLVV, ventilates the fuel tank until the maximum filling volume is reached and maximises its capacity; and the inlet check valve, or ICV, connects the filler tube with the fuel tank to allow fuel to flow in during refuelling, minimises the flow of fuel up the filler tube and restricts gas emissions for environmental protection.

Kaizen for optimum production

“Getting the most out of both people and machines can be a challenge”, says Mr Proffitt. “A machine is more consistent, but if there’s a production problem, only a human being can raise the alarm.” Raval adheres to the “Kaizen” method, an approach that encourages everyone involved in a process to take responsibility for improving it. “We try to involve everyone concerned,” says Mr Proffitt. “It’s good for productivity and good for morale.” The company also uses the lean technique Single Minute Exchange of Dies (SMED), designed to minimise or even eliminate equipment downtime during changeovers.

“We will really need to think outside the box on this one.”

 Julian Proffitt



Mr Proffitt says Raval’s next challenge will be the development of valves for hybrid cars. “We will really need to think outside the box on this one,” he says. “Hybrid cars have totally different requirements for fuel tank venting – their battery packs generate heat and they don’t use the fuel tank all the time.”

Temperature sensors for the world

The recently renamed Cebi, formerly ELTH, specialises in temperature sensors for cars and household appliances. The first Cebi companies were established in Luxembourg and Switzerland in 1976, and since then the group has added production facilities in Italy, Poland, Spain, Brazil, China and, most recently, Mexico. Last year, Cebi Luxembourg sold 75 million parts and reported a turnover of €82.2 million.

“When we set up the group holding company in Luxembourg in 2011, I quit my job in a law firm and joined the family business,” says Executive Board member Lynn Elvinger. Cebi currently employs around 3,000 people worldwide, including 650 at its Steinsel plant, 50 of whom work on R&D.

“There is at least one Cebi product in most European cars, and you probably also have a Cebi thermostat in your dishwasher, washing machine or tumble dryer.”

 Lynn Elvinger

Products for every household

Cebi’s automotive products include thermostats for cooling systems and warning switches, negative temperature coefficient (NTC) temperature sensors, positive temperature coefficient (PTC) air heaters, diesel fuel heaters, oil level sensors, liquid tanks for windshield wiper systems and telescopic nozzles for headlamp cleaning. For domestic appliances, the company supplies fixed temperature thermostats, NTC temperature sensors and no-frost thermostats for refrigerators and freezers. According to Ms Elvinger, “There is at least one Cebi product in most European cars, and you probably have a Cebi thermostat in your dishwasher, washing machine or tumble dryer.”



Award for innovation

“We have a zero-defect philosophy,” says Ms Elvinger. “Each product undergoes 100% quality control before it is shipped to the customer.” Cebi is also an active member of Luxinnovation’s Automotive Components Cluster and was part of its contingent at the Frankfurt Auto Salon.

In 2014, Fedil – Business Federation Luxembourg awarded Cebi, then ELTH, its “Prix de l’Innovation” for an angled vehicle oil level sensor made from plastic instead of the traditional brass. This enables the sensor to measure oil at varying levels, while the 40% reduction in weight makes the product less expensive to produce and saves fuel. The plastic components are all produced at Cebi’s Steinsel plant, and the sensor’s design is such that its assembly is fully automated. The sensor is already in use by Renault, PSA and Ford. According to Ms Elvinger, “Demand for the sensors is expected to grow to 2.8 million a year by 2020. And every one of them will be made in Luxembourg.”

Cebi International

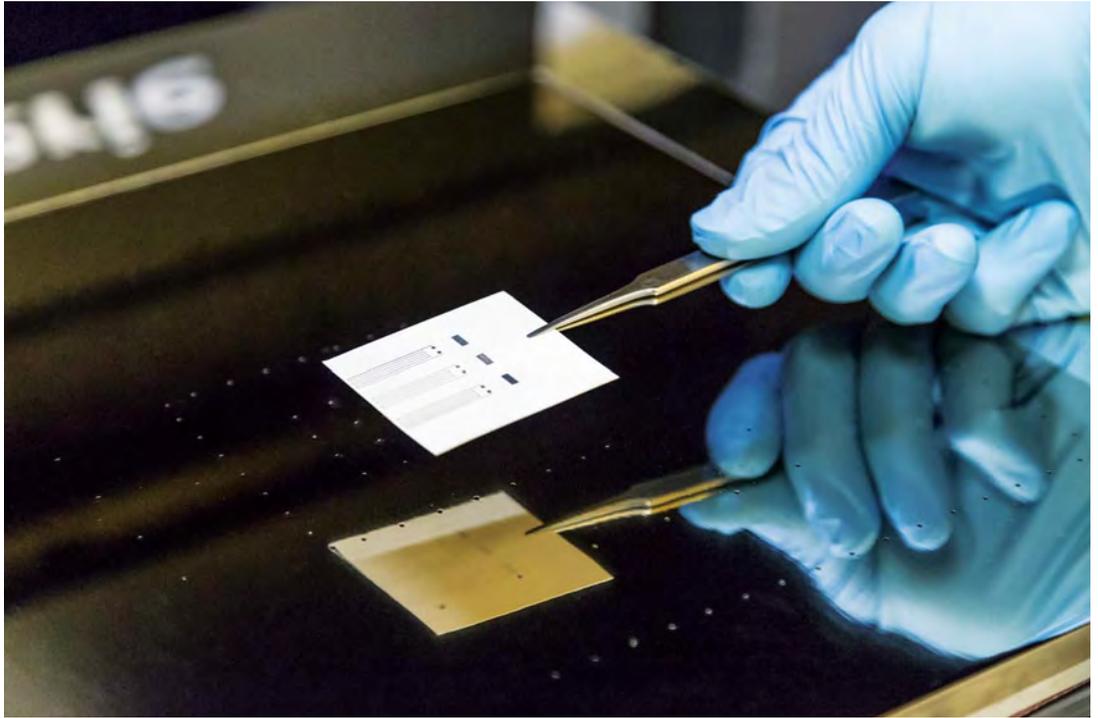
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RESEARCH MEETS INDUSTRY: ADVANCED MATERIALS SCIENCE



Luxembourg has historically followed a policy of targeting its research strategy on a small number of carefully-selected fields. One especially well-supported discipline is advanced materials science, with particular emphasis on composites and nanomaterials. The University of Luxembourg and the Luxembourg Institute of Science and Technology (LIST) have particular expertise in this area and are making a solid contribution to the development work undertaken by industry and research organisations.

The Faculty of Science, Technology and Communication at the University of Luxembourg has five research units: Computer Science and Communications, Engineering Science, Mathematics, Physics and Materials Science, and Life Sciences. "We have a faculty of 70, plus around 1,000 Bachelor and Masters degree candidates and 300 PhD candidates, which is a good number," says the faculty's Dean, Professor Paul Heuschling. "Over the last few years, our fastest-growing fields have been mathematics and physics. The fact that we have two European Research Council fellows speaks volumes about the quality of our research programmes, as does a recent OECD assessment of our research and innovation capabilities. We also enjoy an endowed chair; the ArcelorMittal chair in Façade Engineering."



“We are extremely keen to start setting up longer-term public-private partnerships.”

 Paul Heuschling

Knowledge transfer and PPPs

The University is engaged in academic research in several areas of great interest to industry, among them the physics of materials science, photovoltaics, lean manufacturing and human-robot interaction. Professor Heuschling is fully committed to knowledge transfer and working with industry in public-private partnerships (PPPs). The faculty is currently working with a number of local companies, among them Goodyear, DuPont, Delphi, ArcelorMittal and Rotar-ex. “We are also extremely keen to start setting up longer-term PPPs,” says the Dean. “At present, the average length is the duration of a PhD.”

The faculty’s Computer, Mathematics and Engineering units are currently working on a joint project using computational science approaches and High Performance Computing (HPC) to develop algorithms and tools to address industry’s increasing need for models able to simulate and predict the behaviour of materials. This approach has already produced several useful models, mostly developed in cooperation with industry. “In addition, Engineering Professor Peter Plapper has set up a Laser Competence Centre, which interacts intensively with our industrial partners,” says Professor Heuschling. “This centre develops tools and applications for the use of high-power lasers in welding and manufacturing.”

Smart specialisation

Professor Jens Kreisel, Director of the Materials Research and Technology Department (MRT) at LIST, explains that the direction of his department is very much in line with Luxembourg’s smart specialisation strategy. “We have two research units – Nanomaterials & Nanotechnology, and Composite Materials – which are supported by the R&D and top-notch equipment in our Central Materials Laboratory. Advanced Materials and Nanotechnology are two of the Key Enabling Technologies (KETs) highlighted in the strategy.”

He adds, “MRT has 150 staff, and our priority is to translate cutting-edge materials research into applicable technology. We collaborate with partners in academia and industry as well as research and technology organisations (RTOs) to deliver the Luxembourg innovation agenda.”

An international institute

The Central Materials Laboratory is furnished with state-of-the-art equipment for the use of all MRT researchers.

“We are much more than a local research centre.”

 Jens Kreisel

It has a clean room and supports up-scalable processing technologies enabling the synthesis of nano-structures and nano-particles in addition to thin-film processing and engineering, functional measurements, electromechanical testing, polymer processing, prototyping, thermo-physical analyses, electromechanical testing machines and photo-spectrometry. “We want to get the best use out of the lab and our very high-end instruments,” says Professor Kreisel.

MRT works with international partners throughout Europe and as far away as Australia. “We are much more than a local research centre. That said, I strongly believe that research done in Luxembourg should benefit Luxembourg as well as our external partners.”

Nanotechnology for health and the environment

Professor Kreisel is enthusiastic about the proposal to set up a composite competence centre in Luxembourg. “Bio-composites – biodegradable, renewable materials created by reinforcing a polymer resin with natural fibres – have generated a great deal of interest in a wide range of industries. A particular focus of the Composite Materials unit is the design and durability of composites and the quality of the interface between the resin and fibres.”

The Nanomaterials and Technology unit also hosts a research group in nano-medicine which has been working with the Luxembourg Institute of Health (LIH) and the Centre Hospitalier de Luxembourg (CHL) to develop nanomaterials that deliver medications and improve medical imaging. “Obviously in these applications, the issue of nanosafety is paramount,” says Professor Kreisel.

Work at MRT also benefits from the department’s advanced platform for materials characterisation, which is particularly well equipped for investigating physical-chemical and surface properties at both macroscopic and nanoscopic levels. The platform contains equipment for procedures including materials testing, spectrometry, spectroscopy, electron microscopy, X-ray diffractometry and nanoanalysis.



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EXCELLENCE THROUGH COLLABORATION

The Luxembourg Materials and Production Technologies Cluster plays a key role in the country's drive to generate sustainable manufacturing growth. Recognising the crucial importance of collaboration in the development of innovative technologies such as composite materials and additive manufacturing, the Cluster promotes partnerships across industry to create the unique momentum that builds when different players get together and start talking.

"Without innovation, there can be no new products, no new services and no new markets," says Cluster Manager Johnny Brebels, "but you don't get much innovation in a vacuum." One of the main roles of the Cluster is to facilitate joint R&D and innovative activities across the materials and production technology sector, with the aim of creating an environment in which companies can benefit from the joint efforts of different disciplines, while sharing costs and reducing any financial and technical risk.

Plugging the gaps

The Materials and Production Technologies Cluster has around 40 members, including giants such as Delphi, DuPont de Nemours and Goodyear, a variety of smaller companies and also a number of research organisations. "Luxembourg's industrial landscape encompasses a wide range of fields, from steel and other metals to chemicals and industrial services," says Mr Brebels. "It is a somewhat heterogeneous structure, and combined with the fact that we are a small country, it can mean a lack of local value streams. For example, our members might have to look outside the domestic market for, say, a particular component or service."

To address this issue, the Cluster works with its members to identify skills and abilities within their companies that can be further developed, not only to plug existing gaps in the domestic market, but also to create the potential for developing entirely new products. "Our objective is to create new markets for existing companies," says Mr Brebels. "In addition, we can identify gaps in the value chains that cannot be resolved, and seek to remedy those with new companies or actors from abroad."

A competence centre for composite materials

Another major priority for the Cluster is to help members first to understand new technology and then to assess the extent to which they can deploy them in their own areas of specialisation. "Our aim is to help our members gain that extra competitive edge," says Mr Brebels, "and we're working on several pilot projects designed to do just that."

The Cluster's thinking is clearly demonstrated by the proposal to establish a composite materials competence centre in Luxembourg. With composites technology advancing so rapidly, there is increasing demand for these materials in the aerospace, electronics and high-tech construction industries as well as, more recently, in the production of mass-market items such as cars, bicycles and mobile phone covers. "With a competence centre, we could bring all our skills and expertise in this field together under one roof," says Mr Brebels. "We'd be collaborating on R&D, developing new applications and giving our industries a genuine global competitive advantage. It would be an incredible spur to research and innovation, and not just for firms already in this market."

The collaborative road

A second area of concerted effort for the Cluster is a project to create a road map for the implementation of additive manufacturing, which is a joint effort between a number of Luxembourg companies and research organisations and some of their counterparts abroad. A further inter-cluster collaboration is focusing on ways in which local

“Our objective is to create new markets for existing companies.”

 Johnny Brebels

industry could benefit from the implementation of cyber-physical systems, which are interacting networks of computers and physical production processes.



New thinking, new backing

The Cluster also engages with other factors that affect their members, such as access to finance. In Luxembourg, banks and investment companies tend to be more open to proposals from the ICT and service sector than from the manufacturing industry. “The payback time for a manufacturing project is considerably longer than a comparable IT project, and the exit factor is often lower,” says Mr Brebels. “In addition, some of the traditional banks have difficulty assessing the risk in an innovative project, or the potential. We are actively involved in finding – or even setting up – organisations willing to provide seed or growth capital for manufacturing. In fact, we have already identified a number of promising funds, investors and banks.”

Internationalisation for the future

Internationalisation is, of course, a top priority. “The Cluster puts considerable energies into finding organisations interested in basing their R&D and innovation activities in Luxembourg, or forming partnerships with our companies, and we attend international fairs to promote our members to potential clients and suppliers,” says Mr Brebels. “Our ambition is to firmly place Luxembourg on the map as a centre of excellence in materials and production technologies.”



Luxembourg Materials and Production Technologies Cluster

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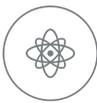


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A large, modern industrial factory interior. The ceiling is high with exposed metal beams, pipes, and various lighting fixtures including incandescent, fluorescent, and halogen bulbs. In the foreground, a group of people, including men in business casual attire, are gathered around a piece of machinery, looking at documents. The floor is highly reflective. In the background, there are tables covered with white cloths and a whiteboard.

LEARNING BY DOING AT THE LEARNING FACTORY

Visitors to The Learning Factory find themselves in a large, immaculate space filled with gleaming state-of-the-art machinery. Director Jean-Jacques Aernout points upward: “See those light fixtures? One uses incandescent bulbs, one uses fluorescent and one uses halogen.” The lighting demonstrates The Learning Factory’s commitment to teaching industrial efficiency, from energy use to lean production.



The Learning Factory, based in the Technoport 2D business incubator in Foetz, was founded in 2013 via a successful public-private partnership set up by the government in conjunction with the Chamber of Commerce, Fedil, ArcelorMittal, Schneider Electric, Enovos, Sudstrom and the city of Esch-sur-Alzette. Partners and sponsors include ING, KSB, Atlas Copco, Cofely Fabricon, McKinsey & Company, Spirax Sarco, Axa Insurance, Paul Wurth, Agora, Sesa Systems, Köhl and Veolia Water.

Its mission is straightforward: to promote industrial competitiveness through the teaching of energy efficiency, operational efficiency and lean Six Sigma management. "Companies need to treat their energy costs as rigorously as they do their labour and material costs," explains Director Jean-Jacques Aernout. The results so far have been impressive. In 2014, 101 people undertook training at The Learning Factory; in the period thereafter, their companies' total energy costs came down by €8 million, 50% of which was achieved without capital expenditure.

Hearing, seeing, doing

"There are basically three ways to teach," says Mr Aernout. "Hearing, which is when someone stands in front of the class and lectures; seeing, which is when the teacher demonstrates what he's talking about; and doing, which is when the students participate. At The Learning Factory, we believe in learning-by-doing. We are very hands-on."

At The Learning Factory, learning-by-doing means producing iced tea. Iced tea? "Yes. Making iced tea, the kind you can buy in cans and bottles, involves a complex production process that starts with selecting the tea leaves, then drying them, grinding them, brewing the tea, cooling it and flavouring it," explains Mr Aernout. "We're using processes and equipment that are used in all types of industry, so it's the ideal way to teach efficiency in both energy use and operations." He adds, "We don't actually drink the tea."



Training for savings

Courses are offered to companies throughout Luxembourg and the Greater Region in French, English or German, and companies are encouraged to send personnel for training in pairs. "Except for Lean Six Sigma training, which is for team leaders, we prefer one person on a fairly senior level and one who's more junior. The senior brings experience and the junior enthusiasm and openness."

"Learning Factory energy management techniques can help Luxembourg companies make huge reductions in their energy costs," says Mr Aernout. "Initially we estimated that it would take us four or five years to reach an annual saving of €12 million – the equivalent of taking 50,000 vehicles off the road or cutting 95,000 tonnes of CO₂ emissions. As it turned out, we contributed to savings of €8 million before our first year was even over."

“Companies need to treat their energy costs as rigorously as they do their labour and material costs.”

 Jean-Jacques Aernout

The Learning Factory



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LEADING GLOBAL INNOVATION STRATEGIES

In the manufacturing sector, constant innovation is the key to staying ahead, and in recent years, a number of leading global organisations have chosen Luxembourg as the base for their strategic R&D and innovation activities. To find out why, *FOCUS* spoke to Anne-Christine Ayed, Group Executive Vice President, Research, Innovation & Environment with flooring firm Tarkett, and Jean-Pierre Jeusette, General Director of Goodyear's Innovation Center in Luxembourg.

Why did your company decide to base its research, development and innovation centre in Luxembourg?

Anne-Christine Ayed: Tarkett is an international company that needs a creative, outward-looking environment. With its global outlook and skilled, multicultural, multilingual workforce, Luxembourg is the ideal location for our international Research & Innovation Center. The Center is the global hub of our innovation strategy; here, we conduct breakthrough research and development and supervise the work we do at the regional level to adapt our products and processes to local needs. We have 24 laboratories worldwide, sharing skills and best practice to create a solid and effective knowledge network.

Jean-Pierre Jeusette: One of Luxembourg's major advantages is its international flair. Here, we have a talented, multinational workforce, a must for a global company like ours. Our Goodyear Innovation Center* Luxembourg acts as the technical support for our operations throughout Europe, the Middle East, Africa and the Asia-Pacific region, which include 20 Goodyear production facilities. We work closely with our partners in the global vehicle manufacturing industry and we also maintain close contact with our markets and customers through regular product analysis trips. Ultimately, we are responsible for guaranteeing the quality and marketability of our tyres worldwide.

“With its global outlook and skilled, multicultural, multilingual workforce, Luxembourg is the ideal location for our international Research & Innovation Center.”

 Anne-Christine Ayed



What other advantages does Luxembourg offer to innovative companies?

Jean-Pierre Jeusette: There is an extremely good support network here. We have an excellent relationship with the government and civil service, who are always willing to listen and to help when they can. The public research system is both well-resourced and responsive, and the University and Luxembourg Institute of Science and Technology (LIST) in particular add real depth to our innovation efforts. On top of that, there is an excellent mutual support network which gives us access to colleagues via the Chamber of Commerce, Fedil – Business Federation Luxembourg and the Automotive Components and Materials and Production Technologies Clusters. The country's central location is also important; it helps us not only to stay in close contact with clients and suppliers but also to find the type of staff we need and provide them with an excellent quality of life.

Anne-Christine Ayed: There is strong financial support here for innovation. Projects receive substantial backing from the state, while Luxinnovation is highly proactive in

helping businesses to understand the opportunities available and access the various funding mechanisms at both local and European level. The tax regime is designed in such a way as to promote the development of intellectual property. Like Jean-Pierre, we appreciate the mutually supportive environment and we work closely with the Luxembourg EcoInnovation Cluster as part of our strategic push for the highest possible environmental standards.

What facilities do you have here?

Anne-Christine Ayed: We have 3,000 m² of laboratory and testing space in Luxembourg. We have at least one of every machine used within the group, so we can develop, fine-tune and pilot-test all our new products and production processes here. We also have chemical and physical labs for the design and testing of flooring formulations, as well as one creative space specifically dedicated to innovation. In the last five years, we have doubled to around 60 the number of staff at our research, development and innovation centre in Luxembourg, and these people support a further 120 staff worldwide.



“Luxembourg’s central location is important; it helps us not only to stay in close contact with clients and suppliers but also to find the type of staff we need and provide them with an excellent quality of life.”

 Jean-Pierre Jeusette



Jean-Pierre Jeusette: GIC*L has tyre engineering and material divisions, tyre and vehicle test laboratories, an Advanced Design studio, several chemical, material and analytical laboratories, a prototype manufacturing facility and a test circuit, as well as business departments including a patent office and a film and photographic studio. Good-year Luxembourg’s operations also include a major manufacturing plant. In total, we employ around 3,250 people from more than 50 countries, including over 1,000 engineers, scientists and technicians working in the Innovation Center.

Which are the most important products, processes and services that have come out of your R&D and innovation work in Luxembourg?

Jean-Pierre Jeusette: A tyre has between 25 and 30 rubber, steel and fabric components. We evaluate and optimise each of those components, as well as the underlying raw materials, to ensure the quality and performance expected and demanded by our clients. We develop new construction materials and rubber compounds, new tyre shapes and tread pattern designs. We are responsible for



7 Goodyear and Tarkett: international innovators

The Goodyear Innovation Center*Luxembourg is one of the tyre manufacturing giant's two global Innovation Centers. The other is located alongside the company's corporate HQ in Ohio, USA. Goodyear's Luxembourg operation, established in 1957, develops, builds and tests new tyre technologies, mainly for the European, Middle Eastern, African and Asian-Pacific markets.

Tarkett is the world's third largest producer of innovative flooring with clients in over 100 countries and a worldwide network of 34 industrial sites. Tarkett first established a presence in Luxembourg in 1963 with a production facility and design centre in Clervaux in the north of the country. Its global research, development and innovation centre supports 24 R&D and innovation laboratories around the world.



formulate the composition of our vinyl flooring to optimise technical performance, aesthetics and health and environmental benefits.

developing a wide range of new products, and we are particularly pleased with our recent UltraGrip 9 winter tyre and Efficient Grip A/A tyre ranges. The Efficient Grip tyre has received the highest EU tyre labelling rating for fuel consumption and wet grip, meaning that they are safer for the driver and beneficial for the environment.

Anne-Christine Ayed: Two recent developments illustrate the range of our work. We have just launched FloorInMotion, an intelligent, integrated flooring system combined with a monitoring service for use in care homes and medical facilities. The system has ultra-thin sensors which detect events such as a patient falling and trigger an alarm on, say, a mobile device. It is a real breakthrough and the result of substantial in-depth R&D, particularly in the areas of IT and service offering. In fact, some of these technologies are quite new to us; we worked with a range of experts, including universities, and coordinated the whole project from Luxembourg. We also have a strong commitment to high environmental standards and have recently completed a three-year project to replace all the phthalate plasticisers in our products. While there is no firm scientific evidence that these plasticisers present a health hazard, we want to be proactive and anticipate any new regulations. This has been a huge task, requiring us to re-

How do you see the future for your R&D and innovation centre in Luxembourg?

Jean-Pierre Jeusette: Much depends on the economic situation, but under normal circumstances we expect to enhance our R&D activities in Luxembourg.

Anne-Christine Ayed: Our ambitious innovation strategy means we need to adapt our organisation and our thinking to new realities. Luxembourg is the place for this because we have the right people and the right support here. We are in good shape here.

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Effective 1 September 2015, Jean-Pierre Jeusette has been appointed to the position of Vice President Product Quality and Plant Technology, based in Akron (Ohio). Carlos Cipollitti, Director Technology Quality and Product Development, Asia Pacific region, has been appointed General Director GIC*L, replacing Mr Jeusette.



IDEAS ENVIRONMENT



Paul Wurth - the capacity to continuously innovate

The development of new products and the optimisation of our existing portfolio have always been a high priority for Paul Wurth. For a technological company such as ours, innovation is crucial as it means that we are able to take a technological lead and meet both market and customer expectations. Thanks to the know-how and innovation skills of our highly-qualified employees, we offer most advanced solutions in our different fields of activities:

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ENTREPRENEURSHIP AND INNOVATION NEWS



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FIRST SPIN-OFF FROM PROOF OF CONCEPT PROGRAMME

The first commercial spin-off has emerged from Luxembourg's new Proof of Concept (PoC) programme, set up by the National Research Fund to provide the financing needed to carry promising and innovative projects from the pure research stage into the commercial arena.

The new company, Motion-S, will manage the prototyping and marketing of a smartphone driver monitoring system in partnership with a major Luxembourg insurance company. The system, developed by the University of Luxembourg's Interdisciplinary Centre for Security, Reliability and Trust (SnT), uses embedded GPS and motion sensors to profile driving behaviours, identify risky manoeuvres and improve safety and efficiency.

www.fnr.lu
www.motion-s.com

FROM FINANCIAL TO HEALTHCARE E-SERVICES

Luxembourg start-up TheMarketsTrust is launching an innovative evaluation platform designed to provide a far fuller

picture of the factors contributing to investment risk. Unlike standard risk models that rely solely on quantitative data, the new platform will include qualitative factors such as investor bias and the impact of information derived from social media and other non-traditional sources.

TheMarketsTrust will provide real-time rating of complex securities and plans in the longer term to create a European Rating Agency to compete with existing agencies in the US and elsewhere. The project is supported by the European Commission through the Horizon 2020 SME Instrument.

The company is also developing an e-healthcare portal, MyHipocrates, based partly on the generic infrastructure used in its risk platform. The aim is to provide doctors and patients with access to patient e-health records from any location, and to make it straightforward for patients to share information about their state of health with their doctor on a day-to-day basis.

TheMarketsTrust currently has 15 staff based in Luxembourg and other locations, and expects to increase this number to several hundred over the next 7-8 years.

www.themarketstrust.com

A EUROPEAN HOME FOR CITYHOUR

TrueBear Corporation, US creators of the hugely successful business networking app CityHour, have chosen the Technoport incubator in Luxembourg as the headquarters for their planned expansion into the European market.

"At first glance, Luxembourg might not seem an obvious choice for the headquarters of a start-up born in Silicon Valley, but when you take everything into consideration, it's a phenomenal place to be," says company founder and CEO Alex Lubinsky. "Luxembourg's convenient location and multilingual workforce are going to make our growth much more explosive than if we were based in Berlin or London."

CityHour, first launched in 2013 in the US, enables professionals to identify and contact peers with common business interests who are located within a 50-mile radius and available for discussions within the next two hours.

www.cityhour.com
www.technoport.lu



FIRST TENANTS INSTALLED AT NEW HOUSE OF BIOHEALTH INCUBATOR

Fast-track Diagnostics, Complix and Flen Pharma are among the first companies to have taken up space at the new public-private incubator House of BioHealth, officially opened early this year.

The House of BioHealth is aimed at both new and established private companies and public research organisations in the biotechnology, ICT and clean technologies sectors. The intention of the facility, which is located very close to Luxembourg's major public research organisations, is to provide a dynamic environment in which tenants can take full advantage of the collaborative potential across the three sectors. The incubator

currently offers around 5,000 m² of laboratory, conference and office space. A further 5,000 m² is currently under construction.

www.houseofbiohealth.lu

BECOMING AN INTERNATIONAL FINTECH HUB

Seeing the stability and strength of the Luxembourg financial centre as an excellent foundation for the development of new, innovative services, the Government has placed financial sector innovation at the top of the priority list for its "Digital Lëtzebuerg" strategy launched last year.

An ever-growing number of innovative companies – both established firms and start-ups such as Digicash Payments, Yapital,

MANGOPAY, 2gears, Loomion and KYC3 – are developing new FinTech products, services and business models. At the same time, the Government and industry experts have embarked on a series of joint discussions with the aim of defining how best to attract more innovative high-tech and financial companies to Luxembourg.

FinTech is a relatively new term and refers to the changing directions in finance arising from the introduction of new technologies.

www.abbl.lu



© House of BioHealth



HOW TO DO WELL IN BUSINESS

No question, Etix Everywhere is one of the most exciting Luxembourg start-ups of recent years. Set up in 2011 by Charles-Antoine Beyney and Antoine Boniface, it specialises in modular, fully customisable data centres, involving the client at every stage of the process. The company's refreshing approach and innovative solutions have led to rapid growth, and with the help of a recent €15 million capital injection, it is set to make ambitious new inroads into the international market.

The company's founders have an enviable track record as entrepreneurs. Mr Beyney, still only 32, headed five profitable companies before setting up Etix Everywhere, providing him with both a start-up fund for the new venture and a thorough practical knowledge of the industry.

Put boldly, Etix Everywhere is doing so well because it knows its business inside out and charges 50% less than the competition. Emphasising transparency, simplicity and sustainability, its policy is to cut costs, not corners. As an example, its new data centres are not housed in containers but built from scratch with bricks and mortar. The customers win out in two ways; their data centres are more secure, and they avoid the staggering cost and upheaval of vacating their container every 15 years or so for refurbishment.

The lateral approach

"We are out to reinvent this industry," says Mr Beyney. "We are constantly searching for state-of-the-art technology and sustainable solutions; 40% of our budget goes straight into R&D." Etix Everywhere has an indisputably creative approach; take, for example, their system of preventing power outages. A standard method would be to have two 270kW generators; one in constant use and the other



on standby. Instead, the company sets up three independent power-producing chains (a generator, a UPS and a switchboard), each operating at 67% capacity to generate a total of 270kW. If one fails, the other two ratchet up to 100% capacity, maintaining a 270kW output and preventing damage to the stored data. This system reduces energy consumption by 25% and also improves the overall power usage effectiveness (PUE), the ratio between the data centre's total consumption and the power delivered to its IT infrastructure.

Eliminating the unnecessary

"This industry is riddled with painstaking, long-winded and very risky processes," says Mr Beyney. "We see them, and we know how to change them." Their starting point is the customer; they meet them and together devise a solution, from a dedicated space for the client in one of Etix Everywhere's existing colocation data centres to a fully customisable, modular and scalable data centre built to order. The customer is fully involved at every stage from the choice of location to final delivery, a process which can take as little as 16 weeks. Etix Everywhere also deploys DCIM – Data Centre Infrastructure Management – in its data centres, which for the customer means fewer engineers on site and further cost savings.

Home and away

Etix Everywhere is seeing a growing increase in demand for its solutions from the blue chip sector, one of the factors contributing to a projected increase in turnover from the current €12 million to €35 million next year. "We wouldn't be looking at that kind of growth if we didn't have great people," says Mr Beyney, "but fortunately, it's not hard to persuade people to come and work in Luxembourg." The new international sales and development managers are likely to be very busy in the near future; with smart data centres already up and running in France and Morocco, the company's plan is to launch in ten G20 countries over the next two years and to follow that up with a move into



China and Russia. The expansion will be financed by a €15 million capital investment from InfraVia Capital and Tiger Infrastructure Partners.

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"We are out to reinvent this industry."

 Charles-Antoine Beyney

DRIVING MANUFACTURING FORWARD



With just 25 employees, CPI may look like a small company, but the scale of its operations is matched only by the extent of its ambition. CPI is a “machining facilitator”, developing the applications that control the machines used to manufacture parts for the aerospace, automotive, shipbuilding and other industries. Set up at the Ecostart incubator in 2004 and now operating from offices in France as well as Luxembourg, the company’s expansion policy is straightforward: to go to its clients, wherever they are.

One of CPI’s core business activities is the programming of CNC (Computer Numeric Control) controllers. “CPI provides a vital link between the virtual and the real world,” says CEO Pascal Dine. Its programmers use software such as CATIA, TOPSOLID, NX, NCSIMUL and VERICUT to crunch the code that transforms concepts into tangible results.

The process used to create the parts-manufacturing software begins with a 3D model of the required part, created to the client’s specifications using CAD applications. Next, methods agents devise a machining strategy and select the cutting tools. At that point, the programmers step in to build and simulation-test the final product. If the client requests it, CPI also provides start-up assistance on site, an attention to detail that has proved very appealing to, for example, the aerospace industry, which accounts for about 80% of CPI’s business.



“Luxembourg is the best place in Europe to develop a business, no question.”

 Pascal Dine

Pure flexibility

CPI is willing to go to wherever the client needs it, a level of flexibility that has attracted a number of major aerospace companies and in turn driven CPI's geographical expansion. CPI France was set up in 2013 and the company is currently planning a base in Mexico for potential clients in Canada, the USA and Brazil. “The strategy is to create new leads in those areas to increase our client list,” says Mr Dine.

The company currently has a 150-strong customer base, a tally likely to increase when it introduces planned new consultancy and training services. CPI recently obtained accreditation from a recognised Luxembourg training centre and has hired a training provision specialist. Similar services are in the pipeline for the company's clients in France.

An ear to the market

“The market is the boss,” says Mr Dine. “You may have the best idea in the world, but if the market isn't interested, it's useless.” CPI is one of the very few companies internationally that supply post-processors, adaptors which link the CAD-CAM system to the CNC machine controller by translating the CAD-CAM language into the ISO code used for machine instructions.



CPI also offers clients a “reindustrialisation” service, re-programming upgraded machinery to perform the same tasks as the equipment that was replaced, with the addition where possible of innovative new features. Meanwhile, the company plans to introduce new robotics services to enable customers to fully automate their production processes.

The best place in Europe

CPI has come a long way in ten years. With an ever-expanding customer base and an R&D programme producing continually consistent results, it has seen an increase in turnover from €150,000 in 2005 to a projected €1.8 million in 2015. According to Mr Dine, this is all down to being based in Luxembourg. “It's the best place in Europe to develop a business, no question,” he says. “When you work here, you're working for your customer and your employees. Everywhere else, it seems you're doing it for the state. Mexico isn't like that; there, you're not only welcomed, you're given a helping hand. Just like Luxembourg.”

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DID YOU KNOW IT'S FROM LUXEMBOURG?



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CUTTING EDGE STRENGTH AND RESISTANCE

Luxembourg-based carbide tool specialist CERATIZIT is among Europe's top three producers of cutting rolls, the rotating cutting tools used in the manufacture of sanitary products such as nappies and cosmetic pads. The company has had a long-term policy of working closely with its customers to optimise the composition of the metallurgical powder from which the rolls are produced; as a result, performance has improved significantly over time in terms of both strength and wear resistance. A CERATIZIT cutting roll on today's market can make up to 150 million cuts before it needs to be reground, and can withstand six regrinding cycles – a total of almost 1 billion cuts – before replacement is needed. CERATIZIT is currently seeing an increase in global market share, notably in the US and Asia.

www.ceratizit.com



SUSTAINABLE HIGH PERFORMANCE

The new Goodyear FUELMAX S truck tyre is produced using IntelliMax Groove Technology, an intelligent performance optimisation technique developed at the Goodyear Innovation Center in Luxembourg. The technique is based on a "hidden" tread pattern: when the tyre is new, three tread ribs are exposed; as wear progresses, further grooves appear, ensuring optimum rolling resistance and significantly decreased fuel consumption throughout the life of the tyre, with no compromise on mileage, wet braking or other key performance areas. The tyres, which are manufactured in Luxembourg, will contribute to lower operational costs for fleets and a reduction in the environmental impact of the road transport industry.

www.goodyear.com

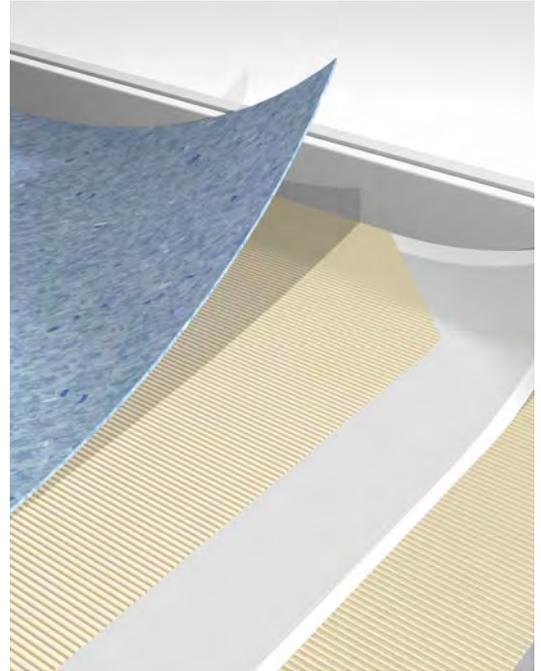


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ROBOTS FOR SAFETY AND COMPETITIVENESS

The FANUC CR-35iA collaborative robot is able to lift weights of up to 35kg, a far higher payload than comparable machines on the market. Used mainly for heavy repetitive processes such as work-piece transfer and parts assembly in the automotive, packaging, distribution and metalworking industries, robot technology frees up workers to concentrate on higher-skilled activities and contributes to improved productivity and competitiveness. The CR-35iA can be equipped with vision sensors which enable it to pick up and handle parts, and also stops dead when a person touches it, enabling it to operate in close contact with human workers without the need for safety fences. The robots are manufactured in Japan, while testing against client specifications is conducted at FANUC Luxembourg.

www.fanuc.eu



© Tarkett

CONNECTED LIVING SPACES IN CARE ENVIRONMENTS

The Luxembourg-based Research and Innovation Centre of Tarkett, the world's leading manufacturer of innovative and sustainable flooring solutions, has created an innovative service for the protection and assistance of patients, the elderly and their carers. FloorinMotion Care is an integrated solution that links sensors located in the floor to a data capture, monitoring and alert system that can be accessed 24/7 via computer, tablet or smartphone. In the event of a fall, intrusion or other event, the system sends an immediate alert to the caregiver, enabling them to act quickly to provide help. The service allows healthcare staff to monitor the patient effectively and unintrusively in real time, while as it is discreet, invisible and uses no cameras, fully protects the patient's privacy and confidentiality.

www.tarkett.com

ANGEL NEWS

Luxembourg Business Angel Network

N° 1 / November 2012

A community for business angels and entrepreneurs

Many great entrepreneurial ideas start out life on the back of a paper napkin to become great businesses. Nowadays the initial investment needed to develop such an idea and set up business is lower than ever, due to cheap devices such as laptops and smartphones, the internet and social media.

However, once the business starts to take off, it will very soon need proper funding for premises, employees, marketing, sales. Unfortunately, without a track record, bank guarantees and some capital, early-stage funding is often hard to secure.

This is where the Luxembourg Business Angel Network (LBAN) can step in. The LBAN brings together entrepreneurs needing money and private investors (Business Angels) who can offer finance, know-how, skills and time to support the start-up.

Business Angels are usually investors, seasoned entrepreneurs or managers who are looking to

invest in high-growth businesses at the seed and early-growth stage, needing between 50,000 and 300,000 in return for a share. They also have valuable experience of the industry or sector in which they wish to invest.

As members of LBAN, Business Angels commit to a code of conduct, which covers, for example, professional conduct, balancing interests as well as confidentiality for all parties.

So how can a company find an investor through LBAN? Firstly, you will need a good business plan to pitch your project, i.e. your profile, offering, customers, competitors, finances, sales projection, etc.

Once your plan has been submitted, it will be published on the LBAN platform so potential investors can see it and contact you if interested. Then it is only up to you to reach an agreement with them.

So whether you are a budding entrepreneur with a good idea for a project, already operating as a start-up or you wish to invest your capital and time in exciting new companies as a Business Angel, now is the right time for you to contact the LBAN!

LOOKING FOR INVESTORS

Claudine, 28, ambitious and creative is looking for serious businessmen or businesswomen to believe in her ideas and to invest and finance her business plan.

Contact: www.lban.lu

LOOKING FOR ENTREPRENEURS

Bernard, 52, a serious businessman with a great reputation is looking for young start-ups who have promising ideas with a well-thought business plan to invest in.

Contact: www.lban.lu

DECHMAN COMMUNICATION

**Do you have great business ideas, but not the means to realise them ?
Or are you an investor who has the financial background to help great business ideas become real ?**

If so, join the Luxembourg Business Angel Network. LBAN is a non-profit organisation dedicated to promoting angel investing and supporting early-stage investments in Luxembourg. LBAN strives to create an ecosystem that helps support industry by bringing together private investors, early-stage funds and promising entrepreneurial ventures. With its direct links to Government, LBAN ensures that the requirements of companies seeking for early-stage investments are not only heard but acted upon. LBAN is driven by a board of high-calibre individuals from within the industry and is supported by the Luxembourg Chamber of Commerce.

LBAN



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BUSINESS ANGEL NETWORK

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SUPPORTED BY





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1 FIND OUT MORE ABOUT RDI ACTORS IN LUXEMBOURG

Luxembourg Portal for Innovation and Research

www.innovation.public.lu



The Luxembourg National Research Fund (FNR) is the main funder of research activities in Luxembourg. Our vision is to establish Luxembourg as a leading knowledge-based society through science, research and innovation, thereby contributing to the country's economic diversification and future prosperity. We aim to set up a sustainable world-class research system in Luxembourg that will generate societal and economic impact in key strategic areas. To this end, the FNR invests public funds into research projects in various branches of science and humanities, with an emphasis on core strategic areas. Furthermore, the FNR supports and coordinates activities to strengthen the link between science and society and to raise public awareness for research.

www.fnr.lu

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