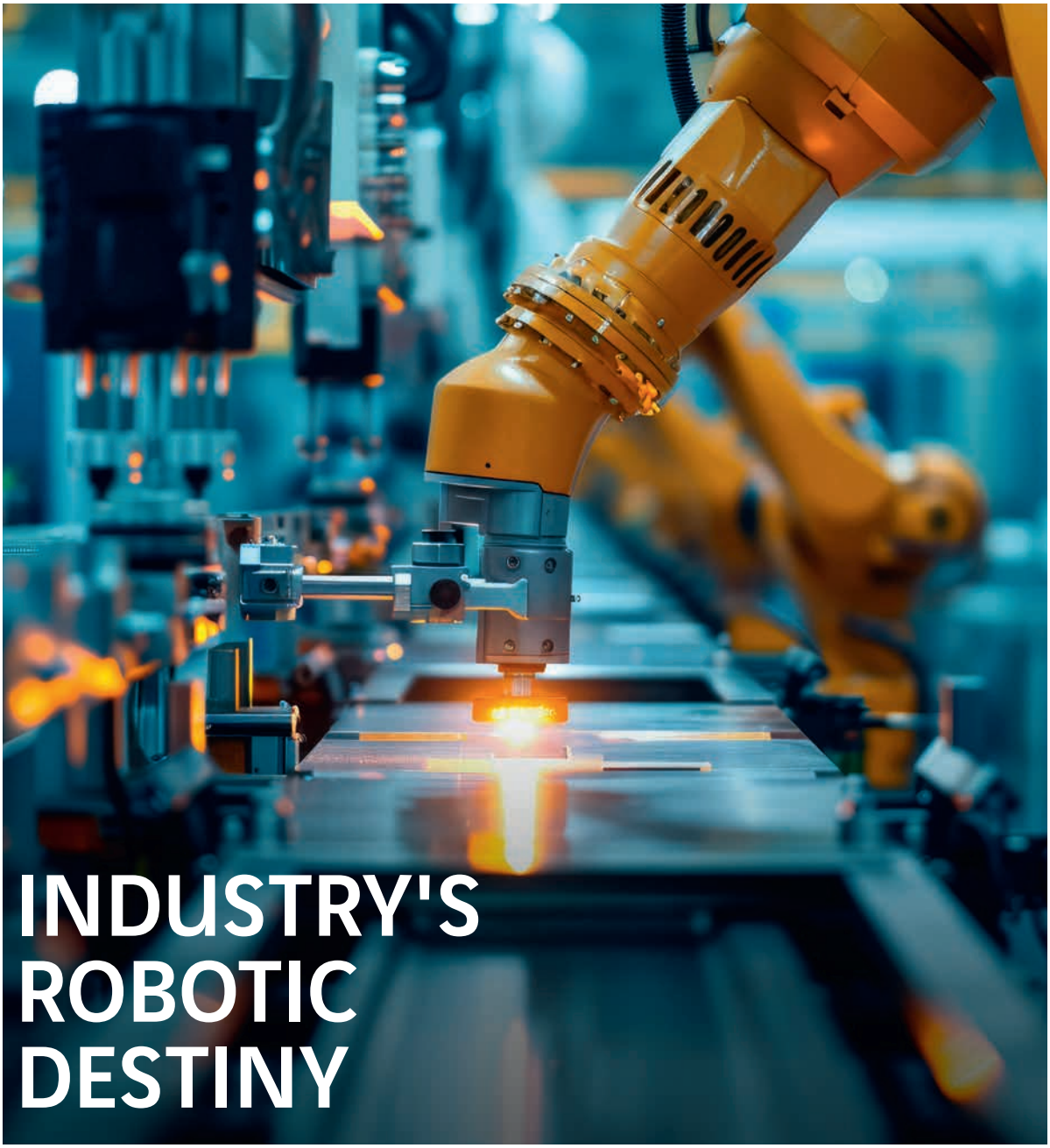
# THE **AGILITY** EFFECT
MAGAZINE

## MASS-MARKET RENEWABLES

## THE PROMISE OF DECONSTRUCTION

## CEMENT MAKERS FACE UP TO THEIR IMPACT



# INDUSTRY'S ROBOTIC DESTINY



VINCI ENERGIES

# SUMMARY





# EDITORIAL

Reindustrialisation is currently a key concern in Europe. Regaining lost ground is a matter of sovereignty, an economic and social issue, a technological challenge, and a necessity for "green" growth. But the road will be long and difficult, and reindustrialisation will remain little more than a slogan without the automation of European production facilities. The experts The Agility Effect has recruited for this issue of your magazine tell us that robots are the future of industry.

Industrial robotisation is booming, thanks to favourable technological and economic conditions. This future is more than yet another solutionist promise: use cases are multiplying in many sectors, from nuclear to pharmaceuticals, from logistics to material handling, with fantastic prospects for acceleration.

But digital transformation is not only happening in factories – it also affects infrastructure. This edition will take you behind the scenes of the ambitious transformation at Lineas, Europe's largest private rail freight operator, aimed at providing a more fluid customer experience. In reality, transformation is everywhere – even in vineyards, such as in the Netherlands, where an organic wine grower has implemented a SaaS solution to maximise the sharing of skills and knowledge.

VINCI Energies business units are well placed to support these transformations and turn their promises of efficiency and sustainable growth into reality.

We hope you enjoy this issue!

The Editorial Team

# BIOSPHERE-FRIENDLY DATA IN PORTUGAL

Biosphere reserves are extremely important sites due to their high ecological, cultural, economic and social value, which UNESCO recognises and supports. There are 12 such sites in Portugal, where two professors from the Universities of Lisbon and Coimbra ran a project with the aim of promoting them and amplifying the impact of their development plans. Axians, the VINCI Energies ICT brand, was responsible for development of the “Reservas de Biosfera Portugal” digital platform, which includes a portal showing details of the project’s commitments, the Portuguese reserves, their communities, their history, and their natural and cultural heritage. Each of the 12 reserves also has its own dedicated area and a CMS (content management system) for managing this. Cloud infrastructure hosts all the information and data collected from the sites and makes them available in 20 interactive dashboards packed with 350 indicators, along with two interactive maps highlighting the reserves’ cultural and natural heritage.

ENERGY INNOVATION

# TOWARDS THE MASS-MARKET ROLLOUT OF RENEWABLE ENERGIES

**Renewable energies are one solution to global warming. Accelerating their implementation is now a matter of urgency and will require the mass-market rollout of existing solutions. In Belgium and the Netherlands, VINCI Energies Belgium through its brand Omexom is taking on multiple photovoltaic solar projects.**

The European Union is committed to reducing its greenhouse gas emissions by 55% by 2030 (compared with 1990) and to becoming the first carbon-neutral continent by 2050. To achieve targets like these, it is essential to wean ourselves off fossil fuels and accelerate the development of renewable energies.

Of all renewables, solar appears to be the most potent driver for this energy transition. According to the Solar Power Europe association, 2023 marked a new record in solar installations in Europe. This is the third consecutive year that the market has grown by 40% or more.

This momentum can be attributed to lower equipment prices (down 20 to 25% over the year), but as Gunter Luyckx, Business Unit Manager at Omexom and specialised in engineering and installing solar power systems in Belgium and the Netherlands, explains: "The solar sector is facing a shortage of available land to develop new facilities."

*"The big challenge lies in addressing the intermittent nature of solar energy."*

Because of this pressure, he adds, "It is important that as many available roofs as possible are fitted with a solar system. Furthermore, car parks at businesses premisses, shopping centres and hospitals are ideal for building a solar carport. Furthermore, it is possible to build floating solar installations or freefield installations. For these last two solutions, it is more difficult to get permits in Belgium"

## New technological building bricks

Other opportunities are there to be seized. Take for example the Ophelia project in France, which aims to develop the linear solar power sector, characterised by solar farm installations on long and narrow land surfaces (dams, roads, railways, etc.). Launched by its five partners (Compagnie Nationale

### 37,736 panels for 5,000 homes

In April 2023, Zonnepark Hemmen was commissioned in the municipality of Overbetuwe, at the heart of the Dutch province of Gelderland. The site, a 20-hectare meadow, is bordered by a motorway and a railway line. With no fewer than 37,736 solar panels, the installation generates 24.81 MWp of green energy, enough to meet the energy needs of around 5,000 households. Over the next few years, it has been decided to allocate €50,000 from the proceeds of this energy production to local sustainable development projects in the Hemmen area, for the benefit of people living in poverty in the municipality of Overbetuwe, of which Hemmen is part.

du Rhône, Nexans, Schneider Electric, SNCF and SuperGrid Institute) in September 2023, this goal of this five-year, €20 million project is to create a 900-metre-long linear solar canopy demonstrator providing shade to the ViaRhôna cycle track along the banks of the Rhône.

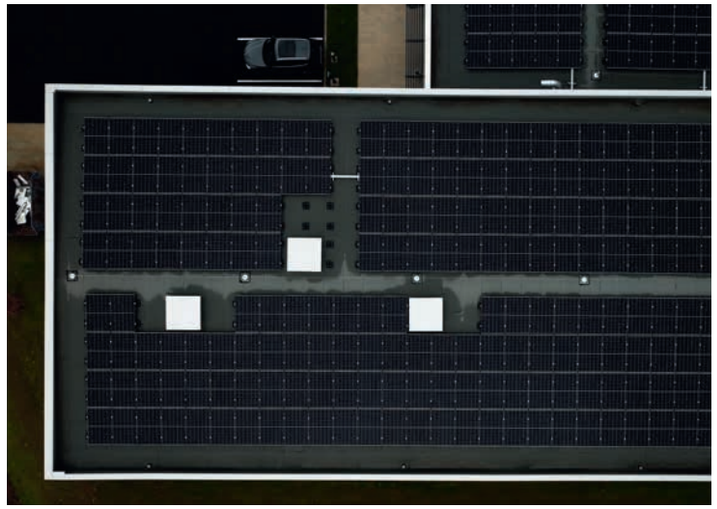
VINCI Energies business units are involved in similar projects to develop new technological building blocks for improving the energy mix and reducing carbon emissions. "The big challenge lies in addressing the intermittent nature of solar energy," says Koen Jonkers, Business Unit Manager at Omexom. "That's why we are developing more and more solar projects coupled with electricity storage solutions."

VINCI Energies is constantly increasing its contribution to the rollout of solar energy. In addition to iconic projects such as Zonnepark Hemmen in the Netherlands and Solar Carport Boortmalt in Belgium (see box), Omexom Belgium has several original and innovative operations to its credit.

### Projects in the agricultural and industrial sectors

In 2021, for the floriculture specialist Bernhard, based in Luttelgeest in the northern Netherlands, Omexom installed 40,000 solar panels with a total capacity of 13 MWp, 1.8 MWp of which is from panels floating on around 2 hectares of ponds. This farm produces invaluable energy for greenhouse heating and lighting, and also uses reclaimed rainwater. Before this transition to renewable energies, Bernhard was using around 15 million cubic metres of natural gas a year.

In the same activity sector, in 2016, Omexom completed



a large-scale project for the bulb specialist Haakman Flowerbulbs: a 1,033 MWp solar farm producing 1,084 MWh of renewable energy annually.

More recently, the sand and gravel producer K3Delta entrusted Omexom with the installation of a 6.4 MWp floating solar farm on Lingemeer, a lake southeast of Utrecht and former agricultural area, which over the last 20 years has become a water leisure park. The project, which was completed in 2022, required the placement of 80 concrete blocks on the lake bed to stabilise the solar farm. Thanks to this installation, the sand extraction taking place on part of the site now emits much smaller quantities of greenhouse gases.

### Monitoring growth

In this context of strong growth in VINCI Energies solar activities, its business unit Omexom RE Solar, which specialises in solar power plant construction, decided to create its own hypervisor tool – OkiO – to monitor all its business management assets and access key data from all these sites in real time, in order to optimise energy production.

### Less energy-intensive malt

Boortmalt, a world leader in malt production, is committed to reducing energy consumption in its plants 50% by 2030. Its headquarters in Antwerp led by example in 2020, equipping its parking area with 2,000 solar panels. The yearly production is almost 900 MWh, along with 50 vehicle charging stations. Omexom and its partner Menapy completed this project in just two months. Surplus energy is either used in the factory or injected into the national power grid. By optimising an already occupied space in this way, the project not only produces renewable energy, but also provides shade and comfort for Boortmalt's employees and visitors.



ENERGY PERFORMANCE

# 105 KM OF HIGH-VOLTAGE LINES DEEP IN THE RAINFOREST

**Potentially sub-Saharan Africa's second-largest hydroelectric producer, Cameroon is continuing work to connect up its infrastructure. Omexom constructed a link to help increase the network's reliability and bring electricity to around 150 localities in the East Region of Cameroon.**

Six million people in sub-Saharan Africa lack access to electricity – 43% of the region's population. The United Nations have made increasing the proportion of renewable energies in the energy mix a support priority for the subcontinent, and the governments concerned have implemented strategies to reduce their dependency on fossil energies.

Cameroon, which has huge numbers of households, mostly in rural areas, not yet connected to the grid, is targeting universal access to energy by 2035.

Tapping the country's hydroelectric potential is a key component of the roadmaps defined by ministers in Yaoundé. Cameroon has the potential to be the second-largest hydroelectric producer in sub-Saharan Africa, with large-scale infrastructure such as the Song Loulou power plant andthe facility attached to the Lom Pangar Dam and reservoir in the country's East Region, an area particularly poorly served by the network.

### 150 localities electrified

Universal access to electricity will require significant work to create connections between infrastructure across the entire region. For example, in 2023, the 31 MW Lom Pangar power plant was connected to a 90/30 kV transformer substation in the town of Bertoua. The state-owned Electricity Development Corporation (EDC) jointly assigned Omexom Cameroon and Omexom Morocco to this sizeable project worth €14 million. The aim of this interconnector is to enhance network reliability and electrify around 150 localities.

As Arnaud Allix, Business Unit Manager at Omexom Cameroon, explains, "Our mission was to perform the studies, manage the civil engineering works, and build a 90 kV high-voltage line 105 km long and some 30 metres across. And in a highly unusual environment, because from end to end, the work was deep in the rainforest, two days' drive from the nearest supply port."

It took around five years to prepare the project, and less than two years' work to construct the 366 towers for the line, pull the conductor cables, and create a fibre-optic link between the power plant in Lom Pangar and the substation in Bertoua. Managed by a project team of 30, the work required up to 150 operators at a time.

### The benefits of cooperation

"The cooperation between Omexom Morocco and Omexom Cameroon was a major selling point in winning a contract of this size," says Arnaud Allix, Business Unit Manager at Omexom Cameroon. "The Moroccan teams were able to demonstrate project experience that we didn't have, and also enabled some of our employees to enhance their technical skills, which we can now emphasise to good effect in local calls for tender."

ENERGY INNOVATION

# HYDROGEN TRAINING DEMONSTRATOR

**Telki is the first hybrid hydrogen and renewable energies demonstrator to be directly integrated into a vocational and educational training centre. It is the result of the collaboration between CIFP San Jorge and Omexom Territories in Bilbao, and this installation helps future renewable energy professionals take their first steps into an emerging technology.**

Since February 2023, CIFP San Jorge, a professional education and training centre located in Santurtzi, a town in the Basque Autonomous Community (Spain), has been equipped with infrastructure for green hydrogen production – a first for a vocational education and training centre.

Named Telki in honour of Maria Telkes, a Hungarian-American scientist and inventor who pioneered solar energy technologies, this complex will enable future renewable energy professionals to learn all about an emerging technology designed to produce sustainable fuels.

Because the green hydrogen production process is significantly more expensive than processes that rely on fossil fuels, technological research and development in this field are essential to optimise this key energy source and make it profitable, for a more sustainable and environmentally friendly future.

## Support from Omexom

The training centre's initial concept received support from Omexom Territories in Bilbao, a VINCI Energies business unit specialised in electrical substations, instrumentation and public lighting. "Omexom supported the centre all the way through the project," says Celestino Gómez Paez, a project manager at Omexom Territories in Bilbao. "On their behalf, we managed various subsidy schemes to reduce the investment costs (solar, wind and hydrogen). We handled the civil engineering and integration work, and also supported the launch phase."

The installation combines the technology and facilities required to obtain pure hydrogen from water, using the training centre's solar and wind power installations as the energy source (see box).

## A scalable and replicable project

"The centre and VINCI Energies are now in the process of inviting public and private entities to come and discover the project," says Celestino Gómez Páez. "These include local authorities, the Port of Bilbao, healthcare facilities, universities and other training providers, private individuals, and other VINCI business units and subsidiaries."

Of course, the Telki project's primary objective is to train the centres' students, who study modules on renewable energies and electrical engineering. But the installation also aims to promote the sharing of knowledge and infrastructure connected with hydrogen, at the local, national and international levels. The project manager continues: "From Omexom's point of view, Telki gives us the possibility to invite market players and to share a scalable and replicable project."

*"Telki gives us the possibility to invite customers and to share a scalable and replicable project."*


The VINCI Energies business unit also hopes to further improve the initiative's environmental credentials. "While this is in itself a 'green' project, we want to make even more detailed calculations of its CO2 emissions, not only in the operational phase, but throughout the entire project life cycle. We are also working to conserve water, by capturing anything unused and reinjecting it into the process."

### 1,200 ml of hydrogen a minute

At CIFP San Jorge, green hydrogen is generated using an electrolyser, which consumes 1 kW. It is powered by a 5 kWp vertical axis wind turbine, a 4.4 kWp dual-axis solar tracking system and a 15 kWp solar panel canopy, with three 22 kW electric vehicle charging points. This allows Telki to produce 1,200 ml of hydrogen a minute.

CITY INNOVATION

# "PLUG AND CHARGE" ON THE ROAD TO ELECTRIC MOBILITY

**To facilitate the user experience, secure the movement of data and accelerate the rollout of smart charging for electric vehicles: these are the aims of the Mobena project, which is supported by VINCI Energies.**

On 7 December 2023, a unique experiment took place in France, at a service area on the multimodal motorway in Longvilliers (Yvelines), south of Paris, which the VINCI Group operates as a mobility laboratory. On that day, engineers from numerous mobility manufacturers and startups were firmly focused on the movements of two cars and how their drivers behaved.

The purpose of this event as part of the Mobena project, which involves businesses from across the entire electromobility value chain (see box), was to perform real-world testing of a new generation of electric vehicle chargers, which offer a comfortable user experience and enhanced security for data exchanges between the various technical links in the value chain.

## "Plug and charge"

The aim of the experiment was to validate "plug and charge" technology, which allows direct communication between the vehicle and charging point without the driver having to present their toll tag. Around 90% of electric vehicle owners in France have a subscription with at least one mobility operator. Most of them are registered with multiple networks and so have multiple tags.

"With "plug and charge", motorists simply plug the charging cable into their car to start charging and also activate the extremely secure payment and billing process, which uses a digital certificate exchange system," explains Júlia D'Avila, Product Owner at Citeos.

*"Creating a market that is open and competitive beyond France's borders."*


In Longvilliers, VINCI Energies teams dedicated to electric mobility worked in partnership with two car makers – Renault Group and Stellantis, two charging station manufacturers – Hager and IES Synergy, and the interoperability platform Gireve.

## Interoperability and electromobility

But behind this simplicity for the user lies a major challenge for the businesses developing this new electromobility solution, which relies on open interoperability between the different suppliers. The ultimate aim of the technology trialled on 7 December 2023 is to allow any vehicle to charge at any station from any service provider.

"The great innovation with this model is definitely its universality," says Mathieu Aveline, Electric Mobility Manager at VINCI Energies. "This requires interactions between numerous providers through a variety of data interfaces, which means adopting a baseline architecture, both technical and organisational. You therefore have to reverse the process, starting from the standard, in this case ISO 15118, and ensure everyone involved adapts to a common framework of rules."

## European scale

The next step for the VINCI Energies teams is to validate "plug and charge" in other configurations, particularly in urban settings. By creating a market open to all electromobility providers, and allowing end users and operators alike to freely select their service providers, this technology is key to accelerating the growth of electromobility.

According to Mathieu Aveline, "The ambition for the VINCI Group and every other every player invested in this next-generation charging system is clearly to create a market that is both open and competitive beyond France's borders. The Mobena project has therefore set up a dissemination unit with a view to collaborating with EU organisations to build a solution that can be replicated at the European level."

### A large-scale project

The testing performed at the VINCI Autoroutes service area in Longvilliers was part of a large-scale programme – the Mobena project. This launched in 2021, with support from the French Institute for Energy Transition VEDECOM, and is based on a consortium of companies representing the entire electric mobility value chain in France: energy firms, vehicle and charging station manufacturers, charging infrastructure operators, electric mobility and technology service providers, and cyber security specialists.

Partners including Atos, Chargepoly, CRITT M2A, EDF, FEV France, Gireve, Hager, IES Synergy, Legrand, Nexans, Renault, SAP Labs, Schneider-Electric, Stations-e, Stellantis, Thales, TotalEnergies, Valeo, and VINCI Energies are already sharing interoperability guides, technical roadmaps, tests and demonstrations, promotion of ISO 15118, and communication standards between electric vehicles and charging stations.

Find out more at: https://mobena.org

CITY INNOVATION

# MAKING DAILY CARPOOLING MORE ACCESSIBLE


**To test and validate a shared mobility service for commuting between home and work in real-world conditions – this is the aim of Trapeze, an ambitious project for decarbonising road use being supported by VINCI Energies.**

With 85% of personal journeys in France being made by road, there is little doubt that, despite committed efforts to develop rail travel and soft mobility, road travel will continue to predominate for a long time to come.

The France 2030 strategic plan demands an acceleration in decarbonising mobility solutions, which are alone responsible for almost one-third of the country's greenhouse gas emissions, and the decarbonisation of road use must therefore be a primary objective. While waiting for a fully electric solution that will itself take time, a variety of testing grounds have emerged, at smaller or larger scales. One such is the TRAPEZE project.

## Carpooling lanes linked to the multimodal network

A consortium of interested parties (VINCI Autoroutes, VINCI Energies, Ecov, Nokia Bell Labs and Cerema) is supporting TRAPEZE, whose name is an acronym from the French for "zero-emission shared autonomous road transport". The project aims to act on two levers: increasing vehicle occupancy rates (combating solo driving and its negative externalities) on one hand; and controlling and improving traffic flows on the other.

How? By encouraging carpooling on the daily commute between home and work, using regulated, reserved lanes. "It's basically a question of developing carpooling routes, just as you now have bus routes," explains Emmanuel Jolly, Business Unit Manager at Actemium Paris Transport SDEL INFI. "The difference is that vehicles will come along far more frequently, and they will not be travelling right from one end of the route to the other, but transporting people along sections specified beforehand by the drivers. For this to work, the routes must interlink with road and rail-based public transport systems, to make daily carpooling a normal part of an intermodal approach."

## Passenger matching application and traffic regulation system

The Trapeze project won the "Automated road mobility, connected low-carbon service infrastructure" call for projects, a component of the fourth Investment for the Future Program, (PIA4) – France 2030.

This three-year project will test an integrated package of services under real-world conditions and on existing infrastructure (initially, the A86 Duplex). Once implemented, the package will include a carpooling route, traffic regulation system, passenger matching application, and mobility hubs, in which users will be offered a personalised journey suggestion, recommending that they take a bicycle, bus or shared car.

*"Developing carpooling routes, just as you now have bus routes."*

"The challenge of this project is to successfully join up the different elements of the service package to ensure the traffic density and fluidity needed to make this model work," says Emmanuel Jolly.

Following a study phase on the A86 Duplex, 2024 will be devoted in part to identifying the lanes to be used for the initial service tests, which should take place by the end of the year at the latest.

INDUSTRY | INNOVATION

# PHD STUDENTS IN BUSINESS: A TRIPLY VIRTUOUS MODEL

**CIFRE, a French system through which postgraduate students can complete their doctorate with a company, allows businesses to welcome PhD students for three-year placements. This arrangement brings numerous benefits. Mouloud Iferroudjene, a PhD candidate at LIMOS and his corporate mentor, Thierry Laveille, Head of Product Management, Research and Innovation at Courbon Software, a VINCI Energies business unit, discuss its workings.**

**What motivated Courbon Software to recruit a PhD student?**

**Thierry Laveille:** We design innovative software packages that can integrate with every industrial production process in various business sectors: pharmaceutical, agrifood, materials chemistry, manufacturing, intralogistics, etc. We wanted a more in-depth look at artificial intelligence. It's already well represented in our models, but we consider it an important theme for innovation and a competitive lever for our industrial customers and for us, and therefore, a strategic area to be investigated.

**Mouloud Iferroudjene, why did you want to be a PhD candidate in a business?**

**Mouloud Iferroudjene:** Working for a PHD in a business, especially an industrial company, is not the most common option. But I am trained in both scientific and engineering disciplines, and really wanted to focus on industry. Working on my thesis in a business enables me to anchor my research in a real environment, giving it an immediate tangible dimension and more immediately identifiable prospects for its application. A kind of usefulness, if you will. I find that interesting and gratifying.

**How did you make a selection?**

**Thierry Laveille:** We are based in Saint-Etienne, so we naturally approached the EMSE graduate engineering school, and more specifically LIMOS, a research laboratory unit within the school specialising in computing, modelling and systems optimisation. We discussed it at length to identify and define a research topic. AI is a very broad subject. We needed to narrow it to a specific scope to serve the interests of both the laboratory and Courbon Software. From our standpoint, we wanted to be able to explain to our customers what concrete benefits AI could bring them. So, it seemed appropriate to work on the explainability of automatic learning models applied to industrial tasks such as fault detection, predictive maintenance, or the optimisation of production lines. This subject was of great interest to Mouloud, who agreed to work with us for three years.

*"To explain to our customers what concrete benefits AI could bring them."*

**Mouloud Iferroudjene:** My work deals with the integration of expert industry knowledge into AI by translating it into rules and formal models (structured data). The title of my thesis in English is Injecting subject area knowledge into automatic learning: integration of formal knowledge into deep learning for Industry 4.0.

**What could machine learning bring to Industry 4.0?**

**Mouloud Iferroudjene:** Modern industrial systems generate immense quantities of data, which automatic learning techniques could make better use of. Deep learning excels on raw data such as images. Industrial data is very disparate (numerical, temporal, structured, etc.), which creates a need for complex pre-processing. By incorporating formalised industry knowledge, I hope to make better use of this diverse data and also make the models easier

to interpret, which is a major issue in critical industrial systems. I'm trying to develop a generic methodology for integrating this formal knowledge into at least two distinct learning tasks, in the fields of agrifood and pharmaceuticals, combining data and expertise from Courbon Software and the research unit at EMSE.

**Is a CIFRE scheme easy to set up?**

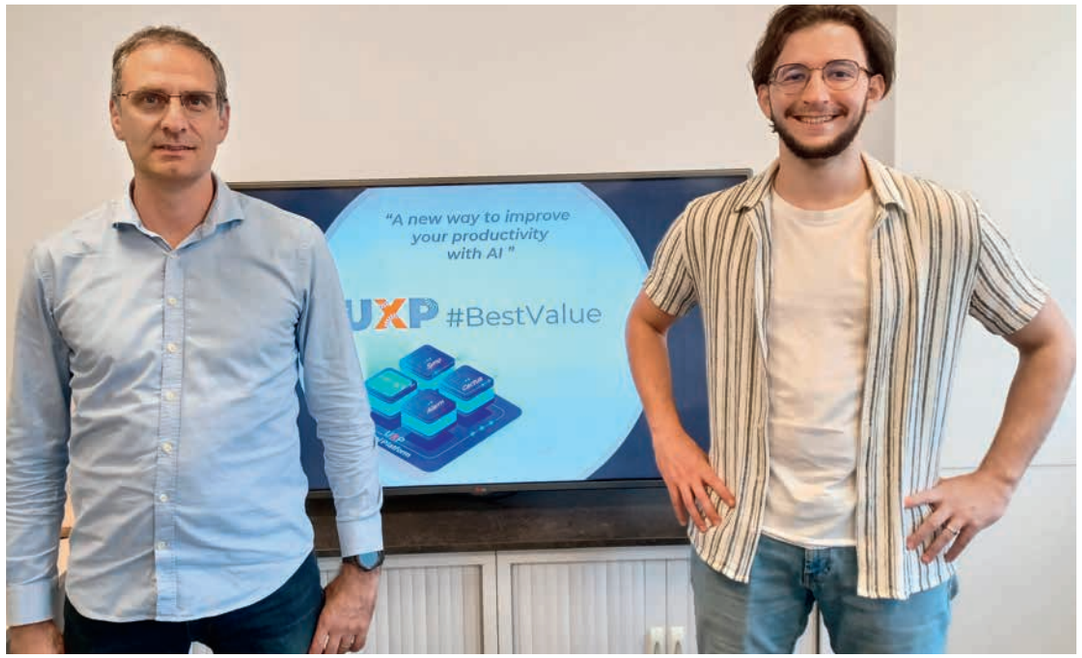
**Thierry Laveille:** From an administrative point of view, it's hard work! We are lucky enough to have an HR department, which made it much easier for us. Besides that, it's important to find common ground for cooperation with the laboratory. We are clearly engaged in a research partnership approach. The aim of the CIFRE framework is to allow a business to access financial aid for recruiting a young PhD student whose research work, overseen by a public research laboratory, will lead to a successful thesis defence.

**What are the benefits?**

**Thierry Laveille:** There is a triple benefit. For the business, it means gaining a valuable human resource and ensuring that time is devoted to R&D. This approach sustains the company's innovation process. A thesis is a wager on the future. We definitely expect a return on investment from this undertaking. For the lab, the CIFRE scheme opens up professionalisation prospects to its PhD candidates and creates potential for the transfer and development of research. As for the PhD candidates themselves, they get to prepare their thesis within a professional framework, which obviously enhances their employability.

**Mouloud Iferroudjene:** My ambition is for Courbon Software to obtain substantial benefits from my work over these three years. I'm currently completing the second year of my thesis and haven't yet decided on my post-doctoral options, but I'm sure I'll find a good job. Working for three years in a subsidiary of a major group like VINCI Energies has already provided opportunities to meet people and work in productive collaborations, and has confirmed my intention to work in the world of industry. I am convinced that the key to an industrial revolution driven by artificial intelligence lies in the harmonious fusion of raw data and industry knowledge.

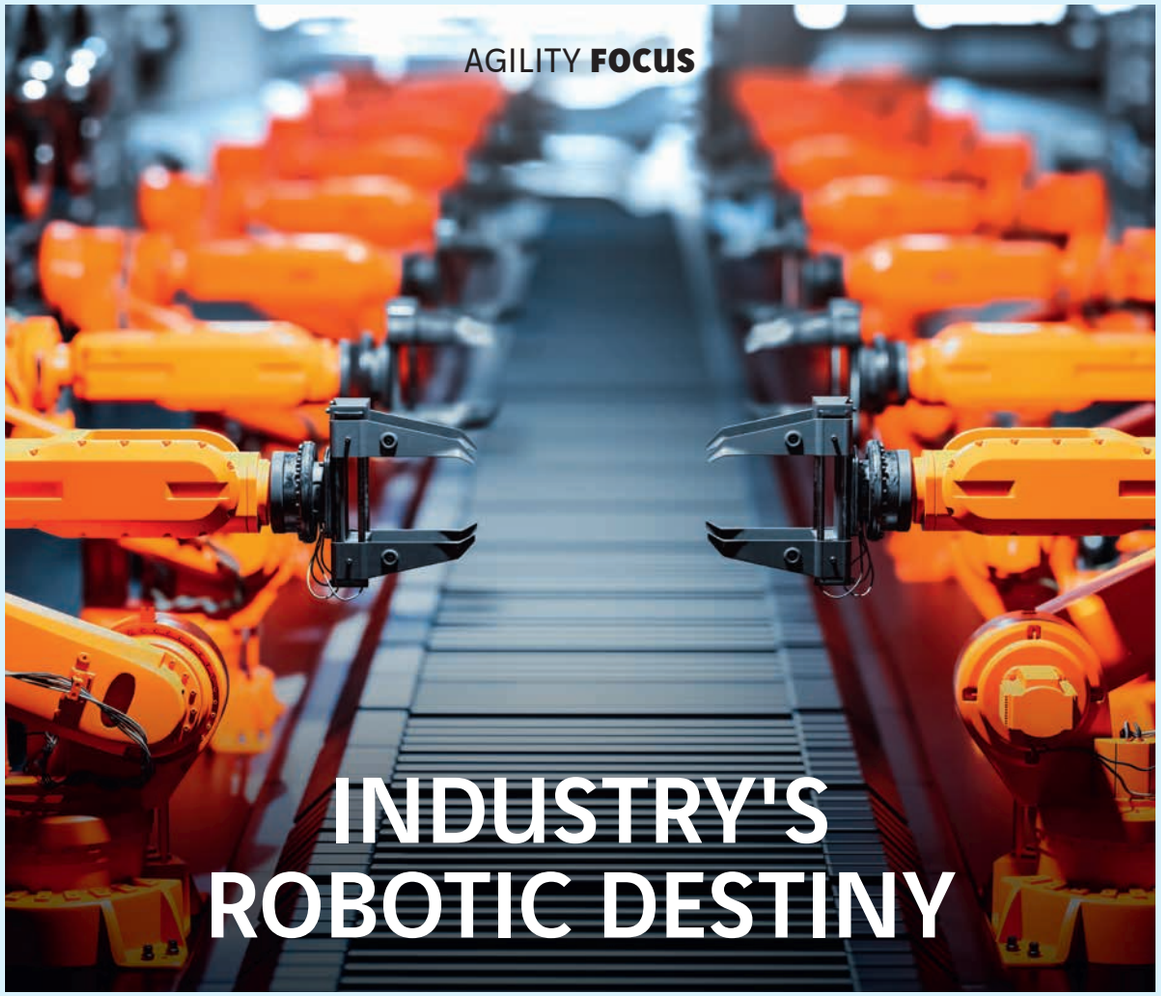
Watch the interview of Mouloud Iferroudjene




Thierry Laveille (left) and Mouloud Iferroudjene (right)







# INDUSTRY'S ROBOTIC DESTINY

Fierce competition, the pursuit of productivity, relocation policies, a shortage of manpower: these are just some of the pressures on an industry searching for solutions to kick-start a new growth cycle and make plans for long-term recovery. One of these potential solutions is robotic automation. Having long been a pipe dream, it is now a rapidly expanding reality.

Industrial robotics represents less an opportunity and more a revolution. The technological and economic conditions have never been more favourable to an expansion in the automation of industrial processes. Use cases abound in every sector, from nuclear to logistics, via pharmaceuticals and materials handling.

Thanks to a formidable network of 55 business units with robotics expertise across France and Europe, Actemium – the VINCI Energies industry brand – is positioned as a leading-edge integrator in this market. The prospects are huge, with the phenomenon of robotisation still in its earliest stages, especially in the small and medium-sized businesses that make up the greater part of the industrial fabric, particularly in Europe.

INDUSTRY | TRANSFORMATION

# ROBOTISATION: DRIVING INDUSTRIAL RECOVERY

**Re-industrialisation and industrial sovereignty are key elements in recovery plans in most developed economies. The development of robotisation is a powerful factor in this global movement.**

In an increasingly competitive economic context, productivity and agility remain key to industrial expansion worldwide. And robotisation has long been seen as a major factor in the sector's transformation. It offers numerous benefits: increased competitiveness, greater flexibility in production, enhanced quality, improved safety and working conditions, and reduced environmental impacts. "There is a correlation between industrial growth and modern production facilities," says Vincent Bouffard, General Secretary of VINCI Energies and Chairman of Actemium.

## Technological advances

In recent years, technological advances have made the conditions for increasing robotisation more favourable than ever. "The boom in cloud computing and mobile networks has helped to optimise robotic performance in an increasingly digitalised production context," explains Jade Le Maître, CEO at Proxinnov, a cluster for promoting and developing France's industrial robotics sector. "Alongside which," she adds, "the creation of new interfaces and the increasing use of low-code and no-code development have considerably simplified programming. Add to that the expansion of artificial intelligence and better-performing equipment, such as vision solutions, which have made automation more accessible."

*"There is a correlation between industrial growth and modern production facilities."*

## The curse of PoC

This alignment of the technological spheres comes at a time when the industrial sector needs to recognise and address the labour shortages in developed countries, in particular for essential tasks such as welding, assembly and handling. Also, production post-COVID is undergoing a profound change with the new challenge of relocalisation or "nearshoring", which involves relocating an activity to another region in the same or a nearby country.

However, according to studies carried out by the research consultants Gartner and Roland Berger, only around 30% of companies worldwide have implemented relevant robotics solutions throughout their organisations.

In areas such as connectivity, data, AI, and indeed AI-enhanced robotics, an overwhelming majority of businesses see these innovations as essential to their growth, but considerably fewer have actually launched related demonstrators or proofs of concept (PoCs), and fewer still (barely a quarter) have deployed these trial solutions at scale.

"To break the curse of PoC, a stage that many businesses struggle to move on from," says the Proxinnov CEO, "it is essential to follow some basic rules: define the organisation's vision, following a clear, phased roadmap and remaining focused on the commercial benefits rather than the technology; identify the technologies that meet operational needs and create an ecosystem of strategic partners committed to the long term; and last but not least, involve teams at every level of the business by encouraging the development of skills through training and by supporting the change process."

## Asia leading the way

Despite all this, increasing numbers of businesses seem to be taking the plunge. According to the

World Robotics 2022 – Industrial Robots report published by the International Federation of Robotics, the number of collaborative robots installed worldwide between 2021 and 2022 increased by 31% (517,000 new units), predominantly in handling, with welding and assembly lagging well behind.

This upswing associated directly with the post-COVID period was mostly driven by Asian countries, which account for 74% of all robots installed, with China alone responsible for 52%. Jade Le Maître emphasises that "This strong growth in the global robotic fleet is primarily due to government support, which is vital for robotics."

China has invested US$1.7 trillion in its Made in China 2025 strategic plan, which launched in 2015 with the aim of increasing national robotics capacities through massive investment in R&D, infrastructure and the development of talent, with appreciable results (see box).

Similarly, early in 2024, South Korea announced a US$2.24 billion investment in its fourth national robotics plan, which includes substantial tax breaks, massive support for R&D and startups, and a target of 1 million robots deployed in industry by 2030. Germany, Italy, the United States and France have also invested considerable resources in developing the robotics sector.

### SMEs on the front line

In terms of business sectors, logistics is one of the most advanced and dynamic. But all sectors face common challenges in their automation and robotisation, such as providing resilient local supply chains, ensuring technological sovereignty, and creating a pool of qualified and highly skilled workers.

Small and medium-sized enterprises are on the front line of robotisation. "SMEs are the new targets for the democratisation of robotics," says Jade Le Maître, who sees this as "a vast and as-yet untapped market in which cobots [collaborative robots that interact directly with human operators] have a particularly important role to play."

To illustrate the potential of SMEs, Joan Guasch, International Development Director at EURECAT, the Catalan technology centre, cites the example of the French programme Robot Start PME. Created by Symop (the French professional union of industrial solution creators), Cetim (the technical centre for the mechanical industries) and CEA List (the CEA technical research institutes dedicated to intelligent digital systems), this programme helped around a hundred industrial SMEs modernise their production bases between 2013 and 2017.

For Joan Guasch, "Robot Start PME played a fundamental role in promoting the use of robots in small and medium-sized enterprises. Thanks to robotisation, SMEs have increased their net earnings by 55% and created 5% new jobs, while stimulating innovation." QED.

### Recycled robots

At its Roche-sur-Yon site in Vendée, western France, Proxinnov, the technological resource centre dedicated to robotics, has 13 robotic cells offering a wide range of applications: cobotics, palletisation, logistics, welding, handling, inspection, machining, etc. One of its priorities is the re-use of robots.

"For a long time, automated cells were linked to a single product," Proxinnov CEO Jade Le Maître tells trade magazine L'Usine Nouvelle. "Afterwards, the line was discarded. But the great thing about robots is their versatility and the possibility of re-using them, which is an important factor in being competitive." Robot manufacturer Kuka, a Proxinnov partner, guarantees that "40% to 100% of their robots can be recycled."

### China – and the rest

The range of public policies dedicated to promoting robotics in industry varies between countries, and the figures reflect this: in 2022, China installed more than 290,000 robots, considerably ahead of Japan, which installed more than 50,000 robots, and which in proportion to the size of its production apparatus, remains the world's most robotised nation, ahead of the United States (just under 40,000), South Korea (over 30,000), Germany (25,000), Italy (11,000), Taiwan (almost 8,000) and France (7,500). Note that in 2023, the number of industrial robots installed in France fell by 18.4%, with 6,022 robots installed according to the robotics group Evolis.

# LOGISTICS: THE SECTOR AHEAD OF THE GAME

**The logistics sector is one of the most advanced in terms of robotisation, having taken on board the benefits and also the challenges it presents.**

"Robotics brings numerous benefits, not least improved workplace safety, improved efficiency and productivity, greater scalability, and the ability to operate 24/7," says Ralf W. Buerk, Senior Group Manager Operations Supplier Coordination at Geopost, a La Poste Group subsidiary and service provider.

"A robotics rollout must nevertheless factor in certain constraints," he adds, highlighting CapEx [the investment spending required], TCO [Total Cost of Ownership, i.e. the total cost of an asset over its entire life cycle] and maintenance costs, "but above all, the speed, and therefore the productivity from technological upgrades to machines; their integration with existing systems; and data security, with cybersecurity the crucial issue."

While the logistics sector is far ahead of many others, third-party logistics in particular, which outsources company supply chains, still has considerable room for improvement in terms of robotisation.

In 2023, 60% to 80% of logistics warehouses worldwide had few or no automated systems. It seems that firms in the sector are still discouraged by the cost – between US$5 and 15 million to equip a typical warehouse.

Prospects in this market are therefore considerable. Robotics for product picking and transportation alone will be worth US$1.34 billion by 2025, and the worldwide market for exoskeletons is expected to be worth close to US$3.7 billion by 2028.

"Robotisation offers undeniable opportunities in business terms," says Olivier Storch, Deputy CEO Finance and Transformation at CEVA Logistics (CMA CGM Group) which specialises in outsourced logistics, "but it is important to keep track of your [financial] depreciation, especially given the speed with which technology evolves, and factor in staff training."

INDUSTRY | TRANSFORMATION

# FREE-RANGE MOBILE ROBOTS!

**The use of mobile robotics in industrial settings is developing rapidly. Private 4G/5G networks are a fast-maturing solution to ensure a reliable, robust connection on complex sites. We look at some examples with Axians, from the Port of Rotterdam to the Mercedes-Benz head office in France.**

Private industrial 5G provides a reliable, low-latency connection for robotics applications on all types of industrial sites and improves on the limited range of uses offered by other technologies: "Wi-Fi has limited power and requires access points every 30 m," explains Yann Bertrand, International Business Development Manager at Axians, the VINCI Energies ICT brand. "This complicates installations, especially outdoors when networking large sites in complex environments – a petrochemical or steel-making plant, for example. 5G provides reliable, robust coverage with very few base stations."

"Wi-Fi also has clear limitations in mobile situations," he adds. We are now seeing increasing use of mobile robots in factories, where even a temporary interruption in connectivity can seriously hamper the industrial process. Using 5G avoids this type of incident."

The predictable nature of 5G's performance as a reliable mobile broadband connection therefore makes it a real asset in an industrial setting. For the past four years, several container terminals at the Port of Rotterdam have been equipped with a private mobile network, designed and installed by Axians, to connect their autonomous vehicles, which transport the containers unloaded from ships to their designated storage areas.

"With Wi-Fi, the system frequently experienced dropped connections, which caused the vehicles to stop dead," says Yann Bertrand. "Given the €100,000 cost of an hour's stoppage, the port had no hesitation in adopting 4G, and soon, 5G." More recently, in the Port of Bordeaux, the port terminal operator Sea Invest had a 4G antenna installed to improve site-wide reliability of the connections to computers on board its cranes and user-operated container vehicles.

## Take-off

"In the field of robotics," says Yann Bertrand, "the rollout of private 4G/5G networks is still in its infancy. It required a long period of evangelism, and the price drop that accompanied the release of versions adapted to industrial needs. But in 2024, the market, especially for 4G, is really taking off. The 5G technology is not yet mature, but new use cases are being developed."

In 2022, the robot and automated solution builder Omron appointed Nokia, in partnership with Axians for the engineering and installation, to install 5G at its factory in Argonay, near Annecy in Haute-Savoie, with a view to trialling the development of robots capable of operating via a private 5G network.

In 2023, at Star Center, the Mercedes Benz headquarters in Montigny-le-Bretonneux, west of Paris, the German carmaker has implemented a novel use case. To avoid having to install electric charging stations for every space in its underground parking area, the group opted for autonomous robots. The robots are connected to a private 4G network with one antenna covering the entire parking area, and move to plug themselves directly into vehicles that need charging.

## Robotisation and virtualisation

A wealth of new uses is emerging from the rollout of private 4G/5G networks. Axians has therefore forged links with an R&D programme financed by Bpifrance, which among others includes the Stellantis group, and manufacturers of connected tools such as Miodex, which specialises in screw assembly solutions.

"With 5G, the aim is to be able to locate objects to within 50 cm, and eventually 10 cm," says Yann Bertrand. "This will allow better quality tracking by verifying that the work has been done in the right place and in the right way, and make it possible to block the use of tools not appropriate for a given workstation."

This kind of application is in particular demand in the aerospace sector. Yann Bertrand explains that "Airbus has private mobile networks on its production sites to provide connectivity everywhere, even to the tip of an aircraft wing on the assembly line."

The Actemium expert concludes that upcoming developments in the virtualisation of automated systems, which separates the physical machine from its software and operating systems to allow remote updates, maintenance and repair (robot-as-a-service), will only increase the need for a fast, reliable connection.

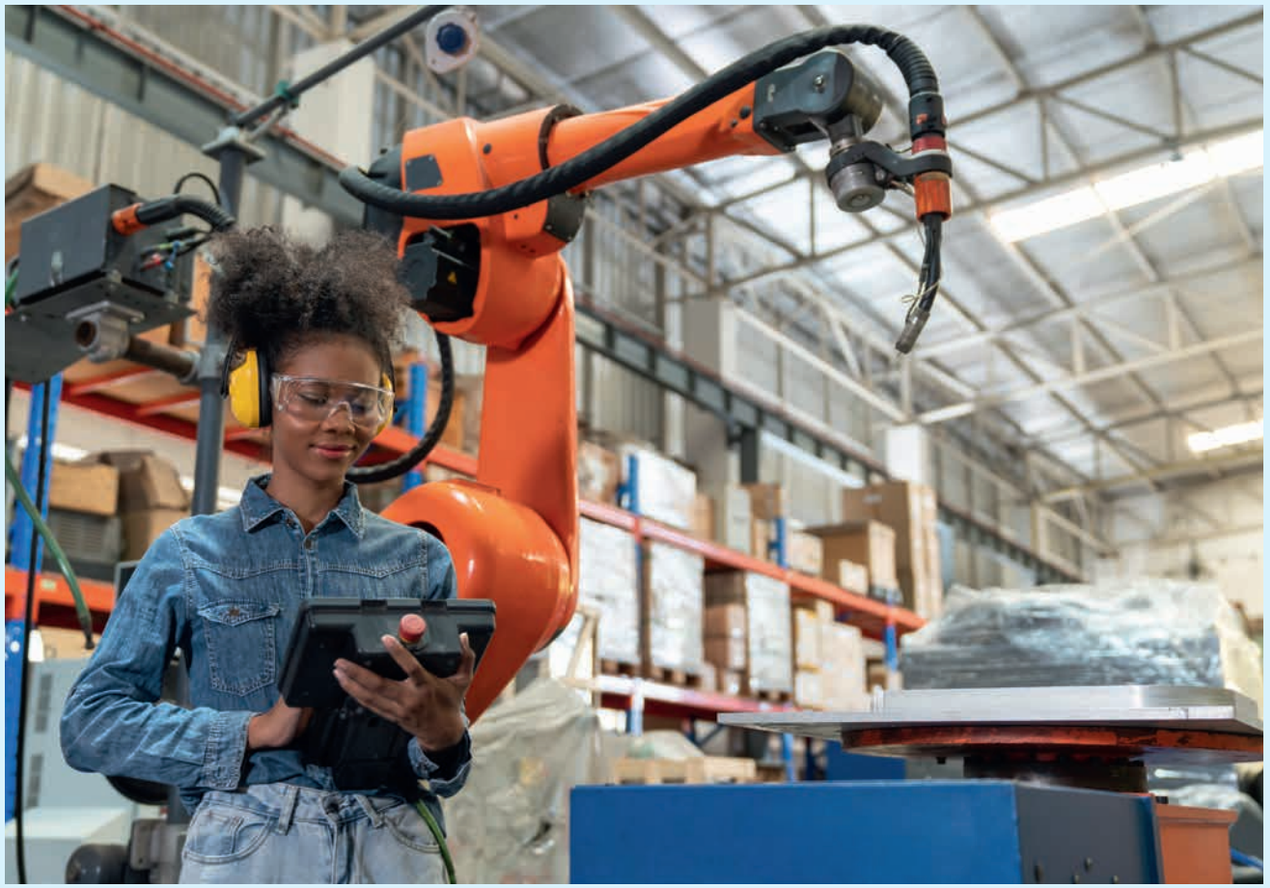
### p5G4OT – the private 5G mobile robot

In 2021, Actemium and Axians, the VINCI Energies industry and ICT brands, launched a PoC (proof of concept) for creating a robust, reliable mobile industrial robot capable of data capture both indoors and outdoors. "On some of our projects, we used to experience latency issues from time to time," explains Frédéric Boulvert, Business Innovation Engineer at Actemium Rennes, who also coordinates the Actemium Robotics Club's advanced industrial robotics working group. "So, we approached Axians, which was already working on applications for private mobile networks in industrial settings. And the result was p5G4OT, which stands for "private 5G for Operational Technology". This demonstrator can load and unload industrial parts or other products anywhere on site with no loss of connectivity, thanks to the installation of a private 5G network. Frédéric Boulvert adds that "This type of configuration particularly comes into its own when you are using robots equipped with AI vision systems, where the transmission of images cannot be interrupted due to a lost connection," and also emphasises the data security benefits of a private 5G network: "The data is basically being generated directly on site via a central server". p5G4OT has been undergoing testing in an industrial setting throughout summer 2024.

INDUSTRY | TRANSFORMATION

# ROBOTICS: INCREASING REGULATION FOR ENHANCED SAFETY

**Robotics is increasingly subject to regulatory and legislative changes being made, in line with technological advances, in order to limit safety and cybersecurity risks. Recent European legislation has been game-changing for manufactures and users alike. Our expert explains.**



The boom in robotics in industrial settings inevitably raises questions around security, and is prompting new regulations. At the European level, directives on machinery (2006/42/CE), mains voltage (2014/35/UE) and electromagnetic compatibility (2014/30/CE), and the machinery regulation (2023/1230), to name just the most significant, are establishing an already-extensive regulatory framework applicable to all robotic systems, or at least those manufactured after the introduction of these legislative acts, which are not retrospective.

"While it may seem restrictive, this legislation is crucial, and the manufacturers that use these machines are themselves calling for it in order to clearly delineate everyone's responsibilities," says Max Deleruelle, Business Technical Manager at CETIM, the French technical centre for mechanical industries.

## Substantial modification

The new 2023/1230 regulation on machinery, which replaces EU Directive 2006/42/CE, will immediately apply directly to every new machine, with no transition period. One new feature is the concept of substantial modification (hardware or software) to a machine in service.

"The new regulation takes account of the fact that machines in service are frequently modified by the end user," explains Max Deleruelle.

"These modifications can create a new hazard or increase an existing risk in a way the manufacturer never considered. And the new regulation therefore now stipulates that anyone making a substantial modification to a machine in service is to be considered a manufacturer."

This means that the user will now assume the same obligation that falls on the manufacturer, namely to assess the equipment's compliance with all applicable directives and regulations, and to renew its CE marking to that effect.

Max Deleruelle explains that "As a producer, the end user generally lacks the expertise to perform this revalidation of the modified machine's safety features. They have to reach out to an expert – a provider such as Actemium, or the machine's manufacturer. But ultimately, the end user is legally responsible for any accident."

Repair and maintenance operations that do not affect the machine's compliance are not included.

## Data corruption

The other major change in the 2023/1230 regulation is concerned with cybersecurity. Insofar as the machine meets the definition of a "product that includes digital components" with data transmission, new safety requirements will also apply.

"This involves taking measures against data corruption that could cause hazardous situations, and also ensuring that every operation is recorded and tracked," says the CETIM manager.

Whether data corruption is accidental or the intentional result of a cyberattack, the manufacturer must now consider reasonably foreseeable malicious acts that could lead to a hazardous situation.

"In other words," explains Max Deleruelle, "in the case of this type of corruption, if the manufacturer's machinery stops working, and this causes a loss of business, it can take legal action against the manufacturer for not having provided the means to implement appropriate cybersecurity to the machinery."

These new requirements should enable the end user, when purchasing a new machine, to comply with the new European Cyber Resilience Act, which from 2026 will require the component manufacturer to inform the integrator of possible incidents and attacks, and from 2027, the integrator in turn to inform the end user and authorities for a five-year period. If necessary, the integrator will be responsible for making the required hardware or software modifications.

"It's worth mentioning that the next revision of the ISO 10218 standard on robots will include cybersecurity. This will require a security assessment, and if necessary, the implementation of specific measures to strengthen cybersecurity."

The new regulation will also cover AI and include autoscaling components that perform security functions. "For example, you might have an AI for recognising human beings or detecting prohibited actions such as reaching an arm toward the robot, which would trigger an emergency stop," says Max Deleruelle, adding that "In this case, the AI would have to be certified by a third party." Our efforts to fully understand the impact of the "AI Act", which comes into effect in 2027, remain a work in progress.

INDUSTRY ACCELERATION

# ACTEMIUM AS INDUSTRIAL ROBOTICS INTEGRATOR

**In the booming industrial robotics market, the VINCI Energies industry brand has, through its extensive network of business units, developed the expertise to position itself as a major player in the sector by integrating every type of expertise.**

From enhanced flexibility, lower costs, increased productivity and improved quality to reduced workplace risk and the elimination of arduous tasks – industrial robotics offers numerous advantages. To support its customers in their implementations of robotic applications, Actemium, the VINCI Energies industry brand, has acquired a broad palette of expertise to become a noted industrial integrator in this field.

"We possess every kind of expertise related to robotics," says Actemium Brand Director Christophe Rousseau. "From consulting to design and installation, we manage operations in their entirety for a turnkey delivery." The automotive industry is the most mature market in terms of robotics, and Actemium is naturally a strong presence within it. But the healthcare and logistics sectors are also rapidly automating their operations, especially since the COVID crisis. In the logistics market, Actemium is also highly active through its "Intralogis'Team" club, made up of 19 companies and more than 1,000 experts in five countries, which generated revenue of €98 million in 2023.

## Opportunities

Among the new growth opportunities in the field of robotics, Actemium is targeting specific areas of expertise such as welding, polishing, deburring and painting, as well as the full range of recycling activities.

"Manufacturers are now obliged to guarantee the recyclability of their products," explains Lionel Kaddah, Head of Business Development at Actemium Bonnétage Automation. "The recycling loops now being established still rely largely on the manual disassembly of equipment, but this will eventually need to be automated using robotic systems".

In addition to waste reclamation, Actemium's future lies in sectors such as agrifood and retail, with the automation of tasks such as pallet, box and bin stacking, and 3D bin picking (automatic object recognition and picking using 3D vision).

## Concurrent engineering

To accelerate its expansion in the booming robotics market, Actemium will rely on four key assets: concurrent engineering, re-use/retrofitting, agility and cybersecurity. "Concurrent engineering, from the customer's point of view, means involving us in a product development project from the outset," explains Lionel Kaddah. "This can considerably reduce the time to market, which is a crucial advantage for the customer wishing to stand out from its competitors." With concurrent engineering, the construction time for a specialised machine can be reduced by almost 40% compared with a conventional project.

There are also significant advantages in terms of cost. "When you buy a machine 30% cheaper in Asia, you need to analyse the overall cost, which can end up quite high when the distance is taken into account. The time savings and reduced follow-up you get with concurrent engineering can limit this type of extra cost," says Lionel Kaddah, adding that "This type of collaboration requires a strong trust relationship with the customer, as they are opening their doors to us very early in the development of their product."

## Re-use and retrofitting

Another asset available to Actemium in developing its robotics business is its re-use and retrofitting capability. The VINCI Energies industry brand has made this a development priority, particularly with historic customers it has already supplied with machinery.

For Lionel Kaddah, "These types of operations are a response to our customers' major expectations: to make savings, reduce equipment lead times, and generate environmental benefits – primarily by limiting the quantities of raw materials used."

Retrofitting is about more than simply renovating physical equipment. "In visually enabled robotics installations, for example, adding AI can improve quality performance without having to physically change equipment, simply by installing new software on the vision controller," says Frédéric Boulvert, Business Innovation Engineer at Actemium Rennes, the chair of the Actemium Robotics Club's Advanced Industrial Robotics working group.

The integration of AI is, of course, a key issue. "There is an abundance of new applications, enabling us to strengthen the solutions we can offer. But before plunging in, it is essential to fully master the AI to obtain the best results," says Lionel Kaddah.

## Agility

Actemium's agility is also key to its strength in the robotics market. Whatever the workload for any one of its business units, each can count on other entities in the network to meet a customer's needs within the allotted timescales.

"We are not only highly responsive, we are also proactive, with the ability to guide the customer toward standardised solutions we have developed, such as robots capable of placing parts on trays for watch making, and robotic parison cutting cells for plastics processing," continues Lionel Kaddah.

## Cybersecurity

One last crucial point and an increasingly strategic aspect of robotics is cybersecurity. Previously, production machinery was managed by automation systems that handled communication with the various workstations between them.

*"From consulting to design and installation, we manage operations in their entirety for a turnkey delivery."*

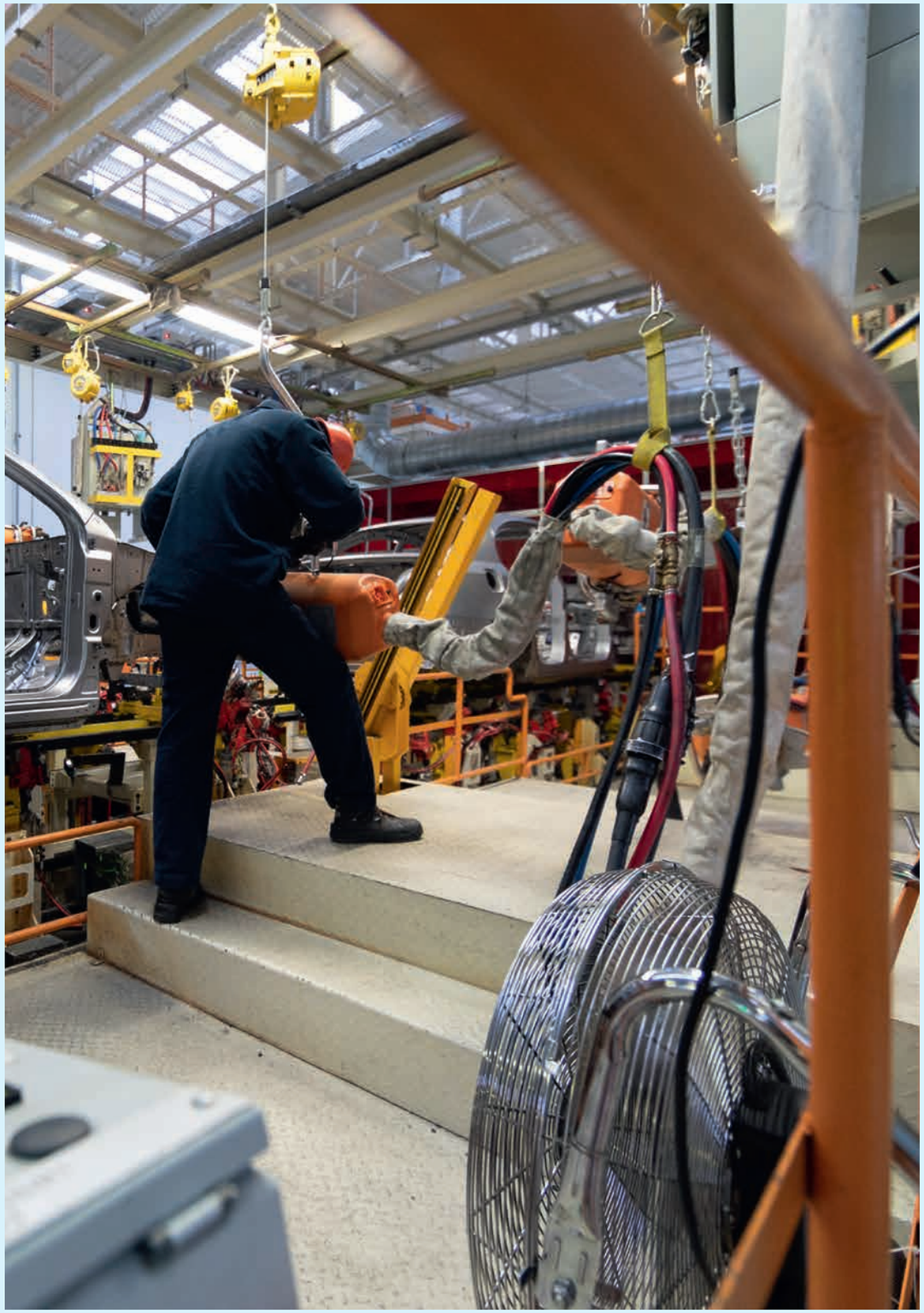
But today's businesses need to communicate with their machinery in real time, to monitor production and even initiate production of live orders.

To do this, machines must be connected to the factory's CAPM (computer-aided production management) system. "Nowadays, there's no discussion of computing without talking about cyber risk," explains Lionel Kaddah. "We now have connected machines at almost every customer site, mainly for remote maintenance. We and our customers are therefore potential targets for hackers. Because of this, in collaboration with Axians, we offer tools to protect systems and minimise failures."

Concurrent engineering, re-use and retrofitting, agility, and cybersecurity: Actemium can mobilise all these areas of expertise to offer its customers bespoke turnkey solutions. One example of this is the automated unit fitted with a Japanese humanoid industrial robot designed and installed by the VINCI Energies industry brand for an electrical equipment manufacturer to perform complex assembly tasks including gluing parts and fitting them together.

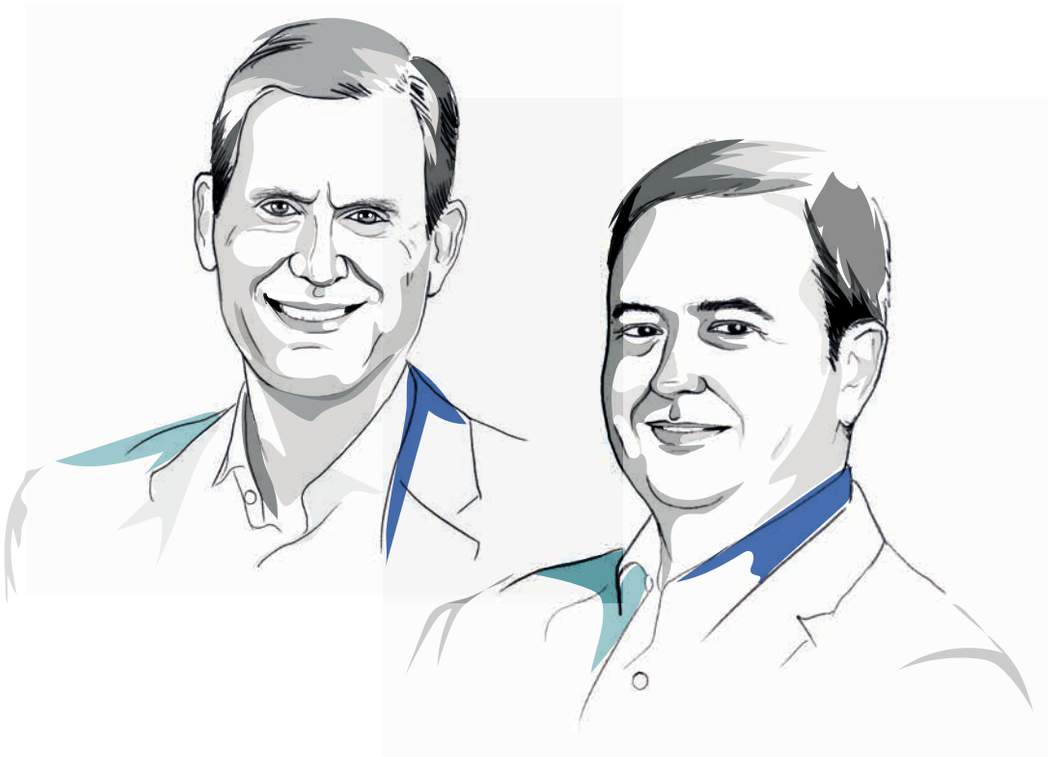
### The strength of an international and local network

Over the past 10 years, the VINCI Energies industry brand has developed an extensive specialist network in France and internationally. Having grown from 18 business units with robotics expertise in 2015, all based in France, the Actemium network now comprises 55 entities specialising in the field, 21 of which are in 10 countries other than France, including Belgium, the Netherlands, Germany and Spain. Actemium's robotics business, which includes robotics installations, specialised machines and mobile robots, grew by 50% between 2021 and 2023. "While we are extremely active in the automotive sector, which accounts for 50% of our activity, we are also present in the markets for capital equipment (13%), medical devices and pharmaceutical products (10%) and agrifood (10%), plus aeronautics, watch making, luxury jewellery, etc." says Lionel Kaddah, Head of Business Development at Actemium Bonnétage Automation.



INDUSTRY | TRANSFORMATION

# "NO RE-INDUSTRIALISATION WITHOUT AUTOMATION"



**In the debate around European re-industrialisation, we cannot afford to overlook the robotisation of industrial processes. Joan Guasch, International Development Director at EURECAT, the Catalan technology centre in Spain, talks with Christophe Rousseau, Brand Director at Actemium, the VINCI Energies industry brand.**

**The consensus today seems to be that re-industrialisation cannot happen without increased automation. How does this pairing of re-industrialisation and automation work, and what makes it so necessary?**

**Christophe Rousseau:** Re-industrialisation and automation are indeed closely linked. These days, there is a robotics element to most new industrial projects. And this automation is not as costly as you might think compared with the overall cost of these projects.

**Joan Guasch:** I would go even further: there can now be no industrialisation without automation. But the problem, in my opinion, is that sometimes the people responsible for these industrial projects have a tendency to over-automate their production lines, with a risk of over-investment that can become a problem. Sometimes people lack a realistic vision of their needs. We need to be careful about that.

**How does this re-industrialisation-automation pairing relate to the required decarbonisation of production?**

**Christophe Rousseau:** For one thing, industrial automation can reduce the cost of processes. But robots also have abilities that human beings don't, which make it possible to optimise production rates, and some operations, while also enhancing safety, making them less expensive, especially in energy terms.

**Joan Guasch:** Industry's priority is to reduce costs. These costs arise from energy spending but also from defective products. By improving production quality, robotisation therefore reduces costs through lower energy consumption and also raw materials savings. That said, up to now, studies that have tried to measure the benefit-cost ratio of robotisation have not found a clear link between robotisation and a reduction in $CO_2$ emissions. Given that automation is unavoidable and that industry needs to improve its carbon footprint, it is therefore essential to develop and refine these types of studies.

**Christophe Rousseau:** It's clear that automation reduces the consumption of raw materials. Similarly, using decarbonised energy to run robotic production lines is positive in terms of your carbon footprint. Also, robotic cells in factories have a fairly long life – in the order of 30 to 50 years. In fact, the things that need repairing or replacing on this kind of equipment are electronic or mechanical components, not the robot itself. We also shouldn't ignore the impact of robotisation as a means of innovating on the very same decarbonisation projects, which would not be feasible without robots, for cost reasons or due to the high-precision tasks involved.

**Which sectors and countries are the most advanced in terms of automation?**

**Joan Guasch:** The automotive sector is the most advanced in terms of the number of robots installed on production lines. But, if we're talking about the level of advanced technologies embedded in robots, onboard artificial intelligence, for example, other sectors are more advanced, especially the electronics sector, but also healthcare.

**Christophe Rousseau:** The robotisation rate in France is very low. It ranks 19th on the number of robots per employee. South Korea is far in the lead, followed by Singapore and Germany. However, France did increase its density of robots per employee by 10% in 2022. In Europe, Germany is in the lead, and Switzerland is also well placed in precision industrial processes. The Netherlands stands out in the logistics sector.

**Joan Guasch:** There are some similarities between Germany, Italy, France and Spain. These are four countries with broad, diversified economies, where there is a high need for robots to cope with international competition, especially from China. But some smaller, more specialised countries such as Switzerland, the Netherlands and Denmark have made huge progress in robotisation in more specific business sectors.

If we look at the number of robots installed by country, the top three are Japan, China and the United States. But in the case of China, the figures we have are

difficult to analyse. On the ground, people say that the robotic units are often old, if not obsolete. I think China is still something of an unknown quantity in this area.

**Is automation itself an area of excellence that could restore power and sovereignty to Europe?**

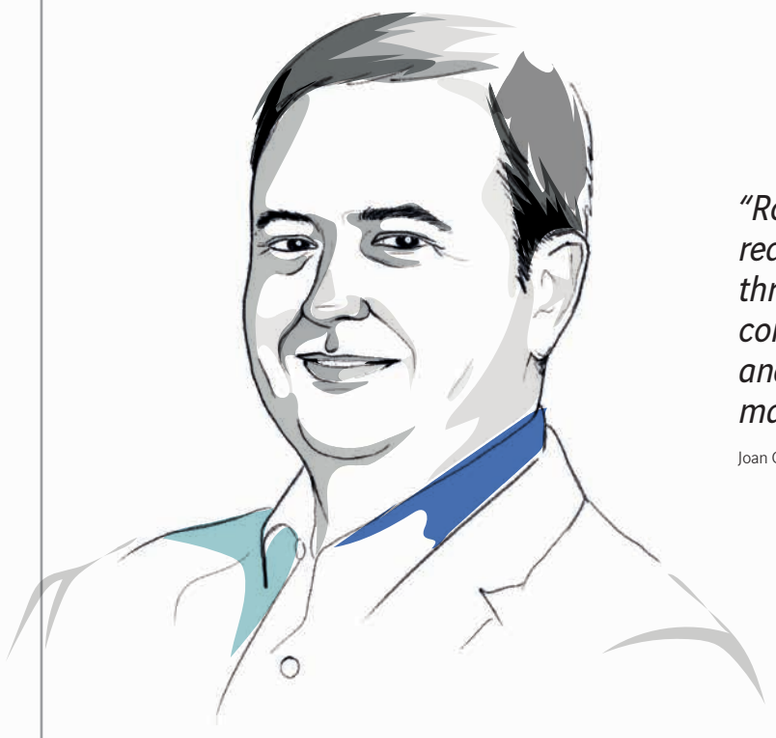
**Joan Guasch:** Robotics is one of those domains where the two essential components – hardware and software – are produced in Europe by a wide array of suppliers. So, it's potentially an important way for Europe to claw back some sovereignty. The problem is that the economically powerful major players in this market are not in Europe.

**C.R.:** Robotisation can be a way to regain sovereignty, but is far from being the only route to re-industrialising Europe. In any case, the bulk of the industrial market will for the time being remain localised in Asia, due to its low labour costs and a highly efficient and attractive ecosystem. On the other hand, for high-end and strategic production, robotisation can be of major help in strengthening European sovereignty.

**According to Deepu Talla, VP and CEO of the microchip giant Nvdia, "The advent of generative AI coupled with simulation and digital twins technology is at a tipping point right now, and that combination is going o change the trajectory of robotics". Do you agree with his analysis?**

**Christophe Rousseau:** We're only just beginning this story. But it's true that when robots gain sufficient capabilities in terms of vision, touch, smell, etc. the field of possibilities will widen considerably. I think that 10 years from now, we should see impressive things appearing on the market.

**Joan Guasch:** I agree with Deepu Talla. But we shouldn't forget that the rise of generative AI in particular at all levels of industry will also reduce the need for robots in some areas. But another question to ask is: what are we doing with the old robots? Do we have to replace them with new robots? In that case, industry is going to encounter serious financial problems. These are all questions that need answering.



*"Robotisation therefore reduces costs through lower energy consumption and also raw materials savings."*

Joan Guasch

*"The fear of robots coming to make jobs disappear is unfounded."*

Christophe Rousseau

**What consequences could automation have on employment?**

**Joan Guasch:** There have been many studies on the subject. What we can say today is that work is going to change considerably in terms of acquiring new skills. On the other hand, to date, we have not established a clear relationship between automation and the destruction of jobs.

**Christophe Rousseau:** The 10 countries with the highest rates of robots per employee in the world are also those with the highest employment. The fear of robots coming to make jobs disappear is unfounded. Many related jobs will be created as a direct result of robotisation, and other jobs will be generated through the momentum that robotising the economy will create.

**Doesn't automation bring its own risks, particularly in the areas of security and cybersecurity?**

**Christophe Rousseau:** It's clear that some manufacturers are still not investing enough in computer security and cybersecurity, but they will have to remedy that quickly. The issue is too important, vital even. With the robotisation of production lines and the increasing power of process connectivity, their entire business is under threat.

**Joan Guasch:** It's essential for manufacturers to surround themselves with experts in this field. In fact, they have to collaborate on this with their competitors, who are equally exposed to this threat. Let's not forget that AI, especially in the hands of cybercriminals, can also pose a risk to robotics.

BUILDINGS TRANSFORMATION

# CIRCULAR ECONOMY: THE PROMISE OF DECONSTRUCTION

**Construction is attracting increasing scrutiny in connection with environmental transition. But there is relatively little focus on deconstruction, the more demanding but clearly more environmentally friendly alternative to demolition. This is a vital component in the circularity of a building.**

Every year, the building sector in France generates around 45 million tonnes of waste, half of which comes from demolition sites. But what happens if we "deconstruct" rather than demolishing? This is the approach advocated by the REP PMCB (extended producer responsibility for building-sector construction products and materials) regulation, which came into force on 1 January 2023. Its aim is to prioritise the reclamation of materials over sending them to landfill.

"In a context where resources are becoming depleted, prices are rising, and supply chains are weakened, we need to promote the reclamation of existing fixtures through reuse or repurposing," explains Nicolas Dumas, Environmental Project Manager at VINCI Energies.

Selective deconstruction is a process of "stripping" the load-bearing structure of the building in the gutting phase, retrieving interior fittings and sorting them in situ to keep them as intact as possible and maximise their potential for reuse or recycling.

## Selective deconstruction

If everything than can be reused is to be reused, selective deconstruction is a way to progress pragmatically, step by step, or rather stream by stream.

The first step is to identify from technical batches the materials best suited to recovery and reuse, such as cables, cable trays, ventilation ducting and emergency lighting blocks.

"The electric cable category includes products used on a massive scale – kilometres or even tens of kilometres per site," says Camille Thiriez, Innovation and Digital Solutions Engineer at Cegelec Nord Grand Projets. "They tend to be highly carbon-intensive (copper and plastic), fairly standard (80% of installations use two or three different types), and not generally altered following installation."

For equipment that contains or transports water, and for refrigeration systems, the implementation of reuse processes becomes more complex in technical terms.

### 300 km of cable trays in Ile-de-France

The Ile-de-France area provides an example of what is possible. VINCI Energies Tertiaire Ile-de-France installs around 300 km of cable trays every year. "In 2022, we decided to launch an initiative to encourage circularity in this sector," says Juliana Ton That, Ecological Transition Engineer at VINCI Energies.

Starting with a few pilot sites, operating procedures were established for each product category, and outlines were drafted for the initial guidelines. VINCI Energies worked with building gutting specialists to define a number of criteria acceptable to everyone involved, compatible with careful removal and clean dissection.

Cable trays are refurbished and stored at RESO Services, a VINCI Energies business unit established three years ago and dedicated to worksite logistics, which has a 7,000 sq. metre warehouse in Blanc-Mesnil (Seine-Saint-Denis department). Around a dozen collection sites and another dozen storage sites have since been added to the loop, and 1.5 km of materials have been installed.

### Concentric circles

Volumes remain modest, which raises the question of acceleration. "We think that 1% of site materials and equipment are reused, but for technical batches, the figure is close to zero.
We therefore need to move forward and work in concentric circles, incorporating other streams such as light fixtures, fan coil units and plumbing items," argues Guillaume Graffin.
A former assistant technical director at Lefort Francheteau, Guillaume Graffin joined VINCI Energies Tertiaire Ile-de-France early in 2024 as a logistics and reuse engineering manager, with a mission to develop circular economy projects.

But scaling up means solving the supply-demand equation. Given its current embryonic state, the reuse market requires impetus from demand, which at least initially, must exceed supply.

*"Circular thinking is not yet an instinct for our buyers. We must make it instinctive, and we are working toward that."*

"Circular thinking is not yet an instinct for our buyers. We must make it instinctive, and we are working toward that," says Anne Taillefer, Purchasing Mission Manager at VINCI Energies France Facilities Sud Centre Est.

Training is being developed to help make this a reality. SEDDRe, a syndicate of almost 250 deconstruction, depollution and recycling businesses, is building a solution in this area.

Now compulsory in France for demolitions of buildings with a floor area greater than 1,000 sq. metres or which have housed one or more hazardous substances, PEMD (products, equipment, materials and waste) diagnosis could prove a valuable tool for accelerating deconstruction operations.

The aim of this diagnosis is to inform project owners of the nature, quantity and location of the various products, equipment, materials and waste present in the demolition zone, helping them to determine the reuse, recycling or recovery potential of the building's interior fixtures.

### Digital marketplaces

By helping forge connections between owners, contractors, architects, engineers, and demolition and construction companies, digital marketplaces such as Cycle Up or Reyuz are also essential to structuring the market. "Working on the data is one of the main prerequisites for moving selective deconstruction forward," says Guillaume Graffin. "When stocks are limited to 800 ventilation duct items, it is perfectly possible to work with Excel spreadsheets and by exchanging emails. But as the catalogue expands, you obviously need different tools."



BUILDINGS INNOVATION

# DIRECT CURRENT: A MORE EFFICIENT USE OF RESOURCES

**In a first for France, the VINCI Energies regional headquarters in Lille will power its electrical appliances directly from a solar production system installed on its roof. The availability of direct current (DC) removes the need for alternating current (AC), improving energy efficiency and reducing the use of natural resources.**

Until now, the different roles of alternating current and direct current were clearly defined: the former used for energy transmission and distribution to homes for heating, lighting and cooking; the latter for everything battery-powered – laptops, mobile phones, electric cars, etc.

The situation changed in late 2023, when WAVE, the VINCI Energies regional headquarters in Lille, showed that it was possible to do without the AC power supply network. This was a first in France and the shared achievement of several VINCI Energies Building Solutions business units: Cegelec Nord Grands Projets (design), Delporte (implementation), Lesot (solar panels) et Smart Building Energies (extension of the WAVE management platform).

Together, they designed and implemented a solution to power electrical appliances directly from the building's own solar

**Project for Schneider Electric in Grenoble**

First Lille, now Grenoble. There, VINCI Energies is developing a project similar to that created for the WAVE building in northern France. A shade canopy for Schneider Electric, covered with solar panels and connected directly to charging stations using direct current, is nearing completion. "Other similar projects are also in the design phase with some of the Group's internal and external customers," says Eric Ammeux, Business Unit Manager at Cegelec Nord Grands Projets.

production system. The installation comprises solar panels on the roof, a half-floor of offices supplied with direct current (for computer equipment and lighting), sockets in meeting rooms, and a storage battery. There is no alternating current, no inverter and no rectifier.(1)

## Energy and resource savings

This first for France came about in answer to a simple question: given that all these appliances (lights, computers, monitors, telephones, electric vehicles, etc.) are powered by direct current, and that the WAVE building produces direct current from its solar panels, why use an alternating-current network, with the conversions, wasted energy, and far higher consumption that come with it?

By eliminating the double conversion of solar panel output from DC to AC and then back to DC at the point of use (laptop, phone, light fitting, charging station, etc.), according to Eric Ammeux, Business Unit Manager at Cegelec Nord Grands Projets, "This solution improves energy efficiency by 20% to 30%."

*"This solution improves energy efficiency by 20% to 30% and reduces the volume of copper used by up to 50%."*

He adds that "It also preserves natural resources by reducing the volume of copper used by up to 50%, because less equipment and cabling is required." A direct-current installation requires just two copper wires, rather than the three or four needed for alternating current.

With this system, the part of WAVE equipped with direct current is autonomous and consumes zero energy from the Enedis network.

Building on the success of WAVE in Lille, VINCI Energies is developing other similar projects (see box). This confirms that while the use of direct current remains marginal, it seems set to steadily increase. Its benefits are clear in terms of energy transition, especially to solar and wind power.

(1) Rectifiers use a series of semiconducting diodes to convert alternating current (AC) into direct current (DC).

**Current War**

The "Current War" between AC and DC has a long history. It began in the United States toward the end of the 19th century, with Nikola Tesla, the champion of alternating current, emerging victorious over Thomas Edison, the chief proponent of direct current. According to Jean-Luc Thomas, a professor at the National Conservatory of Arts and Crafts in Paris,(1) this victory was largely due to the fact that "At that time, the transformers required to adapt voltage levels for the transmission and distribution of power over long distances using alternating current had no direct-current equivalent". But this was not quite the end, and Edison had his posthumous revenge almost a century later, with the advent in the 1990s of power electronics able to adapt the voltage of direct current and transmit it over long distances. This is now the predominant technology for the long-distance transmission of high-voltage electricity. So, is this a surrender or merely a ceasefire? Direct current, which still has a weak market share, is expected to gain ground gradually, because while it facilitates energy transition, in particular to solar and wind power, we are not about to abruptly abandon a hundred years' worth of infrastructure developed around alternating current.

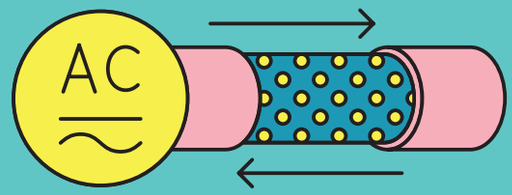
(1) https://www.lesechos.fr/idees-debats/sciences-prospective/la-revolution-silencieuse-du-courant-continu-2100539



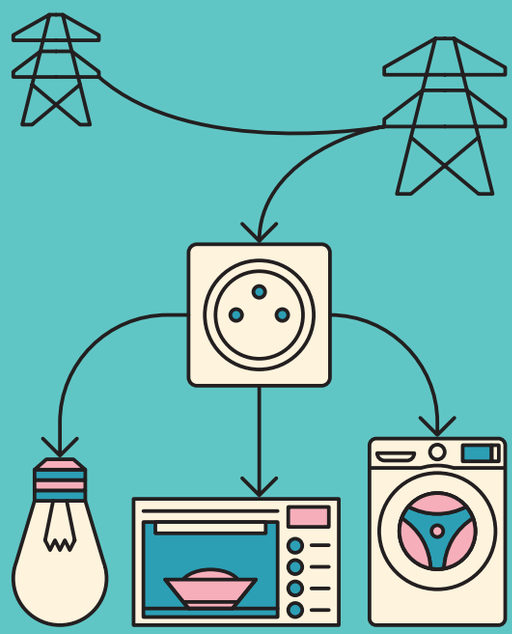


# ALTERNATING CURRENT

When electrons flow **alternately in either direction** in a circuit, this is known as alternating current (AC). It cannot be stored in this form.

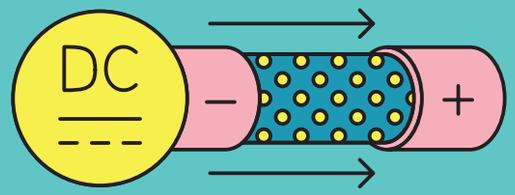



AC is used for the transmission and distribution of energy, and in domestic settings



# DIRECT CURRENT

When the flow of electrons is **always in the same direction**, from the positive terminal to the negative, this is known as direct current (DC). It can be stored




It is used mainly in electronic devices and for transporting energy over very long distances.

Watch the animation

BUILDINGS ACCELERATION

# SUPPORTING THE ENVIRONMENTAL TRANSITION IN STATE-OWNED BUILDINGS

**Because of the large-scale contracts it generates, the French government's energy transition strategy for state-owned building stock requires a dedicated organisational approach from the companies involved. VINCI Energies is at the forefront of this dynamic market.**

The French government's real estate assets number more than 190,000 buildings. Representing around 94 million square metres of floor space, this building stock is subject, like any other, to regulatory requirements in relation to energy transition. The France Relance plan has therefore allocated several billion euros to achieving an annual saving of 800 GWh, comparable to the domestic consumption in a town of 200,000 residents.

In 2023, AGILE (the French government real estate management agency) announced a development plan to install solar generators for self-consumption on 300 roofs and plots of land by 2025. This concerns every type of building – administration centres, workshops and warehouses, educational and research buildings, prison facilities, residential buildings (police training schools), decentralised service offices, etc. – provided they have a roof measuring at least 1,000 sq. metres, ideally flat, relatively free of obstructions (chimneys and vents), and structurally capable of supporting an additional 15 kilograms per sq. metre.

The government's target is to produce total solar power output of 1.45 GWp (Gigawatt-peak) by 2029, equivalent to 12% of installed solar capacity in France. This strategy is based on a national framework agreement divided into four geographical areas (northwest, northeast, southwest and southeast).

## A large-scale market

Businesses specialised in energy performance in real estate assets are looking forward to a large-scale market with specific features. And VINCI Energies business units are at the forefront.

"First of all, VINCI Energies products and solutions address both the energy crisis and legislative requirements," explains VINCI Energies director Patrick Bortolino. "Our business units dedicated to solutions for buildings are designing, installing and monitoring the performance of solar energy systems to unlock the full solar power potential of these buildings. This reduces their dependence on conventional power supply networks thanks to these easy-to-install systems. In addition, since solar power is a 20 to 25-year investment, we are supporting our customers closely with maintenance solutions to ensure the effective long-term operation of these installations."

Just over a year ago, VINCI Energies set up a special cell to better tackle working models on a national scale.

*"A captive network of business units specialised in solar, electric vehicle charging infrastructure, and energy security and efficiency."*

Patrick Bortolino continues: "The idea was to create, among VINCI Energies business units, a network of companies specialised in solar, electric vehicle charging infrastructure, and energy security and efficiency. We identify national calls for tenders and pass them on to the VINCI Energies Building Solutions network, which can then form instantly operational teams of specialists. With this approach, we were able to meet the government's requirements for its solar programme."

ICT INNOVATION

# ORGANIC VINES AND SAAS – THE WINEMAKING SECRETS OF A DUTCH VINEYARD

**In order to share their know-how with not only their seasonal workers, but the whole winemaking world, De Wilde Wijngaard organic vineyard has adopted the Axele on-the-job SaaS solution developed by Axians Belgium.**

De Wilde Wijngaard organic vineyard, located in the Dutch province of Flevoland, near Lelystad, northeast of Amsterdam, and about 7 metres below sea level, has been producing excellent white wines since 2016. The vineyard's founder and author of this success is Johan Rippen who had been looking for a way to share his experience of organic viticulture, pass on his knowledge for the benefit of the whole winemaking community, and show that working organically and making great wine can go hand in hand.

He also wanted to pass on the knowledge applied at every stage of the winemaking process, from pruning and harvesting to the transformation into wine, to all the volunteers, students, and trainees from the Netherlands and beyond who come to work on the property.

His project took a decisive turn in October 2023, during a conversation about a solution called Axele on-the-job developed by Axians Belgium, part of the VINCI Energies ICT brand. As Jef De Clerck, Sales Engineer at Axians Belgium explains, "Axele stands for 'Axians e-learning' and 'on-the-job' indicates that this is not a conventional e-learning service, but one designed for interactive guidance during any field task."

"To begin with, De Wilde Wijngaard wanted to record all their knowledge in a book," he adds. "But they quickly realised that Axele on-the-job would make it far easier to add new instructions at any time, and also allow them to include video content which is less time consuming and easier to understand."

## Simple and intuitive

As a SaaS (software-as-a-service) solution, Axele on-the-job can be accessed using a smartphone, tablet or PC depending on where and how it is being used. In due course, the solution will also be available as a progressive web app (offline).

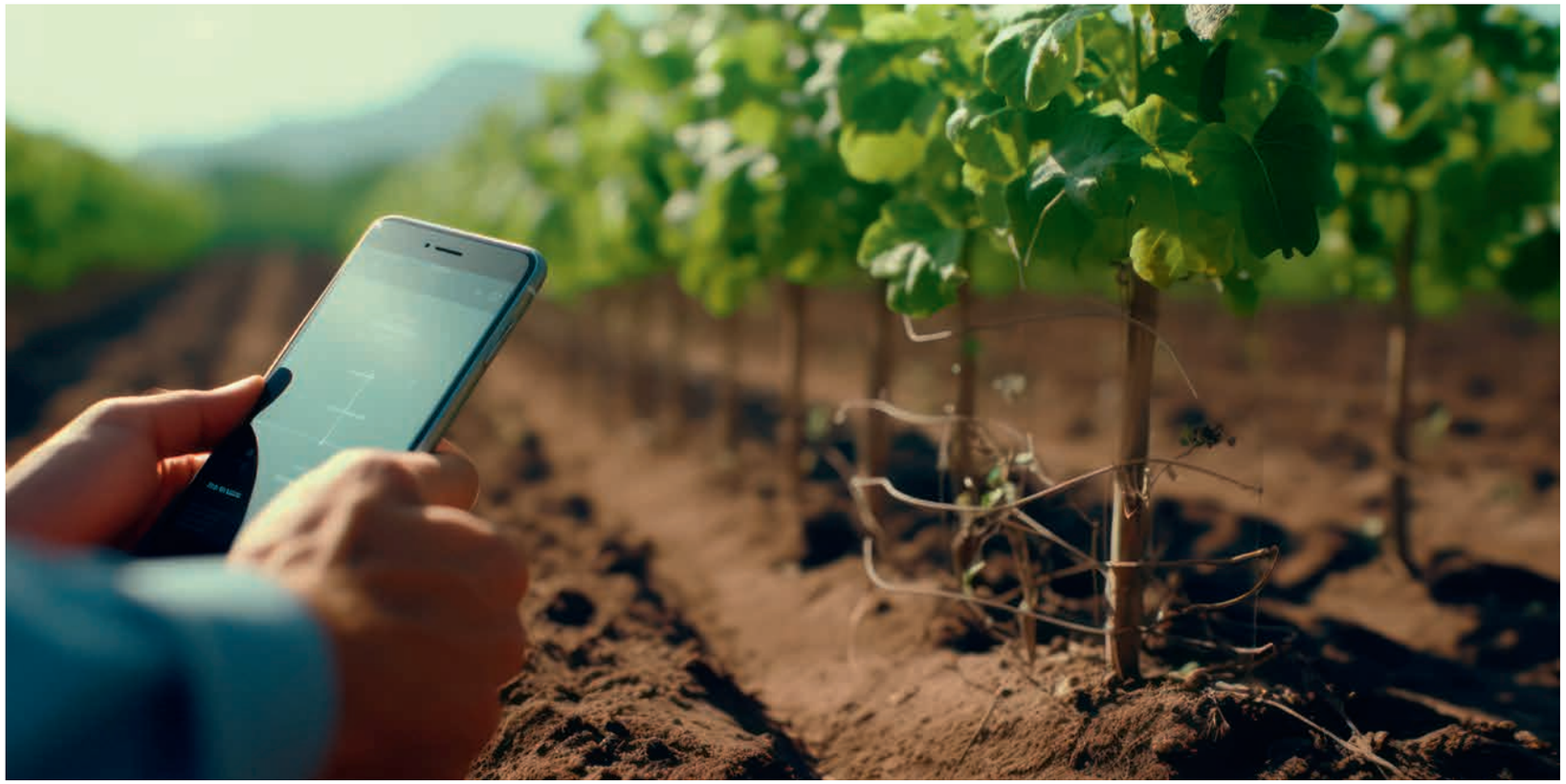
For De Wilde Wijngaard, Axele on-the-job allows them to provide detailed step-by-step instructions, including pictures and videos, for every stage of the winemaking process. Thanks to this digital guide, De Wilde Wijngaard has been able to further enhance its production process.

"The main challenge was overcoming the resistance to change that we often encounter in the face of new tools and processes," says Jef De Clerck. "The person on the vineyard team responsible for creating the training content was initially reluctant to use the tool. But she quickly discovered how intuitive and simple it is to use."

Axele on-the-job also allows easy knowledge sharing, making it possible to encourage others for a more sustainable approach to winemaking. This way, De Wilde Wijngaard can be a source of inspiration and education for the whole winemaking community. The tool also encourages knowledge sharing, making De Wilde Wijngaard a source of inspiration and education for the whole winemaking community.

## Experimenting in all directions

Axians Belgium has been experimenting with Axele on-the-job in numerous sectors other than viticulture: manufacturing (operator training, equipment maintenance, etc.), plant hire (product manuals, replacing or clarifying FAQs, etc.), DIY (visual instructions) and healthcare. "By testing the tool in such varied real-world scenarios, we are finding out what works and what doesn't – we're constantly upgrading it," says Jef De Clerck, Sales Engineer at Axians Belgium.




ICT TRANSFORMATION

# BEHIND THE SCENES OF LINEAS CONTROL TOWERS

**Lineas, Europe's largest private rail freight operator, has launched a huge digital transformation aimed at providing a fluid customer experience for its pan-European rail freight services. For this complex project, it engaged the services of VINCI Energies.**

With slow-to-evolve infrastructure, heavy engineering, and particularly stringent regulations, especially in terms of safety, the rail sector suffers from significant levels of inertia. But this is a situation that Lineas fully intends to defy.

Europe's largest private rail freight operator (Belgium, France, the Netherlands, Germany and Italy) has undertaken an ambitious digital transformation to support the Modal Shift. The aim is to provide fluid customer experiences for its pan-European door-to-door freight services in order to encourage more customers to modal shift from road to rail. Lineas is an heavy supporter of European Union's climate neutrality targets, reducing road traffic congestion, improving air quality, health and safety.

To that end, in 2021, the operator engaged the services of Truewind, the low-code[1] business and a leading digital transformation provider acquired by VINCI Energies in Portugal in June 2023 and incorporated into its ICT brand, Axians.

Employing 200 people in Portugal, the United States, the United Kingdom, Benelux and Brazil, the company has long experience in applications development. A key partner in OutSystems[2] technology, Truewind (now Axians) worked on the development of a composable strategy[3] designed to overcome the numerous computing barriers that often detract from a fluid customer experience.

### The Control Towers

"Lineas was struggling to provide its customers with information such as precise planning data, current workload, estimated time of arrival and justifications for delays in a timely manner," explains João César, Customer Manager at Truewind.

"The entire planning process through to execution was previously done using a combination of manual systems based on email and Excel spreadsheets, which were not scalable as the volume and complexity of services provided and the number of long-term contracts increased."

Truewind enabled Lineas to achieve its objectives, which were to create a trio of Control Towers that ensure true end-to-end visibility and control of the supply chain and offer a tool for information sharing and collaboration between departments and partners, and to provide confidence and convenience for customers.

Lineas is now capable of a better collaboration and communication with suppliers through the Product and Network control tower, where solutions are designed based on the customer contract leading to optimized performance and cost-effectiveness, and by deploying these solutions through the End-to-End control tower where their efficient planning and execution takes place.

The self-service platform called MyLineas allows partners to have a centralized view of expected orders, a dashboard for scheduling and workflow management, and a real-time track and trace feature for real time information up to train, wagon and load level.

The platform allows for deviation management, real-time follow-up on train and delivery status, and provides insight into what is in execution and what may be delayed due to infrastructure works. It improves efficiency, reduces delays and exceptions, and increases transparency in the supply chain for all parties involved.

### Optimised resource utilisation

"The Control Towers enabled Lineas to ensure fully transparent on shipping, discrepancy management, full track-and-trace and proactive notifications," says João César. " And now they have end-to-end control over deliveries across their entire ecosystem of partners. The reliable data delivered by Lineas Digital Twin and managed in real time with the new system helps Lineas optimise its use of resources, including trains, wagons, external suppliers and personnel. Their customer satisfaction score has risen from 2.5 to 4.1 in just three months following the launch."

With the Control Towers Lineas is now transforming its order execution into a competitive advantage by offering real-time end-to-end visibility of orders, improved collaboration with suppliers and customers, and more on-time deliveries. This performance owes a great deal to the "Agile Methodology" (4) implemented by Truewind's team, now integrated to Axians.

*Lineas has transformed its order planning and fulfilment into a competitive advantage.*

(1) Low-code is a method for developing software and applications that allows more people to contribute to development using a graphical interface and drag-and-drop functionality that require little or no coding experience.

(2) OutSystems is a low-code platform that provides tools to help businesses develop, deploy and manage multichannel business applications.

(3) Composable strategy is a dynamic approach that focuses on assembling and rearranging various business capabilities to respond quickly to market changes, seize new opportunities, and optimize performance.

(4) Agile Methodology is a collaborative process in which the development team and project stakeholders define the goals and the work to be done in a given "sprint" – a small block of planned work that generally takes between two and four weeks.

ICT INNOVATION

# BETTER CONNECTIVITY TO INCREASE ICE HOCKEY FAN ENGAGEMENT

**The telecoms equipment in the new Gottardo Arena in Switzerland meets the most modern standards, allowing fans to interact more with their community on game days. This technical and organisational feat is the work of Axians.**

They take ice hockey seriously in the Swiss Canton of Ticino. The old Valascia ice hockey rink in Quinto, built in 1959 a few kilometres from the Gotthard Tunnel, was where Hockey Club Ambri Piotta played its home games in the Swiss National League, but had become unsuitable for events at this level, including in terms of the network coverage, which was not up to modern standards.

Swisscom, the operator responsible for telecoms equipment during construction of the new Gottardo Arena – a combined ice rink and 7,000 seater multi-use hall completed in 2021 – joined forces with Axians, the VINCI Energies ICT brand.

"The equipment in the former stadium was quite limited, and the supporters, club and organisers wished something more" explains Diego Scheggia, Business Unit Manager at Axians Switzerland. We therefore installed sufficient bandwidth and power in the new stadium to allow almost 7,000 spectators to share big ice hockey games with their families and friends via their mobile phones."

## Advanced mobile infrastructure

To cover all the requirements of a site that also contains numerous meeting rooms, eleven sponsor lounges and four restaurants, Axians installed, on behalf of Swisscom, advanced mobile infrastructure to support fast, stable networks. "This made the Gottardo Arena the first ice hockey rink in Switzerland equipped with cutting-edge technology," says Diego Scheggia. To achieve this, Axians installed special antennas, each equipped with eight 30-metre wired connections to avoid network congestion around the stadium.

*"The first ice hockey rink in Switzerland equipped with cutting-edge technology."*

"To avoid interfering with the visual site design created by the internationally renowned architect Mario Botta," Diego Scheggia continues, "We had to make all the installations as unobtrusive as possible, while ensuring optimal reception throughout the stadium. It wasn't always easy and at times pushed our creativity to its limits."

## Flawless organisation

A further challenge was an extremely tight timescale exacerbated by the Covid-19 pandemic. It became a real race against time. "We needed to complete the ice hockey rink before the start of the ice hockey season. The fans would have been extremely disappointed if we had failed to do so. There were supply bottlenecks at the materials suppliers' end, and an initial consignment was lost somewhere on its journey by sea from Asia to Europe. The new order was sent by air freight at the last minute. We had to reinforce our team with installers from other Axians business units to meet the deadlines."

But working to tight deadlines cannot be to the detriment of safety. "We had to pay close attention to ensure that regulations were scrupulously observed. Particularly given that a large part of the work had to be done at height. Numerous business units were involved in construction work in and around the site. It took a lot of coordination to avoid getting in each other's way."

Today, Ambri Piotta supporters enjoy Swisscom improved connectivity, allowing them to interact and share their ice hockey experience via social media and live streaming, uploading and downloading videos using all the transmission technologies available.

ICT TRANSFORMATION

# “IN A WORLD WHERE EVERYTHING IS CONNECTED, CYBER RISK IS EVERYWHERE”

**Over the last 12 months, 43% of organisations in France have fallen victim to a successful cyber attack, according to the economic research company Asterès. What are businesses currently doing to address cyber risk? Analysis by David Ofer, President of the French Cybersecurity Federation.**

**What is the current extent of cyber risks?**

A number of studies show a phenomenon on the rise. The number of financially motivated attacks notified to the French national information security agency (ANSSI) in 2023 was 30% higher than in 2022. This escalation has also been observed by the Paris Public Prosecutor’s cyber criminality unit.

Whatever the figures being produced from different quarters, one thing is certain: in a world where everything is connected, cyber risk is everywhere. Digital’s invasion of our daily lives, both personal and professional, has opened up a vast playing field to a new generation of criminals ready to exploit weaknesses in information systems to paralyse organisations and steal identities in the hunt for modern society’s new Holy Grail – data. Individuals, businesses, nonprofits, institutions, local authorities – none are safe from these cyberspace pirates.

**Is artificial intelligence likely to redraw the battle lines of this new war?**

Algorithms equip those involved in prevention and protection to better understand and identify attack sources and areas of weakness. They are a valuable ally in data protection and attack detection. AI is used by numerous sensitive services, including the army and police, to improve their data analysis. But it is equally useful to the criminal fraternity, enabling them to make their attacks more sophisticated, for example, using the deepfakes we hear so much about in the media.

**Is it true that criminals are a step ahead of defence and counter response methods?**

The race against time between an increasingly professionalised threat and a defence that is still mobilising is indeed rather one-sided. The pirates, because they are invested – literally – in cyber, have moved ahead of governments and businesses that have long viewed cybersecurity as a cost centre. The myth of the hooded hacker working alone at the back of their garage is now further removed from reality than ever! Cyber attacks are now orchestrated by criminal organisations at international level. They are increasingly sophisticated, with precisely established targets and serious consequences for national security and economies.

**Which activity sectors are most under threat?**

The health sector is one of the worst affected by recent attacks. The reason being that it performs services that are vital for individuals and holds extremely detailed, and therefore highly lucrative, personal data. Other sectors that, if paralysed, would affect the way society functions are also in the attackers’ crosshairs: regional and local authorities, energy, telecommunications and transportation in particular. The risk is currently strongly focused on supply chains. Market globalisation and the proliferation of subcontracting has clearly left supply chains exposed. In the United States, these are subject to repeated attacks. And French supply chains are now being affected as well.

*“Pirates are a step ahead of governments and businesses.”*

**What is the French Cybersecurity Federation’s place and role in the digital security ecosystem?**

Various stakeholders in France are currently invested in the cyber issue. ANSSI deals specifically with so-called Operators of Vital Importance (OVIs), major groups, and large regional and local authorities. The cybermalveillance.gouv website was created to inform and to process (with limited financial resources) reports from the public and from business. But for small businesses, SMEs, and smaller local authorities, which are extremely numerous in France, the messages are diluted, often leaving business leaders and elected officials powerless in the face of information they feel detached from. There are a multitude of cybersecurity issues that need to be communicated better: regional networks for small businesses and SMEs; training for young people; cross-industry links; access to controlled cyberspace; etc. This is the space we wanted to inhabit with the French Cybersecurity Federation, created four years ago at the behest of elected officials to bring together digital security specialists, businesses, local authorities and chambers of commerce. Our ambition is to unify efforts to inform, prevent, and protect the economy, through an independent community approach completely separate from any commercial interest. Unlike the various clubs and associations that have invested in the ecosystem in order to defend private interests, we sell no products or services, and we follow a strict public interest and public utility policy.

**How much have businesses done in terms of prevention?**

Again, there is a wide gap between the major groups, which can deploy greater resources, and the mass of small business and SMEs, which have no idea who to approach, what steps to take or what systems to implement.

In 2023, the Federation carried out a survey, which showed that more than 60% of SMEs don't have anyone with specific responsibility for cybersecurity, and only 25% have taken out related insurance. We urgently need to strip the subject of cybersecurity of its technical baggage in order to reach out to business in simple and understandable terms.

*"More than 60% of SMEs have no one responsible for cybersecurity."*

The fight against cyber criminality is entirely dependent on money. The acceleration in digital advances is not being matched by an increase in security spending. Today, because they do not fully understand the subject, small businesses and SMEs are not inclined to allocate adequate budgets to protective measures.

**We often hear about a mismatch between the corporate need for technical skills and the talent available...**

I honestly think that things are more complex than that and that the issue of resources cannot simply be reduced to this gap between supply and demand. Cyber training courses have come a long way in recent years. But there is a paradoxical situation. On one hand, some courses are failing to fill their places. On the other, companies are not offering enough dedicated digital security roles, and they also have a tendency to demand hyperqualified masters-level candidates when their needs lie, in part, elsewhere. Once again, we must not reduce cybersecurity issues to their technical dimension. With a view to broadening the spectrum of profiles and supporting these companies, the French Cybersecurity Federation recently created the profession of cyber assistant.

**What does it involve?**

The role of cyber assistants is to make contact with users within the business, communicate with them about computer hygiene rules, and check that people understand and are applying security policies. The aim is to shrink attack surfaces, reduce risk, and report critical points back to the departments concerned. At the same time, we created a training course for this profession of cyber assistant, with 400 to 600 hours of learning open to young people with high school diplomas and to people changing careers.

**Is the current legal arsenal sufficient to prevent and control risk?**

Yes, it is largely sufficient in providing a framework in the area of security [see box]. Given the scale of the challenges, the regulatory response is not the most urgent factor. Essential services must be ring-fenced to protect and consolidate the prevention and protection ecosystem, to regulate responsibilities across the entire cyber value chain, to develop insurance products, and perhaps most importantly, to raise awareness and provide training at every level. The task is colossal. Lastly, we should remember that the GDPR has a cyber component, which if it were properly applied, would save companies a lot of trouble.

**A robust legal arsenal**

The 1988 Loi Godfrain penalises unauthorised access – or attempted access – to automated data processing systems (ADPS). In recent years, numerous laws have been created in response to each situation. The Digital Operational Resilience Act (DORA) introduced by the European Union strengthened cybersecurity in financial services. The Network and Information Security (NIS 2) directive, which was transposed into French law in 2024, will enable ANSSI to enhance cybersecurity for thousands of systems in a number of activity sectors that will be regulated from now on.

INDUSTRY TRANSFORMATION

# CEMENT MANUFACTURERS ARE GOING ALL OUT FOR DECARBONISATION

**The industrial cement and concrete sector alone accounts for 5 to 8% of worldwide greenhouse gas emissions. Despite being a key factor in the "Net Zero" trajectory, decarbonisation in this sector is still in its infancy.**

With almost six billion cubic metres being produced annually, cement is the world's second most-consumed resource after water. The industrial cement and concrete sector accounts for 5% to 8% of worldwide greenhouse gas (GHG) emissions. Production of cement, an ingredient in concrete obtained from a mix of limestone and clay, emits large quantities of greenhouse gases, since it involves heating the limestone and clay to 1,400 °C in a kiln to bring about a chemical reaction, which emits huge quantities of $CO_2$, to form clinker, a key component of cement.

In addition to the GHGs already generated since the Industrial Revolution, cement and concrete production continues to increase, largely in response to demand from China and India. In fact, the International Energy Agency is forecasting an increase in global emissions directly linked to cement production in the order of 12% to 23% by 2050.

Decarbonisation in this sector is therefore crucial to the planet's future, and also for an industry increasingly under attack from critics, and ecological organisations in particular. At a worldwide level, the sector has lofty ambitions: following a 20% reduction in its GHG emissions between 1990 and 2020, it is targeting a further 25% reduction between 2020 and 2030 on the way to achieving Net Zero by 2050, according to the Global Cement and Concrete Association.

In France, the sector is responsible for 2.4% of GHG emissions, and according to government figures, 21 of the country's 50 most $CO_2$-emitting industrial sites are cement factories. To accelerate their decarbonisation, cement manufacturers recently signed "transition contracts" with the government. The professional organisation France Ciment has in effect revised its decarbonisation roadmap from two years ago with far more ambitious targets: a 50% reduction in $CO_2$ emissions (compared with 2015) by 2030. The new RE 2020 environmental regulation for new buildings, which came into force in 2022 with the aim of reducing the carbon footprint of all new construction, played no small part in this readjustment.

### Iconic projects to launch the movement

"The levers in the decarbonisation roadmap are being implemented on various sites based on ecological transition contracts signed with the government," explains Laure Hélard, Delegate-General of France Ciment. "Every one of these levers requires significant investment."

Four iconic projects have been highlighted with the publication of this roadmap. The first concerns the installation by the Heidelberg Materials group of a new dry firing line with precalciner on its site in Airvault, in western France. In future, 88% of the site's thermal consumption will draw on alternative fuels made from non-recyclable waste instead of fossil fuels such as coke or coal. The project will also reduce the proportion of clinker in cement and reduce the site's carbon footprint by 27% compared with current production.

*"The roadmap levers for decarbonising the sector require significant investment."*

Working with Air Liquide on the K6 project, the EQIOM group is aiming to transform its factory in Lumbres, in northern France, into one of Europe's first carbon-neutral cement plants by 2028. This project aims to capture and store almost 8 million tonnes of $CO_2$ in its first

10 years in operation, through the implementation of innovative technologies.

The third project, managed by the Lafarge group, involves a production line for activated clay, a new low-carbon additive that can reduce the carbon footprint of cement by 50%. This new facility at the cement plant in Saint-Pierre-la-Cour, in northwestern France, has been designed to emit virtually no carbon. It recycles waste heat from the clinker kiln and burns only alternative non-fossil fuels, mostly biomass from local circular economy loops.

Fourth, the Vicat group's Argilor project at its Xeuilley site in eastern France will equip the site to produce activated clays from clay sourced on site and using fuel predominantly made with waste from the surrounding area, decarbonising the operation by around 30%.

### Activating levers and removing barriers

As seen with these projects, several levers must be activated to accelerate the sector's decarbonisation, says Laure Hélard: "$CO_2$ capture is a must, because two-thirds of the carbon emitted comes from limestone decarbonatation in the kiln as the clinker is produced. But at the same time, we must activate other levers: energy efficiency, fossil fuel replacement, and optimised construction. The circular economy will also play a role in decarbonisation, particularly with cements newly standardised under NF EN 197 6, which incorporate recycled

concrete fines and reuse waste and ash (industrial sludge, foundry sand, contaminated soil, etc.) in the clinker."

There are still major barriers to decarbonisation to be removed, beginning with the huge investments required. Here, cement manufacturers are counting on the Carbon Border Adjustment Mechanism, which takes effect in 2026, and on government support frameworks. Laure Hélard concludes that "In terms of electricity consumption, which is set to double with carbon capture, these needs have to be anticipated, especially in terms of electrical connections. This is essential if this industrial transition to low-carbon is to succeed."

**KEY FIGURES**

**4.1 billion tonnes:**
annual worldwide cement production, of which China accounts for 52%, India 6.2% and the European Union 5.3%.

**12 to 23%:**
predicted growth in worldwide cement production by 2050.

**5 to 8%:**
the proportion of worldwide greenhouse gas emissions caused by cement production.

**2.4%:**
the proportion of GHG emissions in France caused by cement production.

**-19.2%:**
cement industry reduction in $CO_2$ emissions per tonne of cement produced between 1990 and 2020.

**-25%:**
worldwide emissions reduction target between 2020 and 2030.

**-50%:**
2030 emissions reduction target in France.

ENERGY | TRANSFORMATION

# HSEQ AMBASSADOR

**Maarit Koivupalo, HSEQ Manager for VINCI Energies Finland, is responsible for developing various issues: health, safety, the environment, and quality of work. Her mission is all the more crucial since external growth recently doubled the business' size.**

The mission facing Maarit Koivupalo, 41, the HSEQ Manager at VINCI Energies Finland, is to ensure that the business units are constantly improving in health, safety, environment and quality. Since late 2022, when VINCI Energies purchased the Finnish business TLT, which specialises in solutions for electricity and telecommunications network operators, this mission has been on a whole new scale.

"We have doubled in size and now have about 500 employees," she confirms. "We are implementing an integrated HSEQ management development plan in support of this new stage in the business unit's development. The aim is to introduce the excellence of the VINCI Energies safety and environmental culture into every business unit."

In September 2023, Maarit Koivupalo launched sessions to present key elements in the HSEQ strategy to each business unit. "The idea is to talk with managers to gain an understanding of their needs and prepare for the implementation of action points in the field."

*"Enabling business units to develop a positive culture of safety, sustainability, responsibility and well-being at work."*

In this cross-business mission involving not only business units but also the various support functions (communications, HR, IT, etc.), she is supported by the division's network of HSEQ representatives in every country. "This support is invaluable, especially with regard to the large-scale development of principles, guidelines and tools. Through this network, I'm also learning a lot about the energy industry."


ENERGY | INNOVATION

# BRINGING INNOVATION TO ELECTRICAL TRANSMISSION TOWERS

**Blessed with a dual Italian and German background, Michael Erspamer has made his mark at Omexom Germany as its Technical Director for Transmission Lines, with a firm emphasis on innovation.**

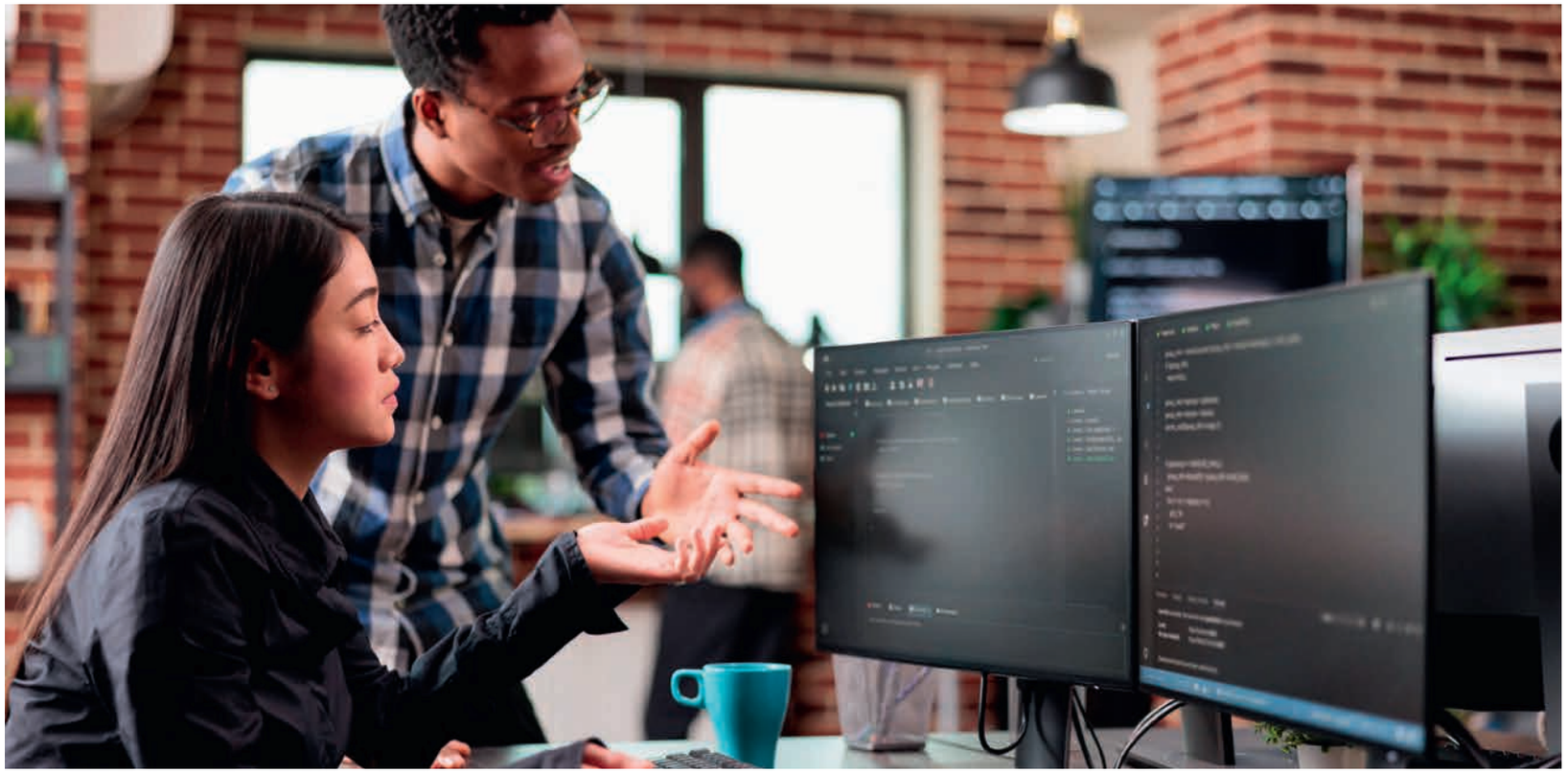
Michael Erspamer does not get bored. As the technical director for transmission lines at Omexom Germany, he works in a sector with a reputation for technologies and working methods that have barely changed since the 1950s. But his day-to-day experience certainly does not reflect this rather old-fashioned image of the business. The subjects he works on are more redolent of the high-octane world of innovative startups than of electrical transmission with its good old-fashioned transmission towers.

The latest innovation to his credit is an innovative catenary rollersystem to make the installation of high-voltage lines safer. A minor revolution against the traditional system!

But there are more innovations on the way: 3D modelling of transmission towers, a solution for managing steel road plates, quality control using a combination of drones and AI, and maintenance robots are all new projects he is working on.

Aged 43, this Swiss-Italian engineer has come a long way since 2006, when he started out in the family construction and electrical distribution business, which merged with the German firm GA Gruppe shortly before their acquisition by VINCI Energies. “VINCI Energies’ policies, processes and methods suited me down to the ground. Its international network offers countless opportunities.” He currently heads up two business units and would ultimately like to shift toward a role tackling environmental issues – the thesis he is currently writing on urban mobility is testament to that. After all, the opportunities are endless at VINCI Energies.

# WHAT ARE THE IMPACTS OF AI ON CYBERSECURITY?



**Artificial intelligence is a technology that brings opportunities and risks in equal measure to the field of cybersecurity. An evaluation of its benefits and limits is the best way to fight effectively against cybercrime.**

The rapid evolution of artificial intelligence (AI) is impacting cybersecurity in ways that we must understand as a matter of urgency. With the introduction of LLMs (Large Language Models) such as ChatGPT, and the proliferation of open-source models, new opportunities are becoming available to the IT specialist – and to the cybercriminal.

One advantage of LLMs is the efficiency gain from using AI to analyse massive data sets to detect potential threats. This task would traditionally take hours, if not days, but can now be completed in minutes or seconds.

The same technology is also being used to create increasingly sophisticated techniques for analysing threat models, identifying unusual behaviour patterns at system access portals, improving breach and attack simulations, etc.

Beyond simple vulnerability detection, GenAI (Generative AI) models can also be trained to recommend corrections to insecure code, generate training materials for security teams, and identify measures to reduce the impact of threats.

## Risks not to be ignored

However, any disruptive technology also has its drawbacks. The standard arsenal for combating and preventing cyberattacks is no longer sufficient. Hackers now have access to generative video and voice tools to help them craft increasingly sophisticated social engineering attacks.

Another major concern is the ability of amateur cybercriminals to exploit vulnerabilities in AI systems to manipulate their behaviour. If they are not properly secured, AI models can be tricked or manipulated into performing undesirable actions. For example, this type of malicious engineering can allow individuals to acquire sensitive data previously shared with LLMs in requests from other people.

In addition, the development of generative AI chatbots such as WormGPT, FraudGPT and Darkbert may help some of their users create their own cyberattacks without the need for detailed computing knowledge. Cybersecurity Ventures predicts that cybercrime will cost 10.5 trillion dollars a year in damages by 2025 (compared with 3 trillion in 2015). This is roughly equivalent to one-third of all euros currently in circulation.

Ultimately, by creating over-reliance on AI, these new tools can lead security professionals to drop their guard. Just as the calculator has replaced paper and pencil in maths classes, there is a risk that organisations will replace human judgement with AI systems.

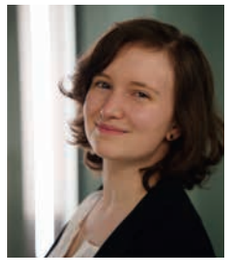
*“Human beings and AI must work together in the fight against cybercrime.“*

But human beings bring a degree of consciousness, contextual understanding and intuition that machines so far lack. And unlike the calculator, these AI systems may provide incorrect information.

## Robust counter-measures and a proactive approach

It is therefore necessary to meet these threats with robust counter-measures. This means examining, revising and securing current and future models, as well as the data used to train them; investing in education and training for cybersecurity professionals on the limits of AI, to find the right balance between human expertise and AI-based automation; and ensuring constant monitoring for deviant behaviour in AI models.

Cybersecurity experts need to collaborate more closely with AI developers to address the related security issues. Further research is also required into the reliable and secure rollout of AI technologies in various fields. A proactive and well-informed approach will be the best weapon against AI-based cybercrime.



**By Julia Himmelsbach**
Team Lead Advanced Analytics & AI at Axians ICT Austria

AGILITY **PICTURE**

# SWEDEN'S BEST-LIT SCIENCE PARK THANKS TO AI

In southern Sweden, between Gothenburg and Stockholm, the Jönköping Science Park is a creativity, innovation and development hub for students, startups and businesses, centred on a 15-storey building formed of the three so-called "Science Park Towers". There, Emil Lundgren, a VINCI Energies business unit specialised in electrical engineering, conducted a hugely innovative project to install new AI technology as part of an agile, energy-saving lighting system for the three business towers. Following completion of the works in September 2023, the building's lighting system can now be managed in real time, and the system can self-learn to optimise its usage. This means reduced energy consumption, less environmental impact and lower costs.

# VINCI ENERGIES ACCELERATOR OF ENVIRONMENTAL TRANSITION

In a world undergoing constant change, VINCI Energies contributes to the environmental transition by helping bring about major trends in the digital landscape and energy sector.

VINCI Energies' teams roll out technologies and integrate customised multi-technical solutions, from design to implementation, operation and maintenance.

With their strong local roots and agile and innovative structure, VINCI Energies' 2,000 business units have positioned themselves at the heart of the energy choices of their customers, boosting the reliability, efficiency and sustainability of their infrastructure and processes. VINCI Energies strives for global performance, caring for the planet, useful to people and committed to local communities.

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