THE **AGILITY** EFFECT
MAGAZINE

AGILE PROCESSES AND PRODUCTION-AS-A-SERVICE

FOCUS ON GEOTHERMAL ENERGY

COMBINING SMART BUILDING AND LOW-TECH

THE CIRCULAR ECONOMY: AN ABSOLUTE IMPERATIVE FOR ENVIRONMENTAL TRANSITION

VINCI ENERGIES

SUMMARY

EDITORIAL

Environmental transition, which is central to every challenge we face today, is the strategic priority for VINCI Energies, its business units and its people. We implement this priority by pursuing three goals set by VINCI: acting for the climate, preserving natural environments and optimising resources thanks to the circular economy – which means much more than merely managing waste.

The circular economy is the theme of the special report in this edition of *The Agility Effect*. Whether by turning to less resource-intensive materials, extending the life of equipment, thinking again about solution functionality and incorporating mixed use, or reusing and recycling tools and materials, every economic agent has a responsibility to revamp its design, production and distribution processes by stepping up stewardship. The stakes are high, but so is the ambition of VINCI Energies, its business units and its people!

As well as the report, as you read the articles in this edition you will find other key themes for VINCI Energies, namely digital transformation and the energy transition. As you will see in our projects and our colleague portraits, these themes are a key part of what motivates us to strive for all-round performance every day.

We hope you enjoy this issue!

Corinne Lanièce
General Secretary of VINCI Energies

AI PUT TO USE ON SOLAR FARM PROJECT

A remarkable solar farm located in Sines, two hours south of Lisbon, came on stream in July 2023. What is distinctive about the project carried out by Omexom Renewables Portugal on behalf of German electricity producer RWE is that it combines bifacial panels, which absorb light on both sides, and a system that tracks the sun, increasing energy production by more than 20%. This feat of engineering and construction is based on an innovative artificial intelligence technology called AI Clearing which is supported by the CATALYST programme at Leonard, the VINCI Group's foresight and innovation platform.

MORE AGILE PROCESSES FOR PRODUCTION-AS-A-SERVICE

In response to increasingly challenging markets, manufacturers are having to re engineer their production lines. We look at examples involving Actemium and a major car manufacturer in Germany.

One of the big promises of digital transformation in the manufacturing world is that it will enable businesses to become more responsive and develop increasingly customised products. Under pressure from increasingly volatile markets and ever more demanding customers, manufacturers need to match their processes more closely with demand. But this requires changes to their production lines.

Custom production has emerged from the long process of evolving manufacturing models. In the 1950s, the Ford system aimed to produce standardised goods for a mass audience. Thirty years later, the Toyota model continued to target mass markets, but with a focus on lean manufacturing. This was the birth of "lean", which allowed the customer to choose a partly customised product from a range of options.

Today, a new chapter is beginning in the history of manufacturing, with the development of hyper-agile production models able to meet individual customers' requirements (flexibility) and diverse demand (reconfiguration). This applies to business-to-business and business-to-customer scenarios alike.

On-demand and bespoke production

Customisation can combine different formats: on-demand production and bespoke production. With the former, production begins only when an order is confirmed. Manufacture and assembly are reserved for products that have actually been sold,

rather than working to sales forecasts. This system offers significant advantages: low or non-existent stocks, zero risk of unsold products, accelerated execution, short time-to-market for products and innovations, and the ability to test markets before increasing capacities.

Bespoke production, on the other hand, involves creating a unique product from scratch to the customer's specifications. This approach, which offers major benefits in creating an intimate relationship with the customer and facilitating the collection of valuable quantities of marketing data, is taking hold rapidly in sectors like fashion and eyewear.

Whether on demand or bespoke, both approaches are based on satisfying customers' needs with a more or less customisable product, reducing production costs through automation, and making production more agile.

Retrofit at a major car manufacturer in Germany

To be comprehensive, industrial agility must be implemented upstream of the manufacturing processes themselves, extending even to the layout and operation of production lines and flows. Of course, this requires advanced engineering expertise.

The recent example of a major car manufacturer in Germany neatly illustrates this trend. The German group has undertaken major renovation and reconfiguration projects at several of its production sites.

At its plant, not far from Stuttgart in Baden Württemberg, Germany, automated handling lines in the paint workshops have been totally transformed. Actemium Guebwiller Handling Systems and Actemium

Mulhouse Plant Solutions were engaged for the electrical retrofit operation to update these production lines to meet the latest safety standards.

The brief handed to the two VINCI Energies business units included a critical organisational clause: the motors, variators and cabinets had to be replaced during active production.

New assembly platform

Also in Germany, the car maker has an even more complex project under way near Baden Baden. From 2024, it will be bringing new vehicles to market and therefore needed to equip its factory with a new assembly platform.

"We were brought in to adapt the four main auxiliary flows: wheels, seats, mechanical engineering, and front and rear axles", says Patrick Benard, Director of VINCI Energies France Industrie Nord Est. "This task combining systems integration, surveying, materials handling and electrical engineering required us to consider the whole environment (fixing supports, conveyors, catwalks, etc.) and identify any elements interfering with these to be dismantled or modified".

Actemium's role was to design, build, assemble and commission two lines. The pre-production startup phase should begin in September 2023, with full production expected to start in 2024, and new launches continuing until 2027.

LOW-CODE AS A DRIVER OF REINDUSTRIALISATION

The reindustrialisation of a country like France hinges on automating production lines. However, a severe lack of programming skills is hampering the process. The solution may be to develop low-code applications.

In the space of a few years, the manufacturing sector has harnessed a range of leading-edge technologies to enhance the operational and economic performance of its production lines. Artificial intelligence,

augmented reality, 3D printing and developments in data are just some examples. By integrating ever more intelligence into their factories, businesses are better able to analyse, understand, measure, anticipate and adapt their processes.

But in the future, investment in industrial innovation may be guided by another aim. Employers will face serious hiring pressures, if not talent shortages, in a number of professions: cargo handling, engineering, computer programming, painting and welding.

One of the more seriously explored avenues to plug this skills gap is automation.

Until now the deployment of robots has been seen mainly as a way to reduce physically demanding work for operators. Today, it also addresses the crucial issue of industrial sovereignty.

"The reindustrialisation of France will not happen without an acceleration of automation."

"Reindustrialisation will not happen in France without an acceleration of automation," says Frédéric Boulvert, innovation business engineer at Actemium Rennes and coordinator of the advanced robotics working group at the Actemium Robotics Club.

If there are to be more robots in workshops and on production lines, then the scope of the trades

and tasks they are assigned to will need to be expanded. Programming skills will therefore be required to ensure that robots are versatile, in line with an as-a-service industrial production approach.

An "agnostic" system

This means mobilising resources in order to train engineers and technicians in programming languages that become rapidly obsolete. To avoid giving up in the face of a severe skills shortage, businesses will need to transition gradually towards low-code or, at a later date, no-code automation.

So what is this technology? It enables operators to customise functional requirements themselves and to teach robots to meet these requirements using offline software applications. With low code or no code, you no longer need to be an IT expert to show robots what "movements" to recreate.

Although the main manufacturers of industrial robots (FANUC, KUKA, ABB, Stäubli) already sell applications that allow their machines to be designed, optimised, simulated and programmed offline, "these are mainly proprietary solutions for use by robots of the same brand," notes Frédéric Boulvert.

A manufacturer that equips its production lines with robots from different brands will have to invest in as many software programmes or licences and consequently make provision in its budgets for training.

There is therefore a market need for more open, technology- and vendor-agnostic solutions like Robcad from Germany's Siemens, DELMIA Robotics from France's Dassault Systèmes, RoboDK from Canada's RoboDK, KMeleon from France's Tesseract Solutions and D:PLOY from Denmark's OnRobot.

Some solutions even aim to make industrial robotics as widely accessible as possible, for use say in short-run or single-item production, processes that are hard to automate because of high costs.

General-purpose solutions

"Most low-code or no-code robot applications on the market today are geared towards business functionality, whether that is palletising, welding, part cleaning or waste management," points out Frédéric Boulvert. For example the Actemium Le Mans Intégration design office has developed a bin-picking[1] solution that can be used to determine the positioning of the various bulk components in a single bin and pick them up.

However, general-purpose solutions are also emerging. At the beginning of 2023 Paris start-up Fuzzy Logic Robotics announced that it was making its no-code robotic programming and simulation software available online, along with documentation and training tutorials.

Isn't this acceleration in the deployment of low-code (and soon no-code) robot applications on production lines likely to overshadow the profession of integrator? "The use of heavy-duty robots will always require expertise like ours, especially in terms of maintenance. And offline applications will quickly generate new needs – a market we will legitimately target," says Frédéric Boulvert.

(1) A technology applied in the manufacturing sector to move components so that they can be used in subsequent production stages.

WHAT IS GEOTHERMAL ENERGY?

Geothermal energy is the heat that is generated within the Earth.
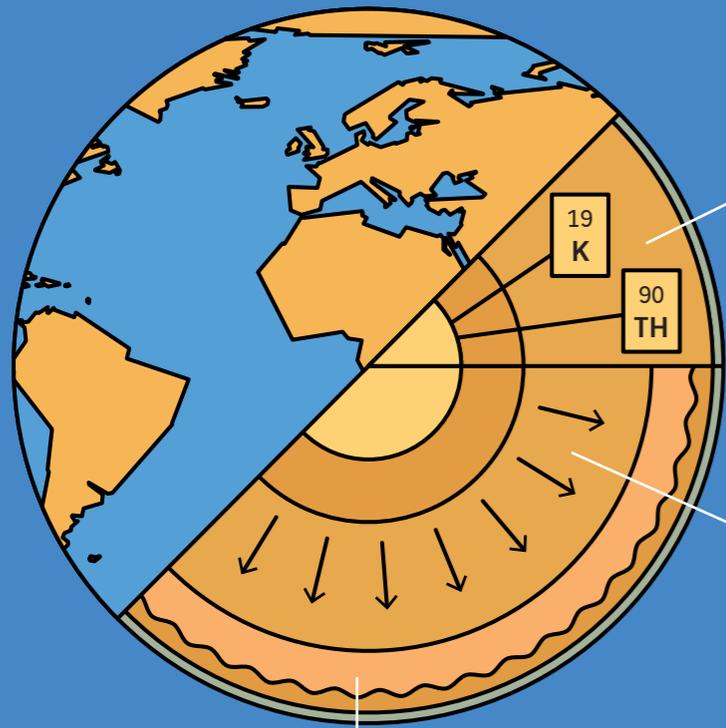
1. This heat is **produced mainly by the radioactive decay of potassium and thorium isotopes** in the Earth's core.

2. Heat from the core is constantly radiating outwards and warming rocks, water, gas and other geological material.

3. If **underground rock formations** are heated to about 700-1,300 °C, they **can become magma**.

4. Magma heats nearby rocks and underground aquifers. Hot water can be released through geysers, hot springs, steam vents, etc.

5. However, some of the Earth's geothermal energy remains in the mantle. **This dry geothermal heat can be accessed by drilling, and enhanced with injected water to create steam.**
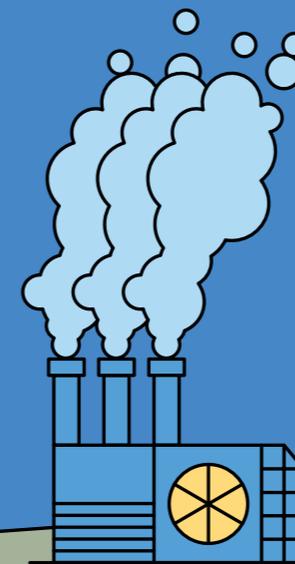
6. That is how geothermal energy works. **It is a clean, natural resource that can be harnessed to generate electricity**.

Watch the animation

A SMART GRID DEMONSTRATOR TO BOOST ENERGY TRANSITION

The ESTP Paris engineering school has developed a demonstrator that is open to manufacturers who are keen to test infrastructure and equipment projects in the field of smart grids. This energy transition-based initiative, carried out in partnership with VINCI Energies, promotes cooperation between public and private players.

On 29 September 2022, the ESTP Paris (Ecole spéciale des travaux publics, du bâtiment et de l'industrie) engineering school inaugurated on its Cachan campus (in the Val-de-Marne department in Greater Paris) a rather unique smart grid demonstrator in partnership with VINCI Energies, and in particular three of its business units: Actemium Vitry, VINCI Facilities TEM and Citeos Solutions Digitales.

"We are the only educational establishment to have designed and hosted a full demonstrator, incorporating all the key components of a smart grid as well as industrial equipment," says Bilal Amghar, head of the electricity laboratory at ESTP.

"An innovation approach which extends – in an agnostic way – to all organisations working to accelerate the energy transition."

Intended to meet training, R&D and innovation needs relating to smart grids, the demonstrator provides a testing and validation environment accessible to all

manufacturers wishing to trial infrastructure and equipment projects that centre around the energy transition.

The aim of the ESTP Paris Foundation, which is funding the scheme, is to attract not only manufacturers, as mentioned, but also schools and universities, businesses, start-ups and regional authorities to the Cachan campus.

"ESTP's proposition is unique in that it is fully in keeping with a comprehensive approach to innovation, which extends – in an agnostic way – to all organisations working to accelerate the energy transition," notes Juliette Gaborit, project manager at Citeos Solutions Digitales.

How algorithmic modelling supports energy efficiency

In the drive for energy efficiency, smart grids are seen as a focal point.

Based on digital technology, data analytics and algorithmic modelling, these distribution, consumption and storage grids make it possible to adjust energy flows in real time to the specific needs of a given block, neighbourhood or area, integrating renewable energy sources into the process as much as possible.

In short, smart grids help to cut energy use, shift systems towards cleaner sources and drive self-consumption where applicable.

But the rollout of these smart loops is dependent for the time being on progress in research and, to an even greater extent, cooperation between public and private players. That's where demonstrators come into play. They can be used to test smart energy solutions for buildings and neighbourhoods, to trial connections to a local or regional grid with integrated renewable energy facilities, and to test

and validate new equipment and services.

A hypervisor platform with an educational focus

To achieve this goal, the Cachan demonstrator comprises a 10kW UPS system (generation), 100kWh batteries (storage), a 14kW charge point for electric vehicles (mobility) and a smart variable-load emulator of up to 50kW (consumption).

Test configuration, scenario transmission, control, visualisation and analysis of energy consumption data are handled by a hypervisor platform designed by Citeos Solutions Digitales, the business unit responsible for the development of digital solutions for local and regional authorities.

"We had to design a platform capable of configuring tests and of being used as a teaching tool since the demonstrator forms part of the

curriculum at ESTP, which wants to raise awareness among tomorrow's engineers about energy transition issues and the role of alternative and renewable energy sources, especially in the construction sector," highlights Juliette Gaborit from Citeos.

Scalable, the scheme is shortly due to be supplemented by a roof-mounted solar installation. Its power output is also set to be scaled up as future connections are made and new sources of energy are integrated. The project required the installation of a slab strong enough to support the load and ensure a properly sized power supply.

"We've already planned to add two charge points, in partnership with Citeos. In the short term, the network should also include hydrogen fuel cells. We want there to be an open approach to the demonstrator; we are not ruling out any future development," explains Bilal Amghar from ESTP.

SIGNALLING TO INCREASE RAIL TRAFFIC

Energy transition in the highly greenhouse-gas-emitting transport sector involves the development of rail. To accelerate the process, the sector needs low-cost, resilient, flexible equipment. And Mobility's strategic approach to signalling encapsulates this perfectly.

The transport sector represents more than one-quarter of all greenhouse gas emissions in the European Union, according to the European Environment Agency.

But the relative emissions from different modes of transport in the sector vary widely. In France, for example, according to ADEME, "Per person and per kilometre, trains pollute eight times less than cars".

Developing rail travel, whether transporting passengers or goods, is therefore key to accelerating ecological progress and the subject of various EU priority schemes.

Rail's low carbon footprint in France is primarily due to the energy efficiency inherent in this mode of transport. But to see the light of day and get used, rail infrastructure must be economically accessible and thus requires

high-performance, lower-cost fixed assets. Signalling is a key part of this infrastructure.

"Accelerating the modal shift to rail for passengers and goods involves the development of signalling systems that are less costly, longer lasting, cleaner and better performing", says Stéphane Berthet, Mobility Signalling Business Unit Manager at Mobility.

This VINCI Energies business unit specialises in the design and implementation of signalling systems that combine performance, safety and frugality. This is a somewhat iconoclastic approach in a railway signalling market dominated by the three electronics giants Thalès, Alstom and Hitachi, whose proprietary solutions proliferate across the network.

Faced with this de facto near-monopoly, the only choice for challengers looking for a place is to focus on innovation.

Open mass production

Mobility Signalling has built its offer on three principles: openness, modularity and optimal sizing of signalling systems. First, the business unit is positioned as an integrator, designing its architecture and software in a completely open way.

"We retain no intellectual property, and 100% of the materials used are commercially available, and in quantity", says Stéphane Berthet. "When we sell a project, we supply every component: source code, validation systems, components. Our customers are then free to adapt their systems according to their needs".

Second, the equipment used is manufactured in huge quantities – many tens of thousands of the automated safety systems are made every year,

for instance – whereas production runs for proprietary solutions are limited to a few hundred items a year. All components are individually modifiable and interchangeable with other products on the market, ensuring a long life for the system in the event there is a problem with any single component.

"Our modular model allows us to configure our solutions precisely to our customers' needs."

And third, Mobility Signalling is not trying to sell oversized systems. As the business unit manager explains, "Our modular model allows us to configure our solutions precisely to our customers' needs".

A leader in tram signalling

In 2015, this open approach enabled Mobility to win over its first customers in the form of tram network operators. City transport authorities in Luxembourg, Nice, Caen, Bordeaux and Brussels, along with Ile de France Mobilités, adopted its automated systems.

"We are the market leader in tram signalling in France", says Stéphane Berthet. "But the biggest potential is in rail. Currently, we are entering the market via small regional lines,

sidings, technicentres and shunting yards". Other targets include: organising authorities, technicentre operators, ports and industrial sites, infrastructure managers, and private or tourist networks.

In 2019, Mobility secured the contract for the SNCF Tram-Train T12 and T13 maintenance and storage facilities in Versailles and Massy. More recently, Chemins de fer de la Corse (Corsica) chose Mobility's system for its 232 km network. Mobility also handled the design, supply, installation and commissioning of 10 level crossings for the renovation of the Petit Train de La Mure tourist line in Isère.

The TGV can wait

What about the so-called "backbone" network of TGV plus regional trains? The historical French railway operator currently uses only proprietary solutions developed in house over many years. As Stéphane Berthet explains, "Currently, the SNCF Réseau technical reference system does not allow us access to the backbone network. We have opened a dialogue with SNCF Réseau's engineering division to consider the possibility of adjustments that would enable us to compete, but these processes inevitably take time".

Nonetheless, the business unit manager is confident: "The trend is moving in our direction, with France's mobility orientation law (LOM), the future recovery in freight that the operator needs to rationalise its costs, the rail network opening up to competition, etc. A significant proportion of the equipment currently in place is becoming obsolete, and SNCF knows that our systems are much less expensive, at least as safe and effective, and certainly more resilient and cheaper to run than the existing equipment".

THE CIRCULAR ECONOMY AT THE HEART OF ENVIRONMENTAL TRANSITION

With society under pressure from the climate crisis and the urgent need for energy transition, businesses are being asked to radically overhaul their design and production models. In France, for example, the anti-waste for the circular economy (AGEC) law took effect on 10 February 2020. This major transformation includes massive adoption of techniques and materials that use fewer natural resources; systematic reuse and recycling of tools and materials; and widespread promotion of short loops. This approach is applicable everywhere, but is crucial in high-emissions sectors such as transport and construction. Future urban construction standards are not exempt from this revolution. Elected representatives, developers, operators and architects need to slow urban sprawl and encourage densification within a fixed perimeter, based on the existing built environment. Consideration of land use beyond the remit of urban planning is key to new production paradigms. For example, manufacturers are increasingly optimising their brownfield land to install low-carbon sites serving circular economy loops. All sectors, including digital and IT, quickly need to replace models based on massive, continuous extraction of resources with circular models that ensure resilience and reduced consumption, with a view to the ultimate goal – environmental transition.

BUILDINGS | TRANSFORMATION

AN ABSOLUTE IMPERATIVE FOR A SUSTAINABLE ECONOMY

As the only way out of a linear approach that is now revealing its full harmful impact, the circular economy has quickly become a priority for many economic sectors and the companies in them. But there are numerous obstacles to be overcome for this new paradigm to reach its full scale and potential.

There are multiple competing definitions of the circular economy. It can be interpreted quite differently when viewed from the perspectives of academic research, public policy, non-profit organisations or business. But despite their differences, these all share a common intent: to create a new economic paradigm to accelerate the environmental transition.

The model that has been in place for decades is based on massive, continuous extraction of resources, leading to equally sustained production of waste, destroying natural equilibrium and jeopardising the sustainability of our societies. This linear model and its damaging effects are now being challenged by a more circular approach built around three main elements: 1) more sustainable resource management based on reduced inputs, and reuse and recycling of the resource previously called waste; 2) mitigating climate change and reducing greenhouse gas (GHG) emissions; and 3) increasing the proportion of controlled resources (security of supply and the ability to extract, produce, process and consume resources locally).

In short, the circular economy is about extracting, producing, discarding and wasting less; and reusing, repairing and recycling as much of the material and energy flow as possible. It is therefore central to environmental transformation, and key to limiting and adapting to the effects of climate change.

Five years of lawmaking

From a strictly regulatory viewpoint, the circular economy officially

arrived on the scene in France with Article 70 of Law no. 2015-992 of 17 August, 2015 on energy transition for green growth (LTECV). Between 2015 and 2020, numerous publications, studies and legal instruments vied to describe and clarify the concept of circularity. FREC (France's roadmap for the circular economy) and the Resources for France Plan, published in 2018 in the wake of the LTECV, then formed the basis for the promulgation of Law no. 2020-105 of 10 February, 2020 on combating waste and the circular economy.

The construction sector generates almost three-quarters of France's waste.

This same law, known as AGEC (anti-waste for a circular economy), outlines a major circular economy initiative: extended producer responsibility (EPR). In a similar vein to "polluter pays", this provision makes businesses responsible for the entire life cycle of the products they market, from their eco-design through to end of life. In line with this principle, public authorities in France, and more broadly at the European level, have created "EPR streams" managed by state-approved federations known as eco-organizations.

Waste reclamation

It is estimated that the construction sector alone generates almost three-quarters of France's waste. This is mostly inert mineral waste (bricks, concrete, tiles and ceramics, glass, soil, rocks and stones from non-polluted sites), but also

includes non-inert non-hazardous waste (wood, plastics, metals) and hazardous waste (asbestos, contaminated soil, solvents, paint, etc.). In 2020, ADEME found the reclamation rate for waste from building sites to be almost 67%, close to the regulatory target of 70% set by the European Union.

The VINCI Group has implemented actions to minimise the impact of its business activity: improving design and production processes; reducing extraction of virgin raw materials, and using construction materials and techniques that consume fewer natural resources; recycling and reusing waste; and promoting innovative techniques, efficient practices, local focus and short loops.

In Concessions, as a project owner, the Group encourages the use of reused and recycled materials.

At VINCI Autoroutes, 100% of waste from its operations and self-managed service areas will be reclaimed from 2025. In Real Estate, the target for 2030 is to generate 50% of revenue from urban recycling operations. In Construction, within the same time frame, VINCI will have doubled the proportion of recycled aggregates produced (20 million tonnes per year).

VINCI Energies is playing its part in the VINCI Group's environmental strategy with three priorities: taking climate action; preserving natural environments; and optimising resources through the circular economy.

Many obstacles to overcome

The circular economy hierarchy prioritises avoiding the use of materials even above recycling. Circularity is not simply a question of waste management. Neither is it just something to consider at the end of the materials, infrastructure and equipment cycle. On the contrary, circularity begins well in advance of any project. It involves the use of eco-designed materials and equipment, and incorporates avoided carbon emissions in the life cycle analysis. The circular economy is inseparable from a functional economy, but calls for a greater mix of uses, reversibility and longer life span.

However, the circular economy still faces a number of barriers. Awareness, inventory and visibility of land assets and materials available for reuse could be significantly improved. The same goes for traceability, which remains haphazard. Another obstacle is the cost of reused materials, inflated by reclamation processing and certification, storage and transport expenses. The increasing pace of the circular economy also demands a rapid response to the stark skills


shortage. This requires substantial training effort in both corporate and educational settings. From a more "political" standpoint, while the circular economy is becoming a talking point for executive and management committees (at least in large companies), it has yet to gain sufficient traction in the boardroom.

Circularity's performance is linked to its adoption at scale. The entire value chain therefore needs to assimilate, and in every sector. For those organisations committed to this endeavour, which is not just virtuous – it is essential, this is an opportunity to forge new long-term partnerships.

Three fields of action – seven pillars

In terms of waste prevention and effective resource management, ADEME divides the circular economy into three major fields of action: production and supply of goods and services; consumption through demand and consumer behaviour (business and individual); and waste management prioritising recycling that can close the loop. These three fields of action encompass seven pillars: sustainable extraction/use and purchasing; eco-design of products and processes; industrial and territorial ecology; product-service system ("production and supply" field); responsible consumption; increasing the length of use ("demand and consumer behaviour" field); and recycling ("waste management" field).
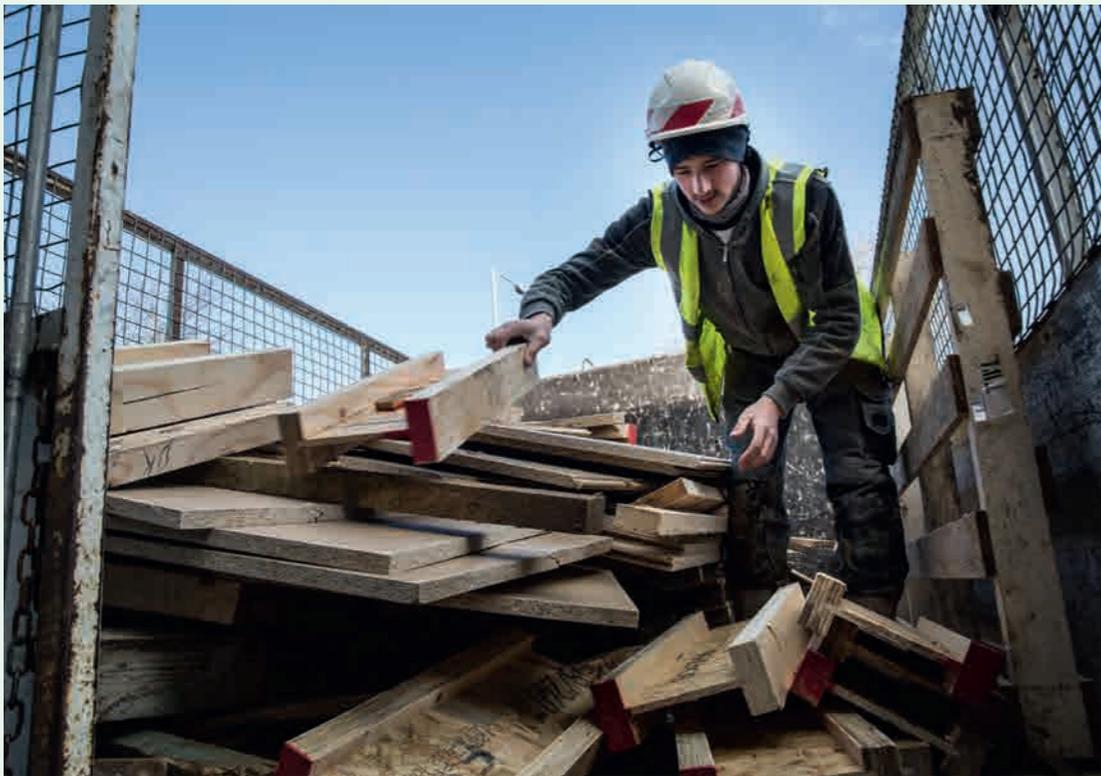
INDUSTRY | TRANSFORMATION

MANUFACTURING SECTOR TO STAKE EVERYTHING ON CIRCULAR ECONOMY

A major source of CO$_2$ emissions, the manufacturing sector must urgently start pursuing energy efficiency on all fronts. Implementing circular economy principles will help it to accelerate this transition. The factory of the future will be circular as well as smart.

Industry is at a critical crossroads in developed countries as it faces the need to respond to economic sovereignty and energy transition challenges. This is particularly the case for France, which has embarked on a policy that aims to revive a manufacturing sector now only accounting for 10.1% of its GDP (compared with 16% in Europe and 28.3% worldwide)

and that must be incorporated into the French National Low-Carbon Strategy (SNBC).

The challenge is all the greater since manufacturing represents 40% of global energy consumption and emits 70% more CO$_2$ than 20 years ago. Businesses must initiate a revolution without delay. The sector is built on a linear

model whose guiding principle is the pursuit of infinite growth; by contrast the resource timescale is finite. We must now speed up the transformation of our models while at the same time slowing down the race for growth. This change of gear requires a radical shift from a linear to a circular system.

Faced with the urgency and critical nature of climate issues, the manufacturing world is knuckling down. But there are still many barriers to overcome. A study by the firm OPEO and the Institut national de l'économie circulaire (INEC, the National Institute for the Circular Economy) shows that in 2021, although 85% of manufacturers saw the circular economy as a genuine opportunity to improve competitiveness and develop new markets, less than 27% of them had started transforming their value chain beyond their core plants – a dimension that accounts for less than 5% of the carbon footprint!

Energy efficiency loops

However, there are many entry points into circularity. As well as cutting their emissions, businesses can reduce resource consumption. This includes land, a key factor in resilience at a time when no net land take objectives have triggered

Only a quarter of manufacturers have started transforming their value chain beyond their core plants.

a comprehensive reflection process on the use of brownfield sites. The transformation of Renault's historic Flins facility into the first European plant dedicated to retrofitting and circularity training is a prime example of this.

Further levers exist such as improving energy efficiency through heat recovery, an option selected by ArcelorMittal which, by connecting its blast furnaces in Dunkirk to the district heating network, avoids the emission of 20,000 tonnes of CO$_2$.

Digital technology is also key to accelerating energy-saving loops. Artificial intelligence can be used to check plant output data against energy costs, digital twins to anticipate drops in energy efficiency, and second-hand marketplaces to acquire site equipment, and so on.

For a long time, the circular economy was the poor relation of the public debate on energy transition and the blind spot in related policies. Due to its importance for the economy and its responsibility in terms of greenhouse gas emissions, the manufacturing sector has a major role to play in driving and scaling up this new model.

"WE FOCUS ON REUSE, WHICH HAS A MUCH SMALLER CARBON FOOTPRINT THAN RECYCLING."

Bruno Nicolas, director of the Actemium brand, explains his circular economy strategy.

What progress has Actemium made with circularity?

B.N. The sustainable development strategy launched by Actemium in 2018 is based on three focus areas: energy efficient industrial processes, low-carbon solutions (renewable energy sources, low-carbon hydrogen, e-fuels and carbon capture) and a circular economy approach. As part of this roadmap we developed Actemium Carbon Tool (ACT), one of the first tools to be aimed at the industrial world and to target Scope 3, which covers all of the company's indirect emissions. This enables our clients to assess the carbon footprint of the solutions we recommend for them. Of all the focus areas, the circular economy is probably the best driver of carbon footprint reduction at the moment.

What does this mean in terms of supply?

B.N. The circular economy can be based on recycling and/or reuse. The option most readily selected in industry is recycling. However, as an integrator we decided to focus on reuse, not least because it has a much smaller carbon footprint than recycling. That being said, we need to convince clients to opt for new solutions that rely on second-hand equipment. Four or five years ago, no matter how much we stressed the cost and environmental savings, it was hard to get the message across. It is different now: protecting the planet has become a priority and the competitiveness of solutions incorporating reused equipment makes them more attractive.

What type of equipment can you reuse?

B.N. Lots of equipment can be reused, but I'll give you just two examples. Firstly, by dismantling electrical systems, you can recover circuit breakers that still work very well. We don't recycle them after checking them; we reuse them by finding a new place for them in other cabinets. Secondly, we recently recovered assembly line handling carts in a car manufacturing plant in eastern France which were transferred to one of our clients in Morocco.

BUILDINGS   TRANSFORMATION
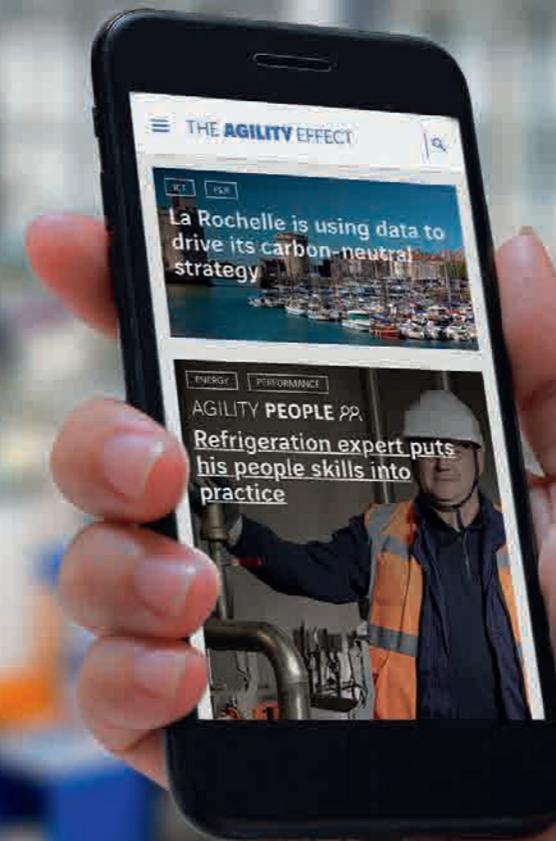
BUILDING: REUSE BEFORE RECYCLING

With 90% of building-sector waste coming from demolition, the reuse of materials is an entirely suitable response.

The building sector in France produces 46 million tonnes of waste every year. That is four to five times less than from public works but 50% more than household waste. For the real estate sector, which alone accounts for 40% of energy consumption and over 50% of raw materials extraction, waste management must form part of the conversation around energy conversation.

The increasingly stringent regulations leave little other choice. The European Union has set targets of 70% for reclamation of construction materials and waste from 2020 onward. The PEMD (Products, Equipment, Materials and Waste) platform, created by the Scientific and Technical Centre for

Building (CSTB) as part of the 2020 Law on combating waste and the circular economy (AGEC) is designed to make resources more visible and facilitate stocktaking by project owners on completion of a project.

Despite these initiatives, waste management in the building sector continues to suffer from numerous technical, regulatory, economic and insurance-related obstacles, a highly fragmented overview of available resources and materials flows, and the sector's sluggish response.

Over 90% of waste produced in the sector comes from demolition and renovation works. Along with eco-design, recycling is now a crucial issue for the entire sector. Reuse of materials currently remains patchy, but will no doubt soon be everyday practice, given the plethora of potentially reusable items found on construction sites: toilet bowls, ventilation ducts, cable guides, precabling, etc.

But here too, very little progress has yet been made: "We are only in the earliest stages. Adoption is low, and there is a lack of quality resources," says Florent Malvezin, Business Unit Manager at GTIE Tertiaire (VINCI Energies Building Solutions).

Ventilation ducts and cable guides

Nevertheless, initiatives are taking shape. As part of the work on its Carré Vert site in Levallois Perret (Hauts-de-Seine, France), Crédit Agricole is giving second life to cable guides from renovation projects. The banking and finance group is also committed to promoting the reuse of ventilation ducting, which is made from steel and therefore has a huge carbon footprint. Ventilation ducts and cable guides are present in large

quantities in buildings, and there is no major risk in handling them.

Lefort Francheteau (VINCI Energies Building Solutions), a pioneer in this circular approach, recently launched a pilot initiative. As Guillaume Graffin, Assistant Technical Officer at Lefort Francheteau, explains, "We have educated and trained a number of site strippers – the technicians responsible for stripping buildings undergoing renovation or deconstruction – encouraging them not to discard used ducting from their worksites. We then collect, recondition and store this ducting in one of our warehouses."

The business unit is gradually building up a database of documents and photographs to help site strippers identify materials and route them into a reuse process.

The challenge of scaling up

The key to viability in a second-hand sector lies in its "industrialisation". Industrialisation means scaling up supply, stocks and flow to massive volumes. And that requires indexing and

traceability. Lefort Francheteau itself already has hundreds of metres of ducting in stock and ready to be reused.

"To speed up the process and achieve the regulatory targets, financial incentives will definitely be required."

Current estimates indicate that only 1% of available material on construction sites is reused. Tonnes of products, some extremely costly, that with (or without) reconditioning could go on working for a long time are still being consigned to landfill. "Environmental issues are now forcing the profession to wake up," says Florent Malvezin, "But to speed up the process and achieve the regulatory targets, financial incentives will definitely be required."

Reyuz: one year on and already in V2

Launched at VINCI Energies in 2022 to allow its business units to buy and sell unused equipment (office furniture, technical equipment, worksite materials, etc.), the Reyuz mobile app is slowly but surely finding its place. In just over a year, it has been used by 145 companies (18% of VINCI Energies business units in France), with 460 ads placed and 68 transactions made. "We estimate that these transactions between sister business units have saved €65,000 and 30 tonnes of carbon equivalent," says Stéphane Bretin, Expertise & Environment Manager for VINCI Energies Building Solutions. In addition to the mobile version, since April 2023, Reyuz has been available on the internet, with an enhanced Version 2 including the ability to search by location. Stéphane Bretin explains that "The mobile app is more practical for taking photos and listing equipment as available, while the web works better for browsing the offers."

ENERGY   TRANSFORMATION

WHERE ELECTRICITY MEETS THE CIRCULAR ECONOMY

Along with transport, the electricity production sector is the European Union's joint highest emitter of CO₂.[1] The circular economy is one key to reducing the industry's carbon footprint, and Omexom in Finland is one of the pioneers beginning to develop new models.

At its business unit in Hikiä, Finland, which employs a dozen people, the Omexom brand (VINCI Energies) has been working since the 1960s to develop a process for reclaiming transformer oil, an essential element in electricity networks.

The primary function of transformer oil is to insulate and cool the transformer. But like any substance, transformer oil deteriorates over time. It accumulates impurities, moisture and oxides that affect its performance.

Used transformer oil is typically treated using either chemical detoxification or incineration techniques, both of which have negative impacts on the environment.

Otso Takala, Project Manager Transformation at Omexom Finland explains that "Our technique uses mechanical techniques such as filtration and vacuum handling to remove the moisture and particles present in used oil. A single 110 kV 25 MVA transformer contains 15 to 20 cubic metres of oil, and a 400 kV 400 MVA transformer contains around 100. We are also using yearly 15,000 to 30,000 litres of recycled oil when we perform maintenance on the on-load tap changers (OLTC) in a transformer or if it needs to be refilled".

Cost savings

Omexom Finland has also taken things a step further by applying the same approach to recycling the entire transformer. A transformer contains numerous components that remain intact when it is decommissioned and various potentially reusable materials including porcelain, steel, aluminium and copper. Reusing these materials both reduces the need to extract new metals and extends the operational life of appliances.

"In addition to the reduced environmental impact, our process offers real benefits for our customers."

"In addition to the reduced environmental impact, our process offers real benefits for our customers," says Otso Takala. "It means we have parts in stock that usually have quite long lead times, while customers often need them in less than 24 hours. Also, having small used parts available avoids having to replace larger assemblies and can therefore allow significant cost savings".

Thanks to this service that can prolong the life of a transformer, Omexom Finland has enabled some customers to delay investment in replacement units by 20 years, based on an initial operating life of around 30 years. At a time when material and component supply problems remain critical, the future certainly looks bright for this Omexom Finland initiative.

(1) EEA / Eurostats 2021
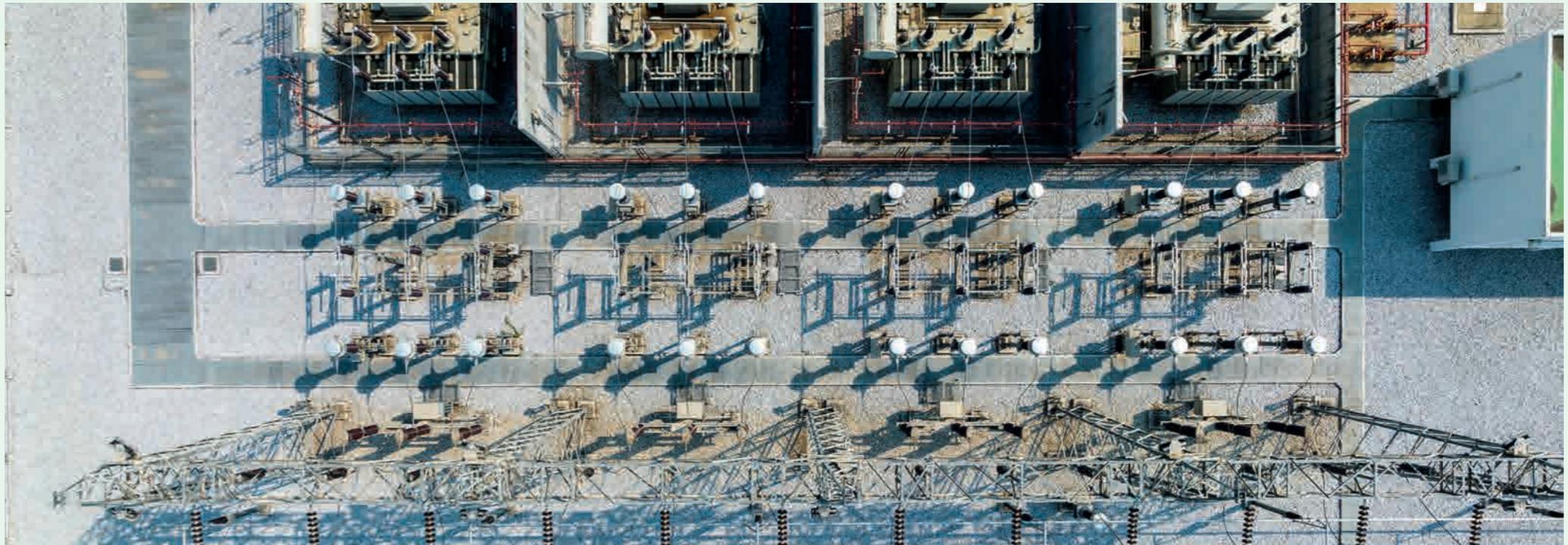
ICT   TRANSFORMATION

"GAINING A COMPREHENSIVE VIEW OF IT-RELATED ENVIRONMENTAL ISSUES"

To reduce the impact of its IT activities, VINCI Energies is seeking to increase equipment lifespan and to tighten requirements for suppliers. Repairs are systematically carried out wherever possible. Dominique Tessaro, information systems Director of VINCI Energies, explains.

What role does the VINCI Energies IS department (VESI) play in promoting a circular economy approach in the group?

Since 2008 VESI has been heading up all VINCI Energies IT operations and managing the equipment used every day by our 80,000 users in more than 57 countries. The department is part of a decentralised group comprising a set of 1,900 business units with long-standing operations in their regions, 60 business lines and 5 divisions. VINCI Energies has set itself the goal of cutting its CO_2 emissions by 40% by 2030 and achieving carbon neutrality by 2050. Although IT accounts for a relatively small share of the group's overall impact, we must take all necessary steps in order to meet this collective ambition. This is also a new strategic challenge for VINCI Energies business units

that develop and market digital services, given the changes in the market and particularly in public procurement in France.

Could you explain your methodological approach?

To meet this sort of challenge, it's important first and foremost to be able to measure and, hence, identify metrics which have been agreed, which are clearly understood by IT managers and which are operationally applicable. In 2020 an audit was conducted on the IT impact of our organisation, which helped us to determine a digital responsibility roadmap. This offers each of our business units specific courses of action for working towards emission reduction targets. The goal here isn't to impose a standard roadmap but to inform the IT managers of each business unit in an exhaustive and accurate way about levers they can pull. We started working on the topic very early on, which resulted in us obtaining the Responsible Digital Technology (Numérique Responsable) label with level 2 status straight away. This certification enabled us to structure our strategy, prioritise our levers and have a comprehensive view of the IT-related environmental and social issues that our IS department was facing.

What are your priority areas for action?

The IS department's strategy is based on one key action: to extend equipment lifespan. We stretched the average renewal frequency of workstations from three years to three and a half years, then to four years, then to four and a half years… And today, there's no limit. An incentive criterion applies to the 600 employees in the department in cases where their own hardware exceeds a lifespan of four years. And we made it a requirement for our suppliers to increase their warranty coverage from three to four years. Just before this period comes to an end, workstations undergo a full inspection. Some are remastered. If a problem is detected, we fix it. If we can't fix it or if a repair is too expensive (more than €160, the annual depreciation cost of a device), we replace the equipment which is then sent to a charity or refurbishment company.

By the way, I'd like to take this opportunity to condemn the scandal of using Africa and Asia as dumping grounds for waste produced in Europe. I don't understand why hardware imported by Europe isn't systematically disassembled in Europe. I would be in favour of a consumer contribution towards financing appropriate waste management centres.

What about smartphones and servers?

We've increased the purchase frequency for smartphones from two to three years, and after this time we give staff a financial incentive of €20 per month to keep their handsets longer. Employees who opt for a Fairphone (a sustainably-designed and

repairable phone) or a reconditioned smartphone can benefit from this allowance after a period of two years. The aim is to incentivise staff to keep their phones for as long as possible at no cost to the company. We have also started replacing end-of-life giant screens in meeting rooms, which have a large carbon footprint, with laser projector systems. And finally, small-scale office servers will gradually start to be hosted in the cloud. Given their average lifespan, this process should take between five and seven years for our business units.

Have you developed a new approach to procurement policy?

We pursue a responsible procurement policy that targets sustainably-designed or reconditioned IT equipment. We buy 30,000 to 40,000 PCs every year. Environmental, social and governance (ESG) criteria now account for 15% of the final score awarded to suppliers. We push manufacturers to improve every dimension of their value chain: the hardware itself of course, but also the packaging techniques and modes of transport and delivery. However, we remain highly dependent on Microsoft, whose Windows versions are increasingly cumbersome and force us to change equipment that is still in perfect working order. It seems to me that Europe has an essential sovereign role to play here by obliging publishers and manufacturers to develop less expensive offerings. But European regulations are moving in the right direction by taking into account the "right to repair".

CITY   ACCELERATION

MAKING THE CIRCULAR CITY A REALITY

Several things need to be done in order to halt the destructive race towards urban expansion: increase urban density on a like-for-like basis, make use of the existing urban environment and develop circular cities. This requires a collective, agile approach. What conditions, constraints and limits will apply to such a far-reaching transformation of our models? The Agility Effect brought together Céline Acharian, CEO of La Fabrique de la Cité, a VINCI think tank, and Sylvain Grisot, urban planner and founder of the firm dixit.net, to discuss these key issues for the environmental transition.

Sylvain Grisot, in 2021 you published *Manifeste pour un urbanisme circulaire*[1] and more recently *Réparons la ville !* with Christine Leconte[2]. What is a circular city?

Sylvain Grisot. It promotes a transition from a linear model, where we use new agricultural land increasingly far away from cities to build new shops and houses, to a circular process where we rely on as many loops as possible to optimise each square metre. Once this principle has been established, a circular city can be defined in several ways depending on whether you look at the functions or the fabric of the city.

By functions I mean material and immaterial flows, everything that comes into, goes out of or stays in the city. And by fabric I'm referring in particular to materials (including waste) involved in construction and engineering activities, which we know to be resource-intensive and a major source of CO_2 emissions.

However, with urban fabric you also need to understand an immaterial resource – space. Looking at urban metabolism means asking what a city is and what it is not, where it starts and where it ends. Traditional town planning culture tends to analyse the fabric of the city from a land perspective. What I call circular town planning is urban fabric seen through the lens of spatial as well as land flows. There are different interpretations of city-based circularity, but the goal they all seek to achieve is to transform practices and make them go in the right direction.

So a circular city is primarily about curbing urban sprawl?

Céline Acharian. France has one of the highest levels of land take in Europe, with a ratio of 47km² of artificial surfaces for every 100,000 inhabitants. That is twice as high as in Italy. Between 2009 and 2019, 70% of this construction spree was driven by housing. Today we all know that soil is essential in fighting climate change and ensuring food self-sufficiency. The linear approach of saying "I've none left, so I'll take some more" is all the more crazy since we are pre-empting vacant land to develop even as people and their businesses are abandoning entire areas, especially urban ones. Basically, we must increase density on a like-for-like basis, starting from what already exists. Many local stakeholders didn't wait for the latest Intergovernmental Panel on Climate Change (IPCC) report to take action in this regard.

Sylvain Grisot. Sprawl isn't the problem, it's the symptom. In fact it's the symptom of a system running perfectly but in the wrong direction. It's a relatively recent vicious circle that gathered momentum in the 1970s and 1980s. The driving force behind this production and construction system was the boom in private cars, which encouraged urban expansion, the rollout of structures and activities further afield, and car dependency. So we've come full circle, ticking all the boxes: soil erosion, biodiversity loss, threat to food security, greater use of carbon-emitting mobility systems, reliance on new construction, and so on. That's why spatial flows are key to the fabric of a circular city. For as soon as you become more efficient in terms of use of space, you automatically look at how to reuse land, buildings and forms of mobility.

How can the government help to accelerate the implementation of urban circularity?

Céline Acharian. Financial help is available, which can be useful. But I should point out that it is dwindling. What the government should do is show its confidence in initiatives emerging at local level and relax regulatory constraints so as to allow room for experimentation. There are exceptions for research permits in some fields – why not also in the field of town planning?

From a methodological point of view, what approaches should be prioritised?

Sylvain Grisot. The research I've undertaken in circular town planning has helped me to identify four loops. The first involves intensifying the use of buildings and focusing more on utilisation time than on space. The second includes reusing existing buildings to avoid demolishing and rebuilding as far as possible. The third seeks to densify available space in urban and peri-urban areas for new build projects. And finally the last loop involves repurposing and restoring the city by assigning new uses to brownfield sites for example.

Is the "no net land take by 2050" objective a step in the right direction?

Céline Acharian. Many elected officials didn't wait for the target to be set in order to devise solutions, submit them to local stakeholder ecosystems and test them. They took the decision themselves to stop granting planning permission indiscriminately, to prevent local urban planning schemes from stacking up and housing estates from expanding, and started increasing the density of suburban neighbourhoods.

However, the fact that the no net land take objective has been established and that it brings all initiatives together under one banner provides an interesting opportunity to examine practices and reflect more deeply on urban circularity. Today everyone is clinging to the objective as best they can, with their own system of constraints, by developing their own metrics. Of course at some point the calculation scales will need to be aligned and local approaches will need to become consistent on a scale large enough to allow an interaction and multiplier effect. One thing is for sure: the objective has stirred up a hornet's nest.

Sylvain Grisot. I agree. Although public policy, including no net land take policy, fails in my opinion to address the cause and consequence of the problem, the effects on the system are there. And you can see a lot of often exemplary initiatives being implemented locally. Having said that, we need to look at how to accelerate them and how to reach critical mass.

What provisions, tools and environments would be likely to facilitate project deployment?

Céline Acharian. What is certain is that local elected officials need to be given free rein. The multiple layers of regulations, the numerous constraints linked to administrative boundaries, the complex standards, the pressure of risk prevention, and civil defence and heritage protection orders form a whole regulatory system, which, even if there are valid reasons behind it, is more discouraging than anything else. This is also the case for issues which are generally agreed to be urgent.

"You can see a lot of initiatives being implemented locally, but we need to look at how to accelerate them and how to reach critical mass."

Sylvain Grisot

"Many local stakeholders didn't wait for the latest IPCC report to take action to promote circular cities."

Céline Acharian

The mayor of a small municipality in Greater Paris recently told us that he had had to fight on all fronts to test a water circularity system in his area. The same observation goes for forests and timber: fire regulations, local fire and rescue services, and so on make it very difficult to experiment. In short, the constraints are such that, in areas where agile processes could be put in place, stakeholders often give up.

**Who is in a position to drive action?
Is the impetus coming from elected officials?**

Sylvain Grisot. Let's be clear, of the 500,000 local elected officials in France 490,000 of them have no control over anything. We must stop thinking in terms of decision-making power. Urban circularity is pre-eminently a collective issue, which must enable us to re-establish ties so that we can reflect, question and experiment together. I believe we must even stop thinking in terms of innovation. It's not a question of innovating, but of giving things up. The real question is: how do we stop doing the wrong thing? What should we stop doing? We must all face up to our responsibilities.

Céline Acharian. I completely agree with the idea that these are collective, shared issues. However, local elected officials and, more broadly, local stakeholders have an important role to play. I'm not talking so much about responsibility but more about their capacity to act and experiment. An elected official responsible for town planning in Rennes recently said that, amid an overall climate of mistrust among the public regarding the government's ability to set clear directions, the only real policy area still considered by citizens to be of some use is that of urban policy, specifically housing policy. This is recognition that elected officials have a genuine capacity to act.

(1) GRISOT (S.), *Manifeste pour un urbanisme circulaire*, Editions Apogée, 2021.
(2) LECONTE (C.), GRISOT (S.), *Réparons la ville !*, Editions Apogée, 2022.

WAVE – THE BUILDING THAT COMBINES SMART BUILDING WITH LOW TECH

In Lille, the VINCI Energies regional headquarters is a melting pot of new uses, in a building that is both "smart" and energy efficient. The key component of the system is a unique web app that allows individual users to interact with the building's spaces.

Often presented as a major indicator of the transformation in working practices, the smart building has yet to generate the response that its promoters predicted.

But the barriers to incorporating so-called smart technologies into existing building stock are not the only reason. The promises of smart building were based on the omnipotence of high-tech applications that are becoming less and less compatible with the requirements of energy transition and growing social pressure for more frugal energy practices in industry.

If the building of the future is to find its place, therefore, it must combine innovation with useful, sustainable, economical and energy-efficient technologies.

Key-free, paper-free, plastic-free

Constructed in 2019 in the EuraTechnologies district of Lille (France) given over to startup incubation, the new VINCI Energies building is one of the first to make the low-tech shift in tertiary real estate.

The absence of tags, keys or fobs grants more fluid access to spaces. The absence of paper means fewer storage cupboards, more floor space and more glass surfaces to optimise heat and light levels. There is no plastic, and therefore no waste bins and less need for cleaning services.

There are fewer parking spaces than car-using employees, and so carbon emissions are reduced.

"We wanted to create a working environment for our 100 employees that aligns with energy transition and digital transformation", says David Desablence, the VINCI Energies Building Solutions business development director for Hauts-de-France, "A place that incorporates the most innovative smart building functions while improving the well-being of its users. Above all, we wanted to make users' needs and expectations our starting point".

Communications solutions

Named WAVE (from "We Are VINCI Energies"), the 2,000 sq. metre headquarters is one of a trio of identical-looking buildings. But unlike the other two, WAVE was built as a comprehensive technical package, with all solutions designed in advance to communicate with each other using an open protocol. The building also uses a mobile application, also called Wave, that enables employees to connect to the building's web platform using their smartphones, to access a multitude of services

FIRE SAFETY: EXPERT CUSTOM-BUILT SOLUTIONS

and autonomously manage various functional applications: lighting, lifts, heating, air quality, blinds, meeting room bookings, parking spaces, alarms, doors, etc.

Smart Building Energies is a VINCI Energies startup created in 2018 to develop the Wave Platform application in partnership with Microsoft. Its Business Unit Manager Frédéric Thouot explains that "Applications developed for smart buildings tend to specialise by function: one app for lighting, another for heating, a third for parking, and so on. This generates extra cost and makes them complicated to use. Crucially, we wanted a single, intuitive interface that is simple but comprehensive and enables any building user to interact easily with every smart feature of the building".

"Measuring to improve"

The building contains 2,700 data points and 570 networked devices.

Because it is fully interoperable, it can analyse the enormous quantity of data produced and self-manage according to its own findings.

"An interface that enables any building user to interact easily with every smart feature of the building."

"At VINCI Energies, our philosophy is one of measuring to improve", says Eugénie Guilpain, Energy Manager at VINCI Energies France

Tertiaire Nord Est & Sécurité Incendie. "And we measure absolutely everything, down to an extremely fine level. Every month, I present dashboards to the divisional management committee, and from these, propose energy performance actions (EPA), under three headings: economic expenditure, kilowatt hours and kilograms of carbon".

WAVE received the public prize at the 2019 Green Solution Awards and the 2019 SIMI Grand Prize, and has achieved BREEAM Very Good certification and the Effinergie+ label. Above all, in December 2020, it became the first building to receive the highest level of the R2S (Ready2Services) label created by the Smart Buildings Alliance (SBA) and issued by the certification agency Certivea.

And the building can boast one further achievement: overall energy consumption is 30% lower than in the two adjacent buildings.

From factories and warehouses to commercial premises and healthcare facilities – fire safety measures must be tailored to every situation and building type. Each case requires an ad hoc installation and specific expertise.

Every building needs fire protection solutions. These are essential safety features for manufacturing, healthcare and the commercial sector.

"Fire safety installations in buildings, especially warehouses and logistics hubs, are subject to extremely strict standards and, of course, the specific requirements of each build", says Kay Sydow, the business unit manager at Calanbau Brandschutzanlagen, a German company specialising in fire suppression systems and part of VINCI Energies Deutschland Building Solutions.

Implementation of these systems has to follow a precise and rigorous process, starting with an in-depth analysis guided by a series of questions: What type of building is it? What kind of goods are stored there? How are they packaged? Are they high-risk goods? What type

"Fire safety installations in buildings, especially warehouses and logistics hubs, are subject to extremely strict standards."

of storage is planned (block storage, pallet racking, high-bay storage, double deep racking, etc)?

Kay Sydow adds that this work must be completed before "Proceeding to the classification of fire hazards – light (LH), ordinary (OH) or high (HH) – that will determine the sizing of the sprinkler system".

Stack effect

Some sites and products require highly specific installations. For example, as Kay Sydow explains, "In facilities with storage over

7.5 metres high, there is a particular risk: a fire may start lower down and spread upward due to the so-called 'stack' or 'chimney' effect. Hot gases from the fire can heat and ignite previously unaffected material on shelves higher up. It only takes a few minutes for the fire to spread right up to the ceiling, and it then becomes difficult to extinguish".

To avoid this type of incident, sprinklers are fitted directly to the racking to extinguish the early-stage fire more precisely and effectively. "Sprinkler placement is determined by the risks and the class of products being stored", adds Kay Sydow.

Like all her VINCI Energies colleagues specialising in fire safety, Kay Sydow has high-level expertise in this area. "You need knowledge of mechanical engineering, construction technology and business engineering. It's also important to understand heating, ventilation and climate control technologies, plus sanitation and technical facilities in buildings".

Examples in Germany and France

Thanks to this expertise, the VINCI Energies teams can provide bespoke solutions for every type of building in France and worldwide. In Germany for example, Calanbau in Darmstadt fitted out a new logistics centre for the food discount chain Penny (REWE Group) in Kronau, Baden-Württemberg, which supplies 275 stores across southwestern Germany.

"We installed a Class 1 sprinkler system, designed in accordance with the VdS HHS 4 directive. Effective fire protection is ensured by 12,200 sprinklers, covering a total floor space of around 50,000 sq. metres divided into six fire compartments. Of these, 5,400 K200-type sprinklers cover the higher fire risks associated with goods stored in plastic media".

The unique features and challenges of fire protection demand the extra-special diligence that VINCI Energies applies to all its projects. The most recent of these was the first construction phase of a gigafactory for electric vehicle batteries on behalf of ACC (Automotive Cells Company) in Douvrin, northern France.

Nicolas Blumel, business unit manager of Uxello Travaux Hauts-de-France, a specialist VINCI Energies business unit, explains, "For this 70,000 sq. metre production facility, which will produce its first batteries in late 2023, we will be installing 16,500 sprinkler heads, 41 control stations and around 800 tonnes of pipework, just for the building itself. We will then install some 17,000 sprinklers to protect the process".

MORE SUSTAINABLE AND LESS COSTLY: PUBLIC LIGHTING GETS A MAKEOVER

The small town of Elgoibar in the Basque Country of Spain called on Omexom to optimise the management of its public lighting with the twin objectives of reducing its costs and its environmental impact.

Located between San Sebastián and Bilbao, the small town of Elgoibar in the Basque Country of Spain has embarked on an ambitious energy efficiency project. This town of 11,500 people awarded a business unit from Omexom (the VINCI Energies brand specialising in the production, transmission, transformation and distribution of electrical energy) the contract to optimise its public lighting, in order to reduce the town's costs and environmental impact.

"The contract, which began in May 2022 and runs until May 2032, covers the overall management of public lighting, including energy management, maintenance, an operational guarantee and investment in renovating the installations", explains Alberto Campo, Manager of Omexom Territories – Sustainable Buildings at Tecuni SA. "That makes it eight contracts of this type that we now manage".

180 tonnes of CO$_2$ emissions avoided annually

The ultimate aim is a 100% carbon-free electricity supply using renewable energies. This project, which entails replacing the current lighting system with LEDs, should allow the town to reduce its annual CO$_2$ emissions by 180 tonnes. As well as improved visual comfort, these LEDs offer reduced light pollution by reducing FHS (light emitted in the upper hemisphere).

Digitalising the lighting system will also significantly improve its management. It makes maintenance work more efficient and reduces the number of incidents thanks to increased agility. The high performance of the new installations will enable the town to make significant energy and cost savings (58% saving expected), a considerable advantage given the surge in electricity prices.

The project in Elgoibar coincides with the Spanish government's launch of its +SE Plan (Plan Más Seguridad Energética). Among the measures introduced under this scheme to help households and the economy, LED upgrades are one of the priority actions for local authorities.

AIX-EN-PROVENCE PLACES DATA AT THE HEART OF ITS CITY MANAGEMENT

Since 2015, France's 11th-largest urban area has been developing an intelligent, empirical and agile data management strategy to improve its citizens' lives and its use of resources.

Aix-en-Provence is often hailed as a pioneering city in terms of data management. This city of 145,000 people (and 10 times that across the metropolitan area) launched its smart city programme in 2015, one of those rare regional projects to actually reach completion, building and growing gradually and thoughtfully over time.

The city owes this success to a pragmatic methodological approach supported by a pool of partners around Netsystem for consulting, some twenty startups for innovation, and Axians for integration. And also a significant budget commitment. In 2022, the smart city budget topped €600,000, largely thanks to the European Regional Development Fund (ERDF). The city hopes to pass the million-euro mark in 2023.

The smart city project in Aix began with a long design phase, with close to 20 projects completed between 2015 and 2018. Five application areas were ultimately selected: smart lighting, air quality, waste, pedestrian flow monitoring and safety. A second stage followed from 2019 to 2021 for POC testing and making the necessary adjustments. The third phase began in 2022: the transition to full-scale project.

Empirical and agile approach

This step-by-step progress would not have been possible without a business model based on framework contracts. As Cláudia Cristóvão, International Business Development Manager at Axians, explains, "The city of Aix-en-Provence opted for an open-ended budget to facilitate

an increase in power and pragmatic rollout of use cases based on lessons learned. We are by definition in experimental territory, where tightly circumscribed planning models and highly specific budget allocations quickly prove unworkable. By moving forward step by step, we were able to make readjustments and reverse some choices that ultimately proved unsuitable".

This is why, after 18 months of studies, the solution initially selected for the supervision platform was eventually replaced with an alternative from PTC. Another empirical move was the rollout of a private LoRa network across the city's 18,600 hectares. For the purposes of measuring pedestrian flows, Wi-Fi was dropped in favour of people-counting cameras. Above all, this agile approach made it possible to integrate new application areas with the five initially selected. The first covered lighting, with 500 connected on-street electrical cabinets. The city also placed sensors in parking areas for better management of parking spaces for people with reduced mobility, and installed equipment for heat island detection and intelligent watering of green spaces. Multipurpose sensors were configured to measure noise levels in the streets for safety.

1,500 sensors by the end of 2022

More than 1,000 sensors are currently distributed across the city, with another 500 being installed by the end of 2022. All the data processed from this intelligent network and around a hundred different indicators is transmitted to the central hypervisor.

Aix-en-Provence opted for an agile approach, deploying a broad-based data platform to better manage the region.

Here too, the use of a single platform controlled by the city is a strategic choice. Axians project manager Christophe Meunier says, "It's the best solution if we want to allow connection of all the data sources and integrate new custom-designed use cases. The city also wanted to ensure effective interfacing with its different services, to help them take ownership of the data and applications".

For example, the local police can check the noise level in a given street if they receive a report or complaint from a resident. Similarly, the company responsible for redevelopment will use the flow data in managing urban design.

ENERGY | ACCELERATION

ENVIRONMENT AMBASSADOR

In order to shake things up on the environmental front, VINCI Energies is looking to speed up information flow by forming a global network of its environmental managers. In Portugal, this responsibility has been assigned to Cátia Margarido, whose role is to build environmental awareness among VINCI Energies employees and to encourage them to take action.

Cátia Margarido has been head of environment at VINCI Energies Portugal since January 2022. Her work involves informing, educating and engaging with the 2,000 or so employees that make up VINCI Energies in Portugal on the subject of environmental protection. "My role is to promote and develop climate action, circular economy and biodiversity actions," she explains. "Together with Portugal's CEO, we set the strategy to be followed and apply it in two ways. First, by organising cross-cutting activities with the various VINCI Energies business lines. And second, by supporting the initiatives taken in the three pillars by each of our subsidiaries." There are plenty of projects

in the pipeline for Cátia Margarido: publishing a report on VINCI Energies Portugal's sustainable development activities, organising Environment Day,

> *"My role is to promote and develop climate action, circular economy and biodiversity actions."*

be part of working groups that tackle biodiversity and circular economy issues, engaging

with VINCI Energies Portugal suppliers to motivate them to reduce their greenhouse gas emissions, and setting up schemes to cut the emissions of VINCI Energies' own Portuguese business units.

Cátia believes the main quality required for the job is "the ability to interact with people from different backgrounds, raising their awareness of environmental topics and encouraging them to change their behaviours. It is harder to shake things up in this field than in areas like occupational health and safety, despite the fact that the impact of climate change is becoming increasingly tangible for everyone."

INDUSTRY PERFORMANCE

REFRIGERATION EXPERT PUTS HIS PEOPLE SKILLS INTO PRACTICE

Industrial refrigeration installer at CEF Industrie in Boulogne-sur-Mer, Cédric Dufossé has developed extensive expertise in his specialist area. This seasoned professional loves transferring his knowledge to younger generations.

Cédric Dufossé, 47, is an industrial refrigeration installer at CEF Industrie (a VINCI Energies business unit specialising in industrial and commercial refrigeration) in Boulogne-sur-Mer, in the Hauts-de-France region, northern France. *"My work involves starting up systems that have been sized by the design office and improving their efficiency. It requires a lot of patience."* The results in terms of energy savings are significant: for example, maintaining the efficiency of a machine set at -7°C when it usually operates at -9°C can generate electricity savings of 4% over the year.

Cédric Dufossé is currently involved in the commissioning of a new plant in Arras for biopharmaceutical firm LFB, which manufactures plasma-derived medicinal products. His experience as installer and service technician has made him the refrigeration expert in the company and a mentor for younger employees in the team. "I'm currently supporting two young team members," he notes. "I give them technical assistance over the phone or, for more complex problems, on site. I enjoy sharing my knowledge and seeing young people grow in their field. It also enables me to maintain links with the team because being an installer is a solitary profession."

> *"I enjoy sharing my knowledge and seeing young people grow in their field."*

Over the next few years, Cédric Dufossé's ambition is to continue doing his job as an installer and to further support young people "so as to make way for the next generation."

BUILDINGS   PERFORMANCE

CROSS-BORDER POWER ENGINEERING

With VINCI Energies, Nicolas Bacos has the opportunity to pursue an international career and to take on the responsibilities to which he aspired. At 27, he is HVAC project manager at VINCI Facilities in Germany.

Nicolas Bacos, 27, discovered power engineering during his first year at the Institut national des sciences appliquées engineering school in Strasbourg. "The variety of jobs and the option to work anywhere in the world appealed to me." He carried out his final-year internship at VINCI Facilities in Mannheim, south-western Germany, before being offered a job in the Group, still in Germany, as HVAC assistant project manager for the construction of a large school complex in Cologne. "That was my first experience of a worksite," he says. "I learnt a lot about the world of work. My boss, the building services manager, was always there to support me. That helped boost my confidence."

Back in Mannheim after a spell at Lagrange, a VINCI Energies business unit specialising in the installation of heating, ventilation and air conditioning systems, he was appointed HVAC project manager within a VINCI Facilities development team in March 2023.

"I like teamwork involving all trades; you can see the tangible impact of it at the end."

"It's the role I was aiming for. Together with 12 or so other people, I work on public-private partnership (PPP) contracts. I like this kind of teamwork involving all trades; you can see the tangible impact of it at the end." So what comes next? " I might be in Germany or elsewhere: that's the advantage of big international groups."

HOW AI IS A PERFORMANCE LEVER FOR OUR BUSINESS UNITS

Day by day, computing power, the scope of algorithms and the wealth of available data are all steadily increasing. At VINCI Energies, artificial intelligence is already being used for the most operational tasks.

One positive effect of the media coverage surrounding ChatGPT and generative AI is that it has helped demystify and democratise the field of artificial intelligence applications and open up debate around the transformative potential of such tools. But while the spotlight is firmly on OpenAI GPT 4, this is just the first step toward general availability of such a powerful tool, which has potential applications far beyond language generation.

Many business sectors are affected to a greater or lesser extent by the increasing power of artificial intelligence (and generative AI). It will have an impact on jobs, processes and business models. Within an organisation such as VINCI Energies, all the vertical expertise is already in place to understand and analyse the benefits of AI, adapt products and services, and reinforce our business units' value proposition.

AI is not a looming destructive force. The intention is not to replace people or their expertise. In our industries, it is already increasingly being used for operational tasks, freeing our employees from low-added-value tasks and offering performance improvement opportunities

that are already showing tangible results.

From energy to maintenance

In energy management for example, sensors capture data about energy consumption and the environmental conditions (temperature, humidity and air quality). This data, when analysed by AI, helps improve equipment operating parameters, reduce consumption and even forecast future energy expenditure to allow better budget planning. Similarly, algorithmic analysis of demographic, climate and traffic modelling data can help urban planners renew and design more resilient towns and cities, and help local authorities anticipate future demand for infrastructure and

facilities to target investment more appropriately.

Without any doubt, maintenance is currently one of the areas in which the benefits of AI are most tangible. In buildings, a major activity area for VINCI Energies, real-time data analysis greatly facilitates predictive maintenance, making it possible to monitor the condition of assets and schedule repairs before a breakdown occurs. The benefits are huge: reduced maintenance costs, maximised operational life for assets and improved operational efficiency.

Case in point: GUTENBRaiN

Buildings are not the only sector to benefit from enhanced maintenance. Manufacturing, services, and regional and local authorities have already taken the plunge and are ideal candidates for artificial intelligence and our innovative solutions.

With help from Leonard and making use of Actemium's commercial expertise, Axians Portugal recently developed an innovative solution called GUTENBRaiN that aims to solve the problems that typically beset a traditional, manual engineering/maintenance workflow.

Using powerful algorithms, this AI-based tool can process large quantities of data from various file formats (containing text, tabular data, technical drawings, etc.), and detect and extract any relevant details to produce a knowledge base that can easily be accessed and searched by maintenance teams.

Another advantage of GUTENBRaiN is its ability to automatically reprocess any updated document and flag changes between different revisions or versions of the same document. This enables the teams to quickly understand any variations and take more enlightened decisions when major readjustments need to be considered, thus avoiding costly business errors.

Making an ally of AI

Day by day, computing power, the scope of algorithms and the wealth of available data are all steadily increasing. There is no doubt that these advances will have significant impacts on sectors, skills and jobs. But it certainly does not follow that manufacturers and their partners should make AI the sole consideration in their models.

Artificial intelligence must make sense, meet identified and measured needs, and provide proof of its benefits. Under these conditions, it can also be a key

factor in attracting young talent. In a pressurised job market, this is arguably one of its most understated yet strategic benefits. To make AI an ally in their value proposition and the performance of our models, our business units and their customers must be convinced of how it benefits them. They need to see, feel and understand the value it brings to their operations. The realm of artificial intelligence is, after all, one that demands as much trust as it does scientific rigour.

Marco Stratemann
Global Business Development Manager Business Applications & Data Analytics, Axians

ROBOTS GET BUSY IN WINE CELLARS

For the past few months four KUKA autonomous mobile robots (AMRs) measuring 2m by 0.80m have been operating in the new wine-making unit of a large Bordeaux château. Their job is to transfer the grapes to vats. "We transposed automation and monitoring technology, which already exists in the automotive, steel and pharmaceutical industries, to the wine-growing environment," says Stéphane Angevin, automation design manager at Actemium Bordeaux Process which installed this unprecedented automated vatting system. It offers unparalleled productivity, reliability and accuracy, and at the same time reduces the physical demands on operators.

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' 1,900 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.

More on
theagilityeffect.com

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