

THE **AGILITY** EFFECT

MAGAZINE

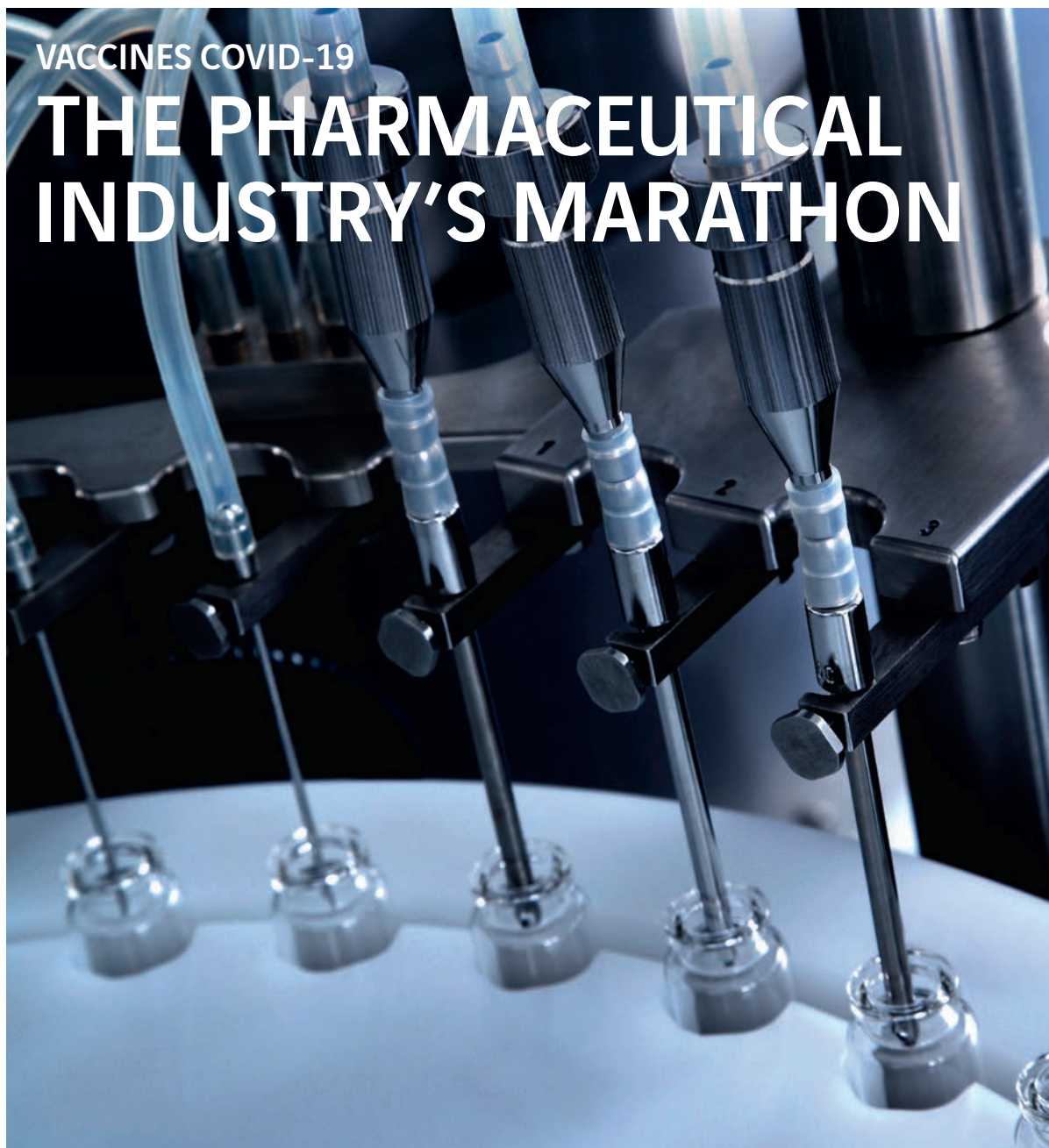
**SOLUTIONS
FOR GREENER
DATA CENTRES**

**AGILITY LEADER
ELEMENTARY
PARTICLES**

**GRABIT, THE
CYBERSECURITY
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VACCINES COVID-19

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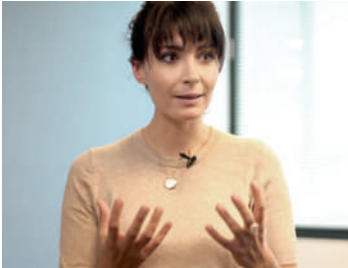
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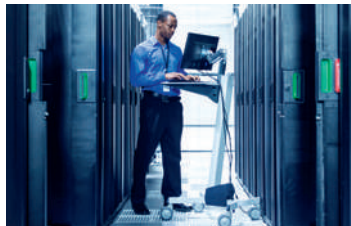


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EDITORIAL

We are living in an era that can be seen as conducive to transformation – not just our own, but that of our clients, partners and suppliers too. It is also an opportunity for us to identify what really matters and should be safeguarded, and shows our need for collective action. For four years now, we have been reporting, in The Agility Effect, on examples of transformation and change that characterise our joint ability to withstand and adapt to challenges, whether energy, climate or more recently health-related. Against a backdrop of global warming and scarcity of natural resources, our environmental ambition responds to far-reaching expectations. What we want to do is work in partnership with our clients to find solutions that lead to the decarbonisation of our economies. For VINCI Energies, this long-term transformation project is central to the plan pursued by our business units and includes a forward-looking growth strategy, based on hiring talent, acquiring expertise and integrating businesses that will enable us to meet these challenges. It’s by pooling our collective intelligence, creativity and inventiveness that we’ll find a more sustainable path.

I hope you enjoy reading this issue.

Arnaud Grison,
Chairman and chief executive officer, VINCI Energies



AGILITY **PICTURE**

20 MINUTES TO INSTALL A MOBILE EMERGENCY CARE UNIT

In November 2020, to provide relief for its emergency department, which was becoming overloaded with the influx of patients during the second wave of Covid-19, the Centre Hospitalier de la Côte Basque in Bayonne (Pyrénées-Atlantiques) introduced a unique mobile hospital, the Multipurpose Mobile Unit Europe Occitanie (UMPEO). Designed in partnership with Cegelec Défense, this care unit was installed in just 20 minutes with all the equipment needed to treat 10 emergency patients and 8 critical patients simultaneously.

AMSTERDAM ACCELERATES DRIVE TOWARDS BECOMING CIRCULAR CITY

The Dutch capital has set itself a model roadmap aimed at achieving a fully circular economy by 2050 by means of controlled production and consumer chains.

Five years ago, Amsterdam enacted a radical change of course by deciding to swap its traditional model of linear development for a circular economy project so as to avoid fully depleting the Earth's resources. The solutions it seeks to implement involve re-using materials, especially raw materials. By minimising waste and relying on renewable energies, the circular economy helps meet climate goals, says the Amsterdam Circular 2020-2025 Strategy report. The roadmap is in line with tests conducted by the city in the construction sector, which included building a new neighbourhood in accordance with circular standards near Schiphol international airport. It outlines the measures to be taken to reduce by half the use of new raw materials by 2030 and achieve a fully circular economy by 2050. This strategic plan is based on outcomes generated by the City Circle Scan tool, which pinpointed sectors in which the city can

make significant progress by implementing business models that promote sustainable solutions. Construction and organic waste processing were identified as possible drivers of the transition. The potential benefits of investing in these two areas have been calculated. The implementation of material re-use strategies can create €85 million of value per year, while more efficient processing of organic waste streams can deliver €150 million per year, says the report. Material savings could amount to some 900,000 tonnes per year, in sharp contrast with the region's current annual import of 3.9 million tonnes. Employment is

also set to benefit, with productivity gains expected to lead to the creation of 700 jobs in the building sector and 1,200 jobs in the food processing industry.

Construction and organic waste processing identified as drivers of the transition towards circularity.

Reducing logistics

The 2020-2025 strategic plan sets out a roadmap for each of the value chains that shape the circular economy: food and waste streams, consumer goods and the built environment. In order to supply a sustainable food system, the plan promotes short chains and aims to increase the consumption of regional products by stimulating circular agriculture and urban agriculture. This should result in a reduction in the environmental impact of logistics. The city of Amsterdam is playing its part in the food action plan by purchasing regional products and





driving urban agriculture. Among the experiments already under way, an initiative devised by residents of K-district is seen as a pilot scheme. Locals here have assumed the responsibility of managing the Zuidooit Food Forest, which is used to produce berries, herbs, fruit trees and vegetables.

In order to improve the collection and processing of waste streams, again as part of a drive to reduce wastage, the plan is to process kitchen and garden waste separately by 2023. Here too, the city is playing its part by “setting the right example”, says the report, and making residents aware of the importance of separating uncontaminated waste. It also plans to create waste collection and re-use sites.

Sharing and repairing

In terms of consumer goods, residents are being encouraged to change their consumption and purchasing behaviour with regard to products such as electronic equipment, textiles and furniture. The aim is to find solutions that extend product lifecycle and prevent raw materials and other types of waste from being incinerated.

The city of Amsterdam wants to lead the way and has set itself the goal of cutting its overall consumption by 20% by 2030. To do this, it is implementing a fully circular procurement process, starting with consumables and furnishings for city premises. Residents can do their bit to reduce consumption by sharing appliances and equipment, and favouring use over ownership. In this respect, the city aims to encourage infrastructure for sharing platforms. The third priority of this circular economy model is the built environment, covering the construction and refurbishment of buildings through to the design

of public spaces and roads. Again, the goals included in the report are specific and measurable: by 2025, 50% of all building refurbishment and maintenance operations should follow the principles of circular construction. This circular strategy, based on the “doughnut” concept (see box), is intended to be scalable. An initial evaluation of the various projects is due to be carried out in 2021 to gain insights into what is working and to refine future circular actions. In order to manage the rollout of the circular economy as effectively as possible, Amsterdam has developed a monitoring tool to track raw materials and assess initiatives.

City doughnut

Amsterdam’s circular strategy is based on the City Doughnut economic model, in which the city is represented in a doughnut-shaped diagram. Developed by Kate Raworth, a British economist, The Amsterdam City Doughnut is an evaluative framework which looks at the city from four perspectives: social, ecological, local and global. The inner ring of the doughnut represents all the basic needs that must be met in order to live comfortably: access to drinking water, food, decent housing, sanitation, energy, education, healthcare, as well as the right to income, political voice and gender equality. Those without access to these essentials live in the doughnut’s hole. The outer ring of the doughnut represents the planet’s needs. An efficient circular economy is one which successfully combines the two rings.

ENERGY

INNOVATION

AN ULTRA-RAPID BATTERY FOR THE 24 HOURS OF LE MANS



Omexom is supporting a team of Dutch students in their goal of entering the famous race with an electric car that can be recharged in two minutes: as fast as filling up a combustion-powered vehicle.

In a circuit motorsport race, refuelling time is a key element. Quicker is better, with valuable minutes saved. This is true for a combustion powered car and an electric car alike. But that’s where things get complicated! Recharging a battery is time-consuming, and trying to make it as fast as filling a fuel tank represents a real challenge. For an idea of the scale of this feat, it typically takes an hour to recharge an electric vehicle, while it only takes five seconds to refuel an F1 car. Fifty students from Eindhoven University of Technology and Fontys University of Applied Science in the Netherlands decided to take up this challenge by entering the 24 Hours of Le Mans in 2023 with a special race-prepared

electric vehicle. Their team, InMotion, dreams of creating the most innovative racing car in the world. The students are using an innovative technology called Electric Refuelling, which should make recharging their electric vehicle as fast as refuelling a combustion-powered vehicle. According to Paul Van Schijndel, manager of Omexom Dordrecht, which is supporting the operation, “To achieve this objective, the team needs to manage the design of the battery pack.”

The future of electric mobility

Explaining Omexom’s (VINCI Energies) involvement with InMotion and the Dutch students,

Paul van Schijndel says the brand is “Invested in the energy transition and in building a sustainable future for all.” “InMotion is also fully committed to this objective,” he adds. “It’s a logical partnership – Omexom is keen to address the challenges of e-mobility and electrical infrastructure. Recharging an electric vehicle needs to be as easy as refuelling a car. When we achieve that equivalence, electric mobility will have become a reality.” This is not InMotion’s first foray into motor racing. The team previously developed the first

“Recharging an electric vehicle needs to be as easy as refuelling a car. When we achieve that equivalence, electric mobility will have become a reality.”

bio-ethanol racer in the Netherlands. With the next car “Fusion”, the team raced on Dutch circuits to show what a team of young students is capable of. With its third creation “Vision”, InMotion is anticipating the future of electric mobility.

THE TOWN PLANNER OF THE FUTURE WILL NEED TO BE AN INTEGRATOR FIRST AND FOREMOST

Urban development has suddenly become a whole lot more complex due to the revolution in use patterns and the ecological transition. Integrating new features, competencies and aspirations is key to the future of cities.

New use patterns, the explosion in digital technology, the green transition and the health crisis are all unprecedented and uncertain factors that the urban planning sector is having to take into account.

Faced with this complex landscape, how should planners reinvent their business and promote new skills? And, going forward, who will deliver integrated urban development solutions? Cities themselves, public or private planners, or indeed tech giants?

These were some of the questions raised on 28 September 2020 at a conference entitled "Urban planning 3.0: who will be the integrator for the usage-driven city?", held as part of the Building Beyond Festival by the VINCI group's foresight platform Léonard in partnership with another VINCI think tank, La Fabrique de la Cité. All the experts who attended reached a common assessment, summed up by the CEO of urban development

agency Euroméditerranée, Hugues Parant: "Use patterns are of paramount importance in urban planning, and the breadth and scope of them is a driver of creativity." However, the whole challenge of urban planning is to strike increasingly tricky balances: between the growing autonomy of civil society and the legitimacy of political decision-making, between growth stimulation and sustainable consumption, and so on.

Introducing new equations

"Clients are everywhere, whether they are elected officials, employees, investors or developers, and the financial model for planners is becoming more and more complex," stressed Christophe Lasnier, senior manager at EY Consulting, which oversees the "Panorama de la ville et de l'immobilier" study (Real Estate & Urban Employment Monitor). The need to master new business models becomes ever more critical as environmental issues increase, asserted Virginie Leroy, deputy managing director for urban planning and major urban projects, and director of the office department at VINCI Immobilier: "The concept of 'no net land take'

[when land taken is compensated for elsewhere] and the increasing scarcity of land mean that we are having to build cities on top of cities. Land consolidation, new partnerships, decontamination and thermal rehabilitation of old buildings: it's not clear which business models should be actioned." Urban planning professions will therefore need to

"Planners-integrators must ensure the long-term viability of applications."

focus on understanding the later stages of the property value chain and how they are financed. Cécile Maisonneuve, chief executive of La Fabrique de la Cité, stressed the impact of these new requirements: "We've gone from 'what do we want to do?' to 'what do we need to do?'" Overall, the conference participants agreed that the diversity of use patterns and increased complexity



of operations require greater cooperation between all industry stakeholders at the earliest possible stage of the urbanisation process.

Building a narrative around consultation

In ensuring that these stages are fully anticipated, where does that leave public consultation? The issue raised some concerns among participants during the conference. Not so much about the principle itself of consultation – indeed, the various round-table speakers agreed that in an increasingly usage-driven system, it's vital that users are linked to urban choices. But the terms implemented for public consultations so far have clearly produced mixed results. Cécile Maisonneuve drew attention

to the failure of Google's Quayside project in Toronto, which promised to be citizen-led. "Consultation is always directed at regulars of the consultation procedure and public debate circuit," confirmed Hugues Parant, and holding a public meeting at 7 pm on a weeknight or 9 am at the weekend doesn't make any difference. "Consultation needs to be redesigned as a narrative so that projects are of interest to people," maintained the Euroméditerranée CEO. And town planners must be warned against the temptation of withdrawing from the process once decisions have been signed off: "You can't involve citizens in a consultation about what their use patterns will look like in the future, then disappear from the scene after two years. Planners-integrators must also ensure the long-term viability of applications."

Delivering that extra-special something

Planners must start finding ways to meet the major challenges of the city of tomorrow, whether by developing hybrid private/public spaces, creating communal private spaces, producing reversible buildings, constructing zero-carbon housing, incorporating greenery into main roads and areas in cities, taking leisure activities into account or offsetting land scarcity with densification.

This means that as well as having expertise in legal affairs and urban development, planners will also need to show a powerful ability to understand, anticipate and integrate. In short, they'll need that extra-special something, insisted the experts at the conference.

BUILDINGS SET TO ACCOMMODATE A MIX OF USES

From their lobbies and meeting rooms to workstations, smart buildings are fit for a wide range of purposes, benefitting regular occupants and others besides.

The smart building offers an unprecedented opportunity to observe and test not just professional practices but also new and future lifestyles. Indeed, digital tools and data outcomes make it possible to track, measure and analyse the behaviours and practices of building users in real time and over the long term. "Never have players in the property sector had as much information to feed into a service offering that meets increasingly complex uses and needs, as flexibility becomes more important," says Philippe Conus, building solutions director and innovation director at VINCI Energies. Flexibility, scalability, modularity:

these are the three aspects that underpin any innovation strategy in the commercial property sector. The strategy is not without risk. Being a large sector, enormous stakes and investments are involved, and each "false start" can prove very damaging economically and environmentally.

The greatest enemy of innovation in this case is probably innovation itself. With society as a whole voicing an urgent need for digital sustainability, the temptation of promoting an ultra-technical vision of digital transformation should be avoided. The concepts of modularity, scalability and flexibility must remain both practical and intelligible.

"Working methods are changing, as are practices, and the smart building must reflect these changes. But the focus must be on simplicity," warns Emmanuel Prod'homme, VINCI Energies project director for the fit-out of the VINCI group's future head office, L'Archipel.



System interoperability and equipment scalability will mean nothing without seamless user experiences. There is no longer any place for gadgets or unnecessary features. Even if, or rather especially if, it is modular, the smart building first and foremost serves those who “experience” it – and this encompasses everything from the access to the building and workstations to meeting rooms. Take the lobby. This is an area which, being modular, is no longer reserved for visitors but accommodates a variety of uses, for example allowing employees from a company housed in the building to meet for an informal catch-up. Workspaces must achieve a subtle balance between openness and customisation. “It’s about playing around cleverly with wall partitions – whether their quantity, shape or material – while using sensors and analysing occupancy data to anticipate space planning requirements and make adjustments transparent for occupants,” highlights Prod’homme.

Workspace design must also incorporate new health and well-being metrics, since physical distancing rules are now applicable in all public environments. Individual workstations will take

precedence over 4 or 6-person bench desks. Meeting rooms, fitted out with web conferencing systems or touchscreens to support a range of working practices, will need to have moveable partitions to create more or less space depending on the number of participants. Here

“Working methods are changing, as are practices, and the smart building must reflect these changes. But the focus must be on simplicity.”

too, points out Prod’homme, it’s essential that equipment is easy to use: “Experience has shown, for instance, that an automatic moveable wall will be used much

more than a manual one.” Today, modular smart building design is more about adapting to diverse practices rather than transforming the structure itself (except in workspaces, where partitions, workstations and equipment are moved around). But the next step could well involve making the smart building itself modular (see box).

“Having a mix of activities and people under one roof is not only becoming possible but integral to a building that meets urban specifications, with the concept of openness to the city and its streets, shops and stations built into the design,” says Philippe Conus. The L’Archipel project in Nanterre (to the west of Paris) for example, which will open its doors to occupants and visitors in 2021, is part of a wider complex consisting of 74,000 m² of office buildings, 90 terraces (intended for eating out, meeting people, working or relaxing), and a hotel and shops covering 1,500 m². Designed as a set of interconnected and interdependent islands linked by walkways, this permeable development provides connections with the surrounding town and transport network. It will be a modular building in an increasingly mobile and adaptive city.

Are modular structures in the pipeline?

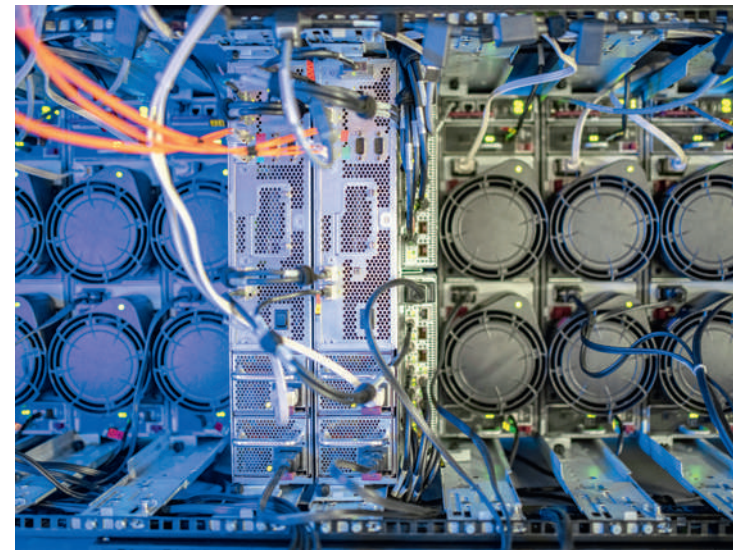
So are we likely to see a convergence between smart and modular in terms of the structure itself? Google promised just this with its Quayside project in Toronto. Built on 12 acres of port wastelands, the smart neighbourhood project, managed by Alphabet group subsidiary Sidewalks Labs, was intended to blend connectivity and modularity. The project included dynamic streets, comprising slabs fitted with LED lights that could be easily removed and swapped to install interchangeable street furniture; ground floors of buildings equipped with prewired modules ready to house cafes, markets, libraries and community spaces; and buildings constructed with mass timber and

a juxtaposition of modules that could be reconfigured and converted based on need. Although Google eventually abandoned the project in May 2020, officially due to “unprecedented economic uncertainty” stemming from the covid-19 pandemic, a gap has opened up. In France, players from the construction sector grouped within the Smart Buildings Alliance recently participated in a call for projects issued by the French Ministry for the Armed Forces involving easily and rapidly replicable patient care solutions. They proposed delivering within a 6-week period re-usable timber modules, comprising around 15 intensive care rooms and associated facilities.

BUILDINGS

TRANSFORMATION

SOLUTIONS FOR GREENER DATA CENTRES



Data centres, which form the cornerstone of network infrastructure, consume a huge amount of energy. But there are several ways they can reduce their environmental footprint.

Data centres are central to digital transformation. They house IT equipment (server racks) that is used to store, process and protect data. Sustained growth in the generation and use of digital data both by homes and businesses calls for ever greater storage capacity and optimised data management systems. This growth makes a similar explosion in energy consumption a legitimate concern.

“With European commitments on greenhouse gas emissions at the top of the agenda, it’s vital that we monitor the issue closely,” says Aymeric Tissandier, Building Solutions director at VINCI Energies and director of France Datacenter, an association bringing together stakeholders from the data centre ecosystem, which has adopted the EU Code of Conduct on Data Centre Energy Efficiency. So what is the best way of

supporting increased use while at the same time limiting the impact on the environment? To bring energy consumption under control, data centres must work on their equipment and processes.

Power generation sources must also be diversified, with renewables incorporated into the mix. Spectacular progress has already been made in terms of IT equipment, which has helped limit energy costs. “Between 2010 and 2018, the consumption of a computing server was reduced fourfold and that of a storage server ninefold,” stresses Tissandier. “Overall, computing volume increased more than fivefold over the period, and the amount of electricity used actually only rose by 6%.”

Infrastructure has also been upgraded. And consumption has been optimised thanks to better management of cooling processes and increasingly sophisticated equipment. “What we’ve noticed as an installer is that data centres are one of the most high-tech sectors,” adds Tissandier. This is true of new-build projects as well as of many replacement or retrofit projects, which are using next-generation, more energy-efficient equipment.

Optimising consumption and developing renewables

Data centre operators have every reason to invest in initiatives to optimise energy consumption, not least financial reasons since energy is a data centre's biggest area of expenditure (49%), according to the Association technique énergie environnement (ATEE), an environmental association that

The VINCI Facilities fluid dynamics simulation tool "helps reallocate servers and spread out energy use more effectively."

promotes energy management. This energy doesn't just power the servers, it also ventilates and cools them. Indeed, all of the electricity consumed by IT equipment is converted to heat, which needs to be removed. Furthermore, the demand for green power from major clients means data centres get the best of both worlds: optimising energy use while also incorporating renewables into their solutions. At Equinix, the world's largest data centre and colocation provider, "renewable sources account for 90% of global energy use," stresses Régis Castagné, the company's managing director for France. This is achieved, in particular, by generating renewable energy in California and buying green energy through renewable energy certificates.



Fluid dynamics and PUE

Furthermore, energy efficiency improvements can be made at the operation stage by working on cold and hot airflow within the server room. The layout in the room can be rearranged to separate airflow with panels by positioning the server racks in such a way that the hot aisle is contained and that hot and cold air does not mix.

VINCI Facilities offers a fluid dynamics simulation tool for use in data centres. "The tool helps reallocate servers and spread out energy use more effectively," points out Thomas Felgines, project manager at the VINCI Facilities Data Center & Télécom business unit. Following an audit phase, VINCI Facilities sets up a monitoring system that uses sensors to collect data and thus identify ways to reduce consumption.

During the subsequent recommendation phase, an expert proposes server room layout changes, and suggests what equipment should be replaced and what adjustments made. The expert also sets out a target PUE (Power Usage Effectiveness), the ratio between the total amount of energy used by the data centre (IT, ventilation, cooling, lighting) and the total amount of energy drawn by the IT and network equipment.

This energy performance indicator can vary by a factor of two. At Equinix, the PUE ranges between 1.1 and 1.3, whereas in "data centres that focus more on security than energy use, it can reach 2.5," says Aymeric Tissandier. The closer the PUE is to 1, the more energy efficient the data centre is. Considering that the average PUE is 1.8 and that 12.5% of data centres have a PUE equal to or higher than 2.5, there is still work to be done in helping digital transition players to transition to renewable energy.



AGILITY **LEADER**

TRANSFORMATION

EMMANUELLE DUEZ, THE FORCE BEHIND “ELEMENTARY PARTICLES”

Consultant Emmanuelle Duez and her firm The Boson Project argue that corporate transformation relies first and foremost on employee autonomy and empowerment.

“As the practice of working from home during the health crisis became widespread, we sometimes overlooked the fact that offices also provided a forum for social justice, enabling each employee to enjoy good working conditions.” Founder in 2012 of The Boson Project, a consulting firm that supports business transformation, Emmanuelle Duez highlights the impact of office closures on employees.

“There are two main risks related to the period we’re living through at the moment,” she adds.

“The first is disengagement, and

the second isolation. The way to respond to these issues is to focus on management excellence, and by that I mean the ability to care for others in the company.”

She continues: “Unfortunately, I think most businesses failed to grasp the extent to which the role of managers would be crucial in getting human capital engaged again at the end of the crisis.”

Together with her team of consultants, called “Bosons” in reference to the elementary particles of the same name that serve as the “glue” holding matter together, Emmanuelle Duez aims to “create

the conditions in which human potential can be fully expressed, both individually and collectively." In order to pave the way for the cultural and organisational transformation of the company of the future, "we must have the courage to open Pandora's box, involving those most directly concerned – in other words employees. Rather than presenting a risk, this ensures the sustainability of ongoing changes," she says.

Looking for impact

At 34, Emmanuelle Duez already has the self-assurance of an old hand in the corporate world. This bothers some people. "Once when I was speaking at a conference about the report we're currently working on, a man in the audience, who doubted my legitimacy to talk about the issue so confidently, asked the speaker sitting next to me, an admiral in charge of staff in the French Navy,

"Businesses must not delay in giving serious consideration as to what justification there is for people to leave home to go and work in the office."

what he thought. My co-speaker give him a real dressing-down. Following the episode, the admiral and I struck up a friendship." This friendship led Emmanuelle Duez to become a Navy reservist in 2014, "a wonderful opportunity to build bridges between the civilian and military worlds." For almost two years, she has even been an external member of the Naval



Innovation Hub, a unit dedicated to breakthrough innovation at Naval Group. "This collaboration with the Navy has given The Boson Project a very practical dimension," she states today. Emmanuelle Duez has a talent for turning adversity into advantage. An entrepreneur at heart, she found her calling purely by chance: "When I was young, I wanted to be a profiler. That's why I studied criminal law. I took a course to become a lawyer or magistrate, but in the end I decided I wanted to save the world. So I moved from the bench to a business school, ESSEC, completing an apprenticeship, with a view to setting up an entrepreneurial project that would have an impact on people's lives." It was by creating the WoMen'Up association in 2011, as part of ESSEC's Leadership and Diversity Chair, that she discovered her flair for entrepreneurship. "Being involved in entrepreneurial activities is nothing less than a way to express my personality," she confides. The WoMen'Up project, whose motto is "Women and young people: facing the same struggle in business!" and which focuses on management subjects related to gender diversity in big corporations, has opened up many doors for her. "It provides leverage for management practices in business, allowing you to go and see senior

executives and say to them: if you're not convinced by parity for ethical reasons, you should adapt your organisational systems anyway for economic reasons and also to attract and retain talent."

Workspace is key to human excellence

In the current crisis, this capacity to recognise the changes taking place, especially among younger generations, makes The Boson Project a popular think-tank. The firm has been working since 2016 on human resource issues relating to spatial changes in the workplace (refitting and relocation specifically). Emmanuelle Duez urges businesses to quickly give "serious consideration as to what justification there is for people to leave home to go and work in the office." She believes that reinventing workspace is a must. "As far as development projects are concerned, it's vital to be able to sensitively reflect an organisation's human and strategic requirements in its workspace and to help staff embrace these projects so that rather than being an inconvenience they are an opportunity for engagement. The human aspect of spatial transformation should not be overlooked."



The battle against Covid-19 has entered a decisive phase. With the first vaccines now available as a result of international research carried out in record time, extensive vaccination campaigns have been launched in several countries. Manufacturers in the sector have shown great adaptability in this race against time. Pharmaceutical companies have had to reconcile speed with safety and compliance requirements across the whole vaccine manufacturing chain. At all stages of this exceptional process, VINCI Energies business units have contributed their respective areas of expertise by adapting to the specific characteristics of vaccine production. Their involvement, whether in setting up or refurbishing production lines, fitting out clean rooms, managing the cold chain, delivering digital product traceability, storing data or increasing the robustness of the supply chain, has helped make this major global challenge possible.

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VACCINE PRODUCTION REQUIRES BOTH TECHNICAL KNOW-HOW AND FLEXIBILITY

The standards and constraints imposed on pharmaceutical production facilities are currently stronger than ever, as the race for vaccines against Covid-19 reaches full speed. For the major pharma players and the VINCI Energies business units supporting them, this exacting environment has become an exercise in responsiveness and agility.

The Covid-19 pandemic and the race for vaccines have increased the pressure on the pharmaceutical industry worldwide to an unprecedented level. Things are particularly intense in the production sector, an area where VINCI Energies business units are in the front line, with their real-world solutions helping vaccine manufacturers to start up their production lines in a reduced time frame. Europe, in terms of vaccine production, means Belgium.

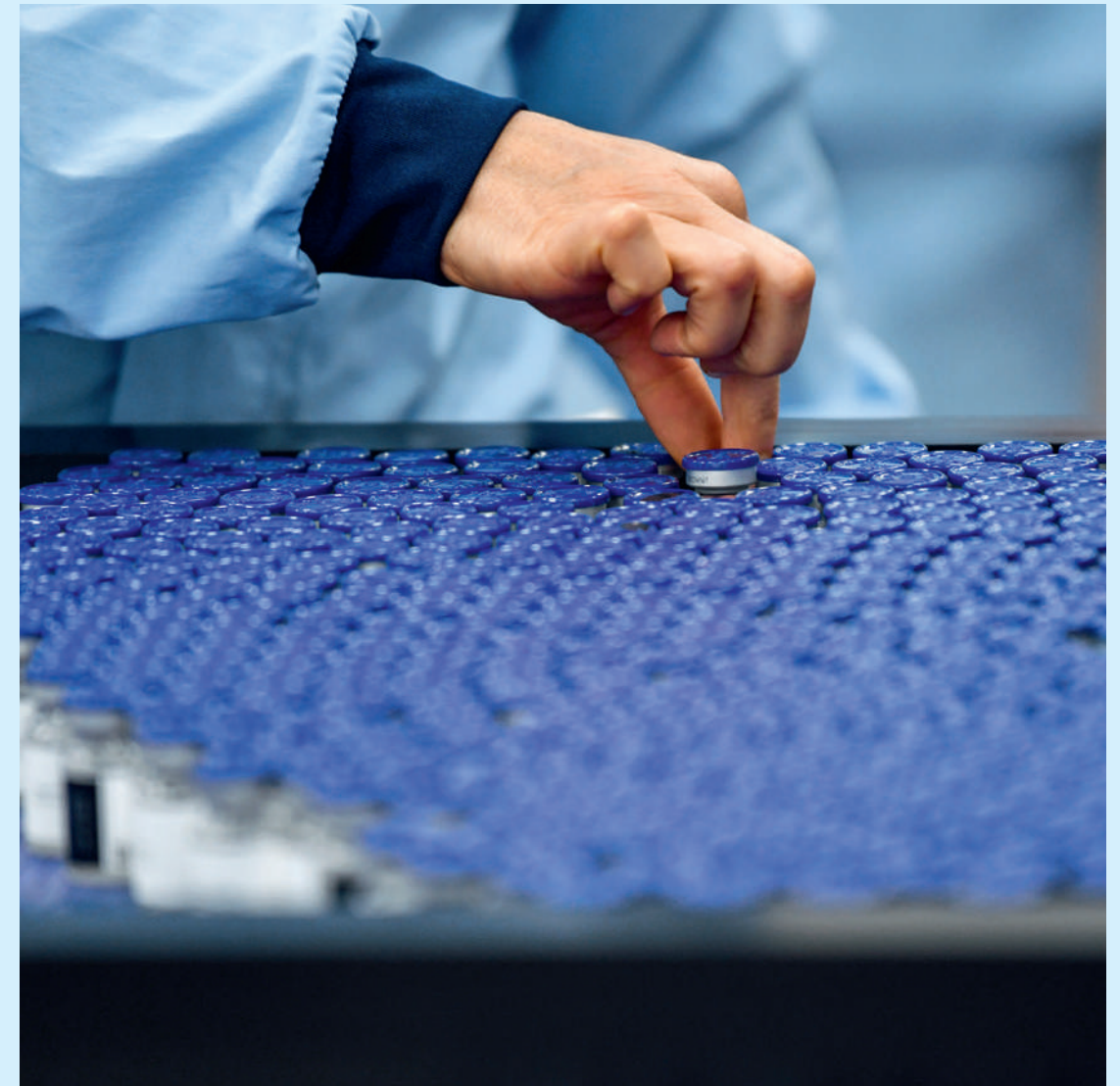
The country is the central hub around which the continent's life sciences industry turns. VINCI Energies has several business units there, supporting the main players in the market. In November 2020, Actemium Leuven, Actemium Herentals and Hooyberghs HVAC won the order for a vaccine production line for coronaviruses (clean & black utilities networks, manufacturing and installation of cleaning and filtration units, integration of production equipment, etc.). "With this project, the challenge is to build a distribution system where most of the loops have to remain completely sterile, with all the required qualifications, within a very short time frame – rather than the usual two-and-a-half years, we barely had a year," explains Bart Groeninckx. The Actemium Leuven Business Unit Manager also highlights the agility this project called for: "Given the reduced time we

have available for the works, the engineering phase is continuously being challenged, sometimes to the very last minute. That requires constant proactive communication with the customer."

Actemium had previously been part of an even larger project from 2016 to 2018: the overhaul of an entire vaccine installation near Brussels. "We built the whole factory with the help of nine VINCI Energies business units from Belgium and France," says Jan Meeuwesen, Client Manager Life Sciences at Actemium Herentals. "This called for huge flexibility, especially given the very short timescales: by definition, the automation component always comes at the end of the chain."

Being close to customers

In Normandy, Actemium is adding proximity to its assets of reciprocity



and flexibility. "On the Sanofi site in Val-de-Reuil, having three of our business units: Nassandres (experts in specialist machinery), Grand Couronne (electrical systems and instrumentation) and Le Havre Process Control (industrial IT) working together enables us to manage and equip much of the complex, but we also remain highly responsive, with all three business units located less than an hour from the site," explains Ghislain Brière, Business Unit Manager of Actemium Le Havre Process Control.

Actemium provides technical assistance in EIA (electrical systems, instrumentation and automation) to the site. "Our assignments concern the installation and management of 'tray turners' (machines that turn the egg trays at the exit from vaccine lines to expel the shells and send them to waste processing), robotised production cells, vial transfer from the filling machine outlets to the freeze dryers, and egg conveyor systems from the Ovopharm plant to the Sanofi Pasteur site," says Ghislain Brière.

"The challenge is to build a distribution system that remains completely sterile, and all within a very short time frame."

But the Val-de-Reuil site is also a worldwide distribution centre, exporting vaccines made by Sanofi in France to 190 countries, with 900 million doses of vaccine shipped every year. "Within the framework of this materials handling activity, we handle all the industrial IT maintenance. Our expertise with the digital command-and-control system is key, as the site is fully automated. We also recently completed the same assignment for the site extension project due for completion in 2023," adds Ghislain Brière, who, for that project, was able to mobilise a technical support team whose members have between 15 and 30 years' experience in this field.

More than 30 years' experience

VINCI Energies' expertise in the pharmaceutical market, and the vaccine market in particular, is the fruit of lengthy experience, just like that acquired by Actemium over the last 30-plus years working in partnership with the Sanofi group. Its long collaboration with the Sanofi Marcy-L'Etoile site near Lyon is a prime example. For the largest vaccine production site in Europe, which exports its product to 150 countries worldwide, Actemium business units have assembled a wide range of expertise. The starting point was in the area of production equipment. "We are established right across the vaccine production chain, but it's primarily in the harvesting and purification stages that we apply our most sophisticated expertise, with special stainless-steel tanks made by our highly qualified boilermakers and pipe fitters," explains Jean-Pierre Nemoz, Director of Development at VINCI Energies France Industrie Centre Est Méditerranée. Actemium also has considerable expertise in the field of equipment automation management, with its different business units built



around teams of professionals with in-depth knowledge of pharmaceutical processes thanks to their dual grounding in chemistry and pharmacy. "Our experts have a thorough understanding of the FDA (Food and Drug Administration) standard that regulates manufacturing processes in the market, which is extremely stringent," says the director of development. "One of our business units also operates a maintenance contract for the whole Marcy L'Etoile site, from production to R&D."

"Our experts have a thorough understanding of the FDA standard that regulates manufacturing processes in the market, which is extremely stringent."

Last but not least, according to Jean-Pierre Nemoz, is Actemium's ability to offer custom-made solutions. "It's largely thanks to this agility that we've been in talks with Sanofi to take part in their EVF (Evolutive Vaccine Facility) project in Neuville-sur-Saône, a new type of flexible unit housing several production modules that allow production of three or four vaccines simultaneously according to their seasonality."

THE CHALLENGES OF CLEAN ROOMS

Controlling the concentration of airborne particles and fire safety in these rooms designed for research or industrial production is particularly crucial during a health crisis. VINCI Energies business units have developed valuable know-how in this area.

Enclosed spaces with a controlled atmosphere to avoid any contamination of the ambient air, clean rooms are essential to researching and manufacturing medicines and vaccines. Outside air, paint, coatings, and particles from on-site equipment or cleaning products are just some of the many sources of air pollution affecting clean rooms. In addition to the quality of their ventilation systems, these installations require a wealth of precautions in terms of construction, fire safety and maintenance. Naturally, expertise in these areas is in great demand during the present health crisis.

Special techniques and materials

VINCI Energies counts several firms with expertise in this area among its business units. One such is

G+H Innenausbau and its clean room business unit located in Ludwigshafen, Germany. With almost 40 years' experience in clean room construction, this business employs 20 people dedicated to creating these special rooms. In the 1970s, it developed the first metal clean room wall with a flush-mounted window for the pharmaceutical industry.

"These rooms require the installation of highly technical, extremely clean and flat surfaces with very fine joints."

"These rooms require the installation of highly technical, extremely clean and flat surfaces with very fine joints," explains Thomas Fuchs, Division Manager at VINCI Energies Deutschland Building Solutions. G+H Innenausbau offers two noteworthy innovations in this area: the Vario Access ceiling and

a hermetic sliding door. The former, fully sealed with silicone without wet joints, comes with a range of suitable installation solutions for lighting, ventilation casings, etc. The latter is equipped with a specially shaped silicone seal and offers increased soundproofing. Exporting chiefly to Switzerland and Turkey, G+H is one of Germany's market leaders for clean rooms. "One of the projects we've managed was the redevelopment in 2018 of a large existing installation for the Bayer group," says Thomas Fuchs.

Bespoke fire safety

Installing fire protection systems in the tightly protected spaces that are clean rooms is a feat in itself. The teams of researchers and technicians working in these areas are handling viruses and other active substances that require special fire suppression and water treatment systems. "The water used obviously needs to be extremely clean and is filtered to 10 microns. But the rooms themselves also have to be fully sealed. Running pipework and nozzles through the walls is therefore subject to serious

restrictions," says Cyrille Harand, Business Unit Manager of Uxello Risques Spéciaux, which is installing the fire protection system in the German Boehringer Ingelheim group's future antigen production facility and laboratory in Jonage, near Lyon.

The challenge posed by this P4-level site, where extremely hazardous agents are handled, is all the greater because the group and the Technip design office preferred a water mist system. This is a first for a pharmaceutical laboratory in France. "There are two advantages with this system," explains Cyrille Harand. "First, it needs, on average, five times less water than a sprinkler system. As a result, it reduces the waste water the fire system

generates, and thus the cost of storing and treating it, by a similar amount. Second, this system is as effective as traditional equipment, if not more so. Essentially, the finer the water droplets, which are forced out under high pressure, the better they absorb heat."

... And ad-hoc certification

On such an unusual worksite, this business unit specialising in fire safety had to adapt and show its agility. "We're having to customise at every stage of the project," says the head of Uxello Risques Spéciaux. "This was certainly the case when designing the programmable equipment

for the installation's remote-control system (for triggering, maintenance, locking down), and also when making parts for passing through the walls, and with all the equipment made from 316L stainless steel to give it the smoothness needed for the industrial cleaning process." In another first, for Boehringer Ingelheim's future P4 centre in Jonage, Uxello Risques Spéciaux was able to manage the whole certification process for this installation without mist – which does not yet comply with any established rules. "We turned to a notified body based in Austria, where the equipment we installed in Jonage is made," the Business Unit Manager explains.



COLD CHAIN: A STRATEGIC ISSUE FOR THE PHARMACEUTICAL INDUSTRY

From production to transport and storage, cold chain management is an absolute priority for drug and vaccine manufacturers. In France and across Europe, VINCI Energies business units are applying their solutions to secure the cold chain.

On 8 December 2020, the first injection of the Pfizer-BioNTech vaccine against Covid-19 was given to a 91-year-old British patient. That was just one of 800,000 doses being stored in a secret warehouse at a temperature of -70 °C. The vaccine, created jointly by the American manufacturer and a German startup, is a reminder of how crucial management of the entire cold chain (production, transport and storage) is to the pharmaceutical industry. But, behind the headlines, says Michel Lecarpentier, Director of Réseau Froid Development at VINCI Energies, "Cold at very low temperatures is now straightforward

down to -80 °C or even -100 °C. The problem isn't the technology, but having the financial capacity to implement it." The costs can be two or three times higher for ultra-low-temperature installations compared with standard cold storage. Michel Lecarpentier explains that "The additional cost is due to the design requirements, plus the specific class of climatic chamber installed, and of course, the higher energy consumption at these low temperatures."

Regulatory storage thresholds

The various types of drugs and vaccines require extremely precise and regulated storage thresholds: controlled temperature (below +25 °C), temperature-sensitive products (+2 °C to +8 °C), negative temperature (-20 °C to -40 °C) and ultra-low temperature (-70 °C and below). "The high quality of pharmaceutical products means that the cold chain must be guaranteed at all times,"

explains the VINCI Energies expert. "That's why the cold storage facilities are all self-sufficient, with double or even triple redundancy to avoid failures. Temperature recorders are also installed, often equipped with an alarm system. It takes four to six visits per year to maintain this refrigeration equipment, compared with two to three as standard in the food industry." Another unique feature of the pharmaceutical market is a highly demanding sanitary environment, often with a controlled atmosphere requiring sophisticated filtration systems and a restricted manufacturing environment. The various business units in VINCI Energies' Réseau Froid network are specialists in securing the cold chain, well versed in handling these elements.

Highly advanced expertise

In Belgium, Actemium Herentals has installed a system to monitor

the freezers that will store the Covid-19 vaccine supply for Europe. Wireless sensors also monitor the vaccines' temperature while they are transported internally on dry ice in cooled container boxes. Roderick Nijffels, Client Manager at Actemium Herentals, explains that "More than 1,300 wired sensors will be installed in the freezers, and 40 wireless sensors in the cooled containers, to monitor temperature in real time. The wireless sensors were tested in a Proof of Concept for use in a large warehouse filled with metal racks and freezers, with very positive results. Besides the vaccine storage, our EMS (Environmental Monitoring System) solution is also used to monitor temperature, pressure, humidity and particulates in the clean rooms where the drugs are manufactured."

Another pharmaceutical company entrusted Actemium with the creation in 2018, and expansion in 2020, of the IMS (Information Management System) monitoring solution for its vaccine freezer facility. The facility was

enlarged with six containers in 2020 and will be expanded in 2021 with a 2,000-cubic-metre storage building at temperatures below -50 °C. "We are currently [December 2020] testing new containers specially designed to store Covid vaccines, to connect them to the IMS system," says Henk Coolen, Project Engineer Automation at Actemium Herentals. "The storage building is under construction to be fully operational before April."

Long-term confidence

In France, CEF Industrie Picardie, a VINCI Energies Réseau Froid business unit, has been working in tandem with the Sanofi group for more than 15 years on the Compiègne site, where it handles preventative and curative maintenance of the water chillers, cold stores for raw materials and finished products, and climatic chambers for storing samples. "Our relationship of confidence with Sanofi is based on our bespoke

services," says Xavier Delattre, Business Unit Manager of CEF Industrie Picardie. "In addition to our permanent maintenance provision, we offer an atypical service, with a mixed yearly visit where our own technicians attend together with the manufacturers of the machinery installed on site, who have perfect knowledge of how their equipment ages."

"The high quality of pharmaceutical products means that the cold chain must be guaranteed at all times."

He continues, "This enables us to improve our predictive maintenance, while our teams acquire new knowledge. Alongside these maintenance projects, CEF also provides new equipment that combines energy efficiency with clean refrigeration fluids."



THE LAST MILE: PRECISION ENGINEERING

Distribution is the final link in the medicine and vaccine chain. Business intelligence and always-on systems are key to ultra-refined logistics. A look at the case of Axians, which manages information systems for Phoenix, one of Europe's largest pharmaceutical distributors.

Phoenix Group is Germany's largest distributor of prescription and over-the-counter medicines to pharmacies, doctors and healthcare facilities. Its mission: to distribute hundreds of millions of healthcare products every year. Established in 27 European countries with 161 distribution centres, the group also holds a monopoly for the provision of medicines in Scandinavia. In addition Phoenix runs about 2,700 own pharmacies.

Its strategic position at the end of the pharmaceutical sector's distribution chain is crucial: the slightest failure on the group's part could threaten the entire healthcare system.

An IT system with no margin for error

At the core of this well-oiled machine, the IT system is a key component. Having worked with Phoenix Group in Germany for more than 15 years, the VINCI Energies ICT brand Axians signed a contract in autumn 2015 to operate the distributor's IBM Power server infrastructure.

"The customer's most important applications and processes, such as the SAP architecture, run on this IBM Power infrastructure," says Jacques Diaz, CEO of Axians Germany, "And we manage this not only in Germany, but across all their markets."

In particular, Axians ensures that the IBM Power server platforms work with the Unix and Linux operating systems. "We also manage the whole IBM backup environment: everything under what used to be known as 'Tivoli Storage Manager', since renamed 'Spectrum Project' [IBM's storage management application]," explains Zoran Olujic, Business Unit Manager Managed & Cloud Services Factory at Axians Germany.

The company, specialised in ICT services and solutions, is also responsible for all the Windows and Linux systems operating on an Intel x86 (CPU architecture) server base.

"The applications running on these systems are extremely diverse. There are at least twenty different business intelligence technologies used mainly by retail customers or logistics companies like Phoenix. This is extremely important for making quick decisions on medicine orders," says Zoran Olujic.

Axians therefore has an obligation to ensure that these systems can be used 24 hours a day, seven days a week, 365 days a year. "This allows Phoenix continuous access to their performance indicators, for example by displaying statistics and estimated stock levels."

Continuously trialling new innovations

As part of the ongoing campaign to vaccinate against Covid-19 in Europe, pharmaceutical



companies, distribution centres and pharmacies, some of which are equipped with clean rooms and intensive refrigeration systems, are on the front line preparing the new vaccines ready to be used in vaccination centres. Phoenix's information services are essential to this arrangement, ensuring that the ordering and distribution systems of pharmacies perform well. "Our task is to keep the IT environment operational. With the backup infrastructure, for example, we're always introducing technical innovations and optimisation options. We extensively test innovations from our IT supplier partners and implement them if they are useful for Phoenix," says Jacques Diaz.

Axians also provides consulting services to users at Phoenix to

"We must be able to adapt to the different infrastructure operations requirements in different countries."

enable them to access data and information more quickly. To mitigate any server failure,

the consequences of which could be dramatic for the healthcare systems of the countries concerned, Axians has technicians on duty at all times, including weekends.

"Another challenge is the threat from cybercriminals. We must be able to adapt to the different infrastructure operations requirements in different countries. For example, if Norway imposes specific rules on how to perform a backup to avoid attacks occurring as a result, we have to implement them," says Zoran Olujic, who has also the expertise of his colleagues at Axians IT Security to draw upon. This is an important issue for Axians, which counts Phoenix as one of its largest customers.

THE IMPORTANCE OF DATA STORAGE IN THE PHARMACEUTICAL MANUFACTURING SYSTEM

IT plays a crucial part in the drug and vaccine manufacturing process, from development right through to production. The vast volumes of data and the computing power involved in the process require considerable storage capacity. This article looks at the data centres of a French pharmaceutical manufacturing specialist, a major Axians partner.

Axians has been working for over 15 years with a leading French drug and vaccine manufacturer. The VINCI Energies ICT brand is specifically involved in data storage, a highly strategic aspect of the pharmaceutical company's IT service. The manufacturer relies on Dell EMC and NetApp for its storage solutions.

It's the NetApp technology that concerns Axians, which is one of just two companies in France to have achieved the highest level of the American storage provider's STAR certification. "We are suppliers of the technology, which has the advantage of offering two protocols within a single storage array, namely NAS (Network Attached Storage) solutions and SAN-style (Storage Area Network)

architecture, which allow users and application servers to access large amounts of data in a shared storage pool," explains Gaëtan Garcin, regional director of Axians Cloud Builder.

Power and agility

According to the Axians specialist, the NetApp system offers many other benefits starting with high scalability, which makes it possible to adapt to the demands of massive data sets without changing operating system. Today, these high-availability storage solutions already accommodate more than four petabytes of the pharmaceutical manufacturer's data.

"The other advantage of the NetApp system is that it is highly resilient and available, enabling it to address any type of failure thanks to its capacity to easily switch to other data centres," adds Garcin. Axians' first task for the client is to advise the group on architecture design, in particular by choosing the best technologies for updating the NetApp system so that it continues to run at optimum performance. "Each year, our client adds several hundred terabytes to its storage system," points out the expert from Axians which, as well as looking after the central data centre, is also in charge of equipping local sites installed in the group's various factories. Furthermore, the VINCI Energies brand provides all the technology

needed for data provisioning via the public cloud. "In addition to central and local data centres, the public cloud helps meet ad-hoc or specific storage needs in a dynamic and agile way," states Garcin.

Computing power and basic research

There is a further area in which Axians, through its HPC (High Performance Computing) and AI business unit, is contributing its expertise and that is in-service support for the two European computing platforms dedicated to basic research on vaccines. "We work continuously to improve the computing power of these machines so as to prevent any disruption that would be extremely

damaging. The computational time for these platforms is several days or even several weeks, so any outage means a loss of productivity

"Computational clusters" are used to model the outcome of a vaccine on a given virus.

for all the researchers running different types of calculations simultaneously," explains Gaëtan Garcin.

The stakes are high, since these "computational clusters", collections of servers offering considerable compute power, are used for example to model the outcome of a vaccine on a given virus. These platforms use artificial intelligence to perform the groundwork, leaving just one or two candidate vaccines – the most promising ones – and thus shortening product development time, as exemplified in recent months by the speed with which Covid-19 vaccines have been developed. "In this case, our work involves optimising the architectures designed for the calculation codes created by researchers. This means that our data scientists are indirectly working on the client's core business," says the regional director of Axians Cloud Builder.



PROTECTING HEALTH WITH DIGITISED TRACEABILITY SYSTEM

In order to combat counterfeiting and parallel trade, there is a need to serialise drugs in a number of markets. Courbon Software, a VINCI Energies business unit at the leading edge of this field, is rolling out its solution worldwide.

The European Falsified Medicines Directive (FMD), in effect since February 2019, requires laboratories and pharmacies to ensure that drugs are serialised. This involves setting up a system to verify the authenticity of products, whereby a unique serial number is added to each drug package then logged in a central database. This system of "package traceability" is intended to prevent counterfeiting and parallel trade. VINCI Energies business unit Courbon Software, which publishes MES software for the industrial sector, anticipated this regulatory development by creating an ad-hoc, Industry 4.0-ready solution 8 years ago. Named "Pharmacim-LSM" (Label Serialization Management), it is one of 5 flagship solutions in the market.

The Pharmacim-LSM solution is currently deployed across some 300 production lines worldwide on behalf of a dozen clients, including Delpharm. This French pharmaceutical manufacturer

appointed Courbon Software in 2014 to incorporate the solution into all of its sites. "With this type of project, you need to be inventive in all areas – not just in terms of the software but also the machines," points out François Lavabre, business manager of Courbon Software.

An agile and non-intrusive system

Many challenges have had to be met so far: "We first had to adapt to changes in the regulation, which is coming into force at different times depending on the market and which varies from country to country, with different QR codes, codifications and sizes," explains the head of Courbon Software. The company has demonstrated its technological capabilities by tailoring the system to various outputs, some of which are very high (over 300 parts per minute), providing information in real

time on the packaging lines by managing big data streaming, and anticipating the replacement of operating systems or equipment discontinued by its manufacturers. Supplemented by a 24/7 maintenance team, Courbon Software's project unit produces and implements the software packages as part of an end-to-end service that includes selling the machines and supporting client project teams.

"In order to be able to deploy the system at the same time both centrally and across the production lines, it's crucial that we have staff on hand who understand the client's business and processes and who are skilled not just in automation systems but in software programmes."

The pressure is all the more intense since the introduction of this type of solution, which is of strategic importance for manufacturers, is generally monitored at the highest level of the company.

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GRABIT, THE COBOT RAISING CYBERSECURITY AWARENESS IN FACTORIES

Two VINCI Energies brands, Actemium and Axians, have developed joint tools including a collaborative robot (cobot) in order to help IT and OT teams in the manufacturing sector come together to counter cyber threats.

Factories and workshops have long been managed by instrumentation and control systems closed to the outside world and particularly to players in the Information Technology (IT) and internet environments. But as the manufacturing sector starts to become more digitised, with the arrival of sensors and other connected objects, the use of mobility tools, and the increasing "cloudification" of numerous industrial applications, we are seeing an integration of production systems controlled by operational technology (OT) with IT. Since IT systems are, by nature, potentially accessible from the outside, this increases the attack surface of industrial facilities. Collaboration between OT and IT is therefore crucial in order to address issues around data flow and processing, and increasingly to find solutions to industry-related cybersecurity problems.

"Given that all the goods we consume on a daily basis and all the services we use, like those linked to power generation/distribution and water distribution, are managed/controlled by OT systems, it's easy to imagine the risk posed by industrial cyberattacks. For manufacturers, the question is not whether their facilities will be affected but when they will be," warns Thomas Leseigneur, innovation manager at the Innovation Department of VINCI Energies. No one is spared; even large groups are hit by hackers, with adverse consequences for Saint-Gobain and Renault, for example, where a mail server was blocked for several days and production stopped for several weeks, respectively.

Reconciling two cultures

"While it's clear that convergence is necessary between industrial and IT business lines, achieving that is not self-evident," says Vincent Bazillio, development manager at Axians, the VINCI Energies brand specialising in ICT solutions. The differences in culture between the two worlds result in sometimes conflicting priorities: for IT technicians,

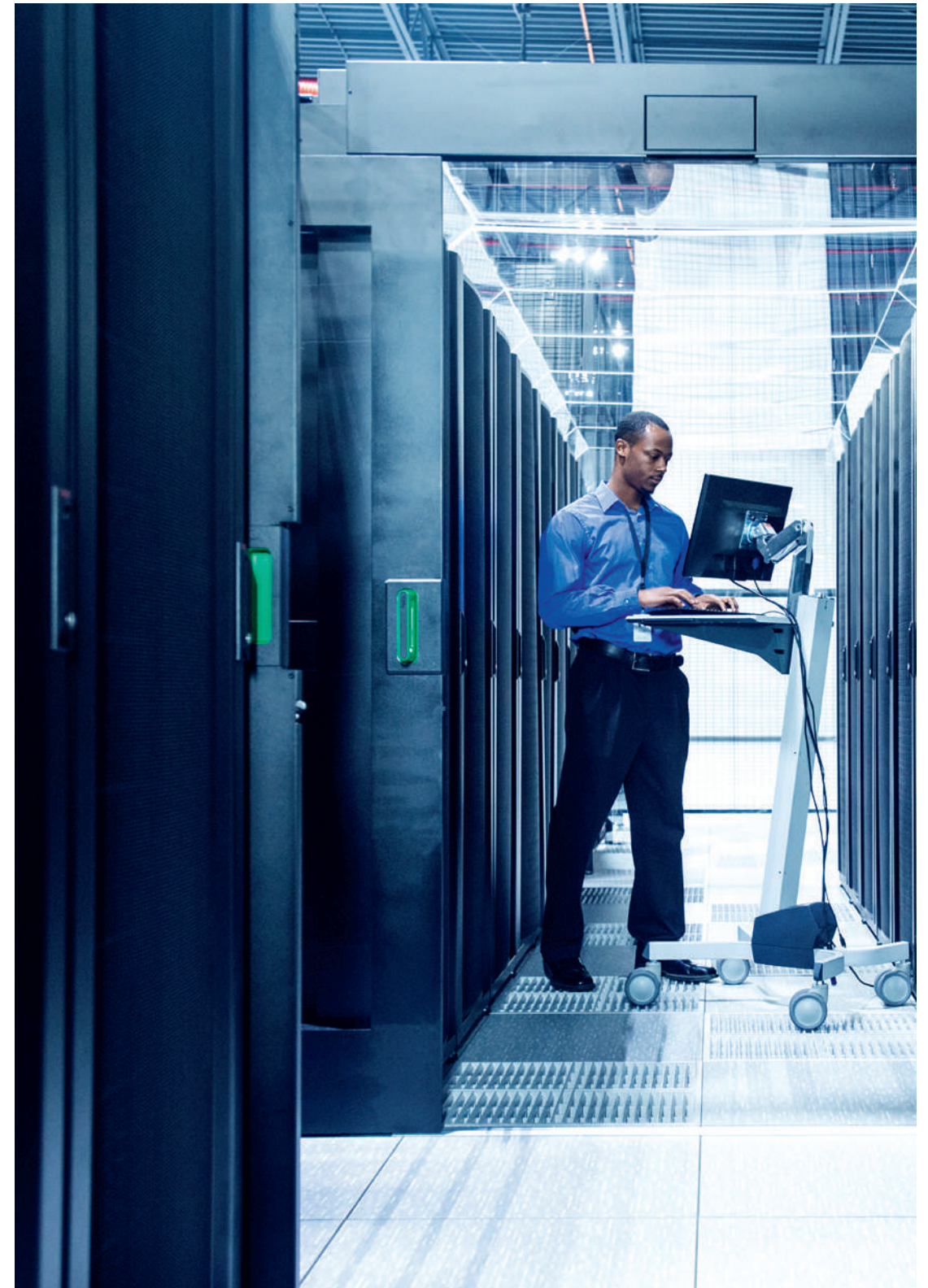
confidentiality comes first followed by system availability; for OT professionals it is almost the reverse.

And they respond differently to threats too: in the IT world, the tendency is to shut down access so as to analyse and take corrective action, whereas production will remain the top priority for OT even in the face of a threat.

Actemium is an expert in industrial culture, its core business, while Axians specialises in IT operating procedures. It was this dual competence that brought the two VINCI Energies brands together to offer manufacturers cybersecurity solutions that comply both with industry-specific requirements and good information system practices.

Awareness-raising tools

In order to enable OT and IT managers to better protect manufacturing equipment and data, Actemium and Axians have developed awareness-raising tools for them, based on system vulnerability assessments and penetration testing carried out by "white-hat" or good hackers. The idea is to show, by means of tests, what vulnerabilities can be





“While it’s clear that convergence is necessary between industrial and IT business lines, achieving that is not self-evident.”

exploited to attack an industrial system and how to secure its equipment.

Two demonstration tools are used in the presentations given to company IT and OT experts: a virtual reality tool and a small cobot called GrabIT. GrabIT delivers a simulation of a connected factory, performed with an operator terminal, an automatic controller and a robot. The aim is to demonstrate what happens in a network. The cobot is given a task to complete: by choosing a colour on a screen, the cobot receives a command to go and pick up an object of the same colour with its grabber.

The task goes to plan up to the point where the simulation involves the operator opening up a Word file on a laptop to read a set of instructions. A virus in the file, spread by the USB memory stick containing the Word document, then causes the cobot to malfunction, its movements becoming unpredictable and potentially dangerous to humans.

Adopting good practices

The simulation helps manufacturers to realise that the PCs they use are not necessarily secure. They are informed that, fortunately for them, 80% of threats can be tackled easily by adopting good practices. “Having a Perspex screen in front of the PC included in the production hardware would have been enough to prevent anyone from connecting an infected memory stick,” says Bazillio. The GrabIT demonstration is supplemented by a map of connected equipment, produced by Axians and Actemium teams.

Participants are often surprised to find out, thanks to the network mapping system, that a piece of equipment or sensor has been forgotten in a suspended ceiling or outside the premises, and that these devices represent a potential security breach. The mapping includes a fact sheet detailing vulnerabilities for each component – information which can be valuable for maintenance technicians.

Once manufacturers are aware of security requirements, they put in place a number of measures, says the Axians cybersecurity expert, such as “a protection system for production line segments.” “Segmentation is a conventional measure in IT,” notes Bazillio. “It involves forming ‘security bubbles’ for hardware that requires the same protection, for example equipment that needs to be accessible to people on the outside.” This might mean configuring network switches or a firewall.

ICT PERFORMANCE

DEVOPS: AGILITY IN SOFTWARE ROLLOUTS



By applying the principles and practices of DevOps, IT development and production teams can align their objectives and accelerate processes. Axians is helping companies to move in this direction.

The numbers illustrate the benefit of helping IT teams work better together: 40% of software rollouts end up having to be reworked because they fail to meet users’ needs. And these failures impact on the company’s bottom line: according to Microsoft, the average cost of downtime for a customer-facing application is close to USD 100,000 an hour. Typically, when a new rollout fails to work perfectly, developers blame

operational staff, and vice versa. This antagonism stems from their different priorities: system stability for the former and cost-cutting for the latter. To minimise this historical antagonism, a set of practices was developed, known as DevOps, with the aim of aligning the functions of the software development (Dev) and operations (Ops) teams.

Faster deployment

Axians, the VINCI Energies ICT brand, helps businesses to adopt DevOps practices, as Ricardo Carvalho, Innovation Project Manager explains, “To align the objectives of teams that will be working closely together.”

The benefits of DevOps go beyond making teams work together and automating the environment and servers. Because it acts on communication and feedback, adds Ricardo Carvalho, “DevOps makes it possible to deploy software faster, then to administer it with an understanding of its performance and added value, and so be in a position to suggest improvements for the next development cycle.”

Agile mode

To implement these practices, Axians offers a range of services, including consulting, training and engineering. Its experts can also assist businesses on site as needed, to install the new tools and train their teams in a shared agile methodology. “In an ideal DevOps world”, says Ricardo Carvalho, “development and operational people work together in a single cross-functional team. This team follows an agile project management method, working iteratively and using short development cycles. This allows teams to be more efficient and adaptable.” Lastly, as the expert reminds us, every implementation is unique. Ultimately, says Ricardo Carvalho, “Businesses that adopt DevOps bring their products to market more quickly.”

ELECTRIC DELIVERIES IN THE STARTING BLOCKS



Electric delivery vehicles have reached a tipping point where the technology costs are low enough to compete with petrol and diesel. This is good news for the planet as the next decade promises an explosion in online shopping.

Of the trends accelerated by the Covid-19 pandemic, one of the most significant is the growth in online trading, with the consequence that delivery truck emissions could rise by almost a third during the 2020s. The good news for planet Earth is that electric delivery vehicles have reached a tipping point where the technology costs are low enough to realistically compete with petrol and diesel trucks and vans. The logistics company UPS offers an

illuminating example. It has decided to take advantage of this tipping point, ordering 10,000 electric vans from Arrival, a British startup specialising in electric vehicles.

The Tesla of vans

"Arrival is the Tesla of vans," says Nick Chambers, Business Unit Manager of Actemium Coventry. "It's coming to market with a complete, integrated solution that challenges traditional car makers and equipment suppliers whose model is largely based on production of diesel and flex fuel vehicles." The UPS initiative is particularly interesting because electric utility vehicles are still relatively rare. In France, the biggest market in Europe, the market share of electric utility vehicles was barely 2% in 2019.

"There are issues with range, availability and price," says Nick Chambers. "It's not quite there yet, but things should improve in the medium term, especially with the technology advancing and prices falling." But he adds that "Implementing a fleet of electric vehicles requires expert advice to optimise the process of switching over the fleet and installing adequate charging infrastructure."

Less expensive than diesel models

UPS is confident in this trend and has gone further still, acquiring a minority stake in Arrival, which has boldly committed to providing vehicles that cost less than competitors' diesel models. UPS is betting strongly on Arrival products: the vehicles ordered will represent around 10% of its total worldwide fleet. The first prototypes should arrive this year, with more substantial production of at least 2,000 vehicles per year to follow from 2022. The transport giant is also counting on the digital opportunities offered by these novel vehicles, which are equipped with numerous sensors that will enable them to improve safety and eventually trial self-driving operation.

VINCI AND PARIS TECH STEP UP THE PACE IN APPLIED RESEARCH

Together with Paris Tech, VINCI plans to accelerate partnerships between science and industry in order to scale up operational applications. The "Lab Recherche Environnement" is driving the project.

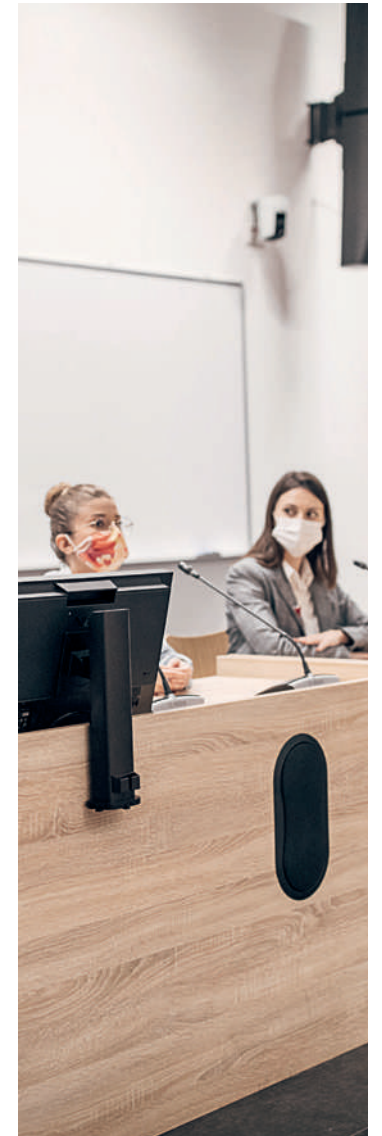
At the end of January 2020, the eco-design chair scheme, formed by the VINCI Group and Paris Tech (a network of engineering schools), became the "Lab Recherche Environnement", an environment research lab. Set up in 2008, the scheme has an impressive record: around 30 PhD research projects, 150 academic publications and 2,500-plus active licences for the Pléiades building energy simulation software. Through the lab, VINCI plans to strengthen its partnership with the three Paris Tech schools: MINES Paris Tech for energy efficiency in buildings and neighbourhood lifecycle analysis; École des Ponts Paris Tech for sustainable mobility; and Agro Paris Tech for biodiversity. "The aim is to increase the pathways between scientific research and Group business lines, in keeping with VINCI's commitment to the environment," explains Maxime Trocmé, R&D deployment director at VINCI.

This application-oriented approach is guided by a 5-year roadmap that focuses on three main areas:

limiting the environmental impact of buildings and neighbourhoods while controlling costs; incorporating environmental factors into business digitisation processes, especially through BIM-based (Building Information Modelling) energy simulation; and enhancing user wellbeing, comfort and health.

Increasing engagement

Research topics can also be proposed directly by VINCI business lines. For example, work has been carried out on the initiative of VINCI Energies analysing the lifecycle of technical trades so as to reduce their carbon footprint. In line with the lab's new goals, VINCI wants to get more people engaged, particularly within the company. "In addition to the 50 or so Group employees involved every year in research programmes, we want to further promote the three big annual conferences that we hold on the topic and to support the Lab Seminar series, the first session of which – focusing on digital technology – took place on 10 November 2020," says Trocmé. A Lab Workshop programme has also been launched, which explores research topics and their operational applications with a view to providing input for green business and solutions at VINCI. The first session on urban agriculture was held on 1 July 2020 at Agro Paris Tech.



HOW VINCI ENERGIES IS IMPROVING ACCESS TO WATER IN AFRICA

As tackling climate change becomes more urgent, high population growth and increasing urbanisation are making the distribution of drinking water a key issue in Africa. VINCI Energies is involved in three projects across the continent.

Water is a vital resource that is in demand more than ever before yet still as unevenly distributed. With worldwide demand continuing to rise, UNESCO has alerted the global community to the need to address the challenge of ensuring water access for all: "Over 2 billion people live in countries experiencing high water stress, and about 4 billion people experience severe water scarcity during at least one month of the year." And the situation is exacerbated by the effects of the climate crisis. Access to drinking water is a particularly sensitive issue in Africa, especially sub-Saharan Africa which is home to nearly half of the population drinking water from unimproved sources, says a 2017 WHO/UNICEF report. This has serious health implications, especially when seen in the context of population growth (the African continent will be

the main driver of this growth worldwide from 2050) and increased migration from rural areas. Cities in sub-Saharan Africa, whose population jumps by 24 million people each year, are not equipped to manage such an influx. Rapid urbanisation creates tension over resources and makes it difficult to roll out drinking water supply and wastewater collection networks.

Better distributing water resources in Morocco

Africa as a whole is concerned. In Morocco, for example, water demand is set to rise by 60 to 100% in most big cities by 2050. The country, which faces recurrent droughts, has undertaken various water supply projects aimed at delivering water to the Marrakesh region from the Al Massira dam and supplying drinking water to the cities of Fez and Meknes from the Idriss 1 dam. Actemium Eau is involved in the works. Azzeddine Oulahrir, the business unit manager, notes that water stress does not affect the whole country in the same way and highlights that, "it's a water resource distribution problem." "In some regions in the north of

the country, high rainfall exceeds water demands, whereas in other regions, especially in the south, there's a shortage of drinking and agricultural water. The works therefore include delivering water from one region to another," adds Oulahrir.

Actemium Eau, together with Sogea (VINCI Construction), a leading construction and engineering company in the country, is responsible for building a sludge treatment facility for the Al Massira dam with a flow rate of 3.5m³/s – a target the company is contractually bound to meet – and a pumping station.

Meeting increasing industrial needs

The aim is to meet the increasing demand for water from three regional hubs, Al Haouz, Marrakesh and Rehamna, and to supply industrial water to three mine sites, Ben Guerir, Bouchane and Youssoufia, belonging to the OCP Group, an exporter of phosphate. The two companies are installing hydraulic mechanical equipment for the two plants, two 25,000-cubic metre storage tanks for desludged water, a return pumping station (5 x 2200kW pump units), low voltage/medium voltage electrical equipment and transformers

Actemium is working to "develop more productive agriculture" while ensuring "effective and sustainable water resource management."

(2 x 630kW and 3 x 6300kW). "The Actemium Eau contract doesn't just cover equipment," says Oulahrir, "it also includes studies, the supply and installation of





hydraulic mechanical equipment including pumps, engines, taps and mains, along with instrumentation, automation, remote management and commissioning of the pumping station.”

Making up the drinking water shortfall in Fez and Meknes

A further project being carried out by Actemium Eau in Morocco involves supplying drinking water to the cities of Fez and Meknes by delivering 2m³/s of water from the Idriss 1 dam. Meknes faces low levels of groundwater due to the city’s growing need for drinking water.

“The project will mainly help make up the long-term water shortfall experienced by Fez and Meknes, and contribute towards conserving the Saïss groundwater resources,” explains Azzeddine Oulahrir. Actemium Eau is fitting out three

plants that will pump water from the dam to Meknes with hydraulic mechanical and electrical equipment, and automation systems for the three pumping stations and chlorination plant, outlines Oulahrir. He adds that Actemium Eau is involved in various irrigation projects as part of the “Plan Maroc Vert”, Morocco’s green plan which consists of “developing more productive agriculture,” while ensuring “effective and sustainable water resource management.”

Abstracting water from La Mé River to supply Abidjan

In Côte d’Ivoire, VINCI Energies Côte d’Ivoire has been appointed by Veolia Water STI to perform the electrical works for the new water treatment plant located 25 km to the north-east of Abidjan, whose water is abstracted from the La Mé River. The project is

part of a programme to boost the capital’s supply of drinking water. The works are being undertaken in cooperation with Actemium Morocco teams, with commissioning scheduled for the end of 2020. The plant will be capable of producing 259,000 cubic metres per day during peak periods, with an average production capacity of 240,000 cubic metres per day, says Yann Le Corvec from VINCI Energies. The electrical works for the treatment plant include the supply, assembly and commissioning of all the power and signal installations.

The project is an opportunity for Actemium Eau to gain a foothold in Côte d’Ivoire and will enhance the range of services offered by VINCI Energies, which “aims to monitor drinking water treatment projects, like the Bouaké plant, and wastewater treatment schemes,” notes Le Corvec. “The needs are huge in Côte d’Ivoire and more broadly throughout West Africa.”

ENERGY

PERFORMANCE

ENERGY STORAGE SYSTEMS HELP BALANCE THE GRID

Battery systems run by power grid operators provide an effective way, especially in non-interconnected island areas, to balance networks and compensate for the intermittent nature of renewable energies.

In large geographic areas with interconnected grids, when one electricity network is overloaded it can receive power from another system in order to be able to continue supplying consumers with electricity. Conversely, if demand is lower than supply, the network will need to implement load shedding. “The inviolable principle of grids is that demand must always match supply,” says Thibault Fauquant from Omexom Conversion & Storage (VINCI Energies).

In mainland France, nuclear power stations are the main tool used for balancing the grid.

But this balance is harder to achieve in non-interconnected areas like islands where isolated systems cannot be backed up by external sources. Traditionally, these areas, which are almost entirely dependent on imported fossil fuels (gas, fuel oil, coal) for power, use generators to help the local grid meet peak demand. The development of renewable energies provides a new energy supply source. But generation is

intermittent and depends on sun or wind levels, resulting in grid stability issues.

Storing energy during the day for use at night

One answer is to roll out centralised storage facilities, which allow solar panel-generated energy to be stored during the day for use in the evening.

Omexom Conversion & Storage has carried out energy storage system installation projects on several French islands.

“This storage system is an attractive option for non-interconnected areas for several reasons,” explains Fauquant. “First, because it helps mitigate intermittent power production. In this respect, it acts as an additional tool for addressing the balancing issue. And second, it’s an effective way to stabilise the grid, which renewable energies disrupt by

causing deviations in the set frequency of 50Hz.” Omexom Conversion & Storage is involved in installing energy storage systems run by grid operators in several non-interconnected areas, including Le Lamentin in Martinique delivered in 2018, Corsica where installation is under way, Guadeloupe, and shortly Mayotte where Total has appointed Omexom to carry out stationery energy storage systems following a tender issued by the Commission de régulation de l’énergie (CRE, the energy regulatory commission). Omexom’s solution uses lithium-ion batteries developed by Saft, a Total group brand, which will deliver an output of 4MW (megawatts) and a storage capacity of 2MWh (megawatt-hours).

Increased response time

In mainland France, energy storage solutions are set to be taken up by electricity transmission system operators like RTE and distribution network operators like Enedis to support the development of renewable energy sources. The advantage of grid operator-run storage systems is that they offer ultra-fast response speed, feeding energy into the grid in 300 ms. Response time is much longer with thermal and nuclear power plants.

PRIORITISE PREVENTION TO KEEP YOURSELF AND YOUR COMPUTER SAFE



Over the past few months, home working has become widespread. Businesses have had to act quickly to set up the necessary infrastructure for employees to access corporate resources remotely. In order to ensure that networks can only be accessed by those duly authorised to do so, additional security systems must be implemented. So what does the COVID-19 pandemic mean for cybersecurity in businesses?

When the instructions limiting physical contact were suddenly introduced, many companies asked their employees to work from home. This meant immediately putting in place the technical foundations needed for staff to use company laptops or personal computers to access

corporate networks remotely, without making them vulnerable to outside sources. A VPN provides remote access to the network server while encrypting the connection, thus ensuring a secure exchange of data between the client computer at home and the company server.

Whole workforces suddenly working from home – and under secure conditions!

Businesses which were already used to working from home before the crisis had an advantage, as they already had the necessary infrastructure. However, they still

had a lot to do to quickly adapt their equipment to the new requirements. This involved ramping up their internet connections or infrastructure for managing VPN connections and clients. In many cases, all they had to do was buy additional licences since the capacity of their existing hardware exceeded their operational needs. For example, businesses might buy 100 VPN licences, when their infrastructure could manage 1,000. Some providers offer specific licences for this scenario, making it possible to increase capacity to 1,000 connections for a brief period of time. Often, these solutions were being implemented for the very first time.

That said, using company equipment outside of the office poses the additional risk of it being lost or stolen more easily. To counter this risk, security can be improved by managing and protecting mobile devices with Mobile Device Management (MDM) solutions.

Enhanced responsiveness thanks to managed services and cloud solutions

Cloud-based solutions are currently facilitating cooperation between staff members working out of different locations. As a result, they are increasingly in demand. However, in order to implement, explain and configure them, IT personnel is needed. By using managed security services, businesses can outsource routine cybersecurity operations and thus free up capacity for other, often unforeseen, tasks. Plus, managed security services can help minimise a whole range of risks. And that will still be relevant after the health crisis caused by COVID-19. Security as a Service, a cloud model that delivers scalable cybersecurity solutions, is also of value now more than ever. As needs vary significantly, due for example to furloughing, companies can make

savings by using software available in the public cloud, for which licences can be terminated at any time, thus limiting costs.

Maximum security with Zero Trust model

Security mechanisms like strong authentication are also in great demand. This type of authentication not only requires a username and password for an employee to be able to access corporate resources, but also a certificate or one-time password.

The concept of Zero Trust cybersecurity reduces internal and external risks to the very minimum. Whereas other security architecture is often based on the source IP address alone, Zero Trust distrusts anyone seeking to access corporate resources. Strong authentication is another way of preventing unauthorised people from accessing sensitive data and malware from penetrating the system. The health crisis illustrates very clearly just how important digitisation is – and not only for businesses. It is also crucial for schools, which had to stop face-to-face learning from one day to the next. Axians is involved in digitising schools and is currently considering a project aimed at equipping 22 establishments in the southern districts of Hamburg with a uniform, exhaustive, integrated and automated cybersecurity solution.

Axians' 5 cybersecurity recommendations for working from home and elsewhere:

- 1.** Ensure secure remote access by exclusively authorising encrypted VPN connections for accessing corporate data and by using strong authentication.
- 2.** Build and use Zero Trust architecture.

3. Create network transparency through Cloud Access Security Brokers (CASB), Security Information and Event Management (SIEM), segmentation and Vulnerability Management.

4. Provide training for employees, using dedicated platforms to send them fake phishing emails. This tests their reactions and enables targeted training to be set up for vulnerable staff.

5. Secure mobile devices through multiple authentication, Endpoint Security (antivirus, hard drive encryption, port verification, etc.) and the use of MDM solutions; perform all application and operating system updates.



Alain De Pauw
Head of Security Division,
Axians Germany

WINE TOURISM MEGACOMPLEX DRIVEN BY DATA

Over more than 30,000 square metres, with nine restaurants, six museums, shopping, bars, wine school, permanent exhibition hall and several event spaces: World of Wine, which opened in July 2020 in the historic Vila Nova de Gaia district of Porto in Portugal, is one of the largest tourist attractions to open in Europe in recent months. For maximum efficiency in managing operations, Axians Portugal designed and implemented a technology platform for analysing visitor behaviour data.



VINCI ENERGIES,
ACCELERATOR OF ENERGY
AND DIGITAL TRANSFORMATION

In a world undergoing constant change, VINCI Energies focuses on connections, performance, energy efficiency and data to fast-track the rollout of new technologies and support two major changes: digital transformation and the energy transition.

Keeping pace with market change, VINCI Energies integrates customised solutions to help its customers roll out technologies that serve a useful purpose and care for the planet, from design to implementation, operation and maintenance.

VINCI Energies’ 1,800 agile and innovative business units build on their strong regional roots to boost the reliability, safety, sustainability and efficiency of buildings, factories, energy, transport and communication infrastructure, and information systems.

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