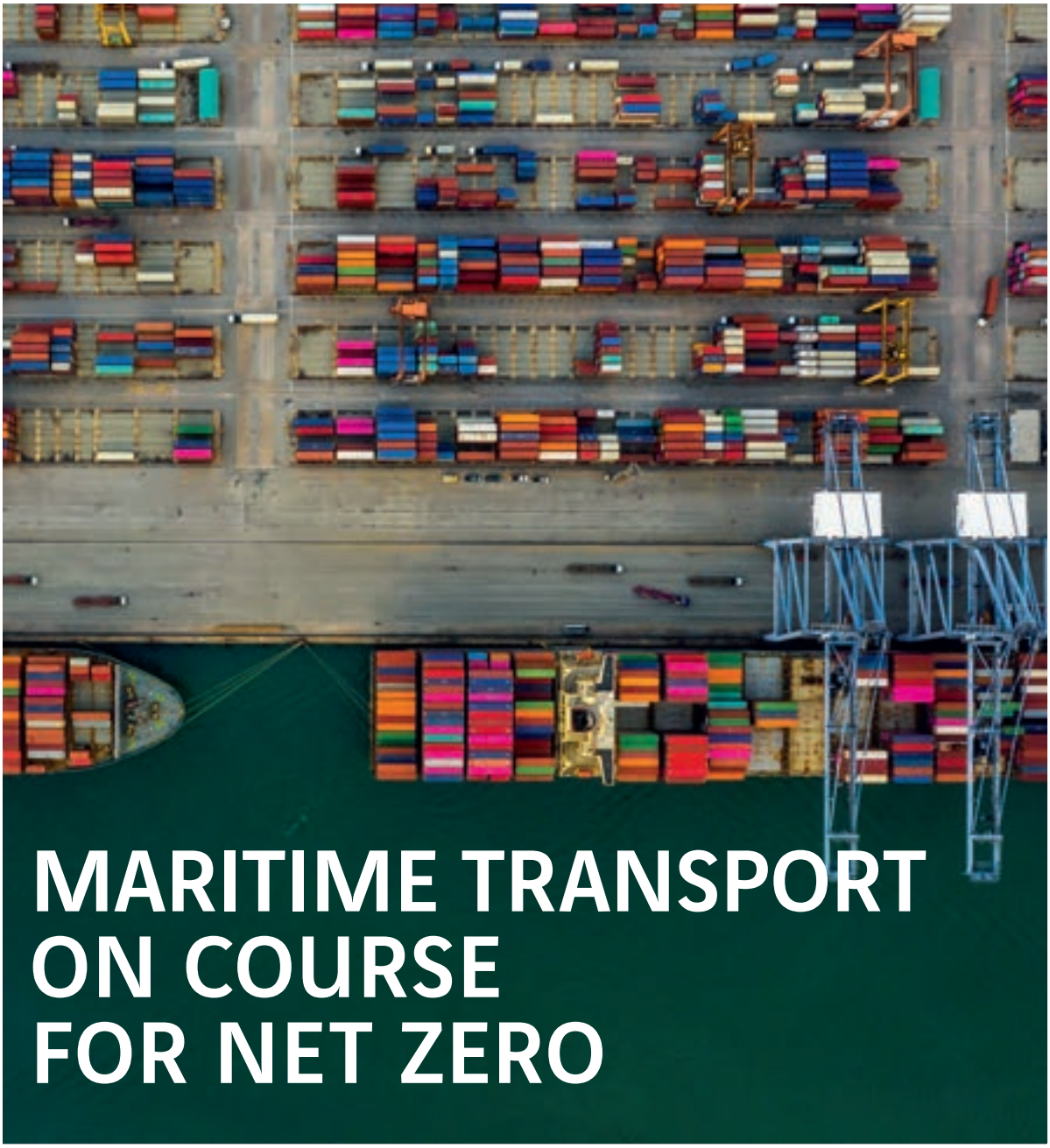
THE **AGILITY** EFFECT
MAGAZINE

WATER: A NEW CHALLENGE FOR COMMERCIAL BUILDINGS

PRIVATE 5G FOR INDUSTRY

SOLUTIONS FOR DARK DATA



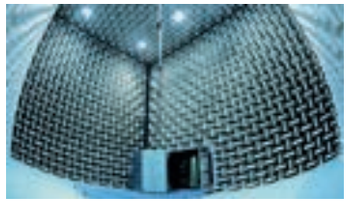
MARITIME TRANSPORT ON COURSE FOR NET ZERO

VINCI ENERGIES

SUMMARY

AGILITY **PICTURE**

INNOVATION AT A STEEP ANGLE 4



INNOVATION TURNING DOWN THE SOUND IN BUILDINGS 6

FRANCE'S FIRST GIGAFACTORY AND ITS XXL SAFETY MEASURES 8

WATER: A NEW CHALLENGE FOR COMMERCIAL BUILDINGS 10

WITH OH!ZONE AND VHYNSEA, RENEWABLE HYDROGEN IS GAINING MOMENTUM IN SPAIN 12

OSLO ROCK FESTIVAL GOES DIESEL-FREE 14

HOW THE LYON METRO IS IMPROVING ITS OPERATIONAL PERFORMANCE 16

AGILITY **FOCUS**

DECARBONIZING MARITIME TRANSPORT 19

MARITIME TRANSPORT ON COURSE FOR CARBON NEUTRALITY 20

"MAKING RIVER TRANSPORT MORE COMPETITIVE THAN ROADS" 23

WHAT SOLUTIONS EXIST FOR PHASING OUT FOSSIL FUEL? 24

"THERE IS NO SINGLE COMPREHENSIVE SOLUTION" 26

PORTS ARE SWITCHING ON TO OPS 28

BARCELONA ELECTRIFIES ITS FERRY TERMINAL 30

VEDETTES DE PARIS 32

PRIVATE 5G GAINING GROUND IN THE WORLD OF INDUSTRY 34

ACTEMIUM AT THE WHEEL WITH AUDI 37

THE ROLE OF CARBON SINKS IN THE ENVIRONMENTAL TRANSITION 38

RIGOROUS PROCESSES FOR GENE THERAPY 40

RECONCILING ECOLOGY WITH CONNECTIVITY 41

WHAT TO DO ABOUT DARK DATA? 42

LIGHT FROM DATA IN THE AZORES 44

AGILITY **PEOPLE**

BUILDER OF RENEWABLE ENERGY PROJECTS 46

WHAT SHE LOVES BEST ABOUT HER JOB IS... THE UNEXPECTED 48

4.0 BUILDING DESIGN EXPERT 50

AGILITY **EXPERT**

INDUSTRY 5.0: USE TAKING PRECEDENCE OVER TECHNOLOGY 54

AGILITY **OPINIONS**

NO SOVEREIGNTY IN HEALTH WITHOUT PROCESS AUTOMATION 54

AGILITY **PICTURE**

ENHANCED PERFORMANCE THROUGH TECH 56

AGILITY **PROFILE**

58

EDITORIAL

Energy transition will require a transformation in the way we use energy. To make this transformation possible, we must fundamentally rethink the infrastructure, buildings and facilities that we use every day. While less visible to the general public, the industrial sector is undergoing a period of serious upheaval that is forcing it into a triple revolution.

First, the need to rethink the products that it makes, to reconsider their usefulness, functionality and uses. The second is to ensure that the composition of these products takes account of environmental issues, the scarcity of materials and respect for biodiversity. The third revolution affects production, with increasingly energy-efficient and virtuous fabrication methods.

In a world that never stops changing, where the climate emergency is in conflict with economic reality and open competition, the time factor is crucial for major industrial groups. Transformation is essential, but it must be fast and effective. This is an exciting challenge in which VINCI Energies has a major role to play by providing all its customers with operational solutions.

In this edition of The Agility Effect, you will discover how our business units are working alongside their customers to support these transformations. That sometimes means changing existing models, but often they have to be reinvented. To provide appropriate solutions, VINCI Energies business units are applying not only their technical expertise, but above all their in-depth knowledge of their customers' processes and uses.

Vincent Bouffard
Deputy Managing Director VINCI Energies France
and Chairman of Actemium

AGILITY **PICTURE**

INNOVATION AT A STEEP ANGLE

Mount Pilatus is a popular destination in the Swiss Alps. Its success is due in no small part to the trains that have been bringing in tourists on the Pilatus-Bahnen cogwheel railway, the steepest rail track in the world (47 percent gradient), since 1886. To continue transporting hundreds of thousands of people a year in complete safety, the rail company has been renovating and modernising its operation. Actemium, the VINCI Energies industrial brand, played its part with the integration of an innovative system that helps the train traffic manager ensure track safety, adherence to speed limits and compliance with virtual signalling, and triggers an alarm in the event of a collision. Thanks to these innovations, the cogwheel train can now run every 35 minutes, compared with 45 previously.

BUILDINGS INNOVATION

INNOVATION TURNING DOWN THE SOUND IN BUILDINGS

The German soundproofing specialist G+H Noise Control has established a cutting-edge laboratory for acoustic measurement. It is proving a valuable tool for customer applications and research alike.

Part of the German group G+H (VINCI Energies), which is active in insulation, fire protection, and technical planning for buildings, G+H Noise Control specialises in soundproofing. In 2019, the company installed a cutting-edge laboratory for acoustic measurement: the Acoustic Competence Center (ACC).

As Business Unit Manager Andreas Zell explains, "We built a lab equipped with every possible standard acoustics application, flexible enough to also cover R&D for our own products and those of our customers."

The facility, located in the Mannheim area where G+H is based, notably houses an anechoic chamber and semi-anechoic chamber. The anechoic chamber has its walls, floor and ceiling entirely covered with sound-absorbing wedges, and is used for testing at frequencies at 100 Hz and above. The room complies with ISO 26101 and contains ultramodern acoustic absorbers for applications in line with the DIN EN ISO 3745 Class I standard.

The semi-anechoic chamber is equipped with a reflecting floor able to support heavy loads (up to 5 tonnes per square metre) and contains a special flat acoustic panel that can measure frequencies of 30 Hz and higher.

"Depending on our needs," continues Andreas Zell, "We can use the anechoic and semi-anechoic chambers in combination, and also an adjacent reverberation chamber."

Advanced measurement

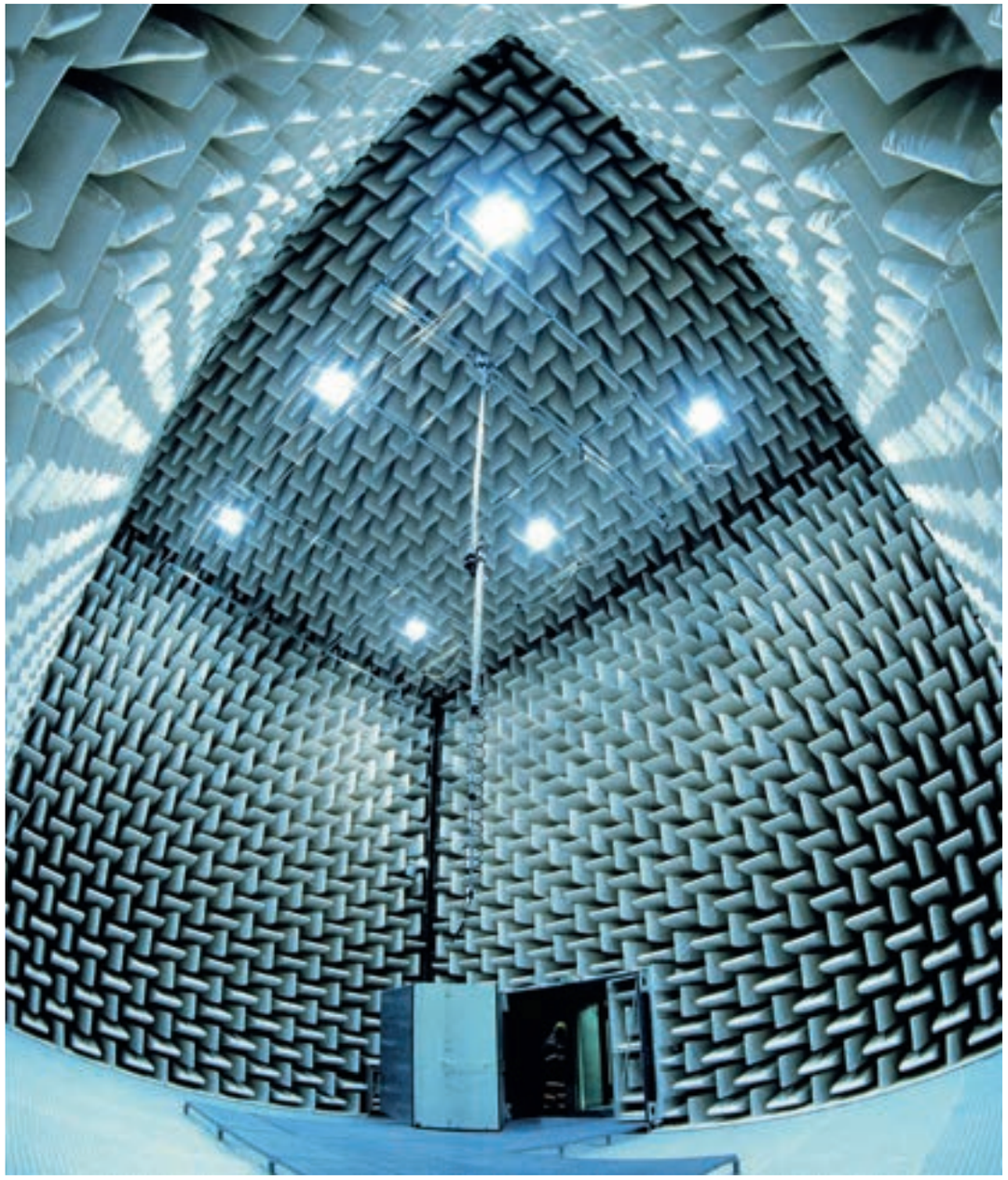
The Acoustic Competence Center is also equipped with duct for measuring the insertion loss of sound attenuators up to 10 metres long.

These sound attenuators are metal baffles, of different thicknesses ranging from around 100 to 500 millimetres, filled with absorbing material and covered with perforated sheeting. As Andreas Zell explains, they are used in different sizes "Depending on whether we are testing standard one- or two-metre ventilation or climate control applications, industrial air supplies between three and six metres long, or applications up to 10 metres long, such as for heavy-duty gas turbine's exhaust stacks."

Testing, consulting and training

Possible applications for the ACC range from validating the basic acoustic materials in a conventional building to running tests customised to a customer's specific needs. The installation allows researchers to measure noise emissions from all kinds of devices and the directivity of speakers or microphones. G+H is also in the process of developing the next generation of sound absorbers.

Andreas Zell explains: "In the case of applications relating to the tertiary building sector, the process involves installing the test item, be it a door, window, or complete wall or ceiling, in an opening between two reverberation rooms. A stochastic signal is generated on one side, and the sound pressure level is recorded from both sides. The difference between the two readings tells us how effective the test item is in terms of soundproofing. The real expertise lies in knowing how to combine layers of materials to achieve the perfect balance between the use of material and soundproofing performance."



In addition to its pure measurement capabilities, the Acoustic Competence Center also offers its customers a consulting service on soundproofing solutions. Andreas Zell says, "The large number of tests and applications available in acoustics and related areas also makes the ACC, which updates its equipment every year, a prime venue for developing young talents and training specialists at G+H Noise Control. And so, every six months, we welcome students conducting fundamental research in the field of acoustics."

"A prime venue for developing young talents and training specialists."

BUILDINGS PERFORMANCE

FRANCE'S FIRST GIGAFACTORY AND ITS XXL SAFETY MEASURES

The facility created by Automotive Cells Company in northern France to manufacture electric batteries for Stellantis and Mercedes Benz vehicles was fitted with a large-scale fire suppression system with help from Uxello, which had to overcome several challenges in the process.

The European Union has set a 2035 deadline for ending sales of combustion-engine vehicles and replacing them with electric vehicles. The three main objectives of this initiative are: reduced greenhouse gas emissions, energy autonomy, and improved air quality in urban environments.

Ecomobility is the new battleground for vehicle manufacturers, forcing them to reshape their industrial models. But the shift to electric remains dependent on the capacity of these major firms to produce batteries in sufficient quantities to meet demand.

Leading the race in France is Automotive Cells Company (ACC), a business jointly controlled by Stellantis, TotalEnergies and Mercedes-Benz that in May 2023, opened France's first gigafactory, located between Douvrin and Billy Berclau near Lens. ACC expects an initial production capacity of 13 GWh. The first high-performance lithium-ion batteries left the factory at the beginning of 2024, and the target is to produce 500,000 units a year by 2030.

35,000 sprinkler heads

To ensure optimal safety in production, ACC drew on the expertise of Uxello Travaux Hauts de France, the VINCI Energies business unit specialising in fire risk management. "Construction of this gigafactory challenged us in more ways than one," says business unit manager Nicolas Blumel. "One of the difficulties was the ultra-tight schedule. We had 15 months to do what under normal circumstances we would allow three years for."

"BIM and 3D modelling made it easier to coordinate the various parties involved."

The sheer scale of the project was another challenge. In a gigafactory, everything takes on XXL dimensions. Fire protection for the Douvrin site required the installation of 35,000 sprinkler heads, 150 hose reels, 41 control stations and 130 km of pipework, and the construction of two 1,000 cubic-metre water reserves.

In addition, Uxello had to adapt the system to the specific chemical properties of the production process. Because batteries contain electrolytes, which can give off hydrogen and acid compounds on contact with water, the business unit opted for a foam spraying system.

3D modelling

The latest technologies were brought to bear on meeting these challenges. As Nicolas Blumel explains, "Right from the project design phase, BIM and 3D modelling allowed us to use a strictly standards-compliant representation incorporating all the technical information pertaining to the different batches. On a 74,000 sq. metre site, in an extremely busy environment with many trades working around each other, this makes it easier to coordinate the various parties involved."

While ACC is leading the race to produce batteries in France, two more gigafactories are due to open soon in the same region. The Sino-Japanese group Envision AESC plans to supply Renault Electricity from a facility on the outskirts of Douai from early 2025. And this will likely be followed a few months later by the Grenoble-based startup Verkor's facility in Dunkirk. Building on the expertise it brought to the ACC installation, Uxello stands ready to protect new gigafactories!

BUILDINGS TRANSFORMATION

WATER: A NEW CHALLENGE FOR COMMERCIAL BUILDINGS

The depletion of water resources demands a reduction in the water footprints of buildings. This can often require substantial alterations. It also requires expertise, such as that of VINCI Energies Building Solutions, which has developed a calculator for determining the potential for reclaiming so-called non-conventional water resources (rain and grey water).

As the frequency and intensity of extreme weather events increase, with droughts and water stress becoming increasingly common, managing the demand for water is now a political priority. In France, for example, on 30 March 2023, the government enacted its first-ever water action plan. Its aim is to reduce water extraction by 10 percent by 2030, and every economic sector is expected to contribute.

The issue has particular resonance in the highly water-intensive real estate sector, where its water footprint is a question of both social responsibility and asset values.

Ordered by the government to start reducing its waste consumption from 2024 onward, the sector has two major action levers for making this happen: reducing consumption of extracted drinking water and reclaiming so-called non-conventional water resources for indoor or outdoor uses where water need not be of drinkable quality.

Rainwater, grey water from sinks or showers, the condensation produced by energy equipment: all these and more are becoming valuable resources. It is believed that using non-conventional water resources on a national scale could avoid the extraction of several million cubic metres of water from groundwater and watercourses every year.

France: must do better

France is far from top of the class in this area, with only 1 percent of waste water reclaimed, compared with 8 percent in Italy and 14 percent in Spain.

"Commercial real estate is not doing any better than other sectors," says Arnaud Morosoli, Energy Project Manager at VINCI Energies Building Solutions. "Including water management criteria in certification standards can only encourage industry players to speed up their efforts."

"Including water management criteria in certification standards can only encourage industry players to speed up their efforts."

But businesses still have to be convinced to invest. Solutions to reclaim, store and redistribute non-conventional water require substantial works and equipment, and the return on investment can be slow, taking several years. "It is therefore important to make informed choices using decision-making aids and take advice from experts," says Arnaud Morosoli.

Expert tools

To ensure good-quality reclaimed rainwater and meet economic criteria, it is essential to pay special attention to the sizing of installations. Expert tools are available, such as the one developed by VINCI Energies Building Solutions, a calculator that can determine the potential for rainwater reclamation on a given site and size the storage tank accordingly, by combining data about the type and surface area of the building's roof, local rainfall, and the building's water needs: toilets, watering planted areas, and cleaning equipment such as windows and solar panels.

As Arnaud Morosoli explains, "Based on this data provided by the building's owner or operator, or compiled directly from on-site audits and national meteorological services, we apply a 2018 standard, NF EN 16941 1, to calculate the correct size for the rainwater storage tank."

Incorporating 2050 climate data

According to the French government's Explore 2070 project, annual flow rates in France's watercourses could fall, based on a median greenhouse gas emissions scenario, by between 10 and 40 percent by 2046–2065, with groundwater recharge down 10 to 25 percent.

VINCI Energies Building Solutions also wanted to fine-tune its calculations by incorporating climate projections from the DRIAS database, which provides region-by-region rainfall scenarios for 2020–2050. A valuable additional feature of the tool is that it allows users to include grey water, and also condensation from climate control installations, which in large enough buildings can be a significant resource.

ENERGY ACCELERATION

WITH OH!ZONE AND VHYNSEA, RENEWABLE HYDROGEN IS GAINING MOMENTUM IN SPAIN

In Spain, VINCI Energies is actively promoting renewable hydrogen with the creation of a dedicated solution based on two flagship projects, one involving wastewater treatment plants and the other in the seaport sector.

In May 2022, VINCI Energies in Spain launched a dedicated renewable hydrogen solution. Leading the way with this particular energy carrier, the business unit is already part of the HyDeal Asturias project – an EPC contract managed by VINCI Construction Grands Projets – and involved in various other renewable H2 production projects currently in the feasibility study phase.

With Omexom Barcelona Renovables y Comunicaciones (an Inove Ingeniería business unit), Actemium and Axians teams in Spain, VINCI Energies intends to play an even more active role in the booming Spanish hydrogen market, in line with Spanish government ambitions. Against this backdrop, the business unit is running two flagship projects: Oh!Zone and VHyNSEA.

Oh!Zone: meeting the challenges of wastewater treatment plants

This first solution is a standardised process for renewable hydrogen and ozone production that can be replicated and adapted for every type of water treatment plant. The objectives of Oh!Zone are to obtain cleaner water, promote the circular economy, reduce the carbon footprint and promote energy autonomy.

As Alejandro García, Director of Hydrogen and Ports at VINCI Energies Spain, explains: "VINCI Energies in Spain and the A Coruña municipal water company (EMALCSA) are working together on the feasibility study for this project, which must address two major challenges facing wastewater treatment plants: to achieve greater energy autonomy and reduce their electricity bills; and to offer people the highest possible sanitary guarantees in terms of water treatment."

In terms of sanitation, the separation of hydrogen and oxygen by electrolysis has to allow the effective transformation of oxygen into ozone for incorporation into water disinfection processes.

This project, for which the budget is close to €8.7 million, would be implemented at the A Telva drinking water treatment plant, which supplies more than 385,000 people in A Coruña province at the northeastern tip of Spain, where the hydrogen and oxygen production plant will be installed. Alejandro García continues: "Across more than 3,800 water treatment plants in the country, there are at least a hundred opportunities to develop and digitalise projects to generate and/or supply renewable hydrogen and oxygen."

VHyNSEA: adding value to the ecosystem of seaports

The VHyNSEA project is focused on developing infrastructure for the small-scale production, storage and supply of liquid hydrogen (LH2) for ships that currently use liquefied natural gas (LNG) as fuel.

The possibility of production in situ close to the point of supply gives LH2 an advantage over fossil fuels that often have to be transported long distances, with an increased impact in terms of CO2 emissions. "Complementary LH2 infrastructure can add value to the ecosystem of a seaport and offer its existing customers alternative fuels with low carbon emissions," says Alejandro García.

With a budget of over €7.4 million, the VHyNSEA project, just like Oh!Zone, combines and applies the varied expertise and capabilities of VINCI Energies, notably from Omexom for energy system design, Actemium for process integration and Axians for IT systems integration.

Madrid's ambitions

The Spanish government hopes to install 4 GW of electrolysers nationally by 2030. Combining this with Portugal's target of 2 to 2.5 GW, the Iberian Peninsula should be able to provide 10% of the 65 GW electrolysis capacity target specified in the European Union's REPowerEU 2030 plan.

In its strategy document "Hydrogen Roadmap: A Commitment to Renewable Hydrogen" published in October 2020, the Madrid government called for green hydrogen to represent 25% of total industrial hydrogen consumption in Spain by 2030.

Beyond the industry sector, Spain also plans to gradually introduce hydrogen into sectors that have never used it before, such as transport, with the creation of a network of at least 100 to 150 public hydrogen service stations, to be easily accessible and no more than 250 kilometres apart.

Another objective is to install fuel cell energy management facilities and hydrogen supply points in Spain's five busiest ports and airports. This equates to a total investment of €8.9 billion.

ENERGY PERFORMANCE

OSLO ROCK FESTIVAL GOES DIESEL-FREE

For Norway's biggest rock festival, Tons of Rock, Omexom dispensed with diesel generators in favour of the local power supply network. The result was improved flexibility and a reduced carbon footprint, without detracting from the music.

Tons of Rock (ToR) is Norway's largest gathering of rock and heavy metal fans. The numbers tell you everything: 80,000 visitors attend the three-day festival held in a public park in the capital city, Oslo (population 711,000). With three days of music and everything that goes with such a large public event, ToR consumes a great deal of electrical energy. But there is little energy available in this vast green space in southeastern Oslo.

In previous years, Omexom Norway had used portable generators to power the stages and camping areas.

But for the 2023 festival, which took place from 22 to 24 June, the focus was on innovation and protecting the environment.

"We proposed a new solution to replace the diesel generators with a private high-voltage grid with a connection to the local power supply network," explains Ove Lende, business unit manager at Omexom Norway Critical Power. "This system required the installation of a meter, several hundred metres of high-voltage cabling and four mobile transformer substations."

Reusable temporary equipment

In total, ToR 2023 was able to use 1.5 MW from the high-voltage grid, plus another 1.25 MW drawn from two mains-voltage connections. The only fixed components required to implement this solution were a high-voltage meter and the switchover point. "The rest is installed and uninstalled each year," state Ove Lende, business unit manager at Omexom Norway Critical Power, and Benjamin Arthur Johnson, project manager at Omexom Norway Critical Power. "That's the four transformer substations, thousands of metres of high-voltage cables, the support pylons and their concrete bases."

He feels that "The biggest challenge was convincing the customer and local authorities to adopt a new solution when the previous system had worked perfectly. But the environmental aspect on a site containing so much historical interest worked in our favour. The Oslo authorities quickly understood the benefits of our proposal, including for compliance with current regulations. The customer played a decisive role in leading this change."

Less CO_2 and a smaller bill

Benjamin Arthur Johnson explains that the Omexom solution brought real benefits for the festival's organisers. "As well as the reduced carbon dioxide emissions from replacing the diesel with electricity from the grid, our new solution reduced the event's operating costs, allowing it to expand and add an extra day. With the energy factored in, the overall effect on the customer's costs was neutral, even with the extra day of the festival."

"This solution can be adapted for other events, provided there is electricity from the local network relatively close at hand."

The initiative also bore fruit for Omexom Norway itself. The business unit secured a three-year contract to supply electricity to the festival, plus two years renewable. "We are also seeing our market share increasing, with new customers coming to us looking for innovative solutions," says Benjamin Arthur Johnson. "This solution, while devised specifically for this customer and this site, can be adapted for other events, provided there is electricity from the local network relatively close at hand."

CITY PERFORMANCE

HOW THE LYON METRO IS IMPROVING ITS OPERATIONAL PERFORMANCE

A new central control room is being created to unify all the various applications and interfaces used to control the Lyon Metro network. VINCI Energies business unit Enfrasys is playing a central role in this ambitious project for the organising authority, SYTRAL Mobilités.

With its 4 lines, 34 km of tracks and 42 stations, the Lyon Metro is France's second-largest after the Paris Metro. Since entering service in 1978, its operational functions (train circulation control, passenger safety, equipment monitoring) have been managed from a central control room (CCR) located beneath La Part Dieu district. This long room contains a line of computer stations and a huge wall-mounted screen. In 35 years, this nerve centre has undergone numerous phases of modernisation, including to incorporate the fully automated Line D, and more recently, to accommodate the extension and automation of Line B.

But the current project promises a far more radical transformation of the Lyon control room. Its tools and computer systems have come to proliferate and overlap over the years, making the operators' job increasingly complex.

Since most of these applications were developed to manage a specific operational function (traffic management, passenger information, video surveillance, communication with conductors and agents, energy systems management), control room operators frequently have to switch from one tool to another to complete their different tasks.

The multitude of different graphical interfaces and the repetitive data entry hamper productivity, cause needless fatigue, and increase the risk of errors. Additionally, the multiplicity of systems makes any upgrade more complex and more costly.

Two contracts and a relocation

That is why, in late 2022, SYTRAL Mobilités, the organising authority for the Lyon region (Lyon Metropole and the Rhône department), launched Operation "Metro Network CCR" with the double aim of relocating the CCR to an operations room in Vaulx en Velin that enjoys natural light and also modernising all the human-machine interfaces (HMI).

This project includes two main IT development contracts, both awarded to a partnership between Capgemini and the VINCI Energies business unit Enfrasys.

"The first contract covers centralisation of all the different HMIs into a single application," explains Charles Delucenay, Business Unit Manager at Enfrasys. "The second involves creating a toolkit and data exchange framework common to all systems."

A single, uniform hypervisor solution to operate all the metro lines presents several advantages: optimised workstation ergonomics; more relevant information shown and therefore greater responsiveness in normal operation or when an incident occurs; improved flexibility in allocating operators according to needs and operational constraints; ease of modernisation of obsolete systems; and improved interoperability through the use of standardised communication protocols with all subsystems, making the system easier to maintain and less costly to upgrade.

Eco-design

Every day, around 700,000 journeys are made using the Lyon Metro. For the organising authority, modernisation of the CCR meets its imperative requirements of quality and operational safety. But the success of a project on this scale depends on users' ability to adopt and take ownership of the new system. The design of that system therefore plays a key role.

As the Enfrasys business development manager, Thomas Vesque, explains, "We brought in the expertise of Use.Design, a Parisian IU and UX design studio, to define a graphical layout and codesign the HMI together with the CCR operators in a series of iterative workshops. This process will have taken nearly 12 months."

The VINCI Energies business unit is involved in every phase of the project life cycle, from the design phase through to development, integration, commissioning, and finally, maintaining the system in operational condition.

Due to the need for continuity of service, validation of the IT development must be approached in a calibrated way. Testing takes place at night, between 1 a.m. and 4 a.m. This narrow window means that Enfrasys has to schedule testing ahead of time on its own premises.

Operation "Metro Network CCR" has an overall budget of €89 million, with creation of the new control room in Vaulx en Velin scheduled for completion in 2027 and transformation of the current facility in La Part Dieu into an emergency control room due in 2030.

#SOLIDARITYEFFECT

Check out the
Instagram vinci_energies
account to keep up to date with the
charitable initiatives undertaken
by VINCI Energies and its employees.

DECARBONIZING MARITIME TRANSPORT

With a carbon footprint that accounts for 3% of worldwide greenhouse gas emissions, maritime transport is as polluting as air transport or the whole of Germany. However, cargo transport – 80% of which is by sea – still outperforms every other transportation system. The decarbonisation of shipping is therefore crucial. The UN, EU, national governments and other key players in the sector (shipowners, shippers, ports, etc.) are working together to accelerate maritime transport's environmental transition.

This adaptation process is just getting started, and there are both technical and financial challenges. Solutions capitalising on advances in digital technology are targeting energy efficiency, reduced consumption and low-carbon measures. On a technological level, there are numerous initiatives for phasing out heavy fuel oil and increasing the electrification of port installations. The decarbonisation of maritime transport has yet to reach cruising speed, but the course is set and momentum is building.

SUMMARY. Maritime transport **on course for carbon neutrality**, p. 20…
"Making river transport **more competitive than roads"**, p. 23…
What solutions exist for **phasing out fossil fuel?**, p. 24… "There is **no single comprehensive solution**", p. 26…
Ports are **switching on to OPS**, p. 28… **Barcelona electrifies** its ferry terminal, p. 30…
Electric transport **comes to the Seine**, p. 32.

ENERGY TRANSFORMATION

MARITIME TRANSPORT ON COURSEFOR CARBON NEUTRALITY

Maritime transport is as polluting as air transport or the whole of Germany. The climate emergency is spurring key players in this vital sector of the global economy to accelerate its rollout of ships with lower emissions.

The International Maritime Organization (IMO) foresees a possible doubling of sea transport traffic by 2050. This is a less-than-encouraging prospect in terms of the fight against global warming.

International maritime transport is already one of the world's biggest polluters, alone accounting for 3% of greenhouse gas emissions, on a par with air transport or the whole of Germany. The sector consumes 400 million tonnes of fuel a year, of which cargo accounts for 250 million, though this represents 80% of all goods transport worldwide.

However, it is important to note that maritime transport is by far the cleanest mode of transport per tonne-kilometre of goods moved.

The climate emergency has prompted legislators to encourage the use of vessels with lower emissions. In July 2023, the European Union approved the new "FuelEU Maritime" regulation. From January 2025, large cargo vessels will be subject to the European Commission's wider "Fit for 55" legislative package.

This text introduced in 2021 aims to reduce emissions in Europe by 55% from 1990 levels by 2030, with a view to achieving carbon neutrality by 2050.

The legislation also applies a new framework, applicable from 1 January 2024 onward to all merchant vessels and passenger ships with gross tonnage of 5,000 or more: the European CO_2 Emissions Trading System. Tariffs based on the shipowner's emissions are now applied to goods entering Europe, and customers will receive invoice surcharges based on this. But policies to decarbonise maritime transport are not confined to Europe. On 7 July 2023, the 175 UN member states adopted the 2023 IMO Strategy on Reduction of GHG Emissions from Ships, with enhanced targets to tackle harmful emissions.

This strategy includes a reinforced shared ambition to reduce net greenhouse gas emissions from international shipping to zero by around 2050, a commitment to ensure an uptake of alternative fuels with zero or near-zero GHG emissions by 2030, as well as indicative checkpoints for 2030 and 2040.

Substantial investment

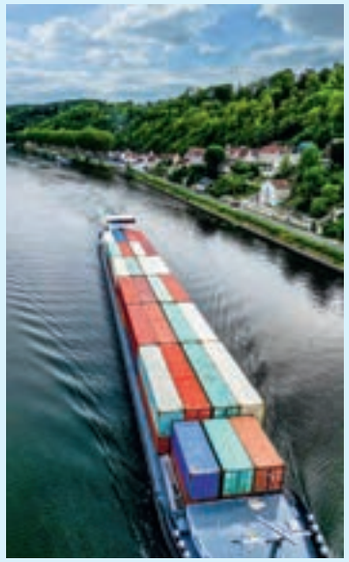
Member states are not the only entities mobilising. In December 2023, encouraged by major cargo shippers demanding zero-carbon vessels, five major shipping firms (CMA CGM, MSC, Hapag-Lloyd, HMM and A.P. Moller-Maersk) committed to the total decarbonisation of maritime transport by 2050.

This declaration, entitled Joint private and public Commitments in favour of the decarbonisation of maritime transport and also signed by France, Denmark and South Korea, is a world first. The initiative was presented in December 2023 at COP28 in Dubai. This commitment comes with a further ambition of setting a firm date beyond which all new vessels built must be powered by transition fuels. Moving beyond liquefied natural gas (LNG), which is not a "green" fuel, the initiative seeks to promote biomethane and e-methanol until such time as hydrogen and ammonia become viable. The capital required to decarbonise ships will fluctuate between an additional 8 and 28 billion dollars (€7 billion and €26 billion) a year until 2050, according to a United Nations costing. Added to which, between 28 and 90 billion dollars a year will be required for port and energy infrastructure upgrades.

The leading maritime transport companies have made a clear statement of intent, and now they must begin to adapt. The challenges are huge, both technically and financially. They will require reconfiguration of a market in which the key players are already highly concentrated. But pressure from shippers could accelerate progress. In 2021, companies including Amazon, IKEA, Inditex, Michelin, Patagonia and Unilever came together to form a new network known as coZEV (Cargo Owners for Zero Emission Vessels), in partnership with NGO The Aspen Institute, with the aim of transporting all their cargo on zero-carbon ships by 2040.

Ports join the movement

Maritime transport's decarbonisation trajectory is not only of concern to shipowners and their customers. The electrification of ports will also play an important role in the sector's energy transition, especially for passenger ships, which spend more time in port. The comprehensive solution dubbed OPS (Onshore Power Supply), of which Actemium, the VINCI Energies industrial brand has made a speciality, represents real progress.



But *"Increasing demand for electricity due to the electrification of ports requires improvements to local power supply networks,"* says Bruno Nicolas, Brand Director at Actemium, which recently created Actemium Marine.

The tidal wave of progress has also reached river transport. Its carbon impact three to five times lower than that of road transport gives river transport a card to play to its advantage. Its key players are trialling various routes toward carbon neutrality. Significant resources are being deployed to improve the energy efficiency of river craft and reduce their polluting emissions (electric, hybrid and hydrogen-powered boats), and also to modernise the waterways.

A fine example of this is the Centre Bourgogne canal system lock modernisation initiative, organised by Voies Navigables de France (VNF), the French navigation authority, with support from VINCI Energies, as is the Vedettes de Paris electrification project on the Seine. In the context of ecological transition, the potential impact of this is huge in a country like France, which boasts Europe's largest waterway network.

Three solutions and some limits

Whether on the river or the ocean, Bruno Nicolas believes that the solutions for phasing out heavy fuel oil fall into three categories.

He explains, *"The simplest way is operational improvement (using digital to optimise timetables and onboard energy management, slower speeds, etc). The second solution is technical: improving vessel design (hydrodynamics, modernisation of engines, wind-assisted propulsion, etc.). And third, the use of alternative fuels (LNG, biofuels, and e-fuels such as hydrogen, e-methane, e-methanol and ammonia), is essential to decarbonising maritime transport."*

However, experts emphasise that the various alternative energy sources are still beset by uncertainties, and indeed limitations.

> *"Most of the technologies required are already available."*

"All low-carbon fuels rely on limited resources, such as renewable energy or biomass," says Nicolas Meunier, head of the Mobility division at Carbone 4, an energy and climate consulting firm. *"And maritime transport is in fierce competition with other sectors, which will limit the activity volumes available for achieving carbon neutrality. And the other barrier is financial. All these new solutions impose significant extra costs, which have to be passed on to the end user."*

There is no single comprehensive solution. Only a combination of different solutions will make it possible to achieve the stated objectives. Bruno Nicolas concludes that *"These multiple initiatives make the stated objective for 2050 a credible one, especially as, unlike with air transport, most of the technologies required are already available."*

Key figures and dates

3 %: the proportion of worldwide greenhouse gas emissions attributable to maritime transport.

400 millions: tonnes of fuel oil consumed in the sector every year, of which cargo accounts for 250 million.

80 %: proportion of goods transported by sea worldwide.

2021: creation of coZEV (Cargo Owners for Zero Emission Vessels) network.

July 2023: Adoption of the European Union's FuelEU Maritime regulation and of the 2023 IMO GHG Strategy.

December 2023: five shipping companies commit to the total decarbonisation of maritime transport by 2050.

January 2024: European CO_2 Emissions Trading System.

"MAKING RIVER TRANSPORT MORE COMPETITIVE THAN ROADS"

Goods and passengers are also transported by river. HAROPA PORT, which incorporates the ports in Le Havre, Rouen and Paris, is France's principal port and largest logistics hub. As such, it has a key role to play in decarbonising the sector. Christophe Gauthier, HAROPA PORT's Project Management and Engineering Director at its regional headquarters in Le Havre explains the challenges.

What are the main challenges in achieving carbon-neutral river transport?

Christophe Gauthier: The main challenge is to expand this high-volume mode of transport, which generates four times fewer CO_2 emissions per tonne than road transport. Even just reducing the pressure on major roads would significantly reduce the carbon impact of transport as a whole. But to do that, we need to make river transport more competitive than roads, either in terms of cost, frequency or reliability. Given that the last mile is usually by truck, the load break involved in using river transport means finding sufficient savings to offset that extra cost. You therefore need a high-performance logistics chain with the right connections and infrastructure.

What is HAROPA PORT's roadmap in this area?

C.G. HAROPA PORT has been working to improve river transport on the Seine for more than a decade. Today, around 11% of container transport goods arriving or departing Le Havre on land use the river. But the river ports in the Seine basin are not all at capacity. Currently, about 200,000 containers go through our ports, but we could take double that with the existing infrastructure.

Which completed projects best illustrate the progress HAROPA PORT has made?

C.G. The completed developments and those still come at Port 2000, HAROPA PORT's deepwater port dedicated to container traffic are testament to the improvements we have made in contribution to decarbonising maritime transport. Since 2010, river craft with suitable capabilities have been authorised to put to sea to collect containers from Port 2000. In 2013, a multimodal system using rail shuttles was introduced to optimise this transfer of containers to river boats. And we are currently working on a development project to allow all river craft to access Port 2000 without going by sea. The project starts this year, will take two or three years, and will resolve meteorological risks, reduce transport costs (because it will allow all types of river craft to access Port 2000 whatever the weather), and increase transport capacities. Also, a river traffic management system was implemented five or six years ago, and electric charging points have been installed all along the river for use by container barges. In fact, around a hundred additional charging points are being installed as we speak.

ENERGY | TRANSFORMATION

WHAT SOLUTIONS EXIST FOR PHASING OUT FOSSIL FUEL?

There is no shortage of initiatives for decarbonising marine transport. While liquefied natural gas is looking to the future, the true solutions of tomorrow are e-fuels and perhaps... sails?

The European FuelEU Maritime regulation stipulates an 80% reduction in greenhouse gas emissions from shipping fuel by 2050. Against this backdrop, e-fuels appear to be one solution for replacing fuel oil and decarbonising the sector using engine technology similar to that in use today. Various possibilities exist, at different maturity levels, and there is no shortage of initiatives.

Hydrogen: a promising but still-limited solution

Of the various solutions, hydrogen produced using low-carbon electrical energy is no longer a pipe dream but a genuine alternative. *"Aside from the fact that the only by-product of burning hydrogen as fuel is water, its real strength is that it contains three times more energy than natural gas,"* explains Nicolas Dattez, Hydrogen Development Director at VINCI Energies, who is responsible for coordinating hydrogen projects at Leonard, the VINCI group's future-oriented innovation platform.

However, he adds, *"Because its density is so low, to store and transport it requires high-tech solutions and costly processes to liquefy or compress it."*

For the time being, LNG (liquefied natural gas) appears to have a role to play in reducing the carbon impact of maritime transport, but the sector will be hard pressed to achieve its 2050 targets without recourse to hydrogen. Compressed hydrogen could certainly be used in small craft making short journeys, and projects abound in this field. The Europe Technologies group's Hylias (Hydrogen for Land, Integrated renewables and Sea) project aims to create the first-ever ship powered by two 250 kW electric motors, with two fuel cells and 350 to 400 kg of hydrogen stored on board in 350-bar high-pressure vessels.

In addition, the use of liquid hydrogen is perfectly feasible for ships travelling moderate distances, such as some ferries. In March 2023, the Norwegian operator Norled introduced its first liquid hydrogen ferry. More than 80 metres long, this ship uses two 200 kW hydrogen cells and a 1.36 MWh battery pack powered by green hydrogen stored at a temperature of minus 252.87 °C.

From biomethanol to wind propulsion

But what about huge vessels like container ships? These are less well-suited to the use of pure hydrogen.

> *E-fuels are a way to decarbonise ships without the need to revolutionise current propulsion technologies.*

"It is extremely difficult to store the quantity of hydrogen needed for these long voyages in either a compressed or liquid state," says Nicolas Dattez. *"So, you have to consider other solutions, including hydrogen derivatives such as ammonia, e-methanol or e-methane."* He continues, *"All three compounds can be produced from green hydrogen using renewable energy sources, but the last two also require carbon dioxide (CO_2)."* Unfortunately, the infrastructure for producing these synthetic fuels has yet to be built. In the meantime, methanol or methane can be synthesised from biomass, and in that context are generally referred to as biomethanol and biomethane.

Here too, initiatives are flourishing. In September 2023, the Danish shipping company Maersk launched its first biomethanol-powered ship and has ordered five more.

Similarly, the French shipping and logistics company CMA CGM and the energy giant Engie forged a partnership in 2021 with the aim of producing and distributing greener fuels to help decarbonise maritime transport. Liquid biomethane is one avenue they are working on as part of the drive to develop a low-carbon fuel production and distribution sector for maritime transport. CMA CGM's fleet should include 44 LNG-powered shipsby the end of 2024.

In a very different vein, wind propulsion, long since left behind by merchant shipping, is back as a potential future solution for international maritime transport. The Michelin group has developed Wisamo, an inflatable sail hoisted and lowered on a telescopic mast. Recognised by the Solar Impulse Foundation in July 2023, this technology can be used with any type of ship thanks to a high-performance inflatable sail system.

"Ultimately, the simplest way to reduce ships' per-kilometre fuel consumption is to reduce their speeds," concludes Nicolas Dattez.

“THERE IS NO SINGLE COMPREHENSIVE SOLUTION”

Bruno Nicolas, Actemium Brand Director, discusses “new fuels” and how competitive they are.

What are currently the most competitive “new fuels”?

In the short term, LNG, which is still a fossil fuel, can help reduce CO_2 and particulate emissions. It is also a way to transition to greener biofuels and e-fuels, which will be usable without modifications to existing engines and fuel tanks on ships designed for LNG.

You’re speaking in the future tense...

Biofuels are already being produced in small quantities at a reasonable cost and should enable us to comply with our 2030 incorporation obligations. But e-fuels are still in the pre-industrialisation phase. They are more costly to produce due to the cascading returns, and require plentiful low-carbon electricity.

What are the factors affecting the competitiveness of these new fuels?

The competitiveness of e-fuels compared with fossil fuels depends on three factors: investment cost, the availability of cheap low-carbon electricity, and carbon taxation. A combination of biofuels and e-fuels is one suggested solution to make unit prices more competitive. The adoption of stringent international standards (through the International Maritime Organization) combined with national government incentives is essential for accelerating energy efficiency improvements in maritime transport.

What are the most promising solutions in the longer term?

There is no single comprehensive solution. Only a combination of different solutions will make it possible to achieve the stated objectives. The result will depend heavily on our capacity to produce and distribute low-carbon alternative fuels.

Solutions for phasing out fuel oil

- **Electricity:** suitable for shorter distances, because of the volume of batteries to be carried.
- **Hydrogen:** virtuous when produced using renewable energies, but difficult to store and transport.
- **E-ammonia:** cheap, easy to store, but highly toxic.
- **Biomethane:** produced from the methanisation of biomass, this gas has limited production capacity.
- **Biomethanol:** biofuel produced from biomass.
- **Other synthetic or e-fuels (e-methane, e-methanol, etc.):** easily usable in place of current fuels, but production is still in its infancy, and they remain expensive.
- **Nuclear:** zero greenhouse gases and a high degree of autonomy, but there are safety concerns.
- **Wind:** has the lowest carbon impact, but does require engines as backup.

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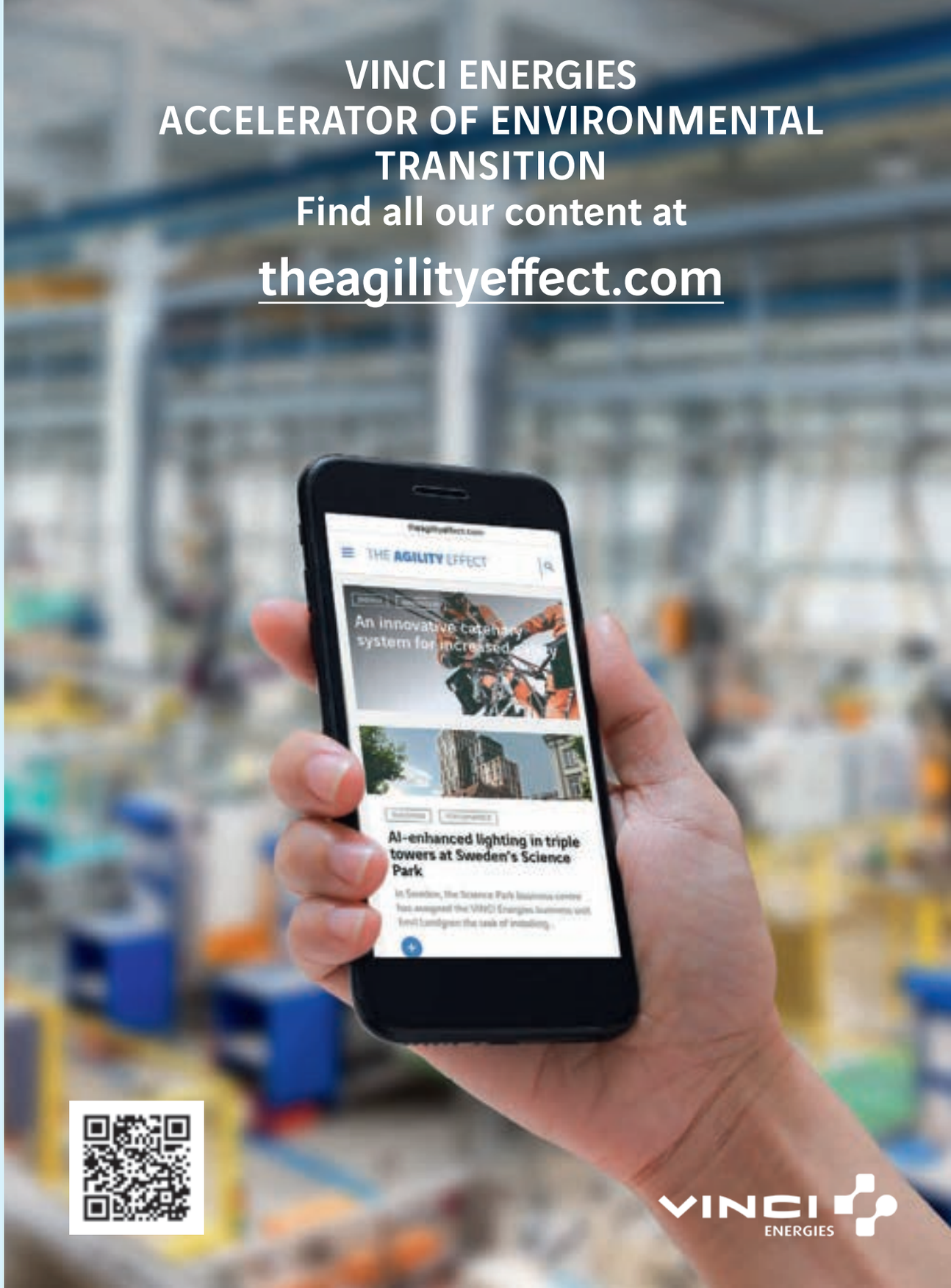


ENERGY | TRANSFORMATION

PORTS ARE SWITCHING ON TO OPS

As part of the drive to reduce greenhouse gas emissions from ships, quayside electrical supplies will become the norm by 2030. Actemium is extremely active in one future solution: Onshore Power Supply.

The decarbonisation of maritime transport is not confined to the high seas. When docked in port, ships do not typically stop their engines. Even when berthed, they need electricity, if only to keep the lights on. This is not only noisy and smelly, but also produces significant greenhouse gas emissions. This is a sizeable problem, considering that 74 percent of European imports and exports are transported by sea.

The good news is that a solution exists to significantly reduce emissions from ships in port: Onshore Power Supply (OPS).

This system allows ships to connect to the local power supply network, and is all the more environmentally friendly if the local grid uses low-carbon energy.

Technically speaking, an OPS system is composed of a substation that receives and distributes electricity from the grid, a frequency converter to provide the required frequency (typically 60 Hz for ships as opposed to 50 Hz for most onshore electrical networks) and a cable management system to transfer the electricity from the quayside to the ships. With this type of installation, the reduction in emissions can be in the order of 30 percent for SO_X (sulfur oxides), 70 percent for CO_2 (90 percent in France due to the French energy mix) and 95 percent for NO_X (nitrogen oxides).

A booming market

Outside Germany and the Nordic countries, few ports are currently equipped with OPS. But that could change quickly. The European regulation states that "From 1 January 2030, a ship at berth in a port of call under the jurisdiction of a Member State shall connect to on-shore power supply and use it for all energy needs while at berth."

Through its Actemium brand, VINCI Energies has been developing this technology for a decade in several European countries and the United Arab Emirates.

The OPS market is not lacking in growth opportunities. In France, there are future projects in Cherbourg, Caen-Ouistreham, Dieppe and the container terminals in Le Havre. In Spain, for example, in 2023, the Autoridad Portuaria de Valencia (APV) initiated a call for tenders for an OPS to power ships at the Transversal Costa-MSC quay (budget: €12 million). At the same time, a new electrical substation (part of a separate call for tenders) will supply green energy to the Transversal Costa-MSC quayside electrification project.

The OPS market is not lacking for growth opportunities, especially in Europe, thanks to new European regulation.

Major contract in Le Havre

One of Actemium's most recent contracts, announced in February 2024, covers the installation at the Pointe de Floride terminal in the Port of Le Havre, a port of call for cruise ships that receives 150 stopovers a year.

"We will be equipping each of the terminal's three berths," says Loïc Vizioz, Business Unit Manager at Actemium Brest Major Projects. To do this, he will be calling on Actemium Brest, the expert in this field, which has already installed OPS for French Navy frigates in Brest and the first quayside connection for container ships in the Port of Dunkirk.

"Due to its scale, with a maximum capacity of 30 MW, this €25 million project is rather complex to manage. We also have to deal with the large (9-metre) tidal range here and the need to keep the cruise ship business running during the work. Not to mention the ambitious schedule: the first phase is due for handover in spring 2025."

ENERGY | TRANSFORMATION

BARCELONA ELECTRIFIES ITS FERRY TERMINAL

The Port of Barcelona has awarded VINCI Energies Spain the pilot project to electrify the docks in its ferry terminal. This is a first step toward becoming a carbon-neutral port by 2050.

With an investment of more than €110 million, Nexigen, the quayside electrification plan for the Port of Barcelona, is one of the main projects the port is promoting to reduce its CO_2 emissions by 50 percent by 2030 and become a carbon-neutral port by 2050.

Around €90 million of the total will be invested in OPS (onshore power supply) systems to connect docked ships to the electric power supply network, using clean energy from certified 100 percent-renewable sources. The remaining €20 million will be used to create the power network infrastructure (substations, high-voltage connection and medium-voltage network). The aim is to supply electricity to all cruise ship mooring points by 2030.

Five VINCI Energies business units working together

In May 2023, the Port of Barcelona awarded VINCI Energies Spain the €3.6 million contract for the dock electrification pilot project. VINCI Energies has previously been involved in 39 OPS system installations worldwide (in Sweden, France, Norway, United Arab Emirates and Denmark).

"The call for tenders included project design and execution, as well as the ship connection and disconnection service, installation maintenance, and the supply of electricity to ships in the ferry terminal," explains Alejandro García Gómez, Hydrogen and Ports Director at VINCI Energies Spain. "The terminal will have two berths equipped with OPS systems, allowing ships to stop their engines while in port, which will avoid polluting emissions."

The project required collaboration between five VINCI Energies business units from 3 different countries: Omexom Spain, INOVE Ingeniería (Spain), Axians Spain, GTIE Synertec SAS (France) and Actemium Electro AB (Sweden). (see boxout).

"As the first-ever OPS scheme for ferries in Spain, this project represents a real challenge, with new teams put together specially."

Organisational and technical challenges

"As the first-ever OPS scheme for ferries in Spain, this project represents a real challenge," says Alejandro García Gómez, "Because the teams, for example the cable management team, were put together specially f or this project. Fitting the civil engineering work in particular around the day-to-day workings of an operational port is also a major challenge."

The project began on 30 May 2023 and is scheduled for handover in January 2025. According to calculations by Puertos del Estado, the public company responsible for managing Spain's state-owned ports, the per-ship reduction in emissions will be 8 percent for SO_X (sulfur oxides), 64 percent for CO_2, 96 percent for NO_X (nitrogen oxides), and 94 percent for particulates.

Five business units at work

The quayside electrification pilot project for the Port of Barcelona involves five VINCI Energies business units:

- **Omexom Spain** will carry out the connection work with the electrical distributor and civil engineering work, install medium-voltage power lines, set up the OPS substations, supply and install the CMS (cable management system) and the two quayside terminal boxes, and finally, test and commission the installation.
- **INOVE Ingeniería** (Spain) will manage the construction project, design the OPS substation information management system, and install and connect the fibre-optic cabling.
- **GTIE Synertec SAS** (France) will supply the OPS substations.
- **Actemium Electro AB** (Sweden) is bringing in a team manager with experience of similar projects and of performing the initial ship connection and disconnection operations
- **Axians Spain,** in coordination with Omexom, is helping to define the right networking and cybersecurity architecture for all the elements of the OPS solution in a scalable and secure way. After the final architecture of OPS is accepted, Axians is also planning to supply and configure all the required elements for providing connectivity and cybersecurity to the OPS solution.

ENERGY | TRANSFORMATION

ELECTRIC TRANSPORT COMES TO THE SEINE

Vedettes de Paris, an operator of tourist boats on the Seine, appointed Actemium Marine to upgrade its fleet of five vessels to use electric engines.

The decarbonisation of water transportation is not confined to cruise liners, supertankers and giant container ships. It also applies to river transport, particularly in urban areas, and primarily involves the electrification of watercraft.

In the French capital in autumn 2021, the transport operator Vedettes de Paris committed to a proactive "responsible" climate change policy with the aim of halving its carbon impact by 2024. As part of this policy, the company decided to electrify its fleet of five tourist boats, each of which can carry 250 people. The conversion cost is estimated to be €7.5 million.

A competitor to Bateaux Mouches and Bateaux Parisiens, the company employs between 70 and 100 people depending on the season. On 1 February 2024, it relaunched its first transformed 100% electric-propulsion vessel, the Paris-Trocadéro. Two more vessels are due to be similarly equipped this spring, and a fourth in 2025, the transformation of which is currently in the design phase. The electrification of each boat will avoid 460 tonnes CO_2 equivalent per year.

To meet this challenge, Vedettes de Paris approached Actemium Marine following a call for tenders that concluded in June 2022. Actemium Marine, which since 1 January 2024 has included teams from Barillec Marine and Cegelec SDEM Dieppe, was awarded the project in its entirety (see box).

Challenges and constraints

"This is the first transformation of its kind on a sightseeing cruise vessel of this size," says Bruno Libert, Business Unit Manager at Actemium Marine Fluvial. And it presents a number of challenges, the first relating to the power required: it involves "Optimising communication between the different parts of the system so that battery charging and discharging occurs in a balanced way. It's all a question of automation."

> *"The first transformation of its kind on a sightseeing cruise vessel of this size"*

But the installation of an onboard electrical power plant to allow zero-emissions navigation of the Seine presented another challenge: the need to match the customer's business model based on ten 75-minute journeys per vessel per day.

As Bruno Libert explains, "Knowing that each craft takes around twenty minutes to disembark and embark its passengers, we decided to implement a rapid charging system, which allowed us to optimise the size of battery bank on board."

For help with sizing the battery banks, Actemium Marine made use of technical and regulatory transformation and integration studies carried out by the naval design studio Ship ST.

This collaboration, which also drew on the expertise of the Parisian boatyard Chantiers Navals du Nord Vanpraet, ultimately opted to oversize the battery banks. "The customer selected this option based on the impact of the Seine's strong current on power consumption," says Bruno Libert. "It allows us to take normal battery aging into account and ensure that the boats can work under the current operational constraints for the next seven to eight years."

A complete electrical conversion package

The full electrical conversion package for Vedettes de Paris includes the electrical conversion cabinets, the batteries (each vessel is fitted with two 550 kWh packs, each containing 40 batteries that weigh 125 kg apiece), two energy conversion batches, the electric engines, and the central control system that makes piloting the vessels easier and safer, so that pilots need not worry about the complex electrical architecture behind this type of propulsion, and can instead concentrate on navigation.

INDUSTRY ACCELERATION

PRIVATE 5G GAINING GROUND IN THE WORLD OF INDUSTRY

Use of industrial 5G, most commonly implemented in the form of private networks, will undoubtedly continue to expand thanks to its huge promise in terms of personal and data safety, maintenance of installations, and process performance. Thierry Delpech, Industry 5.0 expert at Actemium, gives us an overview of the situation.

Driven by the digital revolution and ecological transition, French industry is making fundamental changes to its models and tools, and the growth of 5G is offering businesses opportunities to accelerate their transformation. Unlike previous mobile network technologies such as 3G and 4G, 5G was designed for use in business, especially industry and infrastructure. In particular, 5G can be an asset when deploying wireless networks in installations that require high levels of coverage, speed and security.

What are the key advantages of the fifth generation of mobile telephony standards? It offers higher bandwidth (at least 10 times that of 4G), latency in the order of one millisecond, capacity for a million connected objects per square kilometre, and improved cybersecurity.

Development of specific applications

In the world of industry, 5G is mainly taking hold in the form of private local networks that are independent of public networks, reducing their exposure to public interfaces and protecting businesses from the risk of congestion.

Thierry Delpech is an Industry 5.0 expert at Actemium, the VINCI Energies brand specialising in industrial processes. He explains: "Private 5G presents numerous advantages for manufacturers mindful of keeping their data secure from external and internal threats. It also allows enormous quantities of data to be processed, given the proliferation of data sources."

In a private configuration, businesses take ownership of frequency bands, issued by the local regulator (e.g. Arcep in France) on payment of a licence. Network service zones are divided into small areas called cells. The ability to "slice" the 5G network allows businesses to define multiple virtual networks on shared physical infrastructure, with each optimised for a specific group of applications.

Private 5G also makes it possible to tailor service levels to the criticality of each operation. As the sole administrators of their networks, businesses can define different levels of priority access according to their needs.

"In sectors like chemicals or petrochemicals, where production sites are often very spread out, owning their own networks allows operators to configure service quality priorities to cater for emergencies," says Thierry Delpech. "In alert situations for example, evacuation orders will be transmitted seamlessly, even to employees who are quite remote." This is thanks to one of the main benefits of 5G in industrial situations, namely its coverage outdoors, where Wi-Fi is often impractical.

Unlike operator networks, private 4G and 5G were specifically designed for use in business.

Supplementing Wi-Fi

Another major application for 5G is mobile connection for automated guided and remotely controlled vehicles, IoT devices, and virtual-reality remote maintenance. It makes tours of inspection, safety audits and maintenance operations more efficient by enabling operators equipped with tablets or smartphones to capture, input and share data in real time.

In Europe, industrial 5G is currently most used in Germany, especially in the automotive industry, where private networks are used to securely transmit data to production-line robots with minimal latency.

And in France? "Communication technologies such as Wi-Fi, and even wired technologies, are still eminently suited to certain applications," says Thierry Delpech. "5G is therefore more a supplement than a replacement technology. But the lower costs for acquiring frequency bands decided in early 2023 really sparked interest among manufacturers."

Actemium Rennes is involved in numerous projects to interconnect autonomous mobile robots (AMR) so they can communicate with their industrial environment indoors or outdoors. With 5G, large amounts of data can be exchanged – video streams for example. It also makes the network far less susceptible to the interference generated by some of the equipment on industrial sites.

At a specialist chemical site in the Centre-Val de Loire region, Axians teams are currently working to replace an old walkie-talkie network with a "push-to-talk" system on a private 5G network. This system migration also makes it possible to perform scans and connect industrial equipment in ATEX zones not accessible via the Wi-Fi network.

"5G is still in its infancy, primarily due to a limited ecosystem of equipment and terminals," notes Thierry Delpech. "To work around this, we are recommending installation of a private 4G network that can be upgraded to 5G without adding any extra infrastructure. That way, manufacturers can familiarise themselves with the technology and gradually introduce new uses when they become mature."

INDUSTRY | PERFORMANCE

ACTEMIUM AT THE WHEEL WITH AUDI

The design and construction of a new Audi logistics centre is the result of close collaboration between the automaker and two VINCI Energies business units, Actemium ASAS Valencia and Actemium ASAS Saarbrücken. This was a major challenge in terms of coordinating all the stakeholders.

In March 2023, Audi opened a new logistics centre in Ingolstadt, in the south west of Germany. The site includes an automated warehouse with eight stacker cranes and a capacity of 60,000 KLT containers, a circuit of entry and exit conveyors, picking stations, and a robotic palletisation station, in a facility capable of handling 1,200 orders an hour.

Commissioning this centre enabled the renowned Volkswagen-group manufacturer to double its capacity for managing replacement parts and reduce delivery times to its customers – central European Audi dealerships.

The VW group entrusted Actemium with the design of this new logistics centre, one of the largest of its type ever built by the VINCI Energies brand specialised in optimising industrial processes. "The €9.5 million tender was awarded in January 2021," explains Eloy Hernandez Coffey, Commercial Director at Actemium ASAS Spain, which specialises in materials handling systems, particularly in the automotive sector. "Production ramped up gradually from the summer of 2022 onward, with the site reaching full capacity in March 2023.

The organisation of this large-scale project was managed by two teams from the Actemium network working in tandem: ASAS Valencia (Spain) for all back-office tasks, engineering studies, design, fabrication and testing; and ASAS Saarbrücken (Germany) for direct customer management, with a project manager, a site manager and an engineering coordinator working closely with the customer and ASAS Valencia.

Lengthy engineering phase

As Eloy Hernandez Coffey explains, "Actemium ASAS is used to this type of collaboration with group business units and the formation of cross-business teams hailing from different countries, including Spain, Germany and the United States. How a project like this is launched internally is key: the team meets and defines each member's responsibilities. A single overall project manager has final responsibility for making the project a success, and is the main contact for all stakeholders."

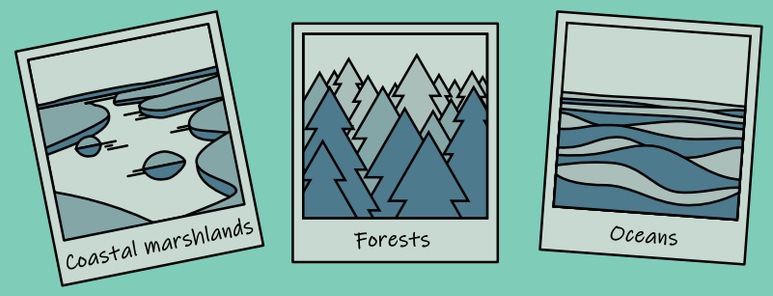
Unlike most VW group projects, while Ingolstadt was guided by a precise picture of the customer's needs, the specific solution had to be invented from scratch. "The solution was conceived in a lengthy engineering phase that kept getting longer due to new functionality requirements," says Eloy Hernandez Coffey.

"A single overall project manager has final responsibility for making the project a success."

Another unique feature of this project was the development of a custom software layer that connected to Audi's ERP system and encompassed warehouse management and the picking management software. Ten Actemium engineers were involved in the design and construction of the new logistics centre, making full use of 3D design solutions. The completed project is testament to the innovative solutions Actemium can bring to the logistics sector.

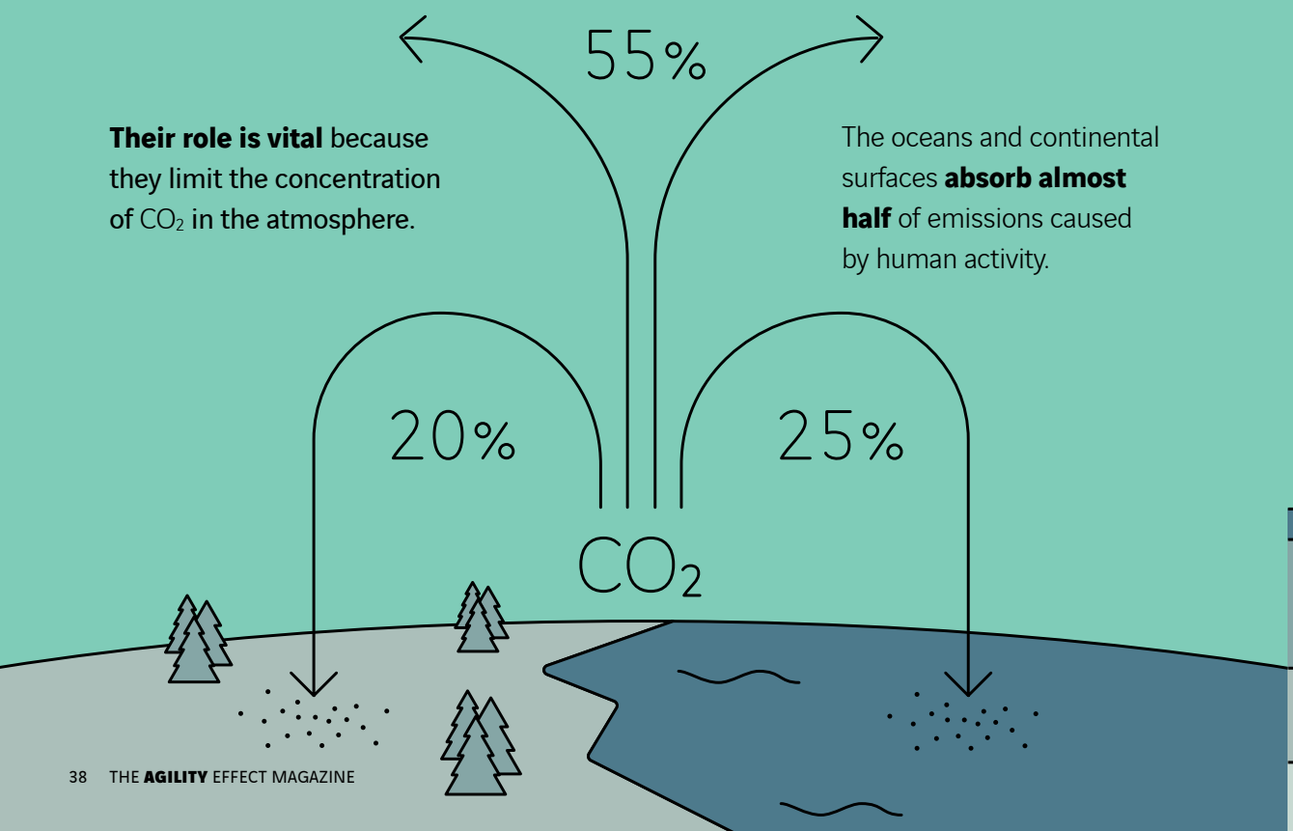
THE ROLE OF CARBON SINKS IN THE ENVIRONMENTAL TRANSITION

Natural carbon sinks are ecosystems that naturally absorb and store CO_2 present in the air.



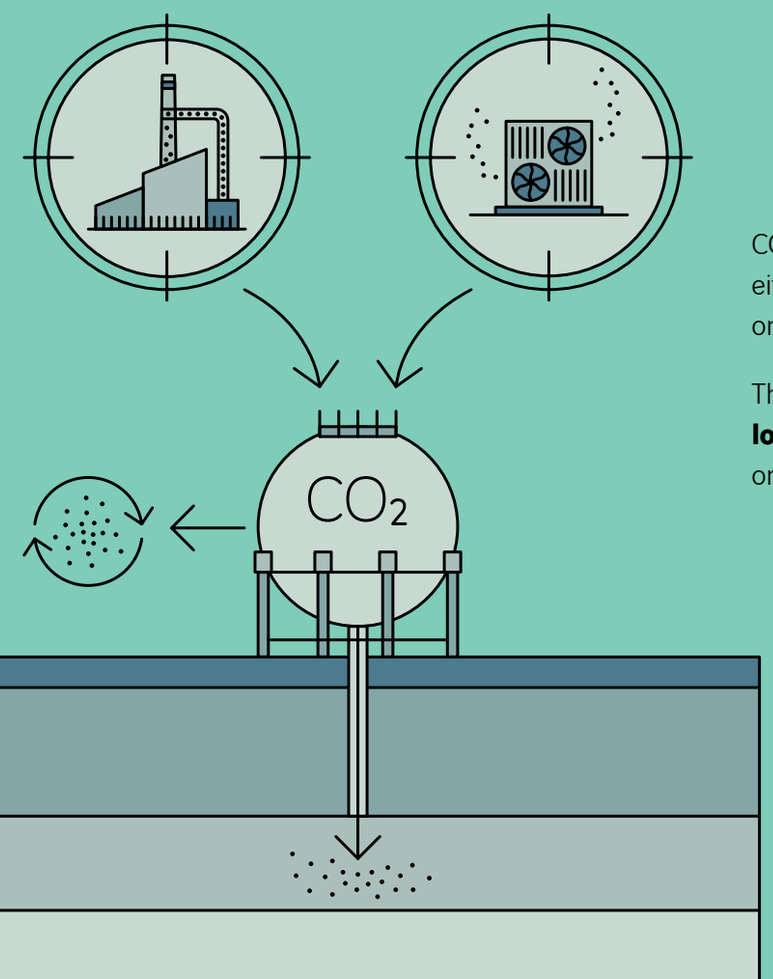
Their role is vital because they limit the concentration of CO_2 in the atmosphere.

The oceans and continental surfaces **absorb almost half** of emissions caused by human activity.



Technological carbon sinks are solutions created by humankind to capture CO_2 emissions from the atmosphere.

According to the International Energy Agency, technological sinks could **reduce emissions 15% by 2060.**



CO_2 is first **captured** either at the emission source or from the air.

The CO_2 is then **stored long-term** in subsoil or **reclaimed**.

Watch the animation

INDUSTRY INNOVATION

RIGOROUS PROCESSES FOR GENE THERAPY

Pharmatech firm Yposkesi is due to begin operations at its new site south of Paris in 2024. Actemium Paris Process Instrumentation will be installing the site's power-supply and extra-low-voltage infrastructure.

Gene therapy is a major source of hope in the battle against cancers, blood disorders, and genetic, hereditary, and neurodegenerative diseases. The therapy works by introducing genetic material – DNA or RNA – into an organism, but this requires complex and extremely costly technology.

Production capacities for gene therapy medication are currently limited, but research is progressing, with more than 2,000 trials currently under way worldwide, within an active and innovative ecosystem.

Yposkesi (from the Greek word for "promise") is a company specialising in gene therapy medicines. The business produces custom-developed solutions that enable pharmaceutical laboratories to manufacture their medicines, and recently developed a new 5,000 sq. metre production site on the Genopole Campus, south of Paris. The aim is to triple production capacity, made possible in part by four new 1,000-litre bioreactors.

Power supply, extra-low voltage and clean rooms

"To reduce the (often very high) costs of these treatments, healthcare-sector manufacturers have no choice but to prioritise productivity," explains Olivier Bardet, Business Unit Manager at Actemium Paris Process Instrumentation, which is responsible for power supply and extra-low voltage work at the new site. "The difficulty lies in reconciling this with the exacting and strictly non-negotiable hygiene requirements for the clean rooms."

The VINCI Energies business unit joined forces with Tunzini (VINCI Energies), CBI (VINCI Construction) and FOSELEV to provide comprehensive implementation of Yposkesi's specifications.

"The healthcare sector has extremely rigorous certification processes for new units, which can take between six and twelve months," says Olivier Bardet. "You then need approval from the French national agency for medicine and health product safety."

Production will require around 80 operatives, and the plant should be ready to start producing batches in 2024.

ICT BUILDINGS

RECONCILING ECOLOGY WITH CONNECTIVITY

High-performance thermal insulation can impair connectivity in new commercial buildings. The solution? DAS (Distributed Antenna System).

New construction techniques and materials have helped us make significant environmental progress by providing maximum thermal insulation. But these new environmentally friendly buildings have a limitation: they are so well insulated that it becomes difficult for radio waves to pass through them. This phenomenon is causing connectivity problems for employees and customers working in these "cutting-edge" office buildings.

At least 80% of mobile voice and data traffic originates inside a building, primarily from mobile devices. Otto van den Wijngaard, Business Development Innovation Manager at Axians, the VINCI Energies ICT brand, explains that "The rollout of 5G is only accelerating the problem, because the technology uses high frequencies that require a stronger signal and are even less able to pass through these new buildings."

Dropped connections, being unable to hear someone properly or failing to play a video can be frustrating, but more importantly, can quickly become a competitive disadvantage. Additionally, a weaker connection leads to more frequent charging of mobile devices: smartphones and tablets consume far more battery power when they have to transmit a stronger signal to reach the network.

Three-letter solution

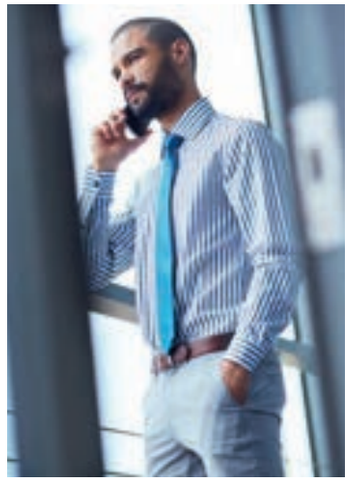
There is a solution to this trade-off between ecological progress and connectivity, one that can be summed up in three letters: DAS – an abbreviation of Distributed Antenna System. With this technique, a mobile operator's signal or private mobile network signal can be transferred from the outside to the inside. DAS also increases capacity, so that more users can access the network simultaneously.

There are different types of DAS system: passive (cables and antennas), active (amplifiers and intelligence), and hybrid. As Otto van den Wijngaard says, "The right choice between these different systems depends on the building type, available space, distances, usage patterns and budget."

"DASaaS"

Installing a DAS during a building's construction is far less costly than adding it to an existing building. More and more construction firms are therefore thinking about mobile coverage within buildings when designing or renovating them. Now considered a utility alongside water, gas and electricity, connectivity – via DAS in this case – is increasingly being provided on a subscription basis.

Taking all these factors into account, Axians developed a "DAS as a Service" solution. Otto van den Wijngaard explains that "This solution ensures good indoor coverage; offers flexibility in terms of finance, management and maintenance; and is modular enough to adapt to almost every situation, even if we need to connect several buildings or accommodate large numbers of users or devices, while remaining operational in the long term."



WHAT TO DO ABOUT DARK DATA?

Billions of information assets lie dormant on servers and in data centres. The financial and environmental cost of this so-called "dark data" has become a problem that can no longer be ignored.

According to a study conducted by the Enterprise Strategy Group institute for software publisher MEGA International, the average amount of data in organisations doubles every two years. Currently, businesses generate 1.3 billion gigabytes of data worldwide every day.

A large proportion of this information is dark or cold data, also called "dormant data". Rarely, if ever, accessed or used, it is generated by countless interactions of users of information systems in businesses and organisations. Server log files, geolocation data, emails and attachments are some examples.

The expansion of the cloud and the increasing use of the Internet of Things (IoT) will only accelerate this mass production of cold data. At global level, The State of Dark Data 2019 report published by TRUE Global Intelligence for Splunk, a software company, estimated that dark data accounted for 52% of data stored in the world.

A hefty bill

As dormant data accumulate on business servers and in data centres, they create a considerable financial burden. A study by American firm International Data Corporation (IDC) finds that costs amount to about €2 billion each month worldwide. Add to that, a high and increasing environmental cost: according to a Veritas study, dark data were responsible in 2020 for the emission of 6.4 million tonnes of CO_2, the equivalent of the carbon footprint of a car travelling 575,000 times around the world.

The data sector already accounts for 4% of greenhouse gas emissions. Data centres alone have a larger carbon footprint than that of the aviation industry (2.5% of CO_2 emissions compared with 2.1%).

A third aspect that senior executives should consider is the explosion in vulnerabilities caused by large amounts of data, which could threaten the security of business information systems.

Waking up to the problem

The issue is clearly not a priority for businesses. "Who is going to take responsibility for deleting this data? No one even wants to half-open the door to clean it all up. It's often easier to keep the data," says Cor Bonda, data & analytics lead consultant at Axians Netherlands.

It is time, however, to give the matter serious thought, now that energy prices and data-centre storage costs are soaring. What's more, regulations like GDPR on the management of personal data, of which there are an increasing number, require that information is not retained indefinitely.

But businesses and especially SMEs with limited resources are often left wondering how to find this data. "In many cases, organisations don't even know they have dark data! So the first thing to do is to identify those assets," notes Cor Bonda. The next step is to classify which cold datasets need to be kept in cold storage, which can be tapped into and which should be permanently deleted.

"You should establish a data management policy that is shared by everyone in the business. But you should use your needs as a starting point, rather than the data."

What solutions are there?

"To do this, you should use your needs as a starting point, rather than the data. And establish a data management policy that is shared by everyone in the business," recommends Axians' data & analytics lead consultant. He adds however that, "first and foremost, you should focus on generating less data; then you have less dark data."

Training teams in these issues, carrying out regular audits so as to identify and eliminate dark data, mapping and creating processing records of personal data to monitor the asset life cycle are all solutions that can help. This kind of work in locating, identifying and classifying data can be optimised by artificial intelligence (AI). Furthermore, AI may be an attractive tool for unlocking the value of dark data. It can significantly improve client knowledge and relationships by using and better leveraging hitherto dispersed client-related data.

ICT PERFORMANCE

LIGHT FROM DATA IN THE AZORES

Axians has implemented a solution for Electricidade dos Açores that offers a complete approach to data analysis and regulatory reporting, automated and in real time. This enables the energy supplier to effectively monitor its activity, make more objective decisions and improve performance.

Electricidade dos Açores (EDA) is the electricity supplier, network operator and distributor for the islands of the Azores in Portugal. The company, which supplies electricity to 250,000 customers, is also committed to protecting the islands' environmental and cultural heritage and to promoting the transition toward renewable energies in the region.

To comply with tighter regulation and provide the required analyses, EDA needed to significantly improve its data collection and analysis, along with its key performance indicator (KPI) monitoring. To meet these challenges, the firm had to invest in robust data management and analysis solutions, rationalise its processes, and foster a culture of decision-making based on data.

This was the context in which Axians, the VINCI Energies ICT brand and an EDA partner of ten years' standing, was tasked with designing a complete data analytics solution.

As João Monteiro Simões, project/client manager for this project at Axians Portugal, explains: "The objective was to provide a data analytics solution to monitor commercial and service KPIs, and also to ensure compliance with reporting obligations to the Portuguese regulatory authority."

The Axians solution implemented a more effective reporting process based on the automated collection and correlation of data. He adds, "This near real-time data collection uses smart meters to collect data from power plants and grid sensors to provide advanced analytical capabilities to monitor and optimise business performance."

Numerous issues to address

The solution was installed in 2018 and has since been continuously updated with new analytical capabilities. It includes five modules providing data modelling for: consumption; billing and debt; financial assets; production and distribution, equipment portfolio; and lastly, quality of service.

"This real-time data collection offers advanced analytical capabilities."

"There were a number of issues to address in implementing this solution," says João Monteiro Simões. "These included the integration of data from different sources; managing change in processes, workflows and organisational culture; implementing appropriate security measures; the need to maintain the solution's performance level without interrupting or slowing down existing systems; and establishing a long-term maintenance and support plan, which is crucial to the solution's continuing success."

With this system, offering a complete approach to data analysis and regulatory reporting, automated and in real time, EDA teams were able to focus on commercial analysis, growth and sustainability in their business, making informed decisions based on data.

ENERGY | ACCELERATION

BUILDER OF RENEWABLE ENERGY PROJECTS

Recently appointed as the Renewable Energy Business Unit Manager at Omexom Göteborg, Kristoffer Ekman is committed to projects involving battery-based energy storage, a booming sector in Sweden.

The aim of the Bredhälla BESS (Battery Energy Storage System) project in southeastern Sweden is to create a battery storage installation with a capacity of 43 MW. In Landskrona, another 250 kilometres to the south, just across the Øresund Strait from Denmark, the Swiss energy production and distribution company Axpo, which has been operating in Sweden since 2005, is also building a 20 MW battery storage facility.

Kristoffer Ekman, Renewable Energy Business Unit Manager at Omexom Göteborg, is closely associated with both these major projects. "It's exciting and hugely rewarding to work on projects like these that will have a direct impact on Sweden's energy transition," he says.

> *"My duties are as technical as they are commercial and managerial, all with an entrepreneurial spirit"*

Appointed to his post last January, 47-year-old Kristoffer Ekman's current assignments are more compatible than ever with his personal tastes and values. "At VINCI Energies, I was able to expand my area of responsibility into a core strategy area for the Group that is particularly close to my heart: energy transition and environmental protection."

While his team currently numbers three people, Kristoffer Ekman fully intends to develop increasingly sustainable new products over the coming years, and thereby expand his business unit in terms of both activity and size. "I really appreciate the diverse nature of my duties, which are as technical as they are commercial and managerial, all with an entrepreneurial spirit that involves finding new projects and new customers. It requires a fair bit of creativity."

ENERGY | CUSTOMIZATION

WHAT SHE LOVES BEST ABOUT HER JOB IS… THE UNEXPECTED

Andreaa Popescu is a Project Manager at Frigotehnica in Romania and a specialist in commercial and industrial refrigeration. What she most likes about her job is novelty, managing the unexpected, and the need to constantly adapt.

Knowledge sharing is important to Andreaa Popescu; after all, she decided to study engineering at the Politehnica University of Bucharest due to the fact that her father, mother and one of her sisters were all engineers in the construction industry. "Given my family environment, becoming an engineer quickly became the obvious choice for me," she said.

After four years designing hydraulic machines for a specialised company, she joined Frigotehnica in 2012. "I didn't know anything about refrigeration! But the prospect of learning more about a new field, and in a Project Manager role, is what helped me make up my mind."

"I didn't know anything about refrigeration! But the prospect of learning more about a new field helped me make up my mind."

Here in particular, knowledge sharing was once more decisive for Andreaa. "My more experienced colleagues immediately took me under their wing and taught me a lot. Two days after I started, my manager had to go on a work trip. I was left to finalise a contract for a client. It was very stressful but also very educational!"

Now, at 39, Andreaa manages two of Frigotehnica's biggest accounts: Lidl and Penny. In 2022 alone, she managed equipment for over 15 Lidl stores in Romania. This year, she is responsible for equipping a dozen points of sale for the company's new client, Penny. When working with both Penny and Lidl, as a Project Manager, what she really likes is managing the unexpected. "We have to come up with solutions in every situation."

BUILDINGS | INNOVATION

4.0 BUILDING DESIGN EXPERT

Having joined Netherlands-based Bosman Bedrijven, part of VINCI Energies, in 2021 Tjerk Alewijn created his own role as R&D coordinator BIM. His work involves using several available tools and standards, and in the near future artificial intelligence to develop an intelligent, autonomous building modelling system.

Tjerk Alewijn is responsible for maintaining and designing the building modelling system within Bosman Bedrijven, which will be managed entirely by artificial intelligence (AI) in the future. R&D coordinator BIM at Bosman Bedrijven, a Dutch VINCI Energies business unit breaking new ground in Building Information Modelling (BIM), the 33-year-old engineer has been working on this ambitious project which seeks to take the way of working adopted by the company back in 2015 to a new level.

"The BIM way of working, which is using Autodesk Revitas a tool, was originally launched to upgrade the method for managing and developing building construction projects." explains Tjerk. "Now, with data and AI, the aim is to make the model more intelligent and effective. By minimising human intervention, we can optimise workflow management in building design and thus considerably reduce turnaround times, costs and the environmental impact of projects."

"AI will help save raw materials and energy by reducing the time spent on the computer design of a BIM model to a few hours."

The sustainable development dimension of his job is a recurring theme for the engineer. "AI will eventually help save energy by reducing the time spent on the computer design of a BIM model to a few hours or even minutes. The process currently mobilises several people at their computers sometimes for more than three years, depending on the size of the project." he points out. "It will eventually also help save raw materials by quickly being able to optimize the design and use of materials within the BIM models."

INDUSTRY 5.0: USE TAKING PRECEDENCE OVER TECHNOLOGY

Three years ago, the Industry 5.0 concept emerged from the debate around business transformation. It is more an evolution of Industry 4.0 than a revolution, and its watchwords are meaning, sustainability and efficiency.

Industry 4.0 has been a fixture for 20 years now, to the extent that it has become a catch-all concept. Many people are unsure what exactly it involves. Industry 4.0 can be thought of as a toolbox of constantly changing technological building blocks for optimising production processes.

But a new concept has emerged in the last three years, namely Industry 5.0, which is not really a revolution, but more an evolution of Industry 4.0. Its aim is to give meaning to the application of new technologies. It serves as a kind of instruction manual.

The aims of Industry 5.0 were clearly defined by the European Commission, based on three pillars: human focus, sustainability and resilience. Technology must therefore be a means for everyone to enhance their skills, and acquire more autonomy and responsibility for value-added tasks. The benefits of this approach are that it increases employee loyalty and makes industry more attractive to young people.

By also considering the environmental impact of technology, Industry 5.0 addresses the topic of sustainability. Last but not least, by bringing increased flexibility and agility, technologies must also make businesses more resilient and capable of adapting to an increasingly uncertain world.

Identifying use cases

Realistically, a transformation of this nature must be based on solid operational maturity. A range of conditions must be met to allow the rollout of Industry 5.0.
The first is identification of a use case from consultations in the field. The issues raised often include reduced effectiveness in maintenance operations, material wastage on production lines and problems with quality.
For the second and third of these, feedback gathered from operators coupled with analysis of the data will usually yield solutions for improving the situation.

Technology as a means to an end

The second condition relates to the technology itself. The technologies – IoT, 5G, MES (Manufacturing Execution System), data analytics, digital twins, cobots, AGV/AMR (Automated Guided Vehicle, Autonomous Mobile Robot), etc. – are numerous, and all at differing maturity levels. But they should only be recommended where use cases have already been identified and the maturity level of the site concerned is sufficiently high.

For example, the use of virtual reality on a production site requires a highly specific use case to be fully adopted and consequently effective. Similarly, to implement remote maintenance or servicing, the infrastructure needs adequate communications (5G, Wi-Fi, etc.) and the ability to manage cybersecurity risks.

"The transformation heralded by the rise of Industry 5.0 must be based on solid operational maturity."

Maturity, mobilisation and adoption

The third success condition for 5.0 concerns the business unit's operational maturity. There must be a proven process culture where the principles of lean management and lean manufacturing are consistently applied in pursuit of continuous improvement.

The fourth essential element is the availability of project sponsors. Without determined commitment from senior management and designated people tasked with driving forward 5.0 projects within the business, there is a real risk of seeing the transformation fizzle out.
It is therefore necessary to mobilise personnel with the ability to visualise the long-term future, well beyond production timescales.

And finally, teams in the field must be sufficiently available and invested in cobuilding and adopting the changes inherent in the transformation to 5.0.
The means mobilising a group of employees that represents the departments involved as closely as possible.
This transformative approach can only work if the implementation of new technologies is accompanied by rigorous change management.

The complementary nature of the expertise in different VINCI Energies business units enables us to support businesses through the implementation phase of their transformation to 5.0. But this approach will only be sustainable long-term with proper follow-up over time.

Thierry Delpech
Business Unit Manager,
Actemium Consulting 5.0 Nord & Est

NO SOVEREIGNTY IN HEALTH WITHOUT PROCESS AUTOMATION

The Covid-19 crisis revealed the structural failings of an entire industrial system and France's pharmaceutical dependency. To regain sovereignty will require a number of economic and technological choices.

On 13 June 2023, the President of the Republic, Emmanuel Macron, announced that the production chains for some 50 medicines deemed "critical" would be re-established within France. The Covid-19 crisis came and went, revealing in passing the structural failings of an entire industrial system and our country's pharmaceutical dependency on third-party economic powers including China and India.

The facts are clear: imports account for 60 to 80% of the market for so-called mature medicines (antibiotics, anaesthetic products, etc.), a number that soars to 95% for biopharmaceuticals. Of close to 500 new drugs introduced to the market in Europe since 2017, only around 40 are manufactured in France.

The healthcare sector is a strategic priority in the battle for France's industrial sovereignty. But getting back into contention involves a number of economic and technological choices. To become a leading nation in European healthcare, France must become more competitive, and its manufacturers must focus on the operational performance of their production chains. Automation and robotics are key allies in this campaign.

Restrictive environments

Requiring manufacturers to adhere to strict safety standards and the validation metrics imposed by health authorities is a prerequisite for any attempt to optimise industrial processes at very high levels of quality. White rooms in particular require proven expertise to ensure absolutely clean environments, a reliable ultra-cold chain, and flawless site and facility safety regimes. Advanced expertise in technologies such as access control monitoring, alarm systems, and air filtration and controlled atmosphere systems is critical in allowing these cutting-edge production facilities to operate.

Of 500 new drugs introduced to the market in Europe since 2017, only around 40 are manufactured in France.

The healthcare industry imposes special conditions on the design of assembly lines and robots: machines free of places that could retain water or cleaning products; no mechanical movement permitted above the end product; mechanisms surrounded by laminar flow hoods; etc.

Supporting the entire value chain

All this equipment is expensive. But the returns on investment come within three or four years. The speed of these time-to-profitability cycles is particularly important given that health product manufacturers are subject to an intense pace of innovation and regulation that means they frequently have to modify their production lines.

Across the entire industrial value chain, from consulting to maintenance via the design and construction of facilities, VINCI Energies business units have built up recognised expertise. We are expert in the machines, equipment and systems involved. Our assembly machines are custom-manufactured to our customer's specifications. We stand ready to provide 360-degree support to help them improve their performance and regain our industrial sovereignty.

Lionel Kaddah,
Business Development Manager, Commercial Actemium Bonnétage Automation

ENHANCED PERFORMANCE THROUGH TECH

Generations of soccer players have worn themselves out practising free kicks against a row of static mannequins. This method has hardly changed over the years and has obvious limitations. So, how can sporting performance be improved? This is the question that FreeKickPro has been working to answer. This Dutch startup designed an automated system that allows players to train in real match conditions with four, five or six dummy players, each of which can be adjusted to different heights and jumping capabilities. For support, FreeKickPro approached Actemium Electronic Manufacturing Services, the VINCI Energies business unit based in Veghel in the Netherlands, to develop the FreeKickPro control system. Several professional clubs have adopted the solution for their training sessions and are already reporting improved results in their matches.

AGILITY **PROFILE**

VINCI ENERGIES ACCELERATOR OF ENVIRONMENTAL TRANSITION

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

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

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

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THE **AGILITY** EFFECT

Publisher
VINCI Energies SA
2169, boulevard de la Défense
CS 90274
92741 Nanterre Cedex

Printing
Impression & Brochage Snel
rue Fond des Fourches 21
Z.I. des Hauts-Sarts - zone 3
B-4041 Vottem - Liège (Belgique)

Director of publication
Sabrina Thibault

Editor in chief
Roseline Mouillefarine

Design and production
Clarisse de Martène

Date of legal deposit
Avril 2017

ISSN
2554-019X

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theagilityeffect.com

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