



fives

Industry can do it

2022

ANNUAL AND CSR REPORT

2021 Financial Year



SUMMARY

PURPLE IS THE NEW GREEN!



PERSPECTIVES page 3

Chairman's Message page 6

Human Resources page 8

CSR page 13

Finances page 15

Governance page 19



INNOVATION IS DISRUPTION page 22

Our achievements



PERFORMANCE IS EVERYWHERE page 31

Our achievements



STRATEGY IS AGILITY page 42

Our achievements

OUTLOOK PURPLE IS THE NEW GREEN!



“Fives’ history is a reminder of how industry has developed over the years around innovations that have changed the world”

Frédéric Sanchez,
President of Fives

Fives, your partner for a more sustainable industry

For over 200 years, Fives employees have been at the heart of industrial revolutions. From the first railway lines, to the Eiffel Tower elevators, up to spacecraft systems, **Fives has always been at the forefront of the INDUSTRY OF THE FUTURE.**

A pioneer in the DECARBONIZATION of industry, the Group today enjoys **unrivalled TECHNOLOGICAL LEADERSHIP in the field of ENERGY TRANSITION**, which it makes available to its customers around the world who are keen to reduce their ENVIRONMENTAL IMPACT.





TO RELIVE THE YEAR
2020 IN PICTURES,
scan this QR code



An industrial engineering group, Fives designs and manufactures machines, process equipment and production lines for the world's largest manufacturers.

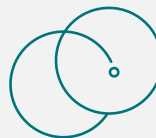
Order intake by activity

36 %



SMART AUTOMATION
SOLUTIONS

37 %



PROCESS
TECHNOLOGIES

16 %



HIGH PRECISION
MACHINES

11 %

OTHERS

Order intake by geographical area

37 %
AMERICAS

38 %
EUROPE

4 %
AFRICA MIDDLE EAST

21 %
ASIA OCEANIA

An international presence, closer to manufacturers



+ 100 locations
in 25 countries



Employees of
69 different
nationalities



31 R&D
and test centers

Key figures

OVER
200 YEARS
OF HISTORY

€**1.889** M
ORDER INTAKE

€**1.724** M
SALES

2 116
CURRENT PATENTS IN 627 FAMILIES

46
NEW PATENTS FILED IN 2021

CLOSE TO
8 200
EMPLOYEES

Chairman's message, Frédéric Sanchez



FIVES, AN ECONOMIC, SOCIAL AND ENVIRONMENTAL LEADER

**“ Fives’ history
is a reminder of
how industry has
developed over
the years around
innovations that have
changed the world “**

The COVID-19 crisis has highlighted the vital need for a strong industry worldwide. It goes hand in hand with a real realization of the need for the world's biggest regions to bring their key industries back home to ensure their independence and strengthen their industrial and technical sovereignty, while striving to address the challenges of decarbonization. Industry has been long maligned but is now at the center of climate and energy transition issues.

Fives' history is a reminder of how industry has developed over the years around innovations that have changed the world. How amazing is it that we designed and manufactured the first steam engines and the Eiffel Tower's elevators in the 19th century and are now involved in the United States' space exploration adventures thanks to our solutions and expertise? Fives, with its women and men, has set itself the ambition to imagine, before anyone else, the challenges we will have to overcome.

“ As a pioneer in decarbonizing industry, the Group now has a clear technical edge when it comes to the energy transition “

Twenty years ago, we took a bold and visionary gamble on the industry of the future. An industry that may or may not be digital and low-carbon. We also prioritized research and development programs aiming to reduce our technical solutions' environmental impact. **This long-standing leadership now means we are a key partner for the major transformations in the mobility sector, with electric vehicles, and the green hydrogen sector,** which is the ultimate low-carbon energy source.

While the race to achieve short-term productivity with little regard for its environmental impacts is still guiding some actors, it is not the winning strategy for the long-term. It is time for a major transformation of our production methods. We have no choice; it is a matter of survival. There will be no industry in the future if it does not decarbonize. It is far from being a simple sectoral evolution, the future of our planet depends on it. As a pioneer in decarbonizing industry for over 15 years, the Group now has a **clear technical edge when it comes to the energy transition,** which it makes available to customers worldwide who are seeking to reduce their environmental impact.

“ As the leader of sustainable industrial progress, the Group's strength primarily lies in the many talented people who innovate every day to build the industry of the future “

As the leader of sustainable industrial progress, the Group's strength primarily lies in the many talented people who innovate every day to build the industry of the future. Without this pioneering spirit, without everyone's commitment, without the solidarity and resilience, without the various subsidiaries working together, we would not be able to seize the opportunities generated by the strong economic recovery or handle the strong rebound in our orders. Fives' employees are what make the Group successful. accompagner le rebond de nos prises de commandes. Les collaborateurs de Fives sont la réussite du Groupe.

There is no shortage of challenges to remain at the forefront of the industry of the future. We must continue to innovate to reduce industry's carbon emissions and ensure its digital transformation, and also attract and retain talent - those are our core challenges. With the increasing awareness of the need to fight climate change, companies have decided to massively invest in reducing their carbon footprint. It is an opportunity but also a huge responsibility for Fives, which now more than ever must use its leadership to take on one of the biggest social challenges of our century. Let us continue to pursue our ambition **“faire aimer l'industrie”** to encourage as many people as possible to join the wonderful adventure that Fives has been on for 200 years.

HUMAN RESOURCES

Céline Morcrette,
FIVES Human Resources Director

THE GROUP'S EMPLOYEES ARE FIVES' STRENGTH



While the uncertainties linked to the pandemic are not yet completely behind us, it is undeniable that 2021 was the year of economic recovery. The record order book for 2022 is a testament to the recovery of our activities worldwide. The result of the incredible resilience shown by the group and its employees, these prospects are accompanied by a considerable need to recruit in all business lines. The Human Resources Department therefore spent a large part of 2021 helping the subsidiaries to strengthen their workforces. This joint effort will continue in 2022 to support the Group's growth and always ensure we achieve operational excellence for our customers.

**“ For over 200 years,
the talented people
at FIVES have shaped
the world's industrial
history “**

« Thanks to its employees, FIVES is the leader in sustainable industrial progress »



Attracting but also retaining talent. The Group's ability to deal with global upheavals reminds us, as if it were necessary, that its employees are its greatest achievement. Without them, nothing would have been or will be possible.

For over 200 years, the talented people at FIVES have shaped the world's industrial history. They are responsible for inventing the solutions and technologies that change the world. From the first railway lines to the elevators at the Eiffel Tower and space exploration, FIVES' employees are key players in some major industrial achievements. For over 200 years, thanks to them, FIVES has been a leader of sustainable industrial progress.

« Every day, in 25 countries, our 8,200 employees create the sustainable solutions the world needs by inventing the technologies of the future. »

As a pioneer in decarbonizing industry, the Group is now the unmistakable leader of the energy transition thanks to its talented staff. **Every day**, in close to 25 countries, our 8,200 employees create the sustainable solutions the world needs by inventing the technologies of the future.

« Thanks to them, FIVES has been the leader of the industry of the future. »

Every day FIVES employees enable industrial companies to optimize their energy efficiency and environmental performance. **Every day**, they work for a virtuous industry, a cutting-edge industry, a mutually responsible industry, an exciting industry, for all of us.

FIVES is above all a group of passionate women and men, proud to be pioneers and especially proud to push the boundaries. **For over 200 years**, thanks to these women and men, FIVES has been the leader of the industry of the future.

HR PROJECTS

THE WOMEN@FIVES PROGRAM

Along with dialogue and development, diversity is one of the three fundamental pillars of the Group's HR policy. Yet it is difficult to achieve a gender balance for two main reasons:

- The low number of female engineering students at university;
- The poor appeal of the industrial sector.

The Women@Fives program was launched in early 2021.

It has three objectives:



While the proportion of women within the Group has been stable for many years (16% female employees), **the recruitment of female talent grew in 2021 compared to the two previous years: 18% of new hires (all contracts) were women;** 2% more than in 2020, and 1% more than in 2019. They accounted for 17% of new open-ended contracts in 2021, 3% more than in 2020 (+2% vs. 2019).

HR PROJECTS

Positive momentum

Women@Fives momentum is building at Fives. The program has taken different forms depending on the region of the world: creation of an official community of women to expand their network in the United States, development of a mentoring scheme in China, and promoting Fives professions among female junior high school, high school and university students in Italy and France.

In France, around ten female employees were also able to take part in the **Women in Leadership** program in 2021 as part of a personalized career path. This program will be repeated during 2022.

“ It has been a success, because for progress to be made it is essential that the teams adopt this program and tailor it to the country, depending on their needs and local culture “

confirms Magali Oyono, Group Talent Manager.

In North America, this strategy has yielded positive results: since 2018, **Fives has increased its recruitment of women by 5%** (compared to the overall recruitment rate).

Finally, **in this region Fives recruited 22% more women than in 2020** in the “Engineers, Executives and Managers” category - the majority Engineers.

Women@Fives momentum is well under way at Fives.

“Our challenge is to continue to welcome even more women to our teams in our core business”

Magali Oyono adds.

For this reason, in 2021:

18% of employees recruited to sales/Pre-Project teams were women;
16% to Project and Services teams; and just 10% to the Design Office.

HR key figures

72%

OF EMPLOYEES HAVE ATTENDED TRAINING

20%

OF WOMEN IN MANAGEMENT

17%

OF MEN IN MANAGEMENT

68%

OF EMPLOYEES REVIEWED BY THE CAREERS MANAGEMENT COMMITTEE

OVER
150

150 INTRA-GROUP EMPLOYEE PLACEMENTS IN FRANCE

The Fives **DISABILITY UNIT**

Hiring disabled workers is one of the pillars of the FIVES diversity and inclusion policy.

The Group endeavors to step up its actions to improve support for employees with a disability, arrange awareness activities with teams and expand the recruitment of personnel officially recognized as disabled workers.

The Disability Unit launched in November 2021 aims to:

- Continually raise awareness among all teams to change their view of disability;
- Be more welcoming to employees with a disability;
- Recruit, onboard and train employees with a disability, and keep them in the job;
- Support them with the official disabled worker recognition process;
- Prioritize partnerships with companies in the sector.

The Disability Unit coordinates, promotes and reinforces awareness and support actions at Group level (previously carried out at local level), thanks to its strong network of dedicated representatives - the local Disability Unit advisers.

During **European Disability Employment Week** from November 15 to 19, 2021, the Group shone the spotlight on some actions implemented in 2021 at sites in France:

- Participation in the **Integration Awards** for Fives Filling & Sealing (Loire Atlantique)
- Welcoming a service dog alongside a disabled worker for Fives Cryo (Vosges);
- Information on service providers (gardeners, caterers, printing, archiving) employing disabled people (in structures such as ESATs – French organizations that help disabled people back into work) that Fives could potentially use, where possible.

CSR

Editorial Ingrid Jaugey-Ndiaye, Fives CSR Director



The Fives Group was among the first to implement a corporate social responsibility (CSR) approach based on a map of its main environmental, social policy, business ethics, and supply chain management challenges.

For almost 15 years, Fives has deployed structured approaches to address these topics and the results are plain to see. In terms of safety, for example, significant progress has been made: the **Group has divided its accident frequency rate by 4**, dropping from 11.32 in 2009 to 2.92 in 2021, and **the severity rate has been divided by 3**, going from 0.32 to 0.10, over the same period.

“We have decided to double-down on our commitment to fight climate change in 2022 by making the climate a core focus of our strategy.”

This success is down to the strong involvement of all Group companies, which set themselves targets and ensured they had the resources to achieve them. **But it is also the result of Group-wide commitments, especially on the environmental performance of our solutions.** The teams are improving our customers' environmental performance by working on optimizing energy consumption, extending the service life of equipment, and predictive maintenance.

The Fives Group operates in markets that have a significant effect on climate change, especially cement, steel, glass and aluminium manufacturing. **So, it is our responsibility to support these industrial companies in their low-carbon transition.** That is the choice we have made. Many innovations already enable them to reduce their CO₂ emissions, and we have decided to double-down on our commitment to fight climate change in 2022 by making the climate a core focus of our strategy.

The Divisions and the Innovation, Strategy, Purchasing, and Sales departments are getting involved, but we cannot succeed without the support of motivated employees and without taking action in the regions where we are present.

“The teams are improving our customers' environmental performance by working on optimizing energy consumption, extending the service life of equipment, and predictive maintenance.”

Fives' CSR approach is regularly assessed by external organizations :



Fives, a member of the United Nations Global Compact since 2011, underlines its role in a global community of companies concerned about Human Rights, working standards, the environment and the fight against corruption.



**Scan this QRcode to
download the action plan**



Since 2012, Fives has been rated by EcoVadis, a corporate social and environmental rating agency. This year, the Gold status obtained by Fives places it in the top 3% of the highest rates companies assessed by EcoVadis.



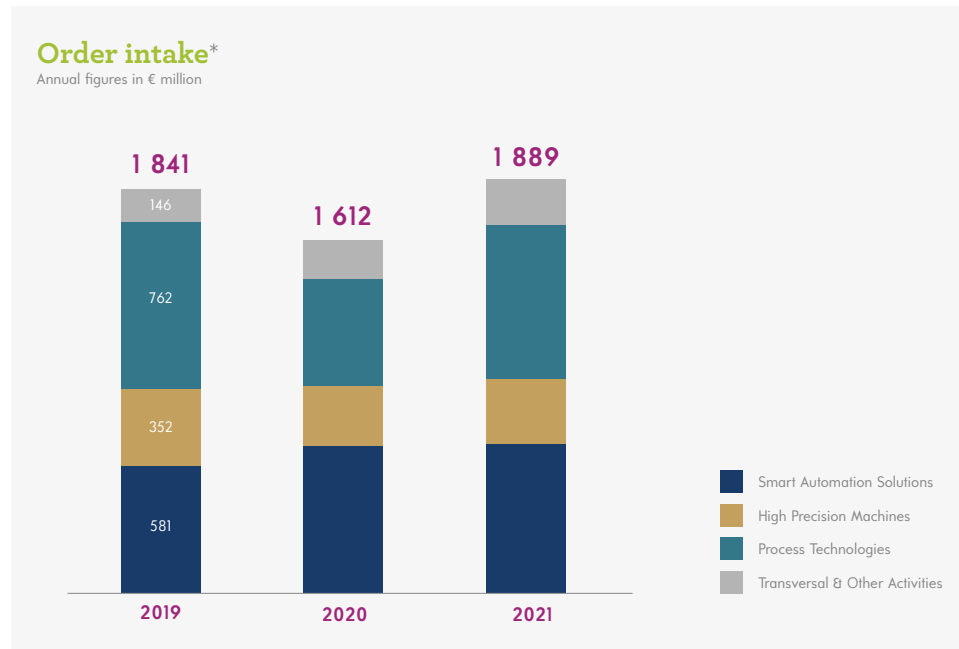
**Scan this QRcode to
download the rating**

FINANCES

Order intake grew significantly in 2021, after a year especially hard hit by the pandemic in 2020

Despite uncertainty in the first few months of the year, marked by fears about a “third wave” of COVID-19 caused by the outbreak of the Delta variant, economic recovery was confirmed from spring onwards. Industrial investment was driven by general optimism about the end of the pandemic, comprehensive recovery plans announced by different governments (following support plans put in place at the peak of the pandemic) and positive financial performance by major clients.

This context resulted in a significant increase in orders, which grew across all Activities throughout the year. While many significant projects under review by clients are not yet in place, due to the review time frames inherent in the nature and complexity of the planned projects, small and medium orders (services, equipment and small systems with a unit value under €10 million) achieved record levels for the Group in 2021. Order intake for the year was €1.889 billion, up compared to 2020 (+18% at constant exchange rates) and also up compared to 2019.



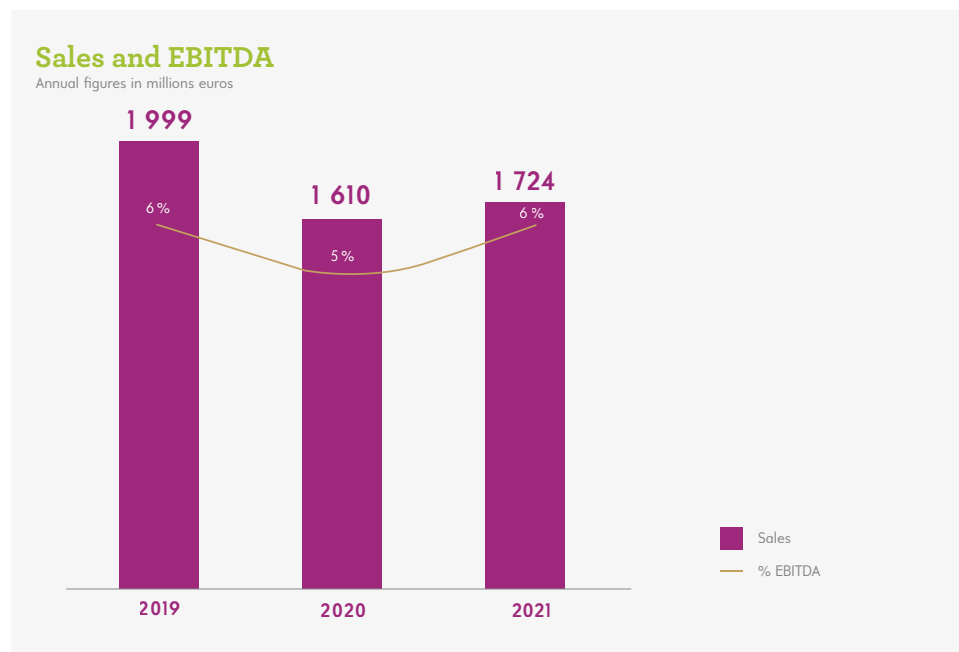
* Order intake corresponds to the aggregate value of contracts entered into force during the year

Fives' offer addresses the challenge of accelerating underlying market trends in industry

In the Smart Automation Solutions activity, the extensive transformation of end consumers' shopping habits, which can be seen in the growth of e-commerce, offers excellent opportunities to Group technologies for high speed flow management (automated sorting centers and storage platforms, last-mile logistics) and automated solutions (order fulfillment, palletization). In 2021, Fives continued to grow in the American market, while strengthening its position among the main international e-commerce players.

In the Process Technologies activity, industrial groups' awareness of climate issues and the need to reduce their carbon footprint, deepened by increasingly strict prospects in terms of regulations and finance, highlight the Group's portfolio of technologies whose environmental and energy performance are central to the innovation strategy. In 2021, Fives experienced a sharp upturn, led by growing demand across all its business lines (cement, steel, aluminium, glass, energy).

In the High Precision Machines activity, the major shortage of key components and dependency factors appearing in the wake of the war in Ukraine are pushing national sovereignty issues to the forefront in industrial segments considered strategic. While discussions around electric vehicles have not yet led to the return of investments by automotive manufacturers comparable to the pre-pandemic years, in 2021 Fives strengthened its position with major aerospace and defense players.



The Group gets back to its pre-pandemic level of operational profitability, despite project performance conditions that remain challenging

The sales for 2021 were €1.724 billion, which is an increase of 8% at constant exchange rates versus 2020. This increase is linked to the Smart Automation Solutions activity and transversal activities to a lesser extent. However sales from the High Precision Machines and Process Technologies activities fell, due to lower opening order book numbers.

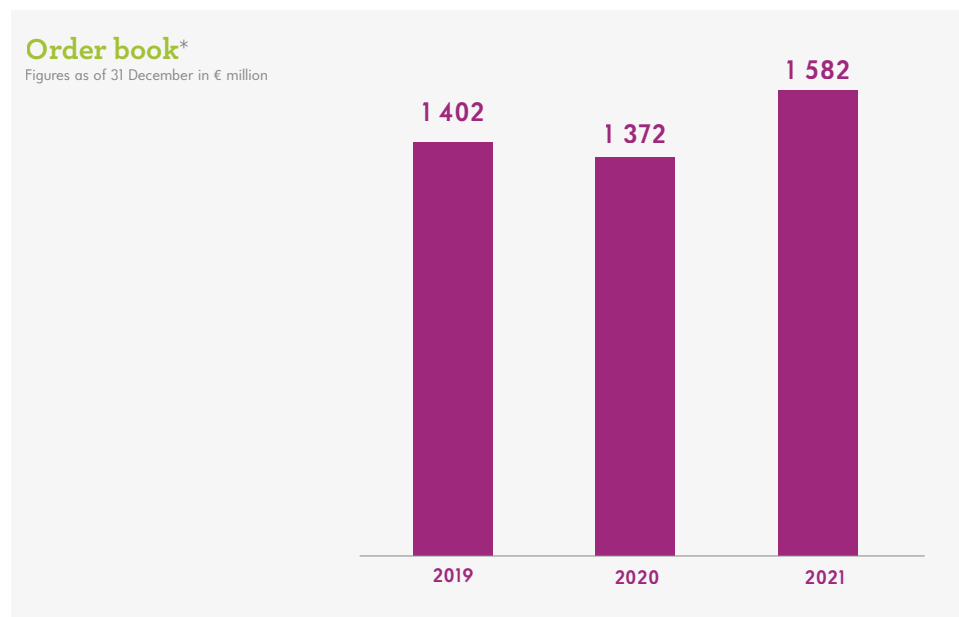
Compared with 2019, sales are still down by 15% at constant exchange rates, due to lower opening order book numbers, on the one hand, and slower performance rates for existing projects as a result of longer supply times (for electronic components in particular) on the other hand.

The 2021 gross profit was 19.3%, up by 0.7 points compared with 2020. Despite the increased costs of raw materials and logistics and operational disruption linked to travel restrictions in many countries, project performance allowed the Group to achieve a gross margin in line with pre-Covid levels (19.3% in 2019).

Overheads are under control: at constant exchange rates and excluding the impact of the support measures implemented by governments for the pandemic, they grew by 3% compared with 2020 (for a sales figure up by 8%), mainly in the Smart Automation Solutions activity. Compared with 2019, they are down by 8%, in particular owing to structural savings achieved in the High Precision Machines and Process Technologies activities.

In this context, the Group's EBITDA totaled €104 million in 2021, an increase of 30%, at constant exchange rates, over 2020. This is 6% of sales, one point above 2020, and at the same profit level as 2019 (despite much lower sales).

Finally, the Group's net profit was back to a positive figure in 2021. It reached €17 million in 2021, after the losses in 2019 and above all in 2020, at the height of the pandemic.



* Order book corresponds to the remaining value to be executed (and converted into sales) under contracts in force as of 31 December

With a record order book at end 2021 and favorable market trends in all Activities, **Fives is more confident in its opportunities for growth than ever before**

We ended 2021 with an order book standing at €1.582 billion, a huge increase compared with 2020 and 2019, and a new all-time record for the Group.

Despite project performance rates that continue to be affected by the increasing shortage of raw materials and components due to the war in Ukraine and the resurgence of the COVID-19 pandemic in China, this order book gives the Group excellent visibility over our activity, workload and performance levels for the 2022 financial year.

Driven by the underlying market trends linked to e-commerce, decarbonization, and regional sovereignty, which were amply anticipated by the Group in its strategic choices, its organization and its innovation policy, the growth prospects of the Group's Activities are, at last, looking particularly favorable in the coming years.

GOVERNANCE

SUPERVISORY COMMITTEE

With members from outside the Group, the Supervisory Committee meets several times a year and is responsible for overseeing Fives' management

Members:

- **Philippe Reichstul, Chairman**
- François Dufresne
- Dominique Gaillard
- Alain Cianchini
- Heyoung H Lee Bouygues
- Jean-Georges Malcor
- Antonio Marcegaglia
- Laurence Parisot
- Jean-Dominique Sénard
- Stéphane Guichard

SENIOR EXECUTIVE COMMITTEE

- **Frédéric Sanchez, Chairman and Chief Executive Officer**
- Suresh Abye, *Finance Director*
- Alain Cordonnier, *Deputy General Manager, President of the Cement, Minerals & Sugar Division*
- Sébastien Gauguier, *President of the Aluminium Division*
- Guillaume Mehlman, *Deputy General Manager, President of the Steel & Glass Division*
- Denis Mercier, *Deputy General Manager of Fives*
- Céline Morcrette, *Human Resources Director*
- Luigi Russo, *Deputy General Manager, President of the Smart Automation Solutions Division*
- Frédéric Thrum, *Deputy General Manager, President of the Energy Division*
- Michelle XY Shan, *Deputy General Manager*



EXECUTIVE COMMITTEE

The Executive Committee is primarily in charge of ensuring the implementation of decisions made by the Senior Executive Committee and reviewing the relevance and effectiveness of cross-functional policies based on feedback.

- **Frédéric Sanchez, Chairman and Chief Executive Officer**
- Suresh Abye, Finance Director
- Hervé Boillot, Mergers & Acquisitions Director
- Daniel Brunelli-Brondex, Country Director - India
- Jean-Marie Caroff, International Development Director
- Alain Cordonnier, Deputy General Manager, President of the Cement, Minerals & Sugar Division
- Sébastien Gauguier, President of the Aluminium Division
- Arnaud Lecœur, Group General Counsel
- Guillaume Mehlmán, Deputy General Manager, President of the Steel & Glass Division
- Denis Mercier, Deputy General Manager of Fives
- Céline Morcrette, Human Resources Director
- Frédéric Renaud, Country Director - Italy
- Luigi Russo, Deputy General Manager, President of the Smart Automation Solutions Division
- Frédéric Thrum, Deputy General Manager, President of the Energy Division
- Thierry Valot, Innovation & Digital Director
- Michelle XY Shan, Country Director - China



COUNTRY COORDINATION AND STEERING COMMITTEES

These committees are responsible for adapting Group strategy to local specificities in North America, China and Italy, where appropriate, and ensuring its implementation.

ORGANIZATIONAL CHART



INNOVATION IS DISRUPTION



OUR ACHIEVEMENTS

- 23 A complete and innovative concrete recycling solution
- 24 A complete low-carbon cement production solution
- 25 Bryant TTG, the game changer in the bearing manufacturing industry
- 25 FIVES, a pioneer in eco-responsible glass production solutions
- 26 FIVES further digitalizes industrial processes using SmartLine technology to improve its customers' productivity
- 27 FIVES confirms its leadership in breakthrough innovations with its ultra-fast steel coil tempering technology
- 28 FIVES, a key partner in the energy transition
- 28 China's leading cement company chooses FIVES to improve the quality of its clinker and reduce its energy consumption
- 29 FIVES Sofia and Mirea technologies, innovative solutions to produce more ecological aluminium
- 30 A major aluminium producer chooses FIVES to help reduce its environmental footprint



A COMPLETE AND INNOVATIVE CONCRETE RECYCLING SOLUTION

CIRCULAR ECONOMY

A compressive crushing technology recognized for over twenty years for its performance across a wide range of minerals (particularly hard and abrasive minerals), the FCB Rhodax® 4D is now being used for a new process - recycling demolition concrete.

For this process, the technology's unique selective grinding method easily releases the 3 components making up concrete: aggregate, sand and cement paste. Multiple tests have already been conducted for major industry figures, and the FCB Rhodax® 4D will start to industrially process demolition concrete for the first time in H2 2022 for the Heidelberg Cement group in Poland.

This unique stage in the circular economy offers multiple benefits, notably in terms of demolition product recovery: reusing aggregates and sand in new concretes, and reusing cement paste in the cement production process to create low-carbon clinker, or as a cement additive.

The released sand and cement paste components will also be recarbonated using the CO₂ captured from cement plant gas emissions.



FCB Rhodax®'s selective material bed compression grinding process optimally releases the three components making up concrete - aggregates, sand (0.125-2 mm) and cement paste (0-0.125 mm), which will then be separated and retrieved.

FCB Rhodax® operation relies on the relative movement of the grinding chamber/cone, driven by the rotation of four unbalanced masses. They cause the external part (grinding chamber) to rotate. In this unique technology, the material elements being processed compress each other instead of being subjected to an impact, like most conventional crushers. This ensures optimal release, improved cubicity and a low wear rate.

A COMPLETE LOW-CARBON CEMENT PRODUCTION SOLUTION

Clinker production is responsible for the vast majority of CO₂ emissions in cement production.

Fives has developed a complete suspended clay calcination solution to produce artificial pozzolan, a low-carbon substitute for clinker, and **THUS REDUCE CEMENT'S CARBON FOOTPRINT BY UP TO 40%.**

The solution is highly flexible due to the choice of the flash process, which allows it to:

- Process a wide variety of clay mixtures, giving customers the opportunity to **USE A LARGER NUMBER OF RAW MATERIALS** from quarries;
- Maximize the use of alternative fuels, a **KEY FACTOR FOR THE SMALLEST POSSIBLE CARBON FOOTPRINT**;
- Optimize the calcination temperature and thus **SIGNIFICANTLY REDUCE ENERGY CONSUMPTION** of the production line compared to a rotary kiln solution, while guaranteeing **IMPROVED CONTROL OF THE PRODUCT QUALITY.**

To support its customers well in advance of their project, Fives carries out feasibility studies and material identification. For this purpose, **Fives has an industrial pilot - an exact, smaller replica of the industrial solution, which is a reliable predictive model of the future production tool.**



The Fives flash clay calcination system includes a patented color control process, and allows:

- up to 40% reduction of CO₂ emissions compared to traditional cements
- up to 40% reduction of CO₂ emissions compared to traditional cements
- direct and precise control of the calcined clay color
- lower energy consumption and maintenance requirements compared to rotary kilns
- lower energy consumption and maintenance requirements compared to rotary kilns

BRYANT TTG, GAME CHANGER IN THE BEARING MANUFACTURING INDUSTRY

Grinding has always been considered one of the least flexible manufacturing processes, with downtimes when a changeover is required.

To address this problem, the **Fives Global Product Development teams** have adapted the Bryant TTG machine, originally engineered as a high-end optical grinding solution. By combining multiple grinding operations into one single, it allows manufacturers to:

- Produce different types of bearing for various applications, without losing time during production changeovers and without increasing the number of machines;
- **INCREASE THEIR PRODUCTION CAPACITY AND REDUCE THEIR OPERATING COSTS;**
- **QUICLY REACT TO MARKET DEMANDS, WITHOUT SACRIFICING ACCURACY.**

The Bryant TTG can grind outside and inside diameters, faces, tapers, concentric and eccentric diameters, every feature of a bearing, up to 320 mm in diameter.



FIVES, A PIONEER IN ECO-RESPONSIBLE GLASS PRODUCTION SOLUTIONS

GUARANTEEING ENERGY EFFICIENCY

Aware of the need to improve the energy efficiency of its facilities, a major glass manufacturer asked Fives to install a newly designed electric furnace at one of its plants in the United States.

This all-electric furnace designed by Fives will offer competitive benefits on the glass market by:

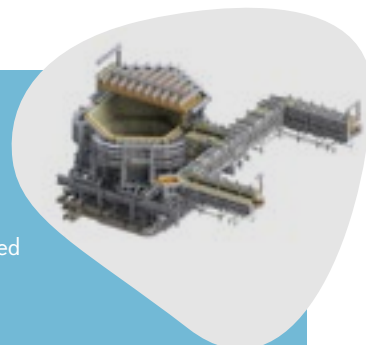
- Reducing energy consumption
- Increasing equipment service life
- Optimizing the quality of the final product

Primum® E-Melt Furnace

As a leading supplier of tried-and-tested all-electric melting technology with zero combustion-related emissions, Fives proposed a state-of-the-art furnace using cold top melting technology with immersed electrodes. Supported by empirical experience and CFD modeling, this technology offers improved energy performance and a longer service life. The Primum® E-Melt furnace combined with the BH-F forehearth system offers optimal glass quality levels and operational stability.

Primum® Eco-Flex Furnace

For the leading European packaging glass manufacturers, Fives developed the Primum® Eco-Flex furnace, which helps reduce their carbon footprint while securing the quality and flexibility of the glass bottle manufacturing process. The Primum® Eco-Flex furnace uses patented hybrid gas-electric technology, able to adapt to a wide range of electricity-gas consumption ratios, up to 80%.



FIVES FURTHER DIGITALIZES INDUSTRIAL PROCESSES USING SMARTLINE TECHNOLOGY TO IMPROVE ITS CUSTOMERS' PRODUCTIVITY

INCREASING YIELD

Fives has developed a revolutionary digital solution, SmartLine, to help steelmakers to meet increased demand for steel grades with high added value.

SmartLine is a completely automatic control system. It allows steelmakers to simulate the annealing and galvanizing process of a strip processing line via models, and to determine optimal control of equipment to **INCREASE PRODUCTION YIELD AND QUALITY**.

Fives has successfully implemented the SmartLine solution on four continuous galvanizing lines at the Marcegaglia plant in Ravenna, Italy.



To optimize a complete set of parameters, the SmartLine solution links all key process models together, also taking into account data relating to upstream coil processing, notably steel metallurgy, hot and cold rolling and various thermo-mechanical processing stages, as well as laboratory data before the coil enters the annealing, coating and skin-pass rolling stages.

There are various benefits gained from SmartLine implementation:

- Improved productivity
- Reduced variation in coating thickness
- Reduced dross production
- Faster production speeds across the entire range of steel grades

FIVES CONFIRMS ITS LEADERSHIP IN BREAKTHROUGH INNOVATIONS WITH ITS ULTRA- FAST STEEL COIL TEMPERING TECHNOLOGY

REDUCING OPERATING COSTS AND ENVIRONMENTAL IMPACT

Fives has unveiled its latest breakthrough technology, Non-Oxidizing Wet FlashCooling®, which will completely change the way that steelmakers view steel production. This technology, installed on a hot-dip galvanizing line in the United States, allowed the steelmaker to produce third-generation advanced high-strength steel directly on the galvanizing line. This helps avoid the need to route steel strips to a continuous annealing line and to coat them afterwards. This leads to a **significant reduction in:**

- **OPERATING COSTS LINKED TO STEEL PROCESSING;**
- **ENVIRONMENTAL IMPACT**, as this technology helps reduce liquid effluents linked to pickling and energy consumption.

Non-Oxidizing Wet FlashCooling® technology is based on spraying an aqueous solution containing additives intended to prevent strip oxidation.

Highly flexible, it allows the production of all coated steels, with higher productivity than standard technologies. The exclusive features of this Fives technology include:

- Outstanding cooling performance up to 1,000°C/s
- Control of all key process parameters: cooling speed, final strip temperature, uniform crosswise strip temperature
- Stable production in terms of strip mechanical properties and flatness



FIVES, A KEY PARTNER IN THE ENERGY TRANSITION

REDUCING THE ENVIRONMENTAL FOOTPRINT

Fives supports its customers with their ambition to **REDUCE** carbon emissions through its combustion solutions meeting the highest environmental standards. Fives supplied and commissioned Pillard NANOxFLAM® burners for an urban heating network operator in Zurich, Switzerland that was keen to **CONSIDERABLY REDUCE ITS ENVIRONMENTAL FOOTPRINT**. The boiler manufacturer chose Fives and its technologies, confident in its expertise and its experience in designing ultra-low NOx burners. NOx emissions measured across the entire burner operating range were well below the maximum values required by the end customer. These excellent results confirm Fives' **LEADERSHIP** in the design of combustion solutions with very low emissions.

The Pillard NANOxFLAM

The Pillard NANOxFLAM® is Fives' latest generation ultra-low NOx burner for the boiler industry. This technology, supporting the performance of industrial sites, is recognized by the European Union as the "best available technique" (BAT) to limit and avoid emissions.

End customer requirements

natural gas: $\text{NOx} \leq 20 \text{ mg/Nm}^3 @ 3\% \text{O}_2$

diesel oil: $\text{NOx} \leq 100 \text{ mg/Nm}^3 @ 3\% \text{O}_2$

Pillard NANOxFLAM® results with FGR

natural gas: $\text{NOx} \leq 12 \text{ to } 20 \text{ mg/Nm}^3 @ 3\% \text{O}_2$

diesel oil: $\text{NOx} \leq 71 \text{ to } 85 \text{ mg/Nm}^3 @ 3\% \text{O}_2$



CHINA'S LEADING CEMENT COMPANY CHOOSES FIVES TO IMPROVE THE QUALITY OF ITS CLINKER AND REDUCE ITS ENERGY CONSUMPTION

The Conch group, China's leading cement company, chose Fives' combustion technologies to improve the quality of its clinker while minimizing energy consumption required for production. Conch placed an order for thirty Pillard NOVAFLAM® Evolution+ burners that perfectly meet its needs.

Thanks to its mixing efficiency and unrivaled tuning capacities, the Pillard NOVAFLAM® Evolution+ produces an intense flame to improve the quality of clinker and thus reduce its proportion in cement production. As clinker production generates CO_2 , using less in the cement mix significantly reduces this cement producer's emissions.

Since its launch just over a year ago, the Pillard NOVAFLAM® Evolution is a real commercial success with over 100 units already sold, notably to major cement groups like CRH, Heidelberg, Holcim, Ultratech and Vicat.

Pillard NOVAFLAM® Evolution

A new generation burner with unrivaled performance for rotary kilns in the cement industry.

Main features

Power: from 10 to 200 MW

Two versions: mono-channel and bi-channel (Pillard NOVAFLAM® Evolution+)

Multi-fuel burner: natural gas, alternative fuels, hydrogen



FIVES SOFIA AND MIREA TECHNOLOGIES, INNOVATIVE SOLUTIONS TO PRODUCE MORE ECOLOGICAL ALUMINIUM

OPTIMIZING PRODUCTION COSTS AND THE ASSOCIATED CARBON EMISSIONS

To reduce its carbon consumption and thus contribute to more ecological aluminium production, **ONE OF THE WORLD'S BIGGEST ALUMINIUM PRODUCERS SELECTED FIVES DIGITAL SOLUTIONS** to digitally track its anodes throughout their life cycle.

SOFIA and MIREA are part of the Amelios Suite, a digital solution to help aluminium producers to **OPTIMIZE THEIR PRODUCTION COSTS AND ASSOCIATED CARBON EMISSIONS**. The Amelios suite was selected by the Solar Impulse foundation as one of the solutions to combat climate change by optimizing CO₂ emissions per ton of aluminium produced.

Fives offers unrivaled expertise in technologies linked to the anode life cycle: green anode plant, anode rodding shop and anode baking furnace firing control system.

- MIREA, an advanced sensor that continually measures the electrical resistivity of baked anodes, offering reliable characterization for 100% of the anodes produced based on collected data, and no longer on visual criteria.
- SOFIA, a 3D measurement machine for on-the-fly anode butt inspection using fixed laser scanners to virtually measure their geometry and reflectivity. By compiling information, the system feeds back information on the anode's behavior in the electrolysis tank.

Thanks to this data, the customer is able to improve performance of the electrolytic aluminium production process.



A MAJOR ALUMINIUM PRODUCER CHOOSES FIVES TO HELP REDUCE ITS ENVIRONMENTAL FOOTPRINT

CLEAN AND EFFICIENT COMBUSTION

As part of the conversion of its plant to natural gas, **A MAJOR CANADIAN ALUMINIUM PRODUCER SELECTED FIVES TECHNOLOGY, HELIOS**, when replacing all of its firing control systems (FCS) for its four anode baking furnaces.

THIS SOLUTION OFFERS CLEAN AND EFFICIENT COMBUSTION with an optimized injection system to **REDUCE NOX EMISSIONS** at the source.

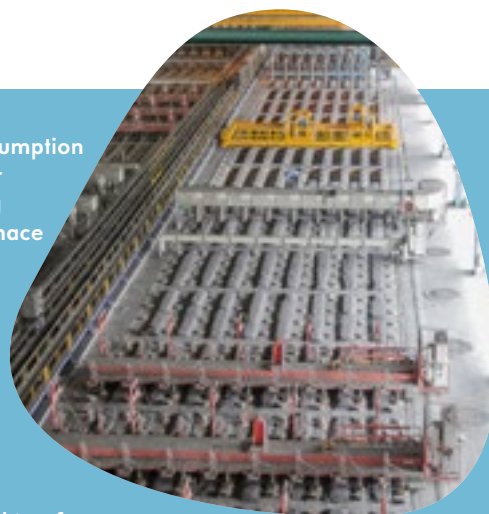
Thanks to outstanding efforts by the teams and strict management of all supply, design and manufacturing stages in a complex logistical and public health context, the furnaces could restart in the scheduled time frames once gas arrived on site.

Through its digital and low-emission innovations, Fives stands out on the anode baking market and **SUPPORTS ITS CUSTOMERS WITH THEIR TRANSITION TO ALUMINIUM PRODUCTION WITH A LOWER CARBON IMPACT.**

HELIOS offers perfectly even anode baking while reducing energy consumption and furnace emissions. It includes the Amelios suite baking module, our digital solution for tracking anodes, which analyzes data and offers key performance indicators to track and optimize the baking process. A furnace chamber monitoring module compiles observations in the field to track refractories and schedule maintenance.

The anodes used during electrolytic reduction of aluminium production should be baked beforehand for several days at 1,100°C in furnaces heated with natural gas or heating oil.

Fives offers tailored firing control systems (FCS) for optimal quality and performance, energy efficiency and durability for all types of anode baking furnaces.



PERFORMANCE IS EVERYWHERE



OUR ACHIEVEMENTS

- 32 GORSA selects FIVES to build a more environmentally-friendly cement grinding workshop
- 33 Ciment Québec INC. chooses FIVES to reduce its carbon footprint and increase production capacity
- 34 VICAT renews its partnership with FIVES to supply a complete clinker production line combining flexibility and energy efficiency
- 35 FIVES sets a new record in the supply of cold boxes
- 36 FIVES contributes to the process automation of Nexter and Airbus Helicopters to increase their production
- 37 The world's leading e-commerce company chooses FIVES for more efficient order picking and home delivery
- 38 FIVES supplies the world's fastest tube production lines
- 39 At the heart of a major industrial transformation, FIVES reinvents itself and receives the "Industry of the Future Showcase" label
- FOCUS FIVES commissions an exceptionally efficient galvanizing line ahead of schedule
- 41 Composite: a new automated platform offering unrivaled performance

GORSA SELECTS FIVES TO BUILD A MORE ENVIRONMENTALLY-FRIENDLY CEMENT GRINDING WORKSHOP

FIVES has supported the Mexican cement producer GORSA Materiales y Concreto S.A.P.I. de C.V. to:

- **Optimize its financing**
- **Build a turnkey grinding facility**

The cement distributor from southern Mexico selected Fives to build a **grinding facility** in Mexico, allowing it to vertically integrate the cement production process. This newcomer to the cement production market - convinced by the quality of Fives technologies and its expertise - specifically chose **FCB Horomill®** technology, making it stand out strongly in terms of **PRODUCT QUALITY AND ENVIRONMENTAL PERFORMANCE (low energy consumption and small carbon footprint)**.

Fives' ability to offer the ideal financial package for the customer's project was also a major factor in its decision. Thanks to its partnerships with banks and credit insurance firms, the Group could offer GORSA a **COMPLETE FINANCING SOLUTION** in the form of buyer's credit, in partnership with BPI AE and BPI Financement.

Thanks to its specialized resources and expertise, the Fives financing department can offer comprehensive solutions tailored to each specific project - whether established businesses or industry newcomers. Fives is a true partner of its customers, developing personalized financial packages. The Group supports them throughout their projects, and ensures they obtain the most effective financial arrangements depending on their objectives:

- Assessing and coordinating financial packages to obtain the most beneficial financial agreements.
- Filing applications with financial institutions (export credit agencies - ECA, commercial banks, development banks, etc.)
- Mobilizing finance solutions provided by the French, European or international authorities to back projects in a given country.
- Identifying personalized financial packages depending on objectives, notably longer-term finance at the best cost.

The majority of Fives innovations are also classified as the best available technologies. They are recognized by leading institutions as the best technologies in terms of sustainable development, performance and efficiency. These innovative solutions allow its customers to minimize their carbon footprint and obtain tailored finance solutions on the most attractive terms.



CIMENT QUÉBEC INC. CHOOSES FIVES TO REDUCE ITS CARBON FOOTPRINT AND INCREASE PRODUCTION CAPACITY

To modernize the Saint Basile cement plant, Ciment Québec Inc. chose Fives to supply two new **FCB Horomill® grinding plants** to meet its **QUALITY, PRODUCTIVITY AND SUSTAINABLE DEVELOPMENT CHALLENGES**, notably by producing cements with low clinker content and a small carbon footprint.

Ciment Québec Inc. was persuaded by a visit to facilities in the United States and Mexico, as well as tests conducted at the **FIVES RESEARCH AND DEVELOPMENT CENTER DEDICATED TO CEMENT AND MINERALS**: the pilot facilities obtained excellent results compared to industrial tests using traditional technology.

Luc Papillon, Chairman & CEO of Ciment Québec Inc.

*"Following a thorough technical review of different technologies currently available for cement grinding, we chose FCB Horomill®. We are confident that it is the **solution best adapted to our varied range of cements and our ambition to reduce our environmental footprint.**"*

FCB Horomill® grinding technology offers unique performance in terms of energy efficiency, flexibility, lack of water consumption and quality of the finished product. It operates in full automatic mode and with continuous data processing for ongoing facility optimization.

It helps significantly reduce CO₂ emissions linked to cement production, thanks to its low energy consumption and reduced clinker levels in the cement.

It also integrates perfectly into the existing system, as it is compact and generates low noise and vibration levels.

With over 60 units in operation, including around 20 in America, FCB Horomill® meets production and environmental requirements at over 30 companies worldwide.



VICAT RENEWS ITS PARTNERSHIP WITH FIVES TO SUPPLY A COMPLETE CLINKER PRODUCTION LINE COMBINING FLEXIBILITY AND ENERGY EFFICIENCY

PERFORMANCE, ENERGY EFFICIENCY, LOCAL SUPPORT

For its project in Senegal, SOCOIM Industries, a subsidiary of the VICAT Group, wanted to use the **BEST TECHNOLOGIES AND INTERNATIONAL STANDARDS**, notably in terms of alternative fuels use and energy efficiency.

The new line will integrate the latest Fives filtration and pyroprocess technologies, allowing: **better quality finished products, maximum flexibility, optimal equipment efficiency and automated pyroprocess control.**

Beyond technical performance, the pyroprocess systems will meet the customer's high environmental requirements: **low heat consumption, low level of dust and NOx emissions and extensive use of alternative fuels.**

UP TO 70% OF THE FUEL MIX WILL COME FROM ALTERNATIVE FUELS (specifically biomass), while maintaining operational stability.

Guy SIDOS, Chairman and CEO of the Vicat Group

*"The Vicat group is renewing its partnership with the Fives group through this major project to build a new line with a strong local dimension, **employing local workers and contractors.** This plant will eventually help eliminate the use of fossil fuels, reduce our energy consumption and **support local development in Senegal** to make a high-quality product, while doubling our production capacity. "*

FIVES SETS A NEW RECORD IN THE SUPPLY OF COLD BOXES

PRODUCTION RECORDS

Fives has once again beaten **ALL PRODUCTION RECORDS** to supply its customer (a leader in ethylene production) with a replacement cold box and limit the downtime of its plant in Qatar.

Outstanding efforts by Fives teams, strict management of all supply, design and production stages, as well as improved organization of subcontractor follow-up were key to this success. The cold box was designed in under 5 months at the Golbey workshops in France, and installed during a scheduled maintenance shutdown at the site, as requested by the customer. The equipment operates in line with its expectations, and it was highly satisfied with Fives' ability to manage emergency replacement projects.

The customer then asked Fives experts to service a second cold box already on site. The results showed that there were no leaks, and Fives teams carried out preventive maintenance actions to improve control over its equipment to avoid future outages.

Fives has over 60 years of expertise in the design, production, installation and maintenance of cold boxes. Cold boxes are self-supporting structures which contain plate-fin heat exchangers, as well as other cryogenic equipment. They offer protection against bad weather, but above all heat insulation. Fives has supplied over 350 cold boxes worldwide to natural gas and industrial gas treatment plants, as well as petrochemical plants.



FIVES CONTRIBUTES TO THE PROCESS AUTOMATION OF NEXTER AND AIRBUS HELICOPTERS TO INCREASE THEIR PRODUCTION

More than just a machine designer, **Fives is a SUPPLIER OF COMPLETE MACHINING SOLUTIONS**, that enable industrial player to **modernize their processes and increase their production**.

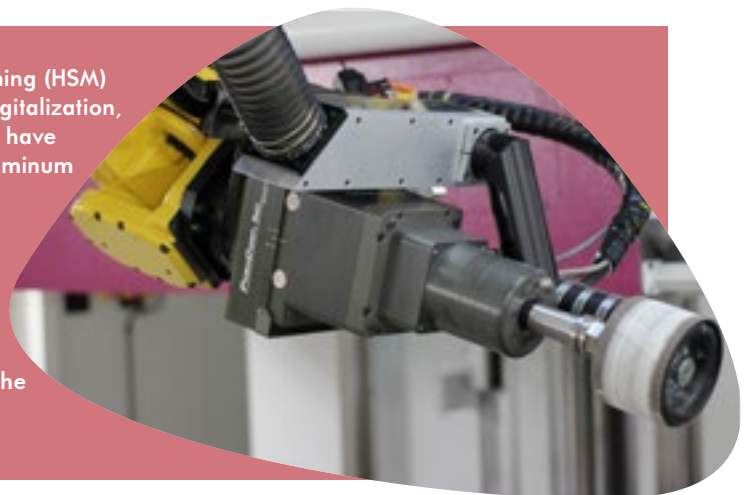
Last August, **Nexter** inaugurated their new high-speed machining unit developed by Fives, which will eventually enable the production of parts required for 450 vehicles per year. This is part of the NextFab modernization project, which aims to **TRIPLE THE ANNUAL PRODUCTION CAPACITY of Army machinery and vehicles by 2025**.

A chance for **Sylvain Rousseau, Nexter's Director of Operations**, to emphasize the major step that the commissioning of this machining cell plays in the production ramp-up of the Roanne site, and **the UNPRECEDENTED CAPACITIES ACHIEVED ON AN INDUSTRIAL AND TECHNOLOGICAL LEVEL THANKS TO FIVES' EXPERTISE**.

At **Airbus Helicopters**, the fully automated Liné Machines cell for machining composite helicopter blades is now in production at its Dugny site. It helps **MODERNIZE AIRBUS HELICOPTERS' PRODUCTION PROCESSES** and meets their ambition to meet automation of their processes through robotics, programming and process control levers, which are integrated into the production chain.

The Nexter machining cell, featuring high-speed machining (HSM) technology combined with advanced automation and digitalization, includes four Forest-Liné V-Star machines, two of which have already been installed. It can trim and drill the thick aluminum plates required to manufacture the sides of SCORPION program armored vehicles.

The automated cell installed at Airbus Helicopters includes the Liné Machines RoboTool technology to position and hold the blades, a Liné Machines HMM horizontal milling machine to machine the blades, and the Liné Machines RoboFinish for blade deburring.



THE WORLD'S LEADING E-COMMERCE COMPANY CHOOSES FIVES TO BOOST THE EFFICIENCY OF ITS ORDER PREPARATION AND LAST MILE DELIVERY

PERFORMANCE

The world's N°1 e-commerce company wanted to further consolidate its position on the e-commerce market in 3 major areas of development: expanding its network, boosting the performance of, and improving the efficiency of its last-mile delivery.

As a partner of the e-commerce leader since 2016, Fives was selected to tackle these challenges by providing cutting-edge technologies and automated order preparation sorting and order picking systems. As a world leader in mechanized and robotic solutions, Fives also incorporates the customer's proprietary technologies.

By contributing to the automation of its customer's facilities, Fives has enabled it to:

- **HAVE A DIRECT IMPACT ON THE PERFORMANCE OF ITS LOGISTICS OPERATIONS;**
- **ADDRESS AND MEET THE CHALLENGES OF E-COMMERCE**, such as the increase in online orders and the shortening of home delivery times;
- **ANTICIPATE GLOBAL INDUSTRY GROWTH FORECASTS**, estimated between 20 and 30% by 2025 (MarketWatch, 2021).

The warehouses of the world's leading e-commerce company are equipped with Fives' latest high-end, proprietary and proprietary technologies:

- Tri-Sort SDX+PTM Linear Parcel Shoe Sorter can support mono-lateral (at 198 m/min, or 650 ft/min) or bi-lateral (at 122 m/min, or 400 ft/min) configuration divert switch designs. This allows greater flexibility to divert up to 18,000 oversized parcels per hour to a parallel conveyor, or to direct parcels to another part of the facility as needed;
- Singulators convert bulk flows of packages, small parcels, packets, large envelopes and flyers with high accuracy (error rate of 1 per 10,000 items = the industry's highest singulation rate);
- GENI-Belt™ cross-belt sorters, which offer unrivaled precision of 99.99% and outstanding sorting capacity, regardless of item type;
- The Swiveler Wheel Diverter processes between 1,500 and 6,800 parcels per hour, including both standard and small items. The system is designed to handle different kinds of items, such as carton boxes, flat items and polybags.



FIVES SUPPLIES THE WORLD'S FASTEST TUBE PRODUCTION LINES

Fives was asked to supply the world's fastest tube production lines for a leading manufacturer in the United States.

In partnership with its customer, Fives pushed its standard tube mill range to achieve record production speeds. The new developments incorporated in these lines empowered motor gears, faster accumulators and flashing welders.

The order includes four OTO welded tube mill lines able to produce galvanized tubes to protect cables from magnetic fields and impact or crush damage. The two smallest rolling mills are able to reach a world record speed of 335 m/min.

The safety and automation aspects were considered very closely, with the facility including a complete system for automatic coil loading and crane and burr orientation devices.



AT THE HEART OF A MAJOR INDUSTRIAL TRANSFORMATION, FIVES REINVENTS ITSELF AND RECEIVES THE “INDUSTRY OF THE FUTURE SHOWCASE” LABEL

Through its subsidiary Fives Intralogistics SAS, Fives has been awarded the “Industry of the Future Showcase” label from the Alliance for the Industry of the Future (AIF) for its innovative industrial transformation project, based on the reorganization of production and the appreciation of the human role.

Awarded following recommendation by an ad-hoc committee of the Alliance for the Industry of the Future (AIF) and approval by its Board of Directors, the “Industry of the Future Showcase” label has been awarded since 2015 to those industrial actors most committed to their transformation. SMEs, mid-cap businesses and major industrial groups can submit their application and be awarded the label, which is a marker of dynamism and competitiveness. **OF THE 97 INDUSTRIAL COMPANIES QUALIFYING FOR THE “INDUSTRY OF THE FUTURE SHOWCASE” LABEL, FIVES INTRALOGISTICS IS THE ONLY ONE IN ITS SPECIFIC SECTOR.**

The “Industry of the Future” project by Fives Intralogistics SAS is emblematic of the Group’s complete transformation, in a context of strong growth.

The project is embodied by digital continuity via:

- the commissioning of new industrial tools;
- integration of a configurator;
- the implementation of PLM (Product Lifecycle Management) and a 3D immersion room for training and immersion in designed facilities;
- the deployment of technical document digitalization.

At the same time, particular attention was paid to improving working conditions and to the energy efficiency of the buildings.

This transformation accelerates the shift to the industry of the future and the development of a new range of products (EASY-Stream™ conveyors) whose European production will be focused at the Fives Intralogistics SAS site (Chasse-sur-Rhône - Isère), in the form of a center of expertise.

Through this transformation, Fives applies the highest standards of the Industry of the Future to its own equipment, with the following benefits: reduced costs and time to market, growth in sales and results, improved attractiveness and international development.



FOCUS

FIVES COMMISSIONS AN EXCEPTIONALLY EFFICIENT GALVANIZING LINE AHEAD OF SCHEDULE

Fives has launched a new galvanizing line for the Steel Dynamics plant in Columbus, United States, allowing them to diversify their product portfolio.

With a **HIGH LEVEL OF FLEXIBILITY AND PROCESS PERFORMANCE**, the line produces different types of coated steels for the construction, appliances and automotive markets, a new opportunity for the plant.

The new continuous galvanizing line has a capacity of 360,000 tonnes per year, and is able to process strips to a thickness of 4 mm and a width of 1,830 mm.

Fives supplied the complete line, from entry to exit coil handling, including degreasing, annealing and galvanizing sections and the skin-pass, as well as metallurgical assistance to obtain steel with different coating types.

The first coil was produced in 18 months, ahead of the contract schedule in the difficult context of the COVID-19 pandemic.

Watch the video: https://youtu.be/zYrPEImi_wl



COMPOSITES: A NEW ROBOTIC PLATFORM OFFERING UNRIVALED PERFORMANCE

PERFORMANCE

The composite market has been growing rapidly for many years. The aerospace industry in particular is participating in this growth by using more and more carbon-based composites to lighten aircraft structures (with weight savings of 25 to 30%) and thus limit their fuel consumption.

Fives, which is already recognized for its automated tape laying and fiber placement solutions, Fives goes one step further with its **new Cincinnati Robotic Viper® platform**. Its **unrivalled performance** in terms of cycle time and quality of composite fiber placement **ALLOW MANUFACTURERS TO INCREASE**. Fives has secured its first order from a major player in the development of next generation composite technologies.

Cincinnati Robotic Viper®, the next generation automated solution for composites fiber placement

Designed to automate applications that were previously laid up by hand, the Cincinnati Robotic Viper® is suitable for manufacturing internal and external parts with various sizes and complex shapes. Thanks to an innovative robotic fiber placement head and the state-of-the-art In-Process Inspection capability for real-time quality analysis without stopping the production line, it combines flexibility, accuracy and speed.



STRATEGY IS AGILITY



OUR ACHIEVEMENTS

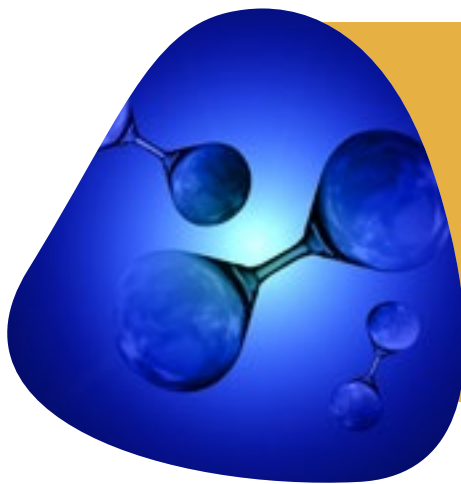
- 43 FIVES consolidates its leadership in hydrogen liquefaction
- 43 FIVES supports the booming semi-conductor industry with a unique grinding solution
- 44 FIVES becomes a strategic partner of AutoStore and consolidates its position as an automated solutions integrator
- 45 DHL chooses FIVES as a premium partner to support its international development and improve its last-mile delivery performance and services
- 46 FIVES, a key partner of the defense, aerospace and space sectors
- 46 FIVES confirms its position as a world leader in high-precision stainless steel rolling mills
- 47 FIVES establishes its position as a leader in the maintenance of SNCF installations and tools
- 48 FIVES supports its customers with their modernization project thanks to a local service and unique technical expertise

FIVES CONSOLIDATES ITS LEADERSHIP IN HYDROGEN LIQUEFACTION

TECHNOLOGICAL LEADER

As a **TECHNOLOGICAL LEADER** in the cryogenics market for over 60 years, Fives has been at the forefront of the hydrogen industry for decades, with over 45 references on this market and the helium market involving the biggest industrial gas operators.

FIVES recently entered into a partnership with Plug Power Inc. and Atlas Copco Gas and Process to supply cryogenic heat exchangers for an ambitious hydrogen liquefaction plant development plan. Plug Power plans to supply 500 tons of green liquid hydrogen per day by 2025, and 1,000 tons per day globally by 2028.



As a **TECHNOLOGICAL LEADER** in the cryogenics market for over 60 years, Fives has been at the forefront of the hydrogen industry for decades, with over 45 references on this market and the helium market involving the biggest industrial gas operators.

FIVES recently entered into a partnership with Plug Power Inc. and Atlas Copco Gas and Process to supply cryogenic heat exchangers for an ambitious hydrogen liquefaction plant development plan. Plug Power plans to supply 500 tons of green liquid hydrogen per day by 2025, and 1,000 tons per day globally by 2028.

FIVES SUPPORTS THE BOOMING SEMI-CONDUCTOR INDUSTRY WITH A UNIQUE GRINDING SOLUTION

Fives has once again been selected by a major optical systems manufacturer to provide an ultra-precision grinding machine: **THE OGM1600, IS THE ONLY HIGH-PRECISION GRINDING MACHINE BEING USED IN PRODUCTION TO MANUFACTURE THE NEXT GENERATION OF MIRRORS USED IN THE SEMI-CONDUCTOR INDUSTRY.**

This customer knew that it was not economically viable to manufacture the next generation of mirrors - which are larger, up to 1,600 mm in diameter - using conventional grinding technologies. A machine reducing grinding times and the time for subsequent process steps (polishing) was required. Convinced by the performance obtained during demonstrations on the Cranfield Precision OGM 1600 grinding machine, they have selected this machine, which can grind mirrors with highly complex surface profiles and with no axes of symmetry at the required level of precision.

Within five years, most of the semi-conductors being used in high end in premium phones, computers, etc. will be manufactured using light guided by mirrors that were ground on the Cranfield Precision OGM 1600 machine.



FIVES BECOMES A STRATEGIC PARTNER OF AUTOSTORE AND STRENGTHENS ITS POSITION AS AN INTEGRATOR OF CUTTING-EDGE AUTOMATED SOLUTIONS

SPEED, FLEXIBILITY, RELIABILITY

As part of its development strategy, Fives adds is giving new dimension to its intralogistics activity in Europe, thanks to the rapid implementation of AutoStore complete solutions, thus supporting the growth of the retail and e-commerce sectors.

AutoStore technology a pioneering in cube storage automation complements Fives technology portfolio, allowing the Group to extend its “piece picking” offer to help customers tackle automation challenges.

By developing AutoStore projects, Fives allows its customers to:

- **IMPROVE THEIR STORAGE CAPACITY;**
- **BOOST THE THROUGHPUT, FLEXIBILITY AND RELIABILITY OF THEIR ORDER PICKING.**

ULTRA-HIGH DENSITY AUTOMATED STORAGE AND RETRIEVAL SYSTEM (AS/RS)

It offers customers flexible and rapid order picking, while maximizing the use of space in their warehouse, as the solution offers the highest density ratio of all goods storage systems on the market (over 100,000 bins as part of a logistics facility or overall production).

Thanks to its unique aluminum cubic grid system, AutoStore™ reduces the storage footprint by 75% compared to a traditional storage space. AutoStore™ adapts easily to the company's needs with minimal disruption. They simply need to add bins, ports or robots to boost throughput, or expand the grid while the system is in operation for greater storage capacity.

Just like building blocks, the grid can form any shape or height as required. The grid adapts to the shape of the building, whether it is rectangular, triangular, or irregular. Any shape is possible, not like traditional AS/RS that require longitudinal shaped buildings.

Based on a modular system, each port and robot works independently and can be serviced without stopping. This means there is never a point of failure. Thanks to software innovation, AutoStore has a 99.6% up-time worldwide system average and can access the entire inventory 24/7.

The robots recharge themselves at the right time to avoid excessive charging and regenerate energy whenever they lower a bin or slow down. Since the robots do not require ventilation, heating, cooling or lighting, the energy consumed by 10 robots is equivalent to a coffee machine used for the same amount of time.



DHL CHOOSES FIVES AS A PREMIUM PARTNER TO SUPPORT ITS INTERNATIONAL DEVELOPMENT AND IMPROVE ITS LAST-MILE DELIVERY PERFORMANCE AND SERVICES

KEY PARTNER

Fives' turnkey offerin enables DHL to sort parcels with **HIGH RELIABILITY AND PERFORMANCE**, thus offering error-free express (next-day) delivery to its customers anywhere in the world. Fives' technologies not only help process an exponential number of parcels, but also manage parcels containing irregularly sized objects of an irregular size, which are difficult to process automatically. Fives' solutions can process up to 28,000 parcels per hour, enabling couriers like DHL to address the 30% growth forecast predicted for the parcels market by 2023.

A European collaboration dating back 20 years, Fives is now a true **partner** able to collaborate on a global scale. The Group is now the only player capable of providing solutions ranging from basic systems to mega hubs. Fives is committed to a virtuous industry by investing in **MORE SUSTAINABLE, ENERGY-EFFICIENT INNOVATIONS**, to improve the working conditions of logistics operators.

To date, Fives has installed around fifteen major systems, including DHL's recent European mega hubs, and at least ten other medium-sized systems that make up DHL's network of service centers.

Alongside this European partnership, Fives has consolidated its relationships with DHL in Asia Pacific (APAC), with facilities in Tokyo, Shanghai and Hong Kong, as well as in the Middle East and North Africa (MENA), with facilities in Israël, the United Arab Emirates, Qatar, Jordan and Morocco.

Fives is also working alongside DHL in North America and recently in Mexico, with a new sorting center in Querétaro and over 20 upcoming centers.

DHL's service centers and mega hubs feature Fives' latest premium and proprietary technologies:

- GENI-Ant™ sorters based on AMR technology (autonomous mobile robots) for automatic sorting of irregular shaped or sized parcels, thus not compatible with current sorters ;
- GENI-Belt™ cross-belt sorters, which offer unrivaled accuracy of 99.99% and outstanding sorting capacity, regardless of item type;
- GENI-Flex™ modular sorters for oversized and irregular parcels;
- Conveyors;
- Warehouse management and control software (WMS, WCS, etc.)



FIVES, A KEY PARTNER OF THE DEFENSE, AEROSPACE AND SPACE SECTORS

Fives establishes its **LEADERSHIP** through its ability to advise its customers to improve their manufacturing processes and support them with technological advancement.

By adopting this approach, the Group has been able to strengthen its relations with major players in the Military/Defense, Aerospace and General Industry sectors in North America. Fives has established itself as a **KEY PARTNER FOR SHIPYARDS, AIR FORCE BASES, ARMY ARSENALS AS WELL AS TIER SUPPLIERS** such as **General Dynamics Electric Boat, Sikorsky, Lockheed Martin network, Northrop Grumman, Forrest Machine, Oshkosh Truck**, providing them with the best technological solution at the best cost and in the best time

FIVES ALSO SUPPORTS THE SURGING SPACE INDUSTRY by accompanying customers such as **SpaceX, Blue Origin, Northrop Grumman or United Launch Alliance** in their pursuit of space travels to the Moon and Mars for exploration. The increasing demand for rocket launches implies a shift from one-off build production to serial manufacturing production processes*.



«*Giddings & Lewis Vertical Turning Centers are used for manufacturing rocket engine nozzles and other engine components; Lund Engineering automated solutions for material/rocket delivery for rocket engine mounting and propulsion chamber assembly.

FIVES CONFIRMS ITS POSITION AS A WORLD LEADER IN HIGH-PRECISION STAINLESS STEEL ROLLING MILLS

MEETING THE NEEDS OF CUTTING-EDGE INDUSTRIES

Fives has successfully commissioned new ultra-high precision stainless steel cold rolling mills at the Zhejiang Yongjin Stainless Steel Group and Ningbo Baoxin Stainless Steel Company plants in China.

The new DMS 20Hi EcoMill is able to obtain strip thickness as low as 30 microns across a width of 1,250 mm, which is a world record in stainless steel rolling. They are designed to **meet stainless steel requirements in cutting-edge industries** such as the automotive, electronics or photovoltaic panel sectors.

The DMS 20Hi EcoMill draws on the latest technological developments, notably with a faster rolling speed, a new strip and work roll spray system design, new wipers, improvements to the fume exhaust system and a cutting-edge concept applied to flatness actuators and the mandrel greasing system.
Watch the video: <https://youtu.be/X10SuAco-Fk>



FIVES ESTABLISHES ITS POSITION AS A LEADER IN THE MAINTENANCE OF SNCF TECHNICENTER INSTALLATIONS AND TOOLS

SAFETY AND QUALITY

Fives has offered its support to SNCF to maintain its installations and tools since 2009. This long-term collaboration has allowed the two companies to **IMPROVE SAFETY** within facilities and **significantly improve the reliability of installation and tool maintenance**, all while **optimizing costs**. Fives has made a commitment to SNCF to **OPTIMIZE PRODUCTIVITY GAINS BY 30% and improve results in terms of safety, installation availability and quality**.

As part of this contract renewal, Fives has been awarded 3 out of 5 work packages, the highest possible number for a single provider. This covers 23 SNCF sites, including all industrial technicenters recognized as the most technical. In addition to this commercial success, Fives was also awarded the prize of “2021 SNCF Supplier” in the «Social Innovation» category for its internal training school, Fives Academy – Maintenance. SNCF appreciated its objective to address the shortage of qualified labor in the industrial maintenance sector.



The 150 Fives employees dedicated to rail maintenance work with SNCF on a wide range of installations, including:

- underfloor wheel lathes, to machine axles;
- underfloor wheel lathes, to machine axles;
- pit jacks, to fit and remove axles;
- machine-tools, to precisely and repeatedly move a tool to machine a part.

FIVES SUPPORTS ITS CUSTOMERS WITH THEIR MODERNIZATION PROJECT THANKS TO A LOCAL SERVICE AND UNIQUE TECHNICAL EXPERTISE

FEWER RISKS, IMPROVED PRODUCTIVITY

In Mozambique, as part of a general reliability and productivity improvement plan for a primary aluminum production plant, Fives was asked to upgrade the electrical and automation systems for the entire multi-purpose overhead crane fleet.

Bolstered by its technical expertise and the support of its local subsidiary, Fives was able to advise and support its customer with its technological decisions to **IMPROVE THE PERFORMANCE OF ITS EQUIPMENT**.

The technicians pre-equipped 18 overhead cranes operating in the potrooms, using the SMARTCrane “GateWay” module that enables a remote connection. Thanks to this industry 4.0 technology, access to dashboards/alerts will offer a real-time overview of overhead crane operation to **ANTICIPATE MAINTENANCE REQUIREMENTS AND MINIMIZE THE RISK OF COSTLY OUTAGES**.

After renovating four overhead cranes in 2020, this new contract confirms the customer’s confidence.

In an aluminum smelter, the multi-purpose overhead cranes help carry out all the required operations for electrolytic cell operation. Now, Fives equips all its cranes with SMARTCrane digital technology, a custom solution based on its CEM expertise, to track the crane fleet in real-time to help anticipate maintenance requirements and minimize the risk of costly outages.





fives

Industry can do it

