

ACTIVITY REPORT 2023



FLANDERS
MAKE

DRIVING INNOVATION IN MANUFACTURING

TABLE OF CONTENTS

ACTIVITY REPORT

2023

1	Key figures	57	Innovation ecosystem
3	Preface of the Chairman	57	Our membership network
9	Preface of our CEO	59	Join Flanders Make
13	Highlights 2023	61	Organisation and figures
15	International collaborations	61	Organisational flowchart
19	Working together on digital transformation	62	Board of Directors
21	Tech Uptakes	63	Advisory Committees
52	Flanders Make	64	Balance sheet and annual results
55	Clusters of and to the benefit of companies	65	KPI 2023

KEY FIGURES

2023

Flanders Make performs high-tech research together with and to the benefit of companies. As such, we contribute to product and production innovation for vehicles, machines and factories. In this way, we help companies to be competitive in a globalised market. Below, we've listed some notable figures. In this report, we take a closer look at the results that Flanders Make realised in 2023, in its three co-creation centres as well as in its core labs at the five Flemish universities.



€ 106 mil.
revenue



165
companies involved in
ongoing covenant projects



+900
employees



457
ongoing research projects



18
new covenant projects





Urbain Vandeurzen
Chairman

Preface of the chairman

NO SUSTAINED PROSPERITY WITHOUT STRENGTHENING OUR INDUSTRY

My final foreword as chairman of the board of directors of Flanders Make revolves around the striking observation that today it is make or break for our industry. Indeed, all alarm bells are ringing. Fortunately, the required response is clear: besides a Green Deal, we more than ever need an 'Industrial Deal', in Europe, in Belgium and in Flanders.

By alarm bells I mean bankruptcies like the one at Van Hool, which has cost at least 1,000 jobs, or closures like that of paper manufacturer Sappi in Lanaken, costing 600 jobs. Or missed investments like Audi's new high-end electric model that will not come to Brussels. The entire nitrogen and permit policy also constitutes such an alarm bell: INEOS' environmental permit for a new ethane cracker in Antwerp, an investment worth several billion dollars, has been annulled in first instance; Umicore is considering moving its new recycling plant from Belgium to northern France; and ArcelorMittal's planned €1.1 billion green investment in a green blast furnace in the Ghent Canal Zone is under pressure because France, with its lower energy prices, is launching a charm offensive.

Our handicaps are well known: our labour costs are among the highest in Europe. We are facing permanent labour market shortages and – since Russia's invasion of Ukraine – our energy costs are three to four times higher than those in America. Add to this the great legal uncertainty of our permit policy and the cry for help from the industry is obvious.

Handing out generous benefits

America, with its so-called Inflation Reduction Act, has a ‘greening programme’ that is actually a re-industrialisation programme in disguise through which the government is generously handing out subsidies and tax breaks to attract large investments to America. A strategy that is working quite well. Europe, meanwhile, decided to drop its strict state aid rules, with the result that the level playing field is gone and individual countries are now offering subsidies and other benefits to attract companies. This creates yet another problem, on top of the high energy prices and uncertain permit policy, namely that of internal and unequal competition, as France and Germany have much deeper pockets than Belgium or Flanders to attract future-oriented investments. Another challenge calling for an urgent response. Hopefully, as the current chair of the European Council, Belgium can weigh heavily on that.

New ten-year action plan

I have been pleading for quite a while now to move towards an Industrial Deal alongside a Green Deal. Also in the recent 'Antwerp Declaration for a European Industrial Deal', top European industrialists plead for maintaining industrial production in Europe. Such 'Industrial Deal' is an absolute prerequisite for the realisation of the EU Green Deal. I absolutely support the 2050 ambitions, but we must ensure that the pace and method of the sustainability process will not destroy our industry. That is why a new Belgian & Flemish ten-year re-industrialisation plan is an absolute must. That plan should focus on a number of reforms – social security funding, health sector, labour market, education ... – but also include an ambitious programme for strengthening our industry.

“A re-industrialisation plan is necessary to be able to achieve more economic growth”

This re-industrialisation plan is necessary to be able to achieve more economic growth. While in the past 15-20 years our productivity has remained high, we are barely making productivity gains: from 4-5 percent a year in the 1970s to 0.4 percent a year today. In contrast, other prosperous OECD countries record 1.1% productivity gains per year. As a result, we have – over the past 2 decades – missed out on 50 to 75 billion euros in economic growth compared to these countries.

There are two ways to increase our economic growth. The first is getting more people at work: today, Flanders with its 77% is close to 80% employment, but Wallonia and Brussels are lagging far behind. Secondly, we need to make the people who are employed more productive again, so that in the coming years we can realise additional economic growth worth 50 billion

euros. This requires a boost to our economy and would allow us to clean up our budget and continue financing our social security. In other words, it would enable us to maintain both our prosperity and welfare.

Investing in industry pays off on all fronts: we already account for 50 percent of all export, and productivity gains in industrial sectors are 40 percent higher than in the services sector. Every additional job in the industry creates another 3 to 4 indirect jobs. Moreover, with the breakthrough of AI, we can unleash some new productivity engines on the economy. The business case is clear and, in that context, the Flemish government has approved a Covenant for Flanders Make for the next five years that remains committed to a growth ambition that will allow Flanders Make in the coming years to support twice as many companies. Only, in addition, we must urgently initiate the necessary reforms and create the required boundary conditions to strengthen our competitiveness.

Flanders Make in 2023

Looking back at 2023 from a Flanders Make perspective, I am pleased to say that we had yet another successful year: we continue to record double-digit growth figures despite the difficult budgetary situation – which shows that our local manufacturing companies remain committed to innovation and sustainability – and last November we were able to open our state-of-the-art Industry 4.0 co-creation centre in Kortrijk. Actually, I should even say Industry 5.0, because not only are we investing heavily in digitalisation and automation, we also rate the importance of the human operator very highly. After all, technology must also support the operator, so as not to create a conflict between automation and job retention. That is why our recently opened Flanders Make Academy strongly focuses on new competences for operators.

After Lommel for vehicle development and validation and Leuven for mechatronics product development and system development, the co-creation centre in Kortrijk with its focus on Industry 5.0 completes the circle.



Personal reflection

Finally, if you allow me to look back on my ending mandate as chairman of Flanders Make's board of directors, I am particularly proud of three things. First, that we managed to successfully integrate the former smaller innovation clusters Flanders Drive and Flanders Mechatronics with the research teams at the universities.

Secondly, that we have not only developed a strategic vision for Flanders to embrace digitalisation and become a forerunner in terms of Industry 4.0 and sustainable change, but have also translated this strategic vision into a roadmap that has led to close partnerships with an annually growing group of companies. As a result, surveys on Industry 4.0 readiness show that we have grown to a level where 75 percent of our companies say they are more competitive and better than the competition, or at least as good. Thirdly, that we have managed to gain political support for funding the ecosystem of the manufacturing industry and making it a priority.

Besides, the latest evaluation revealed that we have an excellent management and operational team and that the procedures and processes within Flanders Make are very well organised. In other words, we not only have a strong vision for the future, but also the discipline, competences and customer focus to make it happen.

Finally, I would like to thank my fellow board members for their pleasant and professional cooperation. A special word of thanks to Dirk Torfs, CEO from the start of Flanders Make until 2023, and good luck to Grisja Lobbestael, current CEO, and the whole Flanders Make team.

I took the initiative more than 25 years ago to establish Flanders Drive as the innovation spearhead for the vehicle industry, and I co-founded Flanders Make, the strategic research centre for the manufacturing industry. I am now ending my long-standing mandate as chairman, but will of course remain active as entrepreneur and investor. Also know that after leaving office, I will remain an ardent ambassador and promoter of Flanders Make and of the manufacturing industry in Flanders.



Preface of our CEO

INNOVATION IS THE ANSWER TO THE CHALLENGES OF A PARTICULARLY FAST-CHANGING WORLD

There is no denying it: the Flemish (manufacturing) industry is not doing well. The perils at Van Hool are the most recent, but probably not the last illustration of this. "At the same time, this offers great opportunities for Flanders Make to take the stage and show the manufacturing industry the way to new horizons. After all, a competitive manufacturing industry is the best insurance for the prosperity of people and society", says Grisja Lobbestael, Flanders Make's new CEO.

The good news is that Flanders Make has had a successful year, with as eye-catcher the opening of its third centre for technological research and innovation for the manufacturing industry in Kortrijk, focusing on Industry 4.0/5.0. Grisja: "Think of it as a co-housing facility for research and industry. Flanders Make, UGent and KULeuven as well as our industrial partners are united under the same roof. In addition, we inspire young people to choose a STEM study through the VOKA Talent Centre initiative. The new site is strategically located in Kortrijk, close to the large machine builders, which traditionally are strongly concentrated in this part of West Flanders.

Two successful openings

The opening of the centre and the accompanying symposium – where industrial partners and research teams gave an update on their innovation efforts – attracted some 600 attendees. "A combination of the fine fleur of Flemish business leaders, politicians, VIPs and, of course, our own employees who made the day an absolute hit. Moreover, in the following week we welcomed another 400 people during the four-day open house, which we organised under the West Flemish heading "Komm ne kjie binn" (laughs). Visitors could not only discover all there is to know about the collaboration opportunities and our pioneering research, they could also experience top innovations live at work amidst an inspiring immersive experience. That four-day event generated a lot of interesting contacts, an indicator underlining once more the new centre's right to exist."



Grisja Lobbestael
CEO

“If we don't innovate, we as a society end up into trouble”

Robots and exoskeletons

Another interesting development is that Flanders Make has set up a new lab at the VUB named AugmentX, which focuses on the pivotal position of humans in collaboration with technology. "More specifically, we are looking at how technology can assist humans, for instance through the use of exoskeletons and collaborative robots. The validation and demonstration of how they can effectively handle heavy or onerous actions will then be carried out in Kortrijk. In short, an ideal collaboration that can lead to new insights into ergonomics, but just as well into industrial processes. So that people can set to work with them in the best conditions possible."

Industry as cornerstone of our prosperity

From Flanders Make in 2023 to the manufacturing industry in 2024. Here, the new CEO wants to put particular emphasis on the "yes, we can" spirit. "Yes, our industry faces serious challenges and ominous grey clouds are coming its way", he agrees. "But crucial in all this will be how we will respond. In a nutshell: focussing on innovation, which is indispensable in a particularly fast-changing world. And desperately needed, because the changes also have a huge impact on the way in which we work and live. If we don't innovate, our society itself will eventually get into trouble."

"Flanders Make's mission is not only about trying to provide answers through disruptive, innovative research, we must also ensure that our companies set to work with it and become more competitive. In doing so, we can make sure that this industry, the cornerstone of our prosperity, stays afloat. Let that also be a call to our people to truly believe that thanks to our innovative research, we have the power within us to make a difference. Let us embrace innovation!"

The brand "Flanders Make"!

Fine words that are not without some challenges, Grisja Lobbestael readily admits. "Our reach towards industrial companies must become even stronger, we need to make our expertise understandable and clearly and concretely demonstrate the return. Flanders Make must

become a brand, a very attractive research centre where industry comes knocking spontaneously, looking for new technological solutions, business models and opportunities."

Optimism is a moral duty and in this spirit our CEO highlights the positive elements that we can and should include in the future narrative of our manufacturing industry. "The Covenant with the Flemish government that we have now concluded has increased our budget by 24 million euros. We can be proud of this! So what are we going to do with these funds? We will continue to focus on sustainability, which is important and even crucial for the future of our society, and on technology, especially in terms of smart and interconnected innovations in the field of product design and product conversion."

"Furthermore, we are pushing hard for partnerships, for instance with EnergyVille when it comes to renewable energy and intelligent energy systems. Finally, we will launch the Flanders Make Academy, which will focus on the crucial position of humans in the midst of these disruptive new technologies. We must absolutely ensure that people embrace innovations, rather than being afraid of them. If we overlook the latter, we may work on so many great developments, the white and blue collar operators will never set to work with them."

Praise for Urbain Vandeurzen

In conclusion, Grisja Lobbestael would like to reflect on the crucial role played by Urbain Vandeurzen as departing chairman of Flanders Make's board of directors. "He has made the organisation into what it is today: a leading strategic research centre with international appeal, supporting our Flemish industry in its pursuit of global leadership. Urbain has succeeded in turning Flanders Make into an industry-driven organisation, conducting exceptional research with no less than 850 researchers and being part of what we call a collaborative ecosystem: working together to get better ourselves and make each other better. With the ultimate ambition of making the Flemish industry even stronger, keeping our companies in Flanders and becoming a magnet for foreign investors."

HIGHLIGHTS 2023

Opening of our Kortrijk branch



Companies can no longer ignore it: their customers increasingly expect customised products, delivered quickly and preferably at no extra cost. In November 2023, we opened our new establishment in Kortrijk, where we support companies in smart, sustainable production, focusing on small series and a high product mix.

At Flanders Make in Kortrijk, companies are given the opportunity to test the latest production technologies and processes in real conditions. This allows them to continue to invest in highly competitive production in their own region.

Flanders Make is a "Baanbrekende Werkgever"



In 2023, we completed a learning program and received the "Baanbrekende Werkgever" certificate. With this we express a commitment to continue building a sustainable and people-oriented organisation. The three pillars of "Baanbrekende Werkgever" include "Less on the Road", "More Sustainable Work" and "Smarter and Greener On the Road" where environmentally friendly choices by our employees are actively encouraged and supported.

Find more information at

www.baanbrekendewerkgever.be/baanbrekendewerkgevers-24/flanders-make

Only available in Dutch and French

Flanders Make Symposium 2023 The Future of Manufacturing



This year's annual Flanders Make symposium focused on Industry 5.0 and the crucial role of human operators in it. Another major theme of the symposium was the question how we accelerate innovation in our industry.

This networking event for the wider industry, where top keynote speakers from industry and academia share their expertise on topics that are relevant and topical to the sector, once again attracted more than 600 interested attendees from the industry in Flanders and from several countries in Europe. At this event, Flanders Make showcases its top technologies of the past year through demonstrations. Visitors can thus learn about the research results in an interactive way and discover the added value for their companies.

In 2023, Flanders Make combined this event with the festive opening of its new site in Kortrijk. Prime Minister Jan Jambon participated in both the press conference on the opening of the site in Kortrijk and in the opening event that followed the symposium.

Opening of the AugmentX lab



Physical support of people in a production environment is an important research topic for Flanders Make. To be able to effectively put this research into practice, we have been working hard over the past two years to open the AugmentX lab. In this lab, we can perform accurate ergonomic measurements and analyses, which in turn form the basis for determining the best possible physical support. To this end, we use various types of exoskeletons and cobots, which are also available to companies. All these services are designed to support ergonomic experts and companies in their ergonomic challenges.

AugmentX consists of three labs: a lab at the VUB in Brussels, which focuses on very precise ergonomic measurements and analyses. Our lab in Kortrijk focuses on ergonomic measurements and analyses in a realistic industrial environment. Finally, our mobile MakeLab brings ergonomic services right down to the companies' premises.

International collaborations

THANKS TO EUROPEAN PROGRAMMES, WE ARE BUILDING A COMPETITIVE EDGE

Flanders Make is not only active in Flanders, fascinating research is also being conducted abroad and enriching collaborations are possible. Today, we work in a globalised market with cross-cutting topics such as sustainability and people-oriented development. This is why Flanders Make maintains intensive international contacts, primarily in Europe. Ziga Valic, EU Affairs Manager at Flanders Make, explains what this European cooperation entails.

What exactly does Flanders Make do at the European level?

Ziga Valic: "Europe has a lot of interesting grant programmes for innovative research and development. Horizon Europe, for example, but also Interreg programmes and Digital Europe. In this context, we look for the right partners for projects based on the technology readiness level or TRL. The TRL indicates whether you are still in an early research and development stage, or whether your R&D efforts are already close to market introduction. At a lower TRL, partnerships with universities and technology organisations are of interest. As the level of development advances, we start looking more and more for industrial partners. This is how we introduce our Flemish entrepreneurs to a European network."



Ziga Valic
EU Affairs Manager



What makes these European programmes so interesting?

"Grants are one aspect, but are certainly not the most important argument in favour of European programmes. These programmes give us the opportunity to conduct research and perform tests without being bound by tight deadlines. That allows us to tackle more complex challenges, which may not immediately lead to tangible results, but do enable us to build a competitive edge. By zooming out from the Flemish to the European level, we also gain many insights from foreign projects and exchange knowledge and experiences. This in turn creates interesting business opportunities."

What are the priorities of Flanders Make's European collaboration projects?

"The European Commission has identified three major research and development topics: sustainability, focus on people and resilience. Resilient economies, supply chains and technologies, for instance. It is also clear that the manufacturing industry will have to start focusing on circularity and climate awareness. The industry wants to make the switch to processes that are less harmful to people and the environment and use less precious raw materials. If we focus on innovation in this field, we as European region will become more resilient on a global scale and will be able to secure a healthy future."

"Europe has identified three major research and development topics: sustainability, focus on people and resilience."

Number of ongoing European projects

76

Number of new projects in 2023

17



SUPPORTING COMPANIES ON THEIR TRACK TOWARDS DIGITAL TRANSFORMATION

In cooperation with the companies in our ecosystem, we perform pre-competitive research into shared challenges. In addition, companies can also appeal to us for specific research issues. They can call upon our knowledge and services to develop a new concept, validate a solution of their own or perform extensive tests using our unique, high-tech research facilities. We are happy to show some examples of successful collaborations.



MANUFACTURING COMPANY CONFORMA AUTOMATES PRECISION WORK

FLANDERS MAKE DEVELOPS A 'COBOT' TO WORK WITH HUMANS

Conforma is a pharmaceutical manufacturing company in Destelbergen. Their expertise? Among other things, filling tubes and bottles with liquid and semi-liquid products. Those products are then put into boxes to be sold in pharmacies. "We are looking for ways to increase automation of our production", explains Plant Manager Jeroen Mebis. "With the help of Flanders Make, we are developing a robot to alleviate repetitive work on our production lines."

Putting tubes in boxes: more complex than you would think

On Conforma's production lines today, people are carrying out highly meticulous precision work. And that is not easy to automate. Jeroen Mebis: "We produce a large number of different types of packaging, from small to large and each time with different products inside. If we were specialising in one type of packaging, we could buy a specific machine for it. But that's not how Conforma works. Our biggest challenge at the moment is multi-tube packaging: boxes containing five or 10 tubes of ointment."

Looking for a smart solution to work more efficiently, Conforma turned to Flanders Make. "Unfolding the box, inserting tubes, adding a leaflet and closing the box: these are operations during which a lot can go wrong. Today, we need human hands for that. But it is also very repetitive work, which is stressful and monotonous for our workers. By training a robot to do that work, we can deploy our people on more complex tasks where they really add value."

A robot as colleague

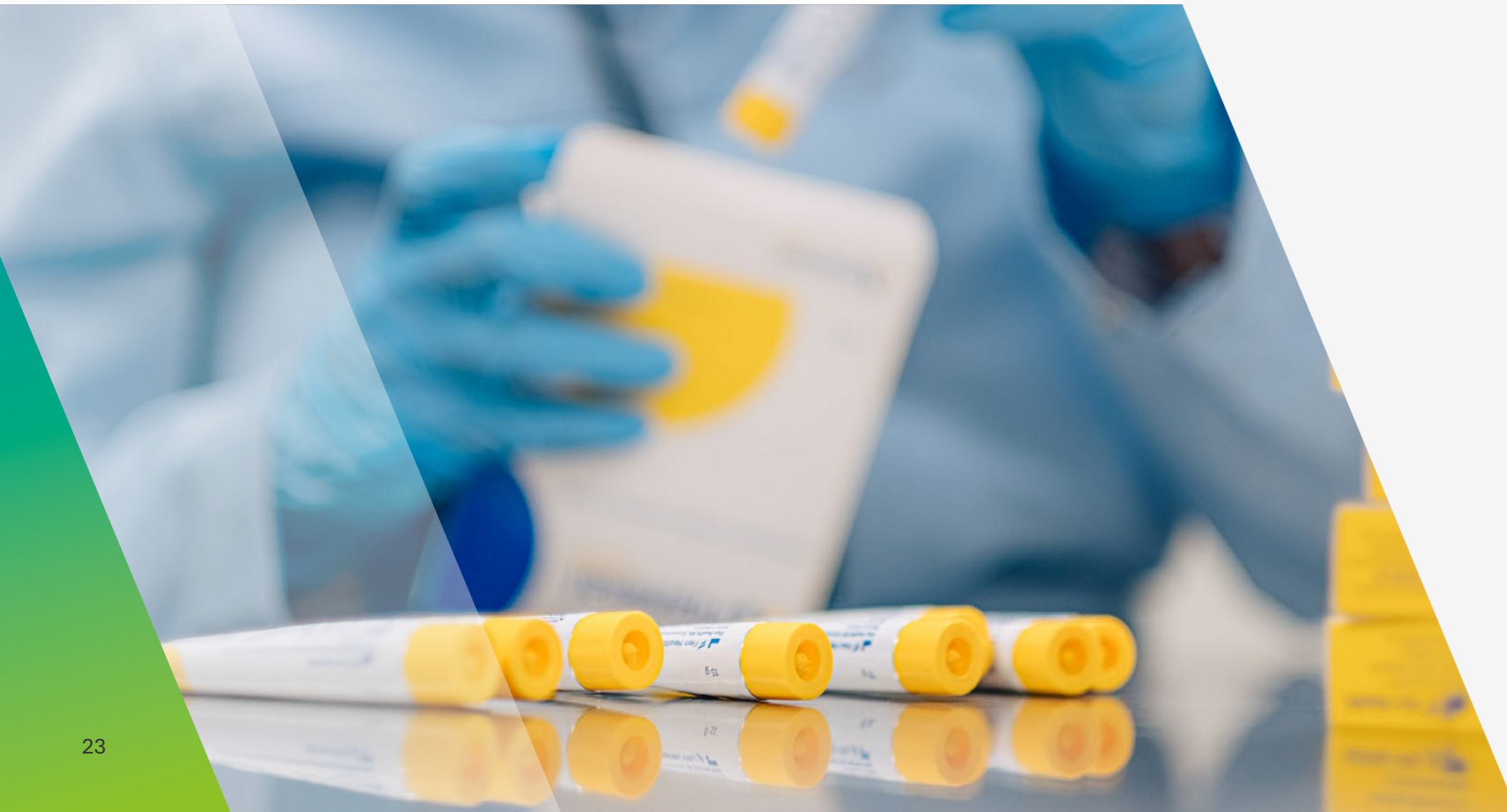
Flanders Make set to work building a prototype of a collaborative robot. Such a 'cobot' works alongside the people on the production line. "We are very happy that Flanders Make wanted to take on this challenge. We were not sure whether our request was realistic. But in the meantime, a test rig is in place and we are currently working on connecting the dots. The robot has already been trained to unfold the boxes, insert leaflets and put the tubes neatly into the box. Now we still need to connect those operations and add checks. For example, we want to make sure there are enough tubes in each box and that they are placed deep enough to be able to close the box."

Apart from the operations to be performed by the cobot, we also looked into safety and maintenance features. "The cobot is equipped with all kinds of safety-related

skills. If someone gets too close, it stops automatically. We also train our technician to know the robot inside out. This allows him to perform maintenance and check the systems at any time."

Freeing up people for valuable work

"As a final step in the process, Flanders Make gives us advice on the correct implementation of the corresponding hard- and software. With that in mind, we go to a robot builder to make our first robot. If this system works well, we will definitely consider expanding. Because if we can use robots and thus free up our human colleagues to perform more complex tasks, we will keep our employees happy and be able to grow better as a company."





SHELTERED WORKPLACE BEWEL EXPLORES OPPORTUNITIES OFFERED BY AUGMENTED REALITY

The Limburg-based sheltered workplace Bewel employs over 2,200 people. "These are people who cannot easily find suitable work due to physical or mental disabilities", says Benny Claes, Technology & Innovation Engineer at Bewel. "With the SESAM project, we want to use augmented reality to make more complex tasks accessible to more of our employees. We achieve this with the help of our partners: Flanders Make, Azumuta and Logflow."

What does 'SESAM' stand for?

Benny Claes: "That's short for 'Sociaal-Economische SAMenwerking' or, in English, Socio-Economic Cooperation. And with this, you're also abreast with the basics of this project. We worked together with Flanders Make for the proof-of-concept, Azumuta created the user interface and Longflow helped us to redesign the logistics processes. At Bewel, we believe that cooperation makes us all stronger. Cooperation with other sheltered workplaces, but also within our wider network. By joining forces, we can come up with creative solutions to shared problems. And as we create generic solutions, these can be used for many more applications. That way, cooperation becomes a win-win story."



**An admirable mindset! But what exactly does your project entail?**

"We are exploring how we can use technology to help our employees with their set of tasks. Some employees are quite capable and fairly quickly able to cope with more complex tasks, but this is certainly not the case for everyone. We want to give all our employees the opportunity to enjoy a sense of autonomy in their work. More specifically, we wish to improve our inbound logistics with this project. Our customer sends us components with which we are to build its control cabinets. When those components arrive, they have to be sorted and prepared for installation. There is also an administrative element: it must be checked on the transfer order how many pieces of each component are expected, and whether or not that number matches the delivery people have in front of them. We want to make that whole process easier by identifying components with augmented reality, with a clear display of the component."



"We are exploring how we can use technology to help our employees with their set of tasks"

Where does the project stand today? And what are the next steps?

"In early 2024, the first practicability tests took place. That also marked the first time some of our employees came into contact with augmented reality. The reactions to it were great. Our employees are proud being able to work with technology. Now we have to use the feedback we received to take the project to the next level. Also for this aspect, we want to cooperate with other interested parties. At the Flanders Make symposium, a number of other sheltered workplaces already showed interest. Not necessarily to deploy the technology in exactly the same way, but to implement at least part of it in their own operations. And so we continue our journey towards digitalisation and the use of technology in our sector. We all get stronger from that."





PCFRUIT: LESS MANPOWER, MORE RESULTS IN FRUIT GROWING

The 'Proefcentrum Fruitteelt' or 'pcfruit' for short is an internationally recognised research centre focusing on fruit growing. The research centre gives advice to fruit and wine growers and performs innovative research. Researcher Kris Ruysen works in the Environment and Technology department. "With technology, we can address some of the biggest issues that growers face today."

The biggest of these issues? Kris Ruysen: "Fruit growing in our region is under a lot of pressure. There are a lot of cheap imports and at the same time fruit growers are facing tightness in the labour market. Abroad, labour costs are lower and it's not easy either to find well-trained personnel. And you really need that in a specialised sector like this."

Precision fruit farming

The pcfruit researchers therefore focus on two fronts: automation and increasing profitability. Kris: "Take an apple orchard, for instance. One tree is growing well, another is having a harder time. The next one, in turn, has too many blossoms. These have to be thinned to avoid having a tree full of small apples. To get the best result, you would have to fertilise, thin and prune almost every apple tree separately. This is labour-intensive and therefore expensive. That is why, among other things, we are looking into new techniques for precision fruit growing. For example, we let drones collect information on the trees to map which tree needs treatment at what time."

Automatic spraying and fertilising

Kris: "Crop protection and fertilisation are two further examples of labour-intensive tasks. In the ERDF project Autofruit, we are working together with Flanders Make, BAB Bamps and Octinion on developing autonomous vehicles for fruit growing. Flanders Make conducted a safety study to understand the risks of steering carts remotely across the different rows of an orchard. Octinion contributes to the R&D for such vehicles and BAB Bamps provides the expertise on agricultural vehicles. Our task as a research centre is to determine for which crops and exactly for which applications such vehicles can be used. Because, obviously, we want to focus on crops that give the best results, within the shortest time possible."





Robots with pruning and thinning expertise

And then there are the tasks that are currently completely manual. Kris: "Pruning branches, thinning blossoms and, of course, harvesting, that still requires a lot of manpower at the moment. With our Acrofruit project, we are looking into whether we can train robots for those tasks. Mechanically, this is not a problem: today, there are already robots available that can perform such delicate tasks. The problem is the knowledge you need to have for this. You need to be able to look at a tree and judge which branch you should prune for the best result. Or how many blossoms need to be on a tree for an optimal yield. And then again, this differs depending on the variety and type of tree."

How far is fruit farming today in implementing technology? Kris: "The partners in our projects are busy figuring that out. Growers are of course entirely ready for technology that can make their lives easier. We continue to look for big and small ways to do that, for example with the Minman project: 'fewer man hours' in pear cultivation. Every efficiency gain makes a tangible difference to our fruit growers."

TENNECO AUTOMOTIVE EUROPE IMPROVED SUPPORT IN ASSESSING THE MANUFACTURABILITY OF A PRODUCT

That there is much to be gained in the design phase of a product is proven by the many projects Flanders Make has completed under the heading "Design For Excellence (DFX)". DFX represents a set of tools helping designers to analyse how a product design responds to the different phases in a product's life cycle: design for manufacturability, assemblability, sustainability in production, cost efficiency, performance and reconversion possibilities for recycling.

In this case, the collaboration between Tenneco and Flanders Make focused on supporting product design engineers in assessing the manufacturability of a product. Based on their needs, Flanders Make further extended the CAMECAD (CApitalize Manufacturing Experience in Computer Aided Design) manufacturability assessment tool previously developed in the CAMEDO_ICON project. In the process, the corresponding method and tool that formalises manufacturing knowledge into mathematical rules that can be understood by both humans and computers have been extended for Tenneco.

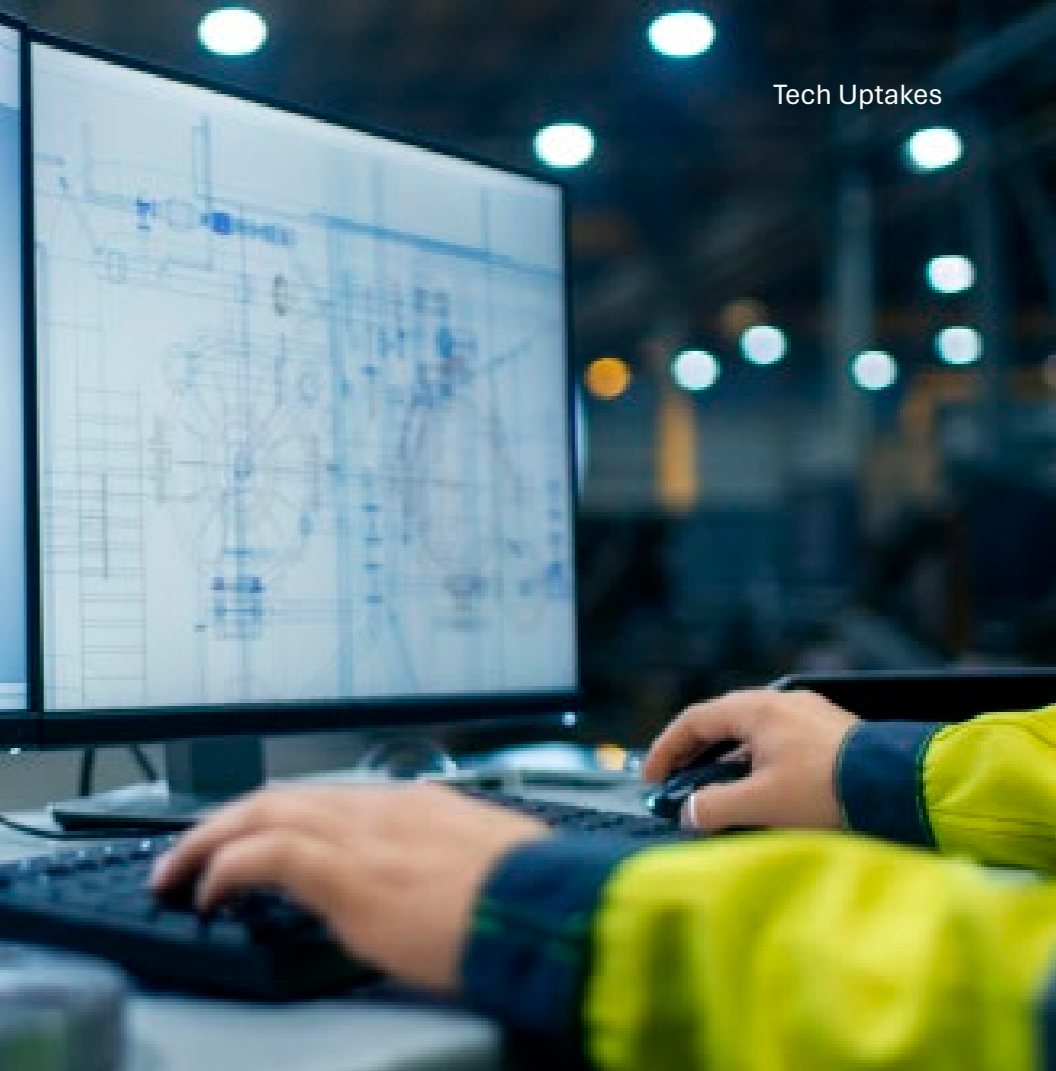
The CAD assessment tool efficiently and robustly evaluates the manufacturability of CAD designs based on formalised knowledge. In addition, it displays the results of the manufacturability analysis in an intuitive, interactive and user-friendly way.



The software checks whether the product design complies with predefined manufacturing rules, for instance to prevent the product from cracking, breaking or deforming during production. It also checks that holes, if any, are spaced far enough apart and that the thickness of the material is within the margins defined by the production engineer.

This CAMECAD software is now systematically used by Tenneco to analyse all relevant component designs for production in the sintering process; this is a process in which grains or powders are pressed together and heated to forge them into a solid whole.

The intuitive and semi-automated workflow helps experienced CAD designers by automatically checking the more obvious types of potential design errors. Furthermore, junior designers with little experience in sintering can benefit from a steep learning curve in designing parts suitable for sintering. Finally, it enables sintering process experts to maintain and expand their expertise using formalised knowledge.



BRICSYS **INNOVATIVE LEAP IN PRODUCT DESIGN: ASSISTED DESIGN FOR ASSEMBLY**

Yet another Flanders Make project under the banner "Design For Excellence (DFX)", through which we support designers to analyse how a product design responds to the different phases in a product's life cycle.

A collaboration between Bricsys® and Flanders Make has resulted in the development of a "design for an assembly inspection tool", which now allows to test the suitability of a product for production as early as in the design phase. The CAD software checks, for instance, whether the sequence of assembly steps is correct and whether the operator has sufficient access to parts to be screwed on.

In the traditional approach, suitability for production is only tested during the first prototype phase, when the product is physically assembled for the first time. This phase quite often involves the manufacturing of several costly prototypes, which is also a time-consuming process. With the integration of the Assembly Inspect tool in the BricsCAD® Mechanical CAD software, this is for many manufacturers a thing of the past.

This tool also enables small to medium-sized companies in the manufacturing industry to have access to these insights, without the need for costly and specialised software.



Want to know more about the technology behind this solution?
Then watch the accompanying video



COLRUYT GROUP

OPTIMAL COOLING CONTROL: COLRUYT GROUP AND FLANDERS MAKE JOIN HANDS FOR SUSTAINABLE PROGRESS

Colruyt Group continues to work on improving the settings of their refrigeration systems as part of their efforts to reduce the ecological footprint of all their products.

Together with Flanders Make, they've developed a methodology that allows them to analyse and improve refrigeration system controllers in a way that is easier than time-consuming tests on real refrigeration systems and promotes system efficiency.

We started by building an offline model of the cooling system. On this, we applied a set of Model Predictive Control (MPC) controllers to control various elements, including partial loads with on and off cycles. The results of the existing controller were then compared with those of the optimal MPC controller. This allowed us to improve the existing controller without switching to a completely new MPC controller.

The changes have led to improved performances, including better transitions during on and off cycles. The improved controller also extends the lifetime of the cooling systems and has a beneficial effect on the energy efficiency of these systems.

DUCO

IMPROVED TEST QUALITY FOR DUCO'S VENTILATION AND SOLAR SHADING SYSTEMS

DUCO is a leading European manufacturer of ventilation and solar shading systems for a healthy and energy-efficient indoor climate in homes, offices, schools and care centres.

DUCO often works with comfort-sensitive systems such as mechanical ventilation systems with heat recovery, solar shading and fan cooling. Extensive testing of these systems is a crucial part of the production process and requires reliable results and a high test quality to minimise the risks of malfunctioning systems.

DUCO engineers use the software tools Matlab and Simulink to design and test their systems. The tool is used to model, simulate and analyse dynamic systems, such as electrical circuits, control systems and signal processing. DUCO indicated that they needed to improve the test quality and reliability of their systems designed with Simulink. Together with Flanders Make, they decided to deploy MUT4SLX, a tool used for automatically generating and testing software mutations for models in Simulink.

Our research into mutation testing of these models yields significant improvements in the test quality of their systems. As such, DUCO has formulated a model-based design and development approach through which they ensure that the design models for their systems are rigorously validated and reliable. This has led to improved system quality in terms of usability, reporting and operator training and, ultimately, to an improvement in the overall reliability of their systems and a reduction of the risk of failures during their operation.



CNH INDUSTRIAL AGRICULTURAL MACHINERY WITH INCREASED YIELD AND DURABILITY AT CNH THROUGH BALER AUTOMATION

Agricultural machinery manufacturer CNH, responsible among other things for the production of New Holland machines, has been working for years with Flanders Make to automate their machines and support operators driving the machines. Nowadays, when baling, an operator has to control the tractor pulling the baler, both in terms of steering and speed, while also having to constantly monitor the various settings of the baler, such as the pressure in the bale chamber, and make adjustments whenever necessary. All these factors influence the quality of the bales that eventually roll out from the baler.

Flanders Make worked together with CNH Industrial on the New Holland baler automation system IntelliSense™, which maximises baler productivity and operator convenience based on swath volume, thickness of cuts, machine load and tractor engine load. It automatically guides the tractor over the swath: a reliable Lidar (light detection and ranging) sensor with IMU (Inertial Measurement Unit) detects the position and cross-section of the swath and the system automatically adjusts the forward speed. The tractor's GPS system further improves guidance accuracy.

In addition, automatic baler guidance ensures even filling of the bale chamber, always using the maximum available capacity without exceeding the limit. This increases productivity, resulting in more bales per day and an extended useful lifespan for the baler. By maximising baler throughput, the baler automation system also reduces tractor fuel consumption, resulting in a lower production cost per bale.



The third development consists of an advanced feature that allows the operator to set the desired bale weight. The system will predict the bale weight along the way and continuously adjust itself according to an algorithm. The result is a consistent high-quality bale weight and bale shape, even under changing crop and yield conditions without operator intervention.

This research represents another step towards fully automated farming. Automating and supporting the sector is important to cope with increasing food demand and labour shortages, but also to cope with the effects of climate change. A more efficient agriculture, where we can maximise yield and minimise effort, is therefore a CNH target that Flanders Make is happy to support.



COFFEEROOTS

REAL-TIME ERROR DETECTION AND PROACTIVE QUALITY MANAGEMENT IN THE PRODUCTION OF COFFEE PADS

CoffeeRoots is a beverage company specialising in coffee and tea. In its facility in Kruibeke, CoffeeRoots roasts, processes and packs coffee in a variety of formats, such as beans, capsules and pads. During the production of large numbers of pads, errors regularly occurred that were not detected in time.

On automated packaging lines, pads and capsules are filled while a camera system checks whether the pads are properly sealed. A dashboard shows a live image of the process. These data are not stored or processed, so valuable information on product errors is lost.

Together with Flanders Make, CoffeeRoots started collecting and using these data to track the status of the packaging lines. Flanders Make made it possible to read image data from the cameras in the packaging machines into an external device. This involved an AI model for quality inspection, a real-time image capturing system for collecting data sets and a real-time AI model inference system. The latter system enables CoffeeRoots to detect packaging problems at an early stage and avoid throwing away large quantities of defective products. The monitoring system also allows CoffeeRoots to collect and analyse historical data to improve its AI models.



BARCO

TEST MODEL MINIMISES RISKS WHEN DEVELOPING NEW PRODUCT VARIANTS

When developing new product variants, it is often difficult to accurately pre-assess the corresponding costs and potential revenues. We have therefore developed an innovative model that helps us to get a clear picture of the impact of new variants within a product family at an early stage. In particular, this model focuses on estimating material procurement costs and inventory costs, factors that are both crucial for making informed decisions.

In collaboration with high-tech company Barco, known for its advanced visualisation, networking and collaboration technologies, we were able to validate our model with real data. During this validation, we looked specifically at the potential development of a new product variant for Barco that has as many as 350 out of 400 parts in common with another product from the same family.

By integrating all available information on procurement costs per part, price reductions for larger procurement quantities and lead times per part, we were able to accurately estimate the potential impact of this new variant.

By using our model, companies such as Barco that develop multiple product variants can minimise the risks of new product developments, increase the efficiency of the development process and enhance the reliability and quality of new products. This improved efficiency also helps to reduce the environmental footprint of product families, allowing companies to make responsible choices in their product development, not only business-wise but also from a social and ecological perspective.

UNILIN DYNAMIC AND EASY-TO-CREATE WORK INSTRUCTIONS HELP UNILIN'S OPERATORS ADVANCE FASTE

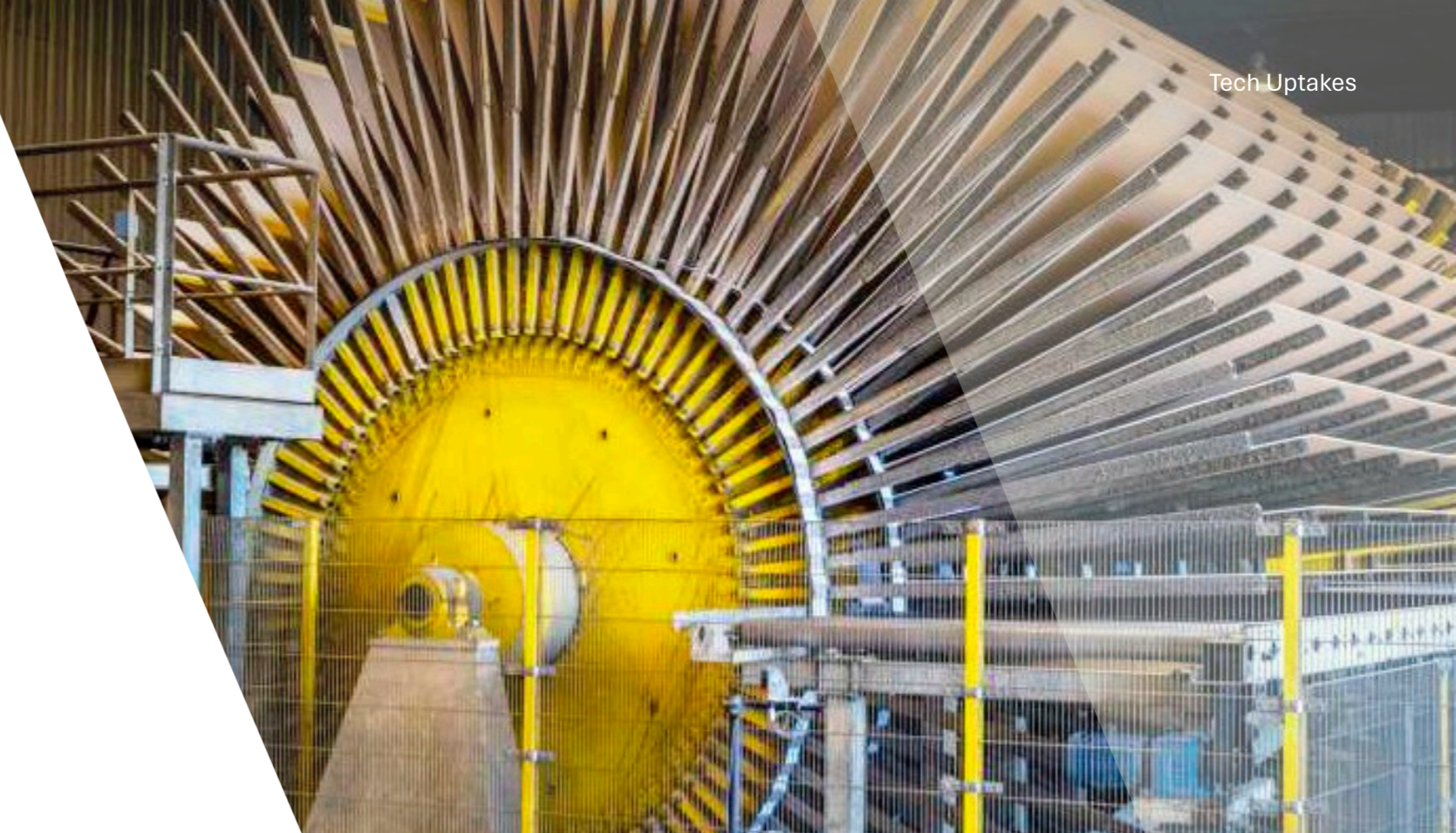
The Unilin Group is a Flemish global player in interior design and solutions for the construction industry. The company is best known for its Quick-Step floors but also manufactures products such as roof panels, insulation panels and furniture panels.

To support its operators in operating the production machines and resolving any malfunctions, Unilin uses troubleshooting procedures. However, these display too limited information, making them often unsuitable for less experienced operators. Also, the steps followed need to be reported and digitalised afterwards by a process engineer for further analysis. Unfortunately, the quality of the input is often low, which also limits the amount of information that can be extracted from it.

Together with Flanders Make, Unilin has now developed a digital work instruction that directly eases the work for both operators and engineers. They can now go through and fill in the instructions digitally, after which a report is generated automatically. Moreover, the necessary data and information are extracted as much as possible from Unilin's machines and systems

so as not to disturb operators unnecessarily. The instructions are dynamic and contain multiple possible paths for the operator to follow so as to reach a solution. These paths are organised in such a way that operators are presented with the most common causes and solutions first, before the less likely solutions are proposed. In this way, problems can be solved quickly and with minimal interaction.

Together with Unilin, Flanders Make created a template in Excel for this purpose so that anyone can easily create and modify complex flow charts and dynamic work instructions without being an expert in a specific work instruction platform. We then deployed our Digital Work Instruction Converter to convert the Excel procedures to the work instruction platform Unilin was already using. Ultimately, this has led to uniformity in work instructions and reports, which in turn has contributed to increased insights into machine and process errors.



BUILDING A SUSTAINABLE FUTURE

Flanders Make as an organisation is committed to sustainability on all fronts, guided by both the Flemish Sustainable Development Strategy and the Sustainable Development Goals (SDGs) of the United Nations. The internal organisation focuses on environment, social policy and ethics and good governance (ESG criteria).

ENVIRONMENT

Flanders Make aims for an all-electric company fleet with a hybrid start. Bicycle allowances and leasing options encourage green mobility. Our investments in sustainable buildings and energy efficiency contribute to a green work environment.

SOCIAL POLICY

We are committed to a balanced, diverse and inclusive human resources policy, supported by a permanent social dialogue and attention to a good work-life balance.

Safety, health and wellbeing at the workplace are ensured by a dynamic risk management system and a culture of safety for all. In addition, training and development are integrated parts of our human resources policy. Finally, we have a dedicated confidential counsellor for confidential issues.

ETHICS AND GOOD GOVERNANCE

Flanders Make's Good Governance Charter and Code of Ethics ensure good governance and ethical practices, in line with national and European scientific integrity guidelines.

Flanders Make is committed to a sustainable future, with the environment, social policy and ethics and good governance being at the heart of its operations.





FLANDERS MAKE

Flanders Make is the research centre for the industry and its digital or Industry 4.0 challenges. We stimulate innovation, both in SMEs and large companies, through excellent research in the field of mechatronics, methods for developing products and technology to make them. The results are applicable to a wide range of companies that often face similar technological challenges. Together, they can innovate better and faster. We also take this approach across national borders. We set up international innovation partnerships and participate in European research projects. Flanders Make has three co-creation centres in Lommel, Leuven and Kortrijk and core-labs at the five Flemish universities.

We work together with both large and small companies within the wider manufacturing industry, focusing on builders of vehicles, machines and production systems and their suppliers. We are proud to say that we create clear added value for these companies, supporting digital and business transformation processes and focusing on sustainability throughout the entire life cycle.

WHAT ARE WE DOING TO SUPPORT COMPANIES TO BE COMPETITIVE IN A DIGITAL AND SUSTAINABLE INDUSTRY?

Joint research

Our research serves one overall purpose: supporting product and process innovation within Flemish industrial companies. That's why we perform industrially driven, pre-competitive technological research into the vehicles, machines and factories of tomorrow. As such, we stimulate the digital transformation of our companies – both big and small.

Initially, this research leads to actual applications for companies participating in the research project. Next, we also share the results with the rest of the industry so that innovation followers can also make the transition to Industry 4.0/5.0.

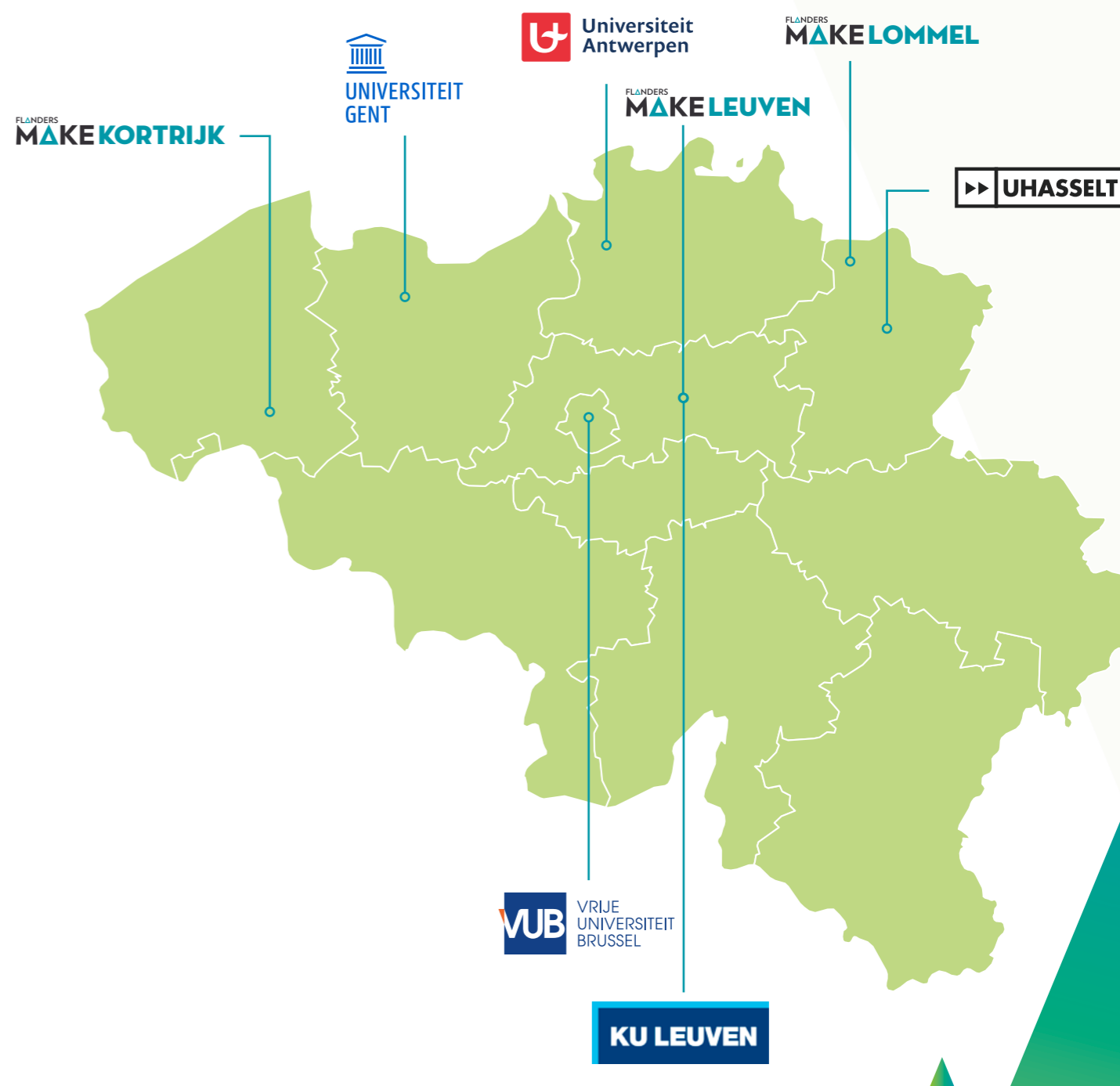
This is how our research strengthens the competitiveness of the entire industry.

Customised innovation

Customised innovation covers our 1-to-1 collaboration projects with companies. For example, we can help your company to develop technological solutions, from when an idea takes shape up to its development into a fully functional product or production process. We also offer feasibility studies, support for your product design and improvements to production processes.

Testing and validation

We offer infrastructure for testing and validating your products and production systems. This includes the validation of production processes, material and component testing, testing of adhesives, robotics and automation tests, evaluation of sensors and measurement systems, digital twin validation, data analysis and AI validation, safety and regulations testing, energy efficiency and environmental testing, prototype validation and simulation and modelling. This is how we help your company to create more innovative products and production systems.



Close to the industry with core-labs and co-creation centers at the 5 Flemish universities

CLUSTERS OF AND TO THE BENEFIT OF COMPANIES

To help the very diverse range of manufacturing companies in their innovation efforts, Flanders Make has subdivided its high-tech research in three dedicated competence clusters. Every cluster focuses its research on specific domains.

END-TO-END DESIGN OPERATION

In the cluster **End-to-End Design Operation**, we look for ways to aggregate knowledge and data from across the ecosystem to improve products, production and business processes. Supporting an ecosystem approach helps companies to make the right decisions for being economically and ecologically sustainable. In this cluster, we see this as a task across the entire life cycle: from initial design over production and use up to the potential reuse or recycling. This is how we realise gains in efficiency and sustainability within the manufacturing industry.

MOTION PRODUCTS

All kinds of moving parts in vehicles and machines: that is the field of expertise of the **Motion Products** competence cluster. The service range is very broad: from support during the design phase to testing and validation using our extensive test infrastructure. Improving drive systems, making transmissions operate more efficiently, or autonomous vehicles: these are just a few of the areas of expertise in which the cluster sets to work in support of the industry.

PRODUCTION

Activities related to the automation and improvement of assembly and production are covered by the **Production** cluster. This cluster takes on everything involving the use of robots and cobots, including all kinds of auxiliary systems to facilitate automation. The human operator is central here, as digital work instructions and tools that increase operator efficiency are also part of this competence cluster.



INNOVATION ECOSYSTEM

Together with some 200 companies, our 850 researchers form an ecosystem in which they work together on research leading to concrete solutions for companies. The Flemish government provides financial support and also sets up living labs to bring new technologies to companies.

OUR MEMBERSHIP NETWORK

Members in bold are also cluster members

#

24Flow
3D Systems Corporation

A

ABB
Absolem Engineers
Accelleran
Achilles Design
Addax Motors
Agfa-Gevaert
Agoria
AI-Blox
A-kwadraat
Albatros
Alberts
Alinco
ALSTOM Belgium
Altachem
AMNOVIS
AMS Belgium
Ansomat
ARCADEL
Arkite
ASCO Industries
Ateliers Pierre Cerfontaine
Atlas Copco Airpower

Audi Brussels
Augniton
Automotion
Averna
Azumuta

B

Balta Group
Barco
Bekaert
Bewel
Blueways International
Bosal Emission Control Systems
Bricsys
Buseloc
Buyse Metal Works Group

C

Camco Technologies
Capvidia
C-Battery
Cibo
CN Rood
CNH Industrial Belgium
Code Care
CoffeeRoots Cantata
Comate
CommScope Connectivity Belgium

Corvus solutions
CTech Metrology
CTRL Engineering
D. Cloostermans-Huwaert

D

Daf Trucks Vlaanderen
Daikin Europe
DAMATEC
DANA Belgium
Dataroots
Deceuninck
Dekimo Kortrijk
Delaware
Dentsply Implants
Digi-Flow
Digital Creations Agency (Scanbie)
dotOcean
Dynamic Dimensions

E

Easy Systems
e-BO Enterprises
Elnor Motors
Eltrex Motion
Emerpoint
Enginity
ESC

Esma
e-Trova
E-Trucks Europe

F

Faktion
Flagstone
Footstep
Forcebit
Ford Lommel Proving Ground

G

Gemsotec
Gumtion

H

Hela
Hupico

I

I-Care
Innoptus
Intermodalics
International Car Operators

J

Jabil Circuit Belgium
Janssen Pharmaceutica

K

Kapernikov
Kautex Textron Benelux
Konfidi
KULeuven

L

Lambrecht Constructie
Leuven Air Bearings
Lichtwerk
Logflow
LVD Company

M

MAEX Precision
Magcam
Magnax
Mariasteen
Materialise
MEAM
Melexis
Melotte
Multronic

N

Nalantis
Nedschroef Machinery
Neskoengineering
NI
Niko
Ninix Technologies
Noesis Solutions
Nokia Bell
Novy

O

Objective International
OCAS
Octinion/Octiva
Oerlikon Balzers Coatings Benelux
Ometa
Optidrive
Optima T

P

Pedeo
Picanol nv
Pixelvision
Premium Sound Solutions
Provan
Punch Powertrain E-Vehicles

R

Raepsaet Product Design
Reniver
Reynaers Aluminium
Rhea Group
Robert Bosch Produktie
Ryhove

S

Sabca Limburg
Sabca
Savaco
Scioteq
Sego
Sentigrate
Sew-Eurodrive
Siemens Industry Software
Siemens
Signify
Sirris
Skyhaus
Smart Technics (Colruyt Group)
Soudal
Spraying Systems
Squadron
Staubli
Sumitomo Drive Technologies
SupportSquare

T

Televic Rail
Tenneco Automotive Europe
Terumo Europe
Toyota Motor Europe
Transport & Mobility Leuven
Tremec

U

Unilin
Universiteit Antwerpen
Universiteit Gent
Universiteit Hasselt
Uperio

V

Van Hool
Vandewiele
 Vansichen Lineairtechniek
 Vaskon
VDL Bus Roeselare
 Vero Duco
 Vintecc
 Vintiv
 Vitalo Industries
 Vlaams Gewest

Volvo Car Gent

Volvo Group Belgium

Voxdale

Vrije Universiteit Brussel

W

WAAK-Beschutte Werkplaats

X

Xenics
 Xeryon

Y

Yazzoom

Z

ZF Wind Power Antwerpen

JOIN FLANDERS MAKE

As a member of Flanders Make, you'll have access to a research group of over 850 engineers, scientists and researchers who help you shape your innovation project. You will also have priority access to the results of our research projects and be among the first to know what is going on and which subjects will dominate tomorrow's research agenda.

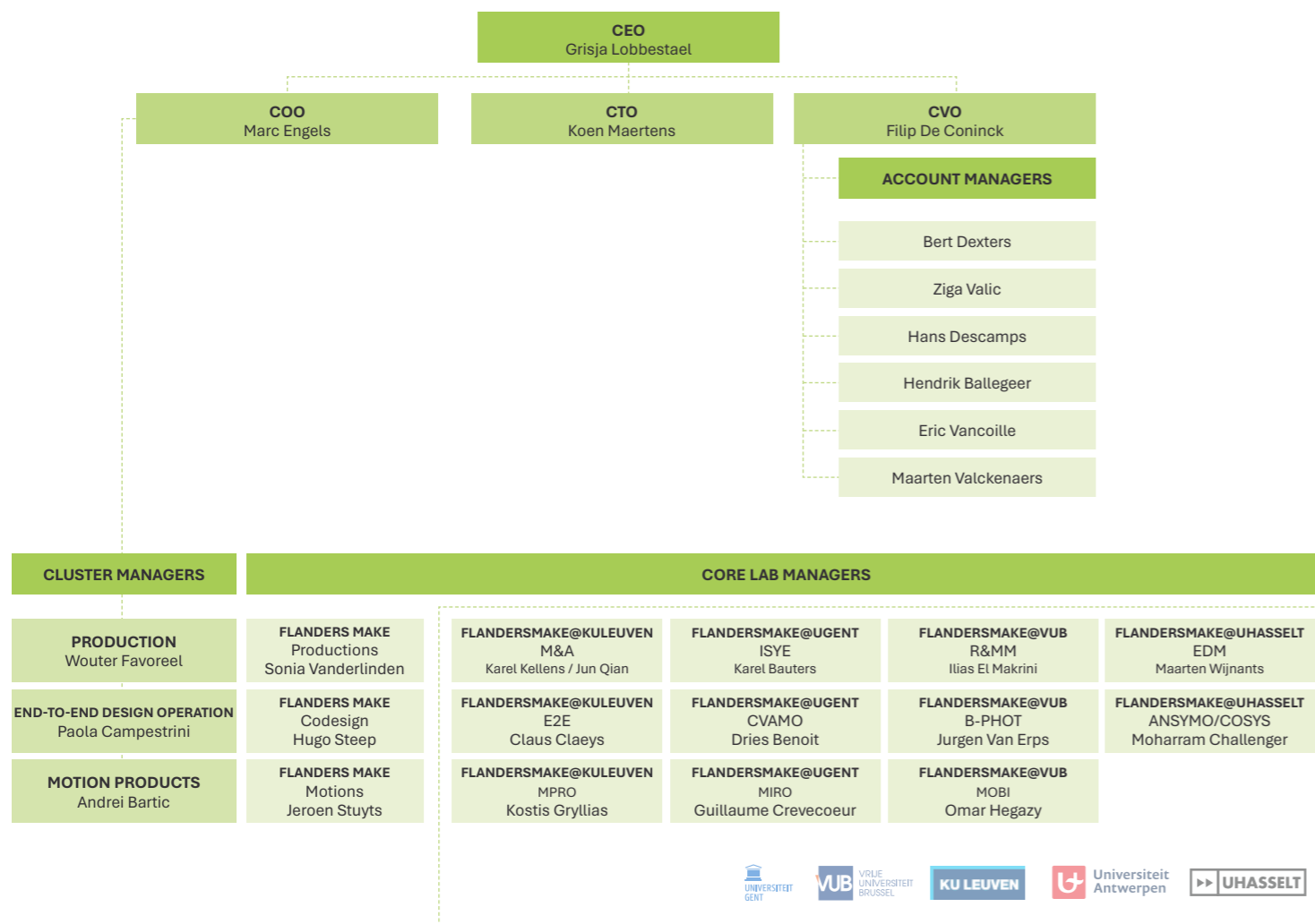
Besides the general Flanders Make membership, we also offer companies the opportunity to become a member of a specific competence cluster. This offers many advantages. Companies that are members of a competence cluster help determine the direction of its research, making it directly applicable to the issues they themselves are facing. Through a number of specific events and direct contacts, Flanders Make keeps these companies informed of what is going on in the research world. At the same time, we keep our finger on the pulse of everything that might concern these companies. Feel free to contact us to discuss the benefits for your company.



ORGANISATION AND FIGURES

ORGANISATIONAL FLOWCHART

Flanders Make structures its research activities around three areas of expertise or competence clusters. Within such competence cluster, we divide our researchers into core labs. These core labs are located both within our non-profit organisation and within the five Flemish universities. Below, you'll find an overview of our organisational structure.



BOARD OF DIRECTORS

Member of the board of directors	Capacity
Urbain Vandeurzen	Independent director
Grisja Lobbestael	CEO
Jochen Vincke	Independent director
Karen Maex	Independent director
Inge Stoop	Independent director
Geert Ostyn	Industrial director
Paul Snauwaert	Industrial director
Katrien Wyckaert	Industrial director
Koenraad Debackere	University representative
Ignace Lemahieu	University representative
Elke Piessens	University representative
André Bouffieux	Director nominated by the government
Herman Derache	Director nominated by the government
Peter Cabus	Government commissioner
Wim Verrelst	Government commissioner
Leo van de Loock	Observer
Erwin Dewallef	Observer

ADVISORY COMMITTEES

Industrial advisory committee

Bie De Backer
 Carl Eeckhout
 Dominique Maes
 Eric Verhelst
 Frans Van Giel
 Hans Vande Sande
 Herman Van der Auweraer
 Jan Anthonis
 Laurent Van Thournout
 Marc De Samber
 Miguel Dhaens
 Paul Snauwaert
 Veerle Van Wassenhove

Observer Industry

Geert Ostyn

Scientific advisory committee

Naam	Country
Jesús Ruano	Spain
Chris Gerada	United Kingdom
Giacomo Bianchi	Italy
Jochen Deuse	Germany
Johann Hoffelner	Austria
Kurt Nielsen	Denmark
Micheal Cassidy	Ireland
Minna Lanz	Finland
Odd Myklebust	Norway
Russell Harris	United Kingdom
Tauno Otto	Estonia
Thilo Bein	Germany
Werner Kraus	Germany
Ton Peijnenburg	The Netherlands

Central Office

Grisja Lobbestael
 Marc Engels
 Koen Maertens

Observer government

Erwin Dewallef
 Leo Van de Loock

BALANCE SHEET AND ANNUAL RESULTS

ASSETS	203,693 k	REVENUES	31,967 k
Fixed assets	30,779 k	Turnover	29,090 k
Intangible assets	32 k	FM covenant	18,289 k
Tangible assets	28,794 k	FM non-covenant	9,307 k
Financial assets	1,953 k	Membership fees & other revenues	1,493 k
Current assets	172,914 k	Other revenue	2,877 k
Stocks and orders	37,987 k		
Accounts receivable within max. 1 year	19,430 k	COSTS	33,442 k
Cash at bank and in hand	114,426 k	Salaries and social security charges	19,607 k
Regularisation accounts	1,071 k	Operating costs	13,702 k
		Other costs	133 k
LIABILITIES	203,693 k	OPERATING RESULT	-1,475 k
Capital and reserves	19,938 k	Financial & except. result	1,596 k
Provisions	46 k		
Creditors	183,709 k		
Creditors amounts falling due after more than 1 year	16,830 k	Profit (loss) before tax	121 k
Creditors amounts falling due within 1 year	91,424 k	Tax on the result	92 k
Regularisation accounts	75,455 k	Profit (loss) to be appropriated	29 k

Flanders Make books for financial year 2023 an operating result of EUR -1,474,566. This result includes the costs (EUR 662,372) linked to the projects approved for using the historical reserves.

In the financial year 2023, a positive financial result of EUR 1,595,801 was achieved. The tax on the result of financial year 2023 amounts to EUR 92,301. This results in a distributable profit for the financial year amounting to EUR 28,934.

KPI'S

KPI (2023 - 2027)		2022	2023	Target 2023	% Target 2023	Growth 2023 versus 2022
KPI 1	Weighed publications	475	419	265	158%	-12%
KPI 1.1a	Open Access Journals	241	215	NA	NA	-11%
KPI 2	European participation	13,470 k€	18,893 k€	13,600 k€	139%	40%
KPI 3	Industrial reach	248	278	134	208%	12%
KPI 3a	Industrial reach SME	118	118	54	218%	0%
KPI 4	Budget industrial income	9,238 k€	9,621 k€	9,800 k€	98%	4%
	Technological utilization	24	31	NA	NA	29%
	Patents	2	1	NA	NA	-50%
	Discrimination reach	784	559	500	112%	-29%
KPI 5	Cross-initiative projects	9	6	NA	NA	-33%
KPI 6	Leverage income	57,577 k€	68,146 k€	42,400 k€	161%	18%
	Joint publications	38	42	NA	NA	11%
	Cooperation in externally funded projects	3	5	NA	NA	67%



**Co-creation centre
machine development**

Gaston Geenslaan 8
3001 Heverlee

**Co-creation centre
vehicle development**

Oude Diestersebaan 133
3920 Lommel

**Co-creation centre customised
production - Industry 4.0**

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**FLANDERS
MAKE**
DRIVING INNOVATION IN MANUFACTURING