SIOUX MAGAZINE • 2025

SIOUX TECHNOLOGIES

TOGETHER

THE POWER OF THE WHOLE

SCHIPHOL INCREASES **OPERATIONAL EXCELLENCE** WITH FULLY AUTOMATIC PASSENGER BRIDGE

‘WE PUSH THE BOUNDARIES IN ULTRA **PRECISE POSITIONING**’

BEST OF SIOUX

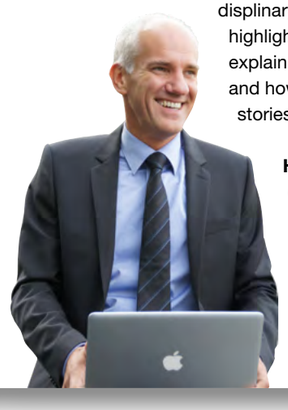
source

Together

No one can do it alone. This rule applies especially in the world of Sioux Technologies. Our know-how is developing at lightning speed. The complexity of technology is growing exponentially. Due to fierce international competition and increasingly short life cycles, the time-to-market is also constantly decreasing. All of this creates a lot of pressure for OEMs in terms of competences, organization and costs.

Anyone who wants to excel in this impressive field of forces must collaborate for the development, industrialization and manufacturing of products. This starts by recognizing that the world is a big place. However impressive your company may be, even more knowledge and expertise in many fields can often be found outside. Using that – in particular in an open innovation model – will lead to success. We have been demonstrating that for years in Brainport, where Sioux is considered a high-tech strategic development and manufacturing partner to renowned OEMs. Our extensive internationalization ensures that this quality is now also being recognized in the rest of Europe, Asia and beyond. This obviously makes me very happy.

The common theme in this Source is the strength of the greater whole. How we work together within our multi-displinary teams and with our customers. That theme is highlighted from various perspectives. Various articles explain how OEMs shape their collaboration with us and how Sioux serves its customers. I hope these stories will inspire you as much as they do me.



Hans Duisters
Owner & founder Sioux Technologies

CONTENTS

8 **AM-Flow on working with Sioux**
AM-Flow automates the production processes of 3D printing factories after the printing is complete, aiming to conquer the global additive manufacturing market with support from Sioux Technologies as an investor and development partner.

16 **AXYT**
Sioux developed the AXYT: a high speed, high accuracy planar stepping stage. System Architect Ronald Plak tells all about this innovation.

20 **Strong partnership**
Sioux and ITEC work together for many years now, developing and producing the Tagliner, a machine specifically designed for applying chips to RFID tags with high speed and high precision.

24 **Medical innovation**
SamanTree Medical and Sioux are investing itogether in the next generation of medical imaging equipment, that allows surgenons to identify cancer tissue real-time in the operation theatre.

SOURCE is also available online at www.sioux.eu

Colophon

Chief Editor
Monique Klooster
Editing & Texts
MdJB teksten & communicatie
Laura van de Burgt
Monique Klooster

Concept & Lay-out
Gloed*communicatie*
Dewi van Dinter
Photography
Hugo de Jong
Twycer
Sioux Technologies

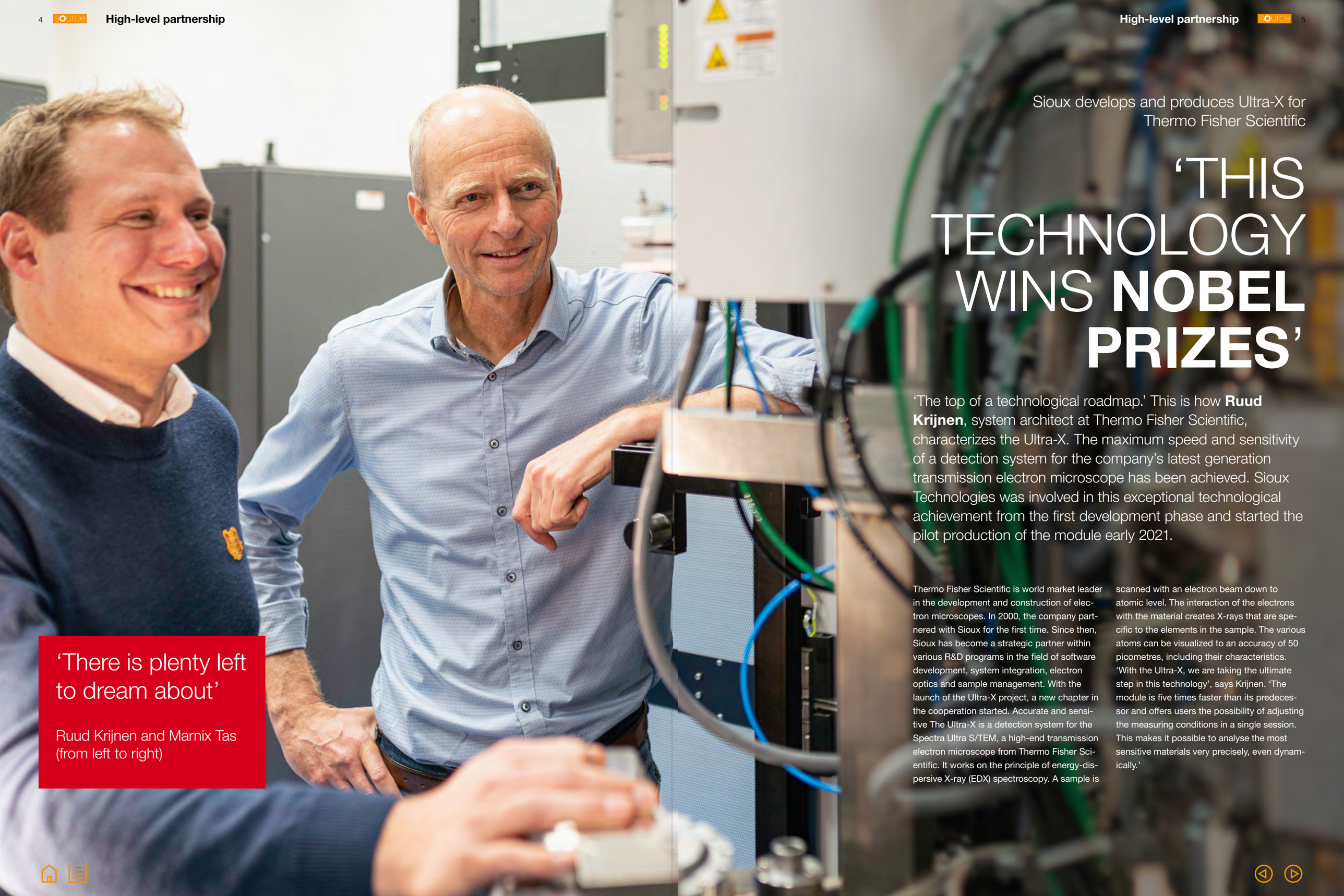
Contact

Sioux Technologies
Esp 130
5633 AA Eindhoven | The Netherlands
info@sioux.eu | www.sioux.eu

SIOUX TECHNOLOGIES

AND MORE

9 ‘What I love most are the people’
15 Social Impact Programme
18 From great apes to assembly
22 Firuzan’s inspiring career switch
28



Sioux develops and produces Ultra-X for Thermo Fisher Scientific

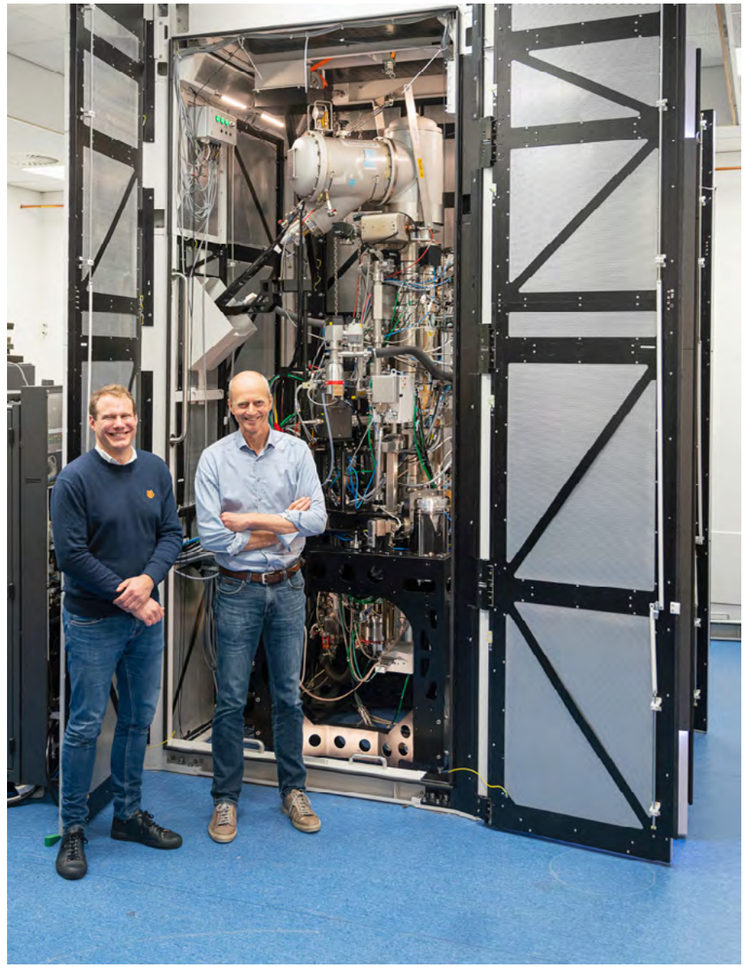
‘THIS TECHNOLOGY WINS **NOBEL PRIZES**’

‘The top of a technological roadmap.’ This is how **Ruud Krijnen**, system architect at Thermo Fisher Scientific, characterizes the Ultra-X. The maximum speed and sensitivity of a detection system for the company’s latest generation transmission electron microscope has been achieved. Sioux Technologies was involved in this exceptional technological achievement from the first development phase and started the pilot production of the module early 2021.

Thermo Fisher Scientific is world market leader in the development and construction of electron microscopes. In 2000, the company partnered with Sioux for the first time. Since then, Sioux has become a strategic partner within various R&D programs in the field of software development, system integration, electron optics and sample management. With the launch of the Ultra-X project, a new chapter in the cooperation started. Accurate and sensitive The Ultra-X is a detection system for the Spectra Ultra S/TEM, a high-end transmission electron microscope from Thermo Fisher Scientific. It works on the principle of energy-dispersive X-ray (EDX) spectroscopy. A sample is scanned with an electron beam down to atomic level. The interaction of the electrons with the material creates X-rays that are specific to the elements in the sample. The various atoms can be visualized to an accuracy of 50 picometres, including their characteristics. ‘With the Ultra-X, we are taking the ultimate step in this technology’, says Krijnen. ‘The module is five times faster than its predecessor and offers users the possibility of adjusting the measuring conditions in a single session. This makes it possible to analyse the most sensitive materials very precisely, even dynamically.’

‘There is plenty left to dream about’

Ruud Krijnen and Marnix Tas (from left to right)



Magnetic fields and vibrations

Thermo Fisher Scientific asked Sioux to take on the full development and manufacturing of the Ultra-X. Krijnen: ‘Thermo Fisher Scientific needs high-quality multidisciplinary suppliers and with this project Sioux was able to demonstrate what it can do. The kick-off of the project was in February 2018 and that started with concept formation; taking note of what was needed to make the product a reality.’
‘The transmission electron microscope (TEM) from Thermo Fisher Scientific is an incredibly complex device’, says Marnix Tas, system architect at Sioux. ‘The vacuum is very deep, the magnetic fields are extremely strong and it is highly sensitive to vibrations. This leads to very specific and high technical requirements, for example regarding materials, precision mechanics and electronics. We tackled the development process together with Thermo Fisher Scientific by working on partial solutions in cross-functional teams of specialists. This led to the detailing of the Ultra-X and the construction of a prototype ready for use, within one and a half years. That is an achievement on itself and not just technologically. These kinds of projects are always risky and under high pressure. From the start, we said to each other that what we do is so complex that emotions and politics should not get in the way. That’s exactly how it turned out: the focus was always on good collaboration and achieving results.’

> ‘We lift our cooperation with Thermo Fisher Scientific to a higher level’

Upscaling

The second phase of the Ultra-X project concerned the industrialization and production. This was entirely in the hands of Sioux for a fixed price and timeline. Krijnen calls this phase at least as exciting as the development process. Tas agrees, stating that the complexity of the assembly of the system should not be underestimated. ‘Thermo Fisher Scientific expects us to deliver completely qualified modules. Guaranteeing good serial production requires, among other things, setting up an optimal cleanroom process, developing and building our own production machines, training people and managing the supply chain. In June 2021, the first Ultra-X beta module left our production facility and we are now working on optimizing our industrialization process so that we can scale up to a solid supply.’

Hot cakes

Krijnen: ‘The Ultra-X is of enormous added value to two important customer groups. First, there are companies in the semiconductor industry that can use this TEM technology for process optimization and control, for example, to set up new production lines faster and cheaper. In addition, TEM with Ultra-X offers new possibilities for materials researchers. This includes research for new batteries and space travel, and fundamental research into metals and other elements.’ ‘For the latter group of customers, the Ultra-X technology is a breakthrough that could win Nobel Prizes’, says Krijnen. ‘In fact, we are at the top of a roadmap; a faster and more sensitive EDX detection instrument does not exist, but there is plenty left to dream about. The previous generation of the module sold like hot cakes. The Ultra-X should be just as successful. Besides, we never have to complain about new ideas or a shortage of work here.’ ‘And for Sioux, it goes without saying that we want to take on more of these multidisciplinary development and manufacturing projects for Thermo Fisher Scientific’, Tas emphasizes. ‘In this way we lift our cooperation to a higher level.’

OTFLOW AND SIOUX JOIN FORCES TO PREVENT **FOOD WASTE**

This is how the OTFLOW-mat works

The quality of fresh fruit and other refrigerated cargo regularly deteriorates during transport. Rotterdam startup OTFLOW developed a simple solution. However, the underlying knowledge is complex. **Anne Eggels**, mathware designer, explains how value is added with a simulation model for air circulation.

What is the problem?

‘An awful lot of fruit is transported around the world. That is usually weeks in transit by ship. If the heat management in a container is not in order, the quality suffers, or the cargo may even be lost for consumption. Food is wasted and it also costs money.’

Where does it go wrong?

‘Inside a container is a refrigeration unit. Cold air enters the hollow bottom and flows into the storage section through elongated openings. Heat is dissipated at the top. That system often does not work optimally, for example when, due to the law of least resistance, air only circulates in the front part of the container.’

What solution does OTFLOW offer?

‘The company has developed a cardboard mat together with Wageningen University & Research. Putting it inside a container covers part of the openings. The shape promotes good air circulation.’

How challenging was this assignment?

‘You have to deal with a lot of variables; the shape and size of the fruit, whether it is in closed boxes or open crates, how they are placed, the heat radiation from the walls... Fruit also produces heat during the ripening process. It is incredibly complex to capture all these things in mathematical rules and include them in a comprehensive flow model.’

So how did you accomplish that?

‘By working with small separate simulations and stacking the results as blocks. In addition, we only included the effects of factors that have a substantial impact. That makes a huge difference to the computational speed of simulations.’

Is the collaboration with OTFLOW finished?

‘We are going to make the model more realistic by including even more effects. We are also expanding on it to make it applicable to other fruits and products, such as vegetables and flowers.’

Can such a simulation model also be used in other markets?

‘Certainly. For example, there is increasing attention to improving air circulation in offices, schools, and aeroplanes. Many variables also play a role in those environments and our model - with the necessary modifications, of course - can be of great value.’

Why was Sioux called for help?

‘We developed a Computational Fluid Dynamics simulation model for the air circulation in a container, specifically aimed at transporting one particular type of fruit, in this case a pineapple. This can be used to determine the optimal dimensions of the mat, and thus improve the product.’

AM-Flow on working with Sioux:

‘WE FEEL LIKE A **KID IN A CANDY SHOP**’

AM-Flow automates production processes of 3D printing factories from the moment the printers have done their job. In doing so, the company aims to conquer the global additive manufacturing industry. In this, it gets a push from Sioux Technologies as investor and development partner. **Stefan Rink, CEO of AM-Flow:** ‘We are of the same technical family, our cooperation is a celebration of familiarity.’

Zie de AM-QUALITY productielijn in actie

3D printing was considered a prototyping technology not so long ago. It is now recognized as a full-fledged production method. More and more components, for example for aerospace, medical technology and the automotive industry are made with commercial 3D printers.

Digital and smart

‘The promise of additive manufacturing is therefore great’, says Rink. ‘3D printing means freedom in design, flexibility in production, zero waste and fewer flows of goods from faraway countries. However, to achieve this, it needs to be competitive with traditional manufacturing processes. In this, despite the booming market, there are still big steps to take. The printing process is digital and smart. It is usually followed by manual identification, sorting and post-processing. This takes time, drives up product costs and increases the risk of errors. So, all these analogue operations hinder the further adoption of 3D printing.

Flying start

AM-Flow has its origins in 3D printing service company and marketplace Shapeways’ quest for more efficient production. To that end, it joined forces with Borges 3D, a startup in 3D modelling, late 2017. From this, AM-Flow emerged in 2018. That same year, the company presented the first digital system for identifying parts. Launching customers included BMW, Shapeways and Midwest Prototyping. This got AM-Flow off to a flying start.

Fraction of a seconde

Rink: ‘Divergent 3D products are printed simultaneously, in large quantities and for various customers. Tiny differences often make them very difficult to identify. It was an incredibly complex case to crack; in fact, we are fighting the infinity of shape. But with our technology, identification can now be done in a fraction of a second, using machine vision, self-learning algorithms, data intelligence and linking our software to customers’ 3D models, among other things. We offer a fully digital end-to-end Industry 4.0 solution. A robotic arm places products on a conveyor belt, which then enters the AM-VISION module. After identification using ten cameras, they go to the sorting system. Autonomous transport robots will then transport them to other departments for additional production steps, such as colouring and polishing before automated labelling and packaging.’

Avoiding pitfalls

AM-Flow’s machines are now running at seven major additive manufacturers. Their portfolio is well filled. But AM-Flow has a bigger ambition; it is the only one of its kind and wants to conquer the world. In doing so, the costs are ahead of the benefits; scaling up and further developing the technology is a necessity. This is partly made possible by Sioux.‘Sioux actually functions as the R&Ddepartment of high-tech companies or as an extension of it’, says Bob Duisters, investment manager at Sioux Technologies.‘We also invest in the OEMs of the future through our own Tech Fund. We prefer to be involved as early as possible. This allows us to give those companies maximum support in fulfilling their roadmap and accelerate their growth and technological development. We have done this many times, we know the pitfalls and we know what it takes to avoid them. We are also happy to give AM-Flow a boost in this way. The company is solving an important, specific problem and the team is well put together in terms of knowledge and skills. Moreover, our competences, including mechatronics, software, electronics, mathware and assembly, fit seamlessly.’

Huge potential

AM-Flow is currently developing a machine for industrialized in-line quality control of 3D printed products. This includes measuring them down to the micrometre and comparing them with the specifications in the original 3D file, all in a maximum time interval of seconds. This technology from AM-Flow will need to be developed further and faster. What does the company gain from Sioux in this regard?

> ‘We are fighting the infinity of shape’

Rink: ‘The knowledge of our people is great, for example in the field of mathematics, optics and mechanical engineering. But Sioux has a lot of those people in-house with exceptional expertise. So, we feel like a kid in a candy shop. We recently introduced the machine for quality control at the Formnext (largest additive manufacturing trade fair in the world). The next step is to make use of big data in further improving the self-learning capability of our systems. 100% error-free identification of products is one of the big dream in this respect.’ ‘In addition, we see opportunities to deploy AM-Flow’s technology in other markets such as waste processing, retail and food’, Duisters adds. ‘This is another great prospect for the future. The potential of AM-Flow is therefore enormous. Sioux wants to help realize it, as an investor and as a partner in development, assembly and lifecycle management.’

‘THE THING I LOVE ABOUT SIOUX IS **THE PEOPLE**’

Tina Bartulovic works as an electronics designer within Sioux. She has worked on various projects for different high-tech companies.

Tina: ‘The thing I love about Sioux is the people. Everybody is very nice here and they all want to make a difference. We are having fun while working, something that I personally find very important. Fun motivates people. Sioux often supports this by organizing fun events and socials. We have a lot of parties, brew our own Sioux beer, there is a Sioux band that some of my colleagues are in and a lot more. I try to join the events as much as I can, because these are great ways to connect with my colleagues, and of course a lot of fun.’

Tina also expresses deep satisfaction in the tangible results of her work. ‘There’s nothing quite like seeing a project you’ve poured your energy into finally come to life,’ she says. ‘For example, I’ve been working on a huge and complex microscope for a long time, and then seeing it actually being used – that’s incredibly rewarding.’ The potential impact of her contributions truly resonated with her. ‘Knowing that even a small part I worked on might have an impact on the world and can help with detecting viruses and battling disease. That is really cool and motivates me.’

‘It is really cool to see your work making an impact’

Schiphol increases operational excellence with fully automatic passenger bridge

‘SIOUX CAN BE PROUD OF WHAT WE HAVE ACHIEVED TOGETHER’

Schiphol wants to become the most sustainable and high-tech airport in the world. The slogan ‘We are innovators’ reveals the path they are taking for this. Technological and process innovation take up a central position in achieving this goal. In September 2021, they launched a **world-first** in this regard. The airport put a fully automatic double passenger bridge into service. The intelligent heart of this technology is the **Automated Docking Add-on Module** (ADAM), developed by Sioux Technologies.

‘Without Sioux we would not have got this far’

Oscar Maan and Annemarie Buddemeijer (from left to right)

Eliminating a problem requires you to know its cause

'Everyone in our sector is looking at what we do', says Oscar Maan, Innovation Manager at Amsterdam Airport Schiphol. 'Together with a few other airports like Heathrow and JFK, we are setting new standards in the field of security, passenger flow, provision of information and baggage handling. Everything developed and implemented at Schiphol serves as a benchmark everywhere; it is discussed and pursued elsewhere. This will be no different for our fully automatic double passenger bridge.'

Joystick

Anyone who flies regularly knows that docking a plane to a gate is not always a smooth process. Passengers regularly have to wait quite a while until the doors are opened. This often leaves them packed in the aisle like sardines in a tin, which leads to irritation. But these kinds of delays have other negative effects as well.

Maan: 'On-time performance is a KPI for Schiphol. Time equals money in the aviation sector. We therefore have financial agreements about this with clients like airlines and baggage handlers. In addition, aircrafts are regularly damaged due to the manoeuvring of passenger bridges. This is not surprising: they weigh many tonnes and are manoeuvred on sight with little margin for error, using a joystick. That also affects our operations and leads to complaints and claims. Eliminating a problem requires you to know its cause. In this case it is a split between technical failure and human error. Automation will then be the solution. There were no ready-made products available at the time, so we decided to create them ourselves. Our bridge supplier – the Chinese company TianDa – and KLM were natural project partners here. But we soon realized that we would not succeed without a development party with exceptional expertise in the design and engineering of complex robots with intelligent visual systems. Furthermore, there are good reasons to keep the development and production of this kind of critical technology close to home. This resulted in us engaging Sioux.'

Self-learning algorithm

The technological core of the new passenger bridge at Schiphol is formed by ADAM. In 2016, Sioux started the development of this module, which can be integrated in existing and new passenger bridges as a plug-and-play add-on. According to Project Manager Annemarie Buddemeijer, the company uses all of its competences in the field of mathematics, software and optomechatronics here.

'The intelligent component is a self-learning algorithm'

'It is an advanced system, if only because it recognizes the two doors to which it should dock all by itself. That is a major accomplishment. Every plane is different: its colours, lettering, size, design, etc. The conditions are also highly variable. Things must go smoothly all the time regardless of positioning, time of day or night, with backlight, in full sunlight, when it rains or snows, when it is foggy, etc. We achieve this by means of two cameras that allow us to see depth. The computing power of the on-board computer – to ensure the reliability of an autonomous system – guarantees the necessary analysis speed for the 3D data. The intelligent component is a Smart Vision algorithm, which during software development was fed more than 1000 images we collected at Schiphol. But there were other challenges as well, e.g. in the field of communication with the drive unit of the bridge itself. Another aspect is that ADAM is mounted to the head of the bridge. Conditions can be freezing there, but the temperature inside the box can rise to 70 degrees Celsius. In addition to this, you have to deal with vibrations and kerosine fumes. This made climate control and robustness key development themes.'

Proud and positive

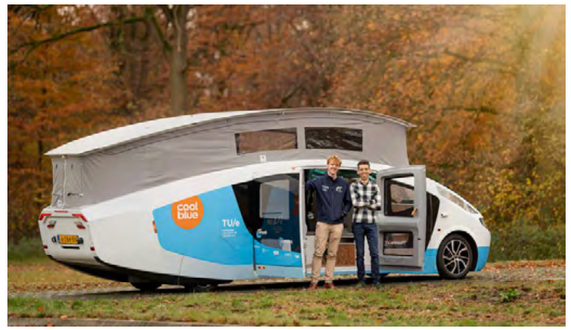
At the moment, the fully automatic passenger bridge is used for intercontinental flights at Schiphol's F Pier by KLM and its partners. The trial - during which an optimization step was carried out in a fully operational environment - was already completed in 2019. A decision still has to be made about the intended rollout – Sioux is prepared to manufacture 50 units in 2020.

Maan: 'The COVID-19-pandemic has hit the aviation sector severely. Organizations are under pressure; the focus is on surviving this crisis. Last year Schiphol received 70 million passengers. At the moment there are a lot less. Revenues are dropping sharply, as a result of which all expenses are being scrutinized, including the budget for the passenger bridge. But this says nothing about our joint achievement. The pilot was a success. Following the system's further development, its failure rate must not exceed 1 in 1000 and we are well on our way towards that goal. This innovation is also one of our own developments, directly affects our strategic commitment to achieve operational excellence, serves sector-wide interests and can be applied globally. Whatever anyone says, that joystick will be a relic of the past in due course. We are therefore extremely proud and positive, and Sioux Technologies can be too. Without them we would not have got this far. Let's hope that we can maintain our momentum and that we will be able to develop a few additional passenger bridges of the future within the foreseeable future.'

Sioux Social Impact Programme

'GOING THE EXTRA MILE FOR **OUR ENVIRONMENT**'

Sioux develops and makes high-value technology, for example for the treatment of cancer, life sciences research, sustainable logistics and electric vehicles. 'Why not also use the knowledge and experience of our incredibly smart people to make a positive impact in our community?' With that question from Sioux, some employees set up the **Sioux Social Impact Programme.**



What is the problem?

'In the Social Impact Programme, Sioux first brought together all kinds of existing initiatives', says Robbert van Herpen, department manager Mathware at Sioux Technologies. 'Think of our annual technology workshops for children, where we show youth how fun and valuable technology can be. We contribute to **Project March**, an initiative by students from TU Delft to build an exoskeleton that enables people with spinal cord injury to walk independently. Sioux also supports **Solar Team Eindhoven**, which is developing vehicles that run entirely on solar energy. This goes beyond mere financial support, the extra value lies in providing knowledge. In addition, our own Sustainability Dashboard is in the making. With this we will soon be able to map Sioux's CO_2 footprint and track exactly how we can reduce it. But with the Sioux Social Impact Programme we are also taking an important next step.'

Health, sustainability and community

The Sioux Social Impact Programme is open to anyone with a good idea for a project in which Sioux can use technology to add value in the areas of health, sustainability and community. 'We already do this within the supply chains in which we operate as a company', says project manager Software, Maarten Meulen. 'With the Social Impact Programme, we are now doing the same - on a non-profit basis - for our community. For instance, a pressing question came in here about the care of a baby with epilepsy who was constantly on monitors in hospital. Our mathematicians made the observation cameras at home so intelligent that they can automatically alert parents to potentially threatening situations. This technology supports the parents, meaning the baby can now be at home more often and the parents have much better quality of life. This is something to be very proud of and a fantastic example of how we can make a difference together with the Sioux Social Impact Programme.'

The AXYT from Sioux Technologies

‘WE PUSH THE **LIMITS** IN LIGHTNING-FAST ULTRA-PRECISE POSITIONING’

Sioux brings high-tech to life. It does so not only within client projects, but also autonomously. For example, it developed the AXYT; a high speed, high accuracy planar stepping stage. **Ronald Plak, System Architect at Sioux:** ‘The prototype is ready and with this we show that Sioux is in the forefront in the field of fast and accurate positioning and the associated system knowledge.’

Moore’s Law states that the number of transistors in a chip doubles every two years. This prediction from 1965 still appears to be reasonably true in 2024. Ever smaller, lighter, faster and more energy-efficient products are being realized thanks to the ongoing trend of miniaturization of components in integrated circuits. However, this has consequences for production processes, especially in terms of speed and accuracy. More products have to be assembled, inspected and machined very precisely in the same time, also from a cost perspective. Here, the point is reached where the positioning accuracy required exceeds the positioning errors already present on the component carriers.

No equal

‘Material deposition is one of the critical actions when realizing a product consisting of a carrier - e.g. a PCB or flex foil - and electrical components’, says Plak. ‘To do this even more precisely and faster, the product carrier must also be able to be positioned more precisely and faster. We solve this problem with our Accelerated XY Table, or AXYT. A second trend in material deposition concerns the increase in operations such as conductive contact deposition and conductive trace printing. Moreover, material deposition is not limited to printed electronics. In the medical sector, for instance, research into various applications is also in full swing, including bio-sensors and lab-on-a-chip. In this area, too, our planar stepping stage is groundbreaking. There is no equal in the market.’

Impressive accelerations

Sioux’s AXYT positions a product table up to 100 times per second, performing position corrections in an XY plane. This is made possible by very accurate feed forward (>99%), a high control bandwidth (>200 Hz) and smart control strategies. In the process, impressive accelerations (4G) are achieved in both directions with sub-micrometre precision. As a result, the process module above the product table does not have to make high-dynamic movements, only slower lateral steps per machining area. This results in higher production speed, more accuracy and lower costs.

> ‘The product table is ready for market’

Enormous power

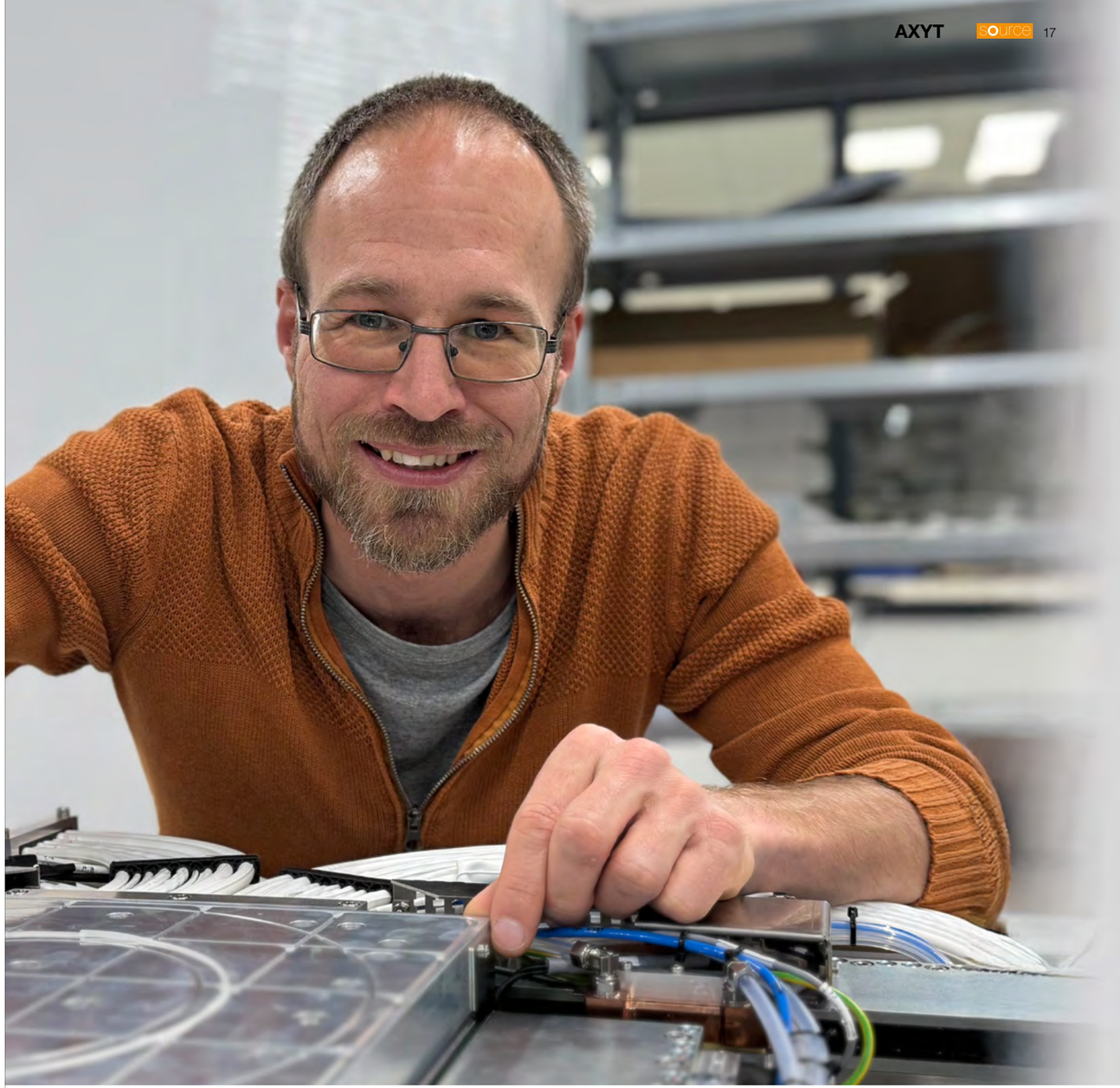
Plak: ‘To make all this possible, we gathered and exchanged a lot of knowledge from all our competences. That is not only really fun and rewarding, but also an enormous strength of our company. For instance, previous experience regarding design rules for maximizing performance has been applied in the design of the AXYT. Examples include direct drive with linear motors, lightweight and rigid construction, eliminating friction by using air bearings and direct position measurement of the product table at the process location. In short, many architectural choices and design details were balanced for an optimal result. This required input from all disciplines within Sioux - mechanics, electronics, mechatronics, optics, physics, software, mathware and realisation & testing.’

Market launch

Where does Sioux currently stand with the development of the AXYT? Plak says that the prototype is ready and is now being further optimized by developing smart calibration strategies. So, the step from an innovative idea to proven concept - both in terms of working principle and performance - has been made. The product table is ready for market launch. However, a positioning table on its own is not yet a total customer solution. Sioux therefore continues at system level. The next task that will be tackled on its own is the addition of an optical module and smart software with which positions and the required corrections can be determined quickly and accurately. This step should be completed by April 2025.

Specific customer applications

Plak: ‘With the proto of the AXYT, we demonstrate that Sioux is one of the top companies worldwide in the field of fast and accurate positioning and has the corresponding system knowledge in-house. With this, we can now start working towards applications in the semicon, analytical and medical industries. This has also been taken into account in the design. We can adapt this as required - in terms of size and length of working area, among other things - and expand it for optimal results at system level. We therefore expect a lot from this development. After all, it will enable our customers to make faster, better products with a higher yield and at a lower cost. In doing so, we also hope to inspire them to come up with new applications where we can provide them with multidisciplinary support in realization.’



‘THE ZOO AS A GOOD LEARNING SCHOOL’

That you don’t always need to have a technical background to work at Sioux Technologies is quite understandable. But the fact that even caring for great apes can be useful work experience is something Warehouse Employee **Joost Peeters** has to explain. ‘Monkeys are just like people. By observing them for hours, I have become good in understanding body language and group dynamics.

As is often the case with many adolescents, Joost’s ambitions shot in all directions when he was young. He started an education to become an interior consultant, but that wasn’t it for him after all. Teaching assistant suited him better: ‘I really liked the enthusiasm of children in elementary education. But around the age of 18 I developed health problems, so I had to miss a large part of my education.’ When things finally improved after 1.5 years, Joost had been out of it for so long that he had to start his education all over again. At that point, he decided to change direction yet again; he chose animal care. I have always loved animals,’ he explains. Cats, dogs, fish, rats, rabbits, lizards; I have had every pet imaginable. Animals are always happy to see you, I love the peace they radiate.’

Monkey business

This study proved to be a hit. He worked at a sheep farm, on an animal holiday farm and stuck around the Beekse Bergen after his final internship. There he took care of the great apes. ‘There were two groups living at the park, but the dynamics were not good - some monkeys didn’t like each other. My assignment was to put together two sociable groups; quite a big responsibility. Chimpanzees are in fact very territorial, but what makes it extra challenging is that they can also pretend to be nicer than they are. If you fall for that and leave a cage open at night for a closer acquaintance, you might find a dead monkey in the morning. Such a death really hits you hard.’

Fortunately, the profession of animal care also has many bright sides. The atmosphere in the monkey groups can also be extremely good and create special moments. ‘For example, when monkeys want to show that they trust each other, the males let each other hold their balls. I’m sure I don’t need to explain how significant such a gesture is. Very special to see.’

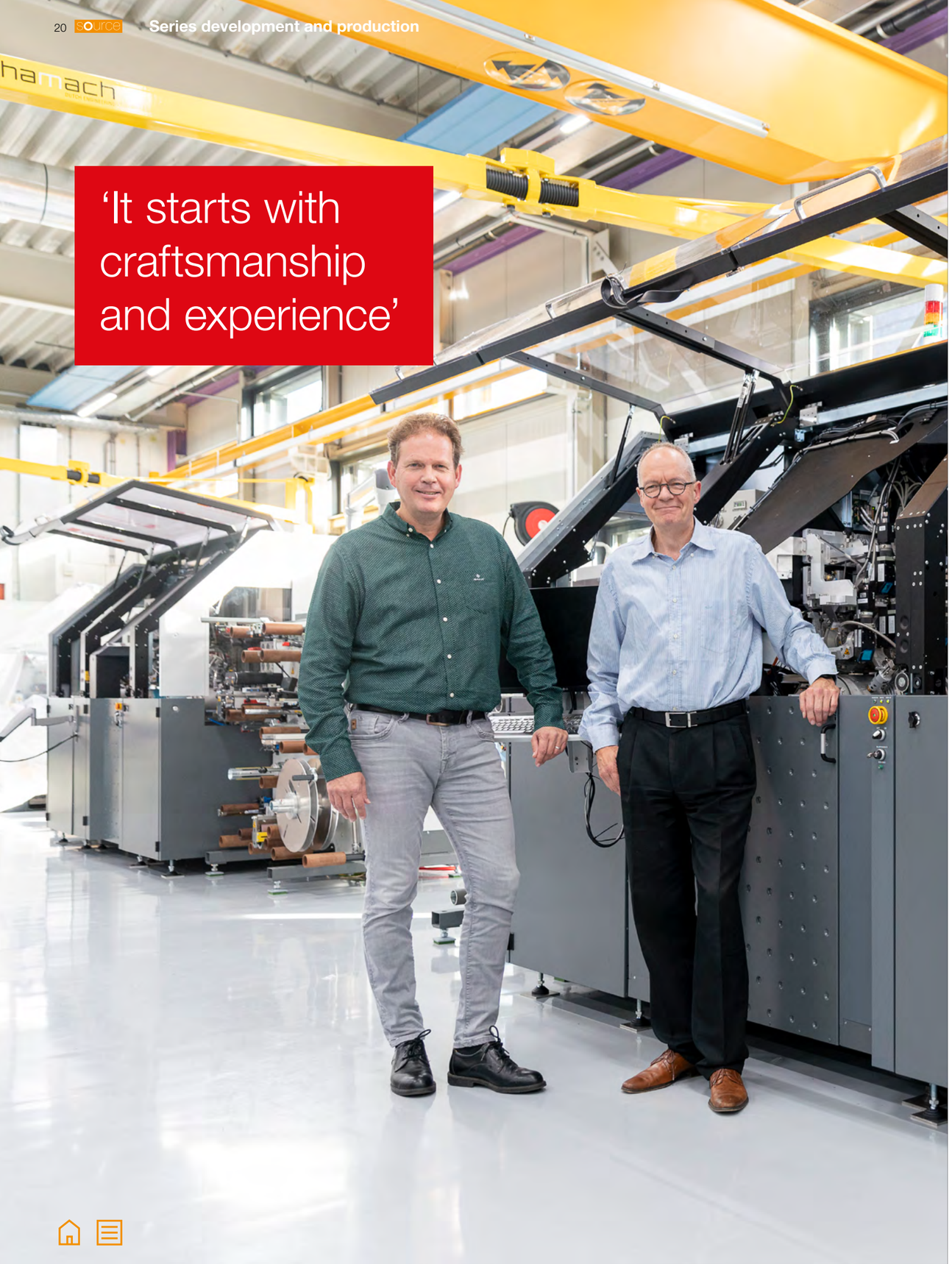
Keep on growing

Listening to his stories about the zoo, one wonders why Joost eventually chose yet another future. But his explanation is logical: ‘I wanted to continue growing. There are only a few zoos in the Netherlands; if you find another job at all, it is never close to home. Moreover, the salary is not particularly good and opportunities for career progression are limited. I wanted to build something more.’ Joost found a logistics job at a tech company in the region, but that wasn’t quite it either. When Sioux was pointed out to him from various sources, he decided to apply for a job as a Warehouse Employee in late 2021. After that, all the pieces fell into place. ‘I now work in a nice, permanent team and I just work day shifts here; I like that better than the shifts at my previous employer. The salary is good and there are opportunities for personal development’.

Body language

The fact that Joost knew nothing about technology proved to be no problem for Sioux. ‘For order picking, a technical background is not necessary; I learned the work by doing. Only the computer programmes took some getting used to, because we didn’t use them at the zoo’. One useful quality that Joost does take with him from the zoo is the art of observation. ‘I spent hours looking at great apes, which teaches you a lot about body language and group behaviour. People are more similar to great apes than they think: teasing, challenging, displaying power, copying, flirting, flattering - we all do that too. This is very useful to me in daily life, and even at Sioux it still comes in handy sometimes.’

So is Joost really completely settled now? ‘If I ever win the lottery, I’ll start a cat pension. But if that doesn’t happen, I’ll happily stick with Sioux and my Bengal cat Dobby.’



‘It starts with craftsmanship and experience’

Sioux and ITEC

‘WE WORK TOGETHER SEAMLESSLY’

ITEC’s wire- and die-bonders do their job at an incredible speed. They can place up to 90,000 chips per hour on a substrate, which is by far the world record. Perhaps even more impressive, is that this is done with an accuracy of five micrometres. Sioux Technologies has been working with ITEC since 2008, contributing to the development and prototyping of this high-tech equipment. Meanwhile, the next step in this partnership has been taken; Sioux is responsible for the construction of the Tagliner.

The Tagliner is specifically developed for applying chips to Radio Frequency Identification Labels, or RFID Tags. That is a growth market. ITEC, that has been operating as an independent subsidiary of semiconductor manufacturer Nexperia since July 2021, therefore sees it as very promising.

Lex Schoordijk, project manager Emerging Markets at ITEC: ‘The paper industry is currently making a massive shift from analogue to digital barcodes, for example for automatic checkout, theft protection and identifying and tracking products. We started developing the Tagliner in 2015 and delivered six to our customers. These are now running in production lines in India, France and Japan, among others. In fact, ITEC is still “the new kid on the block” in this market. But with the best and fastest machines in the world, we can add a lot of value. Now is the time to scale up production, and we are doing that together with Sioux.’

Unique module

The Tagliner is built on the generic technology platform of ITEC’s wire- and die-bonders. However, the heart of the machine is formed by a unique product handler consisting of three modules. The first puts a drop of glue on the substrate, the second places the chip. Which is pushed out of the back of a wafer and picked up by a mill, which passes it to a second mill so that the chip can be placed with the right side up. The third module takes care of the thermal hardening of the compound. All this happens at a speed

Major accomplishment

Paul van Cruchten, project manager NPI Realization-Industrialization at Sioux: ‘The machine places more than 13 chips per second, that rate will be further increased in the future. All process steps are monitored in real-time by cameras and software. These record everything that happens, including when something goes wrong. However, mistakes are rare. The yield of the system is 99.8 percent. That is a major accomplishment. It is wonderful to know that our specialists in mathematics and optomechatronics contributed to the development of ITEC’s technology. That Sioux now gets to make this machine is a very nice next step in our partnership.’

Remarkable

April 2021, ITEC assigned Sioux to build five product handlers for the Tagliner. These were delivered at the beginning of 2022. This was followed by a request for Sioux to take on the integration of this system throughout the entire machine, starting with five Tagliners. Sioux organized the manufacturing process, the supply chain, assembly and testing. Production started in May 2022, to deliver the first Tagliners before the end of the year. The speed with which this all happened is remarkable, especially given the complexity of the product. How is that even possible?

Solid foundation

‘Of course, it starts with craftsmanship and experience’, says Van Cruchten. ‘In addition, Lex and I have a good personal click. We can work together seamlessly on all fronts.’ Schoordijk: ‘And the same goes for our people. Our teams are self-managing and complement each other well. They work side by side in Sioux’s assembly hall. These are ideal conditions for a smooth transfer of knowledge. Moreover, we do everything in complete openness and transparency. If there are problems, and there always are, they are simply solved. The management meets every two weeks. We provide a good briefing so that things keep running smoothly at that level too. This is how we build a solid foundation for the future. Production will be considerably increased; next year, we will build another ten Tagliners. In addition, we will take up new production challenges together.’

< Paul van Cruchten and Lex Schoordijk (from left to right)

From journalism to tech:

FIRUZAN'S INSPIRING CAREER SWITCH

Switching from a linguistic profession as a journalist to the beta world of technology: for software engineer **Firuzan de Groof** it felt like a logical choice. 'I chose journalism because I wanted to address and solve social problems. I still have that motivation, only now I am committed to a different platform. Our future is increasingly determined by technology, I think it is important to leave my mark on that as a woman', she explains. Sioux gives her that space: 'Here, like me, they believe in diversity as a driver of creativity and innovation.'

As a journalist, Firuzan used words to analyse and discuss complex topics, nowadays she does so with data and algorithms. 'Although this work requires completely different skills, both professions are about discovering patterns, finding solutions and developing new insights', she says. Her interest in technology arose partly because of her work as a journalist. 'The potential of technological innovation for societal challenges in the field of healthcare, education or sustainability is enormous. That really appeals to me.' When Firuzan noticed that she needed a new challenge, she decided to make a rigorous career switch. 'To outsiders it may seem like a surprising step, but to me it felt very natural: technology is my new tool to improve the world.'

If a woman wants something

Her decision did mean that she had to go back to school; Firuzan enrolled in the Software Engineering bachelor's degree at Fontys University of Applied Sciences. 'That was indeed quite a challenge, especially if you have been out of education for a while and also come from a completely different field. But if a woman wants something, she can achieve it. I firmly believe in that', she says. 'In the first year, I spent a lot of extra time on maths, so that I understood the basics well. There were days when I studied for twelve hours.' Her dedication and perseverance paid off: 'For the first exam, almost half of the class scored a fail, but I passed! Then I knew I was on the right track. I found the mathematical subjects particularly interesting, but I especially appreciated the good balance between science and alpha subjects. As a result, I not only developed my technical skills, but also my analytical and creative thinking skills.'

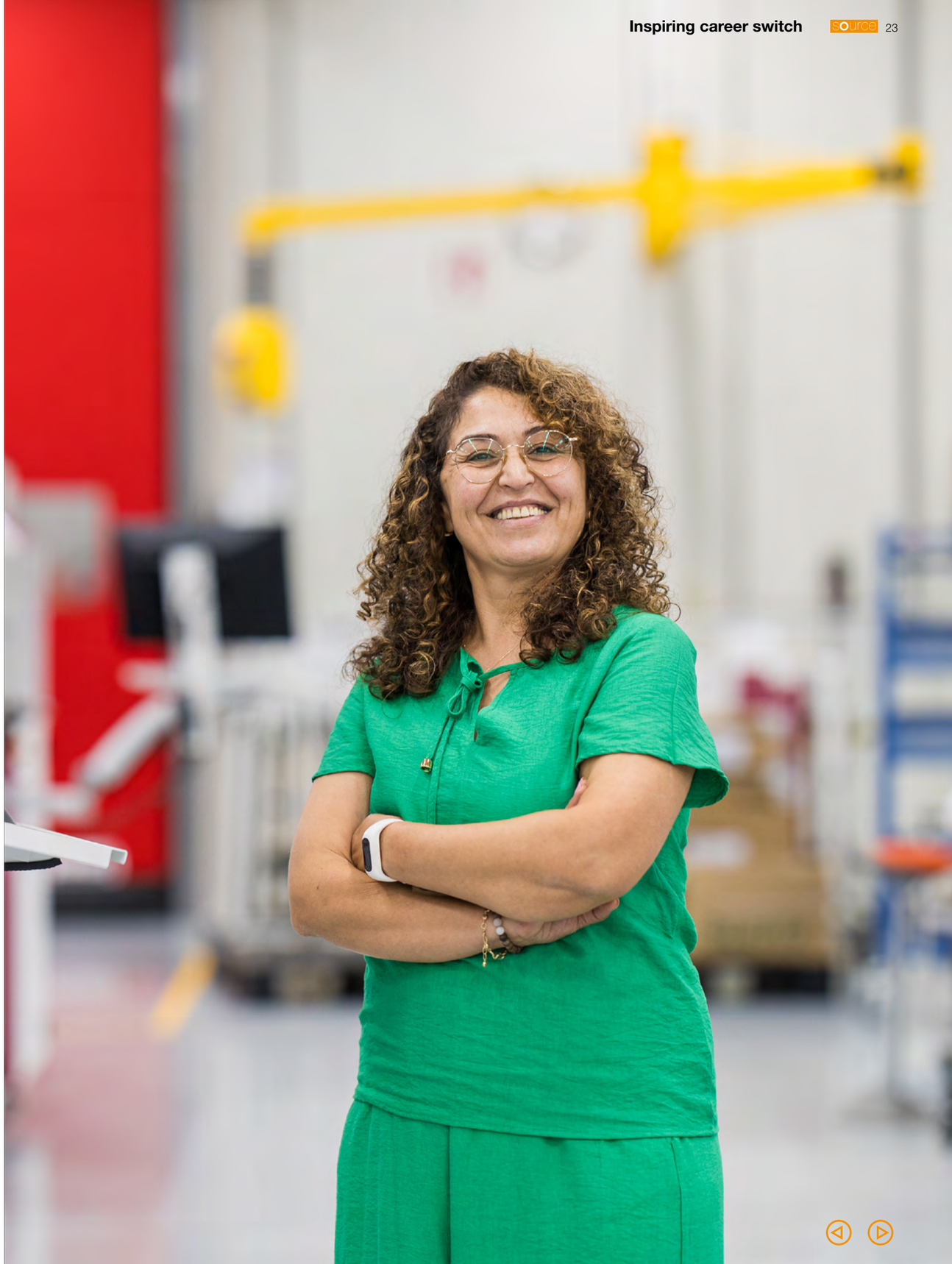
Improving lives

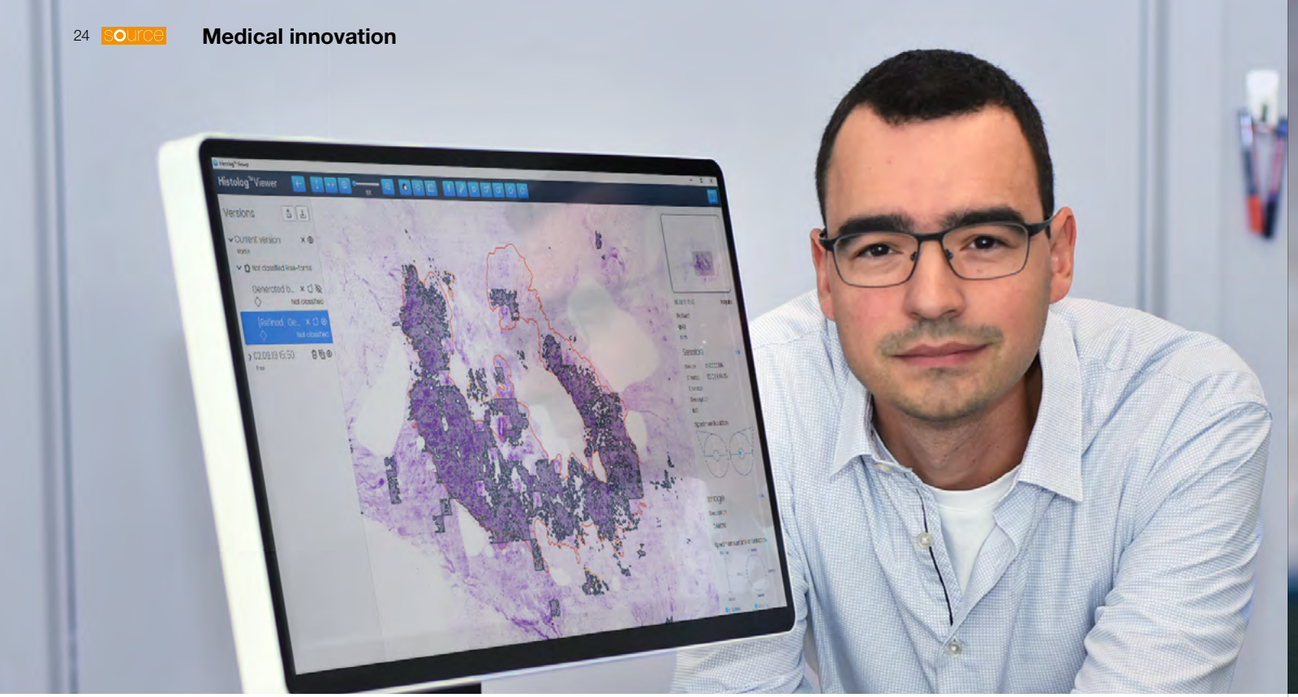
In 2019, Firuzan obtained her bachelor's degree. Four years later, she applied for a job at Sioux. 'The reason for that was that I read in several articles that Sioux wanted to interest more women in technology. That made me curious', she says. 'I believe that science and technology benefit from diversity in teams, so that different perspectives come together. During my application, I clearly noticed that Sioux sees it that way too. Technology is not an end in itself, but a means to improve people's lives. And if you want to connect with what people need, it's not just technical skills that are important, but also diversity in age, gender, and experience. For example, a woman's perspective can be very valuable if you want to improve breast cancer detection; only women know how painful a mammogram can be.'

As a journalist, Firuzan read and wrote a lot about the role women played in world history. 'Women have always had an important role in technology and science. Think of Grace Hopper, who co-developed the COBOL programming language, Rosalind Franklin who discovered the structure of DNA and Maria Telkes who developed the first solar heating installation', she says. 'We often categorize women as more emotionally intelligent and men as more analytical, but the reality is that every person can develop both forms of intelligence. I therefore do not want to be seen as 'the woman in the team', but as a competent professional with a unique perspective. Because of my background as a journalist, I can, for example, build bridges between technical and non-technical people, which turns out to be a valuable quality for a software engineer.'

Empowerment

Nevertheless, Firuzan is well aware of the exemplary role she has as a woman in a sector that is still dominated by men. 'But I am the same as all other women: uncomplicated and strong. I would like to invite them to make the switch to Sioux as well, because there is a huge demand for new talent. This is the ideal place to develop yourself, earn a good salary and build a career, without running aground on stereotypical expectations. This work has not only increased my knowledge and skills, but also my self-confidence. I feel that I can really make a difference here. There are more and more boot camps and short courses available for women who want to retrain. These programs are intensive, but an excellent way to quickly develop new skills and enter the job market. The feeling of empowerment you get from that is more than worth it.'





Etienne Shaffer

SamanTree Medical and Sioux Technologies

INVESTING TOGETHER IN **NEXT GENERATION** MEDICAL IMAGING

The introduction of digital technologies, like 3D printing, robotics and nanotechnology, heralds a new future for medical care. One of the companies shaping this revolution is the Swiss firm SamanTree Medical. They developed the **Histolog® Scanner**, which allows surgeons to identify cancer tissue in real time and are preparing its commercial roll-out now. ‘In all of this, we have found an indispensable partner in Sioux’, explains CTO **Etienne Shaffer**.

Usually, tumour surgery is not limited to a single procedure. Removing malignant tissue and at the same time retaining as much healthy tissue as possible – e.g. when treating breast cancer – is not easy. Furthermore, the level of success is not determined until afterwards in a pathology lab, where the periphery of the removed tissue is analysed and assessed.

Subcellular level

‘This regularly reveals that an additional operation is required’, says Shaffer. ‘These operations are stressful to the patient and very expensive. Our Histolog Scanner offers a solution. We bring ultrafast digital confocal microscopy to the operating theatre. After dipping fresh tissue in a contrast medium, it can be put on the Histolog Scanner; there is no need to cut it or fix it to glass. Within one minute it is ready for imaging. Within the following minute, you have a detailed picture of the morphology with a subcellular resolution. This allows the surgeon to determine margins much more accurately during surgery, to work more precisely and avoid a follow-up operation. But our technology can also be applied more broadly, e.g. for biopsies or as part of the pathology workflow.’

Data management

The Histolog Scanner is a breakthrough in medical imaging by itself. It can scan and process tissue samples with a diameter of up to 8 cm almost in real time. This large field of view – typical tissue sections are 1.5 cm – offers considerable advantages. But it also requires a great deal in terms of data management. According to Shaffer, the second major challenge is the development of user applications. ‘The accuracy with which specialists interpret images depends on many factors, like their training level and experience. We want to help clients eliminate this subjectivity and speed up the analysis process. The first step here is to automate the initial rough analysis. We recently released an application for our Histolog Scanner, which independently identifies areas of interest for further inspection. We created this application together with the software and

Robbert van Herpen

mathware specialists of Sioux.’

Deep learning

‘That tool is cutting-edge technology at the interface between data analysis and artificial intelligence’, underlines Robbert van Herpen, responsible for the Mathware division at Sioux Technologies. ‘The system needs to quickly, accurately and reliably recognize various patterns in a variety of tissue types. That forms the basis for the data model. During its development, we applied the latest insights in the field of deep learning. By feeding it the right data, optimizing the hyperparameters and deploying it in the SamanTree system, we made the leap towards a high-tech solution. Right now, the tool is very good at pinpointing areas of interest and is ready for use in operating theatres. The holy grail would be an autonomous system that is 100 percent correct and excludes human error. We are not there yet, but the current scanner and applications are already facilitating a revolution in tumour surgery.’

Early adopters

SamanTree Medical operates a fleet of eight Histolog Scanners for demonstration projects in various European medical centres in preparation of the commercial roll-out. Sioux also plays a key role in this.

A revolution in tumour surgery

Shaffer: ‘When looking for a development and manufacturing company, we came across Sioux a couple of years ago. Now we are connected in many different ways. The Sioux Tech Fund joined up as an investor. Apart from being an extension for our R&D, Sioux also is our exclusive partner in industrialization and manufacturing. Production has been fully transferred; this helps us to focus on our customers. That market introduction will be a step-by-step process due to the revolutionary nature of our technology. But the masses will follow the early adopters, of that I am certain. Sioux’s engineering and manufacturing skills will also help us then in terms of further development, upscaling of production and cost-down operations.’

‘HERE, I CAN BOTH **SPECIALIZE AND BROADEN** MY EXPERTISE’

Glenn Roumen has been working as a System Designer at Sioux since 2022. He completed his master’s degree in Control System Technologies at TU Eindhoven. He works on high-tech designs where precision and complexity are key.

Glenn Roumen: ‘Sioux has always appealed to me as a true development company with a wide variety of projects, exactly what I was looking for in my work. I enjoy specializing in a specific area, but at some point, you also want to broaden your expertise. The diversity of projects and tasks makes the work both challenging and interesting, which suits me perfectly.’

Poeple managers as mentors

‘Sioux genuinely invests in employee development. There is an annual training budget that you can use for courses and training programs. Additionally, managers actively help match projects to your learning goals. For example, I wanted to improve my knowledge of electronics, and in consultation with my people manager, I was able to work on a project where this was a key aspect. This targeted support has greatly contributed to my professional growth.’

‘Sioux invests in employee development’

SIOUX & PSV GO FOR ROBOCUP WIN

In the near future, it must happen. Sioux and PSV winning the RoboCup. The team of Sioux engineers that wants to make this happen has recently started working hard and will enter the arena of this an international competition for soccer robots next year. Why this ambition, what is the added value for Sioux? Initiator Xi Luo: ‘We want to show what we do and can do. Above all, it’s also fun.’

The RoboCup is not new. The first official edition was organized back in 1997. Its aim: to promote and stimulate technological developments in robotics and artificial intelligence through an attractive and challenging application. The competition was an instant success, and it still is. Starting next year, Sioux will join this global competition at the intersection of high-tech and sports. How did the idea come about?

Creating something beautiful

Xi Luo, System Designer Mechatronics at Sioux: ‘During several events we organized at Sioux, I saw the fascination of visitors, adults and children, for the advanced technology we are involved in. That is wonderful. Every engineer wants to create something beautiful and show it to the world. For us, however, this is not always easy. Much of what we do, for example for the semicon and analytical industries, remains invisible or intangible to the general public. By participating in the RoboCup, we can share our passion for innovation and groundbreaking technology and show what we are capable of.’

Chess, Go, Soccer

In 1997, the world was introduced to artificial intelligence when IBM’s Deep Blue defeated grandmaster Garry Kasparov in a chess match. Later, DeepMind Technologies’ AlphaGo won from the world’s number one Go player. Machines successfully challenged humans in these intelligence sports. That caused a lot of discussions and it generated a lot of excitement. The dot on the horizon of the RoboCup is robots playing against humans in a physical sport, thinking and acting on an equal level so they can play soccer together. ‘That’s a fascinating vision of the future - it will make us think even more about the difference is between humans and machines,’ Luo said. ‘But it’s also incredibly fun. Sioux wants to contribute to making that future a reality.’

Significant challenge

The next revolution in AI is in the making. The buzz word of the moment is Embodied AI. This involves combining artificial intelligence with a physical body: a robot. This is massively changing the way robots are developed. They are becoming smarter and more capable. This also opens up exciting new possibilities regarding the skill and performance of soccer robots.

Luo: ‘This is therefore a great time for Sioux to enter the competition and make rapid progress. Building soccer robots and making them function as a successful autonomous team is a big challenge. We are going to bring together a lot of state-of-the-art technology: high-precision motion control, optimization, model-based software design, machine learning, digital twinning, edge computing... Our advantage: we have vast knowledge in all these areas and can build on a great deal of experience in applying them. That’s what sets us apart from the rest. Moreover, we are the only team that has joined forces with a professional soccer club: PSV. That too makes us unique.’

Statistics and data analysis

‘A brilliant idea.’ That’s how Luo calls the collaboration of Sioux and PSV within the RoboCup team. With this joining of forces, Sioux not only commits to the soccer club as a sponsor. A bridge is also being built between Sioux’s engineers and PSV Academy and thus between soccer robots and real people playing soccer. We can learn from each other. For instance, Sioux will use PSV’s statistics and advanced data analysis to access each robot’s performance and formulate the RoboCup team’s tactics. This will take the game to the next level.

Flying start

Where does the RoboCup team currently stand? Sioux is a big company with huge competences in hardware, software, electronics and mathware, Luo emphasises first of all. These are crucial for creating high-performance robots. Combining high-tech, high- fun and high-value is also a high priority at Sioux. There is therefore no shortage of enthusiastic people who can and want to contribute. The team has now been formed and the work is done in the participants’ free time. Nevertheless, the Robo-Cup team has got off to a flying start.

Freedom and creativity

‘We are building the technology for the RobOCup from scratch,’ Luo says. ‘In doing so, we use existing solutions but also explore new ones. We do this in complete freedom, which unleashes creativity. This is how we speed up, for example in choices regarding components, design principles, the calculation platform and a simulation framework. We have already started building two prototype soccer robots. These will be ready by the end of this year. However, that is just the beginning.’

Most challenging category

Sioux and PSV are raising the bar. In 2026, they want to compete in the RoboCup, and in the most challenging category: the Middle Size League. In this, teams of five fully autonomous robots play soccer with an official FIFA soccer ball. This ambition is not unrealistic according to Luo. ‘As a new team, we start with a blank canvas on which we will apply the latest technologies in robotics and AI.’ A second advantage he mentions is Sioux’s track record in motion control - highly accurate movement on a sub-micrometer scale in microseconds. In addition, the team leverages the company’s assets to go from development and design to a high-quality robot team. Moreover, there is the support of PSV’s professionals who know what it takes to win a football match.

> Soux will use PSV’s statistics and advanced data analysis

International growth

Luo: ‘Sioux brings high-tech to life, we are going to do the same in this case. Meanwhile, we are going to learn a lot and have a lot of fun. In addition, participating in the RoboCup offers us commercial opportunities. It is sometimes difficult for potential customers to relate to the complex high-tech environments in which we work. By demonstrating our competences in a popular sport like the RoboCup, we are showing at an international level what we as Sioux have to offer.’

Read more about Sioux robot soccer team

Sioux Technologies has all the expertise to contribute to the maximum success of high-tech products and production systems. Sioux's strength lies in the unique combination of high-quality competences in software, mechanics, optics, physics, mechatronics, electronics, mathware, system integration and IoT solutions. With more than 1200 engineers Sioux supports or forms the R&D department of leading high-tech companies. Sioux is keen to take responsibility: from creating ideas in the conceptual phase up to the delivery of serial production. Sioux wants to add value to its clients and build innovative solutions that can contribute to a society that is smarter, safer, healthier, more enjoyable and more sustainable. **For more information go to www.sioux.eu**

SIOUX
TECHNOLOGIES