

source

# AMBITION

IS THE PATH TO SUCCESS

THERMO FISHER  
SCIENTIFIC AND  
SIOUX SHARE A  
**JOINT AMBITION**

LIGHTYEAR: 'ZERO  
EMISSION **MOBILITY**,  
FOR EVERYONE AND  
EVERYWHERE'

SIOUX MATHWARE  
PROVIDES A  
**BREAKTHROUGH**  
FOR KADASTER

# ambition

A company like Sioux cannot be created without ambition. Mine has been fed for many years now by my curiosity about technology, people, and my environment. I can see this longing to discover new things reflected back at me throughout the whole of Sioux. That makes me so happy, and not just because I identify myself with it. It is one of the most important pillars of our success. It is reflected in the solutions we develop for our customers, in the way we collaborate with them, and just as much in this issue of Source.

Sioux's uniqueness extends beyond our borders, to countries such as China. The industrial development in and around Shanghai has long since advanced beyond low-grade activities. The same applies for the regional government, which is hard at work on creating a knowledge-intensive economy. They are rapidly making progress in this endeavour; you can feel the progress in every fibre of the Chinese economy and society.

This means that Sioux can find great opportunities here, based on our expertise and our experience as a multidisciplinary development partner, and because no similar companies are active in the area. And taking into consideration our innate sense of curiosity, it is also just wonderful to be a part of a high-tech cluster that is working on a beautiful future with such energy and a drive for innovation. After all, that will help us bring out the best in ourselves, just as it does within Brainport.

Happy reading!

**Hans Duisters**  
CEO Sioux Group



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SOURCE OF YOUR TECHNOLOGY



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Erik van Rijswijk and Leon Giesen

# ‘IF YOU STAND STILL, YOU WILL GET PASSED BY’

Sioux has never lacked ambition, as evidenced by the company’s development. What once started out as a small secondment agency specialising in embedded software has grown to become a multidisciplinary technology partner that provides added value for the entire development and manufacturing chain of high-tech systems. By speeding up its internationalisation, Sioux is adding a new, exciting chapter to its history.



A man with grey hair, wearing a grey blazer over a white shirt and dark trousers, is walking outdoors. He is smiling and looking towards the camera. The background shows a modern building with large windows and a clear sky. An orange text box is overlaid on the top right of the image.

‘We continually invest in our knowledge, technology, customers and employees’

When you ask Erik van Rijswijk, part of Sioux’s day-to-day management team in Europe, about the core of the company, he has a very clear answer for you. ‘Sioux is about technology, through and through. We always have been, and always will be. We have lots of developmental power in terms of software and smart modules. We work for or serve as our clients’ R&D departments. Additionally, we assemble their equipment, in response to the growing demand for partners who are able to take responsibility for the entire life cycle of systems.’

‘Sioux has immense know-how, about subjects such as software, mathematics, electronics, optics, mechatronics, physics, and final assembly’, fellow management team member Leon Giesen adds. ‘We combine that knowledge and experience in a very targeted manner in our projects. And we do so based on a unique identity, a company culture that revolves around dreaming, thinking, and then realising this. Essentially, we are constantly working on the future. You could even say we inhabit it. That is how we push boundaries and bring technology to life, which is very inspiring, and has resulted in our unique position within the regional supply chain; we are a supplier primary focused on people, not machines.’

### **Continued growth**

Sioux now has around six hundred employees and an impressive customer base and project portfolio. However, Van Rijswijk says that money or an urge to expand have never been driving forces in the company. ▶



‘Technicians always manage to come together through their curiosity’

# 'We also do this simply because it's cool'

'At the start of Sioux, our guiding principle was to create a company that would be valuable to its employees, customers, and society as a whole. To do that, you have to really go for the long term and grow your competencies and entrepreneurship. Everything else is simply a result of that, even our current size. At the same time, continued development is a prerequisite for ensuring your company's success. That is why we are always investing and will need to outgrow our home area.'

## New foundation

One of the ways in which Sioux is shaping its future is by supporting promising new OEMs. The Sioux Tech Fund has been especially set up for this and is now a partner in a number of enterprises, such as MuTracx, which developed the first digital inkjet PCB printer in the world. The fund also recently acquired a stake in Lightyear, a startup that will be bringing to market the first electric family car to run on solar energy in 2020.

Giesen: 'By making these kinds of investments, we help create our own future customers. On top of that, it enables us to work on increasing and deepening our knowledge via our focus on market and technology. For example, we are using our expertise regarding automotive to help Lightyear develop all of the software layers for their car. We are also interested in a number of startups in the medical technology industry that we may be partnering up with. But apart from all of these rational arguments, we also do this simply because it's cool, because we get a rush out of working on ground-breaking technologies.'

## Hurricane

Sioux recently acquired a stake in a Romanian software development company employing around 140 people. It now has

three back offices, each with their own strength, such as big data, apps, and real-time software.

Van Rijswijk: 'They are helping us handle the hurricane of orders that is currently flooding us. At the same time, they are well suited to the Sioux of the future. We continually invest in our knowledge, technology, clients and people. If you stand still, you will get passed by. As such, Sioux has to grow, but it has to do so based on substance, in places where we can provide added value as a premium development partner. For example, there is a strong cluster of machine manufacturers in Germany. These are reliable, robust companies, like us, but they still tend to handle a lot of things in-house. On the other hand, they are interested in the successful partnership model that we have become so accustomed to.'

## Drive to innovate

'The same goes for Shanghai, where we are already setting up a Sioux Development Centre', says Giesen. 'Over there, high-tech OEMs have long since stopped focusing on low-grade work. They have a massive drive to innovate and are supported by a government that is hard at work on creating a knowledge-intensive economy. We want to be a part of that, because that is the kind of ecosystem we belong in, and because they need our experience and expertise. Shanghai has had this same realisation. After all, JITRI – a kind of TNO, but then Chinese, and bigger – has recently approached us about engaging in a partnership.'

## Event Centre

The question is whether Sioux is heading out on thin ice with this increased internationalisation. After all, it could be detrimental to Sioux's unique company culture,

which is partly responsible for Sioux's strength. However, Van Rijswijk does not seem concerned.

'That drive to innovate, the human dimension, an openness and a will to learn are all part of our DNA. That doesn't just disappear, and moreover, we will continue to invest in these things. For example, we will be setting up an Event Centre in a new building in Eindhoven, where our people will be able to experiment with hobby projects, among other things. Our campfire sessions – where new people get to know both Sioux and one another – will also stay. These kinds of initiatives will always be a part of Sioux, all over the world. Cultures and people do differ from one another, but technicians with a passion for innovation and quality will always manage to come together through their curiosity and willingness to collaborate, and the same will happen within Sioux.' ◉



Vecos' Bram Kuipers:

# 'SIOUX SHARES OUR AMBITIONS'

In 2013, Vecos decided to redevelop its smart locker system from the ground up, showing no restraint in terms of their ambitions whatsoever; they wanted to create the new standard for the future. Vecos engaged Sioux to provide support throughout the entire process, from architecture right down to realisation.

'I could not have been more lucky when I first started out here in 2010', says Bram Kuipers, director and co-owner of Vecos. 'First of all, I really got along with the people working here, only three people at the time. Vecos was the frontrunner in locker management systems back then. The first few orders were substantial; the market was big and ready for our product. As such, we quickly became the global market leader – by working day and night, I might add!'

## All-in

Vecos' first-generation smart locker system consisted of an operating panel with a display and a pin code pad for selecting lockers and operating the locks. New features kept being added to this basic system, such as a terminal for reading users cards.

Kuipers: 'After three years, we were starting to see the competition approaching in our rear-view mirror. Continuing to innovate based on the existing platform would no longer suffice. We made a radical decision to fully reinvent our product. We went all-in with that. Our aim was to create the locker management system of the future, which led to a list of requirements. For example, the system had to always work, be user-friendly and easy to maintain, to scale up, and to integrate into other systems, as well as being remote controllable. Moreover, we wanted to switch to a cloud-based multitenancy system, for safety and maintenance reasons, among other things. To realise all this, we would need a huge

amount of specialised expertise. That is why we appealed to Sioux to support our own R&D department.'

## Shifting gears

Vecos' and Sioux's collaboration started with the deployment of a system architect who collaborated on various aspects of the technological development framework, such as the data model and the operating principles. Sioux was then involved in the new system's development process. The system consists partly of hardware like locks, power supplies, hubs and readers. It also features Releezme, an intelligent cloud system that stores and verifies data, facilitates the operation of the system by way of an app, and enables systems all over the world to be monitored and updated in Eindhoven, among other things.

'Sioux is now an integrated part of Vecos' R&D department', says Kristof Smits, account manager at Sioux. 'This enables Vecos to make maximum use of our knowledge of software, mathware, mechatronics, electronics, and final assembly, and our experience with utilising these in a multidisciplinary manner in complex development projects. We are also able to add a degree of flexibility. For example, we shifted gears last year to develop Vecos' third-generation Locker Bank Controller, a complicated electronic system with a display that plays videos, operates the lockers, and exchanges secure data with the cloud, among other things. We provided support for the entire

process, from the casing, installation mechanics, electronics, embedded software and safety standards right down to the delivery. We were able to create extra speed by utilising our Embedded Systems Platform, a basic platform with microelectronics and operating software featuring standard features for high tech equipment. We have since manufactured the first few hundred Locker Bank Controllers, which have been successfully operating in the field.'

## Urgency and commitment

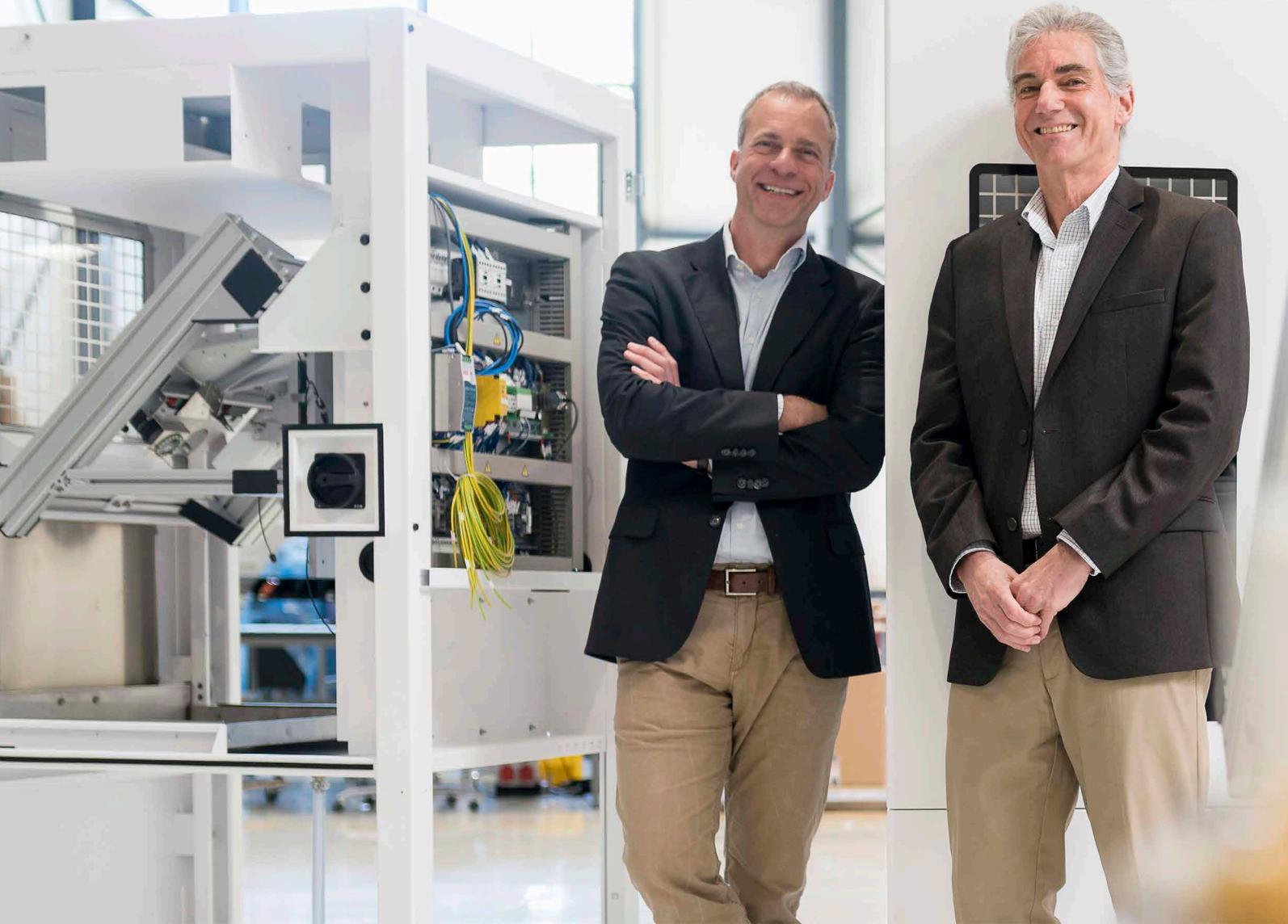
Vecos now employs around thirty people and is marketing its latest locker management system worldwide, to companies, hospitals, governments and schools. Vecos' massive commitment and collaboration with Sioux are now paying off. Kuipers feels that the relationship of trust that has been created during this process is very special.

'By continuously choosing the maximum feasible level in terms of technology, we were racking up huge investments. In a situation like that, you have to be able to depend on your development partner, who senses the urgency you are experiencing and provides the necessary solutions. At those critical moments, Sioux proved that they really shared our ambitions. And they still do in terms of how they maintain our technology. That is crucial for us. A malfunction can have massive consequences, especially in those cases where our system forms an integral part of our clients' workflows. Due to our multitenancy model, we are very much responsible for making sure the system works at all times and in all locations. As such, continuous monitoring, maintenance, and testing are required. On top of that, we are continuously developing the system's functionality, such as in the field of big data applications. In that, too, having Sioux as our partner makes sense for us.' ●



‘You have to be able to depend on your development partner’





Jeroen de Groot and René van Eijkelenburg (left to right) ^

Sioux Assembly and JIACO Instruments

## **‘WE ARE WELL-SUITED TO ONE ANOTHER’**

JIACO Instruments developed the first effective decapsulation machine in the world that does not require any acid or toxic gasses. In doing so, this startup caused a revolution in the packaging industry’s error analysis and quality monitoring. Faced with the prospect of considerable growth, the company decided to find a second source for its assembly processes, and has now found what seems to be a perfect match in Sioux.

In 2010, eighty percent of all chips were connected to their electronic circuits using gold wire bonds. Nowadays, that number has dropped to around ten percent. The lion’s share of chips is now made using copper and silver, thus cutting back on costs. At the same time, the challenges in the fields of error analysis and quality monitoring have increased.

While the casings into which chips are poured could first be removed using strong acids, as gold is not very prone to oxidation, copper and silver demand less aggressive methods in order to prevent the wires from being damaged. After all, that would make it impossible to identify manufacturing errors. The solution was presented by Kees Beenakker - based on his findings when working at the Philips NatLab - and Jiaqi Tang who wrote his doctoral thesis on the subject. They founded JIACO Instruments

‘There is no longer any excuse for half measures’



in 2014. René van Eijkelenburg helped them set up their company, using his background in the business community.

### Serious business

‘We simultaneously developed and built a prototype in collaboration with a mechatronics company that further developed the system into a stable product and is now handling the assembly. At its core, the machine works very simply; plasma is used to scratch off a layer of the casing, and then the silica filler gets shaken off. This process is then repeated until the chip can be removed. Ten of our machines are already operational all over the world, at major chip manufacturers. As such, error analysis and quality monitoring are serious business. In industries such as automotive, medical technology, aerospace, and defence, failure is not an option; safety is paramount and recalls are

expensive. We are now offering a solution that works 100%, for many different types of wires, chips, and casings. There is no longer any excuse for half measures. This has earned us a unique position.’

### Stable machine

JIACO Instruments’ order portfolio is growing rapidly. That is why they began looking for a second source for assembly, and ended up at Sioux. Jeroen de Groot, responsible for Sioux’s assembly branch, describes their relationship as a perfect match.

‘We are well-suited to one another in terms of size and are both very flexible. That enables us to quickly respond to one another’s queries. We also have the necessary expertise and experience to be able to make the switch from prototyping to the controlled, replicable manufacturing of a stable machine. Our capacities as a devel-

oper of high-quality software, mathware, electronics and mechatronics are highly beneficial to this process. But in this case – the Technical Product Documentation and Bill of Materials are relatively fixed – things really start at our assembly operation. Even so, we are definitely able to provide added value in terms of costs, quality, and speed. We do so by optimally organising the manufacturing process, procurement of components, logistics, and testing. And of course we keep adapting based on the changes that are inherent in high-tech manufacturing processes. We’ve reached the following agreement; we will first build the first series of machines, and then we’ll decide if we will keep working together, and in what way. JIACO Instruments’ technical development and strategic roadmap will of course be the deciding factors in this decision-making process.’ ●



‘I learned to look at the big picture’



## Samuel Martin

# ‘SIOUX HELPS ME GROW’

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The battle for talent is raging furiously! Samuel Martin, senior software engineer at Sioux in Mijdrecht, has noticed as much. Recruiters send him roughly two job offers each week. The salaries being offered are absurdly high sometimes. However, Martin does not feel tempted. ‘My current salary is just fine. But more importantly, Sioux is genuinely interested in me and my development.’

Martin pursued his degree in electrical engineering without feeling particularly passionate about it. However, a fire lit in his belly at the start of the programming subjects he took. ‘I turned out to be good at programming and I also really loved it, and still do. It’s about trying to complete a puzzle with a limited number of pieces, but an endless number of options. And when I’ve created something that really works, I can’t even describe how wonderful that feeling is.’

‘I am very much people-oriented’, says Martin. ‘Back when I first applied at Sioux, six years ago, they really took the time to get to know me. To me, that degree of personal interest – along with the extraordinary technologies we work on – is very important for my job satisfaction. At Sioux, everyone is challenged to bring out the best in themselves. I really love that. At the same time, I was given the opportunity to take on tasks that were under less of

a time constraint back when my second child had just been born and I was working on a difficult project. I didn’t have to ask for it myself.’

Initially Martin spent his annual training budget just on increasing his programming capabilities. ‘I saw only the here and now, not what I could become in the future. But Sioux helped me grow and gave me direction. I learned to look at the big picture by working in multidisciplinary teams. This motivated me to start investing more into soft skills such as project design and management skills. I am currently in a transitional phase. The quality of the software coding and architecture is still the main focus in my current position, but my interest in the project-based aspects of things is growing. I do not yet know where this will take me. But I do love the fact that Sioux offers me these opportunities to grow and develop. Try finding that elsewhere!’ 

Rik Ebbeling with the Dutch Cadastre:

# ‘SIOUX COMPREHENDS OUR ISSUES’

Nearly everyone is familiar with the cadastral maps that depict property lots. However, few know that these maps are only an approximation of reality. This does not mean that the Dutch Cadastre (Kadaster) does not know exactly where the boundaries are. They have been measuring and recording boundaries via five million field operations for around one hundred and fifty years now. Sioux’s mathware has created a breakthrough in digitalising this massive volume of complex geo data.

‘Creating an accurate cadastral map of the Netherlands is advisable, even just in terms of public perception’, states Rik Ebbeling, Kadaster’s manager of product and process innovation. ‘On top of that, it will increase our efficiency. Figuring out a specific field operation and then performing the necessary measurements in the field takes around eight hours currently. If a one-to-one map is available, we can speed up that process considerably, thanks to automated interpreting and immediate access to viable GPS coordinates. However, manually vectorising our field operations would cost a fortune. That is why we put out a Request For Information, asking whether automation could provide a solution. Eleven companies responded to our request, each of which suggested a partial solution. That made us feel hopeful. We thought that it would not be possible, but now we can see that there are opportunities out there.’

## Machine learning

One of the companies that responded to the Kadaster’s request was Sioux. Jeroen Franken, Senior Mathware Engineer at

Sioux: ‘As a high-tech company, Sioux has immense know-how regarding image recognition and big data. Our mathematicians saw opportunities right away. Their scientific ability is immense, but they also know when it’s necessary to test complex matters in a practical manner. The Kadaster took up our recommendation and asked us to create a Proof of Concept in four months’ time. The only way to do that was to divide the problem into manageable chunks, enabling us to focus properly and not get lost in the complexity. We spent a few weeks working hard on a theme, before moving on to the next task; like removing the jpeg artefacts in scanned maps. Luckily, we already had the solution for that lying around. We also needed an algorithm that would be able to recognise different types of lines. On top of that, we had to find a way to recognise and read both horizontal and angled numbers. Machine learning is able to do that. Another considerable challenge was understanding the relationships between all of these lines and numbers, knowing which are important, how they relate to





^ Jeroen Franken and Rik Ebbeling  
(left to right)

‘We thought that it would not be possible, but now we can see opportunities’

one another, and whether the input and output is logically sound.’

‘Sioux’s agile approach worked really well for us, because we were able to contribute to a good result’, Ebbeling adds. ‘We do not have the required technical expertise, but we do know which data is valuable, how to interpret it, and what we need exactly. By working together, we are able to bring out the best in each other. As such, Sioux has come to truly comprehend our issues.’

### Human algorithm

After finishing its feasibility study, Sioux came to the conclusion – barring a whole load of ifs, ands & buts – that it should be possible to digitalise a single map in 18 minutes. The lion’s share of that time is taken up by necessary manual work. The project has since entered a new stage. A multidisciplinary team featuring employees from various organisations, including eight Sioux employees, is working on site at Kadaster on optimising the methodology, mathware, and software.

Ebbeling: ‘Digitalising our field operations would never be possible without the dedication of the people who are responsible for colouring in the blind spots. Some maps are too unclear or incomplete or contain errors. Moreover, not all maps utilise the standard methodology for marking out lines and noting down numbers. And I could keep going, listing causes for our troubles. But 18 minutes is already a lot better than the 90 we started with. Sioux’s recommendation to organise the manual correction work per element and not per map, resulted in this potential time gain. They dubbed this methodology the ‘human algorithm’. Our aim now is to go even further in terms of speed and clarity regarding what can actually be achieved. We also need to find a solution for automatically linking digitalised maps together. Kadaster will be making its decision in April 2019. Whenever our people use maps, they are always digitalised. Depending on the final price tag, we may start doing the same for certain other areas or for the Netherlands as a whole.’

Sioux leads I-MECH

# ‘THE BAR IS SET VERY HIGH’

The I-MECH consortium is developing a revolutionary, broadly deployable platform for mechatronic systems that distinguishes itself with its control technology. Using this platform, multidisciplinary development processes can be sped up by half, and intelligent machines with a high degree of reliability can be manufactured. The consortium is being supported by the European Union and managed by Sioux. **Arend-Jan Beltman**, programme manager at Sioux, says the following: ‘What started out as loose grains of sand is now becoming a true team.’



◀ Arend-Jan Beltman and Yves Gigase (left to right)

Horizon 2020, the current European programme for stimulating innovation, represented a departure from old methodologies for the European Commission. Investments in scientific research were resulting in too few innovations that actually ended up in the market. At the same time, against a background of economic globalisation and the rapid emergence of new technologies, the importance of stimulating the transition to industry 4.0 was increasing. As such, the European Union chose to implement an approach that revolves around collaboration between the corporate world, knowledge institutes, and governments. ECSEL Joint Undertaking is one of the organisations putting this concept into practice.

### Digital economy

‘Our stakeholders are the European industry associates, the European member states, and the European Commission’, says Yves Gigase, head of programme with ECSEL Joint Undertaking. ‘This is what makes us unique here in Brussels. We are contributing to innovating the industrial sector, both large and small-scale enterprises. That way, we are securing and strengthening their competitive position. Our focus in this is on electrical components and systems. Our guiding principle is the notion that investing in R&D and innovative projects – and leadership in this key enabling technology – is essential for Europe’s future prosperity and wellbeing. After all, we have entered a period of acceleration, such as in the fields of smart manufacturing, big data, and the Internet of Things. If you are not part of the global vanguard when it comes to these things, you are missing out on major opportunities.’

### Reference model

ECSEL JU launches calls for research and development projects each year. In 2016, Sioux responded with a project proposal geared towards creating a bridge between current knowledge on and the practical application of intelligent motion control for mechatronic systems. This project was kicked off in 2017. The consortium partners are spending 17 million euros on it in total. Of those 17 million euros, roughly 25% is subsidised by the EU. In addition,

‘This project will have a major impact’

some of the parties are receiving a supplement at national level.

Beltman: ‘The Intelligent Motion Control Platform for Smart Mechatronic Systems, or I-MECH, is a consortium of high-tech companies and knowledge institutes, featuring 31 partners from ten European countries in total. The consortium is working towards developing various building blocks, both software and hardware, with standardised interfaces, thus creating a full reference model for a motion control platform. This will enable faster realisation of smarter and better modules and machines. For example, we are working on a method for model-based designs and are introducing algorithms that are able to translate information from the ‘instrumentation layer’ into the system’s condition.’

### Level of ambition

For Yves Gigase, I-MECH is one of the most special projects he is managing as part of ECSEL JU, and not just because of its size. ‘It will have a real impact, both on the developmental abilities of the participants and in terms of its spin-off to other parties. As such, the bar is set very high. This is the kind of project that you could not achieve on your own, but can really be taken to the next level collectively. And even if only eighty or ninety percent of our objectives are actually achieved, that would still result in massive added value, in part due to the expertise that is being generated and the experiences that are being shared. Sioux too will profit from this. And this time around, it will not be within the comfort zone of the high-tech chain in Eindhoven, but – in line with their ambitions – in an international context.’

### Operational stage

Beltman has now been managing I-MECH for eleven months. Those months have mostly been about setting up projects, not just in terms of fine-tuning the substance thereof, but also in terms of impressing the urgency of things on the participants.

‘What started out as loose grains of sand is now becoming a true team. That is a challenge in and of itself, with so many partners who not only have mutual interests, but their own agendas as well. Even so, things are starting to ramp up. We are creating technologies that will allow us to marry big data and machine learning. In addition to that, we are developing wireless sensors that perform fast, accurate data processing every second. We are also working on a fast control system for electric motors in production machines. Yet another building block is based on extremely quick visual inspection that involves the analysis of massive volume of real-time data. We are doing all of this as part of wide-ranging pilot projects that are focused on various things: accurate systems for producing solar cells, providing support for robots in minimally invasive procedures, speeding up the manufacturing of tea bags, and correcting vibrations in chippers. Eventually, all of this should lead to an open platform, utilising modular, standardised tools that can be called on as needed for the development of motion control systems. This way, we will realise faster development times and improve the quality level of equipment.’



**KEY FACTS** Start: 1-6-2017 | Duration: 36 months | Participating organisations: 31 | Number of countries: 10  
**MORE INFO** [www.i-mech.eu](http://www.i-mech.eu)

Lightyear

# 'SIOUX'S SUPPORT IS INDISPENSABLE'

Stella, Solar Team Eindhoven's solar car, won the World Solar Challenge three times. Two years ago, captain **Lex Hoefsloot** and four of his fellow students founded Lightyear. In 2020, this startup will be marketing the first electric self-charging family car using solar energy. Sioux is helping them, as an investor and technology partner.

## Has it always been your dream to found a company like Lightyear?

'The topic did come up a lot. With Stella, we proved that it's technologically possible. The big question was whether there was a need for this kind of car.'

## What made you decide to take the plunge?

'It is incredibly tricky to develop electric cars while simultaneously setting up a charging network with national coverage. To solve this circular problem, it is important for electric cars to be able to get around without a heavy charging network, which brings us to solar cars. Our ambition is to create zero emission mobility, for everyone, everywhere.'

## What is your primary challenge in all this?

'Finding the optimal balance between the consumption and generation of energy. The Lightyear One is lightweight and aerodynamic first and foremost, but it compares to a Tesla Model S in terms of size, exclusivity, and intelligence. In its maximum configuration, the batteries can last you for around eight hundred kilometres. Combined with the solar roof, that means you would not need to charge it manually for weeks to months on end.'

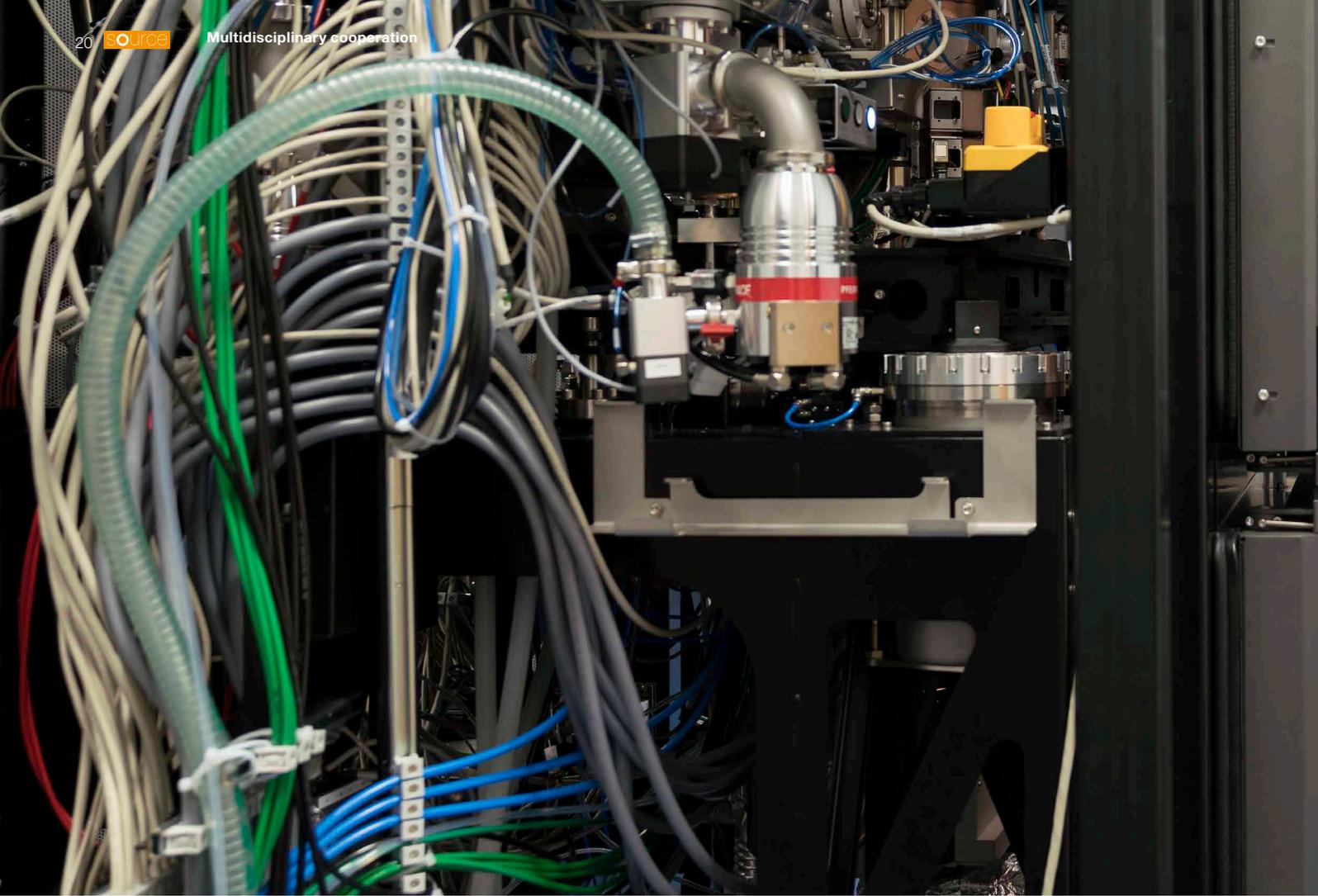
## When will the prototype be finished?

'In 2019. We are fully reengineering Stella: body, dashboard, wire harness, interior, tyres, you name it. Some challenges we are facing are how to fold the solar panels on the roof and developing the corresponding new electronics. On top of that, we are dealing with classic automotive themes such as safety and comfort. And of course, the whole thing has to look cool. Every decision we make has an impact on the energy balance I mentioned, which makes all of these things very complex.'

## How is Sioux helping you?

'By investing money, by buying one of our cars, and by handling the entire software development process. They are experienced in the automotive industry, have the right certifications, and create designs with a focus on robustness and manufacturability. On top of that, they like to share their expertise. All of this makes for a really comfortable working process. And above all, Sioux believes in us, unlike the major car brands. Together, we will prove them wrong.' 





The collaboration between Sioux and the global market leader in electron microscopy, Thermo Fisher Scientific, is very special, even within Brainport. Over the years, the two companies' developmental capacities have been increasingly pooled together as part of a business model focused on joint enterprise. **Brit Meier**, senior director of engineering with Thermo Fisher Scientific: 'We serve as extensions of one another.'

Brit Meier of Thermo Fisher Scientific:

## 'SIOUX HAS A REAL SENSE OF OWNERSHIP'

In 2017, the Nobel Prize for chemistry was awarded to three scientists for developing cryo-electron microscopy that enables biomolecules to be viewed in 3D. At the award ceremony, the Nobel committee mentioned - for the first time ever - that a word of gratitude should also be devoted to the developers of the so-called 'nuts and bolts'.

'That's us', says Brit Meier. 'And the praise is well deserved. We have pushed the boundaries of physics and made possible

what at first seemed to be impossible. With our electron microscopes, it is now possible to view at the molecular level. That is an achievement worth commemorating. The Nobel Prize ceremony was a good opportunity to do that properly, in a festive setting. I have never felt prouder than right then in that moment when I got to thank all of the people who have been working on this for decades, including Sioux's people. I have long since stopped distinguishing between their employees and ours.'



◀ Brit Meier and Ron Willems (left to right)

### Shared resources

When the world does not need microscopes that are able to magnify to a greater extent than is currently possible, the focus shifts to what else you can do with microscopes. As such, Thermo Fischer is focusing more and more on applications for its customers in the semicon, life sciences, and materials industries, pertaining to things such as measuring, workflows, and detection methods.

Meier: ‘That is why developing and implementing software and mathware – the things that Sioux earned its stripes on – have become more important. At the same time, developing new hardware still takes up half of our innovation efforts. As such, it was great that Sioux grew due to the addition of mechatronics specialist Sioux CCM three years ago. That has enabled us to now hand the full development of a new module for visualising the scientific elements over to them and focus our own efforts on the integration with our systems, which is hugely important in these times where good, technically skilled people are growing more and more scarce. By sharing these resources with Sioux, we are able to strengthen both companies. In this, too, we serve as extensions of one another. Sioux has a real sense of ownership and we are able to work together on all levels. That’s what we need to be able to retain our market position; we too have to fight for that. Our vice president of operations Hein Gijbers once said that without Sioux, we would not be able to do what we do. I would like to add to that, that we would not even want to do it without Sioux, neither now, nor in the future.’ ◉

‘We have massive shared ambitions’

### Risk Reward

The relationship between Thermo Fisher Scientific and Sioux started in 2000 when a single employee was posted on secondment. Nowadays, around 30 of them are working on site in Eindhoven (Acht), 10 at the Sioux Development Centre, and another 30 at the Sioux back offices. As early on as 2002, the two companies came to an extraordinary agreement. Sioux developed software that was aimed at increasing the production speed for electron microscopes. The risk reward model took on a new dimension when Phenom was developed. The idea of a tabletop electron microscope had been kicking around at Thermo Fisher Scientific for a while now, but did not fit in with their product

range. As such, the development and construction of such a microscope was taken on in partnership with Sioux and NTS-Group, and has since successfully been brought to market.

### Ownership

‘Thermo Fisher has managed to continually drive us one step further in our development’, says Ron Willems, responsible for Sioux’s software and electronics branch. ‘They obviously keep their own technological core secure, but we work very closely to it nowadays. We do this within all sorts of projects and possible suitable economic models, based on licences, hours, fixed price, etc. Sometimes, it’s hard to see where one company ends and the other begins. There is no clear ‘us’ and ‘them’. On the other hand, we do not take our partnership for granted. We have massive shared ambitions, both in terms of technology and market success. In that kind of situation, it is important to stay on each other’s toes. That is why things can get pretty intense in our trimonthly business reviews.’

Machine learning

# 'THINGS ARE DEVELOPING AT LIGHTNING SPEED'

'Machine learning is a buzzword', says **Mark van den Broek**, senior design engineer with Sioux LIME, Sioux's mathematical division. 'All of this attention being paid to artificial intelligence can sometimes create unrealistic expectations. Even the cleverest of algorithms can only manage a small fraction of the intelligence level of a human being. Even so, machine learning is becoming increasingly important in optimising systems and business processes.'

## What is machine learning?

'Algorithms that improve themselves when they are fed data. There are three kinds: supervised, unsupervised, and reinforcement learning. The first learns a certain feature based on examples of input and output, the second recognises structures, and the third learns based on rewards.'

## How can you utilise it?

'You can utilise it to automate, speed up, and improve all sorts of tasks and sub tasks in business and manufacturing processes. Specific algorithms are often trained based on data such as images, text, or other data. These days, algorithms are often just as good as – if not better than – people at analysing image data.'

## Is it the next big thing?

'It is one of the many tools we use. However, things are developing at lightning speed, such as in the field of deep learning using neural networks. Moreover, our customers, such as those in the high-tech, automotive, and agri-food industries, are utilising big data more

and more for improving their services, manufacturing, and products.'

## Is that reflected in terms of practical applications?

'We utilise machine learning for predictive maintenance and quality monitoring on machines. In the past, we have also used it for the automated recognition of various growth stages in plant seeds, analysing hand-drawn maps for the Dutch Cadastre, and improving individual learning progress in tablet-based education. And these are just a few of the many examples...'

## What are its limitations?

'Machine learning still requires clearly demarcated, unchanging processes and a large volume of relevant data. But provided that those prerequisites are met, it is a very powerful tool, partly due to its scalability. That is why Sioux is investing amply in expertise on machine learning. One of the ways in which we do this is by sponsoring TU/e's robot football team, a real playground for anyone who is interested in self-learning machines.' **Q**





**Bob Mattheij**, managing director of Sioux LIME, is retiring this year. He is handing his position over to his co-worker Janne Brok with pride. 'There is no other mathematical division that equals us in Europe, both in terms of our knowledge level as well as in terms of the solutions we provide to our customers, using mathware. We are growing rapidly and people are lining up to come work with us. As such, I feel fully confident leaving the company at this point.'

Bob Mattheij:

# 'MATHWARE HAS A GREAT FUTURE AHEAD OF IT'

'My interest in mathematical applications for the industry began back while I was studying, and has always been the common thread in my career as a scientist and later on as an entrepreneur', says Mattheij. 'Over the years, I saw our field grow into a specialised profession. Of course, that development has everything to do with the fact that production processes are becoming more and more complex. Clever mathematical modelling and the use of state-of-the-art tools, in short, mathware, can really make the difference in that process. Math is the key technology for faster, better, and more accurate production.'

## Acceleration

Mattheij says that the Sioux mathematical division is a typical product of Brainport, where high-tech companies and knowledge institutes

work together very closely. The company started out as a mathematical lab that was able to successfully valorise the know-how of TU/e in its first years. When they allied with Sioux in 2011, things started to accelerate.

## Unique

'We were embedded in a professional organisation. This enabled us to focus on substance. We had our own customers back in the day, and we still do. But over the years, we started joining projects together with other Sioux departments. This combination of the development of mathware, software and hardware makes us unique. That is why Sioux is able to do what no other supplier of the high-tech industry can do in terms of optimising and realising processes and products.'

## Multidisciplinary

If Mattheij had to pick a single descriptor for his feelings after the past eight years, it would be pride. 'We have grown to 45 employees currently, which will grow further to 100 in five years' time. And even so, we have more job applicants than we know what to do with. Together, we are able to cover nearly every mathematical area. We invest 10% of our time in research, enabling us to continually strengthen our knowledge position. 65 percent of our people have doctoral degrees. Our team is multidisciplinary and international. We work on relevant technology and current topics. The working atmosphere is wonderful and open. On top of that, our pioneering spirit has never left us. As such, mathware has a great future ahead of it within the high-tech industry.' ■

Sioux has all the expertise to contribute to the success of high-tech products and production systems. The strength of Sioux lies in the unique combination of high-quality competences in the field of software, mechanics, optics, physics, mechatronics, electronics, mathematics and IoT solutions. With over 600 engineers Sioux operates as the development and production department of leading high-tech companies. Sioux takes responsibility for turnkey projects from the conceptual phase up to and including series production. Together with its customer, Sioux wants to add value and build innovative solutions that can contribute to a society that is smarter, safer, healthier, more enjoyable and more sustainable. **For more information: [www.siuox.eu](http://www.siuox.eu)**



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