



# source

## TRUST

FORMS THE FOUNDATION OF  
ANY SUSTAINABLE RELATIONSHIP

KULICKE & SOFFA  
AND SIOUX **DEVELOP**  
NEW WAFER FEEDER

CARLO VAN DE WEIJER:  
'REAL **PROGRESS** IS MADE  
ON THE SOFTWARE SIDE'

PETERSIME HAS A SPECIAL  
**CHALLENGE** FOR THE  
SOFTWARE DEVELOPERS  
AT SIOUX

# trust

Trust is a great asset, but it's hard to gain and easy to lose. Great ideas and words are worthless without actions to underline them. That is why saying what you do and doing what you say is something Sioux continuously puts into practice - both in our organisation and in collaboration with customers. We do this in a variety of ways, for example by focusing on values such as integrity, transparency, sharing and personal growth. But above all, we just want to be the best multidisciplinary technology partner for high-tech OEMs. We cannot think of a more solid basis for trust.

This magazine is interlaced with trust: our trust and the trust we receive from our customers. Take the story about Liteq. This start-up chose a close cooperation with Sioux in developing and assembling its advanced packaging machine. Another great example is Wassenburg, which entrusted the development of the embedded platform for its newest generation of medical washers and dryers to us. Or read more on how ACEA relies on our mathematical knowledge and independence in determining CO2 emissions of lorries in Europe.

These stories make me proud. They illustrate the importance of the fundamental choice we made in setting up our business and that still determines our daily business. At Sioux, it is not about me, it is about us. We invest in long-term relationships and a better future for all. We will all benefit from it: our company, our people, our customers and our region.

Enjoy reading!

**Hans Duisters**  
CEO Sioux Group



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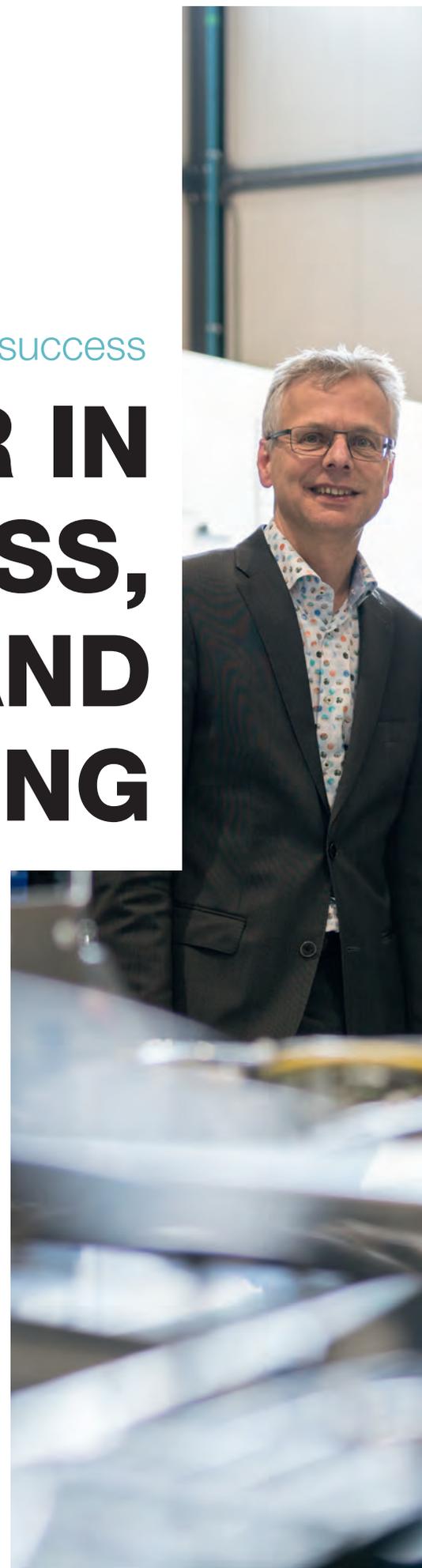


Shared success

# PARTNER IN BUSINESS, DEVELOPING AND MANUFACTURING

With the launch of a mechatronics assembly company in 2016, Sioux took a next step as a high-quality development and production partner for high-tech OEMs. In the meantime, the factory is running at top gear. Liteq, a start-up in advanced packaging machines, is a customer from the very beginning. 'Together, we perform at our best, as investors, technology developers and now as production partners,' says **Sjaak Janssen**, managing director of Sioux Assembly. 'There is only one way to handle such a close relationship: you have to trust each other through and through.'

Gerrit van der Beek, Sjaak Janssen and Hans Michels (left to right) >





‘You have to trust each other’

Sioux never made a secret of it. It wants to be first in line: relieve OEMs as first-line supplier in the market of high complexity, high mix and low volume. After all, this is how Sioux can optimally support its customers. In 2014, that ambition led to the addition of the high-quality development and production skills of mechatronics company CCM, now Sioux CCM. This made Sioux into an even more powerful multi-disciplinary enterprise in software, math-ware, electronics and mechatronics.

### Customer needs

‘During the takeover discussions, we already talked about the benefits of a mechatronics assembly branch within our group,’ says Hans Michels, managing director of Sioux CCM. ‘This was prompted by the needs of our customers. They want the best products and speed, all at a good price. From this point of view, it is often beneficial to put the entire chain in the hands of one party, from concept development to delivery of end products. By setting up a Sioux company dedicated to the production of prototypes, one-off products and series production, we can now offer that added value.’

### Learning curve and synergy

Janssen looks back with satisfaction on last year. His assembly company opened its doors in August of 2016. It has 1,500 m<sup>2</sup> of production floor, of which 350 m<sup>2</sup> clean-room, and 800 m<sup>2</sup> of offices. It had a flying start. ‘We focus on integrating, assembling, testing and delivering modules, systems and machines. If you want to do a good job, you have to perform well on many fronts. It takes time and energy to optimise all the processes, for example in the field of manufacturing, procurement and logistics. Moreover, what we do is a complex, concerted action with the customers. ●



‘Development and production are rarely linear processes in high-tech’



Sioux has a high-quality cleanroom of 350 m<sup>2</sup> 

Development and production are rarely linear processes in high-tech. Continuous tuning is vital; lines should be short and the processes well-tuned.’

‘We want to perfect our customers’ output,’ Michels adds. ‘This can only be done if there is a shared learning curve. But it also calls for synergy within Sioux. That is why we involve our assembly people in the development of new products from the earliest design phase. This leads to optimal choices in the areas of design for excellence, cost, assembly and quality. We also apply the interaction between different disciplines while performing intermediate and end tests, and ensuring a high yield and system reliability.’

### Bright future

Meanwhile, Sioux’s assembly plant is “filling up”, as Janssen describes it. The list of clients includes MuTracx and Nexperia. A special client from the very beginning is Liteq, a start-up in advanced packaging machines in which Sioux took a share at an early phase. ‘Success is our shared goal, as investment development partners and production partners.’ Says Gerrit van der Beek, who has been in charge of Liteq since June 2015.

Van der Beek predicts a bright future for Liteq. ICs are becoming smaller and thinner, while the number of contact points increases. This makes it increasingly difficult to install chips on PCBs using conventional wire bonding. Liteq’s Flex Pack

100 - a back end stepper for advanced packaging - has been developed and built around a new fan out wafer packaging technique. And that will give customers the edge.

### Smart software

Van der Beek: ‘Our market is growing and we offer what others cannot: a combination of speed, high accuracy, robustness, flexibility and low cost. We achieved this through an agile way of working. Sioux has made a valuable contribution. Now we have an innovative machine - both in mechatronics, optics and software intelligence - which truly gives us the edge. It allows us to offer a high throughput, thanks to an innovative optical process.



## 'We are working on a common goal'

sion was carefully weighed.

'If you want a business like this to take off, you need to focus on what you're good at. We focus on two things: our technological core and our customers. We have out-sourced matters such as assembly, installation and service delivery. When we entered the production phase, a number of things came together. Sioux wanted to set up an assembly company, I was looking for one. It was obvious that we needed to combine our efforts in this field, first of all because they are a strategic development partner of us. Sioux knows us and our machine through and through and really has a head start in that respect. Furthermore, there was a great mutual trust. Next to this, Sioux amply meets our quality requirements with its cleanroom facilities and production systems. The opportunity to use Sioux's premises ensures strong interaction and direct communication.'

### Mutual commitment

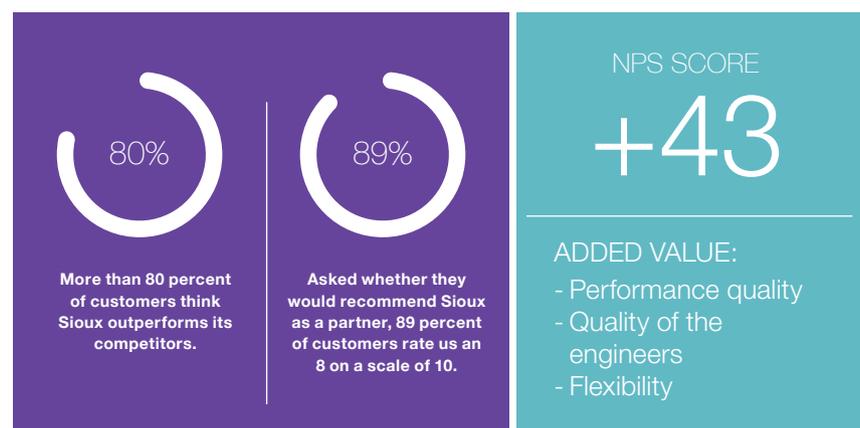
After years of intensive collaboration with Liteq, Janssen does not want to speak of a customer-supplier relationship. The bond is now so close, it has become difficult to differentiate between the contractor and the customer. 'In a project like this, everybody is asked to push their limits, in terms of technical skills and the development and production processes, but also in the way you shape the relationship. What we do requires mutual commitment, transparency and the will to make the most of it. We share the same interest. We are working on a common goal. There is no us and them. We are one team. Liteq's success is Sioux's success. We are proud of what we have achieved together.' ◻

However, the majority of the engineering effort is in the smart software. Sioux built the complete software stack, delivering top performance in developing embedded systems in particular. The fact of the matter is, there are only a few parties that can provide the level of performance necessary to have such a machine do what it has to do. And there are even fewer companies who, if they believe in something, are also willing to share the risk by taking a stake in the company.'

### Head Start

For Van der Beek, the choice for Sioux as a production partner was logical as well. This does not mean, however, that the matter was concluded hastily. The deci-

**The cooperation between Sioux and Liteq is based on mutual trust, as financial partners, technology developers and manufacturers. Trust is something Sioux invests in continuously, regardless of the customer or the assignment. It is the foundation of every lasting relationship. In this edition of Source, several customers emphasise this quality of Sioux. The results of Sioux's annual customer survey underline their experiences:**



Petersime

# ‘ASK SIOUX, AND YOU GET THE BEST PEOPLE’

Petersime is world leader in the development and production of industrial incubators and total solutions for hatcheries. They asked Sioux to develop the HMI for a new generation incubator. It turned out to be a special challenge for the software developers at Sioux. The project had to be completed within a year. It also required a great deal of empathising with Petersime’s customers.

What does an embryo need, to develop optimally into a chick? This question is central to the biological research carried out by Petersime and the KU Leuven (University of Leuven) since the seventies of the last century. It is not an easy question at all. You don’t hatch an egg just like that. A chicken - the expert after all - does this intuitively, for example by tilting her eggs and regulating humidity and temperature. Petersime imitates these aspects in its incubators.

## Happy chicks

Nicolas Christiaens, R&D manager at Petersime: ‘Our goals are twofold. Firstly, it is all about maximising yield. A profitable hatchery in the Netherlands or Belgium produces a minimum of one million chicks per week. Most do two to six million. The investments are huge and the companies want efficiency: as many chicks as possible based on the number of fertilized eggs. Some of our customers achieve 99 percent. In addition, the quality must be as good as possible. This concerns

the development of a healthy chick, but also animal welfare. We want these chicks to be as comfortable as they can be, for example by having the eggs hatch at the same time as much as possible to ensure the chicks do not stay in the machine for too long.’

‘Compromising on quality is not an option’

## Fool proof

Petersime thanks its success to a leading edge in knowledge and technology. ‘We are seen as the best, but certainly not as the cheapest. We therefore distinguish ourselves by delivering quality, we do not compromise on quality and we continuously invest in innovation,’ says Christiaens. ‘And we tune in on the market devel-

opments to the maximum. Many of our customers have decades of experience. They have hatchery experts who influence the process to get the maximum yield and know exactly what they are doing. However, wherever there are large sums of money to be made, you will see an increasing number of businesses entering with less knowledge. This translates into new requirements for incubators. They must have such flexibility, that the hatchery experts can direct them anyway they like. But we also want fool proof systems that deliver fully automated results.’

## Functionality and complexity

In 2016, Petersime introduced its latest generation of incubators. The technological core is formed by an embryo-response process that monitors the eggs real-time on various parameters and provides a control algorithm for optimal conditions during the pre-hatching and hatching process. Sioux developed the HMI of the machines. The requirements were clear. It had to be user-friendly in operating and visual feedback. At the same time, it should not compromise on functionality and allow for the ability to dive deep into the complexity of the system.

Christiaens: ‘It also had to be finished within one year, otherwise we would miss market opportunities. This is sometimes the case in development programmes. Those are the times when you need a partner that you can count on. I called Sioux, because if you bring in Sioux, you get the best people.’ ●

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'If you talk about  
quality, you talk  
about animal welfare'





Nicolas Christiaens and Filip Eykens at Petersime's incubator (left to right) ^

'You must be able to empathise with the end user'

### End Users

Filip Eykens, Managing Director of Sioux Embedded Systems in Belgium: 'These types of projects are about collaboration and trust. Incubators often contain hundreds of thousands of eggs. You're playing with a huge capital. The system must be extremely robust. Working on such an HMI

also affects Petersime's technological core. You can come to all kinds of agreements about the HMI development, but you don't just ask any company. Petersime wants a partner that can take part in their team, that involves colleagues in processes and decisions, that takes care of business after consulting with all parties involved. A partner that transfers knowledge allowing the team to build on it, such as further development and maintenance. Furthermore - and this is even tougher - they need a party that can empathise with the end users. And that's one of our key qualities as well.'

### New market opportunities

Meanwhile, the collaboration between Petersime and Sioux, with the recent

introduction of the new incubator, entered a new phase. Hatcheries show an increasing demand for services in the field of generating, exchanging and integrating data, for example in the context of traceability of products. Within the chain, this is generally well arranged according to Christiaens. 'But in our niche, what happens in our machines is still a grey area. Customers want us to offer solutions here. That means new market opportunities. Here we can use Sioux's knowledge and experience as well. So that's what we do, by jointly visiting clients and initiating new developments to ensure our success in the future.' ●

Bright Move and Sioux

# BUILDING THE HIGH-TECH BASE OF THE FUTURE

The TU/e Innovation Lab is the maternity chamber of technostart-ups and spin-offs of the Eindhoven University of Technology. 'We want to bring as many start-ups as possible to the market,' says **Spanbroek**, director of Bright Move.

'We do this by unlocking knowledge. But what makes us unique in the Netherlands is that we can financially support them as an early phase fund. Bright Move focuses on the phases from *proof of principle* to *proof of concept*, and then to the *pre-seed phase*. We can finance a company with a subordinated

loan, up to 350,000 euros. Supplemented with funds from our partner Rabobank, this can amount to 400,000 euros.'

## Clients of the future

De Geus, director of new business development at Sioux, participates in the investment committee of Bright Move. He knows the risks of financing high-tech start-ups like no other. 'Sioux combines a passion for innovative technology with entrepreneurship and regional involvement. We have an intrinsic drive to create promising high-tech OEMs. Moreover, they are our customers of the future. As an autonomous investor, we participate in new companies such as Phenom-World, Fleetlogic, Liteq, MuTracx and SoLayTec. In addition, we support Bright Move, by sharing knowledge and sometimes as a financial partner. In this manner, we keep

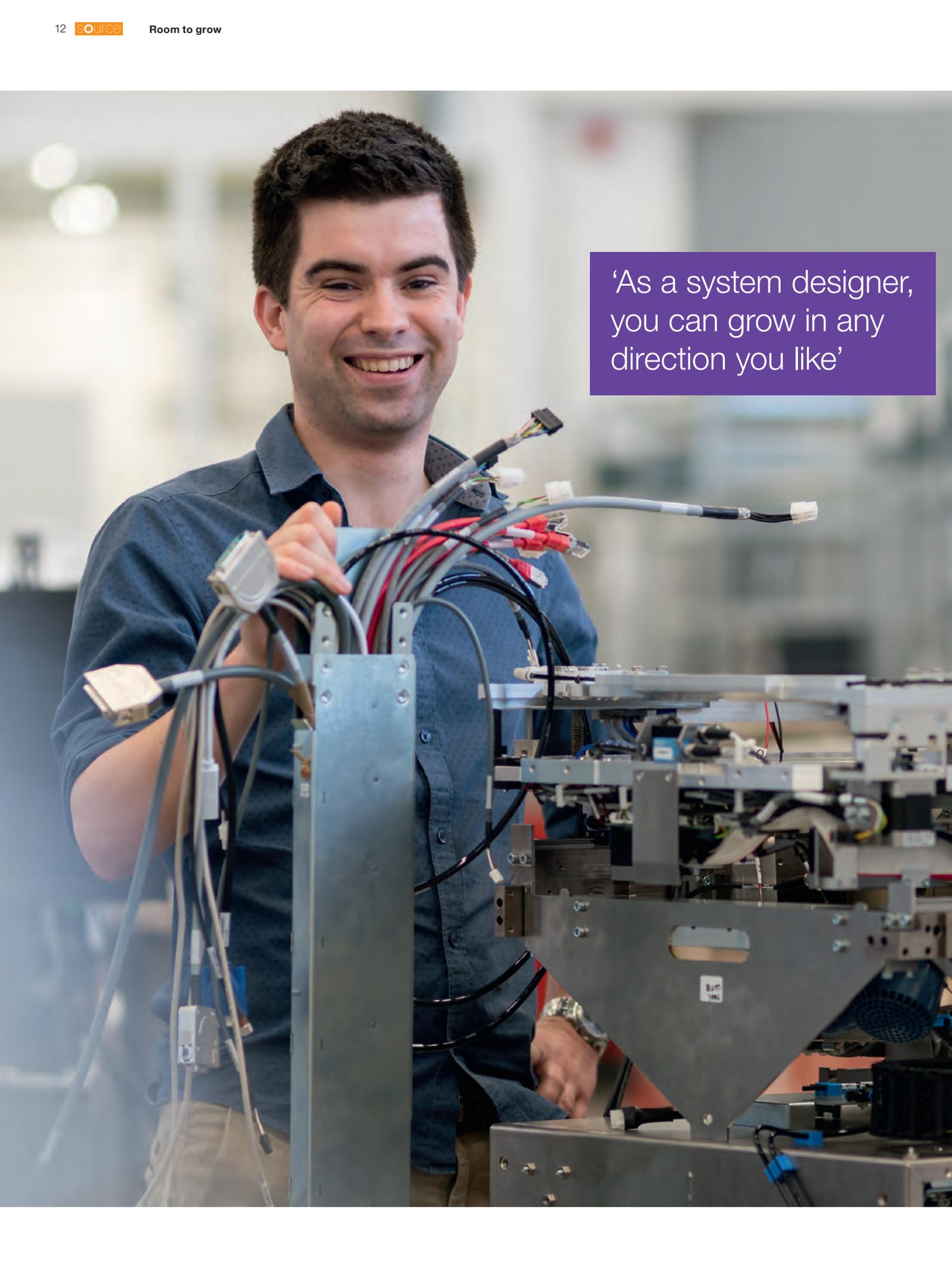
track of what emerging technologies have in store and bring companies to a next phase, of which we may be part as well.'

## Success on the horizon

To reduce the investment risk, Bright Move applies strict selection at the gate. Before launching a start-up, the proposition is reviewed by a number of experts. The primary focus is on the technical validation. Next up, market opportunities will be scrutinised.

'Currently, our capital asset amounts to about six and a half million euros in around thirty companies,' Spanbroek says. Despite our thorough work, some of them will not survive. That doesn't make our activities less valuable. If we are successful, it can be huge. Look at the prospects of EFFECTPhotonics and SMARTPhotonics that build on the technological advancement of TU/e in photonics. It is a market with enormous potential. There is support for investing hundreds of millions in this market, and rightly so. Another promising example is Preceyes, which works on an eye surgery robot. Those successes on the horizon are wonderful. At the same time, our investment domain is one of *family, fools, friends and grants*. Sometimes, you just have to dare to write off an investment. That is not always easy, as a public organisation and certainly not as a private party. From that point of view also, I really respect Sioux.' 

Investing in early stage start-ups is risky. It does not happen very often in the Netherlands. Gerard Spanbroek of Bright Move and Arnoud de Geus of Sioux think we are missing out on good opportunities. The high-tech OEMs of the future deserve a maximum chance of success. Their potential economic added value is huge.

A man with dark hair, wearing a blue button-down shirt, is smiling and looking towards the camera. He is standing in front of a large, complex piece of electronic equipment, possibly a server or a specialized computer system. The equipment is made of metal and has many cables connected to it. The man is holding one of the cables. The background is blurred, showing what appears to be a laboratory or office setting with some lights.

‘As a system designer,  
you can grow in any  
direction you like’



## Thomas Lembrechts

# ‘THIS IS THE PLACE TO BE’

‘The pressure can build up quite high here,’ says **Thomas Lembrechts**, junior system designer mechatronics at Sioux CCM. ‘The work is complex, at the same time that makes it challenging. You have to work hard to realise the ambitious projects, especially because you get a lot of responsibility here. That is why I learn a lot.’

When he was studying Mechanical Engineering at TU Delft, Lembrechts was a member of the excursions committee. ‘Go visit Sioux CCM, that’s a good company,’ his mother said to him. She knew what she was talking about. As a biologist, she developed a test facility there for the fertilisation of frogs in space. ‘It turned out to be good advice,’ says Lembrechts. ‘I was grabbed by this company immediately. Sioux develops a variety of impressive high-tech machines, from concept to prototype to series production. As a system designer, you can grow in any direction you like. For me, this really is the place to be.’

Lembrechts, who has now been employed at Sioux for one and a half years, worked on the MuTracx PCB printer, tested a wafer feeder for Kulicke & Soffa and functioned as a troubleshooter in building Liteq’s advanced packaging machine. ‘So far, I’ve been employed as a system integrator and tester. That’s good training, especially if you have to manage and make sure everything will turn out all right. Now it’s time to advance as a mechatronics system designer. I’m looking forward to that a lot. Creating concepts for state-of-the-art high-tech systems and machines based on my knowledge of electronics, mechanics and software is the most beautiful thing for me.’ ◉





Jos van den Bergh, Henny Knorth and Koen Smits (left to right) [^](#)

# A NEW GENERATION OF CLEANING AND DISINFECTION MACHINES FOR ENDOSCOPES

In the development of the next generation of endoscope cleaning and disinfecting machines, Wassenburg Medical set itself a clear goal. The systems must set the future standard in quality and functionality, and performance has to improve.

Project leader **Henny Knorth**: 'With these kinds of major projects, it is crucial for us to work with a fully-fledged development partner who supports you through thick and thin. And we found that at Sioux.'

In the 1980s, endoscopes were still manually cleaned in most Dutch hospitals. That led to a number of incidents that shook the medical world. For Gerrit Wassenburg it was the reason to develop a cleaning and disinfecting machine for flexible endoscopes. What started out in his barn, quickly evolved into a successful international company through a leading edge in technology and smart partnerships.

## **Disinfection**

An endoscope is a diagnostic and therapeutic tool. It is an inspection device, but it can also be used to take biopsies and do treatments. 'They have a light source,

## ‘We want to conquer the world market’

‘The joint venture between Wassenburg Medical and Japanese multinational Hoya Group at the end of 2013 offers a new perspective for the future,’ according to Jos van den Bergh, managing director at Wassenburg Medical BV. ‘We want to enter the world market. That means we are in need of a new approach. Our history is that of a classic machine builder, but one that always stood out through innovation power. Now we continue on that path: we want to be a total solution provider. Our domain will no longer be limited to machines that clean and dry endoscopic equipment, but everything that affects ensuring a safe endoscope for a next treatment: peripherals, financial and technical services, data and workflow management, as well as consumables in the processing cycle of our customer. Thus, we create a knowledge and advisory function for our customers and a more stable business model aimed at conquering a place in the global top 3.’

in terms of total cost of ownership. In addition, we wanted to reduce investment costs for our customers.’

### ESP base platform

In 2017, Wassenburg will introduce its new generation of cleaning and disinfecting machines. Sioux is an important technology partner in the development process. According to Koen Smits, account manager at Sioux Embedded Systems, that collaboration is evident. ‘The life science & health market is one of our focus areas and we are ISO 9001 and 13485 certified. Next to this, we are very good at high end electronics and software design. But more importantly, Wassenburg wanted fundamentally different machines: to make a leap in quality, intelligence and functionality while pushing the cost price. For this reason, expensive PLC technology had to be replaced by an embedded platform. We are not only good at it, we also happen to have a wonderful product in store: our Embedded Systems Platform, or ESP. It is a basic platform with microelectronics and control software, a generic solution incorporating a number of standard features for high-tech equipment. It has countless benefits. You can shorten development times without compromising on flexibility and reduce cost at the same time.’

### Simulation

‘That’s why creating the embedded design went like clockwork,’ says Knorth. ‘We could adjust the base platform as needed by expanding it with specific functionality. At the same time we intro-

duced another major change. The data and information on the usage history and the cleaning and disinfection process of endoscopes are integrated into the machines. Again, Sioux’s added value was essential, for example as developer of the application software and the user interface. Meanwhile, we are in the final stage of the project, that of the final tests. Sioux has convinced us to do this partly through simulations because it requires less rework. Whether it will give us a financial advantage in the end is not yet clear, but at least it will save time. Simulations will also offer another important advantage. We build medical equipment to which strict requirements apply. The validation process is challenging. By working with a simulation model, you can easily divide the process into pieces. All in all, these are the last battles of a project that is very important for our future.’

### Total cost of ownership

Until 2006 there were no harmonised standards that the cleaning and disinfection machines for flexible endoscopes had to meet. When they were established, the market changed in which Wassenburg set the tone in terms of standards, innovation and quality. The competition improved their machines and quickly moved closer.

Knorth: ‘Customers felt it was a requirement that the machines were certified according to the applicable new standard. Purchase price and cost of use became an increasingly important factor in purchasing decisions. For us, that meant two things. Heading the list by delivering quality remains paramount. We stand out



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VECOS High-tech locker system

# ‘A NEW ERA CALLS FOR NEW TECHNOLOGY’



With the recent introduction of Releezme, VECOS set a new standard in smart locker systems. Sioux is involved in the development of cloud-based solutions, embedded software and electronics.

**Dennis Verheijen**, software designer at Sioux: ‘A new era calls for new functionalities, and therefore new technology.’

## **What was the problem?**

‘Hospitals, schools, offices ... you’ll find lockers everywhere, and in many places people have the same questions. Which ones are in use, which are available near my workplace and how do you ensure that the right lockers are accessible to the right people? Many issues to address. Sometimes old systems simply no longer comply for a variety of reasons.’

## **How does it affect the domain Sioux operates in?**

‘If you want to tackle all those issues, you need to introduce an entirely new intelligent system that addresses all the issues at once. Meaning it’s about optimising capacity, efficiency in use and management, safety, user friendliness, etcetera. It calls for a combination of various high-tech solutions.’

## **How does Releezme work?**

‘All the lockers in a building are connected through the Cloud. Users can request, retrieve, open, and release lockers by means of an app or a card at a local terminal. Administrators

can provide individuals or groups with user rights for specific lockers, for example through automatic linking with an HRM system. This creates a dynamic, transparent and flexible system.’

## **What was Sioux’s contribution to the development?**

‘As a strategic partner, we assisted the VECOS R&D team, among other things, in designing the cloud-based system, the server-side infrastructure to enable communication with the app, the electronics, the embedded software and the packaging. Now we have a dedicated team that is constantly working on system development and maintenance for global customers.’

## **What will this bring VECOS and its customers?**

‘VECOS remains trend-setting as market leader. Their customers can have dynamic locker usage in a controlled manner, and thus meet their high storage requirements with less lockers while saving time.’ **●**



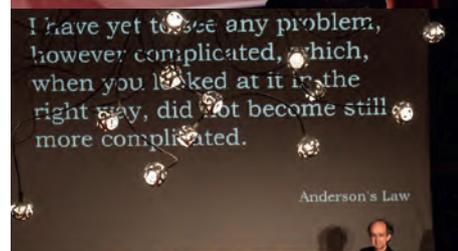
Hot-or-Not seminar

# FUTURE OF SOFTWARE ENGINEERING

'It is not the strongest of species that survives, nor the most intelligent, but the one most responsive to change.' With this expression, Charles Darwin summed up the core of his theory of evolution. It is also directly applicable to the world of Sioux. The complexity of high-tech systems increases significantly while their time to market becomes increasingly critical. As a result, Sioux's software engineers must continuously adapt to a fast-changing knowledge domain and work field.

According to Sioux, the development and sharing of knowledge is an essential ingredient for success. We do this in our Hot-or-Not meetings, where technological developments are being explored by our employees, relations and world-renowned experts. For example, we dedicated a Hot-or-Not seminar to the future of software engineering. Next to Kevlin Henney and Simon Brown, authorities in this field, Sioux software architect Robert Hendriksen addressed the central question: 'What is required to survive the coming decades?'

Hendriksen: 'Software is a relatively new technical area, but already it often represents half of the efforts and the budget in the development of high-tech products. What will happen in the future is very exciting. Increasingly, software determines the innovation speed and quality – the productivity and functionality – of systems. This means that new knowledge and skills are necessary to remain relevant in the future. For example, at Sioux, we invest in our skills in software development based on a model-driven environment, where *machine learning* techniques are used to generate code.' 



The European Union has been working to establish a policy for reducing CO2 emissions of heavy duty vehicles for a decade. The political and official part of the regulation and enforcement game is just one side of the story. The input of manufacturers, united in the European Automobile Manufacturers Association (ACEA), is the indispensable other side. For instance, they provide the necessary figures on the CO2 emissions of their lorries. That information is generated using a simulation program and certified input data. ACEA turned to the mathematicians at Sioux to test whether the average driving cycles used by the tool, account for the actual use on European roads. As it turned out, this was not the case. Therefore, Sioux was asked to optimise the driving cycles to make them more realistic

# ‘THE STAKES

**Sioux provides scientific basis for monitoring  
CO2 emissions of European lorries**



# ARE HIGH'



Robbert van Herpen, Janne Brok and Ralf Krukenberg in the European district in Brussels (left to right) ^



ACEA has two tasks: organise the collaboration between members in creating technological standards, and contributing to relevant government policies. Ralf Krukenberg, Head of Powertrain CAE Daimler runs the Taskforce CO2 of the group of European automotive OEMs.

### Simulation tool

'After a decade of preparation, EU legislation on reduction of CO2 emission of heavy vehicles will come into force in 2019,' says Krukenberg. 'The automotive industry has committed itself to this matter right at the start of the policy making process. It is crucial to work with reliable CO2 emission data and that is a

'As mathematicians, we love a good challenge'

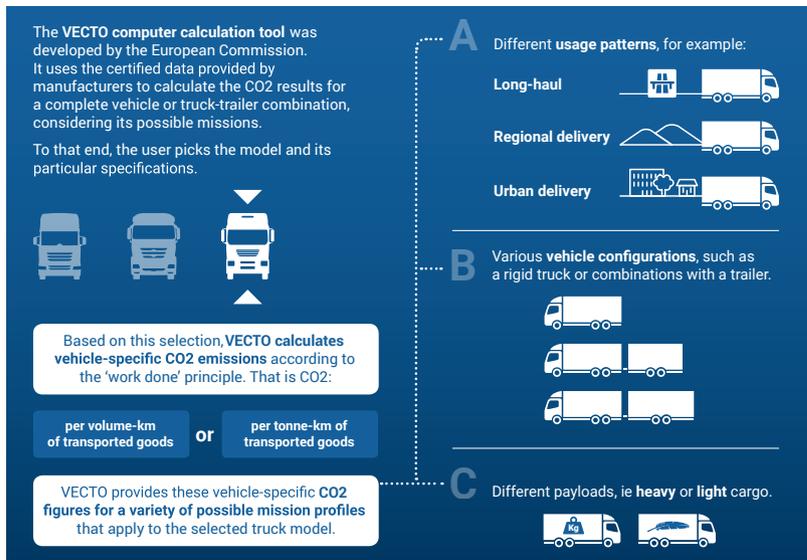
complex matter. There are not enough test rigs for all heavy lorry configurations. Furthermore, the number of different heavy vehicle configurations is enormous so the test effort on rigs would be huge. Moreover, CO2 emissions are directly related to fuel consumption, and thus to the routes driven throughout Europe. That's why we work with a simulation tool – called VECTO – based on routes that represent an average transport ride combined with specific heavy vehicle categories.'

### Complex mix

VECTO ride data input consists of standardised cycles with specific speed and height profiles for long-distance, regional and urban use. Over time, however, the question arises whether these driving cycles match reality. On the recommendation of DAF, ACEA called in Sioux's

mathematical expertise to validate the reference routes.

Janne Brok, commercial manager at Sioux LIME, the business unit specialised in mathematical engineering: 'To realise this, we had to develop multiple mathematical methods. For long-distance traffic, valuable data was available - metrics of rides of different lorry types across Europe. We did not have this kind of information for freight traffic in regions and cities, so we had to use a complex mix of multiple data sources. Below the line, however, the conclusion was unambiguous: we have a problem. None of the original driving cycles proved to be representative enough for real average European driving. That is why we received the assignment to develop reference routes that match the conditions that European lorries actually experience. This required a combination of our knowledge and experience. Based on an analysis of the energy management of transport vehicles, we have derived a set of KPIs that are relevant to characterising CO2 emissions. These provide a mathematical method to link the speed and slope profile of a route to energy consumption. Then, using statistical analysis and optimisation techniques, new driving cycles could be determined which truthfully represent the average conditions of different types of European transport.'



### Huge interests

In the meantime, the new driving cycles have been created, validated by TU Graz and the European Union, and put into use. According to Brok, this is now a scientific basis for measuring CO2 emissions of lorries. Krukenberg endorses its significance.

'The interests are huge. We are talking about a reduction of 80% of CO2 by 2050. The environmental impact is evident, while investments for the industry are enormous. Reliable monitoring is a good thing for this. That's what we offer with VECTO. It is an open system and the driving cycles have been developed in a responsible manner by an objective and independent party.'

'In turn, as mathematicians, we love a good challenge', says Robbert van Herpen, project manager at Sioux LIME. 'In this respect, we definitely felt at home in this project. We often engage in solutions for high-tech machine builders. However, with our competencies we can contribute to addressing a wide range of complex issues. So it was wonderful to prove our value for an organisation such as ACEA and to contribute to a solid foundation for further European cooperation in reducing CO2 emissions.' ●

Innovation in the automotive market

# 'REAL PROGRESS IS IN THE SOFTWARE'

'Disruptive.' That's how **Carlo van de Weijer**, director of Smart Mobility at the Eindhoven University of Technology, characterises developments in the automotive market. 'The digitalisation of the car provides traditional OEMs with enormous challenges. This creates great opportunities for Brainport.'

## What's going on in the automotive industry?

'There is a digital revolution going on. Vehicles remain a necessity, mass needs to be moved. But the change is going fast. Look at the emergence of service providers like Uber, new

dealer models, self-propelled cars and connected vehicles. Smart mobility and smart cars are the future.'

## What does that mean for the established OEMs?

'They need to innovate to ensure their future, in their thinking and their technology. But many car manufacturers experience difficulties in shifting towards a service model. The focus must be on building contemporary vehicles ready for more flexible use. In doing so, real progress is being made on the software side.'

## What will the car of the future look like?

'Go for a ride in a Tesla. After that, a ride in any other car will feel like a step back in time, due to the electric drive, but especially because the whole vehicle can be upgraded remotely. Almost nothing is stuck in buttons. The car is becoming a smart cyber-physical system, half-hardware, half-software. It features a range of innovations and on-board and remote solu-

tions that enhance comfort, safety, durability, efficiency and mobility.'

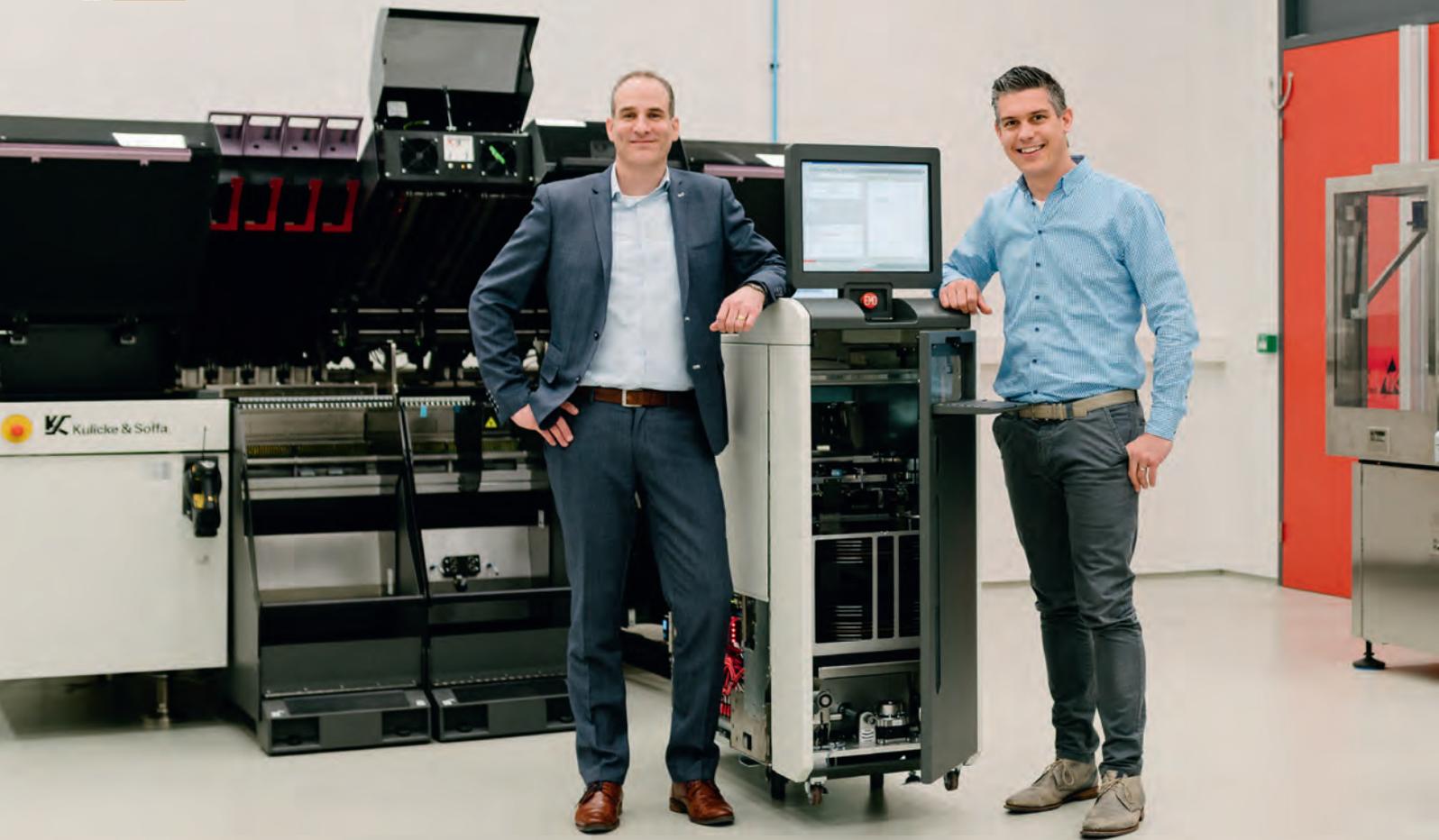
## And that requires new development capabilities...

'Innovation at the cutting edge of hardware and software is key for fast, cost-effective development of new high-tech technologies, for example in the field of human machine interfaces or systems for observation, navigation, communication and maintenance. Traditional mechanical engineers remain indispensable, but new competencies will determine success more and more.'

## How does this affect the automotive chain?

'There are new opportunities for innovative multidisciplinary suppliers. That's good news because in our region we are very good at developing state-of-the-art embedded systems. Take Sioux, which is leading in this field and already has a great track record in the automotive market.' ■





Robbert van Leijsen and Jarno Lathouwers (left to right) ^

R&D manager **Robbert van Leijsen** of Kulicke & Soffa (K&S) and manager projects **Jarno Lathouwers** of Sioux CCM leave no room for doubt. The development of K&S' new wafer feeder was no sinecure. It required constant interplay of their best people: commitment and engineering at the highest level. 'Masterpieces of this type are only possible if you operate as one team.'

Kulicke & Soffa and Sioux develop new wafer feeder

## TOP PERFORMANCE IN THE FIELD OF MECHATRONICS AND MOTION CONTROL

K&S Eindhoven - formerly known as Assembléon - and Sioux are no strangers to each other. Sioux has been called in regularly by the OEM in pick and place machines since 2006, for example as a development partner in software, electronics, remote connectivity, vision and mathware. Over the last two years, the relationship has intensified during the development and construction of a state-of-the-art wafer feeder.

Where the semicon industry is driven by miniaturisation of integrated electronic circuits, smaller components must also be applied to PCBs. That calls for new requirements for surface mount technology, K&S' domain. In addition, classic wire bonding increasingly makes room for new advanced packaging technologies to connect and stack at die-level.



‘This can only be created if you operate as one team’

### Fastest in the world

‘The advanced packaging pick and place battle is fought from two sides,’ according to Van Leijsen. ‘High-precision machines are becoming faster and fast machines are becoming increasingly accurate. Assembléon originated from the latter and proves to be very successful in this. K&S took us over in 2014, and rightly so. It gave us a boost on a number of fronts. This included the development of a new wafer feeder, almost a pick and place module placed for a pick and place machine. Wafers are inserted, fed through and stretched. Then

a die is raised from the wafer. It will be caught by a suction cup and handed to the pick and place robot. After passing a flux dipping station and vision module, the die will be placed. All in all, we have created one of the smallest horizontal wafer feeders in the world. It can compete with the fastest machines and can pick up dies up to 0.5 by 0.5 millimeters.’

### Competences and culture

At the start of the development process, one thing was clear to K&S: collaboration with a technology partner was essential. You simply cannot claim your entire engineering organisation for a new project. The company almost immediately thought of Sioux, because of the clear match in competences and culture. The concept development took place at K&S and took three months. For the design phase and prototype building, the joint team was moved to Sioux CCM in Nuenen and was scaled up to twenty people for several months. After the prototype, the 0-series was also developed and built together. Lathouwers: ‘The joint team performed at

top level in the field of mechatronics. We assembled a team of our best people because of the complexity of the project. First of all, there was a very challenging and inescapable restriction: the available space. Next to this, there were strict requirements in terms of speed, accuracy, robustness, product cost and development time. With so many variables, the trade-offs are almost infinite and you may start to run in circles. So, apart from having to make keen choices from the first concepts onwards, you must also work with simultaneous solutions. This requires craftsmanship and a strong capacity for abstraction at system and detail level.’

### Regional effect

Thanks to parallel software integration and testing, K&S’ new wafer feeder is ready for the market. This has resulted in a world-class performance, also from a time to market perspective. According to Van Leijsen, Brainport’s high-tech ecosystem is to be credited too. ‘These masterpieces can only be created if you operate as one team. It involves more than just picking up a huge challenge and committing to it, which is usually not a problem if you have some technicians join a team. Creating the optimal architecture and detailing it in the engineering phase is a constant process of resolving technical conflicts. To do that optimally, everyone must think the same way. In this respect, we have the benefit here of a special regional effect. We share the same DNA, we have the same ancestors. I am talking about the Philips heritage. Our company originated from it, just like many companies around us. Many of our more experienced technicians have worked there. They use uniform methods and standards, and transfer their knowledge and experience to the new generation. You can see this at K&S and Sioux. We speak the same language and show the same behavior. That pays off on the workfloor, when people - often without making a fuss - take very practical decisions that connect seamlessly.’

Sioux has all the expertise in-house to make a maximum contribution to the success of high-tech products or production systems. The strength of Sioux lies in the unique combination of highly-quality competencies in software, mechanics, optics, physics, mechatronics, electronics, mathematics and remote solutions. With over 500 engineers, Sioux supports or acts as the R & D department of leading high-tech companies. Sioux is keen to take responsibility: from consultancy in the concept phase up to and including series production. Sioux aims to add value for its customers and help them build innovative solutions that 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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