

Nolato Magasin

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Increased need for local production with global coordination

Digitalization improves diabetes management

Integrating electronics
Science-based emissions targets
Containers from surplus material
Eight soccer pitches of solar power

A smart combination of local and global

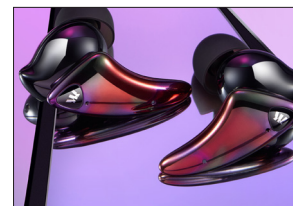
Any company working with Nolato has access to a smart combination of close, local partnerships and the Global Group's resources.



► Find out more on pages 3–4.

Amazing new decoration technique

Nolato is now offering a new decoration technique that, combined with painting, opens up endless possibilities for product decoration.



► Find out more on page 5.

We take responsibility for our impact

Sustainability is a natural part of our corporate culture, deeply rooted in the company. We are now setting absolute targets using SBTi.



► Find out more on pages 6–7.

Record-quick time to market for IVD product

Although medical device projects often involve extended lead times from decision to production, there are times when time to market is key.



► Find out more on pages 14–15.



Image above: Global developments mean businesses are increasingly realizing they need to rethink and bolster their supply chains to diversify the risk of having production only in Asia, for example. Nolato has an effective concept of globally coordinated local production on three continents.

This magazine is produced for our customers, shareholders and employees, and anyone else with an interest in the Group.
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Global developments increase need for local production with global coordination

Global conditions have changed drastically because of trade barriers, the Covid pandemic, logistics chaos and Russia's invasion of Ukraine. Global trade chains have been significantly affected and companies across the world have become concerned after discovering how vulnerable their supply chains are.

More and more businesses are realizing these developments mean they need to change tack, not put all their eggs in one geographical basket and start manufacturing closer to their various markets.

Geographically limited suppliers

"Many companies in Europe and the US have used local suppliers in China, for example, to produce various types of consumer products," says Patric Mattsson, Director of Marketing and Sales for the Integrated Solutions business area, who has extensive experience of business in China.

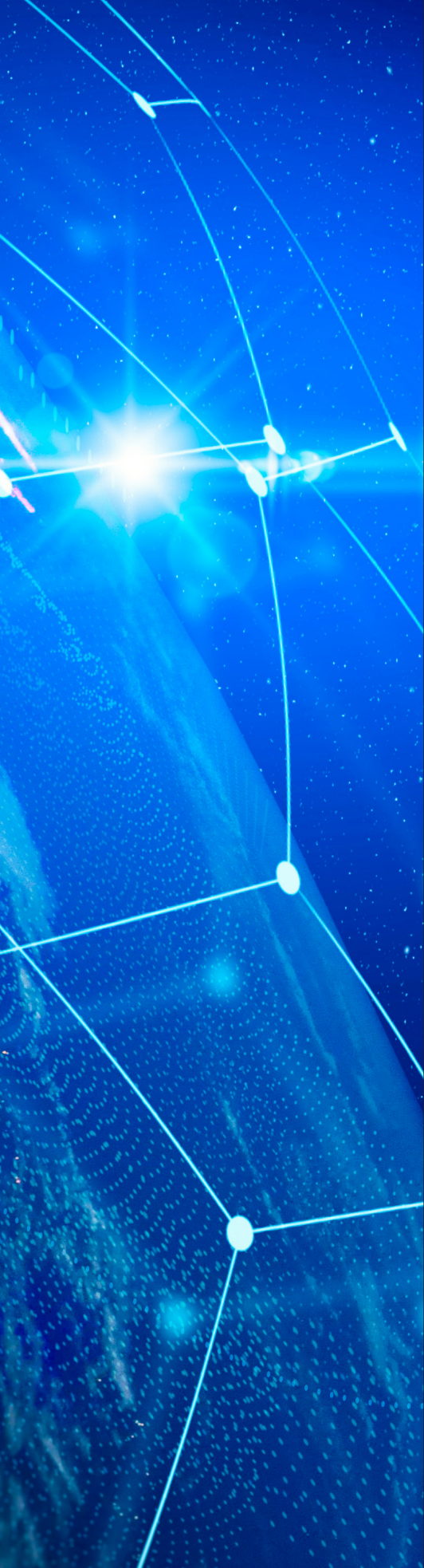
"Manufacturing in China offers many advantages," says Patric. "But the distances

and time involved in shipping to the end markets where the products are sold is a negative factor, along with the fact that many local producers are geographically limited and not able to start production elsewhere in the world."

Need to diversify production

The need to split production up and combine China with manufacturing in other parts of the world has grown, and Nolato has recently received numerous inquiries from both new and existing customers who want to diversify their risk by manufacturing in different locations globally.

"This is a perfect fit for us," says Patric.



“We’ve long taken an approach based on a smart combination of local and global.

“We now have almost 30 of our own production units on three continents – Asia, Europe and North America. In addition, each of these units can handle customer needs from concept to production, while being based on the same core values and technology.

“This makes it easy for our customers to manufacture locally in different locations simultaneously, while coordinating this production globally.

“Not all units can do everything, but we

have extensive experience of adapting our infrastructure and transferring know-how between our different units around the world.”

Environmental benefits

“Manufacturing close to your markets not only offers advantages in terms of risk diversification, but also provides environmental benefits, which is important today, with sustainability factors playing a key role in the success of products,” notes Patric Mattson. ■

A smart combination of local and global

Any company working with Nolato has access to a vast and varied offering as part of a smart combination of close, local partnerships and the global Group’s expertise and resources across three continents.

From the very outset, Nolato’s business was built around the core philosophy that it is close, local partnerships that generate successful outcomes for customers.

“This mindset remains extremely relevant to this day,” says Christer Wahlquist, Nolato’s President and CEO. “That’s why we are a highly decentralized group, which provides a solid basis, ensuring we have committed and motivated employees. This enables us to make key business decisions close to our operations and customers.”

One Nolato

“But while Nolato’s roughly 30 local development and production units together form our entire offering, it’s the entire offering that defines the individual parts,” notes Christer. “Because, although we have a flat organizational structure with efficient decision-making lines and significant local influence, we are also One Nolato.

“Our operations are based on a shared foundation. Our Group has shared values,

shared technology and shared goals. So cooperation is always based on the individual Nolato unit’s resources and expertise, as it is close to the business and understands its customers’ specific needs and preferences.”

Access to all resources

“Nolato’s combined expertise is always available to customers that wish to benefit from it,” emphasizes Christer. “Sharing expertise as well as technologies, materials and processes allows us to deliver complete, customer-specific solutions that reduce customers’ time to market.”

Local production globally

“Our solution also makes it easy to transfer skills from one unit to another, including between continents, and offers customers local production globally at a number of different locations simultaneously to spread risk and/or carry out manufacturing closer to their customers.” ■



Imagination is the only limit.

Amazing new decoration technique

Nolato is now offering a new decoration technique that, combined with painting, produces a highly sustainable surface for all kinds of consumer electronics.

Printing the decor onto a medium and then transferring it to a product cre-

ates decorative possibilities that can't be achieved by printing directly onto the product.

The process takes place in two stages, the first of which is to print the decor onto transfer paper. In the second stage, the

printed decor is transferred to the surface of the product using heat and pressure.

This technique opens up endless possibilities for product decoration.

Imagination is the only limit. ■

Integrating electronics during injection molding

Integrating components during the injection-molding process has long been one of Nolato's core capabilities. Adding sheets of fiber-reinforced plastic or complex metal components at the injection-molding stage have been some of the methods used to strengthen vulnerable parts of products, or to simplify the assembly process during injection molding.

In-mold electronics

Integrated Solutions in China has now taken this way of refining the injection-molding process a step further by integrating electronic components during injection molding using a method called in-mold electronics or IME.

"The advantage this offers is to simplify the process that follows, because you avoid having to assemble the electronic components separately," explains Mattias Bengtsson, Projects & Engineering

Director at Nolato Beijing. "But you also create a completely watertight and secure environment for the electronics, which is a major advantage in many applications."

The technique of integrating electronics during injection molding can also be combined with in-mold labeling, IML, which involves printing the electrically conductive tracks onto a thin plastic film along with electronic components and actually

creating a simple circuit board inside the plastic component. The plastic film is then formed to fit the shape of the component and molded over during injection molding to completely encase the electronics.

This integration generates opportunities to create numerous built-in functions at the injection-molding stage of a plastic component, such as touch function, NFC, haptic response and lighting. ■





Nolato is now setting goals using Science Based Targets

We are responsible for our environmental footprint

Sustainable development has long been a top priority for Nolato. It's a natural part of our corporate culture and something that is deeply rooted in the company. Now we are setting absolute targets according to SBTi.

One of our basic principles is that we take responsibility. We are the ones who are responsible for the effect our business has on the world around us; today, tomorrow and in the future. We need to use resources efficiently and keep any adverse impact on the environment and people to an absolute minimum.

This is a long-held belief, and we're delighted that these days sustainability is an issue that the majority of our stakeholders, including shareholders, customers,

equity analysts, employees, suppliers, job applicants and other key groups, believe plays a significant role when evaluating our company.

Addressing challenges

"Nolato's sustainable development strategy is focused on addressing challenges in the near future, while equipping ourselves to respond to future expectations and requirements," notes Glenn Svedberg, Director of Sustainable Affairs and a member of Nola-

to's Group management. "Our work encompasses targets and activities within social responsibility, business ethics, financial responsibility and the environment.

"The threat of global warming remains the single most significant issue on the agenda. Overall, greenhouse gas emissions from the business sector are a key factor in global efforts to achieve the Paris Agreement's aim of not exceeding the 2 degree target.

"To support efforts to cut global emissions, Nolato has signed up to the Science

Based Targets initiative – SBTi. It's a framework for companies that offers guidance in setting emissions targets that are consistent with scientific recommendations for achieving the Paris Agreement targets."

SBTi is a collaborative initiative between the UN Global Compact, World Resource Institute (WRI), World Wide Fund (WWF) and Carbon Disclosure Project (CDP). Companies that pledge to establish emissions targets according to SBTi have to take stock of emissions generated throughout their entire value chain, and carefully analyze the financial effect, feasibility and effects of their targets.

Absolute targets

"Our work on establishing our targets according to SBTi is ongoing," explains Glenn Svedberg. "These new emissions targets will relate to the 2020–2030 period and supplement the targets that are already in place up until 2025."

Unlike our existing targets, the new targets will be absolute and require a reduction in the amount of CO₂ produced by Nolato's operations.

"In addition to the impact of Nolato's own production and purchase of energy, which we have spent 10 years successfully working to reduce, we now need to factor in emissions from greenhouse gases in the rest of the value chain as well," says Glenn. "We estimate that the latter primarily comprises CO₂ and accounts for 80 percent of our total impact."

Effective cooperation

"When it comes to the external portion of emissions, we are highly reliant on effective cooperation with both suppliers and customers to identify alternative raw materials to realize the transition from fossil to renewable raw materials.

"We believe it's going to take time for a substantial section of industry to make the transition," notes Glenn. "So we plan to separate our new targets into ones we can achieve ourselves and ones that others need to work on. Meanwhile, we are an important link between suppliers of materials and customers' products.

"This gives us a key role in our customers' transition to products with a smaller carbon footprint." ■



We aim to reuse and recycle as much as possible in a constant loop

Circular economy is a term used increasingly frequently in relation to sustainability. Unlike a linear economy, which involves extracting natural resources, producing, consuming and then eventually getting rid of waste, a circular economy is based on reusing and recycling as much as possible again and again in a constant loop.

"The plastics industry has good opportunities to be part of this development, as plastic has excellent properties for being recycled to make new products," explains Glenn Svedberg, Director of Sustainable Affairs at Nolato.

Regulatory challenges

"One obstacle to this is that certain areas, particularly pharmaceuticals and medtech, face regulatory and technical challenges to using recycled materials.

"But technology is developing rapidly, with new ways of increasing the level of recycling and improving the quality of recycled material.

"One example is chemical recycling, which entails plastic being broken down to its constituent molecules, which then form the basis for new plastic," explains Glenn.

The chemical industry has numerous industrial projects underway, which are

expected to produce significant volumes of chemically recycled material from 2025.

"Of course, mechanically recycled materials can also be used in many applications. For instance, Nolato currently manufactures many products for the automotive industry using mechanically recycled raw material.

"But increasing the amount of recycled plastic raw material requires good infrastructure in society to collect plastic products that have reached the end of their useful life."

Designed for recycling

But Nolato also has an important role in the circular economy by encouraging customers to design products for recycling from the outset.

"A product can hardly be deemed environmentally sustainable if it's difficult or even impossible to recycle," notes Glenn Svedberg. "It's best to manufacture a product in a single material. This is often possible, for example, with packaging or single-use products for health care. Whereas a product with a longer lifespan that requires different materials to achieve the desired functionality can be designed so that the materials are easily separable once the product needs to be recycled." ■

Mass balance of plastic can accelerate the transition to bio-based raw materials

Mass balance is an interesting way to accelerate the industry's transition to using plastic produced from sustainable, bio-based raw materials or recycled plastic.

There is now significant interest in switching from plastic produced from fossil raw materials to plastic made from more sustainable,

renewable raw materials such as tall oil, used frying oil, other vegetable oil or from recycled plastic. However, transitioning the

entire industry to only use sustainable raw materials is a huge change that can't be made, either economically or practically, in the short term.

The mass balance approach to plastics has emerged to accelerate this transition and make it possible to do this gradually. This approach is an important milestone on the path to bio-based, circular use of plastic.

In simple terms, the mass balance approach is when, together with one of our customers, we decide to manufacture a product in bioplastic and order that amount of bioplastic granules from one of our raw-material suppliers. Our supplier, in turn, buys in the corresponding amount of bio-based raw material, mixes this with fossil raw materials and produces the granules that we use in our injection-molding machines.

Our granules then consist of a mix of bio-based and fossil raw materials. The exact same mix is also supplied to the raw material producer's customers that did not order bio-based raw material. So although the product we manufacture is not manufactured from pure bio-based raw materials, we know that a corresponding amount of bio-based plastic will be used overall in the plastics industry.

This means the decision to use bio-based raw materials has increased the use of sustainable raw materials around the world and reduced the use of fossil raw materials to a corresponding extent.



Containers from surplus material

Plastic containers for the pharmaceutical and dietary supplements industries are produced using blow molding. This process is more sensitive and harder to control than traditional injection molding, which means the production of containers generates slightly more surplus material. For this reason, Nolato has started a project to assess the possibility of using such material in the production of our standard containers instead of selling it for use in the production of plant pots and door panels.

"The surplus material is mostly what is automatically screened out from in-line

systems that monitor each individual product for visual flaws such as oxidized material, thin sections, etc.," explains Jonas Henriksson, Project Manager at Nolato Cerbo.

"We're now seeing promising results, with the ability to produce our standard containers from raw material consisting of up to 100 percent of this material," says Jonas. "But because it's complex maintaining complete traceability, which is what the pharmaceutical industry requires us to have, the most appropriate use for these containers at the moment is for dietary supplements." ■



“This approach is very similar to developments in global electricity production,” says Glenn Svedberg, Director of Sustainable Affairs at Nolato. “It’s the same electricity in the cables to your house, whether or not you pay for green electricity, but your order to the electricity company to only purchase electricity produced from renewable sources like wind, hydro and solar means the overall mix is slightly greener for everyone.”

But using the mass balance approach to plastic doesn’t work equally well in all situations.

“We find it’s mainly in single-use medical products and packaging that mass balance works best, as it’s easiest to calculate what percentage of bio-based raw material the client can label their final product as,” says Glenn.

Within Nolato, Gothenburg-based Nolato Plastteknik has been certified by the regulatory body International Sustainability and Carbon Certification (ISCC) for the use of mass balance for the manufacture of plastic packaging. Nolato Plastteknik’s customers that also have ISCC certification or licensing can then tell their end customers that, for example, three of the company’s products are made from bio-based plastic at the percentage that the company opted to buy. This is a purely mathematical calculation, as all versions of the packaging are in fact manufactured from the same plastic.

Nolato Cerbo in Trollhättan, which manufactures pharmaceutical packaging, will also start using the mass balance approach for the production of Cerbo Classic containers. They have undergone ISCC certification and should achieve certification by the end of 2022.

The advantages for customers in the pharma industry is that they can increase the percentage of renewable raw materials without needing to undergo new trials of the containers by global authorities. That saves a lot of money and, above all, time. ■

Choosing lower-carbon alternatives

When Nolato joins a customer’s project at an early stage of the concept phase, we can help make adjustments to the design of a product to reduce its carbon footprint. We can select low-carbon alternatives, optimize material weights, use the right type of plastic, examine whether recycled or bio-based alternatives can be used for the customer’s application and design it in a way that facilitates end-of-life processing.

Life cycle perspective

“We’re also happy to help analyze the customer’s product from a life cycle perspective requirements,” says Glenn Svedberg, Director of Sustainable Affairs. “For example, we have made comparisons of Nolato’s pharmaceutical packaging and we can see that the CO₂ footprint is reduced by over 50 percent if you switch from glass to fossil plastic, and by a further 15 percent if you use bio-based or recycled plastic raw materials for the same product.”

In addition, 70 percent of the electricity

that Nolato purchases for its plants globally is renewable, which cuts the impact from greenhouse gases by a further 20 percent in manufacturing for those products made in plants that use renewable energy.

An important link

Many of Nolato’s customers have also signed up to the Science Based Target initiative, under which they have set targets to reduce external CO₂ emissions from the activities over which they have no control – also known as Scope 3 emissions.

“We constitute some of these customers’ Scope 3 emissions with the products we make for them,” notes Glenn Svedberg. “This makes us an important link between suppliers and customers, as we can look for alternative raw materials with a smaller carbon footprint, and then manufacture customers’ products at our plants.

“It’s a sustainable combination that reduces products’ carbon footprint to a minimum.” ■



Code of Conduct being updated

A safe workplace with good working conditions and decent pay have long been prerequisites for Nolato. And this extends to our suppliers as well.


New EU legislation is coming that covers this area, and companies will be expected to take greater responsibility for conducting risk analyses relating to social sustainability throughout the supply chain. Our suppliers’ suppliers are also subject to this. Companies will have to analyze the product ranges and regions that present the greatest risk of

irregularities, and conduct audits to ensure suppliers satisfy requirements.

Other legislation within social sustainability is also changing. The fact that Nolato now operates on three continents, each with their own unique culture, means we are keen to be transparent and clear about the requirements we set for our own and suppliers’ workplaces.

We are therefore in the process of updating our Code of Conduct, which is part of the Nolato Spirit. ■





One of Sweden's largest solar farms has entered operation just outside Åhus in the south of the country. It's the size of eight soccer pitches and generates approx. 8 GWh a year. The investment is a joint initiative between Nolato, electricity company Bixia and solar energy company Alight. The solar farm corresponds to roughly 15% of Nolato's annual consumption in Sweden.

The operational startup of the solar farm marks a further step for Nolato towards achieving its ambitious sustainability target of cutting our carbon footprint by 80 percent by 2025.

The solar farm is part of Nolato's energy supply strategy. It also adds to renewable generation in southern Sweden, where there is a significant need. Globally, around 70% of Nolato's electricity needs are met through renewable sources, and our ambition is to continue increasing this percentage. ■



Digitalization of medical devices has resulted in better quality of life for many people living with diabetes.

Digitalization provides opportunities but also challenges

People living with diabetes used to have to prick their finger several times a day to keep track of their blood sugar levels. These days, continuous glucose monitoring offers a vast improvement in quality of life by regularly measuring levels using a sensor underneath the skin. Digitalization of medical devices has created opportunities, but also poses new challenges.

Diabetes is an illness that affects the body's ability to transform glucose from food into energy for the body's cells by either entirely or partly stopping the production of insulin. The roughly half a billion people around the

world living with diabetes therefore need to constantly check their blood sugar levels to add the correct amount of insulin.

These blood sugar checks used to be done by the patient pricking their finger

several times a day to determine what the insulin dose should be. Nowadays, this process has been replaced for many by sensors that send a signal to an automatic insulin pump.

These sensors are put in place with a simple needle prick and can then be worn for weeks or even months. And they are also so small that patients often forget they have them on their body. The insulin pumps, too, have now become so small and simple that they are barely noticed.

Improving patients' quality of life

Modern diabetes technology is largely about improving quality of life for patients. Digitalizing sensors and insulin pumps allows patients to easily keep on top of things and make sure everything is working. Data can be presented in real time via the patient's smartwatch or mobile phone, which can also alert them if their values fall outside permitted levels.

Forwarding the data also keeps the patient's care team in the loop, for example so they can support patients who are unable to get to a care provider themselves. The significance of this was felt particularly during the Covid-19 pandemic. When patients were unable to visit their doctor, the systems were able to share important diabetes data during virtual healthcare meetings.

Technical innovations in sensors and insulin pumps have meant challenges for medtech companies and their suppliers to continually come up with new and improved solutions.

"One of the challenges is to constantly make the products smaller, which often requires a product's various components to be able to carry out several tasks simultaneously," explains Bill Torris, who heads up Nolato's Technical Design Center in North America.

Seal, protect and release

"Take gaskets, for instance; previously, the material was chosen solely because of its sealing properties. In modern medical devices that are packed with electronics, the gaskets have to be made from materials that provide a seal from liquids, release signals from antennas and protect the electronics from interference from electromagnetic radiation. And when we injection-mold silicone around a battery, for example, the material has to both protect the battery physically and conduct electricity to enable the battery to be charged via induction.

"At Nolato we have the ability to custom-

ize our own silicone material and give it precise properties," says Bill. "This means, for instance, that we can control whether the material conducts or doesn't conduct electricity, whether it insulates against or conducts heat away from the unit and whether or not it shields against electromagnetic radiation."

Medical device digitalization poses numerous challenges, but Nolato is better

equipped than most thanks to its extensive experience of integrating electronics into products.

"For over 25 years now, Nolato has been integrating mechanical components and electronics into mobile phones and other handheld consumer electronics," notes Bill. "So using that experience and know-how to digitalize medical devices isn't new or unusual for us." ■



Packaging with excellent vapor barrier designed for mailboxes

Subscribing to omega-3 capsules is a convenient way of not having to think about buying more when you run out. So Nolato has developed packaging specially for mailing products to subscribers.

Nolato Pharma Packaging offers 200 ml mail packaging specifically designed to make deliveries to customers' mailboxes easier. It's a rectangular-shaped container with a snap lid. And to guarantee the packaging hasn't been opened before the customer receives it, it has a security tab that breaks when the packaging is first opened.

"The packaging is produced in three sections and delivered to customers in two parts; the container with the assembled lid and the bottom part," explains Anci Petersson, Sales & Marketing Director at Nolato Cerbo. "These two parts are

joined using ultrasonic welding after the container has been filled with the contents. When the packaging is assembled and joined, it offers excellent performance as a barrier against water vapor. This avoids the risk of the omega-3 capsules, whose outside coating is sensitive to moisture, sticking together."

The packaging is also suitable for other prescription-free products. It has a large, useful surface for labelling and really stands out on the shelves with the wide side of the container facing the customer. ■



December 1, 2020



January 7, 2021



April 1, 2021



May 19, 2021

Record-quick time to market for IVD product during pandemic

Although medical device projects often involve extended lead times from decision to production, there are times when time to market is key.

Some time ago, Nolato MediTech in Hörby completed this kind of project, in which the normal lead time of two to three years to design and build a fully automated production line had to be halved.

And, what's more, it was in the middle of a global pandemic!

"The customer, a global pharmaceutical company, approached us in late spring 2021 wanting us to help them build a fully automated production line for the manufacture of a new diagnostic product," explains Pelle Ekerholm, Key Account Manager at Nolato MediTech. "The product consisted of several parts that had to be injection-molded and then assembled.

"It was a complex, assembled product, which in itself required complex production equipment," notes Pelle. "But the fact that it was also a product that would be used to detect illnesses, conditions and infections, known as in vitro diagnostics or IVD, meant there were stringent requirements in terms of the technology and the production environment."

Stringent standards for IVD products Nolato MediTech is used to producing medical devices in cleanrooms with exacting cleanliness requirements. But the standard cleanroom environment wasn't enough for this product.

"The key difference is that the production of IVD products has to be completely free of DNA," explains Niclas Johansson, Operational Coordinator at Nolato MediTech. "So there are requirements for special monitoring of particle levels in the cleanroom, staff have to wear protective clothing that covers the entire body, with a hood and face mask, which is restrictive and means the work environment has to be adapted."

All the material used in production also has to be free of DNA. The tiniest fragment of foreign DNA in the product would be disastrous for the diagnosis security.

"As I've said, we have considerable experience of cleanroom production, but we'd



February 1, 2021



March 1, 2021



June 2, 2021



June 30, 2021

not worked with IVD requirements before,” says Pelle Ekerholm. “To get some advice, we contacted our sister company in Switzerland, Nolato Treff, which is a world-leading manufacturer of IVD products.

“We got some great help from Nolato Treff’s IVD specialists and were able to work together to create a solution that satisfied all the customer’s needs,” explains Niclas Johansson. “And in the middle of July 2021, the customer placed their order – not just for one but for two of the same fully automated production lines.”

We started work on the project straight after the summer, which involved Nolato MediTech, in record time, converting an existing cleanroom of 900 square meters to IVD production, moving 14 injection-molding machines to different premises, adapting the infrastructure to the new area of use and then establishing the two new, fully automated production lines.

“Usually this kind of work would be carried out with a lead contractor, but we realized that normal solutions wouldn’t be suitable in this particular situation,” says

Niclas. “So we appointed an internal project manager, who put together the necessary team of subcontractors. This meant we were able to work much more efficiently with parallel subprojects to make swifter progress.”

Two to three years’ work in one year
The IVD cleanroom was validated at New Year and ready to receive the new production equipment. And everything was in place just six months later. The first line was validated at the end of May and the second a month later.

“To complete in one year something that usually takes two to three years feels like a huge achievement,” says Niclas Johansson. “Some 15 suppliers were involved, and in record time we installed 10 injection-molding machines and equipment for fully automated assembly, with environmental requirements that were completely new to us.

“And all this during a global pandemic, with all the challenges that involved, including physical issues, production limitations and unexpected disruption.

“To successfully complete a project like this requires us to work in close coordination with the customer and our suppliers. Everyone has stepped up to the plate and been keen to do something new to get the product to market as quickly as possible.”

“One key element of the project was the vast pool of knowledge within Nolato,” emphasizes Pelle Ekerholm. “We were quickly able to access help from our sister company, which had the know-how and experience of IVD production that we lacked. We’re never alone at Nolato; we support one another as One Nolato, so we can always offer the customer the best solution.

“We also try to be one step ahead at all times; to be constantly ready so we can adapt to changing circumstances. In this case the key was that we had spare cleanroom capacity by building for future needs when we recently extended the plant here in Hörby.

“Because you never know in advance when a customer might need a quick response!” ■

Cleanroom in Querétaro expands Nolato's customer offering in Mexico

Since fall 2020, Nolato has also had a unit dedicated to the development and manufacture of plastic products in Mexico. It is located in Querétaro, a two-hour car journey north of the capital Mexico City, and was part of the acquisition of GW Plastics.

The business in Querétaro started in 2006, since when the company has primarily worked with injection molding and assembly of products with tight tolerances for automo-

tive sector customers, such as fuel systems, thermal systems and electronic units.

"As part of efforts to broaden our customer offering after joining the Nolato family we've now added a cleanroom to our production plant," says Justino Barrientos, Director of Sales at Nolato Querétaro. "This allows us to also make products requiring a controlled environment."

The new cleanroom in Querétaro has an

area of 107 sqm and satisfies ISO 14644 class 8 for control of parameters such as the maximum permitted concentration of particles. The cleanroom also has tight tolerances in terms of temperature and humidity.

Since it is mainly people who contribute to particle concentration, use of the room is subject to specific clothing requirements in the form of hair nets and lab coats. ■



Mexico cleanroom ready to open



Electric buses at Nolato Beijing

At Nolato Beijing in China, eight electric buses transport factory employees to and from the workplace. Conventional buses were replaced by electric vehicles during the year. The buses cover an average distance of 80 km a day, six days a week. This means that the switch from fossil fuel to electric is cutting emissions from over 15,000 km of driving every month.

Nolato's plants in China have been running on 75 percent renewable electricity generated from wind power for a year now. ■

Significant growth in water-based paints

Nolato's China-based units have long offered end customers water-based paints for consumer electronics, a more environmentally sustainable alternative to traditional solvent-based paints. Most customers have opted for traditional paints, however, as these still provide better physical and cosmetic function than water-based options.

But over the past two years interest in water-based paints has increased, due to the greater focus on environmentally sustainable products and tougher restrictions during manufacturing. Water-based paints have grown from accounting for around 5 to 10 percent to more than 60 percent of total paint usage at Nolato Beijing.

"Water-based paints have improved significantly in purely physical terms in recent years, and a number of our customers are consequently considering using them," says Thomas Hofflander, MD of Nolato Beijing. ■

New extrusion line at Nolato Jabar boosts quality and cuts scrappage

A new extrusion line for silicone products, including various EMC shielding gaskets, aims to boost Nolato Jabar's productivity, cut energy consumption, reduce waste and improve quality through continual laser-based monitoring.

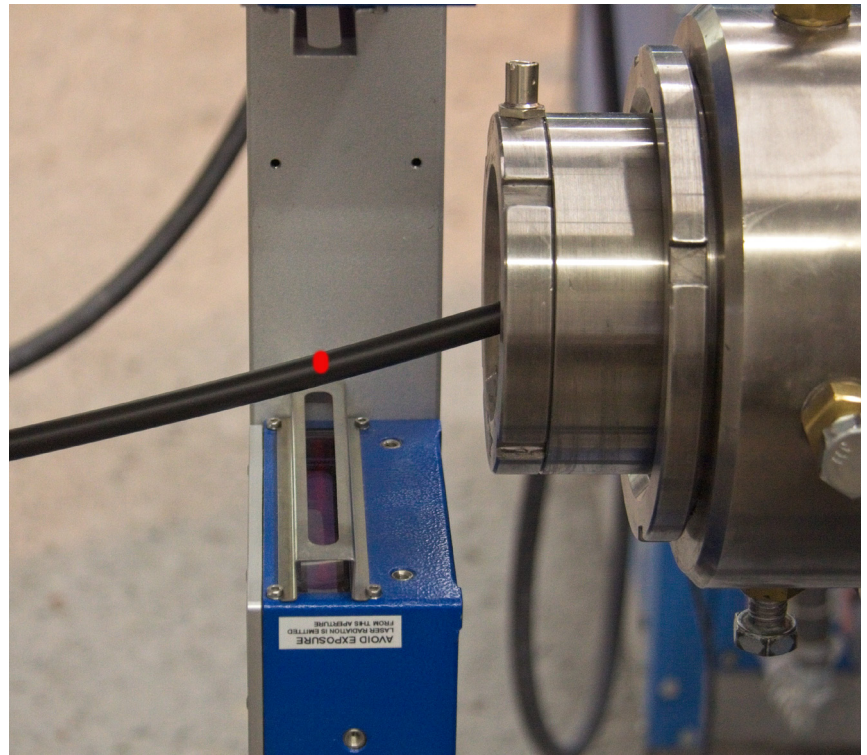
Nolato Jabar, which employs around 70 people in New Jersey on the US East Coast, was acquired by Nolato in autumn 2019 to strengthen the Group's position as a global specialist in electromagnetic compatibility (EMC) shielding products and solutions. The acquisition complemented Nolato Siilikonteknik's already strong position in Europe and Asia by adding process and material solutions in electronics shielding for sectors such as aviation, automotive, telecom and medtech in North America.

"EMC shielding gaskets are used to stop the electromagnetic radiation pro-

duced by electronic units from disrupting other electronics nearby. In most cases, this shielding effect is business-critical when gaskets are used in electronics-heavy environments such as in aviation, automotive, telecom and medtech," explains Berndt Johansson, Managing Director of Nolato Jabar.

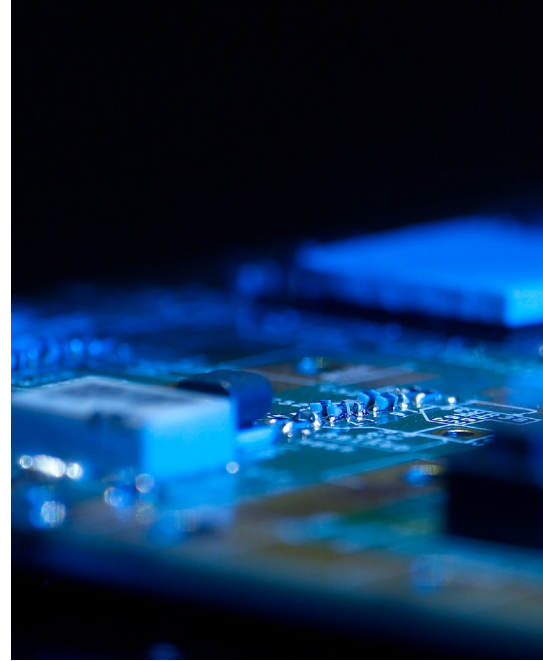
The new extrusion line will not only boost productivity, cut energy consumption and reduce waste, but will also improve the quality of gaskets by continually monitoring production using lasers.

"The laser constantly measures the external dimensions of the gasket and sends that information to the extrusion line control unit," explains Berndt. "The control unit automatically adjusts the process parameters to ensure the preset dimensions are precisely maintained." ■



Laser technology constantly measures the dimensions.

Cool running with silicone-based thermal interface material



Some issues have been raised regarding silicone in electronics. Consequently, in spite of their often-disadvantageous aging, thermal stability, and stiffness properties, PLP TIM products with non-silicone-based matrices have been gaining in popularity. This article by the R&D department of Nolato Silikonteknik addresses these concerns and underlines the benefits offered by silicone".

With few exceptions, current Thermal Interface Materials (TIMs) are "PLP type" materials – Particle Laden Polymers. These are composite materials with functional (in the case of TIM, thermally conductive) particles suspended in a polymer matrix.

This polymer matrix may be an elastomer, gel, oil, or wax – as needed to create an insulating film, gap filling pad or filler, paste, or phase-change material (PCM).

And in the vast majority of materials on the market, the polymer matrix in question is silicone based.

Silicone migration

In silicone as in many other synthetic materials, molecules that have not been cross-linked and thus permanently tied into the polymer matrix can escape the compound.

Volatile molecules – often called low-molecular-weight siloxanes, or LMWs – can escape through evaporation, a process called outgassing. Longer molecules, too large to turn gaseous, can escape as oil leakage, called bleeding.

In TIMs, there will always be a portion of non-crosslinked molecules in the matrix, as TIMs need to be soft and pliable – highly crosslinked compounds are hard. Volatile siloxanes can also be added into a matrix as solvent, intended to evaporate after the material has been dispensed in an assembly, allowing one set of mechanical properties pre-application and a radically different one post.

The escaped silicone may migrate by different paths. Liquid silicone can creep along surfaces as an oily film. Commonly employed as a lubricant, silicone oil can creep through narrow gaps.

Outgassed silicone migrates through condensation: molecules evaporating from a compound in one place may recondense onto surfaces elsewhere in the assembly.

Contamination issues

What then are the risks with contamination from migrating silicone in electronics?

Well, there are some very specific ones:

The first and foremost hazard stems from *sparking*. This may affect devices where repeated flashes of hot plasma – electrical sparks or arcs – can form with any frequency on surfaces, such as in open relays, connectors, switches, motors – devices that allow (a) sparks to occur regularly, and (b) contaminants to reach active surfaces.

Silicone contaminating a surface where it gets subjected to the heat of an electrical spark may gradually form a glass coating. Over time, this coating may grow in thickness, until the point where the resulting insulation causes the electrical connection to fail.

It bears noting however that modern devices seldom allow open sparks, effectively eliminating the issue.

The second notable potential issue is *optical surfaces*. In devices with precision optics, silicone condensing or creeping

onto lenses, mirrors, or optical sensors may affect refraction, reflection, or the quality of sampled images.

Hence, in designing optical devices with open optical surfaces, it is advisable to monitor potential silicone contamination issues.

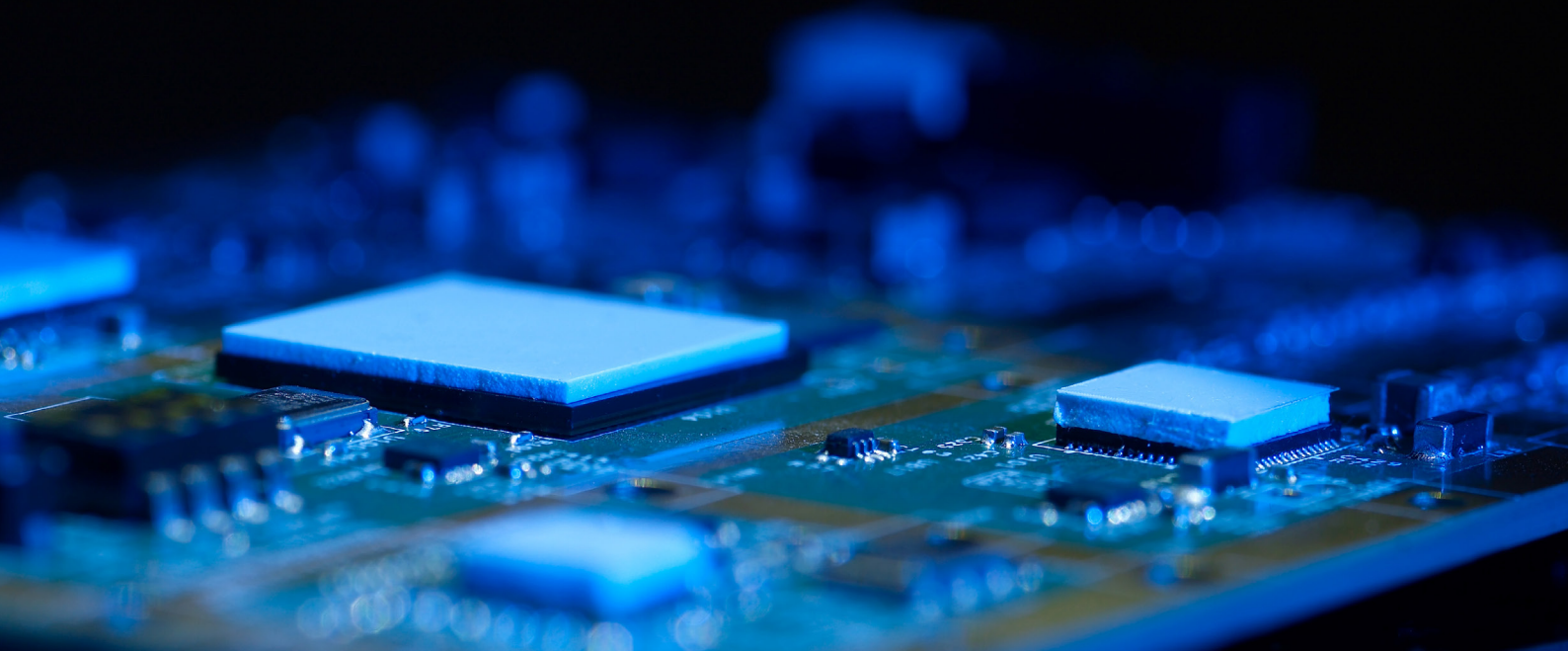
Again however, it bears noting that optical assemblies are usually enclosed, blocking contamination. We have experience designing in silicon-based TIMs into a variety of advanced optical devices, including ADAS vision systems, high-end professional DSLR cameras, thermal-vision systems, CCTV cameras, and more. This particular issue, although a theoretical risk, has yet to manifest a practical problem.

Paint adhesion

In the 1960s, a major car manufacturer experienced problems with blotchy paint finish on their cars.

The issue was traced to the paint shop's ventilation drawing air through ducts that also supplied the workers' locker rooms. The 1960s loved hair spray – products containing volatile silicones. A lot of it found its way into the paint shop and condensed onto the car bodies, causing uneven paint adhesion.

This demonstrates that silicone migration can affect coatings. In most applications, TIM silicone contamination is so minute, and electronics so well enclosed, and/or assembled so far away from exterior paint pro-



Silicone is a really useful material, offering beneficial properties for thermal interface materials, TIM.

cesses, that any contamination from TIMs is unable to affect cosmetic finishes.

However, the real potential issue concerns conformal coating. It is therefore recommended to ensure that boards being coated don't have silicone in the wrong places.

There are a couple of *other* potential issues: One is cosmetics. Silicone oil leaking onto the exterior of a finished product may look unsightly. For some brands, it's also important that the interior of opened products looks clean and neat. For such applications, possible silicone leakage from TIMs should be considered when designing assemblies and choosing materials.

Another is re-work: when components are de-soldered and then re-soldered, silicone contamination on solder pads may affect solderability. Silicone oil is difficult to clean off completely. It is therefore recommended, when possible, to test assemblies where repair and re-work are frequent issues to a point where the need for such operations is identified prior to mounting TIMs.

Possible further issues?

As noted, silicone is chemically very inert. There are thus no known issues of silicone reacting with or degrading electronic components, devices, conductors, PCBs, gaskets, solder joints, or other elements in electronics.

It has been suggested that migrated silicone can cause short circuits on PCBs.

However, we have not been able to study any such occurrences; nor is such a failure mode possible to explain with physical phenomena, as silicone is a powerful dielectric – its breakdown resistance is one order of magnitude higher than air.

It can therefore – until we are able to study it or can formulate a physical explanation for the failure mode – only be regarded as a spurious phenomenon.

Silicone tolerance

So, there are some potential issues with silicone migrating from TIMs. It is also clear that most electronic designs won't be affected by them. In many of remaining cases, potential issues are also relatively easy to work around by proper design and/or processes.

But for those designs that *may* be affected, and where practical workarounds aren't available – what should be done about it? How are silicone-related issues best mitigated?

The simplistic approach is of course to ban silicone outright, only using non-silicone based, or 'silicone-free' products.

However, typical silicone-free alternatives are still based on a polymer matrix of some other chemistry. While the properties of silicone are well known, the exact properties of these alternative chemistries may not always be.

More important, however, are the reasons why silicone is used in the first place;

no other polymer matrix can boast a similar width of properties. This means that most alternative matrices provide materials that are either much stiffer, have lower thermal stability, or worse aging characteristics than silicone – most likely, all three.

Better then, to go the NASA route and determine limits to *how much* silicone can be tolerated in an application. While there are some silicone-based TIMs that extract relatively high amounts of silicone, there are also many that have basically no extraction at all, with a wide range in between.

The available selection of silicone-based materials is so wide that beyond certain very specific space-based applications, there will as a rule always be a superior silicone-based alternative.

Conclusion

Despite what has been implied in certain contexts, there is no foundation for any claims that silicone would somehow be dangerous to electronics.

Silicone is a highly useful material with a multitude of remarkable properties that make it singularly attractive for use in thermal interface materials. However – like everything else – it does have its own drawbacks and limitations, the properties of which any user is advised to be aware.

Given that awareness – which this article aims to promote – those drawbacks are surmountable, often with remarkable ease. ■

The colors of fall in Vermont, the picturesque state in the Northeastern United States, where Nolato has two production units. The reds and oranges of the changing leaves put on a real show as the days become shorter and nature readies itself for tougher times. The reds are mainly produced by anthocyanins, which form in leaf cell cavities in the fall. These vacuoles, as the cells are known, are where trees form sugars during the daytime. These sugars are converted to anthocyanins during the cooler nights. Researchers believe the red pigment is mainly to protect against sunlight, which is detrimental to trees when the green chlorophyll breaks down in the fall. ■

