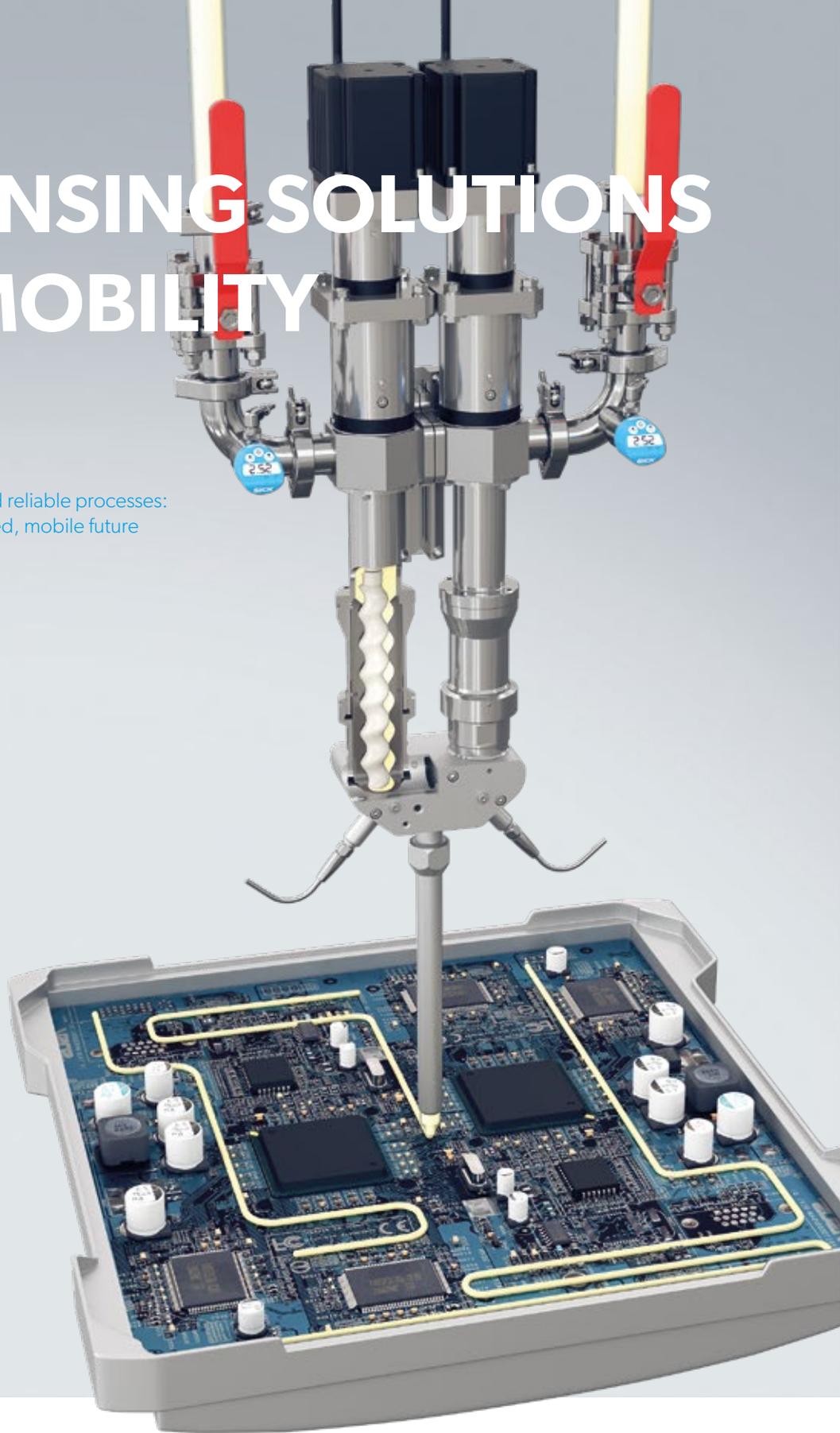




# DISPENSING SOLUTIONS IN E-MOBILITY

Automated, innovative and reliable processes:  
Technology for an electrified, mobile future





# TECHNOLOGY – OUR AIM IS TO ACHIEVE MAXIMUM PRECISION

ViscoTec stands for reliable handling of low to high viscosity, abrasive, pressure and structure sensitive, shear sensitive and solid-containing fluids. It is possible to dispense with a high degree of liability, regardless of viscosity. Systems are always designed to customer specification.

## CORE COMPETENCE

Crucial for the quality of our products: A perfectly coordinated geometry between the stator and rotor. When choosing a suitable elastomer for the stator, different proprietary recipes are used. They enable optimal and long-lasting operation.

## OUR TECHNOLOGY

Volumetric dispensing and filling systems are based on the **ENDLESS PISTON PRINCIPLE** and are used in the application of low to high viscosity liquids.

The heart of every application is a purely volumetric pump. The interaction of the rotor and stator results in a delivery and dispensing characteristic that resembles an endlessly moving piston.

The resulting pressure-stable, linear pump characteristic curve provides a clear indication of the relationship between revolution, time and flow rate. In this way any volume can be dosed and a dispensing accuracy of  $\pm 1\%$  (depending on the material) can be achieved at the pump outlet.



## APPLICATION WITH A HIGH DEGREE OF PROCESS RELIABILITY

of low to high viscosity, abrasive, pressure and structure-sensitive, highly filled or sensitive to shear fluids – for dispensing, regardless of viscosity.



## DISPENSER WITH A HIGH SERVICE LIFE

and extremely high efficiency due to low wear and low friction when conveying material.



## DEFINED FLOW RATE VOLUME

for a repeatability of  $> 99\%$  with linear dependency between the application quantity and revolution for a variable robot speed.



## VOLUMETRIC DISPENSING

with continuous non-stop dispensing at the desired flow rate with maximum repeatability. Pulsation-free with minimal shear and low pressure.



## BROAD APPLICATION RANGE

and individually adaptable systems for a wide range of different process applications.



## PERMANENT INNOVATION

according to our claim: “Standing still means moving backwards – keeping moving is the only way to advance.” Creativity and imagination create innovations.



## ALL FROM ONE SOURCE

From emptying to degassing to dispensing systems. Engineering and material know-how included!



## MADE IN GERMANY

All process steps are created and executed in Tögging. According to the quality feature Made in Germany and the “Think global, act local” approach.



## TESTS & TRAININGS

In our Customer and Innovation Center (CIC), we offer training, dosing tests, events and also focus on your dosing application in a targeted way.



## MORE THAN 20 YEARS OF EXPERIENCE

is the base for extensive expert knowledge. A structured knowledge management helps to create optimal solutions.



# OVERVIEW OF APPLICATIONS IN E-MOBILITY

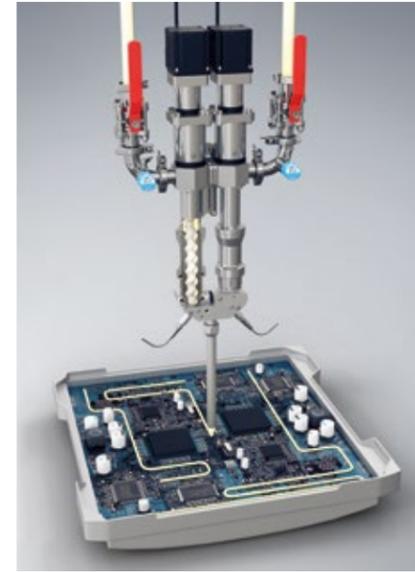
The current change in the automotive industry is now shaped by innovative battery technologies, electric engines, sophisticated sensors, full connectivity, artificial intelligence and their networking with each other. Optimized processes and challenging materials present the dispensing technology with considerable, but solvable challenges.

Specific characteristics of the materials must be preserved, unaffected by the dispensing process. Even with large amounts of fillers.

The focus is on fast and uncomplicated processing of the materials, combined with defined cost control. ViscoTec dispensing systems are perfect for processing all low to high viscous, shear sensitive and abrasive one or two component materials in a wide variety of applications.



**DISPENSING OF ELECTROLYTE**



**HEAT MANAGEMENT**



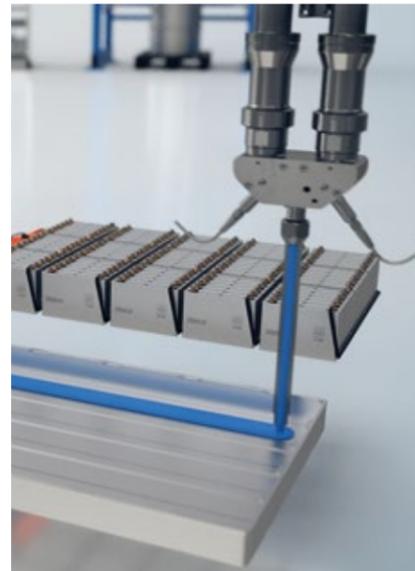
**RESIN IMPREGNATION**



**POWER ELECTRONICS**



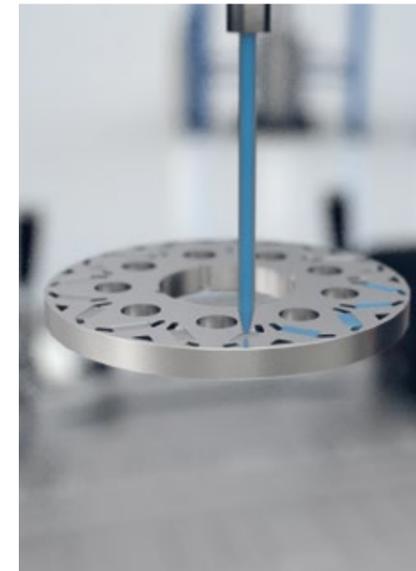
**SLURRY DISPENSING**



**BATTERY MODULE & BATTERY PACK ASSEMBLY**



**SEALING**



**MAGNET BONDING**



**FUEL CELL**



## SLURRY DISPENSING

In electrode production, the high precision application of the active material, the so-called „slurry“, is a key process. This process plays a decisive role in the performance and quality of the resulting batteries: The dispensing of the chemically active substances essentially determines the energy storage capacity and charging capability.

Slurry is a mixture of various additives and a binder. The finished mixed active material is dispensed as a thin paste onto the current collectors.

ViscoTec dispensing systems are perfectly suited for this material. They guarantee an air-free and entirely process-safe solution for this type of application. Thanks to the integrated endless piston technology, a continuous and uniform dispense is achieved – pulsation-free and without pressure peaks or fluctuations.

The sensitive materials are conveyed with low shear. Low dispensing pressures prevent separation and protect other equipment, such as the wide slot nozzle.

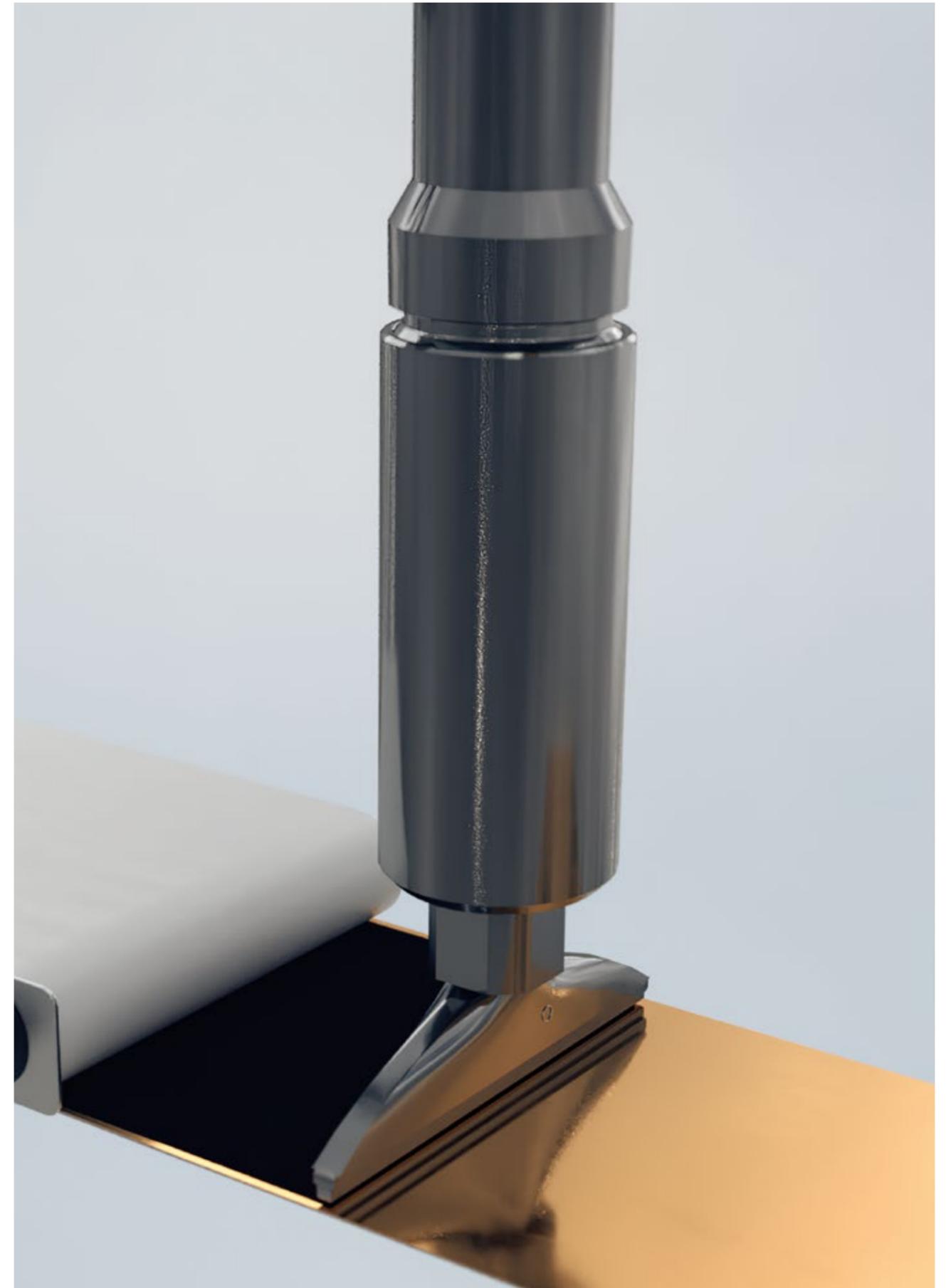
ViscoTec material and process experts support you in the design and implementation of your dispensing system – according to your individual requirements.

### TASK

Application of a thin, even and air bubble-free layer of active material onto current collectors.

### SOLUTION

Volumetric dispensing pumps enable continuous, pulsation-free, low-shear and air-free dispensing within a minimum pressure range. The ViscoTreat-In-line degasses the active material and prevents sedimentation. The dispensing quantities can be flexibly adjusted to any conveying belt speed of the foils.





## BATTERY MODULE & BATTERY PACK ASSEMBLY

In the assembly of battery modules and battery packs an extremely reliable application of one or two component materials is required. To generate the necessary power, individual cells are joined together to form a module and then connected electrically in either a series or parallel: One process step for round cells is the application of one or two component adhesive onto the cell holder. Prismatic cells, on the other hand, are stacked and can be glued together or fixed onto component carriers. The adhesive serves – in case of a defect – as both electrical and thermal insulation. Vibrations between the cells are additionally avoided, thereby preventing damage to the contacts. Fully automatic dispensing of this adhesive with ViscoTec dispensing technology enables short process times with maximum process reliability.

TIM (Thermal Interface Materials) are indispensable in the production of battery systems. The heavily filled one or two component fluids are essential to dissipate the heat generated at all levels of the battery system: From the electronic control module to the battery cells, to the module and pack. The so-called gap fillers are usually characterized by a high proportion of abrasive solids and used to achieve the required thermal conductivity, sometimes over 3.0 W/mK. Due to the abrasiveness of

the material to be dispensed, the dispensing equipment is subject to particularly high loads.

ViscoTec offers components for this application to guarantee the longest possible service life. Thanks to the specially designed components and the integrated endless piston technology, ViscoTec dispensing systems are perfectly suited for the application of high precision one and two component thermal pastes, as well as for the precise and repeatable dispensing of filled and abrasive materials.

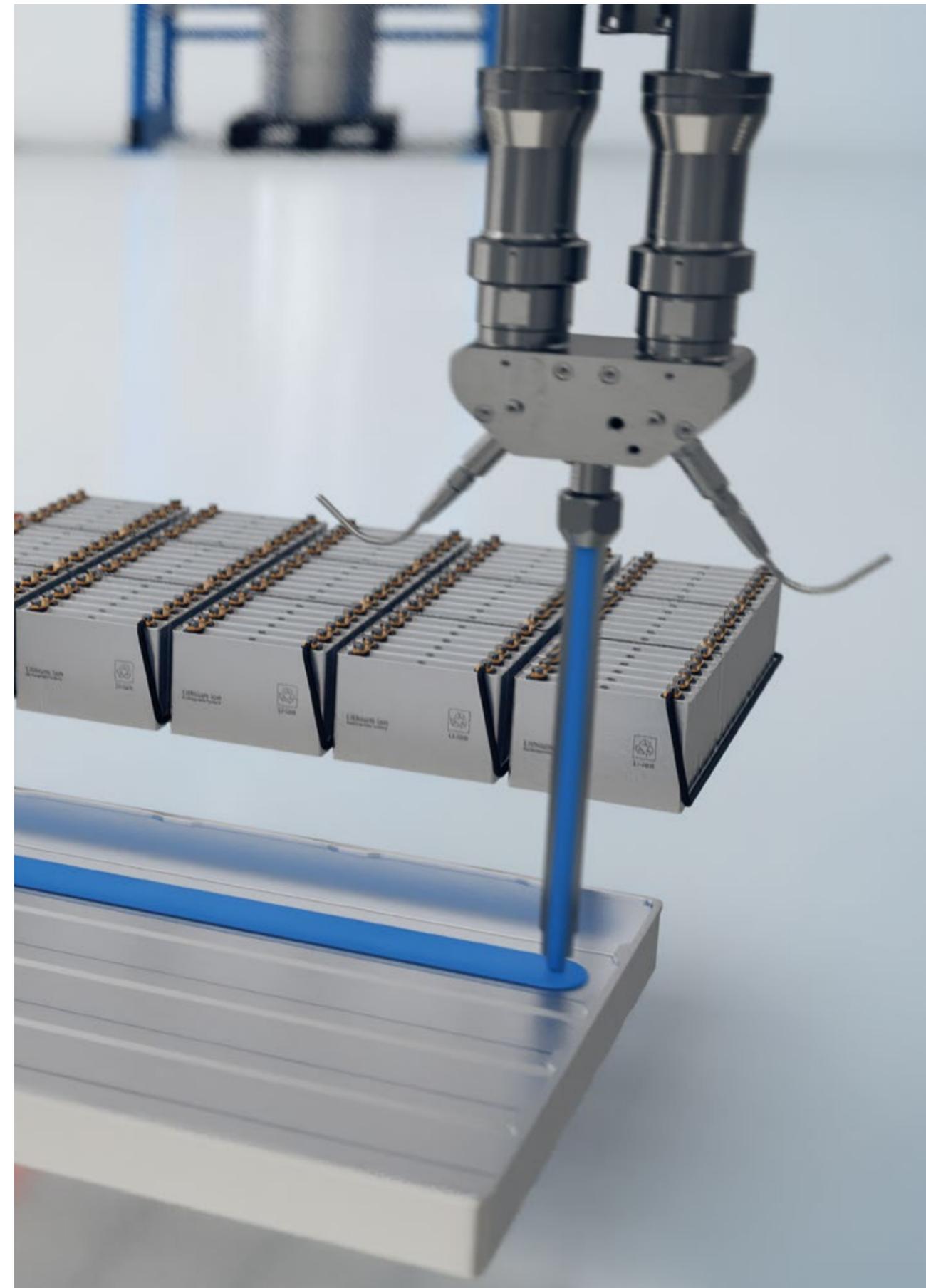
Another application for dispensing technology is the bonding of the housings in the battery system, the so-called sealing. Moisture within the battery system can cause damage through corrosion and significantly reduce performance or even completely destroy the system through short circuits. Reliable sealing is therefore essential: ViscoTec has many years of experience in sealing applications in a wide range of industries and can rely on know-how already acquired from this. Even the most difficult material profiles can be dispensed safely and reliably thanks to the variable dispensing technology.

### TASK

Process-safe application of one or two component materials in the assembly of battery modules and battery packs.

### SOLUTION

Precise, fully automated, easily controllable and endless dispensing: ViscoTec dispensing systems enable a continuous, repeatable and gentle dispensing of TIM, sealing materials and adhesives - regardless of viscosity. The ceramic rotor ensures long service life even when abrasive materials are used.





# HEAT MANAGEMENT

The heart of an electric vehicle is the high-voltage battery. Heat influences in particular can impair the performance and safety of the HV battery and the connected components. In order for electronics and energy storage systems to operate at a high level of efficiency in the long term, reliable heat management is necessary.

So-called gap fillers or thermal interface materials (TIM) with typically loaded filler content ensure heat dissipation, for example between battery modules or cells and housings. The application in liquid form ensures optimum wetting and therefore thermal connections to the heat source and reaches the heatsink.

Gap fillers or TIM must be applied precisely and without air pockets. Only then effective heat transfer is guaranteed and the electronics or battery systems can work safely and durably within an optimum temperature range.

Since gap fillers and TIM contain a high proportion of abrasive ceramic filler, the dispensing equipment is particularly stressed when using this type of material.

ViscoTec dispensing systems are perfectly suited for high precision applications of one and two components, filled and abrasive materials, such as thermal conductive pastes. By selecting the appropriate raw material for the dispensing components, e.g. ceramic for the rotor, the highest service lives are achieved. Even with highly abrasive materials.

By means of an integrated agitator, the material treatment systems from the ViscoTreat series enable an air-free distribution of the gap filler and prevent fillers from settling in the material. In order to achieve a better flow behaviour of the material, ViscoTec dispensing systems can be optionally heated.

Two component thermal conductive pastes can be dispensed without any problems, even in extreme mixing ratios. With the proven endless piston technology, continuous, uniform and pulsation-free dispensing is achieved.

## TASK

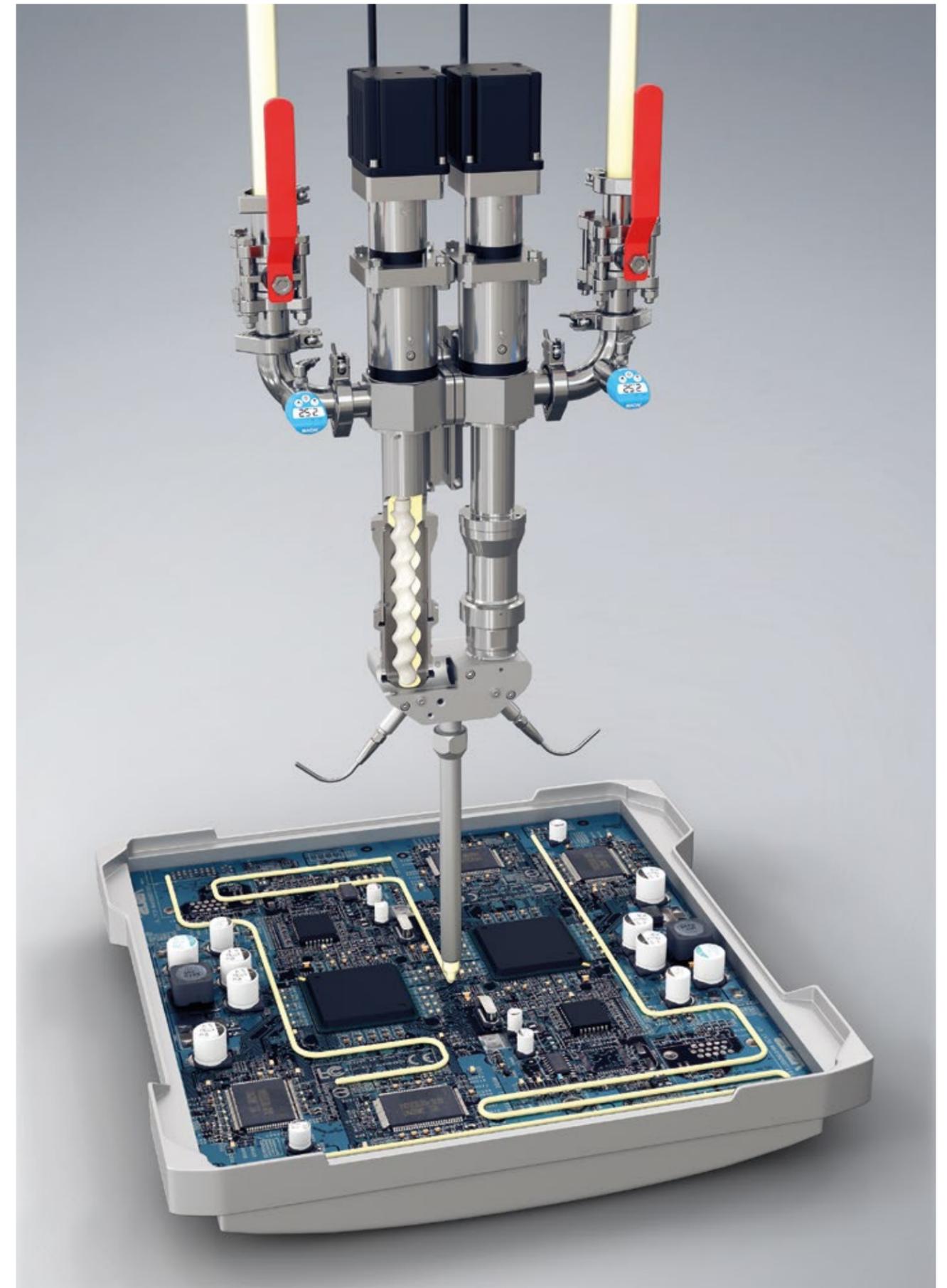
Ensuring effective heat management by applying highly abrasive thermal conductive paste without air pockets.

Low operating costs due to durable components.

## SOLUTION

With degassing built into the ViscoTreat series and the integrated agitator, ViscoTec creates an optimal treatment of the gap fillers or TIM.

A dispenser design with ceramic rotor ensures a long service life – even when using highly abrasive materials.





## SEALING

Volumetric dispensing systems have already proven to be a reliable, cost-effective, flexible and suitable sealing technology in a wide range of applications.

Also, in the housing seals of battery management systems for e-mobility, bonding and sealing applications are state of the art.

Moisture within the battery system, for example, can significantly reduce performance or even cause damage through corrosion. This can be counteracted with a high-quality sealing bead.

ViscoTec has decades of experience in the field of sealing applications in the most diverse industries. Fully automated dispensing with ViscoTec dispensing technology allows short process times with the highest process reliability. Thanks to the variable setting of the flow rate, even the most difficult contours can be dispensed safely and reliably.

### TASK

To protect the battery from moisture, the battery must be perfectly and completely sealed.

### SOLUTION

Reliable, fully automated and easily controlled application of viscous one or two component sealants, even on complex component geometries – with ViscoTec dispensing technology.





## RESIN IMPREGNATION

In addition to battery production, the production of electric motors and generators also plays a major role in e-mobility manufacturing. ViscoTec offers efficient and precise dispensing solutions for the resin impregnation of rotors and stators using the trickle process.

During the resin impregnation of rotors and stators, resin is dispensed into wire windings. This process increases the durability and improves the performance of electrical rotating machines. Mechanical resistance is increased, and noise-generating vibrations are minimized. In addition, thermal coupling is improved by replacing the air in the cavities so that the heat generated during operation can be optimally dissipated. The impregnating resin also contributes to further electrical insulation.

During trickling, the stator or rotor is continuously rotated around its own axis. The component is heated by induction or circulating air heat. During the rotation the resin is trickled on. The resin is drawn into the winding by capillary action and rotation. Due to the rotation, the resin is evenly distributed in the stator.

The prerequisite for high quality during this process is a uniform, pulsation-free dispensing. ViscoTec dispensing systems guarantee maximum dispensing accuracy and complete repeatability. The feed cavities within the proven endless piston principle create a defined volume. Due to the proportionality between the drive speed and the discharge volume, the volume flow can be easily regulated. And a programmable retraction at the end of the dispensing process, the so-called suck-back function, prevents unwanted dripping – for clean dispensing results.

The resin is degassed using the ViscoTreat series of treatment systems. This ensures an air-free process.

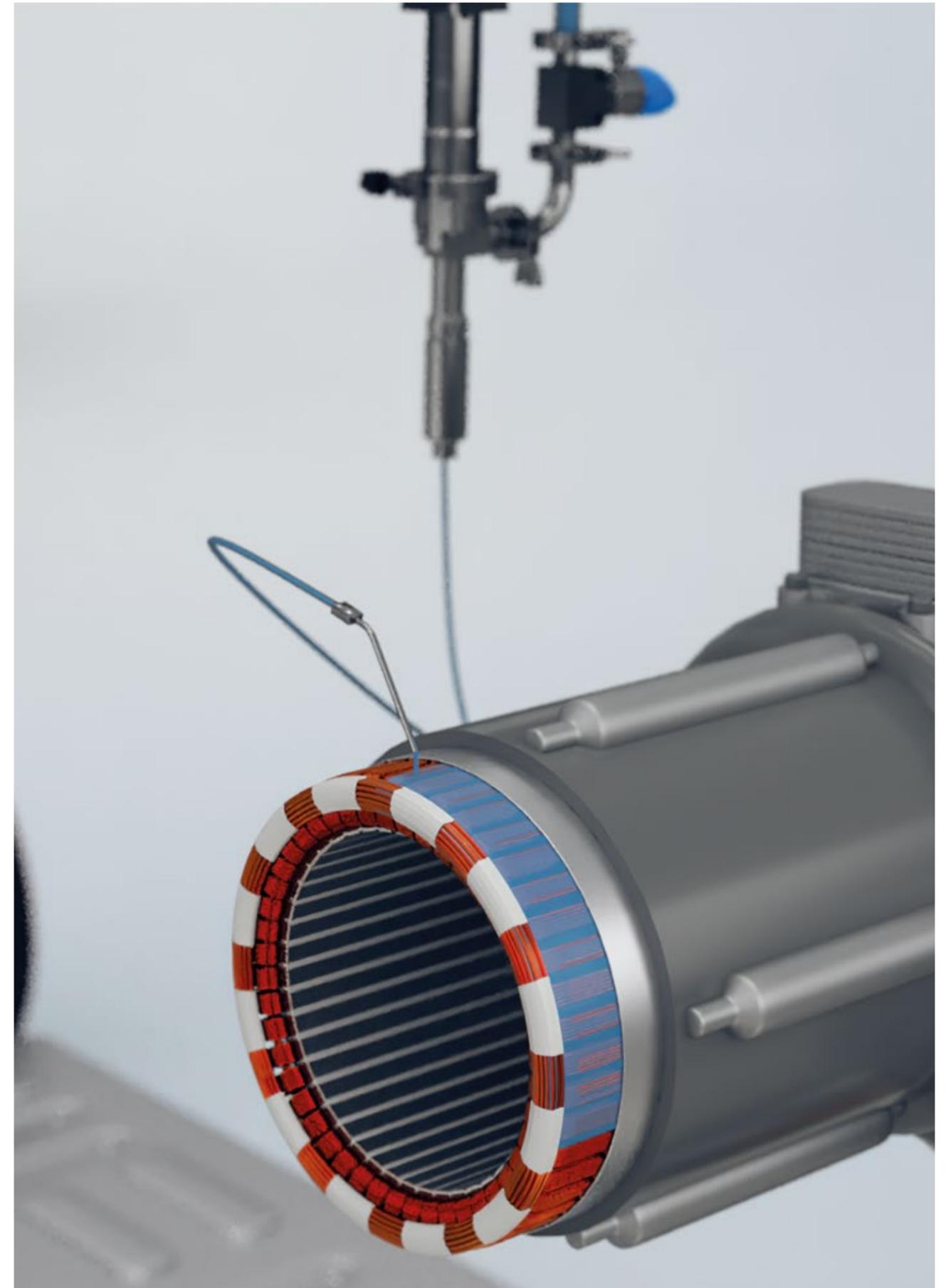
One or two component epoxy resin and polyester resin systems are frequently used as resin impregnation materials. These materials are usually low viscosity and thermally curing. ViscoTec dispensing systems are ideal for dispensing them. Even with extreme mixing ratios of the two component variants.

### TASK

Increasing the resistance and service life of an electric motor by complete resin impregnation of rotor and stator.

### SOLUTION

Dispensing systems based on the progressive cavity pump technology allow a continuous, pulsation-free and above all air-free dispensing of the resin for an optimal resin impregnation result.





## MAGNET BONDING

In the production of electric motors, the use of automated dispensing technology is becoming increasingly important. Especially the mechanical fixing of magnets is a big challenge in connection with the automation of this process. Especially as the process incurs high costs.

The bonding of magnets in sheet metal packs offers numerous advantages:

- Prevention of noise caused by vibration (without mechanical fasteners)
- Contact corrosion is avoided
- Increased strength
- Fast processing

One or two component acrylic or epoxy adhesives are commonly used. Primers can be used to increase the curing speed of structural acrylates.

Depending on the size of the motor, the quantities of adhesives to be dispensed can vary considerably.

ViscoTec Dosiertechnik offers optimal solutions for these applications – for both one and two component adhesives. The dispensing parameters can be easily adjusted for variable component sizes and flexibility.

Dispensing units, based on the endless piston principle, dispense accurately and with complete repeatability. Filled adhesives are delivered with particularly low shear. And curing of adhesives in the pump is conceptually impossible.

By means of an integrated agitator, the material treatment systems from the ViscoTreat series prevent the fillers from settling in the material. In order to achieve a better flow behaviour of the material, ViscoTec dispensing systems can be optionally heated.

Two component adhesives can be dispensed without any problems even with extreme mixing ratios.

### TASK

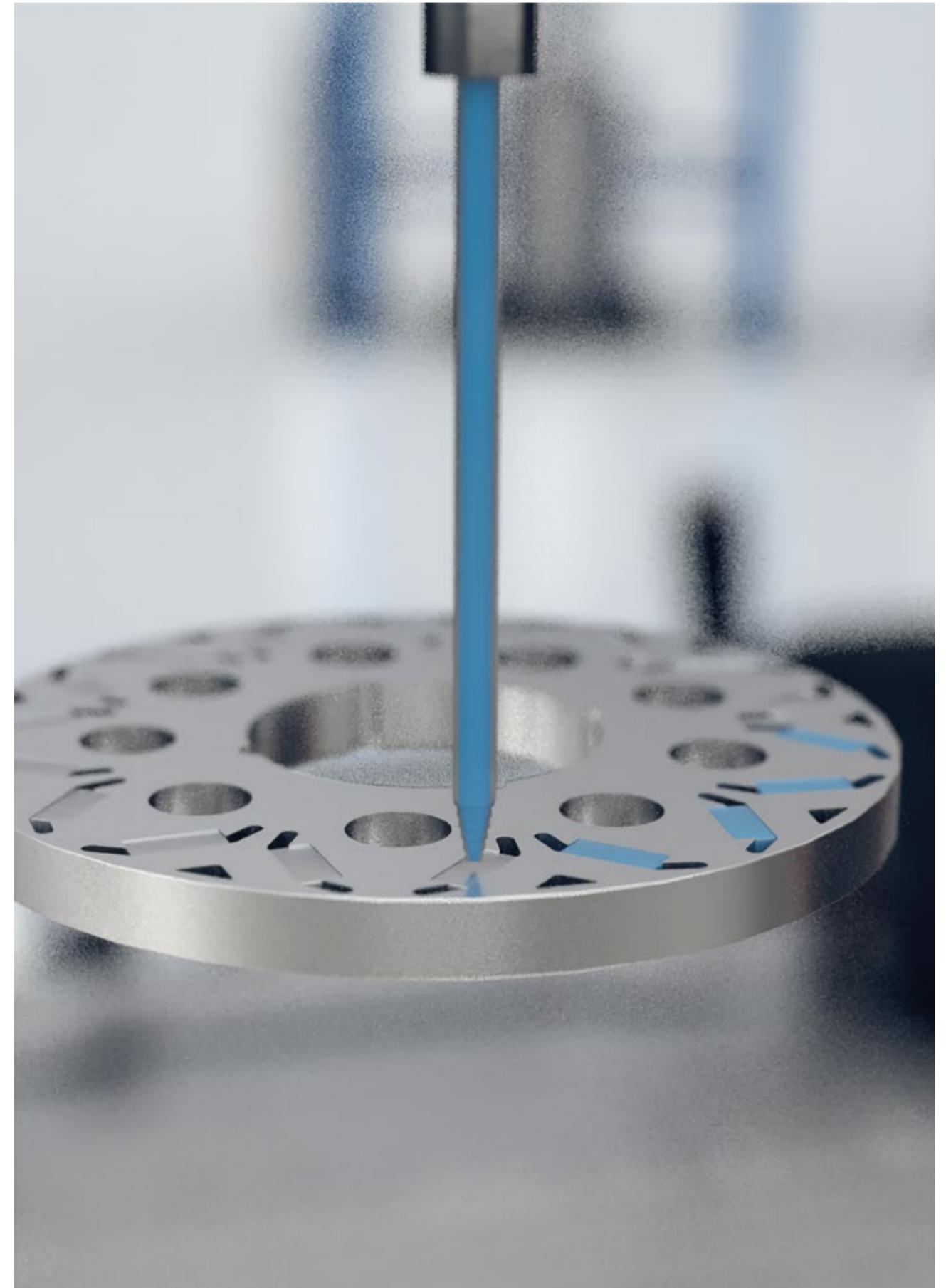
Optimization of the production process by bonding instead of mechanical joining methods.

Increasing the efficiency and performance of electric motors.

### SOLUTION

ViscoTec dispensing systems enable a continuous, repeatable and material-friendly dispensing of adhesives – completely independent of viscosity.

Repeatable and precise dispensing of one and two component adhesives in magnetic pockets of sheet metal packs is achieved.





## POWER ELECTRONICS

Numerous dispensing applications are found in the manufacture of electronic components such as control units, inverters or converters. The aim is to guarantee the performance and a long service life of these components through the precise application of adhesives and thermally conductive materials.

The application of a uniform bead of sealant to housings of electronic components protects them from external influences such as moisture, water and dust. Potting with, for example, two-component epoxy resins enables the electronics to be encapsulated from external environmental influences. Vibrations and shocks are unavoidable in a car. Bonding individual components with an elastic adhesive can absorb these and thus prevent defects.

Due to the high energy requirements of power electronics, the thermal load is very high. The application of abrasive thermal interface materials with high thermal conductivity helps to dissipate the heat generated and protect the component. For long service life with highly abrasive material we recommend our ceramic rotor.

ViscoTec offers you a perfect solution for all applications, from material removal to dispensing needles. The top priority is always a safe, efficient and reliable process.

### TASK

Protect electronics from thermal and external influences through process-safe dispensing of sealants, adhesives, potting materials & thermally conductive pastes.

### SOLUTION

A fully automated and process-safe dispensing solution for one- or two-component materials – from material emptying systems to dispensers. Selecting the right materials protects against rapid wear and reduces running costs. We offer the right solution for every application.





## FUEL CELL

Fuel cell technology has the potential to improve power generation in numerous applications. ViscoTec deals with different applications of viscous materials in fuel cell manufacturing, such as adhesive and sealing beads on bipolar plates.

The sealing bead is applied in different geometries, e.g. as rectangle or ring, depending on the component section. The goal in another application, for example, is to dispense a uniformly thick dispensing bead onto interconnectors. The top priority in this dispensing process is uninterrupted application and absolute repeatability. This is because this material seals the fuel cell and provides a safety function.

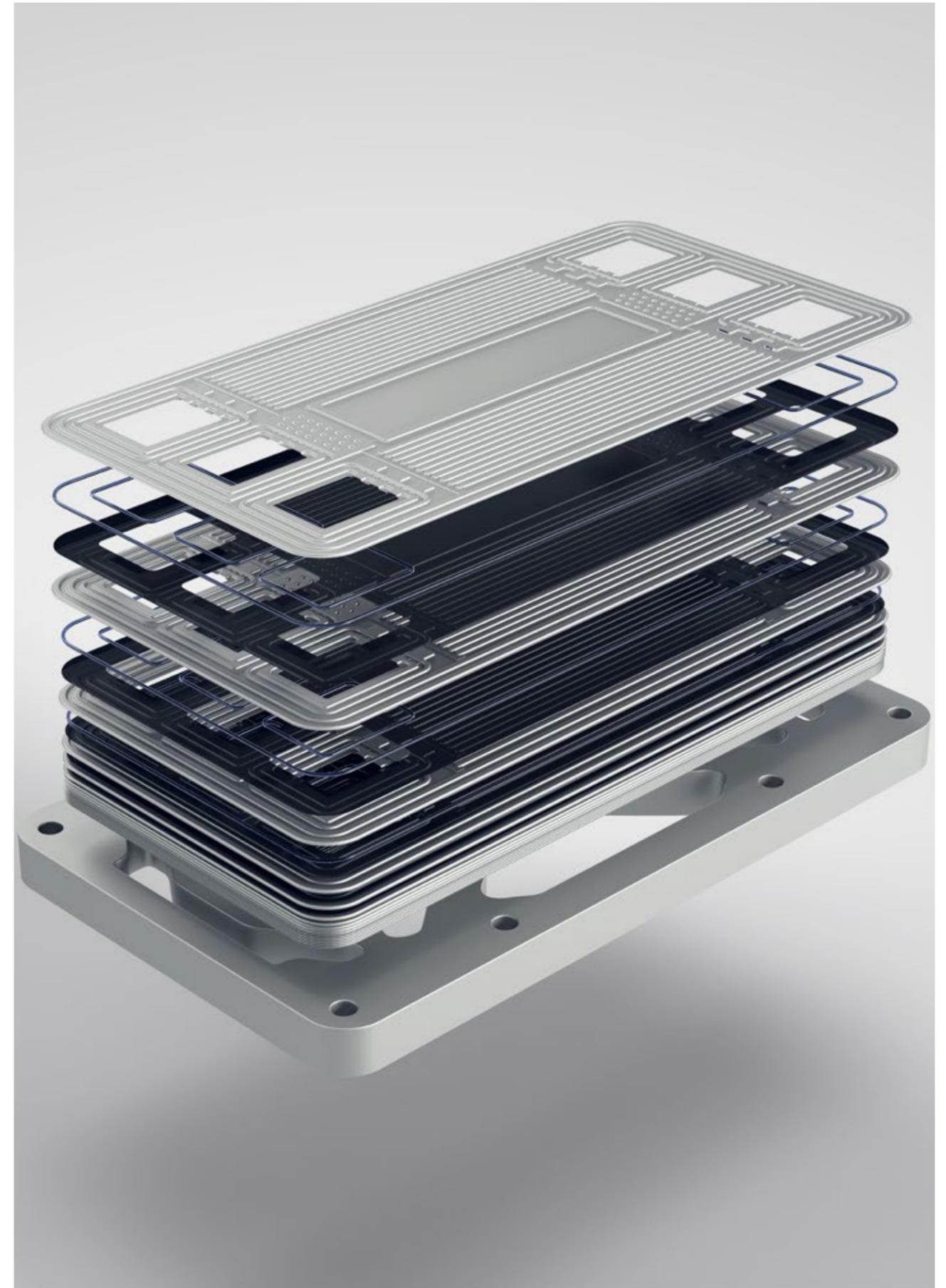
ViscoTec does not limit itself to adhesive and sealing applications in fuel cell production, however. The membrane electrode assembly manufacturing step, for example, is also an interesting application. It contains the proton exchange membrane (PEM) and the active catalysts. The corresponding catalyst-containing pastes of the anode and cathode are applied to the semipermeable membrane in a continuous process via the dispenser.

### TASK

Dosing systems for the fuel cell sector must be scalable, demonstrate a high level of process reliability and be designed to customer specifications.

### SOLUTION

ViscoTec's modular system enables a precisely custom-fit solution with consistently high dosing quality.





# SPECIAL SOLUTIONS FOR E-MOBILITY

## CERAMIC ROTOR

A further development of the proven stainless steel rotor from ViscoTec: For the process-reliable dispensing of abrasive fluids such as thermally conductive one and two component gap fillers, one component thermal conductive pastes or heavily loaded two component adhesives.

The ceramic rotor provides significantly longer service life. It is fully compatible with the dispensing and mixing systems of the RD-Dispenser series from ViscoTec. And can be used in both one, and two component systems.

The surface of the ceramic rotors is harder than that of the stainless steel rotors. When working with highly abrasive materials, this results in less wear and tear and therefore longer service life. For longer maintenance intervals and subsequently less downtime of the production line.



## INDIVIDUAL SOLUTIONS

ViscoTec is a system provider for totally efficient product handling. The portfolio is adapted to the material to be processed and to the production requirements. And finally, it is simply integrated into your production process.

ViscoTec has the benefit of its in-house technical center where dispensing applications can be validated together. Engineers and technicians are on hand to provide customers with advice and practical support in the technical center.

The perfect combination of many years of experience in the industry, system know-how, material knowledge and new, promising ideas drives the company and creates the basis for finding the optimum solution for each application. As a one-stop-shop, ViscoTec enables simple and fast implementation of an entire dispensing process.

## VIPRO-PUMP 100 % METAL-FREE\*

Perfect for the high standards in many manufacturing processes: Highly reactive materials such as sulfuric acids, anaerobic curing acrylates and metal-sensitive electrolytes, which require special treatment in battery production, can be perfectly dispensed with the ViscoTec vipro-PUMP. Perfectly repeatable and precise.

In order to prevent chemical reactions, such as curing or crystallization, the area within the dispenser that comes into contact with the product is completely free of metal.

\*Metal-free in the area in contact with the product.

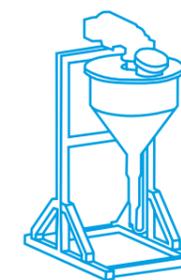


## MODULAR SYSTEM

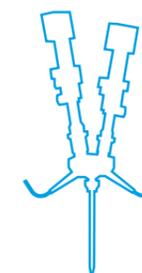
Based upon our process know-how, your system is individually adapted to your process – including engineering and consulting.



Material emptying



Material treatment



Dispensing

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