

117 INNOVATIONS

>> Hennecke customer journal for technologies and trends on the PU market



COVERSTORY

Production of automotive load floors

Hennecke celebrates the commissioning of the 100th PUR-CSM PREG line

PROJECTS

No two pipes are alike

Production of pigs with Hennecke
high pressure metering machines

ENGINEERING

New piston metering devices HT500evo and HT30evo

Processing abrasive fillers
in polyurethane systems





Dear customers,
dear readers,

Who wouldn't want to be ahead of the times? As a provider of machine and plant technology for processing a material as dynamic as polyurethane, this wish has already been a reality for Hennecke for decades. For us, our self-understanding involves not only adapting existing applications to market requirements, but also identifying new applications and consistently exploring the latest technologies. The PUR-CSM technology is an example of this. Even before the turn of the millennium, Hennecke recognised the importance of lightweight construction solutions, a concept that has now long been part of our everyday language thanks to the industry-wide energy efficiency paradigm shift. The commissioning of the 100th PREG plant globally for the manufacture of automotive load floors (see page 4) is a special anniversary here and shows us that this approach is a success for our company and likewise for our customers. We lay the foundation for this and many other technologies in our in-house TECHCENTER. Here, together with customers and raw materials suppliers, we develop applications starting with the initial trials, through to test runs and finally up to readiness for series production, so that the products can then successfully be placed on the market. One such example is the company's success story UNIROR, which produces pigs for pipe cleaning with polyurethane high-pressure technology from Hennecke (see page 8). To make sure this success continues over the long term, we also accompany users after this stage with our know-how and optimum on-site support from application specialists and trained service personnel. This is ensured by a seamless service network which we are continuously expanding, particularly in growth markets. As in the case of our Mexican subsidiary Hennecke México, which, with the change in company location, is considerably strengthening its customer service business alongside its service portfolio (see page 18). As you can see, the focus of our current customer journal is on important investments in the future, because we can only be successful in the long term if our customers become, and remain, market leaders in their areas. We'll leave the crystal ball to other people.

Dates

UTECH LAS AMÉRICAS

México City
04.04. - 06.04.2017

PLASTIC JAPAN

Tokyo
05.04. - 07.04.2017

PMA ANNUAL MEETING

Vancouver
07.05. - 09.05.2017

INTERZUM

Cologne
16.05. - 19.05.2017

PU CHINA

Guangzhou
29.08. - 31.08.2017

CAMX

Orlando
12.09. - 14.09.2017


COMPOSITES EUROPE

Stuttgart
19.09. - 21.09.2017

As at March 2017

Alois Schmid
Managing Director Technology

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Production of load floors for Pimsa Otomotiv:

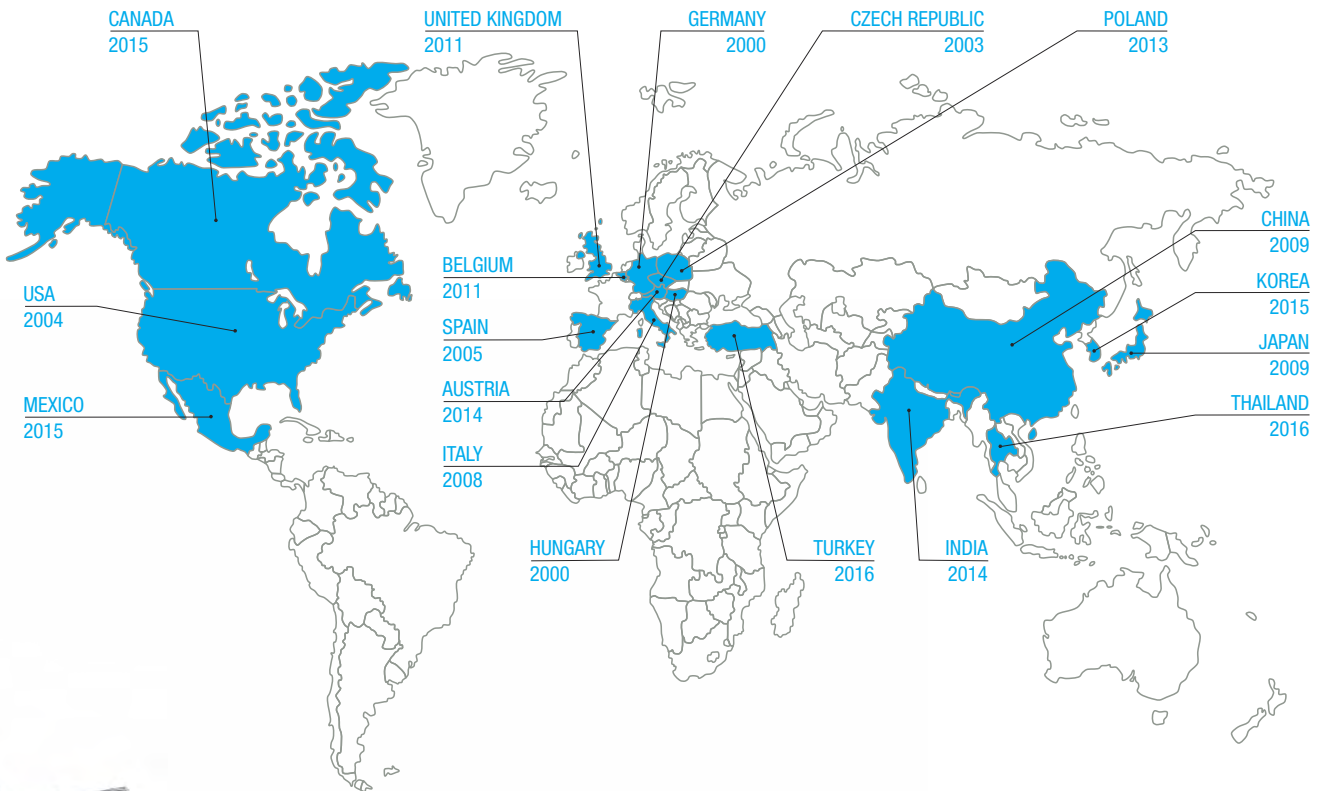
Hennecke celebrates the commissioning of the 100th PUR-CSM PREG line

100 PREG SYSTEMS WORLDWIDE

Hennecke had already laid the foundation stone for the development of a pioneering polyurethane spray technology in 1998 in order to establish an efficient, modular product range from it in 2004 under the generic term PUR-CSM (Polyurethane Composite Spray Moulding). This product range implements highly flexible plant concepts in several areas of automotive and non-automotive applications. A key area of the CSM product portfolio, the so-called "PREG" sandwich load floor technology, is currently celebrating a special anniversary. The Hennecke customer and vehicle interior specialist, Pimsa Otomotiv, headquartered in the Turkish city of Kocaeli, received the globally 100th PUR-CSM PREG line and thus entered the proud group of owners that promote lightweight construction in vehicles with the large-scale production of composite products on a paper core basis.



Pimsa Otomotiv headquarters in the Turkish city of Kocaeli



The focus for all suppliers and OEMs on the market is on lightweight automotive construction not least due to the increasingly stringent emission standards. In addition to more efficient units or alternative drive concepts, weight is a decisive factor for the energy efficiency of all vehicles. The polyurethane specialist Hennecke identified the increasing significance of lightweight construction solutions at an early stage and is now the global market leader for PREG plant technology as a constituent part of PUR-CSM technology. The term "PREG" is the abbreviated form of the well-known Prepreg technology, whereby a glass fibre mat is impregnated in the preliminary process stages. Hennecke has developed this concept further and generated an active spray application from the pre-impregnation of the glass fibre mat, which is used immediately before the moulding process. Various aspects play a decisive role here with regard to large-scale production. For example, the Hennecke experts can rightly be proud of the globally unique self-cleaning and patented spray-moulding technology, which can also implement any desired shot interruptions and local reinforcements.





*Largely automated production
with cycle times of under 60 seconds*

The sum of the benefits also helped to convince the Pimsa Otomotiv company, which produces load floors for large European OEMs using Hennecke technology. Pimsa Otomotiv was founded in the Turkish city of Istanbul in 1975 and was one of the first companies in the Turkish automotive industry at the time to specialize in the manufacture of products from polyurethane. Seating foam, steering wheels and armrests count among their first products. Due to the high product quality and the increasing use of polyurethane in the automotive industry, but at the latest since Turkey's entrance into the European Customs Union, the automotive supplier has grown just as quickly as its product portfolio. In 2012, Pimsa Otomotiv moved into its new "LEED Certified" factory and office building in the Turkish city of Kocaeli. With its continuously growing organizational structure and through cooperation with important European suppliers, Pimsa Otomotiv provides services for a wide range of customers in all European core markets. The current product portfolio includes, amongst other things, PU floor mats, sound proofing elements, interior and exterior trimming, door trimming, sunvisors and load floors for passenger and commercial vehicles. The quality of the products is documented by the company using the highest quality standards in accordance with the ISO standard and in the framework of high demands placed by large automotive groups such as Toyota, Mercedes and Ford.

*Realised using the
PUR-CSM PREG technology:
high-quality load floor from
the Pimsa Otomotiv production*

Like many other PUR-CSM systems on the market, the PREG system technology installed within the Pimsa production is highly standardized and, to a large extent, automated. High-capacity robots place the prefabricated paper sandwich preforms in a spray booth fully automatically, using a gripper specially developed for the process. Following that, state-of-the-art mixhead technology provides a highly efficient spray coat in connection with the patented PUR-CSM spraying technology. The exact surface weight requirement for the later lightweight construction plays an enormous role in this step. Hennecke relies on the self-cleaning tried and tested round jet spray technology. In competition, the PUR-CSM technology often had to be benchmarked against standard spray applications and was always able to demonstrate a further unique selling point in the process: the homogeneous distribution of the reactive PUR mixture. This brings significant savings on raw material for Pimsa Otomotiv.

In addition to the specific quality of the end product, this represents a further competitive advantage for the PUR-CSM technology in general and the PUR-CSM PREG technology in particular. After the successful spray coat, the robots pass the components into a press. Special moulds facilitate a close contour finished part production. Often, several finished components are produced directly in one mould stroke. Cycle times of under 60 seconds therefore facilitate Pimsa Otomotiv's series applications for the mass market.

Adnan Özyeğit, Assistant General Manager of Pimsa Otomotiv, is also convinced about the benefits: "When it comes to being a key player in the automotive Industry at global scale just as in our case, saving raw material is a clear competitive advantage for us. In addition, Pimsa's sustainable performance in providing the high-quality products at pricewise competitive edge through our lean and innovative approach, starting from scratch in design stage up until our products are delivered to the production line of our customers at the right time, quality and quantity make Pimsa Otomotiv stand out from its competitors. We have deeply investigated almost all relevant systems before investing in PREG technology and finally decided that Hennecke would be the best choice to conform our standards to provide the best solution for our customers. In the light of what we have achieved so far it proves to be satisfactory and reassures our confidence in Hennecke technology."

Therefore, it is no wonder that the PUR-CSM spray-moulding technology has become established as the standard for producing load floors, parcel shelves or sun shading elements for sliding glass roofs since the turn of the millennium. "However, this does not mean that the end of technological development is in sight," says Jens Winiarz, Head of Sales for Composites & Advanced Applications for Hennecke: "Hennecke's customers, such as Pimsa Otomotiv, will undoubtedly continue to present components in the field of PREG technology which will fully convince the industry professionals when it comes to lightweight construction."

Like him, Adnan Özyeğit is also certain that the development potential for PREG products has not yet been exhausted: "As it's well known and respected worldwide, we're a highly PUR oriented NVH parts manufacturer company and yet we started to divert our expertise to the composite field of applications trying to provide cutting edge NVH and trim solutions for our customers. In line with this strategy, it is for sure that Pimsa Otomotiv will produce even more high-performance PREG products in the future. As one of the leading automotive supplier in Turkey, Pimsa Otomotiv is always committed to providing innovative products with an impressive property matrix. Currently, we see numerous opportunities in PREG components."



Successful teamwork (from left to right): Zarif Bilgen, General Manager of Galanthus Ticaret, Hennecke's agency in Turkey and Adnan Özyeğit, Assistant General Manager of Pimsa Otomotiv



PUR-CSM PREG exterior applications

The first large-scale application for exterior components will be used in the roof model for the new "smart fortwo". The predecessor model already relied on glass fibre-reinforced polyurethane for this component. However, the PUR-CSM PREG technology was able to once again save significant weight, causing the conventional long glass fibre technology that had previously been used for this component to be discontinued. Fiat Chrysler Automobiles (FCA) were also persuaded by this benefit: The roof module for the new Jeep® Renegade is also realized in a sandwich construction with a paper honeycomb core.

No two pipes are alike

Production of pigs with Hennecke high pressure metering machines



UNIROR
UNIVERSAL ROHRREINIGUNGS GMBH
FORST/LAUSITZ

The UNIROR Universal-Rohrreinigungs GmbH from Forst in the region of Lausitz is an internationally leading specialist in the cleaning of pressure lines. The company has been active around the globe for 20 years providing a free pressure flow in pipelines. The pipe cleaning specialists install pigs made from polyurethane for this purpose. Owing to a new TOPLINE type Hennecke metering machine as well as extensive tests and optimisations in the Hennecke TECHCENTER, the workers at Lausitz are now able to produce significantly more efficient pigs in a better quality.

“No two pipes are alike,” the managing director of UNIROR, Jeannette Jentsch, explains the challenges of this specialist cleaning technology. “Steel, concrete or plastic pipes transport drinking or process water, oil, gas, cement, slurry or liquid and paste-like foodstuffs. Our pigs are suitable for all pipe types and media.”

The pigs pass through the pipe using hydraulic pressure. They are specially manufactured for each particular operational application and can be the size of a small cone or, just like the biggest pig produced so far, have a cylindrical shape with a 3.2 m diameter and 4 m length. The core of the pig is made of polyurethane foam. The external wall is coated with an additional PU material in order to make the pig abrasion resistant. The external wall can be equipped with various small tools in order to remove scaling from inside the pipe, as the pig works in direct contact with the pipe walls for adherent scaling. For loose contaminants, the pig is slightly smaller than the pipe diameter and induces an increase in the flow rate between the pig's external wall and the pipe's internal

wall, thus swirling up the waste material and driving it in front without causing pressure surges. The pig systems are produced in a way so that pipe lines coated on the inside are not damaged.

The appropriate strength for the respective application of the pig is important for cleaning optimally. If there are narrow points, e.g. through spacers, the pig has to be very flexible so that it can reassume its previous shape after the narrow point. For solid deposits, the pig is hard and firm. The workers in Lausitz produce the pigs by hand.

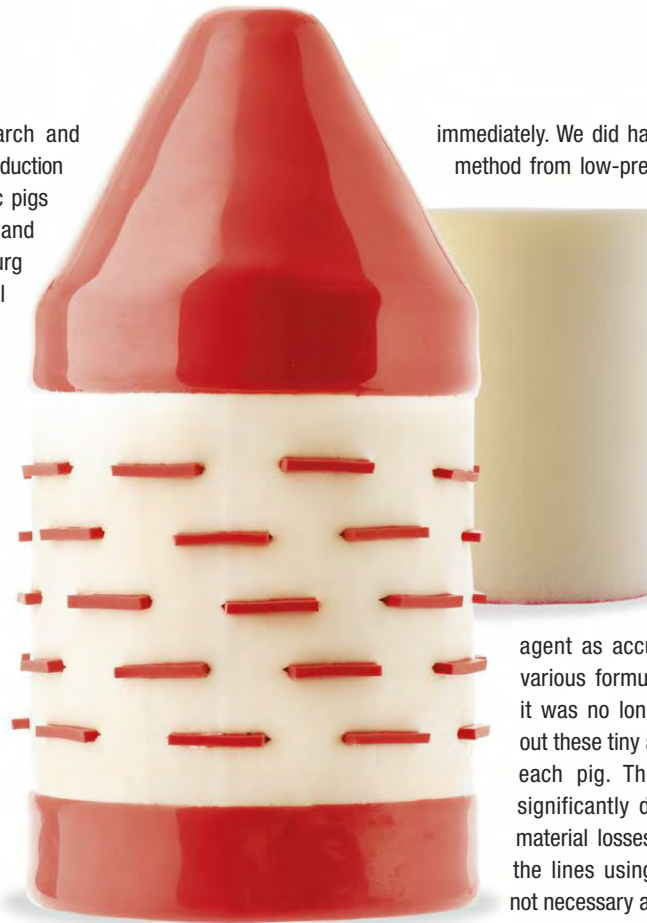


Special pigs in sizes up to a diameter of 3.2 m are available

PROJECTS

“Eight years ago we started a research and development project for improving the production and application technology for synthetic pigs – aided by the state of Brandenburg and with collaboration from the Brandenburg University of Technology Cottbus as well as Vattenfall, BASF and LMBV,” explains Jentsch. “The low pressure system that we had constructed at that time for core production was worn out after a short time and was no longer on par with the current state-of-the-art technology. The material and energy consumption was simply no longer up-to-date. The foaming of the core also took much too long.”

Jentsch and her team looked around for a new system among the producers of PU metering machines. To this end, Jentsch said: “The possibility of extensively testing and familiarising ourselves with the metering machine in the Hennecke TECHCENTER using our mould and raw material components over several days convinced us



immediately. We did have to adapt our manufacturing method from low-pressure to high-pressure mixing, which was unfamiliar to us up to that point. With their extensive experience, however, the application specialists in the TECHCENTER helped us a great deal at this point. What was apparent to us straight away was the clear improvement in the quality of the pigs. With the old system, it was very difficult to meter out the tiny amounts of blowing agent as accurately as we needed for our various formulations. With the new system, it was no longer a problem at all to meter out these tiny amounts with reproducibility for each pig. The manufacturing times have significantly dropped too. Furthermore, the material losses are a lot lower, as rinsing of the lines using high-pressure technology is not necessary any more.”

Passing through the pipe using hydraulic pressure: sponge-type and lamellar pig made of polyurethane



TOPLINE HK for the efficient production of polyurethane pigs in operation at UNIROR

Hennecke has customised the Standard TOPLINE metering machine for the special requirements of pig production. The PU specialists have installed a special injection block onto the mixhead in order to meter out tiny amounts of propellant with reproducibility. Furthermore, the height of the mixhead boom can be adjusted so as to be able to fill the various mould sizes.

At the end of last year, UNIROR produced 120 large pigs within four weeks using the new TOPLINE metering machine for a major contract. "We would never have managed that with the old system," Jentsch emphasised. "It ran like clockwork with the new Hennecke metering machine. I am sure we could even manage more too."



Hennecke TECHCENTER: discover true innovation

PU processors can use state-of-the-art polyurethane processing technology for almost all applications across a surface of around 1000 square metres. Trained Hennecke application specialists get the most from every product idea based on polyurethane and other reactive plastics regardless of whether the focus is on process development and raw material testing under close-to-production conditions or product development and optimisation. The PU specialist also offers training, customer demonstrations and sampling as part of the Hennecke TECHCENTER services.

The following technologies are housed in Hennecke's TECHCENTER:

- » Processing of PU-based rigid, flexible and integral skin foams, elastomers as well as epoxy resin systems and the reactive polyamide 6 (T RTM)
- » Application of the RIM, RRIM, SRIM, PUR CSM fibre composite, clearmelt®, Skinmelt and Sprayskin processing methods and HP-RTM applications
- » Hand or robotically operated pouring of reaction mixture into open and closed moulds

Operators are welcome to register for the TECHCENTER services on the Hennecke website.



New piston metering devices HT500evo and HT30evo

Processing abrasive fillers in polyurethane systems



The material polyurethane has a very broad, customisable profile of characteristics. Additives such as powder or fibrous fillers can extend this again. Fillers are thus used for reinforcement, noise absorption or as a flame retardant. In general, solid fillers have an abrasive effect in the processing machine. Common metering units for liquid components which are equipped with high-speed piston pumps cannot withstand the high abrasiveness of solid fillers long-term. Hennecke has developed the new metering device HT500evo with a low-wear plunger pump especially for processing main components containing fillers. But Hennecke also has a suitable solution prepared for processors who need to meter small quantities of fillers as auxiliary components into multi-component high-pressure mixheads. The PUR specialists show how users can utilise the HT30evo, for example, to efficiently process abrasive colour pigments as additional components or as main components for low output rates. Both devices are constructed in such a way that they can produce for a long time under these highly abrasive conditions with high precision and repeat accuracy.

Adaptable: The HT30evo is equally suited to high and low viscosity components and compatible with all common high-pressure mixheads



Processing of main components containing fillers for part weights of up to three kilograms: the HT500evo

Particularly due to the increased demands of fire protection, many polyurethane processors are being faced with the challenge of switching from liquid to solid and therefore abrasive flame retardants. Without the use of solid flame retardants, fulfilling current fire protection regulations would not be possible when manufacturing polyurethane products. In many sectors, such as the construction sector, for rail vehicles or aviation, the other common liquid, halogenated flame retardants no longer suffice and must be supplemented by non-halogenated flame retardants. Such flame retardants are mostly inorganic and are therefore found in solid form.

With the high-pressure piston metering machine TOPLINE HT for filled PUR systems, Hennecke's portfolio has already included a successful wear-resistant and reactionless continuous metering system with a tandem plunger-piston pump for extreme requirements for many years. For polyurethane processors who have always produced exclusively with liquid flame retardants and must now switch to solid additives – but for whom investing in a TOPLINE HT is not practical – Hennecke has added an efficient metering unit with a very attractive price-performance ratio to its product programme with the low-wear HT500evo. As opposed to conventional devices with high-speed piston pumps, the HT series is equipped with slow-running plunger-piston pumps.

The HT500evo is suitable for processing main components containing fillers for parts weighing up to three kilos. One of the main applications of this device is the production of comfort flexible foam, which is, for example, used for seats and cushions in vehicles, especially in public transportation. Fire protection regulations have recently intensified especially in the rail transportation sector, so producers have to switch to solid additives. Another area of application of the HT500evo is rigid foam applications, as for insulation in the construction industry. The fire protection class required here, B2, can also only be achieved with solid flame retardants.

Hennecke offers the HT500evo as an independent 2-component metering machine or as a module device for retrofitting an existing TOPLINE metering machine. In addition to processing polyols with solid flame retardants – for example, ammonium polyphosphate, melamine resin and expanded graphite – the HT machine is also particularly suitable for processing polyols made of renewable raw materials, recycled polyols, polyols with fillers such as PUR regrind or abrasive fillers such as glass fibres, calcium carbonate, barite, abrasive colour pigments and highly viscous raw material systems.



Partially integrated into a heating cabin:
HT30evo for processing high temperature components

Hennecke also has decades of experience in the processing of additives which are processed as additional components via a high-pressure multi-component mixhead. The new HT30evo is used, for example, to meter abrasive pigment colours or chemically aggressive or filler-containing additives to the reactive main components in a high-pressure mixhead. Like with its "big brother", the HT500evo, Hennecke offers the extremely compact unit in two different versions: as an add-on with the appropriate pump table (with and without control) or partially integrated into a heating cabin for processing high-temperature components. All variants of the HT30evo are fitted with a PLC interface for integration into the metering machine and have important equipment features even in the standard

scope of delivery. The device is equally suitable for components of high and low viscosity. Even particularly low output rates are no problem for the HT30evo. Despite differing ranges of application, the two new piston metering devices have one thing in common: high quality components and first-class processing ensure long product life even in harsh production conditions. For all metering machines, Hennecke offers an extensive mixhead portfolio particular to each respective applicatio



Technical data:	HT30evo	HT500evo
Output	5 – 30 cm ³ /s	100-500 cm ³ /s
Stroke volume	450 cm ³	3300 cm ³
Working pressure	200 bar	200 bar
Filler particle size	up to 200 µm	up to 350 µm
Component temperature	up to 80°C (120°C)*	up to 60°C

*integrated into heating cabin

Hennecke invests in the future of fibre composite components

3-Component STREAMLINE metering machine in the Hennecke TECHCENTER



With a fully equipped 3-Component metering machine of the type STREAMLINE, PU specialist Hennecke expands its performance capability in the field of research and development. The machine system features all the necessary requirements for the production of fibre composite components by means of a wide variety of matrix systems in the HP-RTM process. It is readily available to Hennecke customers at the in-house TECHCENTER.

In the Hennecke TECHCENTER, operators can use both Hennecke's state-of-the-art polyurethane processing technology and know-how to develop and optimize products and also to test raw materials and processes under close-to-production conditions. In order to give the 1,000 m² research and development center a greater performance capacity and further accelerate innovations, the company has recently invested in a tailor-made 3-Component STREAMLINE metering machine, which is able to process all current matrix systems of fibre composite components. These include polyurethane, epoxy or reactive polyamide 6 raw material systems.

"In the TECHCENTER, all reactive matrix materials available on the market can now be used to produce fibre composite components on a metering machine for the first time," explains Jürgen Wirth, Manager Application and Development Technology. "The major benefit is that a variety of matrix systems incompatible with each other can now be processed in very quick succession, as the integration of three individual metering lines minimizes complex rinsing and cleaning processes."

Hennecke thus responds to the ongoing trend of light-weight construction using fibre composite components. These usually consist of a fibres layer and a matrix material which surrounds the fibres and gives the component its solid form. Glass, carbon, aramid,

metal and natural fibres can be used as fibres, for example. The thermosetting matrix systems may consist of polyurethane or epoxy resin. The reactive polyamide 6 is available as a thermoplastic matrix system. It is the only system, which ideally combines with the conventional injection moulding process. "This opens numerous possibilities for the product development of composite fibre components in the groundbreaking thermoplastic-RTM field of application," Wirth emphasizes. Specifically for this purpose, Hennecke is able to provide customers in the TECHCENTER with an ENGEL company-manufactured injection moulding machine.

In the field of tool technology, too, Hennecke is excellently positioned. Various vacuum units, mould carriers and presses can be used to interact with the new metering machine, in order to guarantee an ideal process workflow. All mixhead systems available with Hennecke are also compatible. In addition to the extensive machine technology and the process technology experts, experienced chemists bring their know-how to the TECHCENTER to find the optimal solution on equal footing with raw material suppliers and operators. Furthermore, the specialists are also able to develop new process combinations, thanks to the flexible design of the research and development center.



Cumulative know-how of fibre composite components production (from left to right): Jens Winiarz (Head of Sales Composites & Advanced Applications), Jens Geuer (Product Manager Lightweight Technologies), and Jürgen Wirth (Manager Application & Development Technology) in front of the new 3-Component STREAMLINE in the Hennecke TECHCENTER.

Hennecke México

With strengthened service at a new location

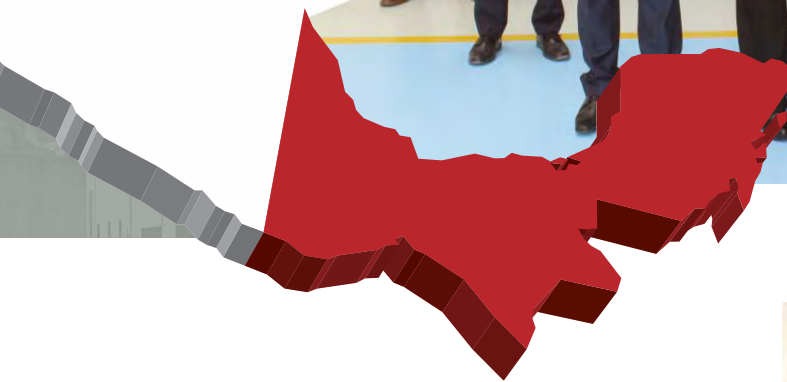


Five successful years after the official formation of Hennecke México, the entire team of the Mexican Hennecke subsidiary is happy about the move to Santiago de Querétaro. In addition to an office space increase, the new location offers quicker accessibility due to the proximity to the capital México City.

Many large OEMs and renowned subcontractors in the immediate vicinity of the Querétaro province produce automobiles, commercial vehicles and accessories for the North and South American automotive market. That way Hennecke México can particularly offer these customers a much quicker and, in turn, better service. What's more, Querétaro has an airport. This means that further removed customers and users, who have essentially worse access to transport routes, benefit as well. The new company building provides larger office spaces as well as an attached workshop and an area specially set up for customer training. The service area has accordingly been strengthened in terms of personnel. Starting immediately, five employees in total will be responsible for technical support, the spare parts business and a comprehensive portfolio for training measures in the national language, which are each offered in varying performance levels. Among other things, a HIGHLINE metering machine, which is also

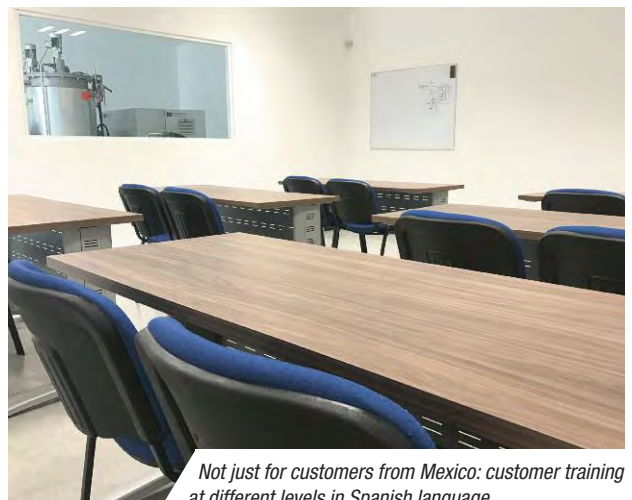


Offices, training rooms and adjacent workshop: the new company site in Querétaro



The Hennecke México team

set up for material test-runs, is permanently available for this. The new company location also provides an essential and extensive spare parts warehouse. This applies for standard parts like mixheads and metering pumps as well as for special assemblies that are stored according to the customer's requirements. Last but not least, all of the advantages of the new location considerably improve the reaction time for local customers, who already treasure the time zone-neutral support. The conditions are therefore ideal to further expand the Mexican market's great trust in Hennecke products.



Not just for customers from Mexico: customer training at different levels in Spanish language

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