



WITTENSTEIN

# move

The magazine for customers and partners of WITTENSTEIN AG



## APPS TO SPEED UP THE MILK RUN

WITTENSTEIN bastian lives – and breathes life into – Industry 4.0

## SHAPING THE FUTURE

The WITTENSTEIN Innovation Factory is officially opened

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## Content

### Masthead

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Dear readers,

For several years now, WITTENSTEIN has been pursuing its vision of becoming a system provider for mechatronic drive technology. By converging mechanics, electronics and software, we are aiming to create new, win-win solutions that allow you – our customers – to continue on the growth trajectory with us. The huge potential inherent in mechatronics is still far from exhausted: on the contrary, the limits of mechatronics are being pushed back farther and farther. Innovations – new and original ideas, devices and processes – are breaking into the markets with unprecedented success. Our group sales, which increased to 254 million euros in fiscal year 2013/14, provide impressive testimony to this. Yet to quote Christian Morgenstern, the popular German poet: “If you do not know the destination, you cannot find the way”. Put simply, innovations are impossible without visions.

You don't need to be a visionary, however, when it comes to tomorrow's production processes. Classic engineering will be fused with modern information technology in “smart factories”. The question is, where will this future of ours be shaped? I'm very optimistic on this point: Germany – and in particular the “German Mittelstand”, which is the object of worldwide envy and admiration – enjoys a clear competitive edge.

The main benefits Industry 4.0 holds for customers are undoubtedly the ability to control flexibility and the realization of new networks between people and objects. This interconnectedness

of the virtual and real worlds is especially important in logistics. By optimizing logistical processes in this area, we can save resources – both material and capital. WITTENSTEIN's “Future Urban Production” facility in Fellbach, near Stuttgart, is already underlining this claim. The “Milk Run 4.0” is currently undergoing a test phase there and is proving to be about fifty percent more efficient than the traditional method for supplying materials to the production shop. You can discover exactly how this works in practice in this latest issue of our customer magazine.

Simply converging the three disciplines mentioned above will not be enough, however. We are all called upon to step up our efforts to understand the needs and individual situations of our customers – and their customers too. WITTENSTEIN alpha GmbH, our biggest subsidiary, is strongly committed to this objective: in an interview overleaf Dr. Bernd Schimpf, the new General Manager there, gives a personal introduction to himself. He has worked for the Group for many years now and has big plans to maintain the momentum of WITTENSTEIN alpha's global growth. I would like to join him in cordially inviting you to visit our booth in Hall 9 at Motek 2014, the International Trade Fair for Assembly and Handling Technology.

Today, the WITTENSTEIN Group is represented by around 1800 staff worldwide. Every single one of them is an innovator and a future shaper. With this in mind, we promise to stay on the move for you in the future!

Professor Dieter Spath  
President of WITTENSTEIN AG

## Dr. Bernd Schimpf

Dr. Bernd Schimpf took over as General Manager of WITTENSTEIN alpha GmbH with effect from April 1, 2014. Dr. Schimpf, aged 52, who originally trained as a mechanical engineer and can draw on rich expertise and management experience in his new challenge within the WITTENSTEIN Group, previously held overall responsibility for the three mechatronic Business Units as Director Mechatronics.

*move talks to:*

## Dr. Bernd Schimpf

***move: Does your new challenge mark a return to your true professional roots?***

**Dr. Bernd Schimpf:** Yes, it does, although what I really wanted was to specialize in aerospace engineering. In those days, there were quite simply more places available for undergraduates in mechanical engineering. I therefore studied Mechanical Engineering at the Institute for Machine and Gear Unit Design at the University of Stuttgart. Following my graduation, I initially worked as an academic assistant for gear units, structural mechanics and information technology. I joined WITTENSTEIN – or to be more precise the WITTENSTEIN bastian subsidiary in Fellbach, just outside Stuttgart – in 2001. My first job there was to help the Executive Management transform what was a traditional family business manufacturing gear wheels into a competitive industrial producer of gearing technology. It took us two years to introduce a new bevel gear technology that would put us in a position to design and make premium quality bevel gears.

***In 2008, you moved to headquarters as Head of Generating Process Management, where you described your new mission***

***at the time as being to “generate new things from creative chaos”. That sounds very exciting.***

The chaos principally consists of a future which sometimes announces its intentions but is loath to give any promises regarding successes or failures. We'll only find out in a few years time whether the issues we're tackling today are the right ones. If you want to succeed, you must be able to rely on your instinct and not just on your technical know-how. And you have to create suitable conditions for your staff to develop their creative, explorative potential. If the general direction is on target, the issues addressed in the generating process will also make the transition to production and sales.

***WITTENSTEIN is driving the technology shift from mechanics to mechatronics – and up until April this year you were responsible. Could you give us your own personal assessment?***

Our Group strategy of systematic specialization in mechatronic solutions also includes the physical convergence of our three mechatronics Business Units: WITTENSTEIN motion control, WITTENSTEIN



Dr. Bernd Schimpf  
General Manager of WITTENSTEIN alpha GmbH

cyber motor and WITTENSTEIN electronics. The new WITTENSTEIN Innovation Factory – the biggest single investment in the history of the company costing thirty-five million euros – enabled us to reach this important milestone earlier this year at the end of May. I switched to WITTENSTEIN alpha with mixed feelings, but with a clear conscience, just in time for the move into the new building.

***What are your plans for WITTENSTEIN alpha?***

My team and I hope to build on the company's impressive success story so far – while keeping a sharp focus on our objectives of continued worldwide growth as well as innovative products and services that will benefit our customers. At the same time, I'll be careful not to neglect the challenges of Industry 4.0. My experience to date both at our various subsidiaries and at the headquarters of the WITTENSTEIN Group will stand me in very good stead with WITTENSTEIN's oldest family member and help us uphold our commitment to being a world class global partner for the customers of our innovative drive components and systems. The close cooperation between the subsidiaries and Business Units is now also

reflected at top management level: Philipp Guth and Michael Müller (joint General Managers of WITTENSTEIN bastian) now also belong to the Executive Management of WITTENSTEIN alpha. We can therefore leverage synergies better and interact even more strongly in future.

***You've been supporting WITTENSTEIN on its journey into the future for thirteen years now. Would you care to give us an idea of what you expect to be doing in the next thirteen years?***

I'm afraid I haven't got a crystal ball to gaze into. If I look back to the days when I was a student, for instance, I could never possibly have imagined how computer performance would literally explode within the space of a generation, not to mention the advent of the Internet or of course the Internet of Things. I can still recall very well how, when I was writing my doctoral thesis on the flow inside a gearbox, it took one of those mainframes two weeks to calculate something that actually happens in no more than a few milliseconds. What I'm trying to say is that only one thing is certain, namely that the future – both my own and that of WITTENSTEIN – will stay just as exciting as it is today.



Shaping the future  
The WITTENSTEIN Innovation Factory is officially opened

»Congratulations on this magnificent installation: I'm not sure whether it sprouted from the fields or landed from outer space.«

PROFESSOR PETER SLOTERDIJK



»Industry 4.0 reaches far out into uncharted terrain. If we can succeed in illuminating, penetrating and comprehending this topic on the broadest possible basis, we will be able to play an active part in shaping the future rather than simply enduring it as our fate.«

DR. MANFRED WITTENSTEIN



*Industry 4.0  
powered by people*



In the middle of the Production area some six hundred invited guests from the worlds of business, politics and science celebrated the official opening of the WITTENSTEIN Innovation Factory

An unusual building and an unusual speaker: just two years after the ground-breaking dig, the WITTENSTEIN Innovation Factory was officially opened at our company headquarters in Baden-Württemberg (South-West Germany) in the presence of six hundred invited guests, who gathered in the middle of the new production spaces. Professor Peter Sloterdijk, the well-known philosopher, shed light on the meaning of "innovation" from a cultural-philosophical perspective. His speech focused on the evolution of man – an inquisitive creature by nature – into an architect of innovation.



**Two-year construction project condensed into 76 seconds:**  
The making of the WITTENSTEIN Innovation Factory

**Industry 4.0 powered by people**

The experts are in no doubt: the core ideas of Industry 4.0 provide a unique chance to respond even more flexibly to customer needs – not only with dedicated products but also with innovative, dedicated production processes. Professor Dieter Spath, President of WITTENSTEIN AG, is extremely enthusiastic about the new opportunities for flexible work organization: "Industry 4.0 is powered by people." He is convinced that the new building offers the best possible conditions for achieving this objective: "We'd be delighted if customers from all over the world came to visit us, curious to learn more about the prospects for cooperation with us in a partnership driven by innovation. Who knows, maybe the Innovation Factory will become another popular place of pilgrimage for future production methods, similar to the one already set up in Fellbach, just outside Stuttgart, with our 'Future Urban Production' concept."



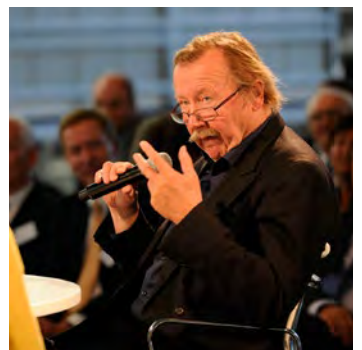


Official opening of the WITTENSTEIN Innovation Factory

**Hands-on drive technology:** Following the official ceremony, guests had a chance to take part in an interactive tour of the new building.



*A place of pilgrimage for future production methods*



**Highlights of the opening ceremony:**

Keynote speech by Professor Dieter Spath, President of WITTENSTEIN AG, and panel discussion between philosopher Professor Peter Sloterdijk and Dr. Manfred Wittenstein, Chairman of the WITTENSTEIN AG Supervisory Board



*Tomorrow's employees will be planners and decision-makers in a complex environment*

**Creating value by blurring boundaries**

The inner workings of the WITTENSTEIN Innovation Factory are designed to spearhead Industry 4.0 in several different ways. Through the Innovation Factory WITTENSTEIN is pushing ahead with the development of mechatronic products and systems for customers' future applications. Parallel to this the company is gradually establishing dedicated assembly processes in line with Industry 4.0 principles. Professor Dieter Spath, who is passionate about the overall concept for the new Mechatronics Centre, predicts: "You create value by blurring boundaries. That's why we expect to become faster and more efficient – and generally better than ever as far as our customers are concerned." In the factories of the future, human beings are at the centre of the production process. According to Spath, people come first, not machines: "Tomorrow's employees will be planners and decision-makers in a complex environment."



ENTREPRENEUR 4.0 AWARD 2014

**The night is upon us, the valley lies in darkness, the city lights are glittering. A cherry tree is in full blossom.**

There's no time to spare, the petals are already flying through the air – fleeting, shimmering pulses of light against a backdrop of obscurity. Sascha Weidner [\*1976] is the winner of the first ENTREPRENEUR 4.0 AWARD photography competition with the pictures in his "Hanami 4.0" cycle (Japanese for "flower viewing"). His photographs form part of the "Portraying Visions" exhibition at the WITTENSTEIN Innovation Factory in Igersheim-Harthausen.

The exhibition can be viewed by appointment (please phone +49 (0)7931/493-10463 or send an e-mail to [veranstaltung@wittenstein.de](mailto:veranstaltung@wittenstein.de)).

*Art is creativity in perfection. If you don't have courage, you can't be creative. And without creativity there is no innovation.*



A knowledgeable guide through the »Portraying Visions« exhibition: curator Felix Hoffmann. He was a member of the ENTREPRENEUR 4.0 AWARD 2014 jury and is Chief Curator of C/O Berlin.

*The WITTENSTEIN  
Innovation Factory is  
an art gallery*

#### **What does the future hold for entrepreneurs?**

Dr. Manfred Wittenstein, competition initiator and successful entrepreneur, fired the public debate with an exciting question when he launched the ENTREPRENEUR 4.0 AWARD: What does the future hold for entrepreneurs? In his opinion, there is definitely no demand for yes-men; on the contrary, critical companions – both internal and external – are called for. “That’s why we need a mirror on the wall – an artist’s perspective on what we do and our plans for the future. Artists stand for freedom of thought: they’re a valuable sounding board for all of us.” He dearly hopes that other business organizations will gradually share the responsibility for the competition and steer it in new, alternative directions with their own ideas and their own interpretations of entrepreneurship. This could lead over the years to a global community of enterprises which understand Industry 4.0 not simply as a technological but also as a social challenge.



Around fifty photographs by ten different photographers can be admired at an exhibition entitled “Portraying Visions”, for which Felix Hoffmann, Chief Curator of C/O Berlin, has agreed to act as curator. Apart from the award winning submissions by Sascha Weidner, Bastian Gehbauer, Mara Ploscaru and Julia Runge they also include works by Michael Najjar, Erwin Olaf, Claus Goedicke, Niko Luoma, Tyne Claudia Pollmann and Daniel & Geo Fuchs. Each of these photographers has documented very effectively their own, highly personal view of the transformations currently impacting on working life as well as the accompanying changes in values and behaviour.



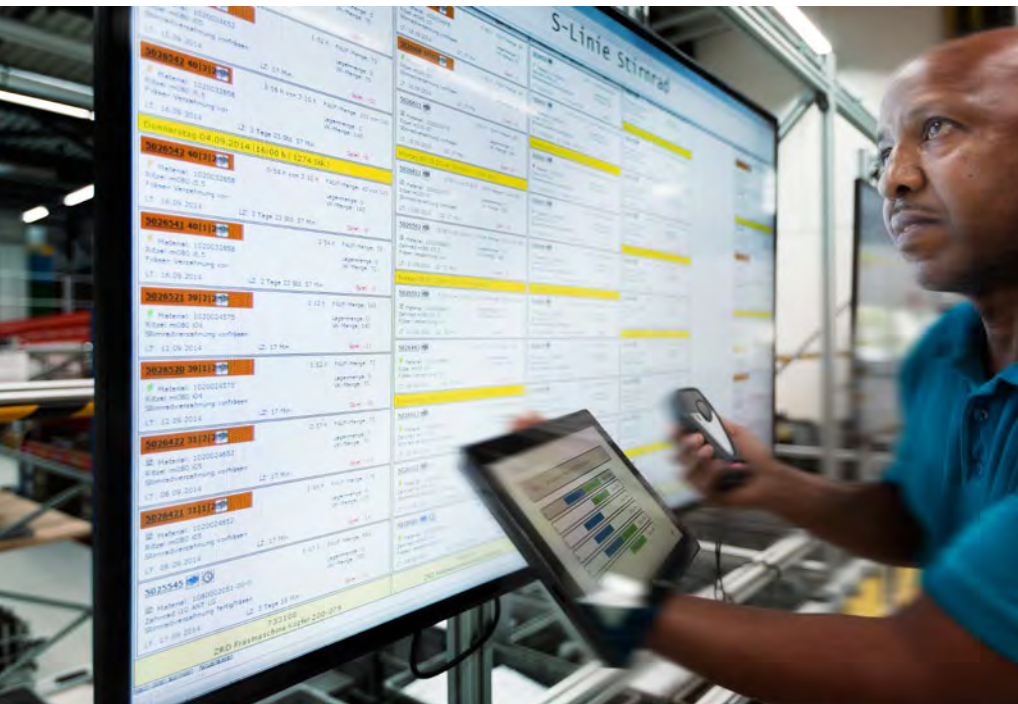
# Apps to speed up the milk run

WITTENSTEIN bastian lives – and breathes life into – Industry 4.0



Definitely one of today's hottest topics: Industry 4.0.

It's essentially about achieving tighter integration between the digital world of information as it exists in production planning systems, for instance, and the real world of physical objects such as workpieces, tools or pallets. People, machines and products will in future exchange information continuously in smart networks with the help of cyber-physical systems (CPS) – enabling processes to be represented almost completely in real time.



Production planning and control in the age of Industry 4.0

which are integrated in a factory Internet. Information printed on paper is making way for digital formats, which are made available for specific applications or tasks in real time and can be converted by people into optimized processes in a targeted way appropriate to the situation. What this means in practice is that organizational losses on the shop floor – for instance due to material not being delivered to a machine on time – can be avoided. Overall productivity is increased.

### We work for people

The role of human beings as “cooperating production factors and decision-makers” is being defined anew: “In the factories of the

»Even in Industry 4.0 problems with tools and processes cannot always be ruled out. In this case, prompt and robust decisions are called for. And that’s something human beings can still do best.«

DR. MARIA HERGESELL, HEAD OF TECHNOLOGY MANAGEMENT, WITTENSTEIN BASTIAN GMBH



The transparency created by digital networks is vital in order to take robust decisions, optimize processes and avoid wasting valuable resources. It is also essential to shape and safeguard a company’s future in a sustainable way. Against the background of today’s mega trends like product customizing – in extreme cases with a batch size of 1 – increasingly volatile markets and globalized, net-centric production, the ability to systematically channel and leverage the flow of information about goods movements is crucial for long-term survival.

### Shop window factory in Fellbach

At WITTENSTEIN bastian’s “Future Urban Production” facility, which opened about two years ago in Fellbach, selected pilot applications are currently taking shape under the

CyProS (cyber-physical production systems) research project funded by the Federal Ministry of Education and Research. This has been a key aspect of the shop window factory on this site from the outset. “As an innovation driver for mechatronic drive technology, WITTENSTEIN is also at the forefront of Industry 4.0. In particular, we are committed to optimizing production processes and developing Industry 4.0 capable products. All new concepts are tested in Fellbach”, confirms Dr. Jochen Schlick, Manager Future Field Cyber-Physical Systems at WITTENSTEIN. Two applications have recently gone live: “Optimizing Intralogistics” and “Representing Production Planning with Mobile Information Access”. In both projects Industry 4.0 is implemented in the form of auto-ID technologies, embedded systems and IT-assisted production systems,

future, human beings are at the centre of the production process. People come first, not machines. The machines simply support the operators with tailored information to enable them to carry out their work efficiently in the right place and at the right time. Tomorrow’s employees will be planners and decision-makers in a complex environment, and a higher skills level will be demanded of them”, emphasizes Professor Dieter Spath, WITTENSTEIN President. Despite this new perception of their role, human problem-solvers will still be in demand because even in Industry 4.0 problems with tools and processes cannot always be ruled out”, says Dr. Maria Hergesell, Head of Technology Management at WITTENSTEIN bastian. “In this case, prompt and robust decisions are called for. And that’s something human beings can still do best.” Each person needs a complete and up-to-date map of all processes relevant to them for this purpose, plus a tool for taking decisions and controlling workflows. In both these current projects –

“Optimizing Intralogistics” and “Representing Production Planning with Mobile Information Access” – WITTENSTEIN bastian is putting its trust in the very latest generation of information technology: tablet PCs with dedicated apps, organized in a WLAN. This hardware is not simply necessary from a technical point of view; it also provides added motivation to get involved. “Compared to traditional media like planning boards and T-cards, new technologies such as tablet PCs and smartphones open up brand new opportunities for interaction – people are obviously very curious and excited about what the future has in store”, explains Dr. Peter Stephan, Project Manager, Future Field Cyber-Physical Systems at WITTENSTEIN.

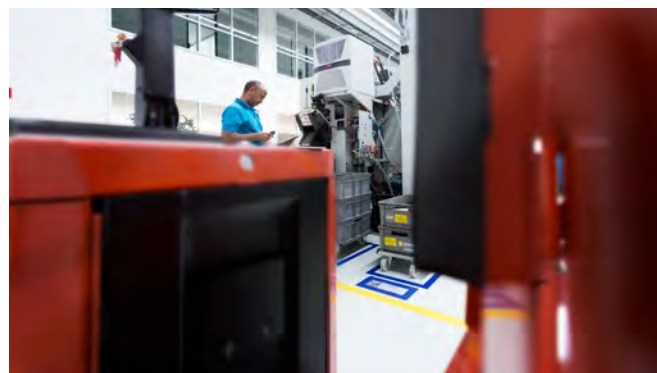
Progress not opposition, acceptance not rejection: in this way, staff themselves help drive the implementation of Industry 4.0. By definition, these dynamics are conducive to the ongoing optimization of processes.

**Optimizing intralogistics: “Milk Run 4.0”**

Among the products manufactured at WITTENSTEIN bastian’s “Future Urban Production” facility in Fellbach are gear wheels. In the past the intralogistics, in other words the physical transport of goods between the various delivery and pick-up spaces, have been controlled by means of the “milk run”: a logistics operator drives around the factory once every hour in an electric truck. This relatively inflexible procedure only partially reflects the actual requirements of optimal material supplies;

after all, when the driver sets out, he has no way of knowing which production orders will be ready to be picked up where or what their present status is. This routine is now being superseded by material supplies on demand at WITTENSTEIN bastian in the framework of an Industry 4.0 pilot project. In future, better use can be made of vehicle capacity, resources economized because the distances driven are shorter and materials delivered more flexibly according to the actual order situation.

**Up to 50% more efficient in tests:**  
Material supplies in Fellbach are now organized on demand.



The first step entailed identifying the real world – order documents, pallets, delivery and pick-up spaces – with barcodes and making it suitable for recording electronically. The production planning and enterprise control systems were “tapped” for this purpose, and the staff concerned equipped with scanners and tablets. Data can now be recorded in digital form and a transparent map generated of all materials in the production shop. The logistics operator does this by scanning the barcodes on the accompanying documents into the planning system for all production orders to be moved with the help of a tablet app. This procedure is then repeated with the codes for the pick-up and delivery spaces. A virtual map of the necessary material flow is created in this way in the background. In the second step this map is converted into a transport route, complete with departure times and stops, and displayed on the milk run driver’s tablet.

A smart planning algorithm, which calculates the optimal travel times based on the virtual map of the required material flow and the number of transport orders per day, is currently being tested. The preliminary results confirm the enormous potential for optimization that was previously predicted with a simulation: by interconnecting smart components, the number of transport cycles actually completed and the distances travelled in order to supply parts for gear wheel production can ideally be halved!

Digital networks create the necessary transparency to take robust decisions and optimize processes.

## »New technologies open up brand new opportunities for interaction«

DR. PETER STEPHAN, PROJECT MANAGER, FUTURE FIELD CYBER-PHYSICAL-SYSTEMS



Join us on a trip around WITTENSTEIN bastian's »Future Urban Production« facility with the Milk Run 4.0







**Mobile information access**

The second pilot project taking place at the shop window factory is concerned with strategies for optimizing WITTENSTEIN bastian's organizational processes in Fellbach's Production Planning and Control department. Once again, the underlying aim was to reconcile physical with informational realities. The traditional media gap between planning board systems based on T-cards, as used at shop floor level, and the IT-assisted production planning system already implemented resulted in content and time disparities between the two

different "worlds", leading to practical coordination problems and hence organizational losses because insufficient or only obsolete information was available. At the heart of this Industry 4.0 compliant solution is a digital planning board, which is connected both to the planning software and to each operator's mobile tablet PC. The media gap is closed in this way; scheduled orders in the process can no longer be overlooked or postponed by mistake and given another priority. Planners and machine operators have consistent, up-to-date and above all identical information

at their disposal. They have mobile access to upcoming jobs and can visualize them on the machine. Thanks to the app, production order processing information can be retrieved on the user's tablet and any problems in connection with a particular order, for example if a tool is not ready, reported and documented using multimedia. Ultimately, this data also provides essential input for the continuous improvement process. Good planning – good processes – good production: this is another project which clearly demonstrates the tremendous benefits and potential of Industry 4.0!



All machines in Fellbach are marked with data matrix codes for fast and precise access to information in production planning systems – with no media gaps

Excellent technology foresight at WITTENSTEIN

## Trend identifiers – and trend setters

Technology foresight, sometimes also referred to as technology intelligence, is the systematic determination and identification of relevant technological developments as well as their targeted commercialization – a highly complex challenge.

Generalists, open to all things new, are called for here rather than specialists. Walter Lang, Michael Lesch and Raphael Rilli, responsible at WITTENSTEIN for technology foresight, fit this definition. A small, seemingly unremarkable mould printed in 3D is a good example of the “successful practices” this team has developed.

Never let technologies take you by surprise – in the light of rapidly expanding technological know-how as well as increasingly complex technology chains and materials technologies, what initially sounds rather trivial is in fact a key condition of long-term business success. In the early phase of the innovation process, therefore, technology foresight is all about identifying promising technology trends, analyzing their development potential and taking appropriate action in preparation for the market launch of new production methods. To Walter Lang, Manager Preliminary Technology Development at WITTENSTEIN, “scanning and monitoring” are the two most important aspects when he and his colleagues Michael Lesch (Expert for Technology Identification) and Raphael Rilli, a development engineer, set out to investigate a defined research area within a so-called future field, for example.

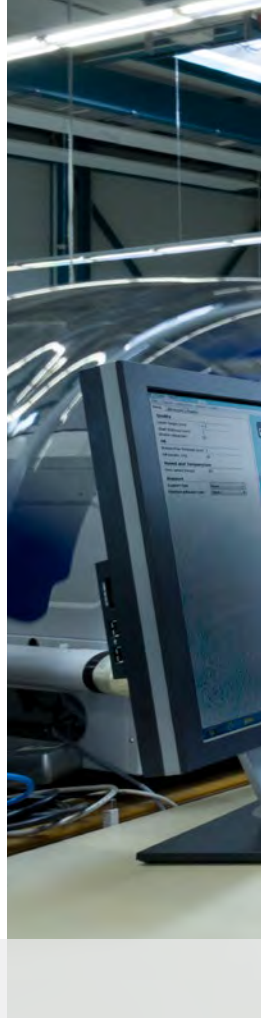
“To examine additive technologies” was the mission in this particular case. More specifically, the challenge for this close-knit team, which belongs to the WITTENSTEIN Group’s central

### WITTENSTEIN is up among the top five

In the summer of this year the Fraunhofer Institute for Production Technology (Fraunhofer IPT), together with a consortium of high-tech industry leaders, selected WITTENSTEIN as winner of its “Successful Practices in Technology Intelligence” award. Although only a relatively small, family owned firm, WITTENSTEIN is one of five “best in class” companies identified within this European benchmarking project, also beating several big corporations. Out of the 207 business enterprises taking part, WITTENSTEIN was singled out by the jury for its strong focus on future issues, reflected in the definition of so-called future fields. This positive overall picture was rounded off by the preproduction centre, which was set up to perform early validations and qualify staff as a way to simplify the transfer of new technologies to production. The aim of the project was to identify particularly successful strategies and concepts for technology intelligence in Europe’s premier enterprises.

»We were particularly impressed by the active role WITTENSTEIN plays in shaping the future, for example through the construction of the “Future Urban Production” facility in Fellbach.«

PROFESSOR GÜNTHER SCHUH, DIRECTOR OF FRAUNHOFER IPT  
AND THE LABORATORY FOR MACHINE TOOLS AND PRODUCTION ENGINEERING (WZL)  
AT RWTH AACHEN





**The Fraunhofer Institute for Production Technology (Fraunhofer IPT) currently ranks their work among the five “best in class”:** Walter Lang (right) is responsible for technology foresight at WITTENSTEIN AG; together with Michael Lesch (left) and Raphael Rilli (centre) he identifies and determines new technology trends. It is not uncommon for new products and production processes to emerge at the end of a fascinating working day: this mould insert printed in 3D rather than manufactured in the usual way from steel is only one example.

**Fresh from the 3D printer:**  
Plastic injection moulds



Development department, involved clarifying the general conditions and constraints, researching the limits of this disruptive technology and then formulating an implementation strategy. The first step following an intensive debate was to purchase a 3D printer. Basic tests with new materials and the crossover with injection moulding technologies finally yielded in the following result: a plastic injection mould, rather than one milled from steel in the traditional way, can be printed using additive technology. Walter Lang was delighted: “From the initial product idea to the finished injection moulded part in just twenty-four hours – the goal we set ourselves had suddenly become realistic.” The fact that, thanks to

additive prototyping, the customer can often be presented with a sample only a few days after the first meeting is a genuine added benefit. It takes about a year on average for an idea to be turned into a concept and finally a project plan. The trio of inventors make a point of cooperating closely with their customers because “successful technology foresight never takes place in splendid isolation. It thrives on openness and external feedback”, Walter Lang insists. He and his colleagues leverage the know-how accumulated at conferences, trade fairs and congresses as the starting point for new concepts, which can also be a functional model, as in this instance: the two parts of the mould insert were printed using so-called

MultiJet technology. The finished mould insert halves from the preproduction centre trial were altogether convincing and the go-ahead was given for series development. “We keep a tight watch on every process from the initial idea to the final implementation”, says Walter Lang. The three development engineers are full of praise for the preproduction centre: it is here that promising technologies are investigated and optimized long before the actual series launch on the future production machinery. “It’s a great advantage – both for us and for our customers – and something that certainly can’t be taken for granted in this structured form at a company the size of WITTENSTEIN.” Walter Lang and his two colleagues are unanimous: “We succeed because we don’t just sit in an ivory tower; right from the outset, we work hand in hand with everyone who will later be involved in the new products and production processes.”

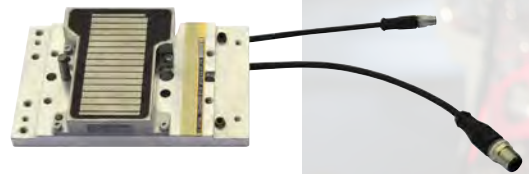
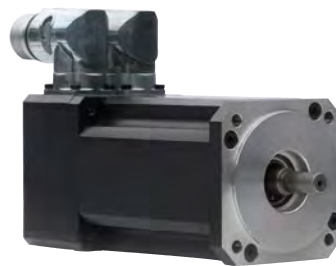
# Exploring new avenues with linear motors

“There must be another way”, manufacturers of high speed process automation equipment often think when searching for the perfect drive concept. A growing number meanwhile choose linear servo technology instead of pneumatics, hydraulics or pure mechanics, for instance in transport and assembly systems. The reasons are many and varied: linear motors offer a long lifetime, better control response and extremely high dynamics and precision. They are ideal whenever short, fast movements determine the process flow.

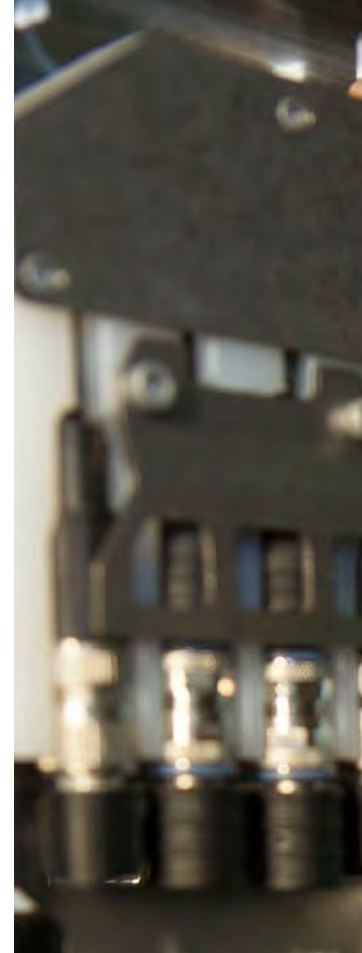
### Precise positioning in three dimensions

The LTM-CI high speed assembly systems manufactured by the Austrian STIWA Group are an excellent example here: they allow small parts to be assembled fully automatically to obtain bigger units absolutely precisely and with very short cycle times. A linear motor solution developed by WITTENSTEIN cyber motor in close cooperation with STIWA meets the specific power and installation requirements of these assembly systems. Based on the “cyber linear motors” product family, it enables the high speed assembly machines to position components the size of a pinhead with exceptional accuracy, namely +/- 0.02 mm at a speed of 2 m/s and a cycle rate of 100 parts per minute. “Four motor versions were developed altogether for different axes and axis lengths”, explains Carolin Ank, a sales engineer in Product Management at WITTENSTEIN cyber motor. “They permit speeds up to 5 m/s and a maximum acceleration of 500 m/s<sup>2</sup>. The housings of the linear motors are always customized to ensure optimal integration in the assembly systems.”

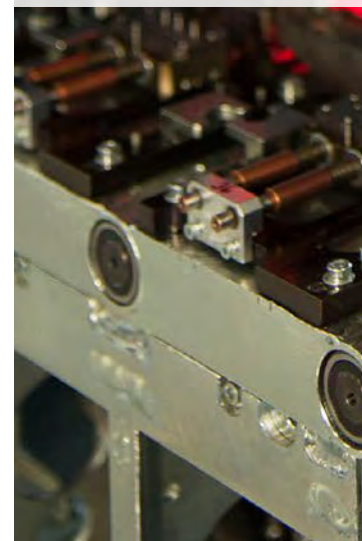
The solution package put together for STIWA also includes rotary motors in the “cyber power motors” family as direct drives for the chain of the pallet transport system.

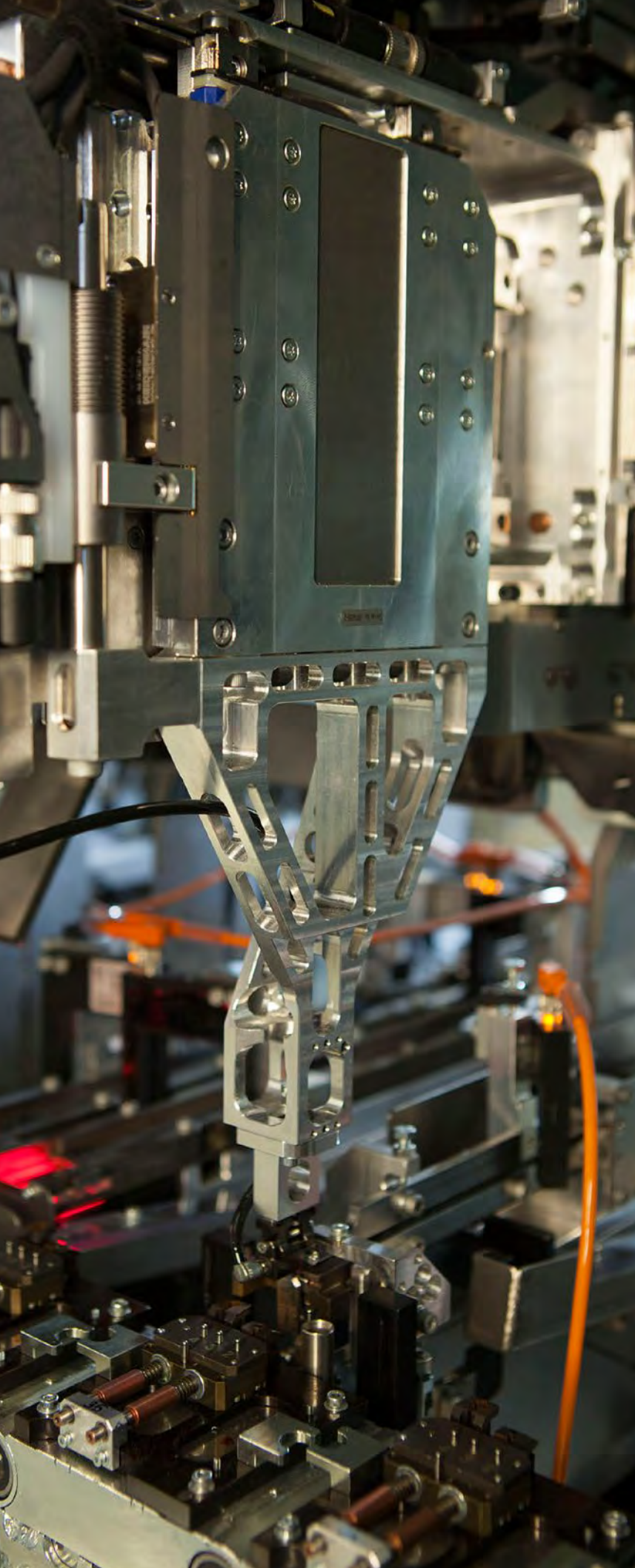


In combination with a displacement measuring system the permanent magnet linear motor provides direct power transmission with maximum dynamics and precision.



Thanks to servo technology made by WITTENSTEIN cyber motor, the STIWA assembly system allows cycle times of less than 0.6 seconds.





“They allow the parts to be cycled through highly dynamically between consecutive pick-and-place modules with a positioning time of 150 ms”, adds Robert Adam-Thaller, Head of Product Management at STIWA.

#### **High performance with linear servo technology**

Linear servo technology is rapidly taking the place of pneumatics, hydraulics and mechanics – for a number of reasons. For one thing, linear motors deliver superior performance. They are easier to control than pneumatic or purely mechanical drive solutions and they offer more dynamics and repeatability. They are characterized by shorter cycle times and enable positions to be approached flexibly with extreme precision. “The speeds of up to 2 m/s we get in combination with controlled, jerk-free positioning profiles would not have been possible without WITTENSTEIN cyber motor’s linear servo motor technology”, Adam-Thaller confirms. The compact design is another advantage: the space required to install the STIWA system is between a third and half that of alternative solutions. The system is simultaneously lighter in weight, so that there is less moving mass and less kinetic energy. This improvement in energy efficiency is not the only benefit for end customers, however; the linear motors are also highly reliable as well as wear and maintenance-free. “If you add up all these points in their favour, linear motors clearly offer considerable development potential as a substitute for pneumatic, hydraulic or mechanical drive concepts in process automation”, Carolin Ank predicts.

## The STIWA Group

The STIWA Group, which employs around 1200 staff, has its headquarters in Attnang-Puchheim (Upper Austria) and is a specialist for product and high performance automation.

STIWA develops, manufactures and ships comprehensive automation solutions comprised of feeding systems, material logistics, packaging, assembly and process modules and transport systems. Its core competencies also include product and software development for production automation, metal and plastic components for automotive manufacturing, energy efficient building engineering and laboratory automation.

Nano-precise rotor runout measurements by attocube systems

# Restoring the right balance

All of us are familiar with at least four fast rotating objects: the wheels on a car. Vibration while the car is in motion creates an unpleasant sensation for the vehicle's occupants and accelerates wear. This radial runout can be eliminated by balancing the wheels, in other words by measuring the imbalance and attaching a balancing weight. Something that on a car is relatively straightforward calls for advanced technology if position errors and imbalance need to be measured with sub-nanometre precision. To show the kind of scale involved, a particle from exhaust gases is ten thousand times bigger by comparison.

The instruments used to detect and compensate such minute imbalances or position errors are, in other words, a true test of engineering skill. The above-mentioned car wheels do not really need such extreme precision – in contrast to nano physics and a growing number of industrial applications, which are about to make the jump from micro to nano. This is the case, for instance, when absolute rotational symmetry is vital for the drive screw of a CNC machine tool or the motor shaft of a servo actuator. attocube systems AG, a WITTENSTEIN subsidiary, has accepted this challenge and come up with an ultra precise, contactless interferometer for measuring runout on fast rotating objects: the FPS3010.

### A question of distance

The FPS3010 is an optoelectronic displacement measuring system with up to three sensor heads. In order to measure the runout of the shaft on a high-precision planetary gearhead, for example, two of these heads are aligned on the rotating shaft axis so that they sense it at an angle of 90°.

Each of them then scans the shaft with a laser at a frequency of 10 MHz and measures its distance from the shaft continuously with fraction-of-a-second accuracy. The interferometer assigns two linear displacement values to each reading – one for the 0° position and one for the 90° position. The difference between the angular distances from one measuring point to the next corresponds to the shaft's eccentricity. The measured values are represented on a graph as a circular line; by visualizing the runout information in this way, the location and extent of position errors and imbalances can be assessed. Conclusions regarding the causes of, say, ball bearing errors or machine vibration can be drawn from this data and the electronic evaluation of the measurements.

### Fit for the world of runout measurement

If you think the FPS3010's ultra precise laser measuring system is only of any use in the lab and needs an expert in interferometry to operate it, you couldn't be farther wrong. The compact sensor heads have a large beam angle, which means they are easy to adjust no matter how confined or inaccessible the space: as soon as they have been aligned, the characterization can start without any specialist know-how. Another advantage is that these tiny sensor heads only contain passive optical and mechanical components, so that they are also suitable in extreme industrial conditions – such as heat, cold or vacuum.

### Runout measurement on a rotating object:

The two sensor heads of the FPS3010 interferometer simultaneously measure the error motion of a shaft perpendicular to the rotating axis.



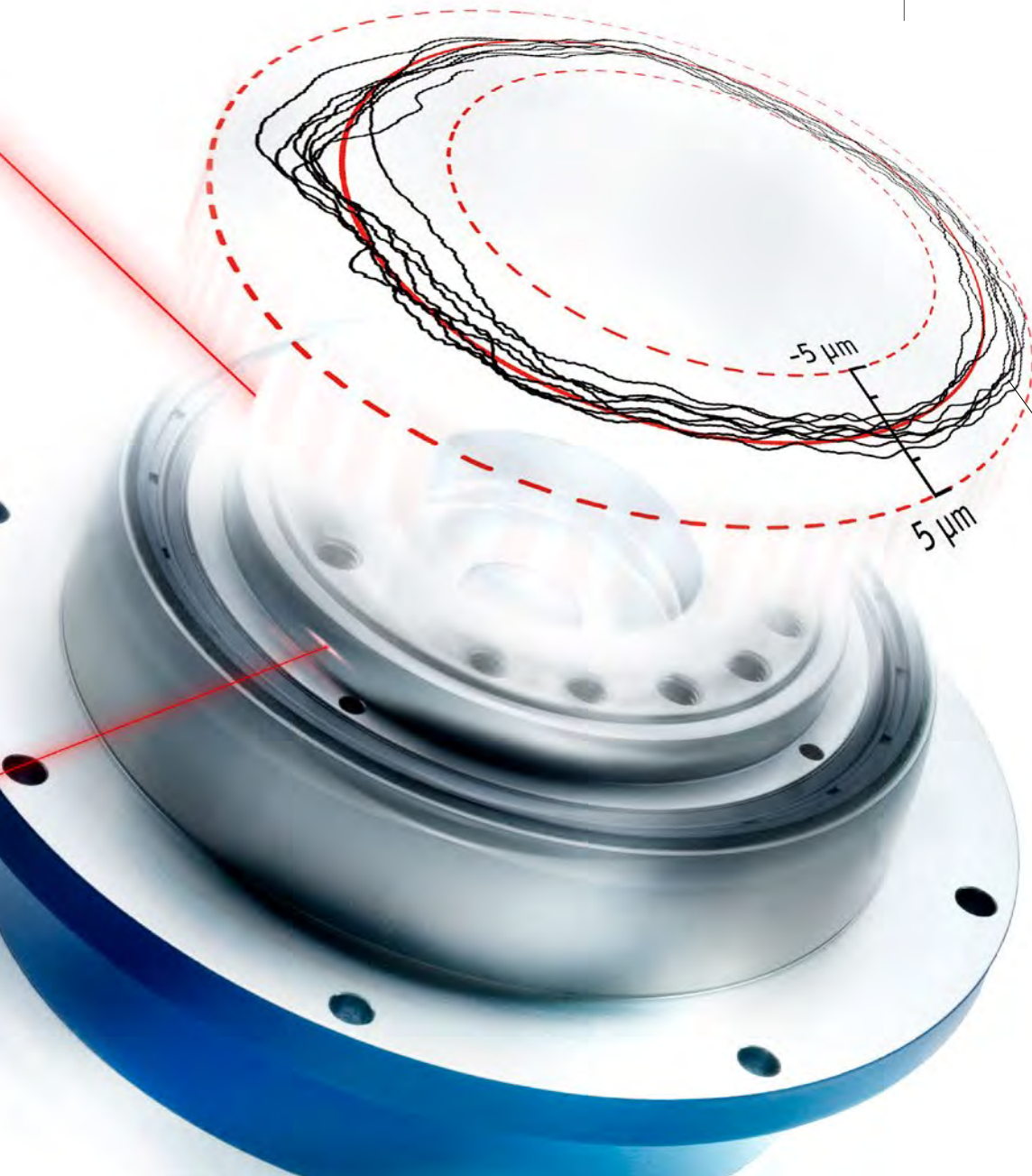
Extreme industrial conditions are not a problem for the FPS3010 interferometer.



### Runout measurements at WITTENSTEIN

“The ability to measure runout contactlessly and with high resolution in the sub-nm range, combined with the ease of integration and user friendliness, opens up an array of applications for the FPS3010”, declares Dr. Thomas Wimmer, Manager Mechatronic Testing at WITTENSTEIN AG.

“They extend from dynamic radial and axial runout measurements through validations of deformation simulations to displacement controlled adjustment of bearing preload.” He is planning to deploy one of these systems in his own department – and there are many more, equally interesting fields of use, not just within the WITTENSTEIN Group.



The black lines show the runout of a rotating shaft in the μm range.

The side panels for the carriages manufactured by an Indian railway company on Balliu MTC laser weld and cutting machines are about 25 m long. Yet even parts as big as these still have to be transported and positioned with millimetre accuracy. That's why the imposing laser machines for cutting, welding and cladding plates, profiles and parts are genuine masterpieces of drive engineering – thanks to rack-and-pinion systems made by WITTENSTEIN.

## On the **right** track

Rack-and-pinion system for portal positioning



Precision cut and welded: the side panels for the railway carriages

### **Timetable to quality with no delays**

Balliu MTC machines are used worldwide in the most demanding applications. The manufacture of side panels for railway carriages is no exception. Yet despite their huge size these panels, weighing more than a ton, have to be handled with millimetre accuracy. "If not, they won't fit properly later on when they're welded", explains Wim Goossens, Engineering Office Manager at Balliu MTC. This means in turn that the portals which transport the side panels from one production step to the next have to be precisely positioned – a challenge just made for WITTENSTEIN rack-and-pinion

systems. Wim Goossens fully agrees: "A rack-and-pinion system with four racks in a row, each two metres long, is installed on either side of the portals. The distance between the two sides is seven metres, within that distance the deviation is a maximum of one tenth of a millimetre." Thanks to this virtually non-existent error, ultra precise recesses can be achieved for the windows, doors and buttons as well as precisely welded side panels. "It's about as accurate as you can possibly get", adds Jelle van Deun, a sales engineer at WITTENSTEIN bvba in Belgium. And about as efficient too – where as it takes a team of twenty labourers in India

up to three days to produce a side panel like this manually, the Balliu MTC machines do the same in not much more than an hour – fully automatically with no delays.

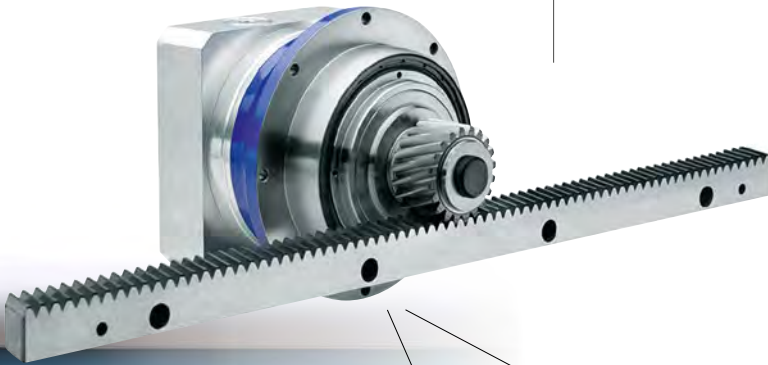
### **Technology gets the green light**

Balliu MTC's engineers have already seen for themselves in the past what WITTENSTEIN rack-and-pinion systems are capable of. Two similar machines featuring this drive technology were sold to India more than ten years ago. Of course, extensive reengineering has taken place since then. "The first machines had racks of half a metre. Now they are two metres



»The distance between the two sides is seven metres, within that distance the deviation is a maximum of one tenth of a millimetre.«

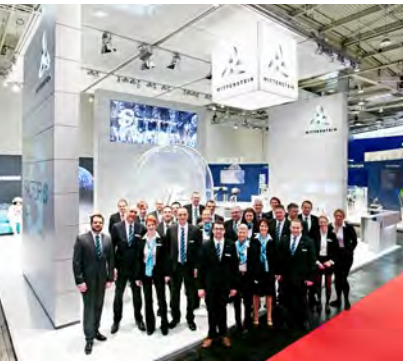
MANAGER ENGINEERING OFFICE, BALLIU MTC



A rack-and-pinion system with four racks in a row is installed on either side of the portals.

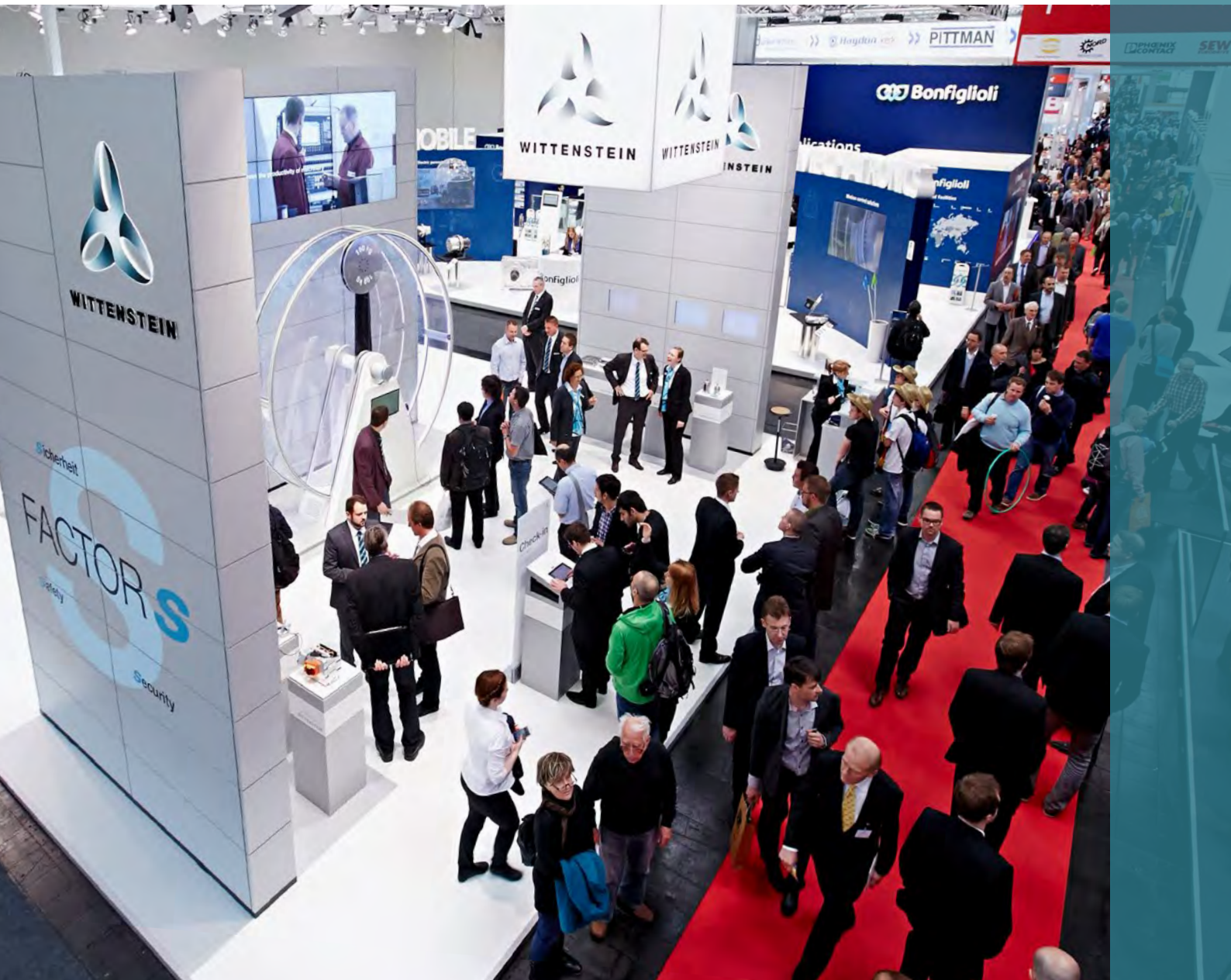
and this makes the installation so much easier”, Goossens replies when asked to name a typical improvement. Van Deun confirms that the mechanical precision has increased dramatically in the space of a decade: “That applies to both the racks and the pinions. Their size has been halved in the last ten years, mainly due to new production processes. The linear error of the drive is quite a bit smaller because of the smaller diameter, and this has also had a positive effect on rigidity.” These are developments that have profited Balliu MTC at the same time: “The dynamics and accuracy of our machines have improved”, says Goossens proudly.

WITTENSTEIN technology gets the green light, in other words – “a good thing”, according to Wim Goossens, who stresses that “almost every laser machine is custom made and demands an awful lot of the drive technology. Every project is also a new challenge, with special requirements regarding precision, dynamics and load.”



#### Expert consulting

WITTENSTEIN experts are looking forward to meeting you at numerous trade fairs and exhibitions worldwide.



High visitor volume at the Hanover Fair 2014

## Trade fair calendar 2014/15

### Motek

Stuttgart (Germany)  
International Trade Fair for Assembly  
and Handling Technology  
WITTENSTEIN Group  
Hall 9, Stand 9-121  
**October 6 to 9, 2014**

### Scanautomatic

Gothenburg (Sweden)  
Trade Fair for the Automation Industry  
WITTENSTEIN AB  
Stand B02:11  
**October 7 to 9, 2014**

### CeMAT

Shanghai (China)  
Trade Fair for Materials Handling,  
Automation, Transport / Logistics  
WITTENSTEIN (Hangzhou) Co. Ltd  
**October 27 to 30, 2014**

### CIIF

Shanghai (China)  
International Industry Fair  
WITTENSTEIN (Hangzhou) Co. Ltd.  
**November 4 to 8, 2014**

### Forum Maschinenbau

Bad Salzflun (Germany)  
Trade Fair for Suppliers in the  
Machinery Manufacturing Industry  
WITTENSTEIN alpha GmbH,  
WITTENSTEIN cyber motor GmbH,  
WITTENSTEIN motion control GmbH  
Hall 20, Stand B36  
**November 5 to 7, 2014**

### SPS IPC Drives

Nuremberg (Germany)  
Exhibition for Electric Automation –  
Systems & Components  
WITTENSTEIN Group  
Hall 4, Stand 4-221  
**November 25 to 27, 2014**

### LogiMAT

Stuttgart (Germany)  
International Trade Fair for Distribution, Materials  
Handling and Information Flow  
WITTENSTEIN motion control GmbH  
**February 10 to 12, 2015**

### Subsea UK

Aberdeen (United Kingdom)  
Exhibition and Conference for Offshore  
Technology  
WITTENSTEIN motion control GmbH  
**February 11 to 13, 2015**

### embedded world

Nuremberg (Germany)  
Exhibition and Conference for Embedded  
Technologies  
WITTENSTEIN high integrity systems  
**February 24 to 26, 2015**

### INTEC

Leipzig (Germany)  
Trade Fair for Manufacturing, Tool and Special-  
Purpose Machine Construction  
WITTENSTEIN alpha GmbH  
**February 24 to 27, 2015**

### TIMTOS

Taipei City (Taiwan)  
International Machine Tool Show  
WITTENSTEIN Co., Ltd.  
**March 3 to 8, 2015**

### Hanover Fair

Hanover (Germany)  
Flagship Trade Fair for Motion, Drive & Automation  
Hall 15, Stand F08  
WITTENSTEIN Group  
**April 13 to 17, 2015**

