WITTENSTEIN

move

The magazine for customers and partners of WITTENSTEIN AG

WITTENSTEIN AG

The Innovation Factory: Room for growth

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move

Das Magazin für Kunden und Freunde der WITTENSTEIN AG

Masthead

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Cover photo: View of the Innovation Factory site from the WITTENSTEIN World Garden in Harthausen
Photo on page 14: Sculpture by the artist Roland Martin

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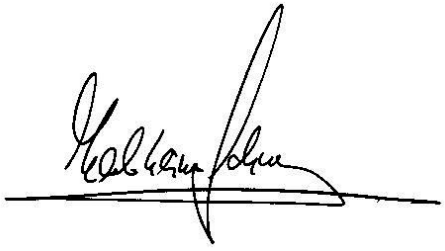
Dear readers,

"If you're doing something the same way you have been doing it for ten years, the chances are you are doing it wrong." This clever quote by American engineer Charles Kettering (1876 to 1958) is more relevant than ever today. Ours are turbulent times in which economic and shock driven phenomena raise potential fears yet simultaneously harbour growth potential.

Over the last few decades WITTENSTEIN has established a strong position for itself in the international market for drive technology. However, just because we operate successfully in a globalized world, it doesn't mean we can afford to rest on our laurels. In times of constant change, when new challenges and crises are commonplace, that can never be enough. We must be open to new ideas and willing to venture beyond our traditional territory, away from our established practices and accustomed routines.
Our aim has always been to think up solutions that no-one has thought of before. By continuously evolving our transmission technology and applying our core competencies in the drive engineering field, we can gain access to new, highly exciting niche markets. In June this year, for example, the wings of the SHEFEX II high altitude sounding rocket (a project undertaken by the German Aerospace Center (DLR)) were successfully controlled by WITTENSTEIN actuators. And as a technology and development partner for electromobile drives, WITTENSTEIN has been actively involved in electric motorcycle racing for some time now. At the recent finale of the FIM e-POWER INTERNATIONAL CHAMPIONSHIP race series in Le Mans (France) the Münch Racing Team competed with a new, even more powerful WITTENSTEIN motor that paved the way for a remarkable triumph: Matthias Himmelmann was crowned World Champion with Katja Poensgen as runner-up. The team also came first in the technically significant Constructors' Championship. For the third time in succession, the Münch Racing Team proved its mettle against rival line-ups from the US, Europe and Asia.

The experience gained from motor racing is regularly incorporated into all eMobility projects in which WITTENSTEIN has a stake. As development and project partner, we are currently supplying a complete powertrain comprised of a motor, gearhead and electronics for high performance electric scooters to a major automotive manufacturer.

We are continuing to delve into new worlds: the transition to a mechatronics group will help WITTENSTEIN cross the technological bridge leading to "Industry 4.0". Fully networked production, manufactured goods with a digital product memory, people who talk to machines, communication driven by Internet mechanisms – for every single one of us the fourth stage of the Industrial Revolution has only just begun.



Karl-Heinz Schwarz Spokesman of the Management Board

move talks to:

Dr. Manfred Wittenstein

Industry 4.0: An intelligent production concept for the future

At present, it's still more of a vision than a reality – the fourth stage of the Industrial Revolution. Yet thought leaders are already predicting in very specific terms how the fusion of modern production and Web-like technologies will revolutionize the entire value chain. For the German government, it's the ultimate future project. Dr. Manfred Wittenstein, President of WITTENSTEIN AG, is one of several distinguished advocates of Industry 4.0.

move: You're fascinated by the vision of an "intelligent production concept for the future". Your new facility, which has just opened in Fellbach is explicitly intended as a "shop window factory" for totally new production processes. Could you explain to us how this idea came into being?

Dr. Manfred Wittenstein: It's basically all about making the production processes in our factories more efficient and more economical – about making optimal use of production facilities, in other words. The future ability to control machinery, means of production and semi-finished products locally and online is most ingenious but still very abstract. We therefore want to demonstrate what the "Internet of Things" will actually make possible in practice. And we want to do it in close cooperation with customers, other companies, research institutes and universities. That's why we're planning to set up an Industrial Campus at our Fellbach site.

move: The word "revolution" is frequently used by politicians and scientists attempting to describe the fundamental changes we can expect to take place in production. Isn't that rather an exaggeration?

Dr. Manfred Wittenstein: Perhaps the term "evolution" would be slightly more appropriate; after all, no-one is going to tear down a factory that works perfectly well or do away with production processes that are already efficient. What is more likely is that intelligent components will gradually be integrated into manufacturing workflows. In the long term, however, this technological leap – which is still in its infancy now – will undoubtedly be mentioned in the same breath as the invention of the steam engine (First Industrial Revolution), the introduction of conveyor belts, leading to mass production (Second Industrial Revolution) and the advance of electronics and IT based automation in the seventies and eighties (Third Industrial Revolution).

Dr. Manfred Wittenstein
President of
WITTENSTEIN AG

move: That doesn't seem to frighten you in the least – on the contrary, you've said you perceive huge opportunities for Germany as a high-tech production location. Why?

Dr. Manfred Wittenstein: Over the last several decades, German SMEs have developed a talent for incorporating and perfecting new technologies. As a high-tech location, we're well equipped to materially influence this revolution from our German base. What's more, we have an exemplary business landscape that is much more amenable to new ideas – and reacts to them faster and in a more intelligently way – than the Anglo-American world, for instance. If we and other engineering manufacturers can succeed in spearheading this radical upheaval of worldwide industrial production, we can do a great deal to safeguard Germany's position as a production location.

move: Your strategy with regard to "Industry 4.0" is founded on networked, sustainable cooperation between industry, science and politics. Apart from the Industrial Campus project you referred to earlier, has WITTENSTEIN entered into any other concrete partnerships with a view to exploring new avenues for production together with other pioneers?

Dr. Manfred Wittenstein: We're an active member of a project called CyProS, which is funded by the German Ministry of Economics. Together with several leading research institutes and industrial companies we're endeavouring to make both ourselves and our products Industry 4.0-capable, as it were. We've got our sights clearly set on a long-term objective: to develop cyber-physical systems that will dominate future production and logistical scenarios as intelligent products and intelligent resources.

move: This fascination for technology and its almost boundless opportunities is understandable – but shouldn't we humans be worried that products and production could soon be taking over our lives?

Dr. Manfred Wittenstein: Anyone who digs into the issues to any depth at all will quickly realize that precisely the opposite is true. The parallel virtual representation of reality – of production processes, for example – won't result in staff being disempowered; it will make the technology controllable. Technology is there to serve people, not the other way round.

My vision for Industry 4.0 is that it will allow us to revert to making more extensive use of our own senses all along the value chain. We mustn't miss the chance to lay the groundwork for this vision to become reality.

The Innovation Factory

WITTENSTEIN AG is investing 30 million euros in a new, ultra-modern and resource-efficient Mechatronics Centre in Igersheim-Harthausen

If the words “innovation” and “factory” are fused together rather than simply existing side by side, a new way of thinking is revealed. WITTENSTEIN firmly believes that in the future innovative products will inevitably go hand in hand with innovative production concepts.
The Innovation Factory will systematically bring about a conscious mind shift. By the middle of next year, it will be in place directly adjacent to the WITTENSTEIN AG headquarters in Igersheim-Harthausen: our Innovation Factory.

Take a look for yourself at how the new building is progressing:
www.wittenstein.de/innovationsfabrik

The new WITTENSTEIN Innovation Factory will be transparent to both the inside and outside.
Pictures: HENN Architekten (2) / WITTENSTEIN (1)

Designed by pioneers for pioneers. The new building will create optimal conditions for innovative production processes in terms of resource efficiency, environmental awareness and work conditions: spacious, light and clean office and production areas with short lines of communication, transparent to both the inside and outside, low-noise and low-emission – the successful reconciliation of economic with ecological requirements.

With a footprint measuring 133 x 90 metres, three storeys and an overall height of 14 metres, the new building will provide around 18,000 square metres of floor space. The whole complex, made from natural stone with a glass façade, will thus be roughly the same size as the six existing production shops and offer room for 500 staff. The topping-out ceremony for the future WITTENSTEIN Innovation Factory will be celebrated later this year.

Room for growth

The extremely ambitious architecture of the new building complex will give the group the extra expanse it needs to continue growing. On the one hand, this 30 million euro investment is the outcome of our positive business development in the past while on the other, it will lay a crucial foundation for sustainable growth in the future. “The target we’ve set ourselves is to realize our vision of becoming a global mechatronics corporation”, says Dr. Manfred Wittenstein, President of WITTENSTEIN AG. “We’re seeking wise and sensible answers to tomorrow’s production requirements.” At the same time, he sees the new building as a clear commitment to keeping production in Germany: “We’re sending out a signal that there’s no better place than our home country.”

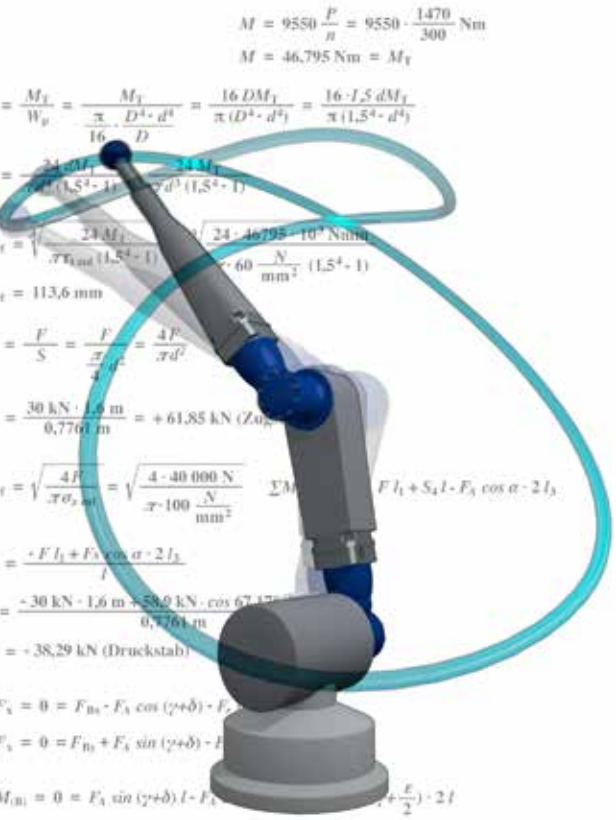
The new building was designed by HENN Architekten, the internationally renowned firm of architects. The future Innovation Factory will unite the manufacture of the most diverse WITTENSTEIN innovations under one roof. “As we understand it, innovations are not simply restricted to products; they can also relate to processes, services or even complete business models and social innovations”, adds Dr. Michael

Geier, General Manager of WITTENSTEIN cyber motor GmbH and project manager responsible for the construction work. In practice, as far as the inner workings of the Innovation Factory are concerned, this means that the Development, Sales & Marketing and Production functions of several mechatronic Business Units will in future interact even more strongly. All process partners – engineers, sales representatives and operators – will work in close physical proximity. Optimized interfaces and new relationship intelligence will be the fruits of this closeness. Amongst other things, lead times will be shortened.

Technology for people

The “articles of manufacture” will be mechatronic components and systems comprised of mechanics, controls, sensors and software for customer applications in a variety of industries such as semiconductors, power generation or automotive construction.

Incidentally, the benefits of these solutions will be enjoyed by absolutely everyone – from drivers of electric vehicles to users of mobile phones and electricity consumers. In other words, the WITTENSTEIN Innovation Factory will house – and in the long term supply – “technology for people”.



WITTENSTEIN engineering – together we develop your made-to-measure solution.

From Ludwigsburg to Asia:

Mission completed in a matter of hours

Oleg Korb
Application Engineer at WITTENSTEIN alpha GmbH

The machine already in Asia, only a few days left until commissioning, an unexpected problem crops up with the drive – a nightmare scenario for any engineering company. If this is not just a bad dream but reality, prompt support is vital. The Engineering team at the WITTENSTEIN alpha Engineering Office in Ludwigsburg recently came to the rescue of a machine tool manufacturer in precisely this unfortunate predicament.

With only a short time to go until an already shipped machine tool with integrated handling systems was due to be commissioned in a country in Asia, the specifications had to be altered at the last minute in order to achieve far higher cycle rates than were originally planned. However, this modification at the end customer's request resulted in the lifting axis drive being overloaded; this drive is designed to move as much as two tons of mass and accelerate it at up to 2 m/s². The motor very soon overheated in the load holding position and was then switched off to prevent thermal damage.

A solution had to be found as quickly as possible. Since a WITTENSTEIN RP+ size 060 gearhead with a ratio of i=110 – which optimally meets the application's high requirements in terms of power density, precision, rigidity and tilting moments – is installed in the machine, the customer contacted the Engineering & Support team at WITTENSTEIN alpha in Ludwigsburg for assistance.

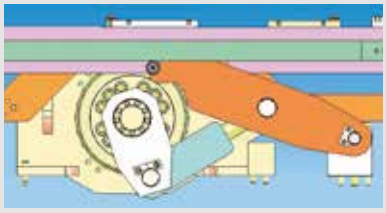
The question: what happens in the powertrain?

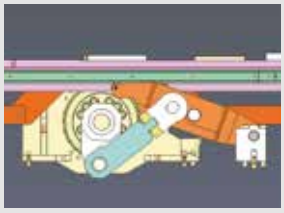
This is a very good question – which Oleg Korb and Samuel Schlecht, two application engineers at WITTENSTEIN alpha in Ludwigsburg set out to investigate.

They began by gathering all the information they could about the basic conditions and constraints as well as any relevant application data. This information was entered into a special software tool for designing lever kinematics, which they then used to analyse and simulate the motion sequence as well as the forces and loads occurring in the application. The results of these calculations were subsequently imported into our cymex® sizing software as motion profiles.

The complete powertrain was simulated with the help of the integrated database, which currently comprises more than 10,000 motors from over forty manufacturers. The WITTENSTEIN Engineering team's follow-up calculations confirmed what had already been observed in practice – the

Lifting axis of the machine tool's handling system as it was originally: the modification requested by the end customer resulted in the lifting axis drive being overloaded.





The point of force application of the lifting mechanism was shifted by WITTENSTEIN based on the calculations to enable the required cycle rates to be achieved with the existing motor-gearhead combination yet avoid overloading the powertrain.

The RP+ 060 gearhead with a ratio of i=110 meets high requirements in terms of power density, precision, rigidity and permissible tilting moments.

motor was overloaded in the S1 continuous duty mode owing to the unfavourable lever ratios and higher cycle rates.

The answer: three options for optimization

The application engineers were able to identify the critical parameters and derive three basic recommendations for optimization from the simulation results.

Option 1: A bigger motor that would guarantee the required performance. The problems: considerable re-engineering on site, higher purchase costs and a very long delivery time.

Option 2: Another gearhead with a larger ratio. However, based on the simulation data the motor would still have been run at a slight overload despite not having to produce as much torque. Moreover, this second suggestion was likewise beset with a long delivery period – and consequently discarded along with the first.

Modifying and optimizing the machine's lever ratios was judged to be a more feasible alternative – and simultaneously the best from a technical point of view. Oleg Korb and Samuel Schlecht therefore calculated and simulated various lever ratios, submitted them to the manufacturer as a video and then collaborated in search of the perfect solution.

It took WITTENSTEIN alpha only a few hours between receiving the first call from Asia and being able to report the results of the simulation and propose alternative optimization strategies.

Prompt implementation prevents commissioning delays

Without being obliged to wait for new components, the point of force application of the lifting mechanism was subsequently shifted on site to enable the required cycle rates to be achieved with the existing motor-gearhead combination yet avoid overloading the powertrain. Thanks to this absolutely timely solution, WITTENSTEIN alpha's Engineering Support helped the machine builder ward off additional design and purchase costs. As a result, the customer was able to keep within the time schedule for acceptance in the field – in particular because no modifications were necessary to the powertrain's control system.

Building on this experience with the lifting unit the manufacturer then also applied WITTENSTEIN alpha's expertise in connection with other, similar machine tools: the respective lever kinematics were calculated and the lever ratios optimized where appropriate based on the findings.

Tobias Gehrig spent three months travelling around Malaysia.

“There’s more beyond the horizon” – this title of a song by German rock musician Udo Lindenberg is also an apt description of an opportunity that has been available to Cooperative State University students and trainees since the end of 2011 prior to finally starting work at WITTENSTEIN. As “PIONEERS on the road” they travel to a country of their choice after completing their training or degree course in order to gain experience abroad and learn important lessons not only about work but also about life in general. They get to know the country concerned as well as its people and its cultural heritage – and above all they discover valuable insights into themselves.

With its “PIONEERS on the road” project WITTENSTEIN has revived a medieval tradition and filled it with the spirit of modern-day globalization. “The global world must be our home. Trust is founded on personal contact and maximum proximity. That’s why the opportunity WITTENSTEIN provides to take to the road will in future be a key element of our strategy for growth as a globally active organization.” Dr. Manfred Wittenstein, President of WITTENSTEIN AG, has no doubt in his mind. As in many other areas, WITTENSTEIN is a pioneer here – and as a pilot project “PIONEERS on the road” has even attracted the interest of the Chancellor’s Office in Berlin.

An ability to understand and empathize with foreign cultures is crucial for the future development of staff, markets and the company itself: How do people in other parts of the world think and feel? How does their culture interact with their working lives? In today’s globalized world, which values matter and where? How important are technology and innovation – and which expectations are placed in them?

Finally, how can collaboration with WITTENSTEIN put people, customers and businesses in these countries up among the winners? The pioneers who opt to “take to the road” spend two or three months on a life-changing journey, which it is hoped will transform all these questions into lived experiences, broaden their horizons, improve their cultural competence and develop their personality – and help both the young people themselves and WITTENSTEIN as their employer move forward on the way to becoming a global mechatronics corporation.

PIONEERS on the road – or

“There’s more beyond the horizon”

WITTENSTEIN‘s next generation on the road worldwide: Malaysia, Argentina and Israel were the first destinations.

Travelling alone – but not left alone

The manner in which WITTENSTEIN graduates approach their time on the road calls for pioneering spirit. With only a few parameters provided by the company as guidance, they define their own mission and organize their stay in a foreign country. They pursue, identify and explore new avenues. By rising to the challenges of an intercultural environment and accumulating experience relevant to the future, they ripen into true pioneers.

However, travelling alone doesn’t mean being left alone: WITTENSTEIN’s Human Resources department provides the youngsters with all the necessary backup, maintains regular contact with them while they are away on the road and frees them up in many respects. “The pioneers continue to be employed by WITTENSTEIN to enable them to focus on the country and its people without any unnecessary distractions”, explains Human Resources Director Oliver Kössel. “We’re conscious of our duty to have regard for their welfare, and the support they receive from us extends well beyond their monthly “on the road” remuneration, the payment of expenses and taking care of social insurance contributions and taxes. All pioneers are additionally entitled to a subsidy package where WITTENSTEIN pays for the flight, vaccina-

There at last!
Matthias Jäger admires the Great Wall of China.

The WITTENSTEIN „waltz“ – a modern idea inspired by a medieval custom

With its „PIONEERS on the road“ project WITTENSTEIN has revived a tradition that dates back to the Middle Ages but has acquired new topicality and special relevance in today‘s global age. The tradition of taking to the road (sometimes also referred to as the „waltz“ or the „journeyman years“) was originally partaken in by youngsters who had completed their apprenticeship as a craftsman. In the olden days, many guilds required them to become journeymen as a compulsory part of their professional training before they could be absolved from the obligations that bound them to their master.

From the late Middle Ages to the early period of industrialization, the waltz was one of the prerequisites for any apprentice aspiring to be promoted to master. The conditions were extremely harsh: during the journeyman years a wanderer was not allowed to return to within a radius of usually 31 miles (50 km) of his home town, not even in winter or on public holidays. He was not allowed to possess any means of transport of his own and was only supposed to travel on foot or hitchhike. Journeyman were expected to profit from their time on the road to become acquainted with new working practices, get to know foreign places, regions and countries and gain experience that would stand them in good stead for the rest of their lives – exactly like the young WITTENSTEIN pioneers today.

tions, supplementary health insurance for foreign travel, a visa if applicable and a medical check-up.” And if ever are any problems needing to be solved from a distance, a contact in Human Resources is at hand to advise and assist at any time.

Acquired and lived experiences

All pioneers who have taken advantage of the chance to go on the road since October 2011 have returned with valuable

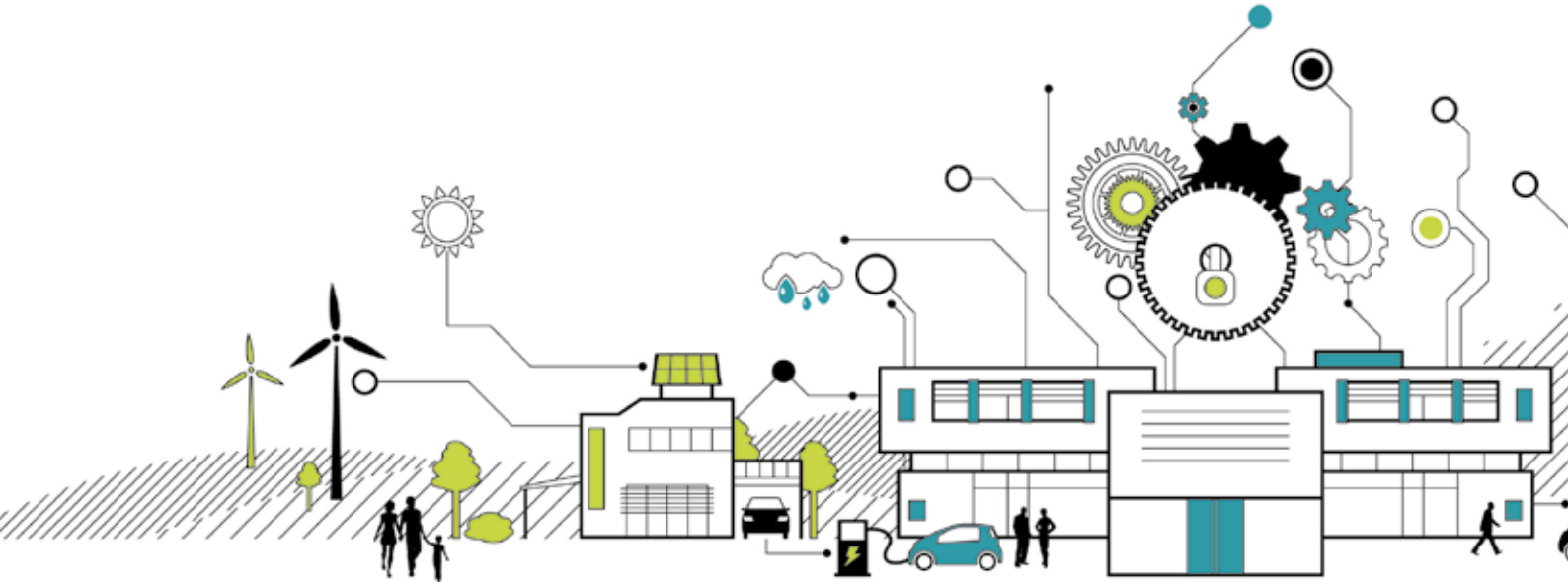
Three WITTENSTEIN pioneers who are proud of their experiences: Babette Winkel, Matthias Jäger and Leonhard Rödl.

insights derived from their everyday experiences as guests living and working in a foreign country. They have reported on problems, setbacks, differences, peculiarities, surprises, progress, openness and tolerance – and above all on how their time away has made a big mark on them and sensitized them to other countries, people and cultures. Against the background of globalization this is precisely what the "waltz" period on the road is intended to achieve:

"Not just WITTENSTEIN but society as a whole needs to adopt a new, uncomplicated attitude to globalization", says Dr. Manfred Wittenstein. "The pioneers' personal experiences and their open view on the rest of the world will stand them – and WITTENSTEIN – in excellent stead as they settle down into their professional lives." The WITTENSTEIN "Pioneers on the road" project will certainly be pursued further. As it says in the song, "There's more beyond the horizon" – and our horizon is the future.

The future is **now a reality**

Official opening of WITTENSTEIN bastian's "Future Urban Production" facility in Fellbach



For more information, see www.wittenstein-urbane-produktion.de.

A factory integrated in a built-up area is not something one comes across every day. Only limited space is available, noise and other forms of pollution are undesirable and sparing use must be made of energy and resources in order to minimize the burden on the population and the environment.

WITTENSTEIN bastian's "Future Urban Production" facility in Fellbach takes account of all these factors. Around 200 invited guests from politics and industry who attended the official opening ceremony were able to see for themselves how the future is now a reality.

"The new WITTENSTEIN building underlines yet again what it is that makes German industry so strong – the long tradition of family owned SMEs. It's thanks to companies like yours that we've managed to emerge from the recession of the last few years so quickly", said Ernst Burgbacher, Parliamentary State Secretary at the Federal Ministry of Economics and Technology and Federal Government Commissioner for SMEs and Tourism. Christoph Palm, Lord Mayor of Fellbach, added: "The project is a fantastic achievement. The success story of WITTENSTEIN bastian here in Fellbach is set to continue."

WITTENSTEIN invested twelve million euros in its new low-noise, low-emission production facility for gearing solutions, which is situated directly adjacent to a residential area in Fellbach's Lise-Meitner-Strasse. The Wittenstein family took a conscious decision to build this new factory in the middle of the economic crisis. "The decision was absolutely the right one – as was choosing to erect it at this inner-city location", commented Erik Rossmeissl, now Commercial Manager of WITTENSTEIN AG but up until the beginning of the year General Manager of WITTENSTEIN's Fellbach branch.

The outcome is an innovative overall concept comprised of optimized processes, the building itself and the energy supply systems for the group's WITTENSTEIN bastian subsidiary christened "Future Urban Production" – a low-noise, low-emission plant that is closely aligned to tomorrow's

Industrial opera: live performance from the heart of “Urban Production” by soprano Gudrun Kohlruss

Successful reconciliation of economic with ecological requirements – “Future Urban Production” in Fellbach

challenges as identified within the Industry 4.0 project – the “fourth stage of industrial development”.

A glimpse into the future

Here in the new production facility WITTENSTEIN plans to set up a “shop window factory” that will gradually integrate a series of typical Industry 4.0 concepts. The project will chart totally new territory: in the light of the increasing fusion of production and Internet technologies, identifying ways to accomplish and organize this revolution in global industrial production will be at the focus of WITTENSTEIN’s attention.

Burgbacher subsequently appealed to those present at the official inauguration in Fellbach: “If we want to be masters of the future, we need to find new solutions to production problems. Simply keeping pace is not enough, however; above all, it will be up to us to set the pace of the fourth stage of the Industrial Revolution.”

“Optimal production conditions guarantee precision technology ‘Made in Germany’.”

Michael Müller
General Manager
WITTENSTEIN bastian GmbH

“Despite all the innovative technology that’s been crammed into it, the new production building is not an end in itself. Its sole purpose is to provide the perfect framework for people and machinery to work in.”

Philipp Guth
General Manager
WITTENSTEIN bastian GmbH

Hole drilling will never be the same again:
The new, modular WITTENSTEIN tool drives system

Customers of large furniture stores know from experience that predrilled holes for dowels and screws frequently differ from one board to the next. In order to obtain the hole patterns required for each individual item, woodworking machinery manufacturers are reliant on flexible machining systems.

With its modular tool drives system, WITTENSTEIN motion control now offers a completely novel solution that will herald in a new technology generation in the woodworking industry.

Thanks to its direct drive machining modules, the new tool drives system is about 30% more efficient than conventional, belt driven tool heads. It consumes up to 70% less energy, makes optimal use of the raw material and can be tailor made to suit any application.

What makes tool drives so novel?

"The tool drives system represents an entirely new approach to fully automated woodworking", says Volker Meier, Head of the tool drives Business Division. The days are gone when a main drive's rotary power was distributed to all the machine tools of a rigid drilling head by the pinions, belt drives and deflection gears – which were forced to rotate too if the drilling plan did not show any holes to drill.

The tool drives system follows a different principle: only the spindle that actually has a "drilling job" is turned together with the drive. Dr. Guido Neumann, a development engineer in the Test Lab, attempts to explain the revolutionary concept adopted for the tool drives: "The key lies in the use of spindles that are driven directly by high-performance servo motors".

Every furniture manufacturer has "its" own tool drives system

Anyone who has ever had to assemble a piece of furniture will know that no two holes are identical, no two drilling patterns are ever the same and even the milled grooves differ from one board to the next. The tool drives system can be individually designed to suit the needs of the customer concerned – no matter whether the company manufactures kitchen, living room or acoustic furniture. "Two direct drive tool spindles form a machining module, which can be used flexibly in a frame", is how Meier describes the mechatronic building block system developed for tool drives. It makes no difference whether the machining modules are arranged in a square, rectangle, matrix, L, T, U or any other shape – they can be positioned in the frame in any way at all and later changed, or new modules added, simply by removing or inserting them in the desired configuration.

Short cut to the fast track with **tool drives**

Volker Meier
WITTENSTEIN motion control GmbH, Head of the tool drives Business Division

No-risk technology change in the woodworking industry: endurance testing in the WITTENSTEIN test lab

WITTENSTEIN motion control's tool drives Business Division in Bad Pyrmont is specialized in the development, production and marketing of intelligent building block systems for mechatronic machine tool units. The modular principle and the benefits for customers through the integration of markets and technologies are key priorities.

Machining controlled by Electronic Tool Manager

The Control Box of the tool drives system determines which module should drill which hole how deep and at which point in the process. "The Control Box integrates up to seven compact dual-axis controllers, a power module for the 400 V power supply and the so-called Tool Manager – the "brain" of the tool drives system. It controls all connected components", Neumann reports. At the same time, the Tool Manager allows the condition of each tool spindle to be monitored during operation. The speed, torque, power and operating time of every spindle can be electronically recorded, evaluated and documented. "Timely and targeted maintenance work is now plannable and feasible", Meier continues, summing up the benefits for users.

No-risk technology change thanks to tool drives

Changing over to a new machine or a new process often involves a degree of uncertainty, yet the risk when switching to a new technology tends to be infinitely greater. Not so with tool drives: loath to take advantage of end customers as "guinea pigs" for its new machining technology, WITTENSTEIN motion control subjected the tool drives system to a thorough scrutiny aligned to real situations at an institute of technology, in pilot plants and particularly in-house. "A set of endurance testing facilities was developed and put into operation for this purpose in Bad Pyrmont", Neumann comments.

All mechatronic and electronic components of the tool drives system then underwent realistic long-term testing at several different loads. Meier cannot contain his excitement about the first-rate prospects for a no-risk technology change in the woodworking industry: "The thirty million drilling cycles completed in the test series are equivalent to an estimated three years of system operation at high loads".

The future of automated woodworking starts here

In many respects, the tool drives system concept provides users with a short cut from conventional woodworking processes direct to the fast track. It unites all the features of a successful future technology – lower lifecycle and operating costs, higher productivity and optimal value creation.

An acoustic guitar, drums and – the newest member – a panpipe harmonize perfectly in the TeamDARE robot band.

A perfect panpipe sound with **planetary gearheads**

The style of music played by the band at TeamDARE, the Dutch engineering specialists, is hardly what you'd call mainstream: not musicians but percussion and guitar robots do the performing. A panpipe is the newest star in this unusual ensemble; thanks to a compact TP+ 004 planetary gearhead made by WITTENSTEIN, it invariably produces the right note.

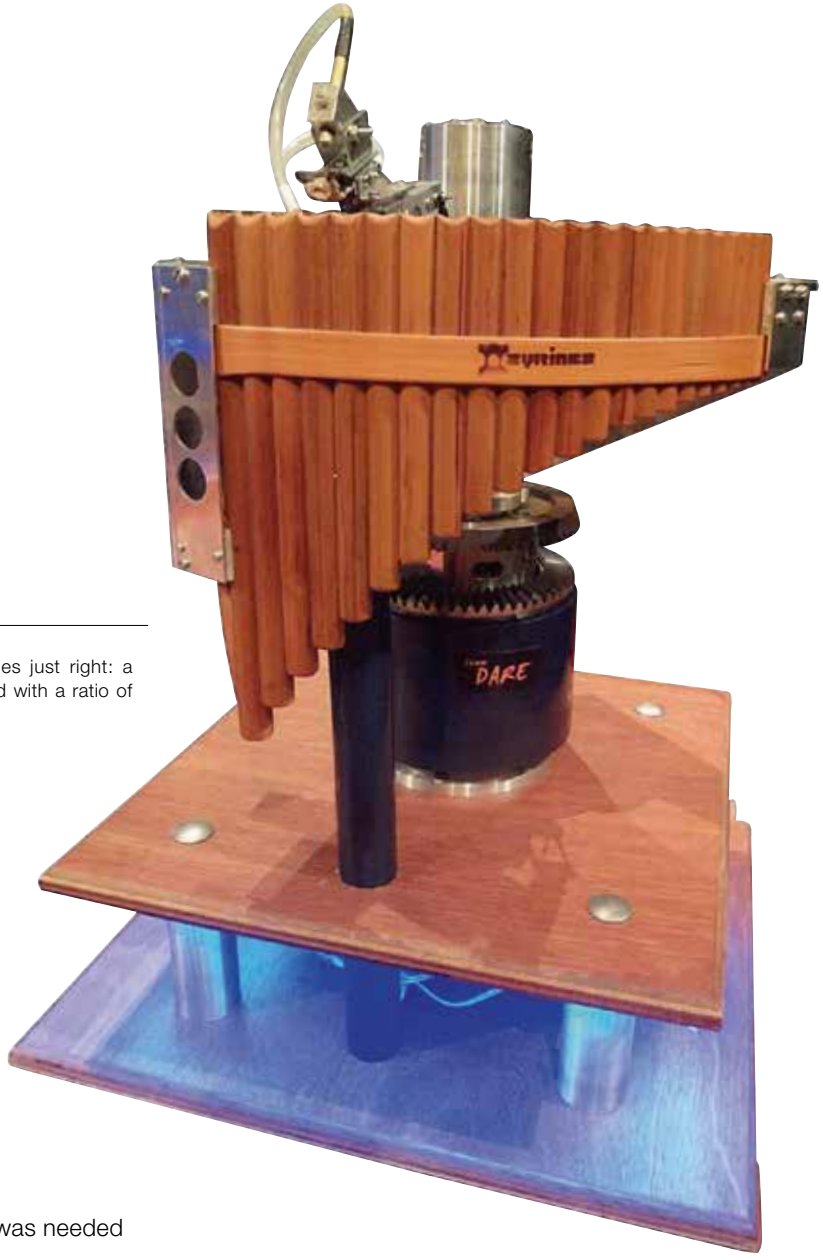
More musical diversity and action on stage

The first music robot – which plucks an acoustic guitar – was built by TeamDARE in 2008. The drum robot – and the band's first tour – followed a year later. Around ten gigs a year have been played to enthusiastic audiences ever since. "Whenever we take to the stage, the fans just love it", reports Frank van Heesch of TeamDARE. "Modern drive and control technology helps our robots put a lot of emotion into their rendering of the music."

Unfortunately, however, the repertoire of suitable tunes for a robot band with only three in the line-up is not very large. Added to that, there's still room for improvement when it comes to rocking on stage like a real combo because every string of the guitar has its own plectrum and every drum its own stick. "We therefore decided to include a panpipe in the band for musical reasons. We wanted to integrate it in a way that would fill the performance with life", Bart Janssen of TeamDARE recalls. He never imagined quite how complicated that would turn out to be in practice.

Tightly sealed lips make a beautiful noise

Even for a human being, the panpipe is not normally considered an easy instrument to learn. It all hinges on the musician knowing the right way to press his or her lips against the mouth-holes in the clay pipes – if not, the instrument will no longer make a beautiful noise but simply screech. Instead of a mouth the panpipe robot has a kind of cushion comprised of a sponge and silicon; "lip-shaped" blasts of compressed air from a reservoir are blown into the pipes via a series of tubes and valves. Once the TeamDARE engineers had succeeded in emulating the function of the lips in this way, their next challenge was to position the "artificial mouth" as precisely and as dynamically as possible over the appropriate clay pipe. "In order to hit the right note, you need to blow exactly into the centre of the pipe", van Heesch explains. "Especially with the shorter pipes, even a minute deviation from the ideal position



Out of sight yet vital to get the harmonies just right: a WITTENSTEIN TP+ 004 planetary gearhead with a ratio of i=16 is mounted to the panpipe.

immediately results in a wrong note." A solution was needed for this dilemma.

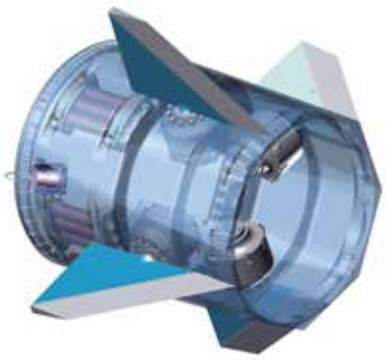
WITTENSTEIN planetary gearhead gets the harmonies just right

Luckily for TeamDARE, Janssen was aware of WITTENSTEIN as a manufacturer of precision gearheads: "We asked WITTENSTEIN's Belgian subsidiary to help us select a suitable planetary gearhead with an output flange – the TP+ 004." There were several factors that finally tipped the scales in its favour: the gearhead's high dynamics, the extraordinary positioning tolerance and rigidity and the space-saving design. What's more, the reduction ratio of 1:16 meant that the effects of the gearhead's angular displacement are only very slightly amplified over the length of the arms that hold the panpipe. As a result, the robot always positions optimally, even with the short pipes, and finds the right note every time", van Heesch concludes.

More new additions to the robot band

Encouraged by the successful integration of the panpipe, the engineers at TeamDARE – none of whom, surprisingly, are musicians themselves – have already set their sights on the next instrument: a double-bass. Once again, dynamics and precision will be vital for the robot that draws the bow over the strings.

Justifiably proud of its contribution to the panpipe robot, WITTENSTEIN is eagerly awaiting the chance to develop an optimal technology solution for future TeamDARE band members training as musicians.



Four WITTENSTEIN actuators are installed in the head of the sounding rocket.

Smart Actuator

Trailblazing technology for the space transporter of the future

The main components of the Smart Actuator – gearhead, motor, brake, sensors, electronics and software – are intelligently networked.

Sharp-edged, economical and compact – that's the specification for the space transporter on which the German Aerospace Center (DLR) has been working for the past several years. When the SHEFEX II high altitude sounding rocket was launched in Norway in June this year, a total of four Smart Actuators made by WITTENSTEIN aerospace & simulation were also on board. Their job was to actively control the position of the spacecraft and damp vibration on its re-entry into the Earth's atmosphere at ten times the speed of sound.

A hypersonic flight into space – and safely back to earth again thanks to a novel heat shield

The objective of the DLR's SHEFEX (Sharp Edge Flight Experiment) project is to investigate technologies for spacecraft returning to Earth. If all goes well, by 2020 it will be possible to design a completely new, compact type of transporter that can be reused for several space flights. Compared to the American Space Shuttle, for instance, the DLR transporter will hopefully be much cheaper to produce and maintain. A novel thermal protection system is being developed as a central component of this plan. Whereas approximately 25,000 heat-resistant tiles – each with a slightly different geometry – have to be attached to the underside of the Space Shuttle, the DLR favours fairing made up of planar surfaces, resulting in the sharp edges that gave the project its name. "The sharp-edged shape has the benefit of making manufacture of the thermal protection system significantly less costly", explains Hendrik Weihs of the DLR Institute of Structures and Design in Stuttgart, which has overall responsibility for the project. "At the same time, the straight leading edge improves its aerodynamic properties." These are particularly important when a manned spacecraft re-enters the Earth's atmosphere because they allow the angle of re-entry to be controlled and the transporter manoeuvred during the return flight.

Smart Actuator – a technical "spot landing" for flight control

In order to be able to control SHEFEX II, the researchers at the DLR have equipped the high altitude sounding rocket with four control surfaces referred to as canards – each one driven by a Smart Actuator made by WITTENSTEIN. "The extreme environments encountered in the course of the mission – 12 g vibration at up to 2000 Hz, 80 g shock when the brake parachute is activated, temperatures as high as 900°C, radial forces of 5 kN owing to the aerodynamic loads on the con-

The rocket on its way to the launcher

Pictures: DLR (3) / WITTENSTEIN (1)

SHEFEX II lifts off from Andøya Rocket Range

trol surfaces – coupled with the limited physical volume and weight meant conventional actuator systems could be ruled out", Christoph Heine, General Manager of WITTENSTEIN aerospace & simulation GmbH, recollects. "That all made it an ideal terrain for us to demonstrate what this revolutionary WITTENSTEIN actuator technology is capable of." The outcome was a technical spot landing. "At the heart of the actuator is a totally new kind of transmission technology", says Heine, "but the real achievement is the actuator system as a whole. It's a hallmark of the Smart Actuator that the main components – gearhead, motor, brake, sensors, electronics and software – are intelligently networked and utilized.

Successful flight experiment in the Far North

SHEFEX II took off from Andøya Rocket Range in Norway at 9:18 p.m. local time on June 22, 2012. With a seven-ton payload and driven by two rocket stages, the 13 m long craft was launched into space before re-entering the Earth's atmosphere again at ten times the speed of sound. During the flight, which lasted a little over eight minutes, telemetry stations on Andøya and in Spitzbergen assimilated the flight data from thousands of measurements until just prior to landing – including information about the Smart Actuators and the canards. Andreas Bierig, project manager for the actuator module at the DLR, was delighted with the success of the mission: "As far as we can tell, everything went off without a hitch. The Smart Actuators were activated as planned at an altitude of 70 km. The WITTENSTEIN Smart Actuators and indeed the entire canard control system can only be described as an unqualified.

The SHEFEX II flight and the researchers' findings have taken the DLR another step closer to its goal of making spacecraft re-entry less expensive. SHEFEX III is scheduled to take off just four years from now in 2016. This follow-up model will closely resemble a real space transporter; it will be able to fly even faster and stay in the atmosphere for longer – and of course WITTENSTEIN aerospace & simulation hopes to play a similarly important role in the mission's success.

DEWITTA sewing machines

A post-war best-seller still runs like clockwork

The recipient at WITTENSTEIN was more than a little taken aback not long ago when an e-mail was received from Zimbabwe. James North Zimbabwe Ltd., a clothing manufacturer, was enquiring about prices and delivery times for six DEWITTA KL 70/3 sewing machines.

The seeds for what is now WITTENSTEIN AG were originally sown by DEWITTA Spezialmaschinenfabrik, which was established by the present proprietor's father as a maker of special-purpose sewing machines for ladies' gloves in the post-war period.

DEWITTA sewing machines for ladies' gloves

DEWITTA Spezialmaschinenfabrik was founded by Bruno Dähn and Walter Wittenstein in Bad Mergentheim nearly sixty-five years ago in 1948 as a manufacturer of special-purpose sewing machines for ladies' gloves and knitwear. Its success in the market was remarkable – the DEWITTA KL 70/3 double chainstitch machine, for example, became an international best-seller in the textile industry, not least due to its outstanding quality. "The low noise level and simple operation of the DEWITTA machines, which weighed in at around 18 kg and also featured an integrated cutter, were likewise praised", recalls Peter Rieger, who used to work for the company's Production department making spare parts.

This auspicious situation continued for about thirty years – until about the time when Manfred Wittenstein took over the running of the firm from his father. He soon realized that the potential for sewing machines had been exhausted: "Fashions and textile production methods were facing fundamental changes", he says looking back. Nevertheless, DEWITTA did him an invaluable service as a source of ideas for the company's future direction: The combination of precision and motion that is an essential aspect of sewing machines provided the inspiration for the low-backlash planetary gearhead – sowing the seeds for what is now the WITTENSTEIN Group.

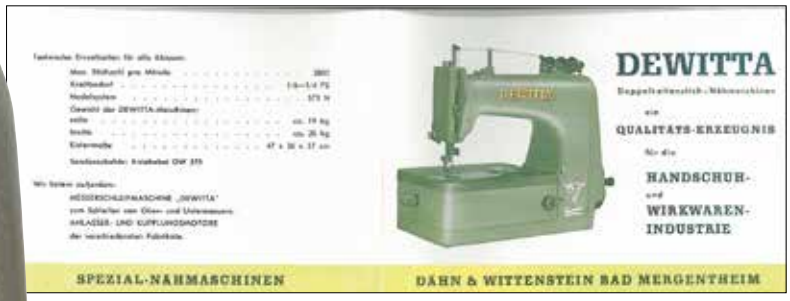
Realignment without DEWITTA

Manfred Wittenstein's decision to sell off the sewing machine portfolio to Häuser + Renner of Ichenhausen in the early nineties was only logical. His wife Edith, who was on the DEWITTA payroll in Central Order Processing at the time of the sale, has never forgotten what it was like when the final machines were delivered: "We shipped our DEWITTAs all over the world – to Europe, of course, but also to far-off countries like New Zealand, South Africa and Zimbabwe, which was still known as Rhodesia." Häuser + Renner kept up the business for quite a while afterwards until cheap competition from Asia forced the DEWITTA sewing machine production line to close down a few years ago.

The machinery stands still – but DEWITTA lives on

The recent enquiry from Zimbabwe is clear confirmation that the DEWITTA brand is still alive and kicking and continues to

Still in demand: DEWITTA KL 70/3 sewing machines



DEWITTA quality products – a flyer proclaims the technical data

A used DEWITTA glove sewing machine from Portugal

be held in great esteem. To this day, Edith Wittenstein has vivid memories of James North in Harare: “The firm also had clothing production facilities in the UK, France and South Africa, and we supplied them with both machines and spares.” The flurry of research activity into the DEWITTA story that was triggered off by the enquiry revealed several interesting facts about the sewing machines.

Harald Renner, for instance, the owner of Häuser + Renner, reported unbroken worldwide demand for DEWITTA equipment even though it is no longer made. Seeking a suitable response to this demand, the company hit on the retrofit trade as a good way to carry on serving the many loyal users. In the last few years, Häuser + Renner has bought up used sewing machines that are no longer in use from all kinds of places – Turkey, France and Portugal, to name but a few. “The machines are completely refurbished to ensure that they are in perfect working order and look as good as new before being offered to potential customers”, Renner continued. “In the meantime, a large number of machines have been either refurbished to order or overhauled by us and subsequently resold.” Unfortunately, nothing came of the deal with James North for six new sewing machines – they proved to be too expensive. Instead, the Zimbabwean manufacturer purchased spare parts for its existing equipment. Business with spares is evidently still going strong: Häuser + Renner’s experience shows that “Somewhere in the world there’s always a wearing part in need of replacement”.

Good quality never goes out of style

Good quality never goes out of style – just one welcome lesson WITTENSTEIN has learned from its DEWITTA brand. Even well into the twenty-first century, an enduring demand exists for the “old” technology because it runs like clockwork and continues to deliver reliable service. “Remarkable!” – we can’t help but share Manfred Wittenstein’s opinion.

An engineer with the resourcefulness of a discoverer

Dr. Manfred Wittenstein turns 70

Showed up to congratulate Dr. Manfred Wittenstein in person: Professor Annette Schavan, Minister of Education and Research

An engineer with the resourcefulness of a discoverer, outstanding motivator, charismatic role model, bold citizen and universally respected entrepreneur.

The Federal Chancellor values him as an adviser in her "Innovation Dialog between the German government, industry and science" while the Minister of Education and Research is indebted to him for his contribution to the Science-Industry Cooperation. Invited guests from politics, industry and society were in attendance at a special gala evening in honour of Dr. Manfred Wittenstein, President of WITTENSTEIN AG, who turned seventy at the beginning of September. As pillars of a visibly large network, they joined in the birthday celebration for one of today's outstanding business figures.

The guest speakers, headed by Professor Annette Schavan, German Minister of Education and Research, and Professor Hans-Jörg Bullinger, President of Fraunhofer Gesellschaft, paid tribute to the unique personality and lifetime achievement of Dr. Wittenstein, who was also President of the German Engineering Federation from 2007 to 2010: "Manfred Wittenstein and others like him make a vital contribution to our society because they have the ability to envisage what the future could look like." The motto for the evening – 'The pioneer on the road' – had previously been touched on by Karl-Heinz Schwarz, Spokesman of the Management Board of WITTENSTEIN AG,

Paid tribute to Dr. Wittenstein's unique personality and lifetime achievement: Professor Hans-Jörg Bullinger, President of Fraunhofer Gesellschaft

in his welcoming address: "Manfred Wittenstein is a person who is always on the lookout for new ideas. A man forever on the move. Someone who only ever looks forward and never back." Dr. Michael Geier, Dr. Wittenstein's nephew and General Manager of WITTENSTEIN cyber motor, spoke on behalf of all employees: "Manfred Wittenstein has a gift for empathy. He provides people with a sense of purpose on an individual and social level. As an architect and an entrepreneur, he changes the course of the big picture."

Dr. Manfred Wittenstein wound up with a few reflections on his professional and personal life while emphasizing his gratitude for the opportunities given to him: "Every step I have taken on my journey has had its own special value. I would like to thank all comrades in arms as well as everyone who has accompanied or supported me."

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Germany as a High-Performance Network

Value Creation and Prosperity for the Future

"Our country needs entrepreneurs like Dr. Manfred Wittenstein" – in her foreword to "Germany as a High-Performance Network", just published by Murmann to mark Dr. Manfred Wittenstein's 70th birthday, Angela Merkel pays tribute to the President of WITTENSTEIN AG. In this fascinating book eighteen eminent personalities representing the worlds of politics and business and headed by Professor Annette Schavan (Minister of Education and Research) and Professor Hans-Jörg Bullinger (President of Fraunhofer Gesellschaft) highlight and analyze Dr. Wittenstein's central ideas and illustrate the importance of high-performance networks for Germany as a traditionally innovative nation with the help of concrete examples. Dr. Wittenstein himself – both the private individual and the entrepreneur – is profiled by Peter Felixberger, who has compiled a biography in dialogue form entitled "Wie war's wirklich, Herr Wittenstein?" ("Mr. Wittenstein, tell it how it really was").

TRADE FAIR CALENDAR 2012 / 2013 (selection)

Motek 2012, Stuttgart (Germany)
International Trade Fair for Assembly and Handling Technology
WITTENSTEIN alpha GmbH,
WITTENSTEIN motion control GmbH,
WITTENSTEIN cyber motor GmbH
Hall 9, Stand 9121
October 8 to 11, 2012

Forum Maschinenbau 2012, Bad Salzuflen (Germany)
Trade Fair for Suppliers in the Machinery Manufacturing Industry
WITTENSTEIN alpha GmbH
Hall 2, Stand 20
November 7 to 9, 2012

SPS/IPC/DRIVES 2012, Nuremberg (Germany)
Exhibition for Electronic Automation – Systems & Components
WITTENSTEIN alpha GmbH,
WITTENSTEIN motion control GmbH,
WITTENSTEIN cyber motor GmbH,
WITTENSTEIN electronics GmbH
Hall 4, Stand 221
November 27 to 29, 2012

Intec, Leipzig (Germany)
Trade Fair for Manufacturing, Tool and Special-Purpose Machine Construction
WITTENSTEIN alpha GmbH
February 26 to March 1, 2013

World of Industry Part II, Istanbul (Turkey)
International Industrial Fair
WITTENSTEIN alpha GmbH
March 21 to 24, 2013

Hanover Fair 2013, Hanover (Germany)
Industrial Automation
WITTENSTEIN Group
April 8 to 12, 2013

IFFA, Frankfurt (Germany)
International Trade Fair for the Meat Industry
WITTENSTEIN motion control GmbH
May 4 to 9, 2013

OTC, Houston (Texas / USA)
International Offshore Technology Conference
WITTENSTEIN motion control GmbH
May 6 to 9, 2013

Paris Air Show, Le Bourget (France)
Salon International de l'Aéronautique et de l'Espace
(Joint stand of the German Aerospace Industries Association (BDLI))
WITTENSTEIN aerospace & simulation GmbH
June 17 to 23, 2013