THE FUCHS GROUP MAGAZINE

Pacesetter

LUBRICANTS.
TECHNOLOGY.
PEOPLE.

FUCHS

“We are setting the pace. FUCHS has continued to grow organically. This presents a secure base that enables us to invest heavily in the future and keep on innovating. We are digitalizing development processes and products, carrying out research as part of an international network, all with our finger on the pulse of local markets and entire industries and a swift, agile approach to implementing our plans. But despite the fast pace, we never lose sight of what lies at the core of our success: LUBRICANTS.TECHNOLOGY.PEOPLE.”

Stefan Fuchs, Chairman of the Executive Board
FUCHS PETROLUB SE

Two pacesetters at work: Development engineer Holger Maisack and chemist Dr. Erik Schuster ensure the speed and traction of all types of vehicles through the research and development of transmission and shock absorber oils. They are finding solutions for our customers’ applications in ever-shorter development cycles.

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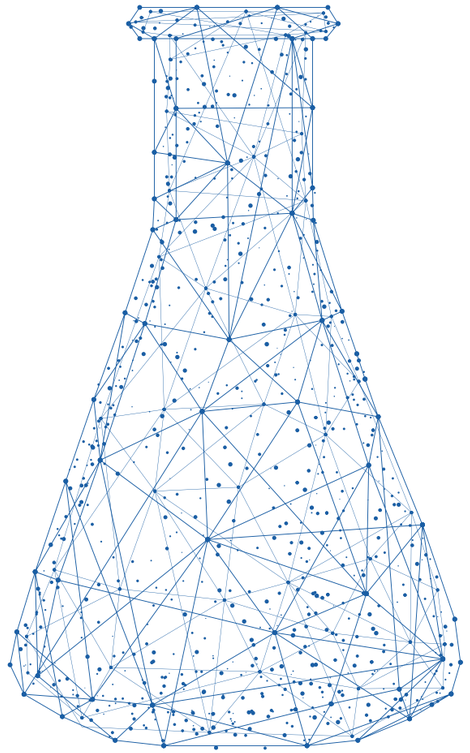
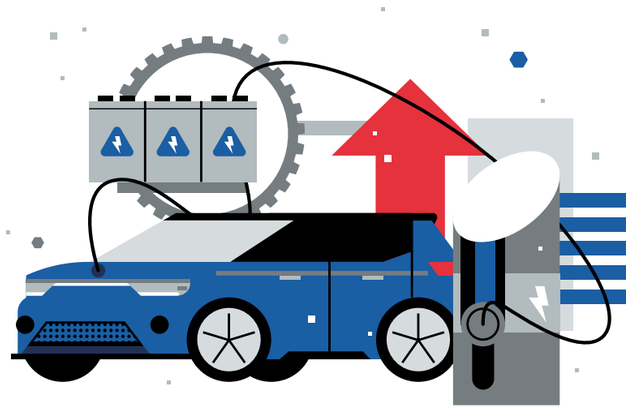
LUBRICANTS. TECHNOLOGY. PEOPLE.

LUBRICANTS.



TECHNOLOGY.

PEOPLE.



Target? The future!

FUCHS – the world's largest independent lubricant manufacturer – has spent the past two years investing generously in an organic growth strategy. The Chairman of the Executive Board, Stefan Fuchs, takes us on a tour of the plant site and explains what this strategy involves, where it is to lead and what areas the company will be focusing on in the future.

By Stephan Weiner

Friesenheimer Strasse is long, stretching around four kilometers along Bonadieshafen. Many companies are based here, FUCHS being one of the largest and longest-standing. The family-run company started production here more than 80 years ago, right from the outset focused on lubricants. What began way back in 1931 with the delivery of oils -imported from the USA- to the companies in the Mannheim port by bicycle, developed into an international success story. Today, the FUCHS Group – comprising 58 subsidiaries operating under the FUCHS PETROLUB SE umbrella – is a global player employing a workforce of more than 5,000 in over 45 countries and manufacturing around 10,000 products.

› There's not a cloud in the sky as we meet Stefan Fuchs – the Chairman of the Executive Board and grandson of company founder Rudolf Fuchs – in front of the new test field building for a tour of the plant site. We are here to talk about two things in particular: the present and the future. What is FUCHS' current situation? And what goals are on the horizon?

FUCHS has specialized in lubricants right from the beginning. What impact has this had on the company?

Lubricants are the core of our business. We offer more than 10,000 products, every one of which is designed to reduce friction. This might not sound very diverse to a layperson, but we have more than 100,000 customers all over the world, including automotive suppliers and companies from the mechanical engineering, mining, aerospace, power generation, agricultural and many other industries. In close collaboration with them, we develop holistic, innovative and customized solutions for an incredibly diverse range of applications. In other words, we cover an extremely broad and fascinating spectrum.

› We take a drive across the FUCHS plant site. A gatekeeper waves to us. Stefan Fuchs smiles and greets him back. We turn right and head toward the main building.

The plant site is growing – and so, too, is the company. Why is this?

An intact business model encompassing a high level of product expertise, holistic solutions offering significant added value for our customers and committed and motivated employees. But we don't want to grow just for the sake of it; for us, it's about achieving healthy, profitable growth close to where our customers are and sustainably adapting to a changing world. Technological advances, new business models facilitated by digitalization, autonomous driving, e-mobility – these are all fields harboring opportunities that we want to leverage. The FUCHS2025 initiative, which we launched in 2018, is designed to support us to achieve this. Among other things, we are working on global processes and standards as well as on our leadership culture. Our aim is to become a more agile company based on our five core values of trust, creating value, respect, reliability and integrity.

"Agile" is probably one of the most commonly used words to describe modern corporate structures. What does agility mean for FUCHS?

For FUCHS, agility means communicating without hierarchies and allowing that decisions are made by experts in the specialist areas. It is a question of making proactive and quick decisions that we can implement immediately. Our already established global networks provide a good example here. All employees ultimately work together as a team in a spirit of openness and

FUCHS intends to invest more than

€100 million

in organic growth annually up to 2021.

trust and provide feedback at eye level. Only in this way we can be truly agile and create, for example, shorter coordination cycles.

What does a company have to do to ensure that employees really can provide "feedback at eye level"?
Here I would like to refer you to the last pillar in our mission statement "PEOPLE.": The people make all the difference here. We have colleagues who are already working at FUCHS in the second and third generation, but our employees are more than 5,000 individuals whose needs we want to address. We have a working atmosphere that fosters trust – including in the future of our company – and is rewarded by the great loyalty of our employees. That makes me incredibly proud. And of course, "feedback at eye level" is not only an internal issue, because we also enjoy a trusting relationship with our customers.

You can read more about our investments worldwide on page 28.

› Every visitor who comes here can see that FUCHS is a self-confident organization – and has every right to be so, too: Having been a listed company for almost 35 years, without a single loss-making year in that time and with annual dividend payments. This is a remarkable track record that has laid the foundations for a broad-based investment offensive.

FUCHS is securing its future viability and making huge investments…
Following a foundation, internationalization and consolidation phase, we are now in our growth phase. In 2018, we again recorded further growth with sales of €2.6 billion. This makes us glad and we intend to continue this trend. Thanks to our FUCHS2025 initiative, we are preparing ourselves for the challenges that this period of expansion will entail – and, of course, making the required financial resources available. We plan to invest more than €100 million each year up to 2021. Most of this will be allocated to new plants and plant expansions. Over the coming three years, for example, around €50 million will be invested in our home location in Mannheim, where we have purchased two plots of land so that we can increase our floorspace by 25% to 135,000 square meters – a measure that will free up a host of opportunities. This is where we will be constructing a new office building and a high-bay warehouse for raw materials.

In addition, you doubled investment in research and development over the past ten years. The Global Research & Development network constitutes an extremely efficient international research structure. FUCHS' in-house innovative strength seems to be very highly valued.
That's right. Our nucleus of research is based here in Germany, but we want to expand above all in the USA and China. It is important to us that local OEMs have access to locally made FUCHS products. It is also important that we support the advancement of pioneering developments such as e-mobility by providing outstanding solutions – after all, new technologies like this require new lubricant applications. Therefore we established our highly successful, global research network. In "Global Key Working Groups," scientists conduct research into fundamental solutions – core recipes for various product families – above and beyond the scopes of individual subsidiaries, a process that results in tailor made products for specific customers. This approach to research helps us to lay the foundations for the technology of tomorrow.

› Stefan Fuchs parks in front of the main building. A short set of steps takes us up to a flat building. We can see huge silos to our left. The foyer is bright, the furnishings modern and understated. And talking of modern:

The digital transformation is currently on everyone's lips. Every single company must be aware that new digital solutions lead to new processes in both production and administration. Is FUCHS properly prepared for this?
Yes, we have significantly expanded our entire IT area over the past few years. To help us to better coordinate activities in this area, we launched our own Digital Board, which will steer these processes worldwide. The subsidiary inoviga, which we founded in late 2016, acts as our think tank here, opening up whole new ways of thinking and driving forward digitalization projects. Just one example: Holistic systems with sensors designed to make lubricants "talk" so that they can automatically inform us of their status and whether any action is required.

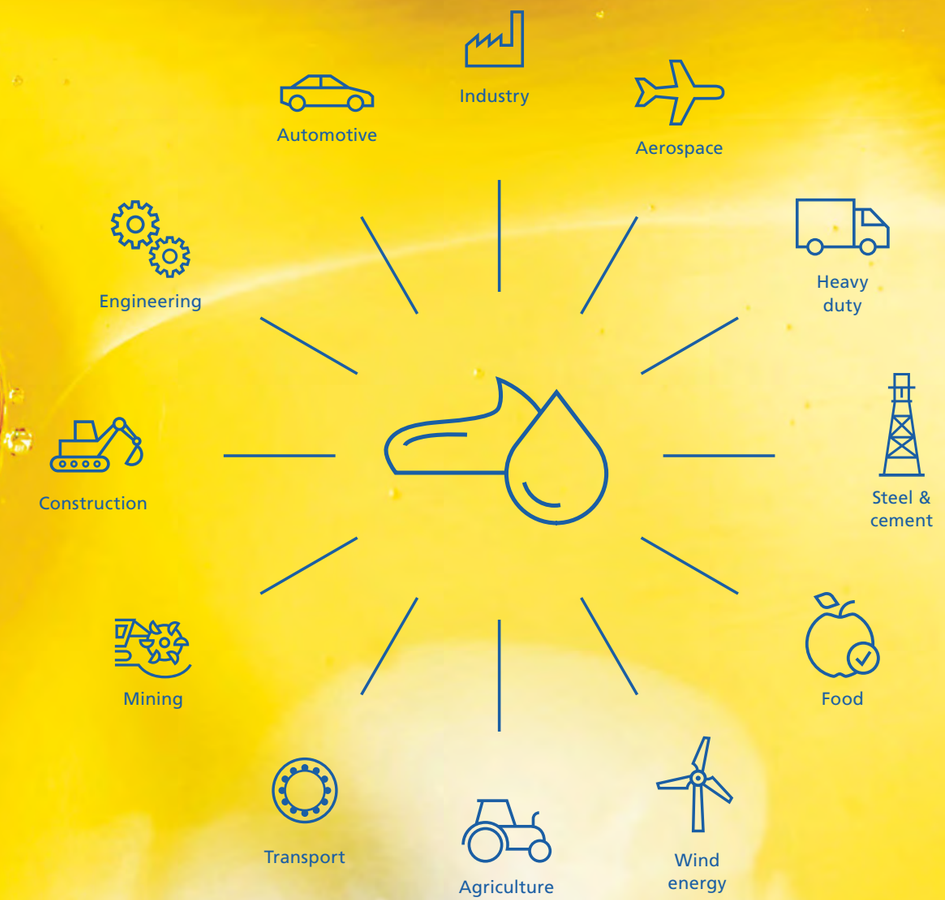
Mr. Fuchs, thank you for talking to us – and of course for the tour of the plant site.
It was a pleasure! ■

"Agility is a key factor: Our experts make decisions quickly, which we can put into practice instantly."

Stefan Fuchs, Chairman of the Executive Board
FUCHS PETROLUB SE

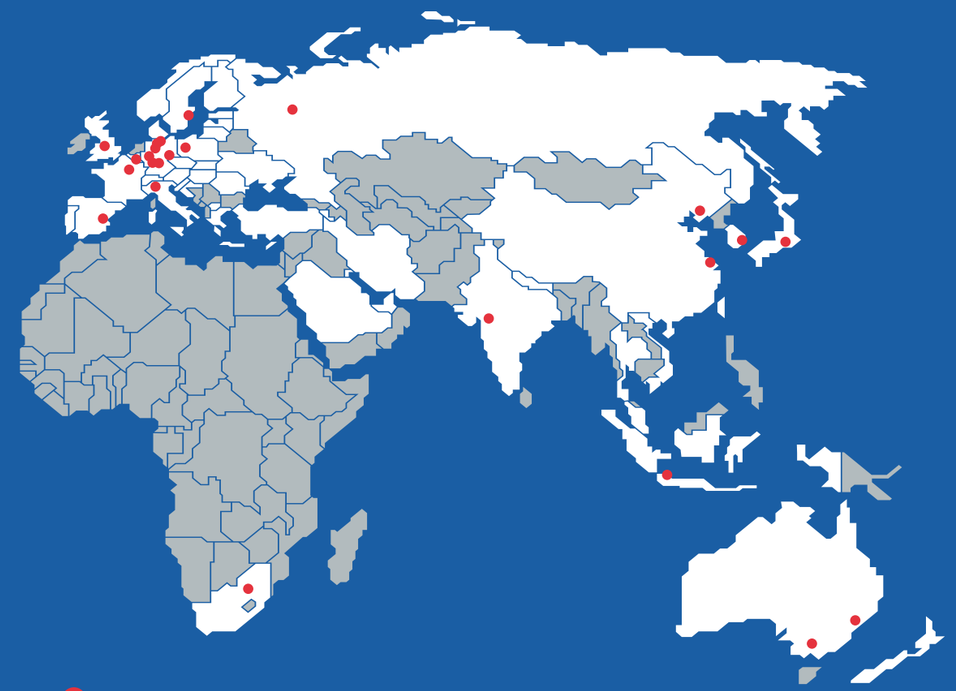
Full program – for every application

When it comes to lubricants offering both application diversity and individuality, FUCHS is your partner of choice! We combine the strengths of full-liners with the individuality of niche specialists to supply high-quality, technologically advanced lubricants – ranging from standard to highly customized solutions, for almost every application and industry, all over the world.



Our company can be found wherever our 100,000 customers are –

all over the world, in more than 45 countries.
Therefore we know the requirements of entire industries and markets to the greatest detail – requirements that we implement through our 58 operating companies and 33 production locations all over the world.



Onward and upward

- Anyone wishing to remain an industry leader has to understand the customers and their markets
- The future is information, the future is digital
- In a globalized world, a local presence counts – FUCHS is expanding its production capacities and sales networks worldwide

The overall market for lubricants is huge and it continues to grow. So, conditions are good. However, a company can grow with the market only with a substantial amount of effort and certainly not without a strategy – particularly in the age of Industry 4.0. This is also apparent in the industry's technical sales. To enable the rapid upward trajectory to continue in the future, it is important to put the focus on the customers' perspective – what they want, need and quite simply expect.

Know the requirements

And this is important, because productivity has top priority for industrial customers. Uptime is the magic word here, meaning maximum machine availability without failures. In addition, we are experiencing a digital transformation on both a commercial and technical level with regard to our customers. The new generation of decision makers in particular expects electronic platforms that make it possible to buy lubricants for all locations worldwide in one place. They want ordering lubricants to be as comfortable as buying books on Amazon.

Dr. Thomas Christmann
Vice President Global Sales
Strategy Industrial Lubricants

The technical development is clearly headed toward a future in which machines use sensors to monitor themselves. This will also make it possible to measure the quality of lubricants. Software will decide when a lubricant needs to be refilled or reordered.

We have to change our perspective and view the world from the point of view of our customers.

But for all kinds of digitalization, customers still need and request sound, solution-oriented personal advice with added value. In short, they rely on strong points of contact with sales expertise. We are challenging ourselves to meet these expectations and we will deliver. In order to meet the requirements of the sales operations, we are currently working on digital sales tools and we will implement internet-based e-commerce very soon.

We are focused on markets and are developing complete solutions.

Meet the requirements

We keep track of our customers. Our industrial customers are relocating their capacities to regions in which we are currently expanding our presence. We are establishing new production capacities in the US, Eastern Europe and Asia, thereby reducing delivery times. Globalization in industrial sales means that we have to focus on the markets, develop relevant lubricants and provide a one-stop service for complete solutions. This also means that the global and local sales networks will undergo organizational changes and adjustments. This will enable us to react to customer requirements with increased speed and flexibility.

The broader the range of customers, the better.

In order to provide the best possible support to our major customers, not only do we have to offer them the best products and services in the world, but we also need to speak to them with one voice. We therefore require a key account management team that would be responsible for coordinating what we have to offer to our customers across products and regions. It would then bundle this up and provide a one-stop service for complete solutions. We alone are able to supply almost all lubricants, understand the correlations and know which operating fluids go together. This expertise forms an essential part of our services.

Our steel team in China has significantly increased sales revenues and gained market shares.

So the biggest investments in sales are made in the training and knowledge of our employees. They use their expertise to develop the right solution, earning trust and creating added value for customers by helping them to increase uptime and productivity on site. The requirement to have detailed knowledge of certain industries is also key here. Our steel team in China is proof that this is worthwhile. Colleagues here were able to significantly and profitably increase sales revenues, and gain market shares. It is our aim and intention to implement this recipe for success in other industries, too, such as aerospace, the medical industry, offshore and wind energy.

Overall, we need various pillars to achieve stable growth. This is why we will operate by the motto "the broader the range of customers, the better" in the future. We are deliberately aiming for a mix of global major customers and many medium-sized customers. And regardless of the customer or industry, providing the highest quality is our top priority.

Anticipate requirements

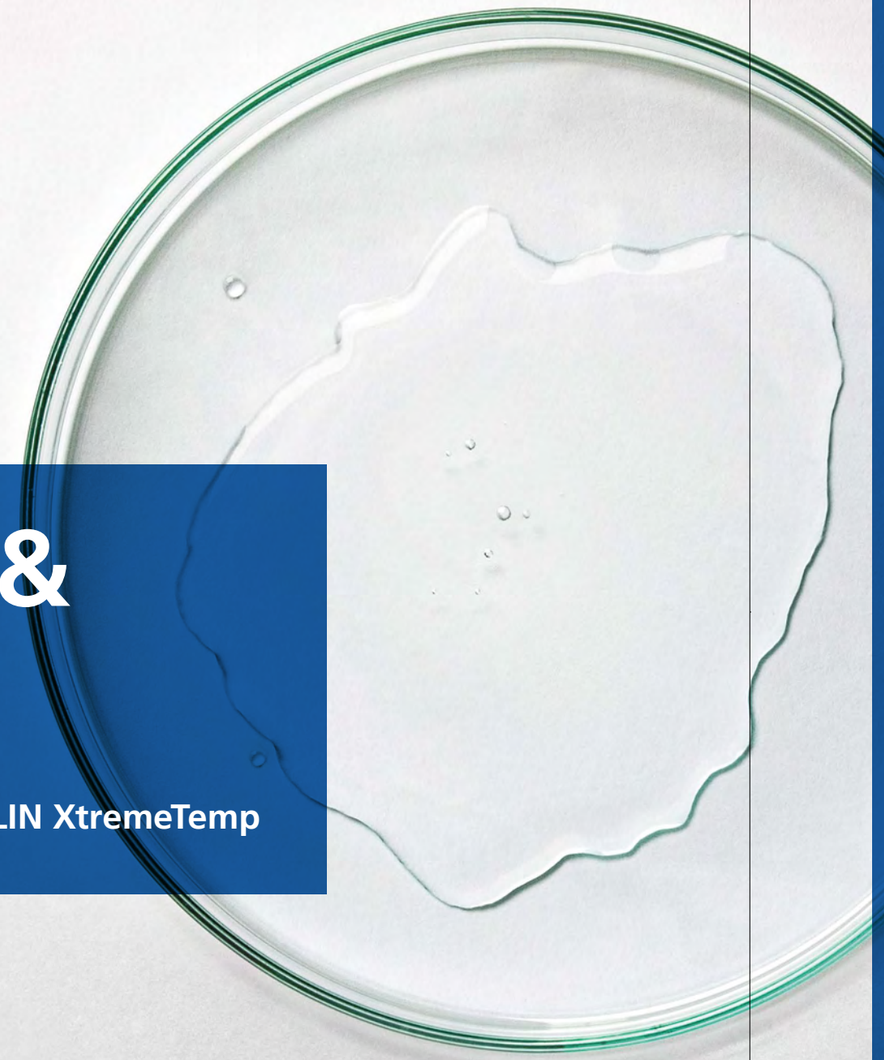
So, even from the customer's perspective, we have the right strategy in place for a successful future. We are working intensively on "talking lubricants" – with sensors and software that recognize when there is no more lubricant left. We are pioneers here. However, not everything can be anticipated. For example, what kind of place will artificial intelligence have in the industry? How will our role as suppliers change? There are still no answers to these questions, but one thing is certain: we want to develop solutions together with customers. In the future, we want to accompany them and continuously adapt our own processes to new conditions. This will enable us to help shape the path to the future. We will then be not only pacesetters, but also pioneers. ■

Lubricants in focus

Our products are often invisible at first glance. However, they can be found almost everywhere, quietly at work in the background – and have become indispensable to the industries that we supply. They have a whole host of hidden talents, standing for performance and sustainability, safety and reliability, efficiency and cost savings in even the most special applications. All over the world.

Kosher & halal
The CASSIDA FM GREASE HD 2
lubricating grease

Icy hot & robust
The hydraulic oil
RENOLIN XtremeTemp



Icy hot & robust

The hydraulic oil RENOLIN XtremeTemp

Extreme temperatures, high pressure, the highest specific loads – hydraulic systems are often pushed to the limit in terms of performance, particularly in construction machinery under various climatic conditions worldwide. Pumps, valves, components and hydraulic oils are used continuously under tough conditions. And the requirements are becoming ever more demanding: there should be a reduction in fuel and energy consumption, while performance and efficiency should increase. RENOLIN XtremeTemp has been developed for extreme operating conditions. It remains fluid, even at the lowest temperatures – and is also sufficiently smooth when it heats up. Its performance is remarkable.

100 %

better starting performance *
RENOLIN XtremeTemp enables a quicker start-up for the hydraulic system thanks to its excellent behavior at low temperatures. This makes work more effective and increases efficiency.

13 %

savings potential on fuel consumption *
thanks to a high level of efficiency, reductions in pressure losses and low fluid density.

* In comparison with traditional hydraulic oils

12 %

increase in productivity*
The machinery's efficiency is significantly improved by using RENOLIN XtremeTemp. For example, crawler excavators that use RENOLIN XtremeTemp are able to move considerably more construction material in over 4,000 working hours than other vehicles which are filled with traditional hydraulic oil in the same amount of time.

400 %

increase of oil lifetime *
Even in high ambient and system temperatures, and high humidity, RENOLIN XtremeTemp achieves a lifetime for excavators and construction machinery used in mining that is one to four times longer than that achieved by a standard oil.

65 %

less wear *
thanks to a high level of protection of the pumps and components under tough operating conditions and high pressures.

Technical performance of RENOLIN XtremeTemp 46:

- Viscosity at –20 °C: 2,150 mm²/s
- Viscosity index: ≥ 180
- Shear stability: < 10 %
- Pour point: –34 °C
- Excellent pump wear protection

Kosher & halal

The CASSIDA FM GREASE HD 2 lubricating grease

During feed and food production, the most rigorous hygiene standards apply – and sometimes even religious dietary rules become relevant. Any risks to people and animals have to be ruled out. Lubricants should therefore under no circumstances come into contact with food products. However, in the event that this could happen, there is the CASSIDA FM GREASE HD series from FUCHS LUBRITECH. The product portfolio is constantly tested and certified to the most stringent standards. And, of course, the lubricants all meet the other traditional requirements for a smooth and highly effective production process.

Less wear
The CASSIDA FM GREASE HD greases not only provide perfect lubrication, but also protect the machinery from dust or surrounding media in storage.

80 %

From 2014 to 2018, FUCHS LUBRITECH was able to increase the product series' sales figures by 80 %.

kosher, halal

Our CASSIDA products meet Jewish and Muslim dietary rules and are therefore considered kosher and halal.

ISO 21469 / NSF International H1

All CASSIDA lubricants are registered through NSF International H1. In addition, the international standard ISO 21469 certifies the manufacturing process for our food-grade lubricants, from raw material receipt to goods issue of the finished product. This enables us to offer our customers maximum safety in terms of food-grade lubricants.

Virtual development

We live in times of massive, digital transformation. The challenge of this for research and development is to find the right digital methods for our specific needs from the many possibilities. This is because data analysis, modeling and simulations do not present an end in themselves. They have to make it possible to produce new and more efficient products in shorter development times.

There is huge potential for using digital tools in development of new lubricants. They make it possible to predict previously unknown processes and properties. They thereby help not only to forecast critical operating states in devices to be lubricated, but they also make a significant contribution to achieving a deeper understanding of our lubricants. For example, in a validating laboratory experiment there is no or limited access to extreme conditions such as those that occur in real machinery. However, they can now be mapped or extrapolated using simulation methods. This enables us to adjust our products to achieve an even closer match to the requirements of our customers, which currently means above all further reducing wear and energy consumption in machinery, thereby increasing efficiency.

Another major advantage of computer simulation is reflected in the "virtual" assessment of alternative, previously unavailable raw materials, the use of which may hold promise. Expensive experiments based on the trial-and-error principle can be dispensed with and development times can be shortened.

New lubricants for e-mobility

Our customers in the automotive industry are also facing various new challenges. The transition to e-mobility is central here. The electric drivetrain will play a leading role in future transport concepts, as will the combination of electric motor and transmission. Such systems call for different lubricants than those required by a combustion engine. For example, it is possible to combine the transmission lubricant and the motor and power electronics coolant in a single product. The compatibilities with materials such as copper, but also with high temperatures that are prevalent in electric motors – due to high speeds and strict performance requirements – are particularly important here. It is vital to take into account all these conditions during the development of new lubricants.

The digital toolbox

Suitable digital methods can be used extremely profitably to complete these development tasks. They provide a better understanding of our lubricants and sometimes even predict the properties of new formulas. The impacts of these properties on the overall system can also be calculated.

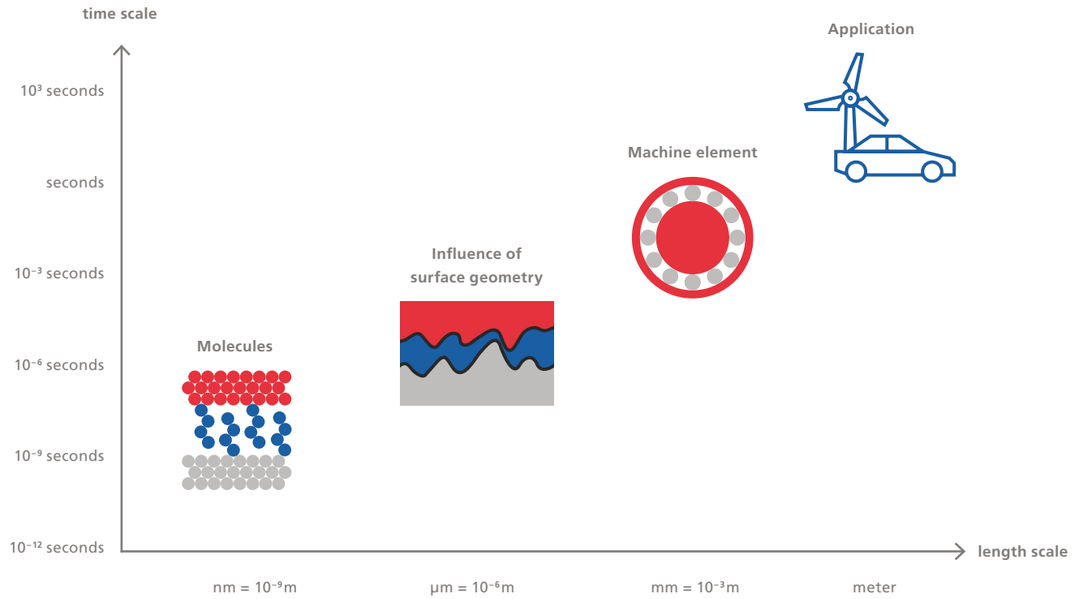
Various digital tools are used in research and development at FUCHS. These include data analysis, chemoinformatics, which is used to calculate the properties of molecules, and the design of experiments. However, alongside rapidly growing processing power, modeling and simulation methods are becoming increasingly important. This enables us to look, as though with a magnifying glass, further inside the virtual lubricant – so far until eventually we reach nano-scale, a range of a few nanometers in which molecules and atoms become visible. We are applying this approach to three different levels of variables, right down to nano-scale: on the macro-scale (larger than 10^{-3} m) we are simulating the technical unit, on the micro-scale (approximately 10^{-6} m) the lubricant gap, and at the lower end, on the nano-scale (smaller than 10^{-9} m) the molecules.

Nano-scale: the calculated additive

The nano-scale tests conducted by the research and development department at FUCHS are reflected in a current development project from the area of electric machinery: to protect against the premature wear of electric motors, what is called an "anti-wear additive" was "virtually" added to the oil-based lubricant. This additive was digitally simulated under "operating conditions." We were particularly interested here in the temperature range in which the molecule takes effect – in other words, the moment in which it reacts. However, the behavior in relation to copper was also important.

Modeling approaches of today and tomorrow

We are conducting extensive research on lubricants, across all variables and timescales: from the behavior of individual molecules within fractions of a second to predictions of properties for technical applications over longer periods. In the long term, we aim to recognize the decisive influencing variables across all these dimensions, understand the significant correlations between them and combine the associated modeling approaches in an integrated method.



For this purpose, the additive was released in a mathematical model via ab initio methods. Equations were solved with state-of-the-art computers, thereby predicting the additive's properties. This simulation not only helped us to understand the additive's reaction mode, but the digital tools also pointed out molecules with improved properties that were then synthesized using conventional methods and are now in the test phase.

Micro-scale: the simulated lubrication gap

Despite all the progress made in terms of high-performance computers, such calculations at a molecular level cannot be directly extended to our empirical world. Here, we would be talking about over 10^{23} molecules, an unimaginably large number.

Through simplified approaches to molecular behavior, digital simulations can nevertheless be completed "one level higher" – to the micrometer scale (10^{-6} m). This will enable us to describe

Digitalized lubricant development

Customer requirement

Our customers need products for highly specific applications. Our products lubricate, cool, have to work at specific pressures and temperatures – and lots more!

Digital laboratory (see box on right)

Using digital tools, we are able to analyze our existing products and raw materials even more accurately than with experiments. We can even predict the properties of new formulas before they have been manufactured.

Forecasts and models

The different digital tools lead to forecasts regarding material characteristics and models of new formulations that perfectly match customer requirements.

Test bench

Model molecules and model lubricants from the "digital laboratory" are synthesized. It must then be ensured in various qualification tests that the new development meets the specified requirements.

Production

The newly developed lubricant goes into production only after successful test runs on application-oriented test benches.

processes in the lubrication gap at the micro-scale level. It is therefore possible to make predictions regarding how our lubricants and additives affect wear and the surface behavior. And measurement variables that are difficult to ascertain in experiments, such as the lubricants' flow properties under extreme pressures and at high speeds, are also "digitally accessible."

Macro-scale: simulation at the product level

The use of application-specific optimized lubricants is crucial to ensure the reliability and efficiency of lubricated systems. Simulation at the macro-level comprises the virtual mapping of individual machine elements, from gears and roller bearings to consideration of the overall system.

Modern simulation solutions and a close working relationship with research partners make it possible to identify the relevant contact and operating conditions of various applications. With this knowledge, we can perform targeted investigations of the necessary product-specific properties using model test benches, thereby ensuring that our products meet the specified requirements.

By implication, this means that we are developing digital methods to make it possible to map and predict, for example, the wear-related behavior of our products as realistically as possible using calculation approaches. As a result, we aim to make it possible for our customers to recognize relevant correlations between fluid and application at a very early phase of their own system development in order to make sound and reliable assessments of these with which to ensure optimal coordination. These possibilities enable virtual pre-screening – and thus significant reductions and optimizations in terms of both our development processes and those of our customers.

Components of the digital laboratory

Chemoinformatics

Database analysis methods that have been expanded to include chemical structures enable a better understanding of the lubricant properties to which each raw material leads.

Data analysis

By evaluating experiments, design of experiments and the combination of both methods, we can reinforce our expertise and understand and take into account correlations and influencing variables. This helps to develop new lubricant formulations.

Artificial intelligence (AI)

Algorithms uncover cause-effect mechanisms in our material databases. These can be used to train neuronal networks for predicting material characteristics.

Modeling

Before they are actually used, materials are transferred to mathematical models. This allows to predict their behavior under application conditions specified by the customer.

Simulation

By merging data about our raw materials, we can predict how the molecules of a specific lubricant recipe behave between different surfaces (i.e. in the lubrication gap).

AI as a formulation aid

Alongside simulations, data analysis is becoming increasingly important in research and development. Assessments of completed research projects play no less of a role here than the design of experiments. With methods that combine both approaches, models can be built for new lubricant formulations and customer requirements satisfied in a shorter time.

With clustering algorithms, we can also recognize various patterns in data arising from the use of our lubricants – and access valuable information regarding cause and effect mechanisms. Once these mechanisms have been understood – and there is an understanding of the formulations used as well as the chemical structures of the raw materials – neural networks can be trained to predict certain oil properties. This is how we are implementing artificial intelligence (AI) in lubricant development and optimization.

Digitalization is a megatrend. It will continue to pick up in speed. New generations of computers as well as better and quicker algorithms will make it possible to produce lubricants that are constantly improving in quality and efficiency. Anyone wishing to set the pace in development has to make use of it. ■

Visionary investments

The right investments in the right place at the right time is a crucial factor in a company's success. At FUCHS, we do this worldwide – and have done for many years. Some recent examples demonstrating our global growth strategy.

By Christina Schneider

More flexibility and individuality in Australia

Within 18 months it was built: the new plant with quality and research laboratory in Beresfield, Australia. The 25,000 m² space was officially opened in mid-February 2018 and replaces the plant in Wickham, Newcastle, which FUCHS had operated since 1979. The Beresfield plant predominantly supplies mining, agricultural and transport markets in Australia and New Zealand. With this new plant, FUCHS is ensuring customer proximity and creating greater flexibility for customer requirements. The plant meets the highest quality, safety and environmental standards, for example through automatic high-speed filling and corrosion-resistant piping and tanks. A special feature of the plant is that 30% of its electricity requirements, roughly 155 kilowatt, are generated by its own solar panels.

Digitalization and customization in the US

Wireless sensor technology for industrial fluids constitutes a future market for our business. Products targeted at precisely this field are manufactured at Fluid Vision Technology LLC in Texas. The American company joined the FUCHS Group in March 2018, meaning that FUCHS customers will have the ability to monitor the condition of their process fluids digitally, automatically and in real time for optimizing fluid maintenance processes. This means improved performance, more uptime and reduced operating and waste-related costs. Thanks to the new specialty grease plant in Harvey, Chicago, customers in the US can now be confident that the specialty greases they require are of the exact same quality and composition as those in Europe and Asia. It covers 3,200 m² and cost around €24 million. Since 2017, it has been supplying American customers with around 30 specialty greases for the North American automotive, truck, construction, railway and off-road markets. The adjoining R&D laboratory, which features a highly specialized test facility, enables the development of customized products.

Higher quality and faster response times in Africa

In May 2018, FUCHS commissioned a new grease plant in Isando near Johannesburg at a total investment cost of around € eight million. The fully automated facility is equipped with state-of-the-art technology for producing a whole range of specialty greases. In this way, FUCHS is responding to rising demands of African customers for ever-increasing quality, improving its ability to respond on the African market and making it easier for itself to export greases to other African countries. The new facility will also allow FUCHS to meet the rising demand in the mining industry.

More than 30 years of growth in China

FUCHS has been operating its own production facilities in China for more than 30 years. In 1988, Dr. Manfred Fuchs purchased the first plant in Yingkou in the northeast of China. Then plants and facilities in Shanghai (1996) and Hefei (1998) followed. The Shanghai plant became the Chinese headquarters in 2008, at a cost of around € ten million. Five years later, a new plant was built for around €24 million in Yingkou because the old one offered no more scope for expansion. The ten-year-old Shanghai plant is now also reaching its limits. In response, and at a cost of approximately €50 million, a new plant is currently being built around 100 kilometers west of Shanghai in Wujiang, where eight highly automated filling lines, 31 blenders and 55 tanks with a capacity of between 60 and 500 m³ are scheduled to be brought on line in April 2019.

More capacity and and high levels of automation in Kaiserslautern

In 2018, FUCHS LUBRITECH in Kaiserslautern underwent further expansion with a fully automatic high-bay warehouse, two production halls and modern offices for 70 employees. The new high-bay warehouse has doubled previous storage capacities. Thanks to state-of-the-art software, it even cleans up after itself at night and on the weekend. Furthermore, the fire hazard is minimized through energy-saving oxygen reductions. Open-plan offices, a library, rest areas for employees and new rooms for the laboratory and quality control team were all constructed at a cost of €16 million without disrupting operations and with increased output. Another new production facility in Kaiserslautern is scheduled to enter service by the end of 2019.

A space for headquarters and production

Our home location is now ready to undergo the next phase of expansion. After several years of searching, FUCHS has managed to acquire two new properties in the immediate vicinity of its current location in Mannheim. This will increase the headquarters' floorspace by 25% to 135,000 m². And the construction plans for the recently acquired properties are already on the table. Once a few old buildings have been torn down, a new building will be constructed for the holding by the end of 2020, creating workspace for over 200 employees. FUCHS is also building a high-bay warehouse for packaged raw materials used in lubricant production. An existing office building will be retained and renovated. And last but not least, FUCHS will also be expanding the canteen area. The investments amount to around €50 million. And there will still be room for further growth.

Keep cool

The climate is changing. In order to become more climate-friendly, companies around the world are producing new refrigerants – all that is missing are the right refrigeration oils. At the forefront of development is the FUCHS Group.

By Stephan Weiner

“The number of refrigerants on the market is constantly rising. Companies such as FUCHS have to be quick and innovative in the development of new, compatible oils.”

Dr. Karin Jahn
CEO of the Research Council for Refrigeration Technology

Refrigerants and refrigeration oils – they come into intensive contact in the refrigerant circuit. Mixed together they are essential to the functioning of, for example, a refrigerator. In much simpler terms, this working relationship functions as follows: the refrigerant cools, while the oil lubricates and protects against wear. One problem persists from the very beginning: if the refrigerant escapes, it can have a negative impact on the climate. For decades, the search for climate-friendly refrigerants has therefore led to the development of many new products. And each of these needs its own compatible oil.

As a manufacturer of refrigeration oils, FUCHS has for decades found itself confronted by a steady stream of new developments and new legal specifications in terms of climate protection. “That began in the mid-80s,” remembers Wolfgang Bock, Head of Product Management for Industrial Oil at FUCHS SCHMIERSTOFFE GMBH in Mannheim. “Back then, the sector was facing a turning point. After CFCs were banned due to their ozone-depleting effects, alternatives had to be developed. Fluorinated refrigerants – known as HFCs – were created. They required new, customized, ester-based refrigeration oils. These new refrigerants were adopted worldwide very quickly. At that time, we became one of the world market leaders in the area of climate-friendly refrigeration oils, with an extensive product portfolio of fully synthetic polyester-based refrigeration oils.”

New refrigerants – new oils

However, another transition is already taking place. The HFC refrigerants that were introduced are being replaced by natural refrigerants such as carbon dioxide (CO_2), hydrocarbon refrigerants (e. g. propane, propene) and ammonia (NH_3). In addition, fluorinated olefins (HFO) will be used in many applications in the future. Why?

The HFCs did not do any more damage to the ozone layer, but they did have a negative impact on global warming. Their global warming potential (GWP) is high, at between 1,000 and 4,000. Fluorinated olefins have a significantly lower GWP. The existing refrigeration oils have to be tested for compatibility and miscibility with these new substances and their compounds, and if necessary, adjusted. This creates new market opportunities for lubricant manufacturers such as FUCHS.

Natural refrigerants such as CO_2 and ammonia also need an optimal refrigeration oil. “Some special products from our RENISO C range work very well in conjunction with the refrigerant CO_2,” says Wolfgang Bock and adds: “Generally speaking, you have to keep cool and maintain a clear focus to make sure that you do not lose sight of the big picture.”

The right refrigeration oil for the respective refrigerant is so important because both have a direct impact on the compressor mechanism, the “driving force” in the refrigerant circuit. A suitable refrigeration oil forms a homogeneous mixture with the respective refrigerant and provides the compressor’s moving parts with reliable protection against wear. It has to demonstrate a defined viscosity and should not be too viscous because without the corresponding fluidity, it will be unable to move properly at low temperatures through the refrigerant circuit and disturb operation of the refrigerating unit.

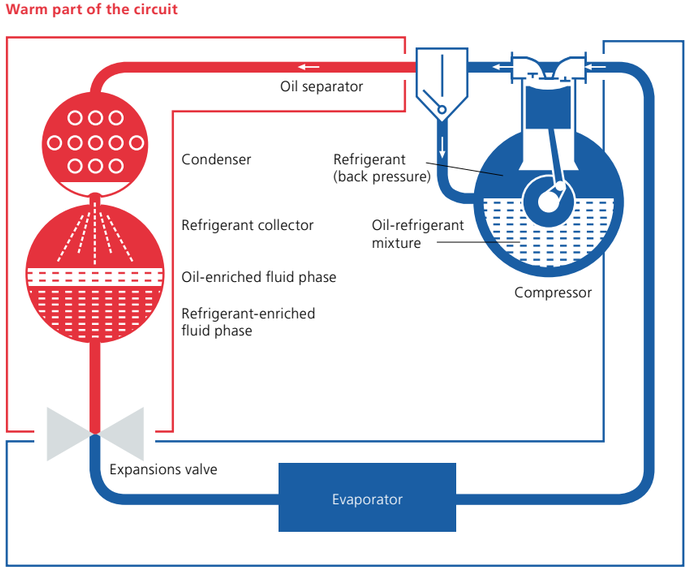
Advice for all events

The Research Council for Refrigeration Technology was founded in 1957 for fundamental developments in the area of refrigeration and was accepted into the German Federation of Industrial Research Associations in 1959. Members of the research council include plant manufacturers and operators, research institutions, industry associations, manufacturers of refrigerant compressors, components and refrigerants, as well as lubricant manufacturers such as FUCHS. The Research Council for Refrigeration Technology promotes technical and scientific research on refrigeration and heat pump technologies and their impact in practical applications. “For a company such as FUCHS, active participation in the Research Council for Refrigeration Technology is a matter of course,” says Wolfgang Bock, who is also Chairman of the Research Council for Refrigeration Technology Executive Board. “For us, it was always a matter of innovative developments. And where, if not in a research association with all those involved sitting at the same table, can future technologies be implemented quickly and efficiently?,” adds Christian Puhl, Product Manager and Application Engineer for Refrigeration Oils at FUCHS.

“The research required for refrigeration and heat pump technologies has, in particular, developed in such a way that new technologies and therefore new components and operating materials are in demand due to the current legislation. There is also a specific need for research and development in the areas of commercial, industrial and transport refrigeration, and in heat pump and low-temperature technologies,” explains Dr. Karin Jahn, CEO of the Research Council for Refrigeration Technology. “The research council members are working on these issues together within the framework of joint industrial research. Each member company has the opportunity here to introduce proposals for a specific project. The research advisory board, in which FUCHS is represented by Christian Puhl as an expert, is responsible for implementation.” The issue of refrigeration oils is an important aspect of almost all projects, not least thanks to FUCHS’ intensive involvement. This is because a refrigerant circuit does not work without a suitable oil. Refrigerant and lubricant have to be perfectly coordinated to ensure chemical compatibility. This also enables refrigeration oils to make an important contribution to climate protection and energy efficiency.

Refrigerant circuit

The figure shows the refrigeration oil in the compressor and the remaining components from the refrigerant circuit



Challenges for specialists

The requirements of refrigeration oils are therefore clearly defined, which is precisely why FUCHS is working intensively in the Research Council for Refrigeration Technology. Mutual exchanges between experts are what will drive innovation extremely fast. This is important because new developments and legal requirements that are appearing all the time call for ever-faster reactions. “The sector has for some time found itself confronted by a number of new refrigerants,” says Dr. Karin Jahn. “Companies such as FUCHS constantly have to readjust to this and develop new, compatible oils. There is no definitive clarification on which refrigerant will ultimately be used for each application.” Whether in refrigerated counters in supermarkets, in air conditioning systems or in the refrigerator, each application brings with it new requirements and can be operated using various refrigerants. The oil in turn has to be specifically adapted to requirements and refrigerants. No simple undertaking, “but we are working on it,” says Wolfgang Bock. “FUCHS is tackling these challenges and is working flat out to find new solutions.” FUCHS refrigeration oils are therefore always the first choice. ■

Next Generation

What are you working on and where do you see your work taking you three years from now? We asked this very question to four of our employees from around the world – and we received some fascinating answers. So let's jump forward in time to the year 2021!

By Christina Schneider

Celina Pfeiffer

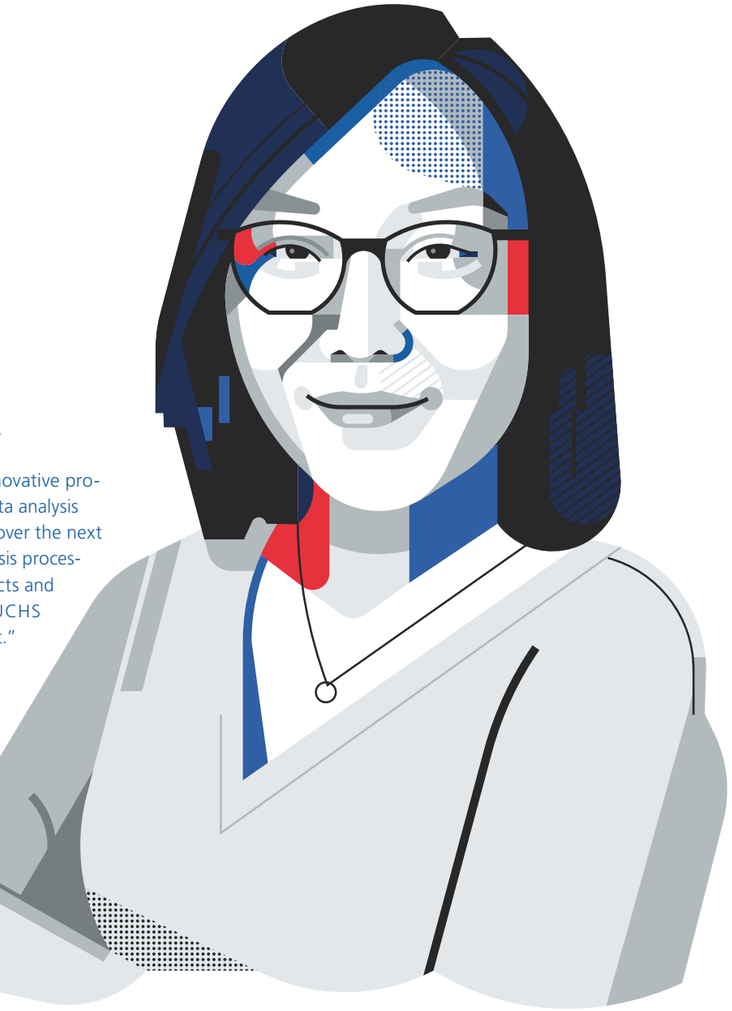
26, Internet of Things project manager at inoviga GmbH

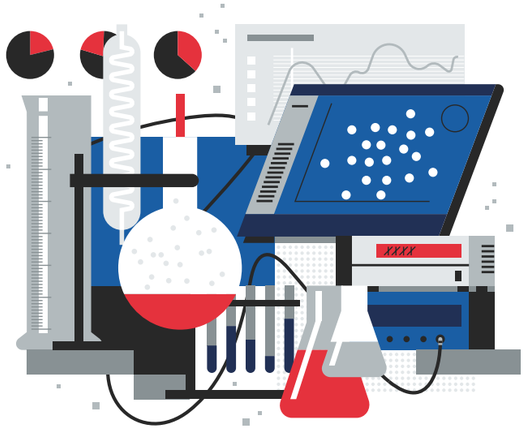
"At inoviga GmbH, the company's in-house think tank, we focus on the question of how FUCHS can help to shape the digital transformation in the various stages of value creation. Alternative or innovative digitally supported business models play an important role here. In this context, I'm responsible for project management in the Internet of Things sector. While we are still testing various initiatives with our customers at prototype level today, in three years, we as FUCHS will have certainly advanced a long way in terms of our digitalization projects: They'll no longer be in the strategic planning phase, but rather well into the operational application stage. We will then have some additional digital services in our portfolio that will open up new avenues for the interaction between FUCHS and its customers. This will result in a whole new set of challenges and responsibilities for the entire FUCHS Group. I can well imagine my own personal development running parallel to our projects, enabling me to become more involved in operational-oriented tasks."

Dr. Na Liu

31, Research and Development, FUCHS USA

"In 2021, just like today, I'll still be developing innovative products in the lubricating grease sector. That said, data analysis skills will become increasingly important here. So over the next three years, I'll be promoting the use of data analysis processes and predictive modeling, both in my own projects and those of colleagues in my team, to ensure that FUCHS is well positioned in this highly competitive market."





Dr. Scheghajegh Kord

34, global key account manager, FUCHS Germany

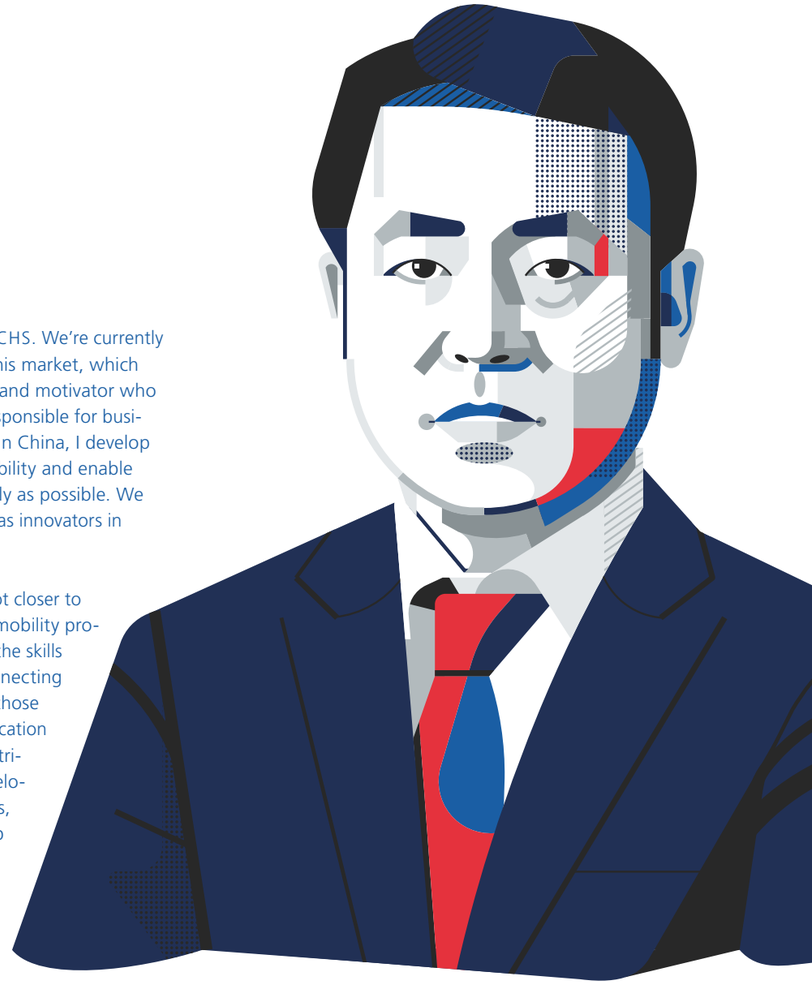
“Even now, I’m on the lookout for trends – and that’s something that won’t have changed in three years’ time. As an international key account manager, I want to identify early on what will be important in the future and promote global cooperation on this within the company. The next few years – including 2021 – will undoubtedly be dominated by the challenges in the fields of e-mobility, hybrid drives, autonomous driving and sustainability. To overcome these, it’s important for the company to be well networked on a global scale. And as a technology partner to our customers, we have to work together with them to find solutions. Another trend we will see are globally available products, something that our customers will need more and more. This is why we’ll be working on global product strategies with sustainable, holistic solutions. This is also why expanding the FUCHS network is so important for the future. Communication is key, which is why we’ll be making intensive use of new communication tools.”

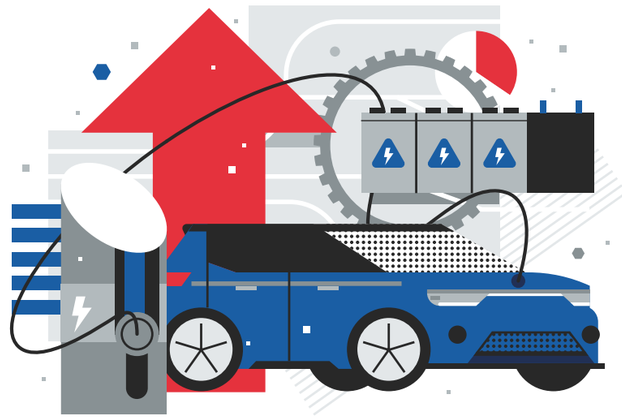
Zhao Jun,

36, e-mobility business development manager, FUCHS China

“In 2021, e-mobility will be old news for FUCHS. We’re currently in the process of positioning ourselves in this market, which is why I consider myself a “future-shaper” and motivator who helps to achieve this goal. As the person responsible for business development in the e-mobility sector in China, I develop strategies to tackle the challenges of e-mobility and enable us as a team to reach our goals as efficiently as possible. We ultimately want to live up to our reputation as innovators in the e-mobility sector.

Three years from now, we’ll definitely be a lot closer to reaching our goal of having a dedicated e-mobility product line. To achieve this, I want to connect the skills of all relevant colleagues and partners, connecting experts from lubricant manufacturers with those from e-mobility applications, R&D with application engineering, product management with distribution. The close relationship between developers and manufacturers of electric drivetrains, motors and OEMs will enable us to develop our skills quickly.”





FACTS AND FIGURES

Brief profile

Holding company: FUCHS PETROLUB SE, headquartered in Mannheim, Germany. World's largest independent lubricant manufacturer with more than 100,000 customers, including automotive suppliers, OEMs, and companies from the mechanical engineering, metalworking, mining, aerospace, power generation, transport, agriculture and forestry industries.

Founded: 1931

Employees: More than 5,000, of which more than 400 in research and development (R&D)

Locations: 58 operating companies and 33 production plants in over 45 countries

Products: A full range of more than 10,000 lubricants and related specialties for hundreds of applications in the key automotive, industrial, metalworking, special applications, lubricating greases and services categories.

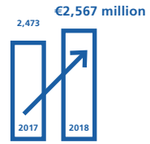
FUCHS lubricants meet the highest quality standards and stand for performance and sustainability, safety and reliability, efficiency and cost savings.

EBIT €383 million
14.9% of sales revenues

Dividend €0.95
per preference share

R&D expenses
€52 million

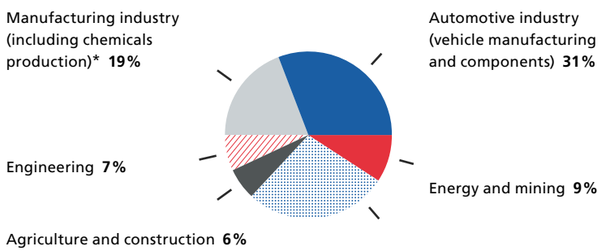
5,446 employees
(+256)



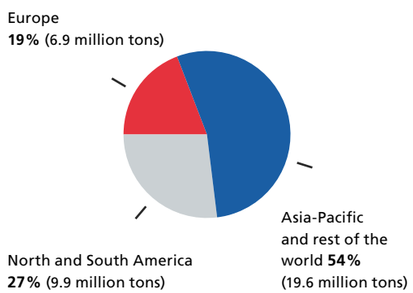
Sales +4%

Earnings per
preference share €2.07

Breakdown of Group sales revenues by customer sector



Regional breakdown of the global lubricant market



* Manufacturing industry = producer goods, capital goods, consumer goods.

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