

BEYOND SURFACES

OPPORTUNITY

Passionate: Marc Hervé consults customers in motor sports

Additive: AM is not (only) rocket science

Creative: We are here for our customers

œerlikon

“Innovation also means **thinking of things in a completely new way, approaching them differently** and being open to change and ready to grow from your own experience.”



Roland Fischer (left), CEO Oerlikon, and **Markus Tacke** (right), CEO Oerlikon Surface Solutions Division

BRINGING TOGETHER WHAT BELONGS TOGETHER

With this edition, we are celebrating a small but important anniversary: The first issue of BEYOND SURFACES was published five years ago. Two years earlier, Metco had joined the Oerlikon Group, and this magazine was created to introduce our customers to the solutions offered by the two brands, Oerlikon Balzers and Oerlikon Metco.

Since then, the Oerlikon Group has undergone significant changes. Today, it is a “Powerhouse of Materials and Surface Solutions.” Our newest business unit, Additive Manufacturing, which focuses on the industrialization of additive manufacturing methods, represents an important augmentation of the Oerlikon Balzers and Oerlikon Metco portfolio.

Innovation and change focusing on our customers

As a globally active technology and engineering group, we have a clear goal: We want to become the leading supplier of surface solutions, modern materials and materials processing. To this end, we invest a significant percentage of our sales in research and development every year — in 2019 alone, this amounted to over 120 million Swiss francs. But innovation does not mean merely investing in R&D. It also means thinking of things in a completely new way, approaching them differently and being open to change and ready to grow from your own experience.

At Oerlikon, when we talk about innovation and change, one question is key: “How can we employ our work, products and solutions to support our customers as they themselves seek to implement innovations, to achieve their sustainability goals and to become market leaders in their respective industries?”

This has also led us to the most recent change: Starting at the beginning of 2021, our three brands, Oerlikon Balzers, Oerlikon Metco and Oerlikon Additive Manufacturing, will operate under the umbrella of the newly created Oerlikon Surface Solutions division. This will be led by Markus Tacke as Chief Executive Officer.

The new organization brings together what belongs together and represents our active response to changing market conditions and customer needs. First, we want to make it easier for you, our customers, to access the full range of our products and services. And second, we are working together more closely so that we can develop new solutions more quickly in cooperation with our customers and thus respond more flexibly to changes in the markets.

Taking on challenges with passion

In this issue, I would like to particularly recommend the articles on pages 12–15 and 22, where, in this case, we are taking the magazine title quite

literally and are looking “beyond surfaces.” These stories focus on the second pillar of the Oerlikon Group, our synthetic-fiber business.

The year 2020 has brought a great deal of change. In a “Special,” we are therefore giving you a unique, insider insight into how our employees around the world have taken on the challenge that the initial months of the Covid-19 pandemic represented for our company with commitment and creativity.

Five years ago, the first issue of this customer magazine stated: “BEYOND SURFACES shows you how we tick and what our heart beats for.” Despite everything that is new and all the changes — nothing has changed in this respect. In this new edition as well, you will find insightful reports about how we passionately turn innovations into technologies, and how our customers use them to realize outstanding projects.

I wish you an exciting read, and stay healthy!

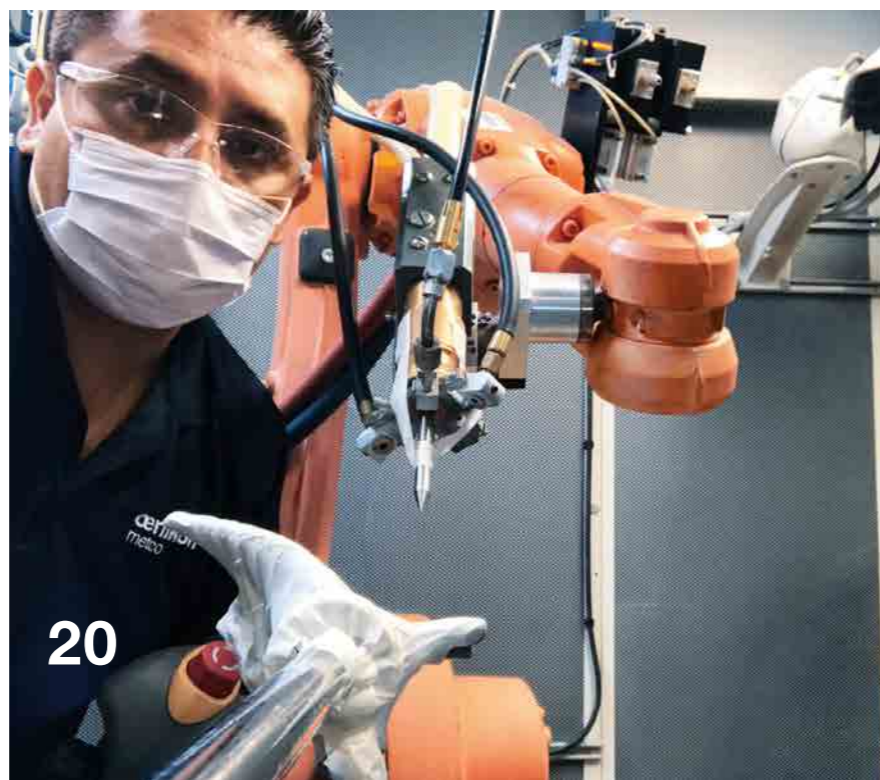
Yours,

Roland Fischer
CEO Oerlikon



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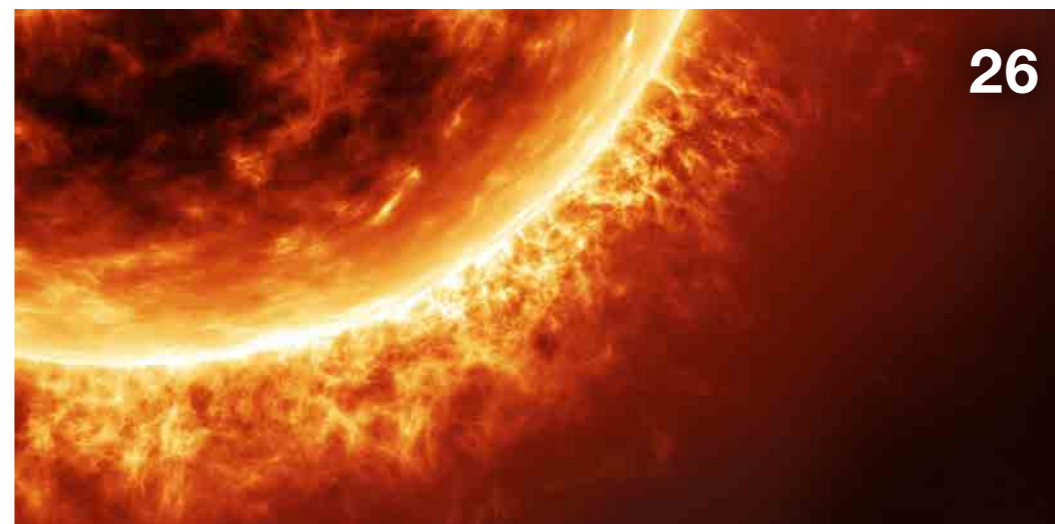


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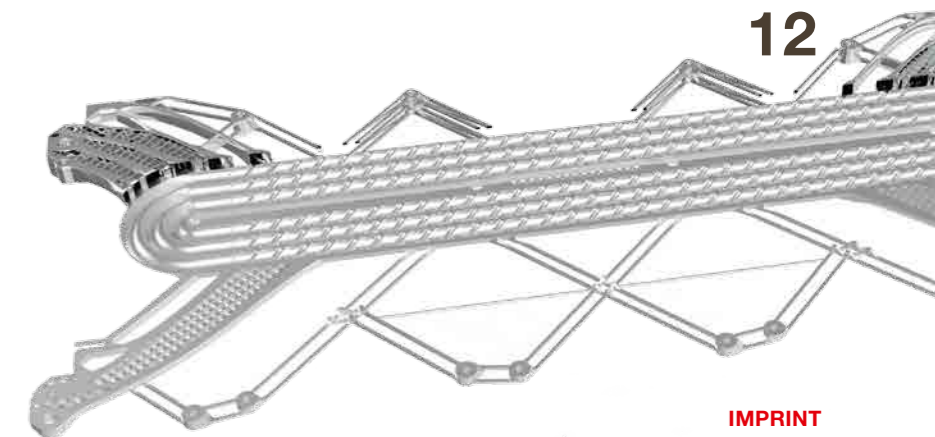
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IMPRINT

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“When you go out on the track, **you have to be sure** it’ll work.”

Marc Hervé,
Global Segment Manager Motorsports,
Oerlikon Balzers

ERRORS NOT ALLOWED

On his own time, he takes to the road in a modest family vehicle. But when he advises his customers, everything revolves around **Formula 1 racing cars, Moto-GP bikes or Formula E racing cars**, and above all the question: Which coating will make them a decisive tenth of a second faster than the competition? **Marc Hervé** drives performance in a niche and knows the secrets of the big and famous in motorsports.

In motorsports, there is only one goal: to win. Everything else is secondary. Normally, Oerlikon Balzers coatings for the automotive sector are used to reduce friction and extend the service life of engine components — with the aim of making engines run more efficiently.

In racing, it’s different, and that difference is measured in tenths of a second.

Those fractions rely on more rather than less: the aim

is not to reduce friction, but to get even more power — and therefore higher speed — out of the engine thanks to the coating.

Marc Hervé, Global Segment Manager Motorsports at Oerlikon Balzers, says: “I am not a coatings salesman, and I don’t have to negotiate the price. When a customer calls me, he either has a problem he wants to solve with our help, or he is convinced that we are the right partner for a new project. In that case, I advise, act as a sparring partner for what-if considerations, and often serve as a coach until we are sure: This will work. Because in →

“When a customer calls me, I advise, act as a sparring partner for what-if considerations, and often serve as a coach **until we are sure: This will work.**”

motorsport, mistakes are not allowed: When you go out on the track, you have to be sure it'll work.”

No fiddling around until the racing season is over

Even off the racetrack, it's all about speed. Development times of several months and long internal approvals? Marc shakes his head: “I work directly with the teams that develop the racing cars and with their suppliers. From the first meeting to the finished solution, we have to manage that in two months. We can't fiddle around until the racing season is over! That's the spirit you need to have to work in this industry. This is lived by the racing teams, by us at Oerlikon Balzers in Limoges, and even by the drivers who bring the engine parts to our customer center for coating: They often spend

the night in the car park so that they can bring the finished parts to their team without wasting time!”

Is it even necessary to ask what still fascinates him about his work after two decades? He laughs: “Imagine, I've had the same desk in the same office for 21 years! I was born and raised in Limoges, studied mechanical engineering there and got my first job with Sorevi. Today the company is called Oerlikon Balzers. Last year, we celebrated our 30th anniversary, and I celebrated my 20th anniversary at the same time — it was very emotional!”

No noise, no smell. But extremely exciting.

In motorsports, a distinction is made between “racing” and supersports. The first category includes Formula 1 — which is dominant mainly in Europe — the American NASCAR series, and rally or motorcycle series such as Moto-GP and Superbike.

“Supersports” include races with high performance vehicles used on the road, such as super or hyper cars and also motorcycles. For the past several years, races with electric drives as opposed to traditional combustion engines (Formula E, E-Rallycross and electric motorcycles) have been added to both types.

How now — Formula 1 and electric in the same breath? Marc laughs. “Yes, I know what you're thinking! At my first E-Race, my first thought was: Children's toys! I mean, they had to change their battery in the middle of the race! And then, no noise, no smell ... it was awful!” Today he is convinced that electric and hybrid drives are the future — in motorsports. For himself and his team, however, this also means that

they are developing solutions for a completely new group of customers with completely new applications: “This is extremely exciting!”

Coatings for an industry that wants to become sustainable

In general, sustainability is driving the entire industry. The question is: How do you put even more power on the track without harming the environment? When Marc started selling coatings for racing 20 years ago, that was no question at all: “Back then, we drove with twelve-cylinder engines, and it was not unusual for four engines to be worn out during a race weekend. For us as supplier that meant high volumes, many parts, low-cost coating. Today, it's completely different: the cars run with six-cylinder engines, and they have to deliver top performance →

for at least five race weekends,” he explains. So the coatings have to ensure that these engines run longer and more reliably, and get the maximum out of the allowed amount of fuel. “That’s what racing today is all about, saving cost and fuel!”

**His personal dream car:
a Nissan GTR**

Motorsports is a world of its own, but also a very small one. “We work for almost all professional racing teams, and therefore for direct competitors.

So my colleagues in Limoges and I know some of the best-kept secrets of the motorsports world. We’re very proud of this because it shows how much the motorsports teams trust us.”

Marc Hervé says of himself in all modesty: “What I do is an absolute niche not only at Oerlikon Balzers. There are not many Marc Hervés in the world.” We believe him on that without hesitation. In any case, he has managed to infect us with his enthusiasm. At the end of the interview, there is only

one question left: What kind of car does someone drive who deals with the fastest cars in the world every day, and also occasionally drives a Porsche or Ferrari on the race track himself? Marc grins: a Skoda Superb! And he puts it into perspective: “But one day I’m going to buy my dream car, a Nissan GTR, and I want to pick it up myself in Japan! Until then, I’ll have to wait a bit, because I promised my wife that we’ll pay off the house first — but somehow she always finds a new renovation project!”

**BALIQ CARBOS — even better than
Diamond-Like-Carbon (DLC)**

When racing cars and motorcycles are pushed to their performance limits, critical components must withstand extreme loads. Then the hour strikes for BALIQ CARBOS and BALIQ CARBOS STAR, two coatings that Oerlikon Balzers has developed specifically for applications with extreme contact pressure and high sliding speeds. They are therefore ideal for high-performance engines in motor sports.



Link to the video:

youtu.be/reDFar141o4

**30-year anniversary of
Oerlikon Balzers in Limoges**

In October 2019 Oerlikon Balzers celebrated the 30th anniversary of its customer center in Limoges, France, with numerous guests of honor and customers. Limoges is known as Oerlikon Balzers’ competence center for motorsports, where precision components of high-performance engines are coated to an exacting standard. Oerlikon Balzers’ success in the motorsports industry over more than 25 years is due mainly to the high-performance DLC coating BALINIT CAVIDUR. With its low friction, very high wear resistance and long service life, it has set the global standard for valve train components.

FIGHTING CARGO CONTAINER RUST

Environmental and industrial corrosive elements can shorten the useful lives of shipping containers. **Oerlikon Metco’s thermal spray technology** protects containers and their contents and reduces costs associated with liability, depreciation, repair or replacement.



To protect their contents and arrive at their destinations safe and intact, shipping containers must be able to withstand corrosive elements present in natural and industrial environments. Paint — which is susceptible to chipping during transport — cannot get the job done. But zinc, aluminum, or zinc-aluminum coatings applied using Oerlikon Metco’s thermal spray technology can shield containers from corrosion for up to 25 years.

Electric arc wire spraying eliminates the need for gases and relies only on compressed air and electricity. Because it does not leave the “greasy”

surface commonly found with hot dip galvanizing, an overcoat of paint can be added immediately without any loss of corrosion protection. The technology delivers an easy, economical coating process that can be completed without disassembling the container.

With an average coating thickness of 100 µm (approximately 1 kg of material per m² of surface area) the process doesn’t add substantially to container weight, which creates a further cost advantage. The benefits extend to the goods being shipped, as the external coating guards against damage to the containers’ contents. Oerlikon Metco technology thus supports shippers’ targets for reduced external and internal damage, lower maintenance costs, and improved operating performance.

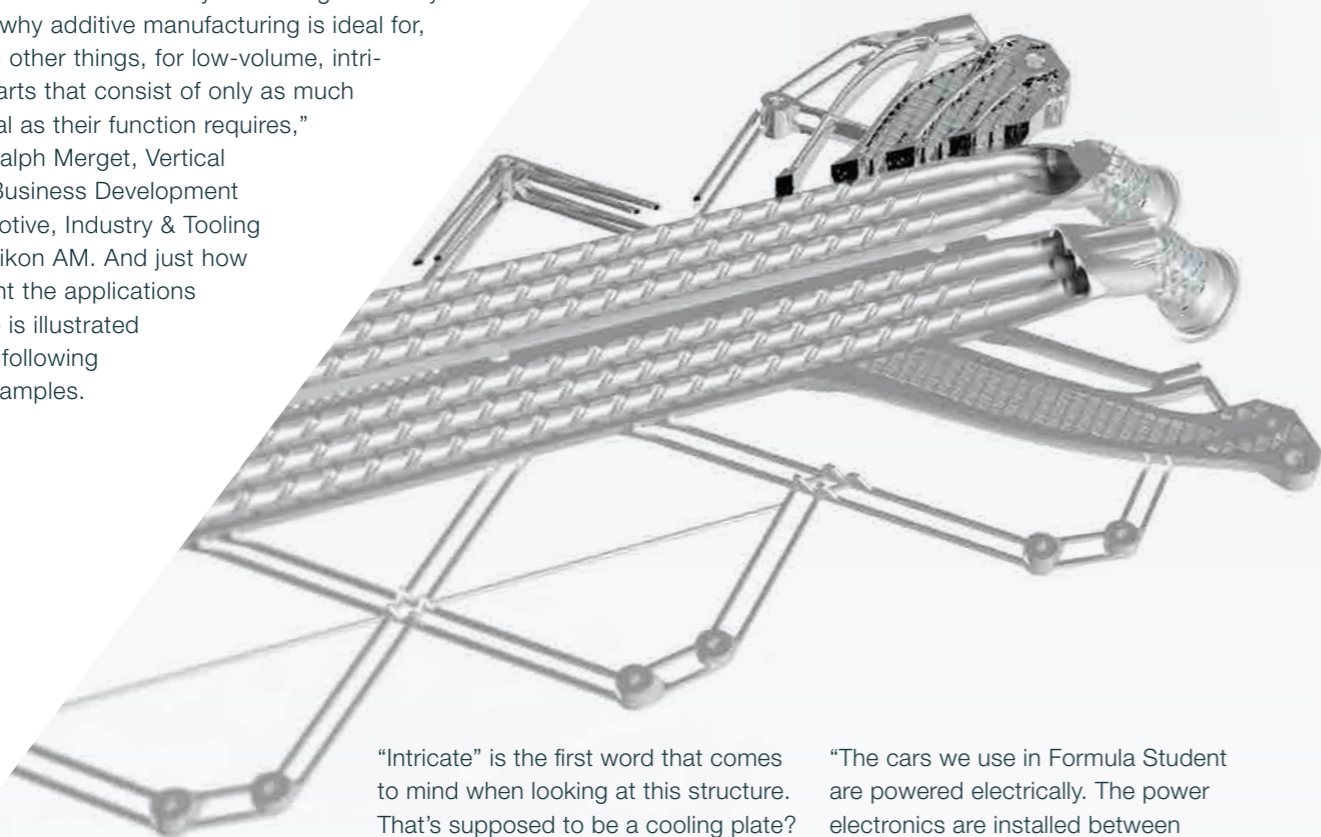
ADD, DON'T SUBTRACT!

Is additive manufacturing rocket science?

Not necessarily! For anything from race cars to pumps, additive manufacturing can optimize even relatively simple and unspectacular components to give them a positive impact on the entire system.

"We are engaged in a general rethink: we're moving away from conventional manufacturing technologies, where something is subtracted, to instead focus on adding. This requires less material, resources and time, while simultaneously increasing efficiency. That's why additive manufacturing is ideal for, among other things, for low-volume, intricate parts that consist of only as much material as their function requires," says Ralph Merget, Vertical Lead Business Development Automotive, Industry & Tooling at Oerlikon AM. And just how different the applications can be is illustrated by the following two examples.

DOUBLE-HELIX STRUCTURE: COOLING PLATE FOR A RACE CAR



"Intricate" is the first word that comes to mind when looking at this structure. That's supposed to be a cooling plate? Especially for a race car? Felix Sanke from KA-race.ing (see box) explains:

"The cars we use in Formula Student are powered electrically. The power electronics are installed between the DC battery and the three-phase motor. In the inverter, the current is

converted from direct to alternating. This generates heat that must be dissipated."

For the 2017 season, the KA-race.ing team decided to use their own tailor-made power electronics to save weight. The cooling plate was one of many components that they designed themselves. Felix Sanke says: "The helix structure increases the surface area, similar to a radiator, and in addition, a spiral flow is induced in the water. This means that many more water particles are 'whirled about' and come into contact with the boundary layer, thereby transferring heat to it. At first, we wanted to mill the part, but that proved to be unfeasible technically. That's how we arrived at additive manufacturing, where you have almost total freedom in design." With success, as it turned out: The cooling plate helped to reduce the total weight of the power electronics from 10 to 4.3 kg, which is not insignificant given the total vehicle weight of 180 kg, and its performance was also more efficient.

Peter Böttner, Business Developer at Oerlikon AM in Barleben, was impressed by the young engineers' professionalism: "Not only did they have a clear idea about what the cooling plate should look like, they also knew what possibilities additive manufacturing offers. Together, we considered what was technically feasible, and then the team gave us the final CAD data completely ready to print the cooling plate."

The KA-race.ing team was very successful with the new car in the 2017 season, when it took second place three times. The following year, the plate originally developed by Felix Sanke was optimized once again by his colleague Robin Schillinger, who further improved the cooling performance and reduced the weight by another 14%. "We deliberately went to the limit to find out what is technically possible — but it still held up," says Felix Sanke, pleased that the delicate design performed perfectly not only in the 2017 and 2018 seasons, but also in 2019. →



KA-race.ing, KIT and the Formula Student

Formula Student is an international design competition for students. Around 900 teams compete against each other in self-built race cars — internal combustion, electric and self-driving. Formula Student Germany at the Hockenheim-Ring is one of the most important of these races, with about 3,000 students from all over the world.

These next-generation engineers are concerned not only with speed, but also with the teams' and cars' overall performance. "KA-race.ing, the racing team of the Karlsruhe Institute of Technology (KIT), is the only team that has always been represented in all three disciplines," says Felix Sanke, who was Technical Director in 2018, supported the 2019 team in an advisory capacity, and is currently completing his master's degree at KIT. The plan called for participation in Formula Student in 2020 with one autonomous and one electric vehicle — until the racing season was canceled due to the Covid-19 pandemic.

www.ka-raceing.de

PUMP COMPONENTS RADICALLY RETHOUGHT: REDUCTION FOR MORE SIMPLICITY

In an example of our brand's complementary expertise, Oerlikon AM partnered on an internal project with Oerlikon Barmag, a global leader in technology developments for process plants in the manmade fiber industry. Gear metering pumps, one of the core components, are used worldwide as carriers of technology in plants in the chemical,

plastics, paint and varnish industries as well as in PUR¹ applications.

Two components for pumps were optimized simultaneously. The idea came to Klaus Lorenz, Head of Pump Design at Oerlikon Barmag, during a cross-divisional teleconference: "Colleagues from Oerlikon AM presented an AM solution to an industrial customer. That's when I had the idea that this could also improve the design of our pump components."

He found a congenial partner and colleague for this in Ralph Merget, who says: "Additive manufacturing also offers the advantage of enabling extremely fast development. Without much effort or using auxiliary tools, you just print a test part from a data set — it's 3-dimensional CAD data. This means that a new idea can be 'tried out' in a cost-effective and uncomplicated way, and you can see immediately where there is still room for improvement — until you find the perfect solution."

This procedure was also applied in the project team: The very first meeting between Oerlikon Barmag developers and Oerlikon AM technicians produced initial ideas for improvements. The first components were produced shortly afterward, and these were further optimized until finished test samples were available — all within less than two months.

Heating sleeves, which ensure a constant temperature in dosing pumps, used to consist of three individual parts that were welded together. Optimizing these in a new design would require discussion with heating and welding experts and various suppliers — meaning an enormous planning effort.

It was easier to "completely rethink" the heating sleeves and change the design from the ground up. Instead

of electrical heat, a switch was made to liquid heat, so that the flow paths could be optimized. The heat transfer now takes place over the entire surface with more efficiency. On site, only the pipes have to be connected; the complicated cabling is completely eliminated. And the new sleeve, which consists of a single component, can be fitted in just a few steps.

In addition, the team looked into the AM potential of a heating plate for a polymer gear pump that was previously made of tool steel. In the end, a complete redesign was carried out here as well. "The aim was to improve the heating performance. We did this by optimizing the heating channels. This made the plate thinner, and we decided to now make it of aluminum, as weight is also a key factor in this application," explains Ralph Merget.

Flexibility from material to production

Ralph Merget explains: "Our engineers are experts in co-engineering. We want to explain to our customers which parts of their products would be suitable for additive manufacturing. To do so, we start by screening the parts, and we have developed a query system for this. Consequently, we can make recommendations relatively quickly as to where the use of AM would be worthwhile. And then we're practically ready to start testing!"

It almost goes without saying that Oerlikon AM and Oerlikon Barmag are working on optimizing other parts as well.

Further information:

oerlikon.com/am/tooling-general-industry

¹ PUR = polyurethane

"Our engineers are experts in co-engineering. We want to explain to our customers which parts of their products would be suitable for additive manufacturing."

Ralph Merget,
Vertical Lead Business Development
Automotive, Industry & Tooling, Oerlikon AM

Complete package

Oerlikon AM offers total solutions built on our foundation of metallurgical expertise — which facilitates the selection of optimal materials — and our command of design, manufacturing and process. This scope of knowledge simplifies integration of third-party solutions and optimization of costs and benefits, all of which we can accomplish with an extremely reduced development time.

THROUGH THE CRISIS WITH CREATIVITY AND COMMITMENT

Lockdown and social distancing. Complying instantly with new regulations or working suddenly from a home office. All over the world, Oerlikon employees have proven they are capable not only of coping with a completely new situation, but of accepting it with engagement, creativity and imagination. **We are proud that our customers can rely on such a team,** and we present here a selection of initiatives from around the world.

Mexico

220 KG OF SANITIZING GEL FOR THE RED CROSS

Employees from Oerlikon Balzers Mexico supported the local Red Cross organization in Querétaro (Cruz Roja Querétaro) with a donation of 220 kg of sanitizing gel, which was distributed to the local hospitals. The Red Cross expressed their heartfelt thanks with a post on their Facebook page: "We greatly appreciate the support of Oerlikon Balzers Coating Mexico, because your donation of antibacterial gel guarantees the operation of our institution and the safety of the volunteers."



China – Germany

MASK DONATION FROM CHONGQING TITANIUM SUPER MEMBRANE LTD. CHINA

Action not by, but on behalf of, Oerlikon Balzers Germany in Bergisch Gladbach: Chongqing Titanium Super Membrane Ltd. China, a long-standing coating systems customer, donated mouth-nose protection masks to the team in Bergisch Gladbach. The donation was made shortly after Germany was also affected by the Covid-19 outbreak and as soon as

the restrictions on the export of protective equipment in China were lifted. "This is an extraordinary, wonderful gesture of solidarity from our customer, and it was possible only thanks to the long-standing, friendly and trusting partnership between us," says Product Marketing Manager Marc Griesinger.

Sweden

PROTECTIVE APRONS FOR HOSPITALS

Employees from Oerlikon Balzers Sweden set themselves the goal of producing 1,500 protective aprons a day in their free time for hospitals around the Västmanland region. Only a few days later they had already exceeded their goal and produced over 30,000 pieces.



Germany

SAFETY GLASSES FOR FIRST RESPONDERS

The Oerlikon AM team in Barleben, Germany, supported local first responders with 4,000 pairs of safety glasses made in-house with injection molding. "My wife, who works as an emergency doctor in Magdeburg, gave me the idea to support our local rescue workers with locally produced protective equipment," explained initiator Andreas Schrader. Among the recipients were facilities such as the local hospital, fire department and rescue organizations.

Brasil

PRODUCTION MATERIAL FOR FACE SHIELDS

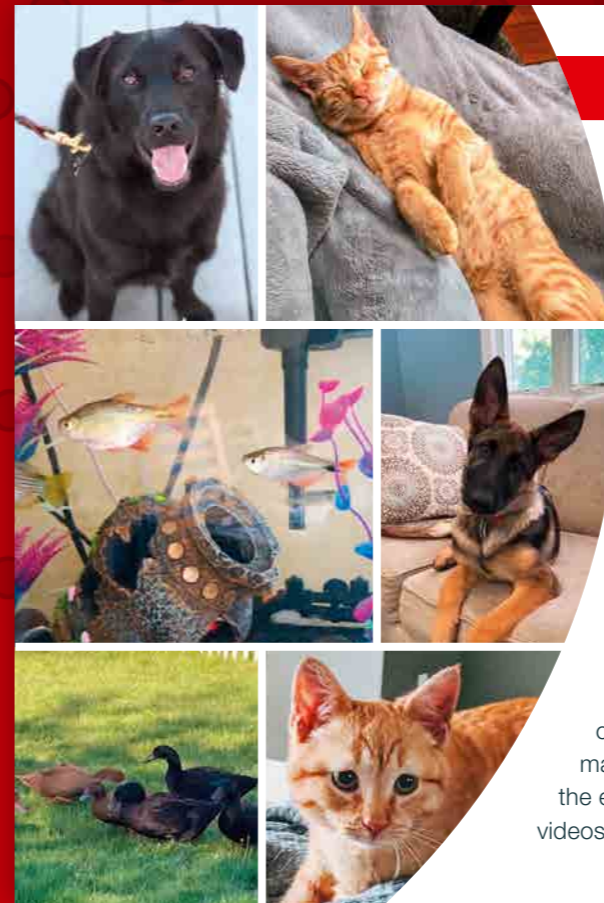
In Brazil, Oerlikon Balzers employees participated in a project initiated by IFMG, a central federal institute for science and technology, and provided production materials for the manufacture of face shields, which were distributed free of charge to hospitals. The goal of the project was to distribute a total of 16,000 face shields.



USA

WHEN YOU CAN'T WORK TOGETHER, DO THE NEXT BEST THING

When management in Oerlikon's US subsidiaries created a video to thank and encourage all coworkers, it kicked off a series of additional videos. "Many of us thought it would be great to skip the commute and work in whatever degree of casual dress we felt suitable. But we soon saw another side, and interacting via Skype just wasn't the same. We also might have felt a bit of guilt knowing that our essential personnel were still in our facilities, working hard to keep our business moving", explains an employee from Oerlikon Metco in Westbury. Thus, the essential workers created a video to support non-essential workers at home that showed how smoothly operations were running. Others produced a video encouraging masks as the new social norm, and another one featured even the employees' pets happy to have their owners at home. "The videos really helped us feel we were all together!"



Worldwide

DIGITAL SERVICES FOR OERLIKON BALZERS CUSTOMERS

With newly developed software tools and apps Oerlikon Balzers supported social distancing — and not only during the lockdown. For example, the "vConnect digital plug" equipment enables coating systems connectivity and supports social distancing by making it possible to monitor the coating pro-

cess virtually. Through our "vSHARE" app, experts can address coating equipment requests quickly, remotely and in real-time. A third tool, the "Pick-up" app, provides "front door delivery" functionality that allows deliveries to be confirmed without signing the driver's scanner.

SPECIAL OPERATION DURING LOCKDOWN



In his 25 years with Oerlikon Metco, **Juan Medrano, team leader Thermal Spray in Westbury**, has performed many service assignments at customer sites. However, he will probably not forget this visit any time soon: despite massive limitations in the course of the Corona lockdown, he was called in to provide **urgent support in the coating of a pelvic implant**.

Juan Medrano and his colleagues from the Oerlikon Metco Coating Solution Center (CSC) in Westbury provide consulting and services to customers relating to materials, coatings, equipment and applications — and how these parameters need to be linked to achieve optimal coating results. For this reason, Juan and this customer in the medical device business have often teamed up on particularly critical projects.

Because the company produces implants for the human body, the necessary requirements and approvals are regulated in the USA by the FDA¹. Not only is the implant manufacturing system prescribed in detail, the coating used on the implant is, as well. To say the least, these requirements are quite rigorous.

Well, under normal circumstances.

Not normal — and a bit scary

When the call from the customer reaches him, however, it is by no means “normal circumstances”: Juan is working in his home office like so many others; the world is in the middle of the Covid-19 crisis; and the USA has gone in lockdown. This also means that if the request for a customized implant comes now, the operation is vital and time is of the essence — a patient's life is on the line and all must act quickly to save him.

For such an urgent surgery, the company was able to quickly build a custom-made pelvic implant.

As the implant has to be coated, Juan is called upon to assist in custom programming of the robot and the Oerlikon Metco MultiCoat™ system. This implant is unique, the geometry complex and there is only one shot at getting the coating right.

Juan recalls: “It was a bit scary! For one thing, all the protective measures at the customer's premises. As the customer is in the medical field, of course, these were even more rigorous than anywhere else. And then the employee who operated the machine and I were almost the only people in a building where otherwise more than 1,500 people work!”

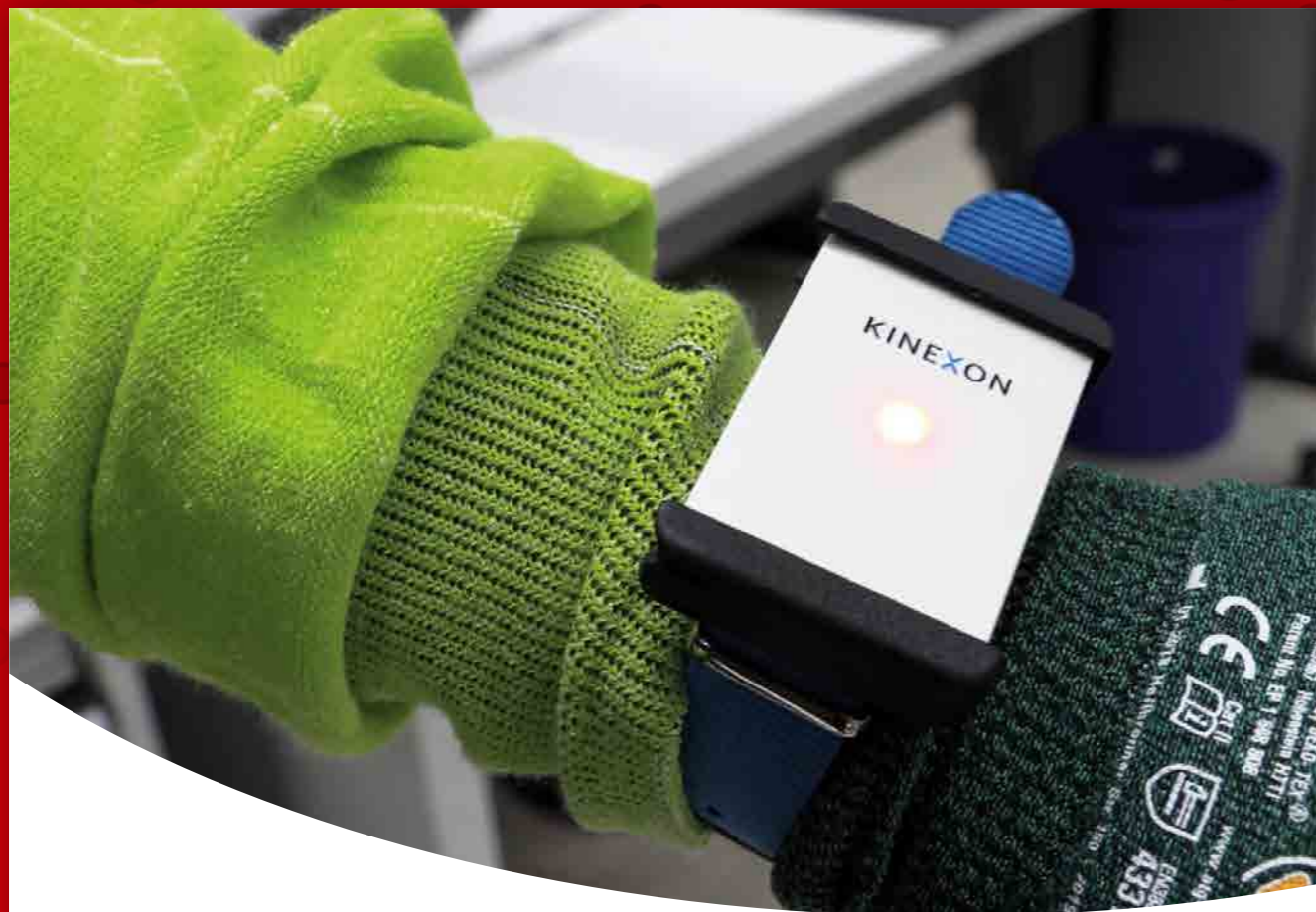
The weight of four elephants

But this job Juan will never forget for a different reason: “My biggest worry was that I had to travel from my home in Long Island, New York to the customers' site — across the state border that had been closed due to the Covid-19 measures! Of course, I had taken all the necessary protective measures, had all the necessary papers and accompanying letters with me, both from the customer and from our management — but my only thought was: If I am stopped and sent back now, the operation, which is vital for the patient, cannot be performed!”

In the end, everything went well — Juan and the operator at the customer were able to complete the job unhindered and as specified, and the implant was coated and sent to the surgeon within a few hours.

“The weight of at least four elephants fell off my heart when the job was done! I hope ‘my’ patient will soon be well again.” Juan Medrano is still relieved in his review.

¹ US Food and Drug Administration



PROTECTION WITH INNOVATIVE DISTANCE-WARNING TECHNOLOGY

Throughout the Covid-19 pandemic, Oerlikon has relied on an innovative technical solution to protect its employees from infections during operations.

Following a pilot phase at the German sites of Oerlikon Balzers and Oerlikon Manmade Fibers, Oerlikon expanded the use of the SafeZone distance-warning technology from Munich-based start-up Kinexon. The solution is now in use in Switzerland at the Oerlikon Metco Site in Wohlen and is scheduled to be deployed across the global Oerlikon network. "As a company, our top priority is to offer our employees a safe working environment," explains CEO Dr. Roland Fischer. "The Corona pandemic is presenting us with new challenges

that affect our work processes as much as our daily lives. With the transponders, we see a reliable, simple and safe solution to protect our employees in their working environment."

SafeZone allows the distance between employees to be measured with centimeter accuracy. Employees wear a sensor either on their wrist or as a tag. If two sensors fall below the defined minimum distance for a certain period of time, a warning tone sounds. By wearing a SafeZone sensor, employees can dispense

with face masks for activities that do not require close cooperation if they are not required by occupational safety law. In the event of an infection, software enables contact chains to be tracked precisely. Compliance with data protection regulations is ensured by separating the data for the numbers of the sensors from the names of the sensor carriers.

www.kinexon.com

Scan the qr-code to watch the video or visit:
bit.ly/safezone-2



OERLIKON TECHNOLOGY FOR 1 MILLION MASKS PER MONTH

In addition to its Surface Solutions business, the Oerlikon Group has another main pillar. The Manmade Fibers business offers solutions to manmade fiber manufacturers along the entire value chain, including turnkey production plants. We are very proud that our colleagues from Oerlikon Manmade Fibers played an important role in the Corona crisis. This is why we have decided to tell their story, which goes "BEYOND SURFACES", here.

By the end of March, the Business Unit "Oerlikon Nonwoven" had already begun converting its laboratory systems in Neumünster, Germany, to produce nonwovens to support small local businesses in the manufacture of oronasal masks. The laboratory system at the R&D Center is normally used solely for research and development purposes and customer trials, and in its original form was never conceived for continuous operation. Thanks to further investments in order to enable continuous operation, we can now manufacture material for more than one million protective masks a month.

Leading meltblown technology

The Oerlikon Nonwoven meltblown technology — with which nonwovens for protective masks, among other things, can also be manufactured — is recognized as being the most technically

efficient method for producing highly-separating filter media made from plastic fibers. The capacities for respiratory masks available in Europe to date are manufactured predominantly on Oerlikon Nonwoven systems.

The demand from Germany, Europe and the rest of the world has quickly secured the company a boom in orders, and Oerlikon Nonwoven has fired up the production of the machines and systems. From the manufacturing site in Neumünster, the high-tech systems are meanwhile being exported all over the world, even to Australia.

Daniel Günther, the Minister President of the Federal State of Schleswig-Holstein, has already visited Oerlikon Nonwoven's production facility in Neumünster to learn more about the technology.

Philipp Heymann, CEO of the mask manufacturer Lindenpartner, learns about the advantages of the Oerlikon nonwoven meltblown technology system from Oerlikon expert Juliane Müller-Weigel.



MATERIALS FOR GIANTS

Their fascination is inescapable: mining machines seem made for giants. Nevertheless, **ground engaging tools (GETs)** such as bucket teeth, cutting edge shrouds or track pad grousers are subject to constant impact, abrasion and gouging.

This affects their functional service life and performance and increases spares requirements and fuel costs. Oerlikon Metco's unique computationally developed materials can help improve their service life by up to 300%.

As a result of the pandemic, many mines experienced supply chain disruptions, including delivery of replacement GETs. This sparked a real interest in having the GETs last longer.

The traditional solution is to hard-face GETs using tungsten carbide overlays. But: "The high costs of hard-faced GETs, the difficult logistics of sending them for hard-facing repairs, and the 'one size fits all' approach that does not consider particular environments on site reduce the cost to value metrics and make them often not economically viable for mine owners," says Adolfo Castells, mining expert at Oerlikon Metco.

Understanding our customers' needs is of paramount importance in developing solutions designed to meet not only the application's performance and technical demands, but also the value metrics for everyone in the supply chain. There-

fore, Oerlikon Metco offers a different approach: a portfolio of hard-facing materials designed to protect GETs in different service environments. They can even be welded on-site with conventional welding equipment.

"Our unique, patented Scoperta™ rapid alloy development allows us to formulate completely new material compositions, designed to solve very specific challenges. It uses a high throughput computational metallurgical process to evaluate millions of candidate alloy compositions, and potential candidates are then experimentally evaluated. This combined approach allows us to rapidly design compositions with much better in-service properties than conventional methodologies, and to develop new materials that meet and exceed performance and cost targets for mining's most demanding applications," says Adolfo Castells.

Watch the recorded Webinar "New Solutions for High Impact and Abrasion for Ground Engaging Tools", conducted by Adolfo Castells and Gerry Manning, Industry Segment Sales Manager Mining at Oerlikon Metco: bit.ly/get-solutions

Adolfo Castells

is Global Product Portfolio Manager for industrial markets at Oerlikon Metco and has been active in the Oil & Gas, Paper, Marine, Agricultural, Aero, IGT (Industrial Gas Turbines) and Mining industry for over 40 years. He's an expert for new alloys for the mining sector and consults Oerlikon Metco's customers globally.



"Our unique, patented Scoperta™ rapid alloy development allows us to **formulate completely new material compositions**, designed to solve very specific challenges."



PLASMA

In our Spot on materials series, we have so far presented solid, tangible materials, such as nickel or titanium. This time, we focus on an “entity” (ancient Greek: plasma) without which modern surface solutions would be inconceivable.

How is plasma formed?

Plasma is the “fourth state of matter” after solid, liquid and gas. It occurs when a gas is supplied with additional energy in the form of heat. The high temperatures cause the electrons to detach from the atomic structure, which creates a mixture of free particles — positively charged ions and negatively charged electrons. The more of these present in the plasma, the more “ionized” it is. The degree of the plasma’s ionization can range from 1 to 100%.

Where is plasma found?

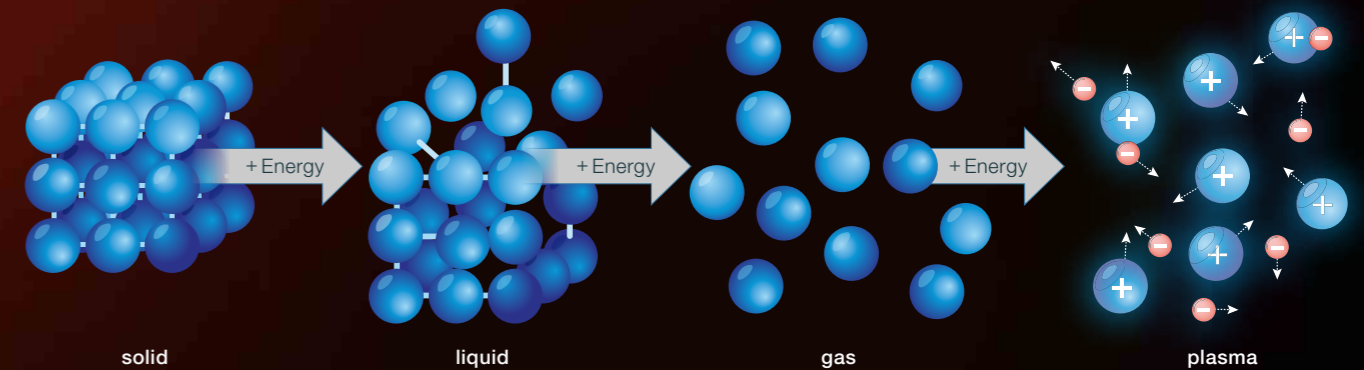
In everyday life, we rarely observe plasmas, but this state of matter is very common throughout the universe. Our sun, which is millions of degrees hot at its core, consists

of plasma, as are most stars. Gaseous nebulae and interstellar space are also largely made of this entity. Plasma does occur naturally on Earth — and when it does, it is spectacular! For example, the northern lights and rays of lightning are made of plasma: With temperatures of up to 30,000 °C, lightning can locally heat the Earth’s atmosphere to such an extent that atoms are split, and we see the resulting plasma as a brilliant flash of light.

Like the other states of matter, plasma and its power have been harnessed by mankind for a number of technical uses. But, in order to be used for these purposes, the plasma must be generated artificially. The energy required for this is usually supplied by an electrically-charged gas or strong laser beams.

What is plasma used for?

Plasmas have very different natures but have this in common: they are electrically conductive and can be influenced magnetically. With their differing characteristics, they can be used for many developments and processes — including in energy-saving fluorescent lamps, in plasma displays, for disinfecting medical instruments and even for nuclear fusion in reactors.



Atmospheric plasma spraying: high pressure and high density

In most thermal spraying processes, work is carried out under normal atmospheric pressure. The coating feedstock, in the form of powder particles, is generally in the size range of 10 to 100 micrometers. This is melted in a narrow plasma jet (6 to 10 mm in diameter) and sprayed onto the surface to be coated. The temperature of the plasma can reach up to 20,000° C, which is equivalent to the surface temperature of our sun! This makes it possible to melt any material. By precisely balancing the properties of the plasma and the material, the particles are brought to their ideal temperature and speed to achieve an optimal coating result.

The plasma generator consists of a narrow nozzle, or anode, through which gas flows continuously, and an electrode or cathode that is concentrically located within the nozzle. The positively charged nozzle and the negatively charged electrode form an electrical couple, thereby ionizing the flowing gas and converting it into a plasma. The coating feedstock material is then injected into the plasma, where it melts and is propelled to the surface to be coated.

“Plasma is very efficient in generating this high heat because all the electrical power is converted into heat.

Oerlikon Balzers and Oerlikon Metco use plasma for surface coating. “Scientifically speaking, we are dealing with the same thing — plasma research. But when it comes to applications, we are working at the two ends of the plasma spectrum,” agree the materials scientists Alessandro Zedda (Oerlikon Balzers) and Alexander Barth (Oerlikon Metco).

We cooperate with partners and universities in plasma coating research, and the findings are incorporated into new products from Oerlikon Metco on an ongoing basis,” explains Alexander Barth.

PVD coatings: low pressure and low density

For high-quality, ultra-thin PVD coatings, the plasma is generated by evaporating atoms from the metallic target. Ions are then formed by separating electrons from the atoms. These ions are attracted to the substrate to be coated (this can be a component or a tool) by the application of an electrical voltage. They strike the substrate with high energy, diffuse on its surface and combine with each other to form a thin, dense coating. To prevent them from colliding with air molecules during their “journey”, a high vacuum is created.

The generation of plasma requires a large amount of energy — in the form of high voltage up to several hundred volts. The coating quality depends not only on the choice of target material but also on the voltage and the energy of the plasma. “The design of plasma sources is very important for the quality of the resulting coatings. That is why at Oerlikon Balzers, we are engaged in constant research to improve both plasma sources and the resulting coatings,” explains Alessandro Zedda.

TURBO-CHARGED INNOVATION WITH SUSPENSION PLASMA SPRAY

How can the thermal limits for thermal barrier systems be increased? Oerlikon is developing solutions with customers **that advance turbine engine efficiency.**

Turbine engine efficiency depends on thermal efficiency: the higher you can raise the temperature in the hot section of the engine, the better your fuel efficiency. That's why turbine engine manufacturers want to turn up the heat in new engine designs.

Thermally resistant coatings applied through thermal spray technology make it possible to turn up the heat to temperatures that, without these coatings, would melt turbine blades. But withstanding the higher temperatures being targeted for engines today requires coating materials of very fine powders — those with particle sizes $3\mu\text{m}$ and lower, including submicron scale — to produce new, advanced coating microstructures.

As such, cost-effective solution alternatives to traditional surface engineering processes used by aerospace engine manufacturers are needed to deposit more advanced thermally resistant coatings. "A coating structure made from much finer building blocks enables development of new coating structures with advanced functional properties," says Applications Segment Manager Jim Girgulis. "You could develop coatings

that are harder, more corrosion resistant, less permeable, or more strain tolerant. The capability also allows you to apply materials that have the right composition for their intended environment."

The catch is that these materials are too fine to be sprayed as dry powders. There are also health risks associated with the inhalation of these very fine powders, so special handling is necessary to protect against inadvertent inhalation.

The answer is Suspension Plasma Spray (SPS), which is a new thermal spray process for producing coatings using these very fine powders. The key difference is that rather than feeding the coating material as a dry powder, these very fine particles are suspended in a liquid (usually an alcohol). This is quite a challenge, as the suspension must be homogeneous and well-dispersed; in addition, it must achieve certain viscosity levels to meet feed consistency and spray quality requirements. Oerlikon is pioneering liquid suspension-based thermal spray technology that meets new application requirements and complies with health standards.

Chris Dambra, Head of Coating Solutions Americas, says that Oerlikon offers customers "the ability to bundle the equipment, material and application to offer a package that's tailored to their needs and attractive because of the unique microstructures that can be created."

SPS technology has the potential for applications beyond turbine engines. SPS solutions are being tested and evaluated in aerospace, semiconductor, electronics and other industrial applications. "As node size goes down in semiconductors, coatings on equipment used to produce these chips need to have higher performance — defined by smoother coatings with less porosity," Jim Girgulis says. "SPS technology allows us to make a leap forward in terms of producing smoother, denser, more erosion-resistant coatings with better dielectric properties." Further opportunities exist for applications in the manufacture of fuel cells, medical implants with coatings of biocompatible materials, and electrical elements in heaters, insulators and electric vehicles.

Oerlikon Metco solutions cover the entire suspension spray process, from our new suspension feeder to hardware that converts spray guns to enable them to spray suspensions. We're also expanding our portfolio of suspension and suspension-ready materials with excellent dispersion characteristics. Our team is available to launch programs for the custom development of new materials. For further information, contact your Oerlikon Metco account manager.

LEAD-FREE

For perfect results:
Ingenious combination
of tool and coating.

The future is lead-free —
at least as far as brass and
copper materials are concerned.

This is leading to **completely different material properties and behavior** during machining. The automotive industry, among others, is noticing the effects. In their search for new solutions, manufacturers are being supported by innovative companies such as **Werkö, a German manufacturer of precision cutting tools, and Oerlikon Balzers.**

It all began in 2013, when a new EU drinking water regulation limited the lead content in drinking water to 10 micrograms per liter. Manufacturers had to use lead-free brass in the production of sanitation products to comply with the ecological rule. As a result, one of those manufacturers, a Werkö customer, saw a dramatic increase in tool consumption when producing turned parts.

Completely altered machining

“The switch to lead-free brass resulted in four times higher tooling costs, long cycle times, tool breakage and a lot of scrap for our customer,” explains Vicente Madrid, product manager and team leader for direct sales at Werkö. The lead that had been eliminated had previously made machining and chip breaking much easier. In addition, some lead-free material substitutes increase tool wear through material smearing and produce long, winding chips, which impairs process reliability. “This changes the machining process completely,” says Vicente Madrid.

Challenges for the automotive industry

Manufacturers in the automotive industry also face the same problem, albeit for different reasons. In many countries, RoHS¹ or similar directives restrict the use of lead in electronic equipment or components. And the ELV Directive² 2000/53/EC on end-of-life vehicles allows an exemption for copper alloys containing a maximum of 4% lead only until July 2021. This means that industries are increasingly faced with the challenge of machining lead-free or low-lead copper. At the same time, demand will grow rapidly due to e-mobility — from only 185,000 tonnes in 2017 to 1.74 million tonnes in 2027, according to one study. The reason: e-vehicles, including hybrids, require up to 3.5 times more copper than cars with combustion engines, and e-charging stations also need copper for contacts and connections.

Partnership provides a solution

After intensive testing in its own application center, Werkö developed a successful solution for its sanitation products customer. The solution is

based on a special tool with a sophisticated geometry and spiraling. The coating was also tinkered with, because classic PVD coatings were unable to improve the results. But the use of BALINIT HARD CARBON from Oerlikon Balzers, a long-standing partner of Werkö, led to success on the second try. The combination of the special tool developed by Werkö with the BALINIT HARD CARBON coating solved the customer's problem — and both tool costs and cycle times were once again within reasonable limits, as before.

This success is a confirmation for Rico Fritzsche, Segment Manager Cutting Tools at Oerlikon Balzers: “We have been gathering valuable knowledge about the machining of lead-free materials since 2014 in partnership with companies and within the research group.” And Edda Enders, commercial director of Werkö, is also satisfied, although she emphasizes: “There's no one-size-fits-all solution for cases like this. Each need is different, and ultimately it's small details that will determine performance.”

Werkö GmbH

- › Ilmenau, Germany
- › 74 employees

Werkö is a leading supplier of precision cutting tools for metalworking and last year moved to a new location with almost double the production floor space. The company is part of the global TDC Group, which has sites in China, USA, Mexico and Brazil.

www.werkoe.de

BALINIT HARD CARBON

This carbon coating is chemically inert and prevents built-up edge formation and sticking. Moreover, it restores chip flow and is also suitable for dry machining thanks to its high hardness (5,000 HV) and low friction coefficient. Three options are available, with different coating thicknesses depending on the application, as well as customer-specific pre- and post-treatment, which further optimize chip flow and cutting pressures.

www.oerlikon.com/balzers/balinit-hard-carbon

¹ RoHS = Restriction of Hazardous Substances Directive (European Union)

² ELV = End of Life Vehicles Directive (European Union)

QUITE A BIT OF FRICTION POTENTIAL

In one of the first physics lessons at school, we learned: When there is motion between two bodies in contact, friction occurs. Scientists study **how this effect can be utilized — or avoided**. Coatings play a decisive role here.

When we rub our hands to warm them up on cold days, this sliding friction is definitely desirable, and without the static friction between the tires and the road, a car would not be able to drive around a bend. Less pleasing, however, is rolling friction, which hampers smooth progress on straight sections.

Frictional forces — whether desired or not — counteract the motion of two bodies and inhibit or even prevent it. The cause lies in their surface properties, because even if a microscope is sometimes required to see the irregularities, apparently smooth surfaces are still rough and “get caught” on each other.

Less friction = lower costs and less CO₂
There is a fundamental relationship between friction and wear. Consequently, components’ performance and service life depend decisively on their frictional behavior.

According to the German Gesellschaft für Tribologie (GfT, Society for Tribology; www.gft-ev.de), friction and wear in industrialized countries causes annual losses of 2–7% of the gross national product. And a study published last year by the GfT concludes that in the mobility sector in Germany alone, almost 22 million tonnes of CO₂ could be saved by 2030 by reducing friction.

Minimizing wear through coatings

Design engineers try to minimize wear caused by friction by optimizing the design of components. Other important factors are the material composition and lubricating media, such as oil, grease or water. It is often even more efficient to coat component surfaces:

- › The SUMEBore coating technology developed by Oerlikon Metco ensures lower friction, increases corrosion resistance and reduces wear in cylinder bores in combustion engines. This allows fuel savings of 2–4%. Oil consumption is reduced by up to 30%, and in locomotive diesel engines, that can rise to 75%.
- › Compared to conventional solutions, coatings from Oerlikon Balzers reduce friction in race car chassis front suspension tubes by up to 20%.
- › PVD coatings from Oerlikon Balzers on valves for the oil and gas industry reduce the friction coefficient by up to a factor of five compared to steel (COF: ~0.05).

The coatings lower the friction torque in water and gas as well as at high temperatures.

- › Ball-joint steering assembly components are subject to severe corrosion and wear. Nevertheless, they must exhibit excellent friction and sliding properties. BALITHERM IONIT OX coatings offer improved surface hardness, wear and corrosion protection and are an environmentally friendly alternative to processes such as hard chrome plating and salt bath nitriding.
- › Cutting tools coated with solutions from Oerlikon Balzers allow significantly higher processing speeds. This reduces machining time and costs and significantly extends tool life.

The focus is not merely less friction, but rather targeted friction in the transmission components used in modern vehicles. Oerlikon Metco’s Friction Systems unit manufactures high-performance synchronizer ring components and modules that are treated with carbon friction linings to provide excellent ease of shifting and a longer service life. They are compatible with all common transmission fluids.

Tribology: a young, interdisciplinary science

Friction, and how to use or avoid it, has always been a focus of scientific endeavor. In the middle of the last century, this even developed into a separate branch of science that combines mechanical engineering, materials science, physics and chemistry in an interdisciplinary way: Tribology, whose name is derived from the ancient Greek *tribein* (to rub, to wear) and *lógos* (teaching, knowledge).

THE WHEEL REINVENTED

Without the **wheels, rollers and casters made by Blickle**, much more than Europe's postal logistics centers would be at a standstill. There are many other sectors in which the company, ranked third in the world market, keeps business running — including in Blickle's own injection molding production. And there, the adoption of **BALINIT CROMA PLUS** has reduced the levels of both maintenance and waste.

A rhythmic booming echoes through the Blickle factory in Rosenfeld, Germany. A wheel is moving through the test process. Firmly secured, it rolls over thresholds on a disc that is turning beneath the specimen. With a load of up to 5 tonnes, the wheel must clear the obstacles successfully many times over to pass the quality test.

As a producer of 20 million wheels, rollers and casters per year, the company manufactures tailor-made products with special properties for a wide range of applications, be it shopping carts or pallet trucks, forklifts or conveyor belts. Over 8,000 items can be ready for shipping across Europe within one day and 12,000 more require only one or two days.

"In terms of vertical range of manufacture, we have the world's largest center for wheel, roller and caster production right here in Rosenfeld," says Marketing Manager Werner Herre. "Thanks to this bundled know-how and closely interlinked processes, we can turn standard goods into a special product relatively quickly, even in small quantities."

A special product made of polyamide and TPU

A good example of the way these special products resolve challenges is the wheel innovation referred to as "POTHS", on the market since 2019. The name stands for wheel bodies made of unbreakable polyamide and a running surface of thermoplastic polyurethane (TPU) for use in hygienic applications or the food production industry. Like its sister product "POTH", it has a high load capacity (up to 550 kg) with low rolling resistance and, with its softer running surface, offers better noise damping and ride quality.

Good adhesion, but undesired side effect

During the production process, adhesive permanently bonds the wheel body and running surface. This requires the use of two injection molding machines. The first produces the wheel body, which is automatically transferred to the second machine, where a running surface is injected around the wheel body. "This way, the components adhere to each other better than if the running surface only clings to the wheel body," explains Frank Binder, designer

of injection molding tools. An additive in the TPU ensures particularly good adhesion between the rim and tire.

Adhesive residues in the machine and hot runner

This adhesion is also the source of an undesirable side effect: The synthetic material adheres stubbornly to the injection molds as well. Demolding is made more difficult, and the material residues in the mold are nearly impossible to remove. After only a few hundred shots, the mold must be cleaned — a removal and reinstallation procedure that lasts 2.5 to 3 hours. The machine and the hot runner must also be cleared of TPU with every more lengthy shutdown, says Binder: "The melted material only has a pot life of around 15 minutes, then it decomposes."

BALINIT® CROMA PLUS against sticking

Blickle was looking for a suitable tool coating to get the sticking under control and to reduce the considerable amount of work as well as the volume of residue — and found it in BALINIT CROMA PLUS. The CrN-based, extremely hard multilayer coating protects tools from abrasion and scratches and reduces adhesion of the plastic melt due to its ceramic-like properties. The formation of residues was greatly reduced and deposits could usually be removed manually using simple means without dismantling the tool. The result: significantly longer maintenance intervals and less scrap. The positive outcome didn't even require much time: "Inquiry, tests and implementation — it all took just a few months," says Ronald Baumhöfer, Key Account Manager, Plastic at Oerlikon Balzers.

Blickle GmbH & Co. KG

- › Founded in 1953
- › Over 1,000 employees

Leading manufacturer of wheels, rollers and casters with more than 17 sales companies in Europe, America and Asia as well as representatives in 120 countries.

www.blickle.de

Sticks the way it should —
but not during production.



QUANTITY WITH 100% QUALITY

Nozzle needles in diesel engine common rail systems are only a few millimeters in size, but they play a major role in ensuring smooth and efficient engine processes. **Vitesco Technologies, the drive division of Continental**, has these needles coated with BALINIT DLC. But how do you ensure that the coating quality of these small components is just right when there are several million of them?

Vehicle manufacturers and end customers expect modern engines to burn fuel as efficiently as possible — for performance, cost and environmental reasons. Only 43 mm long and just 4 mm wide, nozzle needles play an essential role in achieving this, as they ensure the correct injection of fuel from the injector into the combustion chamber. Optimal fuel atomization, which is essential for efficient fuel burning, is determined by a combination of the needle's geometry and precise manufacturing, the nozzle body and accurate spatial positioning.

Even the smallest errors can lead to total failure

The dimensional tolerances for the nozzle needles are in the single-digit μm range. To protect them from wear, Vitesco Technologies relies on BALINIT DLC from Oerlikon Balzers. The coating, which is only a few micrometers thick, is extremely hard and ensures lower friction. This allows the engine to develop its full power with less fuel consumption and lower emissions. But only if the quality of the coating is 100% right. "Even the smallest production errors can damage the opposing body in the tribological system, namely the nozzle body. This then leads to leakage, higher injection volumes, higher fuel consumption and, in the worst case, to complete system failure," explains Harald Schröder, Global Account Manager at Oerlikon Balzers.

Until now, the surface quality of the coated nozzle needles has been inspected randomly under a scanning electron microscope (SEM) by employees at Oerlikon Balzers' customer center in Stollberg, Germany. This is a very time-consuming task, and the risk of subjective results was also ever-present.

Objective measurability thanks to test algorithm

Together with the Vitesco Technologies site in Limbach-Oberfrohna and the inspection systems engineering company GPP from Chemnitz, Oerlikon Balzers initiated an ambitious technical project. "We knew where we wanted to go, but not how to get there," is how Harald Schröder describes the great challenge. And this was: How can we find coating defects in the μm range and objectively measure their frequency — and do so under series production conditions for each individual nozzle needle? The aim was to develop a fully automated system that inspects and clearly classifies several thousand nozzle needles every day with camera assistance.

After two years of close cooperation in development, the testing system was recently put into operation — and since then it has been testing a complete batch in the same time it previously took to manually check six needles. "The system detects the size and number of surface defects →

"The system detects the size and number of surface defects in a defined testing window. A test algorithm calculates a density value from this. **If a component exceeds this limit, it is sorted out.**"

Patrick Donner, Projektleiter, Oerlikon Balzers





Olaf Schulz (Vitesco), Harald Schröder (Oerlikon Balzers), and Dr. Ulrich Dietel (CEO of GPP) in front of the newly designed inspection system.

in a defined testing window. A test algorithm calculates a density value from this. If a component exceeds this limit, it is sorted out,” explains Patrick Donner, technical project manager at Oerlikon Balzers in Stollberg.

Cleanliness is the be-all and end-all

The coating quality — and thus the reject rate — is decisively influenced by cleanliness, both of the component itself and in the production environment in general. A major contribution to this is made by the special loading unit, which automatically loads the coating racks with the nozzle needles. As with the automated inspection and packaging in transport trays, this is done in a clean room that was specially built for the project because of the high quality requirements.

“We are enthusiastic about the project outcome and the performance of the newly designed test facility. As a consequence, we can now dispense with the previous in-house inspections. The cooperation of the partners involved in this project was exemplary,” states Olaf Schulz, responsible for injector project purchasing at Vitesco Technologies. The knowledge gained by the three companies during the test facility’s construction is already being used to develop a further project for injector components with similarly demanding technological objectives.

vitesco TECHNOLOGIES

- › 40,000 employees at over 50 locations
- › Headquarters: Hanover, Germany
- › Revenue: 7.7 billion (2018)

Vitesco Technologies, formerly (until September 2019) the Continental Powertrain Division, brings together the full spectrum of Continental’s drivetrain technology expertise. Vitesco Technologies is headquartered in Regensburg, Germany, and develops innovative, efficient powertrain technologies for all types of vehicle. Their portfolio includes 48-volt electrification solutions, electric drives, and power electronics for hybrid and battery-electric vehicles. Furthermore, the product range counts electronic controls, sensors and actuators as well as solutions for exhaust after-treatment.

EVEN MORE COMPETENCIES IN DIAMOND COATING



With the acquisition of D-Coat GmbH, a German technology leader in diamond coatings for cutting tools and a preferred supplier of coating applications for major airplane manufacturers, Oerlikon Balzers enlarges its portfolio of surface treatment

technologies, especially for cutting tools applied in the aerospace and automotive industries.

D-Coat is a technology leader in diamond coatings for cutting tools, in particular for carbon fiber

reinforced polymers used in structures of airplanes, ships and vehicles. “D-Coat’s technologies complement Oerlikon Balzers’ existing diamond coating services extremely well. Combining our expertise makes us a clear technology leader for these applications,” said Marc Desrayaud, Head of Business Unit Balzers Industrial Solutions at Oerlikon.

The acquisition marks the establishment of Oerlikon Balzers’ 113th Customer Center, which will be its biggest for diamond coatings, in addition to the existing centers in the USA, Korea, Germany (Erkelenz) and Luxembourg. The integration was completed in November and the center operates now under the Oerlikon Balzers brand.



OERLIKON METCO: ONE OF THE BEST PLACES TO WORK IN SINGAPORE

Best Places to Work For, an annual workplace research program, determined Oerlikon Metco to be one of the most favorable workplaces in Singapore. The program recognizes companies for their work culture, leadership and management, well-being, compensation and benefits along with exceptional human resources programs and forward-thinking workplace policies. Oerlikon Metco

made the list in part due to its proactive use of tools to help employees grow their career while improving the company’s growth.

Rakesh Pawar, Regional Head of Sales APAC for Oerlikon Metco Singapore, said: “This recognition is particularly meaningful because it is testament to our continual efforts in creating an inclusive environment that fosters respect

for each person’s unique talents, ideas and contributions. One which enables our employees to feel trusted and empowered.”

The Best Places to Work Program certifies and recognizes leading workplaces in many countries. For more information, please visit the program website at

www.bestplacestoworkfor.org

HIDDEN CHAMPIONS OF MOBILITY

Improved fuel consumption. Lower CO₂ emissions. With Oerlikon's support, innovative automotive and aviation customers meet these environmental and regulatory imperatives.

For automotive OEMs, the clock is ticking: In 2021, European companies will face fines if their fleet CO₂ emissions exceed mandatory limits. That deadline has accelerated the trend toward e-mobility, and Oerlikon manufacturing supports the innovative design behind these emerging standards. You won't see the parts we think of as hidden champions of mobility. But you'll be impressed by the mileage they get in the vehicles of the future.

Our technologies are powering e-mobility applications that enable our customers to advance new auto-

motive transmission parts for hybrid or electric vehicles. One example is our ESync, a synchronization system whose significant reductions in size and weight address customer e-mobility requirements. This is an essential step in the transition from conventional to hybrid transmissions and further advances toward electric engines. "We are making our products and services more efficient in order to contribute to the overall target of reducing fuel consumption and CO₂ emissions," says Marcus Spreckels, Global Technology Manager at Oerlikon Metco's Friction Systems business line.

A further challenge for Spreckels and his team: "We are developing and supplying standard products and services as well as tailor-made solutions reflecting the customer-specific requirements and individual objectives. We therefore cooperate with our customers on a partnership level; our global presence allows a close and trustful interaction with them."

The aerospace sector faces its own mobility pressures. Global air passenger volume first passed the 1.5 billion mark in 1999. That number doubled by 2013 and reached 4 billion in 2018. Here,

the challenge is for aircraft manufacture to keep pace with that growth in demand without causing fuel consumption and emissions to skyrocket — and that means finding ways to reduce engine weight.

"Lighter engines can improve fuel efficiency, lower emissions, and also increase the aircraft payload," explains Ad Verbeek, Head of Oerlikon Metco's Eldim Turbine Components business line. "If you look at the technology, where do we help our customers? The tolerances on the parts become much smaller, and the

parts design is different. Both changes require more advanced manufacturing technologies."

To illustrate the point, he describes one manufacturing and machining challenge that Oerlikon is addressing: the development of components that are as thin and as flexible as sheet metal — but the tolerances that have to be maintained are the narrow ones of machined parts.

Bringing solutions to market requires collaboration with the engine OEMs that develop the designs. "As manufacturing experts,

we give our customers feedback on the manufacturability of the parts," Verbeek says. "We manufacture complex parts and can do everything in-house, so customers don't have to subcontract."

This partnership gives Oerlikon an "unseen" but essential role in automotive and aviation mobility advances. The world is seeking new ways to move faster and smarter than ever, and we're here to help our customers make that progress happen.

AT YOUR SIDE

Even closer to our customers

1

NEW OERLIKON BALZERS APPLICATION SUPPORT CENTER FOR PRE- AND POST-TREATMENT IN SWEDEN

Oerlikon Balzers has opened a new application support center in Uppsala, Sweden, for pre- and post-treatment of cutting tools for the automotive industry. The facility serves as an information and consulting center for customers and a training center for new employees and apprentices.

Oerlikon Balzers' primeGear service, offered in many customer centers worldwide, reconditions high-quality cutting tools to reduce manufacturing costs for gear components and preserve natural resources. It was introduced as a cooperative research and development venture with long-standing business partners and customers.

The new location in Uppsala serves as a Global Center of Competence, where the customized surface pre- and post-treatment service will be further developed and optimized. Also, Oerlikon Balzers' employees can receive advanced training on the latest pre- and post-treatment technology.

In accordance with Oerlikon Balzers' strategy of being as close as possible to its customers, the surface treatment services provided at the former location in Uppsala (formerly Primateria) have been decentralized to the individual customer centers in Sweden. This step brings Oerlikon Balzers even closer to its Swedish customers, accelerates logistical processes and improves the CO₂ footprint by eliminating transport routes.



1 | Uppsala

2

OERLIKON BALZERS IN PUNE, INDIA: TRADITION AND NEW OPPORTUNITIES



More than 350 customers, guests of honor, and employees gathered at Oerlikon Balzers to celebrate 25 years of operation in Pune, India. The event, held in October 2019, not only commemorated this milestone but also looked to the future and the inauguration of a new forming tools center, a sign of the company's continued commitment to the Indian market.

The new production space is dedicated exclusively to forming tools and represents a substantial expansion in response to growing customer demand for innovative coating service solutions with short lead times. The production area features state-of-the-art pre- and post-treatment processes and can handle large forming tools and low-pressure nitriding for metal, plastic and aluminum die casting tools, which aligns with the increasing demand for these services in India.

During the ceremony, Dr Wolfgang Kalss, Head of Cutting Tools at Oerlikon Balzers, said: "Continuous investment in the form of new coating centers throughout India and consistently high-quality customer service have enabled Oerlikon Balzers to build a strong reputation and position itself as a leader in the coating industry. We have always deployed our latest coating technology and equipment in this country to offer outstanding products and services to our customers."

2 | Pune

OERLIKON METCO LAUNCHES DIGITAL ORDERING PLATFORM

Oerlikon Metco introduces myMetco — a digital platform aimed at making the viewing and purchasing of specific products as simple as possible. The self-service tool makes ordering and routine tasks more efficient and simplifies communication with Oerlikon Metco.

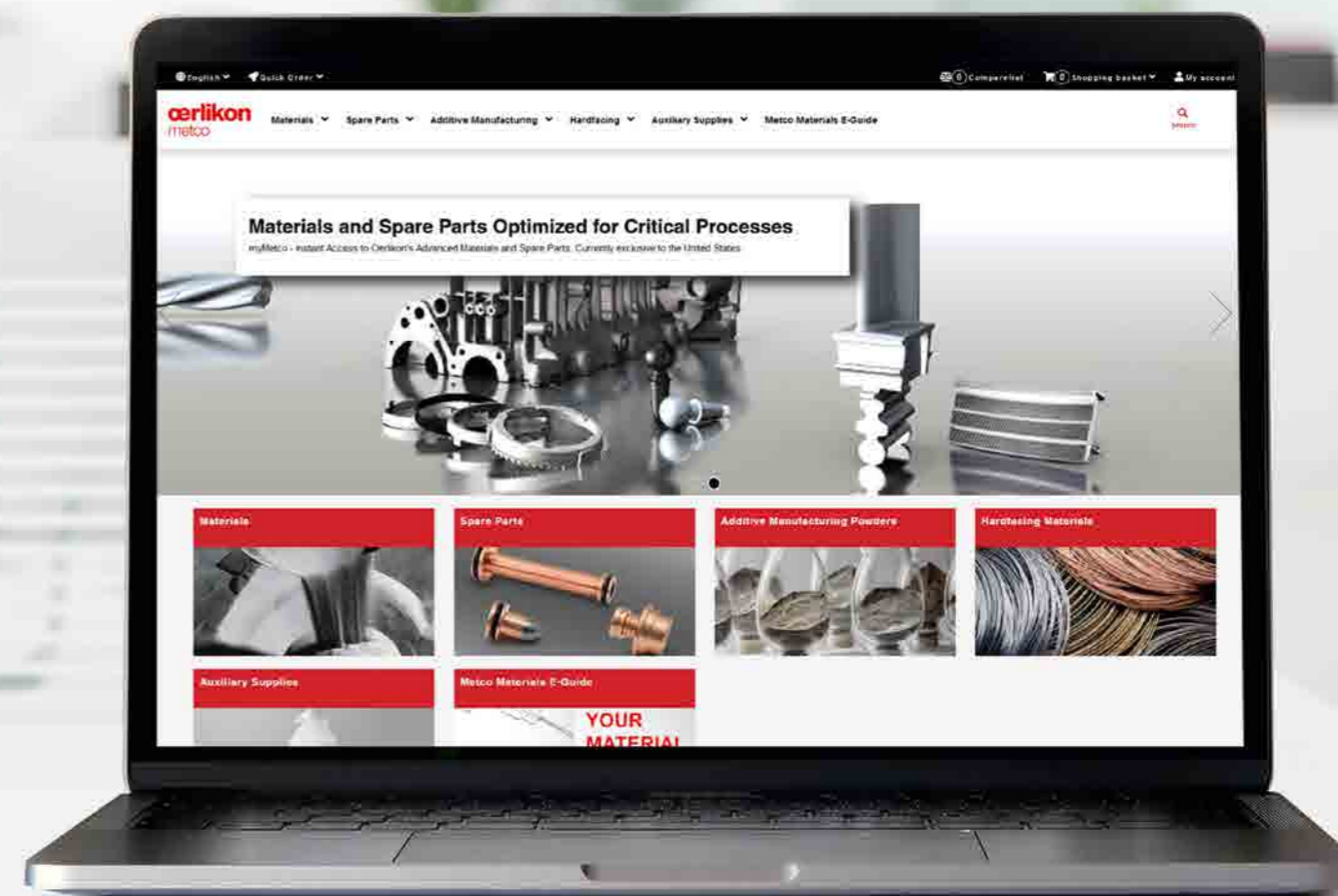
With myMetco, customers can now make orders 24/7, filter searches for specific products for

easier browsing, compare products, and track orders. The platform provides a personalized experience that the user can tailor at will so as to make reordering easier than ever, guaranteeing full product transparency with current product pricing and availability. Furthermore, access to product technical support has never been easier, so as to answer any of the customer's question or help them make informed choices.



myMetco is currently available only in the USA and will be rolled out in stages, and expanded with more materials and parts over time.

mymetco.oerlikon.com





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